Comhairle Contae
Átha Cliath Theas
South Dublin County Council

codema
Dublin's Energy Agency

SOUTH DUBLIN 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 Environment, Public Realm and Climate Change Strategic Policy Committee and the Elected Members of South Dublin 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.

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

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

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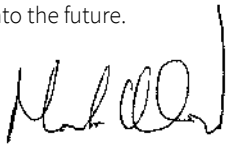
FOREWORD

MESSAGE FROM MAYOR OF SOUTH DUBLIN COUNTY COUNCIL, CLLR MARK WARD

Climate change is one of the most important issues that we as a Council have to face and I welcome the publication of the Draft Climate Change Action Plan 2019 – 2024 and look forward to engaging with the community through the public consultation process and working jointly with the four Dublin Local Authorities to deliver the plan across the Dublin Region.

The SDCC Climate Change Action Plan sets out a range of actions across five key areas – Energy and Buildings, Transport, Flood Resilience, Nature-Based Solutions and Resource Management. Targets such as improving the Council's energy efficiency by 33% by 2020 and actively engaging and informing citizens on climate change are included in the plan. This Council is a signatory to the Covenant of Mayors for Climate and Energy, to which we pledge action to support the implementation of the EU 40% greenhouse gas reduction target by 2030.

As citizens we should look at our individual impact; how we commute, our use of green products, recycling, energy use and waste reduction and water conservation. There are also industry impacts, such as an organisation's commitment to reducing waste and using energy in a sustainable way. Climate change is a global challenge, but together we can all make a difference. I would like to thank the members of the Environment, Public Realm and Climate Change SPC for their work in delivering this Plan and look forward to working with the four Dublin Local Authorities, Codema and the Dublin Climate Action Regional Office (CARO) into the future.



MESSAGE FROM CHIEF EXECUTIVE DANIEL MCLOUGHLIN

Climate change presents a unique challenge for Ireland's economy, environment and society. South Dublin County Council will lead the way by adapting our behaviour to reduce our greenhouse gas emissions, increase our energy efficiency, and promote sustainable development.

SDCC's Climate Change Action Plan sets out measures that address the long term causes of climate change through reducing our GHG emissions while adapting to its effects over the short, medium and longer terms. The SDCC Climate Change Action Plan sets targets to improve energy efficiency by 33% by 2020 and to reduce our greenhouse gas emissions by 40% by 2030. Significant work has already been undertaken in areas such as the public lighting LED programme, energy retrofitting of Council properties, flood protection and adaptation planning and the electrification of the Council fleet. Energy action plans have been prepared for key development zones such as Grange Castle Business Park and Clonburris SDZ. In addition to these ongoing initiatives, the Council has approved a new provision of €250,000 in the 2019 Budget to establish a Climate Action Fund to support the implementation and delivery of this plan. The implementation and monitoring of this plan will involve working collaboratively with our neighbouring Dublin Local Authorities, Dublin's Energy Agency Codema, and the Dublin Climate Action Regional Office (CARO). Citizen and community engagement is a key element of the Plan, building resilient communities in the face of severe weather events is an important theme in the context of adapting to climate change.

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 Councils' 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 South Dublin 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 South Dublin at a significant rate and are very likely to increase in their frequency and intensity. The number of days with heavy rainfall has increased and the amount of extreme flooding events has also risen in the last 10 years. South Dublin has also experienced extreme temperatures, as witnessed recently in 2018, with Met Éireann issuing its first ever Status Red warning for snow in February, followed by one of the hottest summers on record during June and July. All these extreme weather events clearly highlight the need to reduce the impacts that climate change is having on the environment, the economy and the citizens of Dublin.

Photo Source: Fáilte Ireland / Rob Durston

The mitigation baseline calculates the greenhouse gas emissions for the Council's own activities and also for the entire County (including a breakdown of the residential, transport and commercial sectors). It found that South Dublin County Council produced 11,800 tonnes of CO_2 in 2017 and has reduced its emissions by 17% in the last 10 years. In addition, the Council has improved its energy efficiency by 25.4% and is currently on track to meet its 33% energy efficiency target by 2020.

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

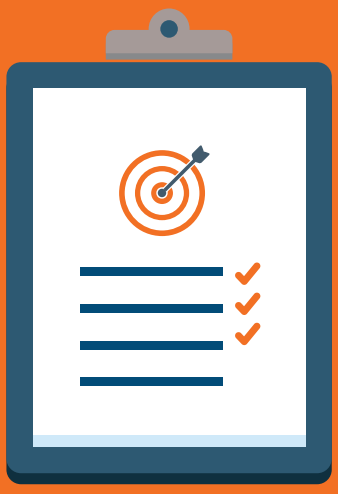
However, given that the Council's buildings, operations and social housing account for less than 3% of the total emissions in South Dublin, it highlights the need to tackle the remaining 97% of emissions produced county-wide. In recognising this challenge, South Dublin County Council will work with key 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, South Dublin 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 South Dublin 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 international best practice and regional research institutions.

ABOUT THE PLAN



South Dublin 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 South Dublin a more climate-resilient region, with engaged and informed citizens. This will be achieved by a range of ongoing and planned actions in five key areas, which will be continuously monitored, evaluated and updated to 2030 and beyond.

KEY TARGETS

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

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

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

GHG

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

OVERVIEW OF SOUTH DUBLIN

MAIN RIVERS:
LIFFEY
DODDER
CAMAC
PODDLE

MAIN RISK AREAS:

FLOODING

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

9
MAIN URBAN CENTRES:
Clondalkin, Lucan, Palmerstown, Rathfarnham, Tallaght, Templeogue, Saggart, Rathcoole and Newcastle

POPULATION
278,749

92,363
HOUSEHOLDS

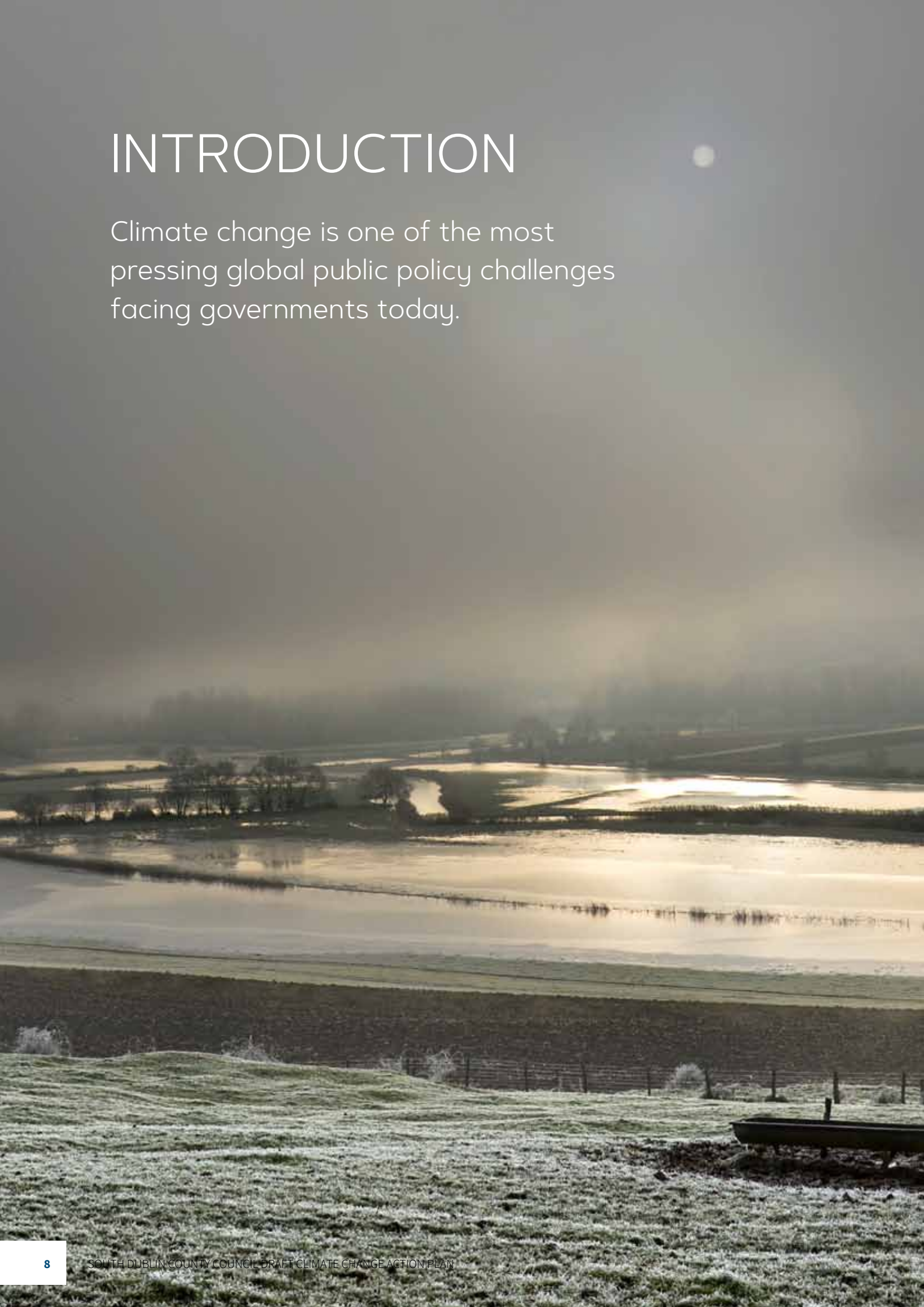
223 km²
ADMINISTRATIVE FOOTPRINT

ACTION AREAS

The actions in this plan have been organised under the action areas shown below, reflecting South Dublin 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:

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

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

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

South Dublin County Council (SDCC) 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, 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. SDCC will apply this target to its own operations but will also influence a reduction in GHGs in South Dublin, by leading by example and working with key stakeholders and decision-makers.

SDCC will also help to make South Dublin 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, SDCC 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 SOUTH DUBLIN A LOW-CARBON, CLIMATE-RESILIENT REGION

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 area
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 area a healthier and more desirable place to live and work

CLIMATE ACTION – ADAPTATION & MITIGATION

This plan concentrates on the two approaches required to tackle climate change. The first, mitigation, consists of actions that will reduce current and future GHG emissions; examples of these include reductions in energy use, switching to renewable energy sources and 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, increased resilience of infrastructure and emergency response planning. The approaches are interconnected and should be planned together.

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

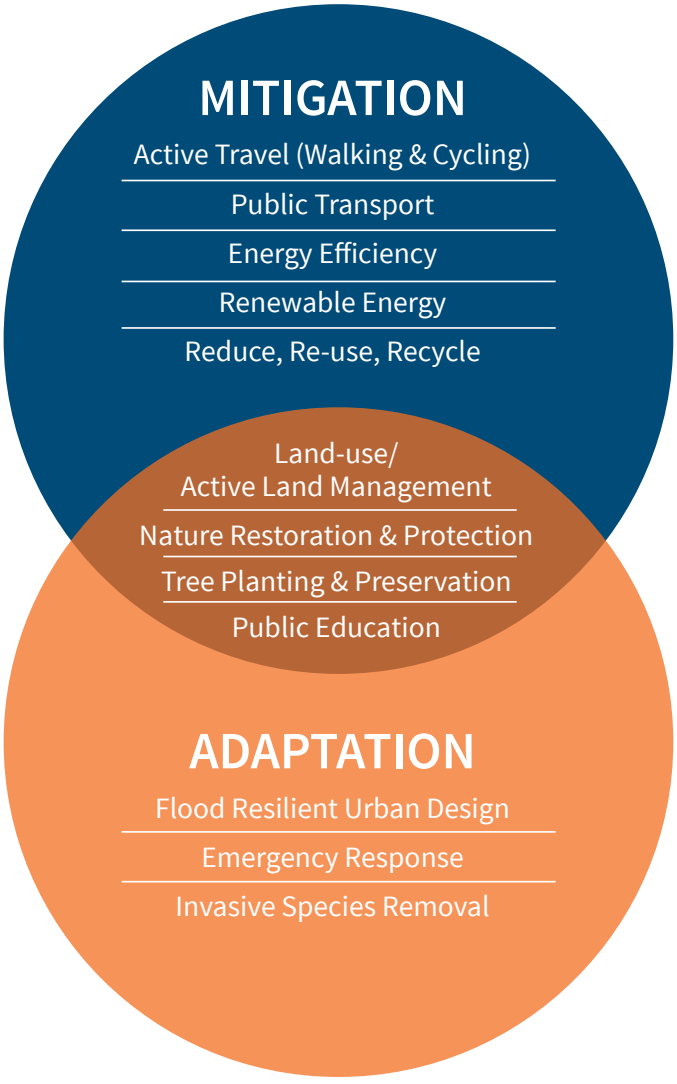


Figure 1 Examples of some Mitigation and Adaptation Solutions and their Crossovers

THE GLOBAL CONTEXT

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

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

GLOBAL RISKS & PROJECTIONS

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

In its Special Report 2018, the IPCC states:

> **Climate-related risks to health, livelihoods, food security, water supply, human security, and economic growth are projected to increase with global warming of 1.5°C and increase further with 2°C.**
> - IPCC Special Report 2018[6]

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

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

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

HEAT WAVES WILL OCCUR MORE OFTEN AND LAST LONGER

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

HURRICANES, TYPHOONS AND CYCLONES WILL BECOME MORE FREQUENT

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

THE NATIONAL CONTEXT - IRELAND

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

- A 20% reduction in non-emissions trading scheme (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.

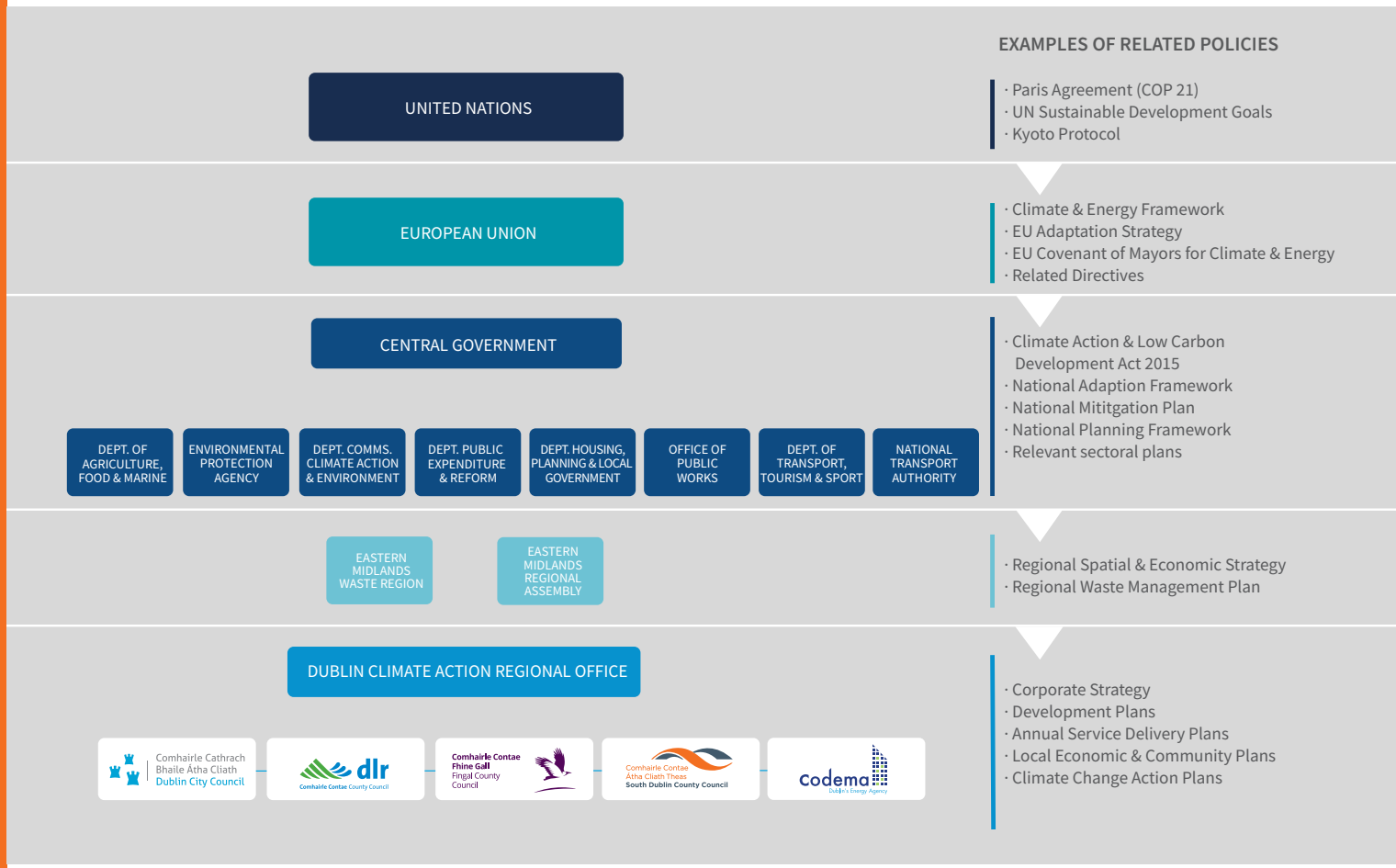


Figure 2 Institutional and Policy Context

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 (DCCAE) to develop a regional approach to climate action through the establishment of four Climate Action Regional Offices (CAROs). The proposed approach groups local authorities based on similar geographical characteristics so that they can address the threats and impacts of severe weather events and ongoing climate change risks within their region. The Dublin CARO will focus on risks particular to urban areas.

THE ROLE AND REMIT OF SOUTH DUBLIN COUNTY COUNCIL

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

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

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

A climate change adaptation baseline and risk assessment is needed to determine the frequency and intensity of extreme weather events and trends, and to highlight the sectors in South Dublin that 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 SDCC 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 SDCC, which identifies and assesses the current climate change risks facing South Dublin. 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 both SDCC's own operations and emissions for the whole of South Dublin. 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

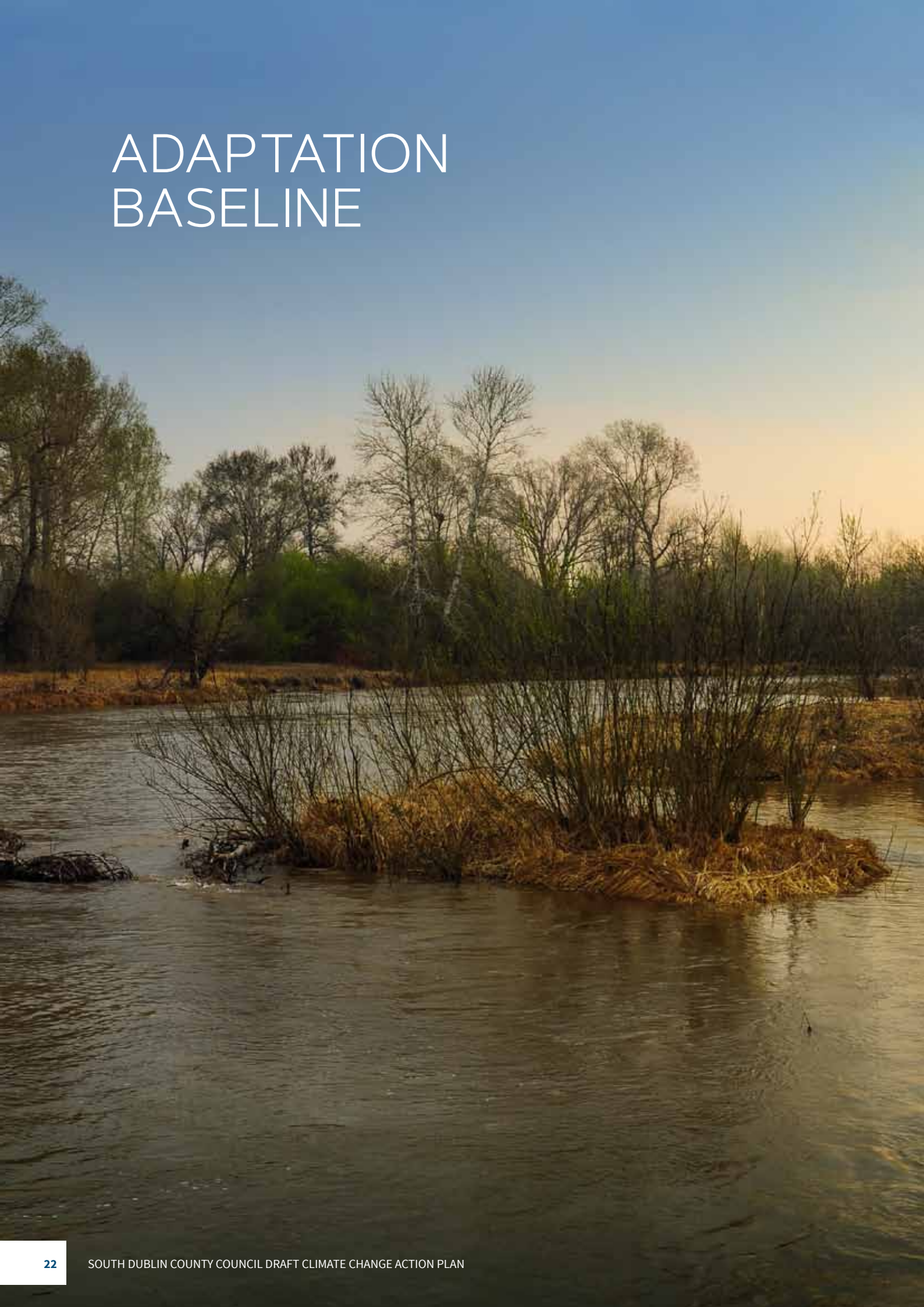
One of the biggest challenges to tackling climate change is public acceptance of the risks and the associated demand for solutions to reduce these risks through policy and services. There are two types of solutions - top-down, such as governmental policy and regulations, and bottom-up, led by citizen 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 South Dublin 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 South Dublin. These risks are assessed and addressed by putting actions in place to build a more resilient County that is robust, resourceful and is able to adapt in response to changes in climate and in times of crisis. The actions are a mix of grey and green solutions, which try to balance engineered solutions with nature-based resilience. A more exhaustive list of all actions, including adaptation actions, may be found in each of the action areas contained in this Climate Change Action Plan.

BACKGROUND AND METHODOLOGY

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

South Dublin covers an area of 223 km^2, and 42% of this area is classed as urban. South Dublin is also home to the Dublin Mountains, which are the source of multiple tributaries such as the River Liffey, the River Dodder, the River Camac and the River Poddle.

According to the most recent Census (2016)[14], the South Dublin area currently has a population of 278,749, with 92,363 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.

As explained in the previous section, this plan follows the ICLEI Five Milestone Approach. As part of the second milestone (Research), information was collected from a range of departments to gather actions in each area, through a series of meetings and workshops between Codema and staff from all internal departments of South Dublin 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 Dublin, 90.8 mm of rain fell. Significant disruption and 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	76 mm of rain fell at Dublin Airport. Severe flooding in areas, many of which had no previous history of such flooding. Over 150 residential properties were inundated, as well as commercial premises, public buildings, major roadways, etc.
Pluvial	July 2009	This was a 1-in-50-year event. Several areas within the Dublin Region were severely affected.
Extreme Cold	December 2010	It was the coldest of any month at Casement Aerodrome in 50 years. Casement Aerodrome's temperature plummeted to -15.7°C on Christmas Day, the lowest temperature ever recorded in the Dublin Region.
Pluvial/Fluvial	October 2011	This was between a 1-in-50 and a 1-in-100-year event across the majority of Dublin. Properties and roads were flooded, some electricity customers had no power supply in the County.
Storm Darwin	February 2014	1-in-20 year event, with gusts of 100-110 km/h in Dublin. Considerable damage to housing and other buildings. 8,000 ha of forests damaged. Status: Yellow
Storm Ophelia	October 2017	First storm to come from a southerly direction, with damaging gusts of 120 to 150 km/h. 100 large trees blown over in the Dublin Region and significant damage to buildings throughout the country. Status: Red
The Beast from the East and Storm Emma	February – March 2018	Met Éireann issued its first Status Red warning for snow on record. Closure of all schools in the country, many businesses affected, water and power restrictions or outages. Status: Red
Extreme Temperatures	Summer 2018	Drier and warmer weather than normal throughout Ireland, with drought conditions in many areas, including Dublin. Temperatures reached 28°C, with above-average sunshine and heat wave conditions. Water restrictions were in place for the country for most 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

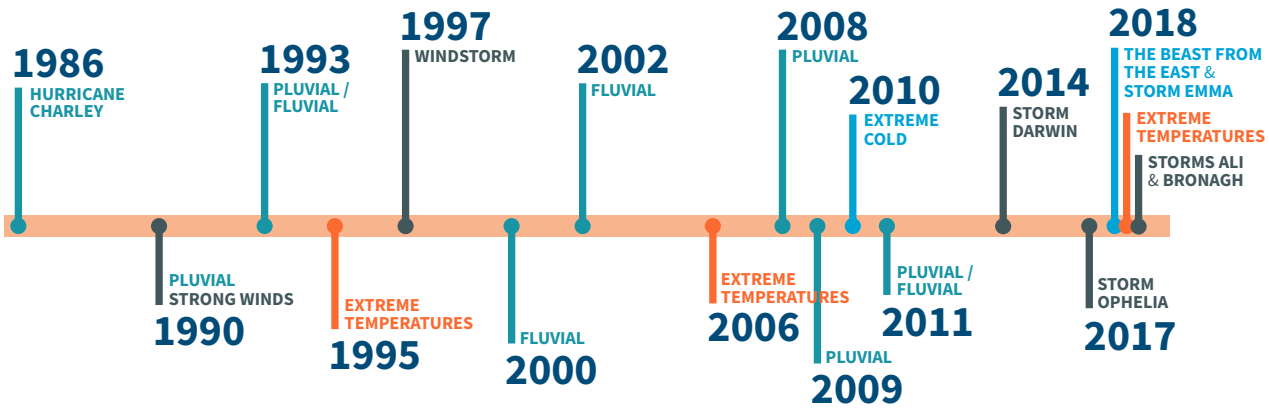


Figure 4 Timeline of Major Climatic Events in South Dublin

CLIMATIC EVENTS, TRENDS & RISKS

South Dublin's geographic and demographic characteristics make it vulnerable to certain risks. As an urban environment, the Dublin Region creates its own unique micro-climate and this can intensify current and future climate impacts. An example of this is the urban heat island effect, making it warmer than the surrounding semi-urban and rural areas. This is mainly due to heat absorption from built-up areas in the urban environment, waste heat generated from urban activities and a lack of tree cover, which can reduce temperatures in the area through shading. Flood risks are also higher in urban areas due to the amount of impervious surfaces and lack of vegetation (pervious surfaces); this results in enhanced rainwater run-off, which may result in flooding.

Risks may be categorised as:

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

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

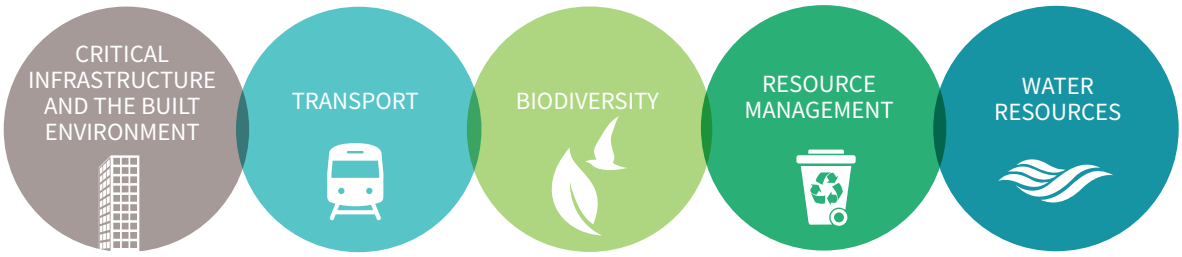
The climatic events and trends that South Dublin is facing are:

Table 2 below shows a 30-year overview of different climate variables (cold snaps, heat waves, extreme rainfall, flooding etc.), which are grouped into two types of events and trends (extreme weather events 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.

Table 2 Climate Variables Projection: 30 Year Overview

CLIMATIC EVENTS & TRENDS	PARAMETER	OBSERVED	CONFIDENCE	PROJECTED OUTCOMES
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 temperatures 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 year, 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
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
	Groundwater	High tides and the increase in intensity of rainfall are causing groundwater levels in tidal areas to flood more frequently	Medium	It has been projected that high tides will increase as sea levels rise, as will the intensity of rainfall. Both these factors will lead to an increase in groundwater flooding

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



These were chosen to mirror the action areas used throughout this Climate Change Action Plan (Energy and Buildings, Transport, Nature-Based Solutions, Resource Management and Flood Resilience), which reflect SDCC'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 South Dublin. The projected changes (Table 2) give an overview of the future risk that South Dublin 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 (least urgent):

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 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 function 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

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

BASELINE ASSESSMENT

South Dublin has experienced extreme weather events within the last 15 years; many of these are summarised in Table 1 earlier on in this chapter.

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

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

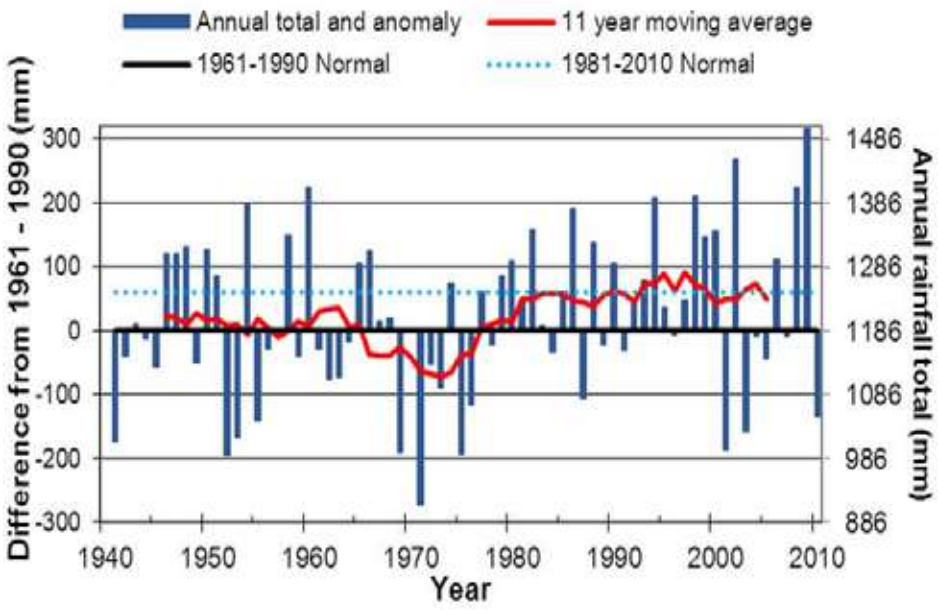


Figure 5 Annual Rainfall (1941-2010) (Source: Met Éireann / Dwyer)

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

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

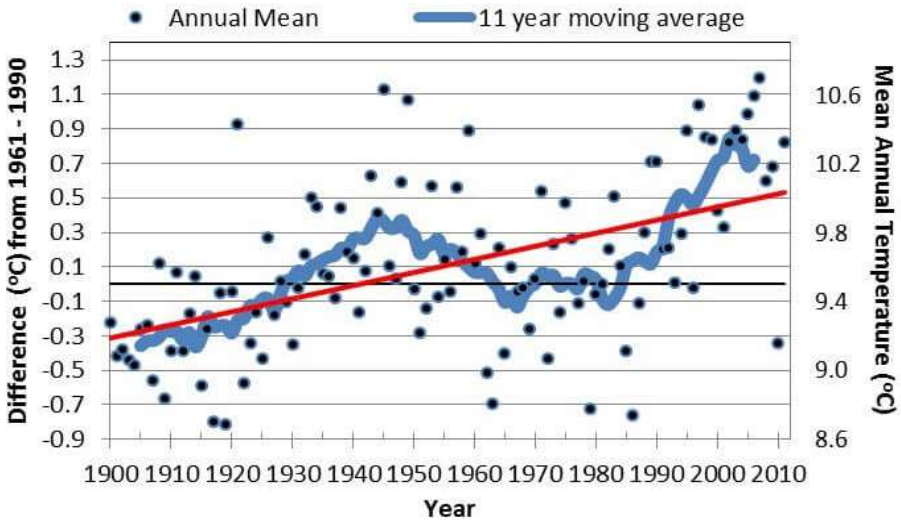


Figure 6 Mean Surface Air Temperature (1900-2011) (Source: Met Éireann / Dwyer)

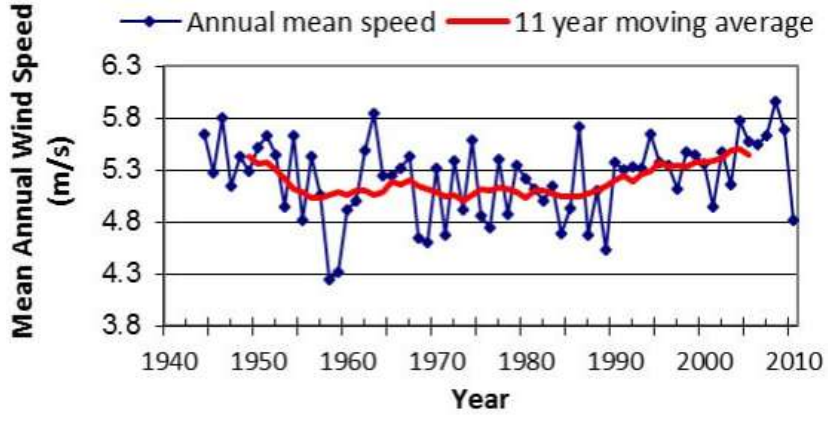


Figure 7 Dublin Airport Wind Trends (1944-2010) (Source: Met Éireann / Dwyer)

EXTREME WEATHER RISKS

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 increase. Recently, in the summer of 2018, Ireland experienced extreme temperatures, which caused heat wave and drought conditions, and resulted in a hosepipe ban for most of the summer, due to water shortages throughout the country.

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

As shown in the Timeline of Major Climatic Events (Figure 4), the frequency of extreme cold spells in Ireland has increased, and this presents additional risks to South Dublin. 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. Due to the characteristics of South Dublin, prolonged heavy rainfall events typically result in urban flooding, which is mainly caused by a lack of pervious surfaces. Flooding also puts groundwater supplies at risk, as these can be contaminated due to the high infiltration of flood water.

FUTURE RISKS

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

Although no long-term wind speed trend can be accurately determined, it has been projected that extreme wind speeds will increase during the winter periods[17]. This would greatly affect critical infrastructure such as communication and transportation, which may be disrupted by the violent winds.

EXTREME WEATHER ADAPTATION ACTIONS

The aim of compiling extreme weather adaptation actions is to reduce the effects of these events. Some of these adaptation actions are also addressed in the Flooding section.

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

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

RISK MATRIX

Table 3 Extreme Weather Events Risk Matrix

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

FLOODING

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

The two main flooding sources are inland and coastal, and since South Dublin is a landlocked County, it will not experience coastal flooding. However, a combination of high river flows and high tide may prevent the river from discharging into the sea and increasing water levels inland, which results in rivers overtopping their banks.

Inland flooding can have multiple causes, including run-off water, heavy rainfall, extreme events and storms. South Dublin experiences several types of flooding, including:

- **Fluvial flooding** is caused by rainfall (extended or extreme), resulting in rivers exceeding their capacity
- **Network flooding** resulting from urban drainage systems being inundated with water and exceeding their capacity
- **Pluvial flooding** from intense and sudden rainfall running over-ground and exceeding capacity of local drainage systems is a key risk across the whole County
- **Groundwater flooding** results when groundwater rises up from an underlying water table and can flood surface and sub-surface infrastructure; occurs during sustained rainfall events and high tide events and affects low lying areas of the County
- **Flooding from dam** discharges or breaches

BASELINE ASSESSMENT

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

South Dublin has a number of rivers, many of which are at risk of flooding. These include the Dodder, Camac and Poddle. The area faces significant flooding risk due to its physical characteristics, with the Dublin Mountains being the source of several rivers and tributaries. This increased risk of flooding also affects the area in terms of increased pressure on water and sanitation systems, and damage to critical infrastructure and property.

The extent of flood damage due to rivers may also be seen in Figure 8, which depicts the potential risk from the River Poddle. This shows how even just one river flooding would impact on 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. South Dublin County Council therefore works to inform residents and business owners of their riparian responsibilities.

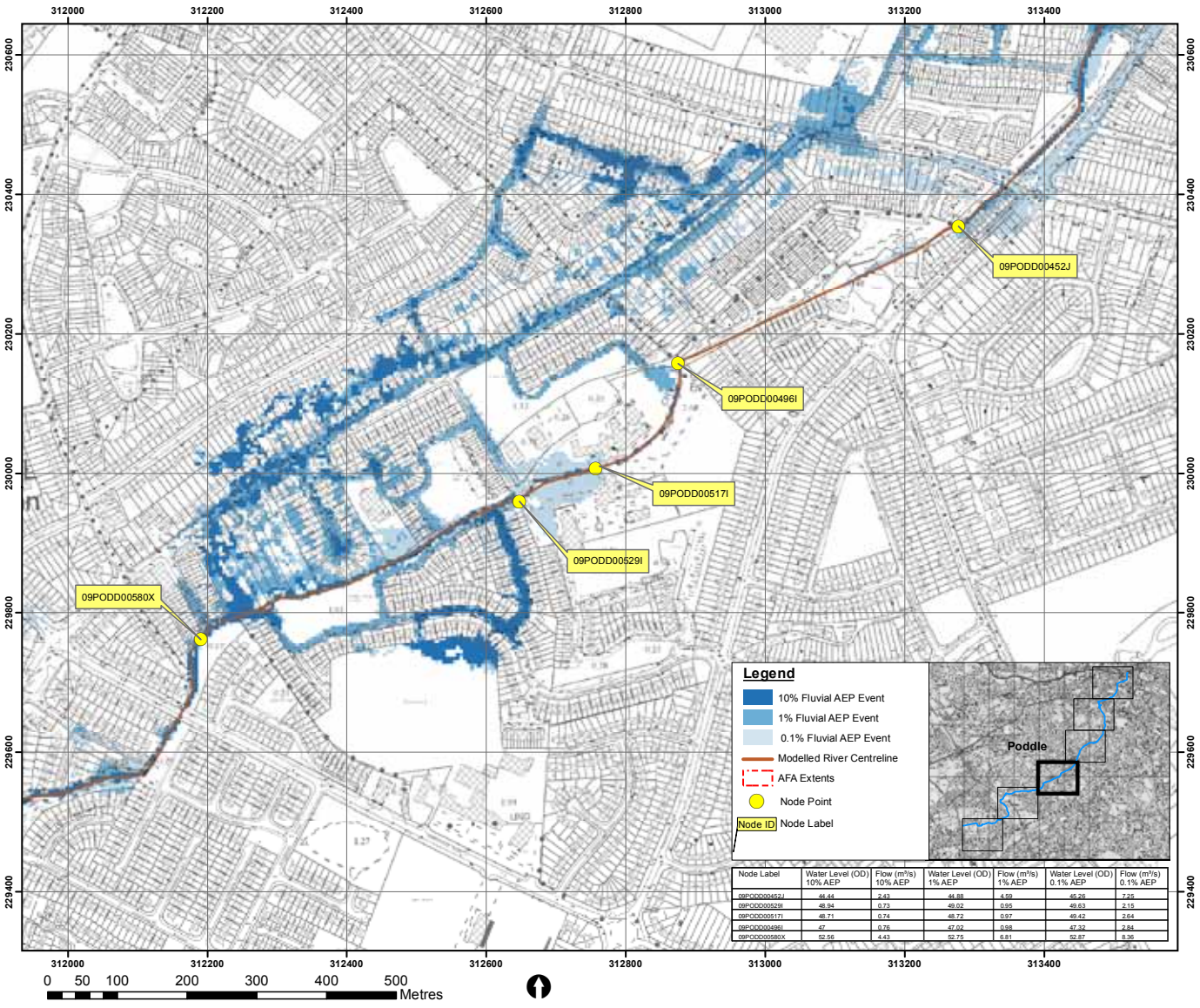


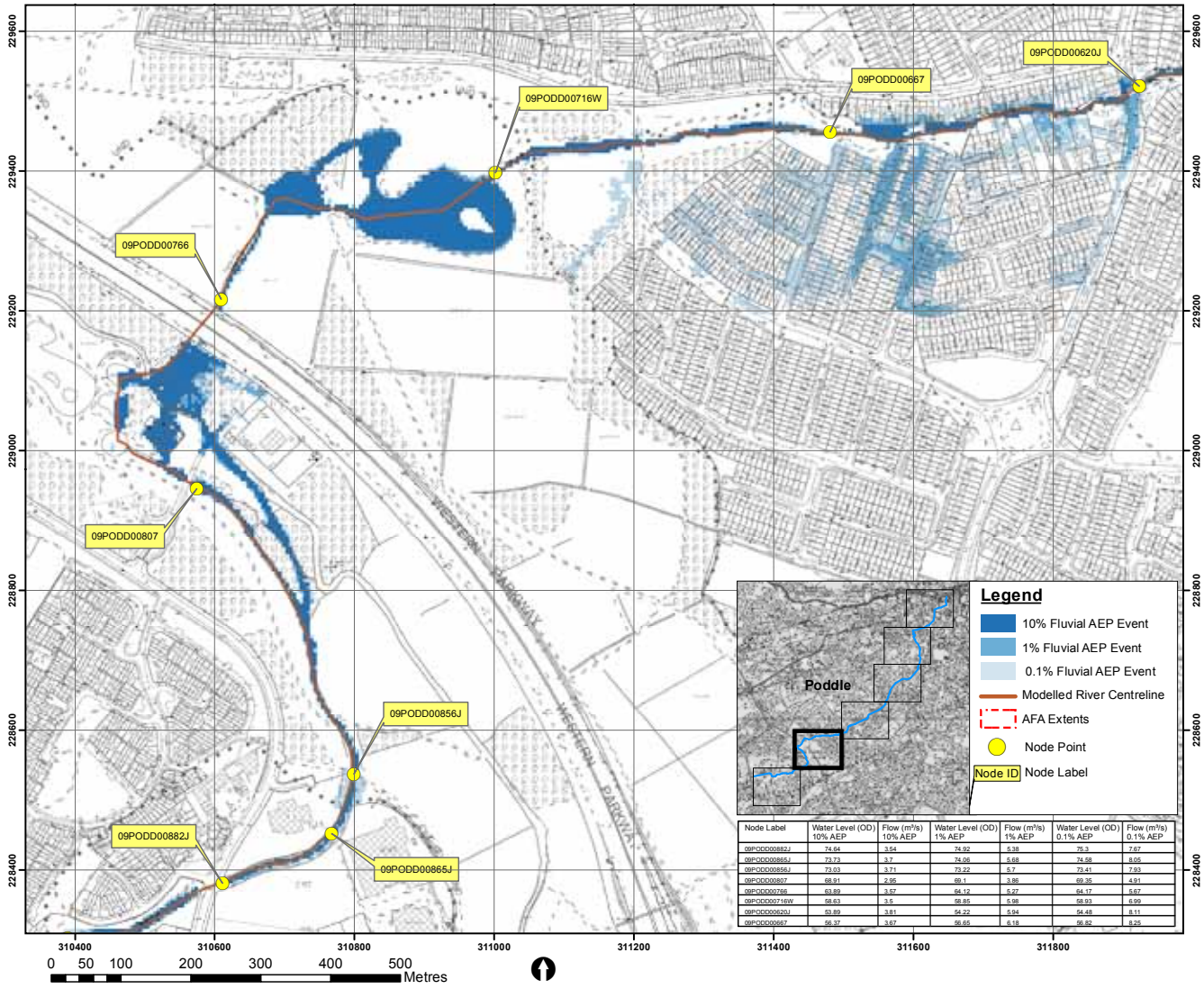
Figure 8 River Poddle Fluvial Flood Extents (Source: Adapted from OPW/RPS)

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 9 below depicts the flood extents study carried out in South Dublin 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 South Dublin's already vulnerable systems, in terms of increased pressure on water and sanitation systems, and damage to critical infrastructure and property.



Node Label	Water Level (OD) 10% AEP	Flow (m³/s) 10% AEP	Water Level (OD) 1% AEP	Flow (m³/s) 1% AEP	Water Level (OD) 0.1% AEP	Flow (m³/s) 0.1% AEP
09PODD00882J	74.84	3.54	74.92	5.38	75.3	7.67
09PODD00865J	73.73	3.7	74.06	5.68	74.58	8.05
09PODD00856J	73.03	3.71	73.22	5.7	73.41	7.93
09PODD00807	68.91	2.95	69.1	3.86	69.35	4.91
09PODD00766	63.89	3.57	64.12	5.27	64.17	5.67
09PODD00716W	58.63	3.5	58.85	5.98	58.93	6.99
09PODD00620J	53.89	3.81	54.22	5.94	54.48	8.11
09PODD00667	56.37	3.67	56.65	6.18	56.82	8.25

Figure 9 South Dublin Flood Extents (Source: Adapted from OPW/ RPS)

RISK MATRIX

Table 4 Flooding Risk Matrix

IMPACT AREAS	DESCRIPTION	PARAMETER	CONSEQUENCE	LIKELIHOOD	FUTURE RISK
Critical Infrastructure & the Built Environment	Fluvial, pluvial and groundwater 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.)	Fluvial	5	5	**25**
		Pluvial	4	4	**16**
		Groundwater	4	3	**12**
Transport	Increases in fluvial and pluvial flooding will cause road damage, which can lead to disruptions to all transport services	Fluvial	5	5	**25**
		Pluvial	4	4	**16**
		Groundwater	4	3	**12**
Biodiversity	Increasing extreme flood events can cause loss of habitats and damage to ecosystems	Fluvial	3	5	**15**
		Pluvial	2	4	**8**
		Groundwater	2	3	**6**
Waste Management	Flooding of landfill sites increases the risk of surface and groundwater contamination	Fluvial	3	5	**15**
		Pluvial	4	4	**16**
		Groundwater	5	3	**15**
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	Fluvial	4	5	**20**
		Pluvial	4	4	**16**
		Groundwater	5	3	**15**

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

South Dublin has 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 flood forecasting
- **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 POLLUTION AND AIR QUALITY

Air quality is a measurement of the concentration of specific pollutants harmful to human health. Changes in climate, especially increases in temperature, will impact the concentration of pollutants in the air, as temperatures increase, so too will the concentration of pollutants. 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[20,21,22].

BASELINE ASSESSMENT

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

AIR POLLUTION AND AIR QUALITY RISKS

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

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

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

FUTURE RISKS

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

Emissions of air pollutants, particularly PM_{10} and NO_x (nitrogen oxide), from road traffic, remain the biggest threat to air quality in urban areas[23]. Even though the new standards for car emissions have resulted in cleaner fuels and reduced emissions, Ireland has still seen an increase in both the number of cars and their engine sizes. Also, there has been a shift to diesel engines in recent years, which are lower in CO_2 but are higher in particulate matter.

The Dublin Region has had an increase in construction and development over recent years, and construction is projected to grow with the increased demand for housing from a growing population. As construction and demolition in South Dublin 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 South Dublin. 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 South Dublin 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, and the expansion of Quality Bus Corridors (QBCs) and increased park and ride facilities
- 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

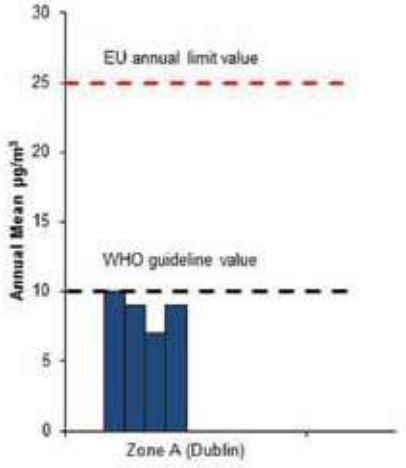


Figure 10 Annual Mean $PM_{2.5}$ (Fine Particulate Matter) Concentrations at Individual Stations in 2016 (Source: EPA)

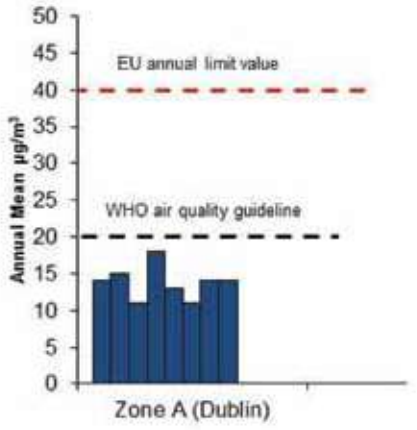


Figure 11 Annual Mean PM_{10} (Particulate Matter) Concentrations at Individual Stations in 2016 (Source: EPA)

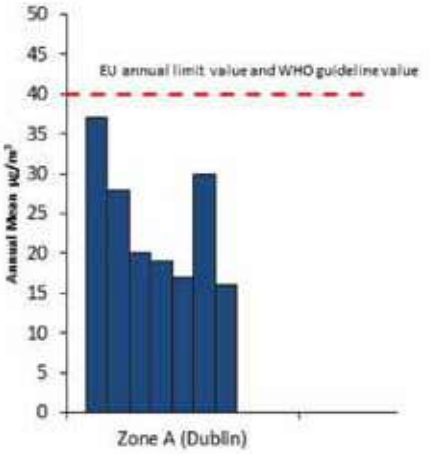


Figure 12 Annual mean NO_2 (Nitrogen Dioxide) Concentrations at Individual Monitoring Stations in 2016 (Source: EPA)

EMERGENCY RESPONSE PLANNING

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

The MEM Framework defines a major emergency as:

"Any event which, usually with little or no warning, causes or threatens death or injury, serious disruption of essential services or damage to property, the environment or infrastructure beyond the normal capabilities of the principal emergency services in the area in which the event occurs, and requires the activation of specific additional procedures and the mobilisation of additional resources to ensure an effective, co-ordinated response[24]*."*

The MEM Framework enables Principlal 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 13 shows the national, regional and local structures that have been set up to support the development of the Framework.

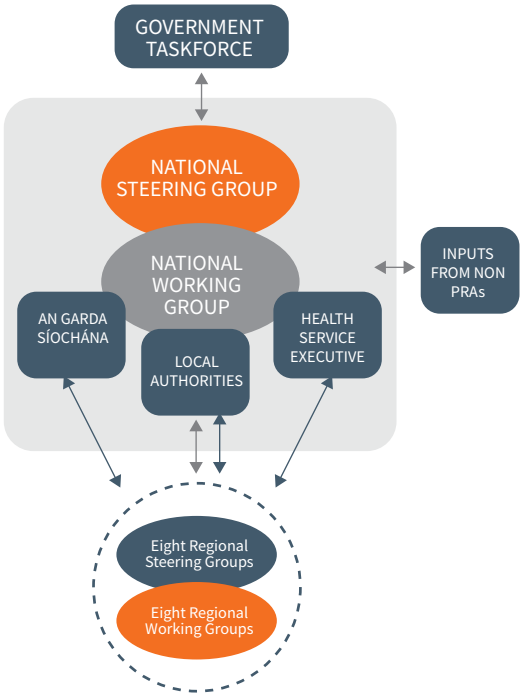


Figure 13 Structures for Implementation (Source: Major Emergency Management Framework)

EMERGENCY RESPONSE AT A LOCAL AND REGIONAL LEVEL

South Dublin 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 *South Dublin County Council Major Emergency Plan 2016*[25] 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 SDCC's Crisis Management Team (CMT).

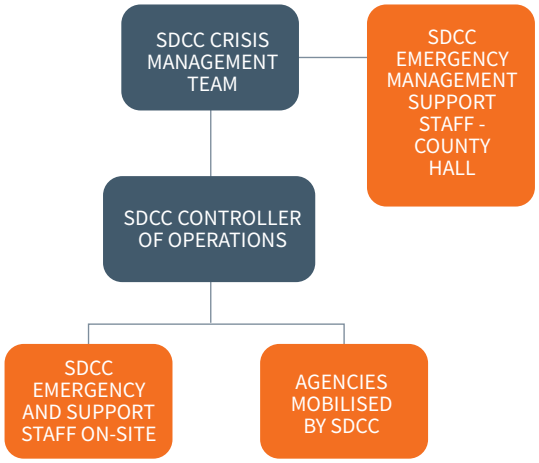


Figure 14 Local Authority Control of Resources (Source: SDCC Major Emergency Plan 2016)

The CMT is a strategic level management team within SDCC 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 SDCC's overall response to the major emergency
- Provide support to SDCC's Controller of Operations on site and gain resources from SDCC or externally
- Liaise with relevant government departments on strategic issues
- Ensure participation of SDCC in the inter-agency coordination structures

EMERGENCY RESPONSE SERVICES & RESOURCES

The Dublin Fire Brigade provides the primary response to emergencies in the County. SDCC 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 SDCC MEM team works with the Dublin Fire Brigade and other local authorities in the region. The SDCC MEM team supports the Crisis Management Team, including carrying out a review of the Major Emergency Plan and Severe Weather Plans.

SUB-PLANS FOR RESPONDING TO SEVERE WEATHER & FLOOD EMERGENCIES

Severe Weather Plans are a sub-plan of the Emergency Plan, and can be activated in preparation, response to or recovery of a major emergency. Severe weather emergencies may pose significant threats to the areas within the local authorities' boundary, so therefore they are the lead agency for coordinating the response to severe weather events in their area. Met Éireann issues public service severe weather warnings to SDCC's Severe Weather Assessment Team, 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.

SDCC has set measures to receive and respond promptly to public service severe weather warnings issued by Met Éireann. SDCC's response to flood events are led by the Drainage Operations Section.

MITIGATION BASELINE

SOUTH DUBLIN COUNTY COUNCIL'S ENERGY USE & EMISSIONS

South Dublin County Council (SDCC) is responsible for the energy use and emissions from its buildings and facilities, its public lighting, and also its vehicle fleet. The information from the Sustainable Energy Authority of Ireland's (SEAI's) Monitoring and Reporting (M&R) database shows that SDCC consumed a total of 53 GWh (gigawatt hours) of primary energy in 2017. The energy database also shows that SDCC improved its energy performance by 25.4% between the baseline year and 2017. This highlights a gap-to-target of 7.6%, meaning that SDCC must improve its energy performance by a further 7.6% between now and 2020, in order to meet its 33% energy reduction target.

The Council's public lighting was the highest energy consumer, accounting for 48% of the Council's overall primary energy consumption. Buildings and facilities were the second highest energy consumers, accounting for 43% of the total energy consumption, while the municipal fleet accounted for 9% of the total energy use.

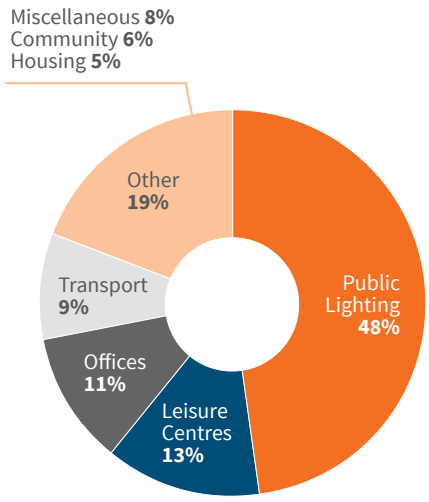


Figure 15 Significant Energy Users

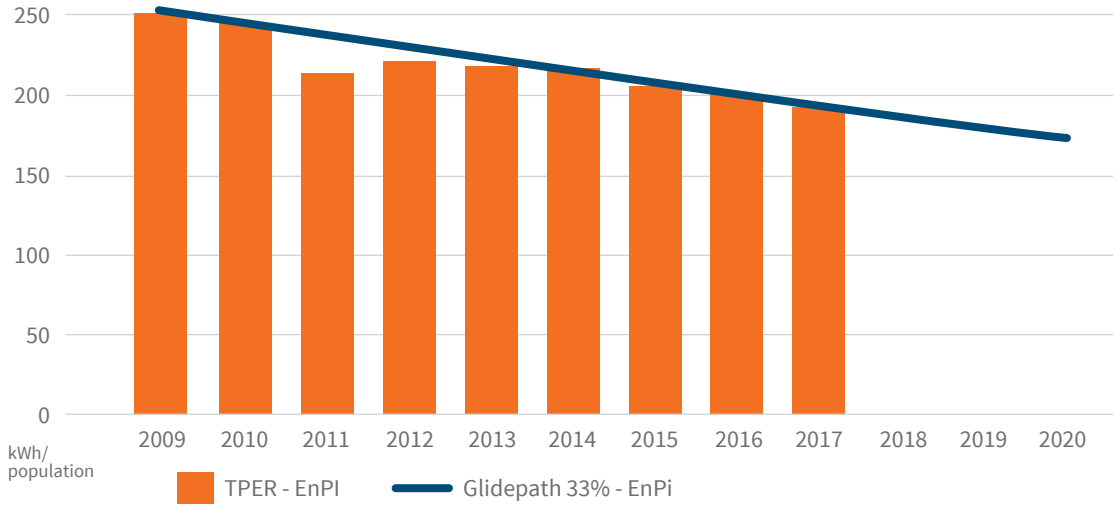


Figure 16 SDCC's Annual Energy Performance Compared to the 33% Glidepath

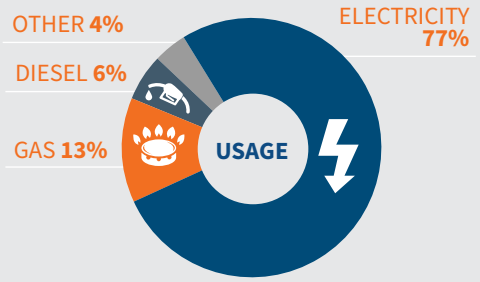
SDCC'S EMISSIONS OVERVIEW

TOTAL EMISSIONS PRODUCED BY SDCC IN 2017

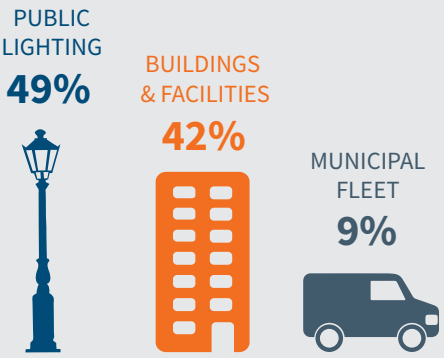
11,800

TONNES OF CO_2

SDCC'S EMISSIONS PER FUEL TYPE



SDCC'S EMISSIONS PER CATEGORY



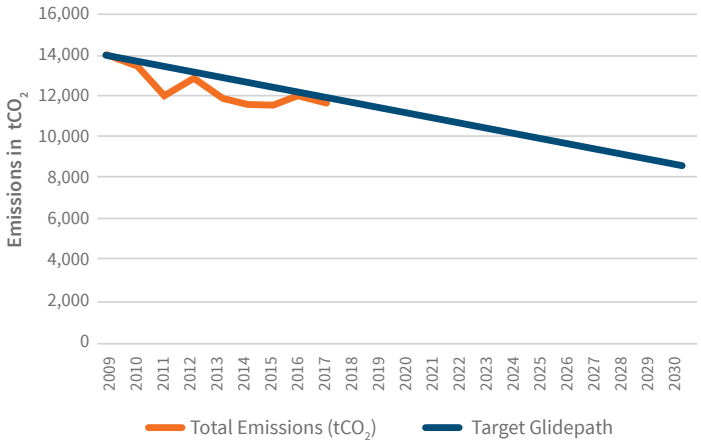


Figure 17 SDCC's Emissions 2009-2017, with Projected Glide Path to the 40% Reduction Target by 2030

As a signatory to the Covenant of Mayors for Climate and Energy, SDCC is committed to reducing its own emissions by 40% by 2030, compared to the baseline year, which is an average of between 2006 – 2008.

Figure 17 shows that SDCC's emissions decreased from 14,230 tonnes of CO_2 in 2009 to 11,800 tonnes of CO_2 in 2017. This means that SDCC is now 3,270 tonnes of CO_2 (23%) away from the 2030 target of a 40% emission reduction.

Public lighting was the biggest emitter at 49%, followed by buildings and facilities and then the municipal fleet, which contributed 42% and 9% to the Council's emissions, respectively.

In 2017, 77% of emissions by the Council came from electricity; this was mainly due to the large amount of electricity used in public lighting and in buildings/facilities. Natural gas was the second highest contributor to emissions at 13%. The majority of gas was used in buildings and facilities in SDCC to meet heating demands. Diesel, which made up part of the energy used for the vehicle fleet, accounted for 6% of the total emissions.

SOUTH DUBLIN COUNTY COUNCIL'S SOCIAL HOUSING

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

Figure 18 below shows the BERs for all the social housing stock in South Dublin. We can see that the most common rating was C2, which made up 27% of the total social housing stock; this was higher than the county-wide average D rating. 77% of the housing stock was rated C3 or better, which reflects the retrofitting work already carried out by SDCC to upgrade the less efficient social housing stock.

Of the total social housing stock, 47 units had an A3 rating. However, no A1 or A2 dwellings could be found in South Dublin for 2016 and data gathered from SEAI's BER Research Tool did not contain any A1 or A2 dwellings, so these are not reflected in the charts. There were very few F and G rated houses; they made up just 1% of the total social housing stock in South Dublin.

SOCIAL HOUSING EMISSIONS OVERVIEW

TOTAL EMISSIONS FROM SOCIAL HOUSING SECTOR IN 2016

29,180 tCO_2

77%
RATED C3 OR BETTER

77% OF SOCIAL HOUSING STOCK IN SOUTH DUBLIN WAS RATED **C3 OR BETTER**, WITH **C2** BEING THE MOST COMMON BER TYPE

65%
OF EMISSIONS CAME FROM NATURAL GAS

FOLLOWED BY ELECTRICITY AT 30%, WHICH SHOWS THE MAJORITY OF EMISSIONS CAME FROM THE NEED TO **MEET HEATING REQUIREMENTS**

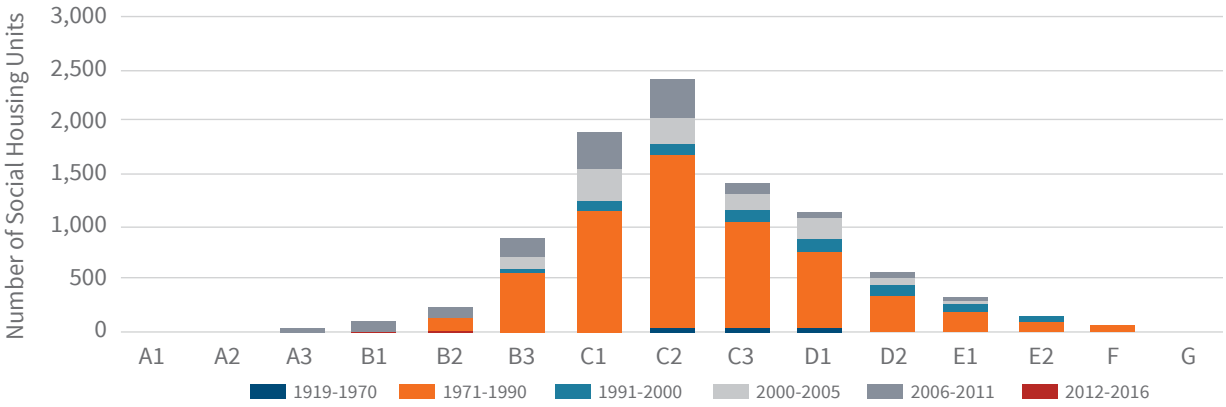


Figure 18 SDCC's Social Housing Units by Construction Period and BER Rating, as in 2016

TOTAL EMISSIONS FOR SOUTH DUBLIN

The most recently-available information for total emissions in the entire South Dublin area is based on Census 2016 data. Therefore, using this data, Codema was able to calculate that the total GHG emissions for the South Dublin area amounted to 1,877,910 tonnes of CO_2 equivalent in 2016. The sectors that produced the most emissions were the transport, commercial and residential sectors, accounting for 38.9%, 32.4% and 24.4% of the total emissions, respectively. South Dublin County Council's own emissions amounted to only 0.6% of this total, with social housing contributing another 1.6%. 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.

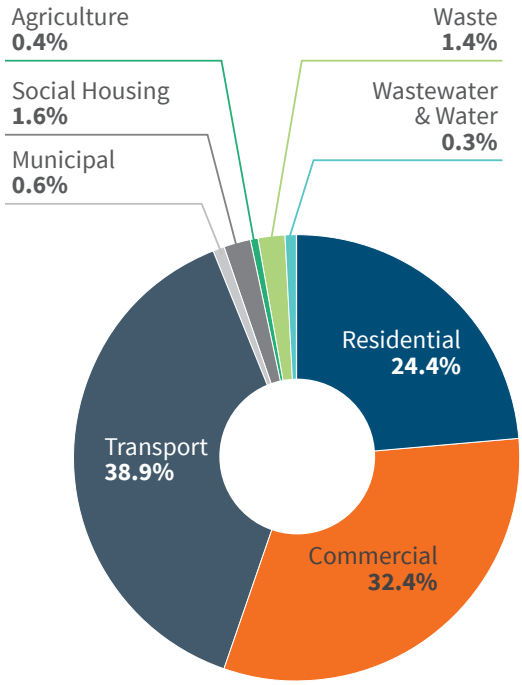


Figure 19 Total GHG Emissions for South Dublin per Sector

Photo Source: William Murphy / Flickr

Further information

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

MILESTONE 3 – PLAN

Having established the current situation of South Dublin's emissions, vulnerabilities to climate change related risk and possible future impacts, the next stage was to formulate actions to reduce these risks. The knowledge gathered through one-to-one interviews, research and 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 swap knowledge and establish regional groups in the various action areas. This section lays out the actions that SDCC 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 SDCC's remit and with the aim of fostering greater collaboration across the various departments within the Council.

SDCC 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, SDCC 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 20 Visualising the Action Plan

ACTION AREAS:

ENERGY & BUILDINGS

TRANSPORT

FLOOD RESILIENCE

NATURE-BASED SOLUTIONS

RESOURCE MANAGEMENT

ENERGY & BUILDINGS

Photo Source: South Dublin County Council

OVERVIEW

48.4 GWh consumed in 2017

=

10,710 tonnes CO_2

TARGET

33% IMPROVEMENT IN ENERGY EFFICIENCY BY 2020

40% REDUCTION IN COUNCIL'S GHG EMISSIONS BY 2030

EXAMPLES OF MAIN ACTION TYPES

- Energy Master Plan for the Dublin Region
- Public lighting upgrades
- Tallaght District Heating Scheme
- Social housing retrofits
- Home Energy Saving Kits in selected SDCC libraries
- Upgrades in buildings using Energy Performance Contracts

STAKEHOLDERS TO WORK WITH AND INFLUENCE

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

South Dublin County should aspire to becoming as carbon neutral as possible and make every effort to increase energy efficiency and unlock renewable energy potential.
- County Development Plan 2016-2022

In 2017, South Dublin County Council consumed 48.4 GWh of primary energy across its buildings and public lighting, which amounted to 10,710 tonnes of CO_2. The actions outlined in this section show how, through better energy planning using energy mapping, improvements in building energy efficiency, the use of renewables, and increased innovation, SDCC will reduce the emissions from its operations and service delivery. For example, the Council will lead the way by implementing Ireland's first large-scale district heating system, which will provide low-carbon heat to public and private buildings in the Tallaght area. SDCC is not responsible for the upgrading of private buildings in South Dublin; however, it will also provide information on how it has retrofitted its own social housing stock and Council-owned buildings, and how it has deployed renewable energy systems. In addition, SDCC is helping citizens to become more aware of their energy use by trialling Home Energy Saving Kits in a selection of its public libraries.

ENERGY PLANNING

South Dublin County Council has an established track record in participating in and delivering European projects in the area of climate change mitigation. These include the LEAP and SPECIAL projects around energy and spatial planning, which were funded by the EU Intelligent Energy Europe programme and involved partnership with other local authorities and professional organisations across Europe. Through these EU projects, and in partnership with Codema, SDCC was the first local authority in Ireland to carry out a Spatial Energy Demand Analysis (SEDA) to directly inform spatial planning policy (in particular, the *South Dublin County Council Development Plan 2016-22*).

The South Dublin SEDA provided information on the current and future energy demand and local energy resources of the South Dublin 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.

The Council has since advanced this evidence-based approach to undertake the Clonburris Strategic Development Zone (SDZ) Energy Master Plan and the Grangecastle Business Park Energy Master Plan, both of which were supported by the Sustainable Energy Authority of Ireland (SEAI). The Clonburris Master Plan also identified Clonburris and Kishogue urban centres as potentially viable areas for local heat networks.

CASE STUDY

Photo Source: Fáilte Ireland / Patrick Bolger

The Dublin Region Energy Master Plan
The South Dublin SEDA was the starting point for holistic energy planning in the South Dublin area and, building on this work, Codema will develop the Dublin Region Energy Master Plan, which will be supported by SEAI's Research, Development and Demonstration (RD&D) programme for over two years. The Energy Master Plan will create evidence-based, realistic, and costed pathways for Dublin to achieve its carbon emission 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 CO_2 emissions, such as district energy systems and renewable energy technologies.

CASE STUDY

The Clonburris Energy Master Plan
Prepared in conjunction with the SDZ Planning Scheme, the Clonburris Energy Master Plan builds on the South Dublin SEDA, and sets out the viability and economic analyses of a range of sustainable energy options for the area, including energy efficiency, energy storage, and renewable heating, cooling and electricity. These energy options vary from 'kick start' local networks or district energy schemes, to more localised, block and individual building level opportunities.

The Clonburris and Kishogue urban centres were also identified as potentially viable areas for local heat networks. The Clonburris Energy Master Plan recommends that all major developments within these two urban centres should be designed to be able to connect to a local heat network in the future if or when such a network becomes available in the future. This Master Plan also identifies a range of delivery models and financing structures for such local heat networks.

Photo Source: South Dublin County Council / clonburris.ie

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'

With regards 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.

ENERGY EFFICIENCY AND RENEWABLES

The energy performance of existing buildings is one of the foremost considerations in responding to the energy challenge in South Dublin County. Increased efforts in this area, in particular the upgrading and refurbishment of homes and business premises, can make a significant contribution in reducing energy demands and costs.
- County Development Plan 2016-2022

SDCC will be a climate leader in renewable energy uptake and energy efficiency through retrofits of SDCC's buildings and housing stock. Presently, SDCC has several ongoing programmes to replace boilers, update lighting, improve insulation, upgrade windows and doors, and install solar photovoltaic (PV) panels in SDCC owned buildings. It has also installed solar panels on County Hall and Clondalkin Leisure Centre and CHP units in Tallaght Leisure Centre, among other civic facilities.

Social Housing Upgrades

South Dublin County Council is continually upgrading its social housing units. Through SDCC's upgrade programme, many units have been refurbished, resulting in significant energy and cost savings and improved comfort level for residents. This programme is set to continue over the next few years.

Annual Energy Reviews

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

Display Energy Certificates (DECs)

The information from Codema's energy database and energy surveys is used to prepare Display Energy Certificates for SDCC's public buildings with a floor area greater than 250m^2, as required under the Regulation S.I. 243 of 2012. Codema assisted SDCC with the annual inspection and certification of 18 public buildings in total in 2018. This information was entered into the SEAI system and Codema issued certificates to the managers of all of these buildings, along with information on how much energy would need to be saved in the following year to improve their energy rating. Each building manager also received a copy of Codema's *Guide to Display Energy Certificates in Local Authority Buildings* to accompany these certificates and encourage direct action.

CASE STUDY

HeatNet NWE and the Tallaght District Heating Scheme

HeatNet NWE is a €11.5 million Interreg NWE project that aims to increase the uptake of 4th generation heating and cooling technologies in the North-West Europe region. As part of this project, SDCC has secured grant money to develop a cutting-edge district heating scheme in Tallaght town centre.

Codema is working with SDCC to develop Ireland's first large-scale district heating network involving its County Hall and other public and private buildings in the surrounding area. The Tallaght District Heating Scheme has recently gone out to tender and is estimated to save the Council 1,736 tonnes of CO_2 on full system roll out.

The proposed system seeks to utilise a low temperature waste heat source from a data centre through a large-scale heat pump, in order to supply space heating and hot water to a cluster of local buildings. The system will also have the capacity to supply other nearby customers in the following phases. This innovative district heating scheme will provide low-carbon, low-cost heat to the Tallaght area, and will be the only not-for-profit energy utility in Ireland.

This project has also recently secured almost €4.5 million in funding through the Climate Action Fund.

Public Lighting

As public lighting is key to SDCC achieving its energy efficiency target, the Council is committed to achieving further energy reductions in this area.

Within SDCC's stock of public lighting, there is currently over 15,000 SOX lamps. The manufacture of these SOX lamps is in the process of being phased out, so these will have to be replaced, and LED lights, with their very high energy efficiency, are the obvious replacement. By replacing 4,000 of these SOX lamps by 2020, SDCC could achieve savings of 2.3 GWh and 514 tonnes of CO_2. This would have a significant impact on the Council's 2020 targets.

Energy Efficiency in Council Buildings

Leisure Centres - Leisure centres are one of the largest energy consumers within SDCC. SDCC currently operates two large leisure centres, Tallaght and Clondalkin Leisure Centres, which accounted for 13% of the Council's total primary energy requirement in 2017.

To tackle this high energy use, Codema is currently helping SDCC to implement an Energy Performance Contract (EPC) project within Tallaght and Clondalkin Leisure Centres. The EPC model is a way of ensuring that projected energy savings in a building are actually achieved after upgrades are carried out, as the contractor is responsible for guaranteeing these savings over the lifetime of the contract. A similar project has already been successfully carried out in three of Dublin City Council's leisure centres, achieving energy savings of 38% in the first year alone. The initial energy audits of Tallaght and Clondalkin Leisure Centres show that a potential 1.6 GWh of primary energy and 373 tonnes of CO_2 could be saved by implementing this EPC project in these facilities.

CASE STUDY

County Hall

SDCC has an ongoing programme to upgrade the lighting in its County Hall building to LEDs. A number of fluorescent tube ceiling panels have already been replaced with 40 watt LED panels, combined with occupancy sensors and light dimming switches. In addition to the 44% reduction in energy consumption per light fitting, fewer fittings are required to achieve the same lighting effect as the old fittings.

Codema has also carried out an energy audit of County Hall, which shows that a further 517 megawatt hours (MWh) and 155 tonnes of CO_2 could be saved by replacing the remaining 2,600 light fittings with high-efficiency LEDs. The reductions could be greater still if some unessential fittings are removed, and a full roll-out of occupancy sensors and light dimming controls is carried out throughout the building.

CASE STUDY

Home Energy Saving Kits

SDCC, in partnership with Codema, is actively encouraging citizens to become more energy-aware by trialling Home Energy Saving Kits in a selection of its libraries. The kits will be available for the public to borrow free of charge from four of SDCC's libraries - County Library (Tallaght), Clondalkin Library, Lucan Library and Ballyroan Library - from autumn 2018. The kits contain six tools for householders to assess how energy-efficient their homes are. The scheme is the first of its kind in Ireland, and has had great success, having been used in over 1,000 homes across the country so far, as well as garnering awards and recognition, both nationally and at an EU level.

RESEARCH AND INNOVATION

To maximise the benefits of advances in technology, SDCC is part of the Smart Dublin programme to engage with academia, the private sector and citizens to co-create solutions to the challenges facing the Dublin Region. The Smart Dublin programme was established in 2016 to enable the four Dublin Local Authorities to collaboratively take advantage of some of the big tech trends that are transforming how we live and work. In partnership with Enterprise Ireland, Smart Dublin runs Small Business Innovation Research (SBIR) competitions, which challenge smart technology providers, researchers and citizens to come up with solutions that will improve the operation and resilience of the Dublin Region. To date, €750,000 in funding has been awarded to small businesses to develop solutions in areas such as cycling, wayfinding, illegal dumping and flooding. Phase 2 of the SBIR competition was launched in April 2018, and has a further €800,000 in funding to develop solutions for areas such as bathing water quality, staff workplace mobility and last mile delivery in urban centres.

ENERGY AWARENESS

A key aspect of reducing energy use is public awareness, as retrofits, technology and innovation can only achieve a portion of SDCC's goals. SDCC, in partnership with Codema, is regularly engaging with staff and citizens about how to save energy. For example, building on the Think Energy campaign in SDCC's County Hall, the Council has trialled Codema's Home Energy Saving Kits with its staff, to help them assess the energy efficiency of their homes; the kits are now available to the public in three of SDCC's libraries since the autumn of 2018.

CASE STUDY

Think Energy

The Think Energy campaign was rolled out in SDCC throughout 2016. The campaign aimed to help staff in County Hall become more aware about the energy use of the building and to encourage positive behavioural changes. As part of the Think Energy campaign in SDCC, Codema developed a monthly activity programme, which was rolled out in association with the OPW and included actions such as a staff survey, a lunchtime energy talk and an energy-saving Christmas colouring competition for children of the staff.

ENERGY & BUILDINGS

NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
ACTIONS CURRENTLY BUDGETED					
ENERGY PLANNING					
1	Create Energy Master Plan for the Dublin Region	2018 onwards	Codema	Website with e-Map	
2	Develop Public Lighting Master Plan	Ongoing	Public Lighting	Plan developed, # of lights upgraded	
3	Prepare South Dublin Sustainable Energy and Climate Action Plan	2019	Codema	SECAP complete	
4	Evidence-based Climate Change Chapter in *County Development Plan 2022-2028*	2020 onwards	Land Use, Planning & Transportation	Chapter with policies and development management standards	
5	Evidence-based climate change chapter in *Tallaght Town Centre Local Area Plan*	2019	Land Use, Planning & Transportation	Climate change chapter in Local Area Plan	
ENERGY EFFICIENCY & RENEWABLES					
6	Comply with obligations for local authorities set under S.I. No. 426/2014	Ongoing	Architects	Compliant with S.I. No. 426/2014	
7	Display Energy Certificates for SDCC's public buildings	Ongoing	Codema	# of DECs generated for Council buildings	
8	Annual Monitoring and Reporting to SEAI	Ongoing	Codema	SDCC's energy data uploaded to SEAI M&R system	
9	Development of yearly Energy Reviews for SDCC	Ongoing	Codema	Energy Review published, # of recommendations implemented	
10	Development of the Tallaght District Heating Scheme	2019 onwards	Architects, Codema	# of buildings connected	
11	Deep retrofits of the Council's housing stock	Ongoing	Housing Maintenance, Architects	# of housing units upgraded	
12	Energy efficiency works in Council owned and operated buildings	Ongoing	Architects	# of upgrades carried out	
13	Ongoing upgrading of lights in County Hall to LEDs	Ongoing	Architects	# of LEDs installed	
14	Energy Performance Contract carried out in Tallaght and Clondalkin Leisure Centres	2019	Architects, Codema	EPC awarded, measurement and verification of savings	
15	Replace 4,000 SOX lamps with LEDs	2020	Public Lighting	# of SOX lamps replaced with LEDs	

NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
RESEARCH & INNOVATION					
16	Expand and develop Small Business Innovation and Research (SBIR) programme	2018 onwards	Smart Dublin, LEO	Energy and climate change challenges identified for SBIR challenges	
ENERGY AWARENESS					
17	Monitor and develop the Home Energy Savings Kit scheme in SDCC libraries	2018 onwards	Codema, South Dublin County Libraries	# of kits in branches, borrowing rates in libraries	

ACTIONS AWAITING BUDGET

18	*Assess feasibility of additional low carbon district heating networks: Clonburris and Grange Castle*	*2020*	*Codema, Planning*	*Study completed*	
19	*Expand housing assistance programme to include tenant energy awareness*	*2019*	*Housing, Maintenance*	*# of tenants provided with energy saving tips*	

EXAMPLES OF RELEVANT LEGISLATION/POLICIES/GUIDANCE

- Technical Guidance Document L - Conservation of Fuel and Energy - Dwellings 2017
- Technical Guidance Document L - Conservation of Fuel and Energy - Buildings other than Dwellings 2017
- Climate Action and Low Carbon Development Act 2015
- Energy Act 2016
- Energy Efficiency Directive (Article 14)
- Ireland's National Renewable Energy Action Plan (NREAP) - Energy White Paper
- National Energy Efficiency Action Plan (NEEAP)
- S.I. No. 426/2014 - European Union (Energy Efficiency) Regulations
- S.I. No. 243/2012 - European Union (Energy Performance of Buildings)
- South Dublin County Council Development Plan 2016 -2022 (Policies E4; E6; E7; E8; E9)
- South Dublin Sustainable Energy Action Plan (SEAP)
- Support Scheme for Renewable Heat

TRANSPORT

OVERVIEW

4.6 GWh consumed in 2017

=

1,100 tonnes CO_2

TARGET

33% IMPROVEMENT IN ENERGY EFFICIENCY BY 2020

40% REDUCTION IN COUNCIL'S GHG EMISSIONS BY 2030

EXAMPLES OF MAIN ACTION TYPES

- Converting Council fleet to lower emission vehicles
- Delivering a County cycle and greenways network
- Using mobile canteens for operational crews
- Stationless bike scheme
- Promoting a modal shift to active travel
- Working with stakeholders to build out 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

The Council will seek to rebalance transport and mobility within the County by promoting ease of movement by sustainable modes (including walking, cycling and public transport) and freeing up road space for economic growth and new development.
- County Development Plan 2016-2022

Transportation contributes to a significant amount of GHG emissions within the South Dublin area. In response to this and together with the National Transport Authority and neighbouring local authorities, SDCC has produced the *Greater Dublin Area Transport Strategy 2016-2035*, which sets out a strategic vision for transport in the Dublin Region, and builds on the Government's *Smarter Travel – A Sustainable Transport Future 2009 – 2020*. Both these plans aim to improve how people get to their destination.

Along with promoting sustainable transport, SDCC has reduced speed limits in residential areas and introduced traffic calming measures to improve the safety of the streets.

OPERATIONS

South Dublin County Council's transport fleet is made up of 308 vehicles, which consumed 4.6 GWh of primary energy and accounted for 9% of the Council's total emissions in 2017.

To tackle this issue, an energy management system is due to be implemented to accurately monitor the overall consumption, and develop energy performance indicators to track the energy performance of the fleet. The Council could potentially see savings of approximately 5% (or 228 MWh and 55 tonnes of CO_2) by implementing such an energy management system.

SDCC's Mechanical Section is embarking on a provisional replacement programme of vehicles that are coming to the end of their lifespan. This three-year programme will replace end-of-life vehicles with more up-to-date, energy efficient models. This may include the electrification of some of the Council's fleet, which could reduce fuel consumption by 254 MWh and 67 tonnes of CO_2.

PLANNING & PUBLIC REALM

The Council is committed to ensuring that best practice urban design principles are applied to all new development, based on the principle that well planned and integrated housing, amenities, shops, employment and transport can dramatically enhance the sustainability, attractiveness and quality of an area.
- County Development Plan 2016-2022

Key to encouraging people to walk and cycle is the design of streets and the public realm. SDCC is working to implement street design guidelines that make the streets more inviting and improve the public realm. The Council is also in the process of developing a public lighting master plan that will improve the ambiance and safety of streets for pedestrians and cyclists.

CASE STUDY

Photo Source: Wikimedia Commons / Niaz

Managing Traffic Flow
Improving traffic not only makes streets safer and makes it easier for people to get to their destination, but also reduces emissions. There are two systems used by South Dublin County Council to move people through the County - a Microprocessor Operated Vehicle Actuation (MOVA) system and the Urban Traffic Control (UTC) system known as SCOOT (Split Cycle Offset Optimisation Technique). MOVA has been installed at busy isolated junctions, and improves traffic flow by 7–9%. SCOOT covers 27 of SDCC's 150 junctions and has reduced travel times by 10-12%. Simultaneously, 30 new pedestrian and cycle crossings have been added in the last three years.

ACTIVE TRANSPORT & BEHAVIOUR CHANGE

> **There are opportunities to make walking and cycling more attractive, to increase the proportion of daily journeys undertaken on foot or by bicycle. This will also promote healthier lifestyles in keeping with Healthy Ireland (2013), the national framework for improved health and wellbeing published by the Department of Health.**
> - County Development Plan 2016-2022

To encourage cycling, SDCC is actively working to improve cycling infrastructure and prioritise the safety of cyclists by developing segregated cycle paths where possible, such as the Dodder Greenway, and provide opportunities for road safety education. SDCC will also work with relevant transport bodies and businesses to expand the availability of bicycle parking to enable people to cycle to and from key public transport nodes.

CASE STUDY

Stationless Bikes
In 2017, BleeperBike and South Dublin County Council joined together to launch a pilot stationless on-street bicycle rental scheme. The BleeperBikes are located in areas in South Dublin such as Clondalkin, Tallaght, Rathfarnham, Lucan and Templeogue; their exact location can be pinpointed using a mobile phone app, which also unlocks the bikes. Bikes can be parked at a BleeperBike Station or left at the user's final destination.

CASE STUDY

Belgard Walkway
The Belgard Walkway opened in June 2017 and is located between Belgard Road and Belgard Square East. The walkway makes it easier for people to walk between The Square Town Centre and Tallaght Village. In designing the walkway, the key priority of SDCC's Roads Department was the safety and comfort of pedestrians. Upgrading the lighting to LEDs has made the walkway safer at night, while the addition of trees and reconfiguration of the path has made it more welcoming.

PUBLIC TRANSPORT

> **In order to ensure an efficient, reliable and effective bus system, it is intended, as part of the 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

SDCC will continue to work with the relevant transportation bodies (National Transport Authority, Transport for Ireland, Dublin Bus, Luas, Irish Rail, Bus Éireann, Road Safety Authority) to introduce measures to achieve modal shift, and promote interchange between modes.

TRANSPORT

NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
ACTIONS CURRENTLY BUDGETED					
OPERATIONS					
1	Implement transport energy management system	2018 onwards	Environment, Water and Climate Change	System implemented	GHG
2	Ongoing replacement of Council vehicles with more energy-efficient alternatives, including EVs	2018 onwards	Environment, Water and Climate Change, Mechanical Section	# of vehicles replaced	GHG
3	Use mobile canteens with operational crews	2019	Environment, Water and Climate Change, Mechanical Section	# of canteens trialled	GHG
4	Promotion of Cycle-to-Work Scheme to Council staff	Ongoing	Communications Section	# of staff availing of scheme	GHG
PLANNING & PUBLIC REALM					
5	Strengthen traditional villages by improving the public realm and sustainable transport linkages	Ongoing	Transport and Public Lighting	# of village improvement schemes	GHG
6	Regular maintenance of regional and local roads	Ongoing	Transport	# of complaints regarding obstructions, blocked gullies, etc.	GHG
ACTIVE TRAVEL & BEHAVIOUR CHANGE					
7	Improve road safety at schools with additional school wardens	Ongoing	Transport	# of school wardens	GHG
8	Organised walks to promote healthy lifestyles, i.e. Clondalkin Route	Ongoing	Communications, Environmental Awareness, Public Realm and Biodiversity	# of walks organised, # of people participating	
9	Develop cycle network strategy	Ongoing	Transport	Strategy developed	GHG
10	Build out County Cycle Network	Ongoing	Transport	Kms of cycle routes added	GHG
11	Development of cycle/ pedestrian greenways	Ongoing	Transport	# of cycle /pedestrian greenway paths added	GHG
12	Increase number of public bike facilities	Ongoing	Transport	# of bike facilities added	GHG
13	Extend BleeperBike public bike scheme	Ongoing	Transport	# of bikes available in County	GHG

NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
PUBLIC TRANSPORT					
14	Facilitate the delivery of public transport routes	Ongoing	Transport	# km of routes added	GHG
ACTIONS AWAITING BUDGET					
15	*Cycle training programme for 6th Class students / pedal power labs*	*2020*	*Transport*	*# of students participating*	GHG
16	*Pilot VMS on Naas road*	*2020*	*Transportation, NTA*	*Pilot established*	GHG
17	*Expand availability of EV charging points in County*	*2020*	*Transport*	*# of charging points in County*	GHG

EXAMPLES OF RELEVANT LEGISLATION/POLICIES/GUIDANCE

- Climate Action and Low Carbon Development Act 2015
- Design Manual for Urban Roads and Streets (DMURS)
- Electric Vehicle Grant Scheme and VRT Relief
- Greater Dublin Area Transport Strategy 2016-2035
- National Cycle Policy Framework 2009-2020
- National Transport Authority's Permeability Best Practice Guide
- Public Transport Act 2016
- Smarter Travel: A New Transport Policy for Ireland 2009-2020
- South Dublin County Council Development Plan 2016 -2022 (Policies CS2; H6; H10; TM2; TM3; TM6; UC3)

FLOOD RESILIENCE

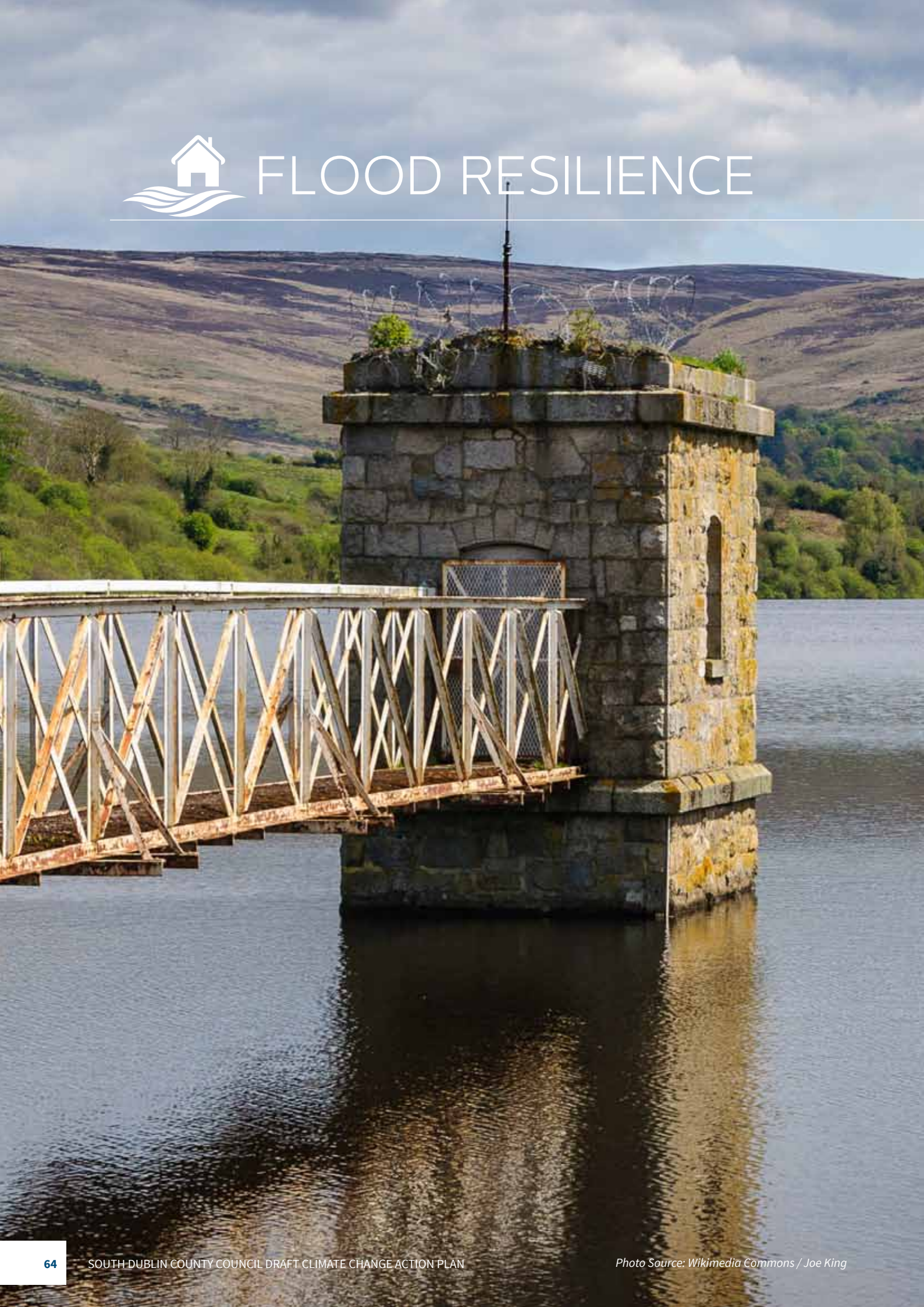
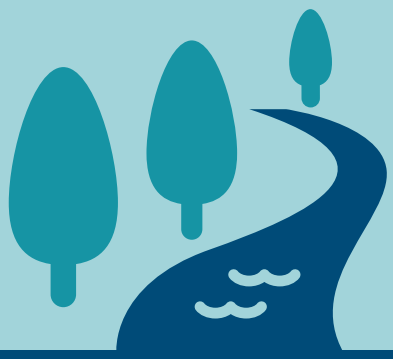


Photo Source: Wikimedia Commons / Joe King

WHERE WE'RE AT

5 MAIN RIVERS: LIFFEY, DODDER, CAMAC, GRIFFEEN & PODDLE



TARGET

A CLIMATE-RESILIENT REGION

REDUCTION/MITIGATION OF FLOOD RISKS IN SOUTH DUBLIN

EXAMPLES OF MAIN ACTION TYPES

- Building flood alleviation, defence or adaption schemes
- Tree planting for water attenuation
- Supporting the development of flood forecasting and warning system
- Implementing sustainable urban drainage guidelines in Council buildings
- Coordinating emergency response plans
- Cross-boundary flood management with neighbouring local authorities

STAKEHOLDERS TO WORK WITH AND INFLUENCE

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

South Dublin County Council is responsible for surface water management and aquifer protection in the County, with the Office of Public Works (OPW) having responsibility for flood risk management. The main objective of the EU Water Framework Directive (WFD) is to protect and restore water quality in both surface and groundwater. It includes a requirement to 'contribute to mitigating the effects of floods', which has been enacted through the Floods Directive. The implementation of the Floods Directive and the development of Flood Risk Management Plans (FRMPs) are closely linked to the implementation of the Water Framework Directive (WFD).

- County Development Plan 2016-2022

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

Photo Source: Fáilte Ireland / DRTA

FLOOD RISK MANAGEMENT

It is the policy of the Council to continue to incorporate Flood Risk Management into the spatial planning of the County, to meet the requirements of the EU Floods Directive and the EU Water Framework Directive.

- County Development Plan 2016-2022

In partnership with the OPW and neighbouring local authorities, SDCC is working to adapt areas that are vulnerable to flooding by using comprehensive flood risk mapping. SDCC is looking at measures that include nature and have multiple benefits beyond flood defence, such as providing new spaces for recreation and habitats for wildlife. Based on its flood maps, SDCC has identified areas such as those along the Dodder, Poddle and Camac Rivers, which will benefit from solutions involving green infrastructure, integrated wetlands and tree planting.

CASE STUDY

Ballycullen Flood Alleviation Scheme
The Ballycullen Flood Alleviation Scheme was implemented to reduce the risk of flooding of homes in the Ballycullen area. This was in response to the floods in October 2011, which caused significant damage to 50 homes in the vicinity of the Ballycullen Stream, which runs under Kilakee Road/Gunny Hill and surrounding housing estates before joining the Dodder River. In October 2017, a 1.5 kilometre pipe was inserted to alleviate pressure on the existing pipe. The new pipe is now able to withstand a 1-in-100-year flood event.

FLOOD DEFENCE

While flood alleviation using nature-based solutions is SDCC's preferred response, there are certain areas of the County that are not suited to soft solutions, such as planting trees. Therefore, SDCC is building physical flood defences that take into consideration current and future risks. Additionally, SDCC is actively researching alternatives to physical flood defences, such as zoning policies to restrict further development in at-risk areas.

Photo Source: Fáilte Ireland / Paul Condron

FLOOD RESILIENCE

NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
ACTIONS CURRENTLY BUDGETED					
FLOOD RISK MANAGEMENT					
1	Transpose national legislation and regulations on climate change adaptation and flood management into development guidelines	Ongoing	Environment, Water and Climate Change	Guidelines produced	
2	Implement flood risk management guidelines	Ongoing	Environment, Water and Climate Change	# of projects following guidelines	
3	Cross-boundary flood management with neighbouring local authorities	Ongoing	Environment, Water and Climate Change	Quarterly meetings with neighbouring local authorities	
4	Flood event emergency response plans	Ongoing	Environment, Water and Climate Change	Plans completed and updated yearly	
5	Support the development of flood forecasting and warning system	Ongoing	Environment, Water and Climate Change	System developed	
6	Implement and demonstrate SuDS guidelines in own buildings, SDZs and LAPs	Ongoing	Planning, Parks and Biodiversity	Case studies completed and reports prepared	
7	Undertake strategic flood risk assessment of all LAPs, SDZs and Development Plans	Ongoing	Multi-departmental	Assessment completed	
8	Tree planting for water attenuation	Ongoing	Public Realm	# of trees planted	GHG
9	Develop demonstration sites to show how to combine SuDS/flood attenuation systems with existing land uses	Ongoing	Multi-departmental	# of demonstration sites developed	
10	Protect and conserve floodplains, wetlands, rivers and watercourses subject to flooding	Ongoing	Environment, Water and Climate Change	Map of vulnerable areas and species' habitats	
11	Integrated constructed wetlands for water attenuation and purification	Ongoing	Environment, Water and Climate Change	# of wetlands created	
12	Develop a climate change impact GIS risk map with scenarios for the Dublin Region	2020	Climate Ireland, Environment and Transportation, Multi-Departmental	GIS map developed	
13	Develop template to capture impacts, response and costs for all major climate events	2019	Environment, Water and Climate Change	Template developed and issued	
14	Update DLA urban drainage and flooding policies for current knowledge of flood risk and the latest best practice in drainage design	2019	Environment, Water and Climate Change	Policies updated	

NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
15	Establish a Working Group to deal with the issue of pluvial flood risk. This shall include: • 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	2019	Multi-departmental	Working group established	
FLOOD DEFENCE					
16	Risk workshops to assess impacts on Council services	2019	All departments	Risks identified	
17	Whitechurch Flood Alleviation Scheme	To be decided	Environment, Water and Climate Change	Project completed	
18	Poddle Flood Alleviation Scheme	Ongoing	Environment, Water and Climate Change	Project completed	
19	River Camac Flood Alleviation Scheme	To be decided	Environment, Water and Climate Change	Project completed	
20	Minor flood schemes and general maintenance	Ongoing	Environment, Water and Climate Change	# of projects completed	
ACTIONS AWAITING BUDGET					
21	*Communication and awareness campaigns on flood risk management*	*2020*	*Environment, Water and Climate Change, Communications*	*# of households reached*	
22	*Promote and encourage community involvement in the retrofit of SuDS in existing developments*	*2020*	*Multi-departmental*	*# of communities involved*	

EXAMPLES OF RELEVANT LEGISLATION/POLICIES/GUIDANCE

- Arterial Drainage Acts
- Catchment-Based Flood Risk Management Plans (CFRMP)
- Eastern Catchment Flood Risk Assessment and Management (CFRAM) Study 2011-2016
- EU Birds Directive 2009/147/EC
- EU Environmental Liability Directive 2004/35/EC
- EU Floods Directive 2007/60/EC
- EU Habitats Directive 92/43/EEC
- Greater Dublin Strategic Drainage Study
- National Biodiversity Action Plan 2017-2021
- National Landscape Strategy for Ireland 2015-2025
- Planning System and Flood Risk Management Guidelines
- South Dublin County Council Development Plan 2016 -2022 (Policies IE1; IE2; IE3; G3; G5)
- The Ramsar Convention on Wetlands
- The 2nd Cycle River Basin Management Plan 2018 - 2021
- Water Framework Directive 2000/60/EC
- Water Services Strategic Plan (2015)

NATURE-BASED SOLUTIONS

WHERE WE'RE AT

1,750 HECTARES OF PARKS AND OPEN SPACES MAINTAINED BY SDCC

MAINTENANCE OF OVER **60,000** STREET TREES

TARGET

A CLIMATE-RESILIENT REGION

PREVENTING HABITAT LOSS

PROTECTING NATIVE SPECIES, PARKS AND TREE COVER

EXAMPLES OF MAIN ACTION TYPES

- Developing tree trails in public parks
- Constructing wetland habitats in parks
- Creating and expanding community gardens and allotments
- Protecting, maintaining and planting trees across the County
- Actions to support pollinators
- Developing the County's green infrastructure

STAKEHOLDERS TO WORK WITH AND INFLUENCE

- GOVERNMENT DEPARTMENTS
- COMMUNITY GROUPS
- ENVIRONMENTAL GROUPS
- GENERAL PUBLIC
- PRIVATE BUSINESSES AND UTILITIES
- THIRD LEVEL INSTITUTIONS AND SCHOOLS

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"*[26].

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

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

SDCC recognises its role in protecting Ireland's rich biodiversity and the ecosystem services provided by Ireland's natural heritage. By ensuring that plans and policies developed and implemented by the Council undergo environmental assessment and appropriate assessment to align with *The National Biodiversity Action Plan* and key EU directives, SDCC will safeguard Ireland's natural heritage for future generations.

GREEN INFRASTRUCTURE

> **The environmental and heritage resources of the County can be described as the County's 'Green Infrastructure', a vital resource for our future… The Green Infrastructure network supports native plant and animal species and provides corridors for their movement, maintains natural ecological processes and biodiversity, sustains air and water quality and provides vital amenity and recreational spaces for communities, thereby contributing to the health and quality of life of residents and visitors to the County.**
> - County Development Plan 2016-2022

SDCC's goal, through this action plan, is to plan for a public realm that promotes walkability by creating streets and spaces that are beautiful and inviting with trees and plants, while simultaneously helping with flood management, maintain or improve ecosystems and promote biodiversity. Green infrastructure and greenways play a vital role in this, and deliver a wide range of services, from water purification and air quality management to recreation space. Most importantly, they help in climate change mitigation and adaptation, by reducing CO_2 in the air and 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 will not cause harm to the local ecosystem. Planning for the inclusion of green infrastructure and greenways in the urban environment is about understanding the role of nature in supporting life and making places liveable. Networks of natural wildlife corridors through the urban environment help animal and plant species migrate through the changing landscape. These must be designed so as to not impact negatively on biodiversity.

CASE STUDY

Photo Source: William Murphy / Flickr

Dodder Greenway

The Dodder Greenway, a 14 kilometre green belt along the Dodder River, is a collaborative project between SDCC and neighbouring Dublin City Council and Dún Laoghaire-Rathdown County Council. The project will expand existing pathways and add new ones to accommodate pedestrians and cyclists who are commuting or are enjoying leisurely activities. Incorporating green infrastructure into the South Dublin area is not just about protecting the area from flood risk, but is also about providing people with opportunities to access nature. Globally, it is recognised that being able to go out and enjoy nature has many health benefits. The Dodder Greenway Project aims to maximise these co-benefits and provide people with a recreational and commuting pathway through the three counties.

AGRICULTURE

> **Proposals for farm diversification that involves the development of sustainable business initiatives that are subsidiary to, and directly linked to the primary use of a property for agriculture will generally be favourably considered.**
> - County Development Plan 2016-2022

As South Dublin is also a rural County, agriculture is an active aspect of life, playing a vital role in the livelihoods of some residents. SDCC is supporting farmers in their efforts to diversify crops and potentially lease land for renewable energy projects through the Green Low Carbon Agriculture Environment Scheme (GLAS). SDCC is also supporting the efforts of communities and schools to undertake urban farming projects.

Council Allotments

There are 425 Council allotments at four locations across South Dublin, ranging in size from 50 square metres to 250 square metres:

- Tymon Park, Tallaght – 13
- Corkagh Park, Clondalkin – 39
- Friarstown, Bohernabreena – 297
- Mill Lane, Palmerstown – 76

The allotments benefit communities in SDCC by providing a source of affordable food and an opportunity for people to socialise. There are co-benefits for climate change adaptation, as these allotments absorb water that would otherwise run off into the drainage network.

TREE MANAGEMENT

> **This Tree Management Policy signals a new commitment by South Dublin County Council to looking after one of our most valuable natural resources. It represents a significant change in how we manage trees with the development of a more strategic, proactive, planned approach to inspection, planting, maintenance and management**
> - Living with Trees: South Dublin County Council's Tree Management Policy 2015-2020

SDCC has developed a tree management policy that guides the management and maintenance of trees in public ownership across the County, in accordance with best practice to ensure a healthy and sustainable tree population for current and future generations. The Dublin Tree Canopy Study, carried out by UCD's School of Geography, has highlighted that South Dublin has a deficit of trees. In SDCC, where 42.2% of the land is built up, it is estimated that trees cover 17.3% of the total area, but only 3-10% of the urban area[27]. In response to this study, SDCC is actively working to increase its canopy cover, while simultaneously promoting retention and recognition of the value of the existing tree canopy cover. A proactive regime of inspection, maintenance and renewal is in operation to ensure that their benefits are guaranteed for years to come.

Photo Source: Fáilte Ireland / Rob Durston

CONSERVATION AND PRESERVATION

It is the policy of the Council to protect, enhance and further develop a multifunctional Green Infrastructure network by building an interconnected network of parks, open spaces, hedgerows, grasslands, protected areas, and rivers and streams that provide a shared space for amenity and recreation, biodiversity protection, flood management and adaptation to climate change
- County Development Plan 2016-2022

South Dublin has over 1,750 hectares of parks and open spaces that host a range of protected and rare species, both within and outside of designated protected sites. Assisting these habitats and species to adapt to climate change is a challenge. Wetlands, floodplains, lakes and reservoir ecosystems also 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.

SDCC has developed a range of plans and strategies (*Draft Biodiversity Action Plan, Living with Trees* and *Invasive Alien Species Action Plan*) to protect its biodiversity. As South Dublin's natural ecosystems have a critical role in the international migration of various bird species, it is important to protect and conserve these habitats. Such strategies require the coordination of planning policies, parks management plans and community engagement projects.

CASE STUDY

Dublin Mountains Partnership
Established in 2008, the Dublin Mountains Partnership sees South Dublin County Council, Dún Laoghaire-Rathdown County Council, Dublin City Council, Coillte, the Dublin Mountains Initiative and the National Parks and Wildlife Service working together to support the sustainable management of the Dublin Mountains.

It aims to improve the recreational experience of users of the Dublin Mountains, whilst recognising the objectives and constraints of the various landowners. The partnership undertakes trail development and establishes marked accessed routes, signage and maps throughout the Dublin mountains.

NATURE-BASED SOLUTIONS

NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
ACTIONS CURRENTLY BUDGETED					
OPERATIONS					
1	Establish regional working group to identify areas and priorities for actions	2019	Public Realm and Biodiversity	Working group established	
2	Establish a cross-departmental Trees and SuDS Working Group to promote and pilot water-sensitive urban design (WSUD) incorporating urban tree planting	2019	Multi-departmental	Working group established, # of urban tree pits used as attenuation systems	
3	Workshop to develop Dublin Risk Assessment for nature and climate change	2018 onwards	Multi-departmental	Workshop conducted, assessment developed	
4	Workshop on NBS, green infrastructure and Sustainable urban Drainage Systems (SuDS)	2019	Multi-departmental	Workshop undertaken, report of outcomes	
5	Produce regional floodplain management guidelines - use Santry River as a demonstration	2020	Multi-departmental	Guidelines produced	
6	Finalise draft *Biodiversity Action Plan*	2020	Biodiversity	Plan published	
GREEN INFRASTRUCTURE					
7	Develop *Green Infrastructure Strategy* that identifies areas and priorities for green infrastructure and investment	2019	Planning, Public Realm and Biodiversity	Strategy developed	
8	Develop *Public Open Space and Parks Strategy* that incorporates climate change mitigation and adaptation	2019	Planning, Public Realm and Biodiversity	Strategy developed	
9	Incorporate natural play space into existing parks for recreation and as SuDS	2018 onwards	Public Realm, Communications	# of spaces developed	
10	Implement policies in the development plan avoiding artificial underground storage of attenuation water, where possible, in favour of nature-based solutions	2019	Multi-departmental	Reduction in the # of artificial attenuation systems as a % of developments	
AGRICULTURE					
11	Develop a hedgerow plan for the County, with actions to map, protect and develop hedgerows County-wide	Ongoing	Planning, Public Realm and Biodiversity	Map produced, # of hedgerows maintained and added	

NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
TREE MANAGEMENT					
12	Develop urban woodland management strategy and action plan	2020	Planning, Public Realm and Biodiversity	Plan produced	
13	Implement Tree Management Policy	2018 onwards	Public Realm and Biodiversity	Annual programme of tree maintenance implemented	
14	Increase tree canopy cover in the County through annual planting and maintenance	2019	Public Realm and Biodiversity	% increase in tree canopy cover	GHG
15	Develop coordinated regional planning approach to prevent the removal of healthy, established trees	2018 onwards	Public Realm and Biodiversity	Protocols agreed and implemented, % annual reduction in tree removal by local authorities	
16	Measure and maintain species diversity in urban tree population	2018 onwards	Public Realm and Biodiversity	Reduction in diseases attacking trees	
17	Develop and promote establishment of tree trails in public parks across the County	2018 onwards	Public Realm and Biodiversity, Communications	# of trails established	
18	Develop demonstration projects for successful planting and establishment of trees in urban hardscapes	2018 onwards	Public Realm and Biodiversity	Pilot areas identified and trial solutions designed	GHG
19	Provide opportunities for community engagement, involvement and activities to raise awareness	2019	Public Realm, Planning and Biodiversity	# of events	
CONSERVATION AND PRESERVATION					
20	Review and climate-proof *Biodiversity Action Plan, Invasive Alien Species Plan*, and *Tree Management Policy*	2018 onwards	Public Realm and Biodiversity	Complete review for climate relevant actions carried out and amended accordingly	
21	Develop list of species native to County and map of habitats that are at risk for use in EIAs	2020	Public Realm and Biodiversity	Map of species, completion of list and baseline numbers established	
22	Include native species into plans where appropriate	2019	Multi-departmental	# of plans including native species	
23	Survey, map and implement control plan of invasive species	2019	Public Realm and Biodiversity	Reduction of M2 of IAS and # of IAS	
24	Incorporate actions from national pollinator plan into *Green Infrastructure Strategy*	2019	Public Realm and Biodiversity	Plan implemented	
25	Manage and monitor identified 'pollinator protection sites'	2020	Biodiversity	% of pollinator species increased	
26	Maintain and expand community gardens and allotments for local food production		Environmental Awareness, Community, Communications and Public Realm	# of sites across County	

NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
27	Support local communities with biodiversity education	2019	Environmental Awareness, Biodiversity, Communications	# of participants, yearly reports	
28	Sustainable gardening workshops	2019	Environmental Awareness, Biodiversity, Communications	# of workshops held, # of attendees	

ACTIONS AWAITING BUDGET

29	*Develop demonstration sites to show how to combine nature conservation with existing land uses*	*Timeframe to be decided*	*Architects, Communications, Public Realm and Biodiversity*	*Demonstration sites implemented*	
30	*Deliver green roofs on civic buildings*	*Timeframe to be decided*	*Architects*	*# of Council buildings with green roofs*	GHG
31	*Maintain and increase Green Schools Programme participation*	*Timeframe to be decided*	*Environmental Awareness, Communications*	*# of schools participating*	
32	*Engage with residents and relevant stakeholders on climate change and biodiversity to incorporate their ideas into Council strategies and plans*	*Timeframe to be decided*	*Public Realm and Biodiversity, Communications*	*# of participants, # of interactions*	
33	*Assess the benefit of increasing buffer distance of 10m from water courses to protect biodiversity and provide greater flood attenuation for distances of 20m, 50m and 100m*	*2019*	*Environment, Water and Climate Change, Engineering, Parks and Biodiversity, Finance*	*Comprehensive assessment completed*	

RELEVANT LEGISLATION/POLICIES/GUIDANCE

- All-Ireland Pollinator Plan 2015-2020
- Dublin Tree Canopy Study (2017)
- EU Biodiversity Strategy
- EU Birds Directive 2009/147/EC
- EU Environmental Impact Assessment Directive 2014/52/EU
- EU Habitats Directive 92/43/EEC
- EU Regulation on Invasive Alien Species - EU Regulation 1143/2014
- EU Strategy on Green Infrastructure 2013
- European Communities (Birds and Natural Habitats) Regulations 2011 S.I. 477 of 2011
- European Union (Invasive Alien Species) (Freshwater Crayfish) Regulations 2018
- European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 S.I. 296 of 2018
- Green Low Carbon Agriculture Environment Scheme (GLAS)
- Living with Trees - South Dublin County Council's Tree Management Policy 2015-2020
- National Biodiversity Action Plan 2017-2021
- National Landscape Strategy for Ireland 2015-2025
- South Dublin County Council Development Plan 2016 -2022 (Policies ET6; G2; G4; HCL8; HCL9; HCL10; HCL17)
- Water Framework Directive 2000/60/EC
- Wildlife (and Amendment) Acts 1976-2012

RESOURCE MANAGEMENT

OVERVIEW

WASTE AND WASTE-WATER ACCOUNTED FOR **1.7%** OF SOUTH DUBLIN'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

GOVERNMENT DEPARTMENTS

IRISH WATER

PRIVATE BUSINESSES

EASTERN MIDLANDS WASTE REGION

COMMUNITY GROUPS, TIDY TOWNS, IBAL

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

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

On a local level, SDCC is working to reduce the production of waste and protect the environment from contamination of hazardous waste materials and general litter.

WASTE MANAGEMENT

Plan Target - Reduce to 0% the direct disposal of unprocessed residual Municipal waste to landfill (from 2016 onwards) in favour of higher value pre-treatment processes and indigenous recovery practices.
- Eastern-Midlands Regional Waste Management Plan (2015-2021)

SDCC will introduce a comprehensive waste prevention and recycling programme within the Council to reduce consumption and waste produced in the Council's buildings and operations. A priority for SDCC is to review procurement procedures and identify opportunities to source local, environmentally-friendly products to use in its operations. For example, SDCC is committed to reducing the use of disposable cups by supporting the Conscious Cup Campaign and encouraging staff to use reusable cups. This will be further strengthened by the recent announcement by the government that all public bodies will not purchase single-use plastic beverage cups, cutlery and drinking straws after the 31st of March 2019 and will be required to report to its respective Minister by the end of November 2019 on the measures it is taking to minimise waste generation and maximise recycling.

CASE STUDY

Photo Source: Goran Ivas / Unsplash

Conscious Cup Campaign - Citizen Led Initiatives

The Conscious Cup Campaign (CCC) aims to reduce the use of disposable cups in organisations around the country, and is a partnership between VOICE and the Eastern-Midlands Regional Waste Office. South Dublin County Council has been actively promoting this initiative and introduced the campaign into Café Coco in County Hall in February 2017, where customers using a reusable cup can avail of a 10 cent discount. SDCC is also encouraging all cafés in the area to participate in the campaign, and also facilitated a meeting with the CCC and the local Tidy Towns Network, in order to boost engagement locally. Also, as part of the Local Authority Prevention Network (LAPN), SDCC has made a submission to the Department of Communications, Climate Action and Environment in relation to the proposed introduction of a levy on disposable cups. In June 2018, SDCC partnered with Dublin City Council, Fingal County Council and the EPA to launch the 'Don't be Dick' campaign, which highlighted how careless actions can have serious consequences on the environment, and encouraged consumers to think about their coffee drinking habits in a new way. The campaign ran for three weeks across across radio, Dublin Bus, cinema, digital and social media channels.

CASE STUDY

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

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

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. SDCC is planning to expand the availability of recycling infrastructure to reduce the amount of recyclable materials that go to landfill. SDCC is also actively working with the Eastern Midlands Regional Waste (EMRW) team to inform people about what they can and cannot recycle.

CASE STUDY

Recycling Ambassador Programme
South Dublin County Council supported the Recycling Ambassador Programme, which was a VOICE initiative funded by the Department of Communications, Climate Action and Environment (DCCAE) and REPAK. The programme also partnered with the Regional Waste Management Offices, with the aim to improve Ireland's recycling rates and reduce levels of contamination in household recycling bins. Many people have become confused about what can and cannot be recycled 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, which educated, supported and encouraged the public to recycle more effectively
- 30 ambassadors across the country

WATER CONSERVATION

Whilst the Dublin Region has an abundance of water, it does not equate to treated water suitable for drinking. As demonstrated in the aftermath of Storm Emma and the Beast from the East, there are challenges with water supply and delivery in the County. While the Council is no longer responsible for water delivery, it will work with Irish Water to ensure that people have security of supply. As such, actions in this plan are also focused on public education around conservation and protection of this valuable resource.

RESOURCE MANAGEMENT

NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
ACTIONS CURRENTLY BUDGETED					
WASTE MANAGEMENT					
1	Monitor and enforce waste regulation	Ongoing	Environment, Water and Climate Change	Environmental Performance Assessment from EPA	GHG
2	Introduce measures to reduce waste in Council buildings	Ongoing	Architects Department	10% reduction in waste in Council HQ buildings by 2021	GHG
3	Introduce measures to increase recycling in Council buildings	Ongoing	Environmental Awareness, Communications and Architects Department	% recycling rate	GHG
4	Civic amenity waste stations	Ongoing	Waste Management Section	# of civic amenity sites that include reuse	GHG
5	Apply for Local Authority Prevention Network grants	Ongoing	Environmental Awareness, Communications	# of grants for waste related projects	GHG
6	Create Stop Food Waste campaign for businesses and schools	Ongoing	Environmental Awareness, Communications, LEO	Campaign developed and implemented, # of people, businesses and schools engaged	GHG
7	Promote Eco-Week	Ongoing	Environmental Awareness	# of events held, # of people reached	GHG
8	Promote Re-Use Month annually	Ongoing	Environmental Awareness, Communications	# of Council run events	GHG
9	Use €co-Merit programme to advise businesses on reducing waste	Ongoing	Environmental Awareness, Communications, LEO	# of businesses participating	GHG
10	Eliminate single-use plastics at Council organised events	Ongoing	Environmental Awareness, Communications	Reduction in non-recyclable / non-compostable material used at events	GHG
11	Ongoing support of the Conscious Cup Campaign / promotion of reusables over disposables	Ongoing	Environmental Awareness	# of buildings in SDCC supporting CCC, # of staff using reusable mugs	GHG
12	Ongoing support of the Small Business Innovation Research (SBIR) challenge for illegal dumping	Ongoing	Smart Dublin	Trialled solution	GHG
LITTER & RECYCLING IN THE PUBLIC REALM					
13	Run anti-dumping/anti-litter campaigns	Ongoing	Environmental Awareness, Communications	# of campaigns implemented	GHG
14	Waste Prevention Fund	Ongoing	Environmental Awareness, Communications	# of programmes implemented	GHG

NO	ACTION	TIMEFRAME	LEAD DEPT(S)	INDICATORS	TARGET(S) IMPACTED
15	Introduce measures to reduce waste and increase recycling	Ongoing	Waste Management Section	Reduced waste tonnage and increased rates of recycling	GHG
16	Provide more glass recycling in public realm	Ongoing	Waste Management Section	Areas of need identified, # of glass banks added	GHG
17	Introduce leaf composting programme	Ongoing	Public Realm, Environmental Awareness, Communications	# of residents' associations participating	
18	Support and promote tidy towns initiatives in County	Ongoing	Community, Environmental Awareness, Communications	# of initiatives supported annually	
LANDFILL MANAGEMENT					
19	Examine the potential of Arthurstown Landfill for development of green energy uses	Ongoing	Architects, EWCC, Codema	Zero GHG emissions by 2030	GHG
WATER CONSERVATION					
20	Implement water conservation campaign in civic buildings	Ongoing	Environmental Awareness, Communications	% reduction in water consumed	
21	Identify pilot locations for water access points	2019	Environment and Transportation	Sites identified	

ACTIONS AWAITING BUDGET

22	*Trial of low-flush toilets in Council headquarters and social housing*	*2019*	*Architects*	*# of Council buildings and social housing units with low flush toilets*	
23	*Research feasibility of rainwater harvesting in Council buildings*	*2019*	*Architects*	*Study completed*	

EXAMPLES OF RELEVANT LEGISLATION/POLICIES/GUIDANCE

- Climate Action and Low Carbon Development Act 2015
- Directive 2008/98/EC on Waste (Waste Framework Directive)
- Eastern-Midlands Regional Waste Plan (Policies B.2.4; B.4.3; C.1.1; C.1.3; C.5.1; D.3.1; E3)
- South Dublin County Council Development Plan 2016 -2022 (Policies SIO5; SI19)
- South Dublin County Local Economic and Community Plan (LECP) 2016 – 2021
- Water Services Strategic Plan (2015)

MILESTONE 4: IMPLEMENTATION

Ownership and implementation of this Climate Change Action Plan (CCAP) clearly resides with South Dublin County Council (SDCC). 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.

SDCC has established a Climate Team, which aims to gather and coordinate 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 South Dublin 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 Dublin Local Authorities are the starting point to building climate resilience, through present and future action on climate change throughout the region.

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

The role of the Dublin Metropolitan CARO is to:

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

Internationally, SDCC 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, SDCC 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 South Dublin County Council (working in close association with the CARO) will report directly to the Environment, Public Realm and Climate Change Strategic Policy Committee (SPC), and to the Chief Executive's Office, through the Director of Environment, Water 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 Climate Change Action Plan was developed through the Environment, Public Realm and Climate Change SPC of South Dublin County Council and approved by the full County Council. The Director of Environment, Water 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 the Department of Communications, Climate Action and Environment (DCCAE), the Environmental Protection Agency (EPA), the Office of Public Works (OPW), Met Éireann and the national Climate Change Advisory Council. This facilitates engagement with the different government departments and helps to align the local authority KPIs with the national and EU climate policy objectives.

Covenant of Mayors for Climate & Energy

COVENANT OF MAYORS FOR CLIMATE AND ENERGY

SDCC, along with over 7,000 cities and regions in 57 countries, is a signatory to 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, SDCC 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 South Dublin 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 South Dublin 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, 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 South Dublin, Codema identified five action areas that include the different sectors in the County:

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

The action areas chosen reflect the action areas used throughout this Climate Change Action Plan (Energy and Buildings, Transport, Flood Resilience, Nature-Based Solutions and Resource Management), and these also reflect SDCC'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 5 on the following page (adapted from the European Commission Non-paper Guidelines[28]) 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 6 on the next page, with the high risks (the most urgent and should be addressed first) shown in red and dark orange, and the low 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 5 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 6 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 7 South Dublin'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**
	Flooding	Fluvial, pluvial and groundwater 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.)	Fluvial	5	5	**25**
			Pluvial	4	4	**16**
			Groundwater	4	3	**12**
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**
	Flooding	Increases in fluvial and pluvial flooding will cause road damage, which can lead to disruption of transport services	Fluvial	5	5	**25**
			Pluvial	4	4	**16**
			Groundwater	4	3	**12**
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**
	Flooding	Increasing extreme flood events can cause loss of habitats and damage to ecosystems	Fluvial	3	5	**15**
			Pluvial	2	4	**8**
			Groundwater	2	3	**6**

IMPACT AREAS	CLIMATE RISKS	DESCRIPTION	PARAMETER	CONSEQUENCE	LIKELIHOOD	FUTURE RISK
Waste Management	Extreme Weather Events	Projected increases in temperature, heat waves and droughts may increase the risk of fires in landfill sites and can also increase the prevalence of vermin and odour	Cold Snaps	2	3	**6**
			Heat Waves	4	4	**16**
			Dry Spells	4	5	**20**
			Extreme Rainfall	5	3	**15**
			Wind Speeds	1	2	**2**
	Flooding	Flooding of landfill sites increases the risk of surface and groundwater contamination	Fluvial	3	5	**15**
			Pluvial	4	4	**16**
			Groundwater	5	3	**15**
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**
	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	Fluvial	4	5	**20**
			Pluvial	4	4	**16**
			Groundwater	5	3	**15**

APPENDIX II: TOTAL EMISSIONS IN SOUTH DUBLIN

This section examines the resulting total emissions from the different sectors in South Dublin. The total emissions from the various sectors in South Dublin amount to 1,877,910 tonnes of CO_2eq. The sectors that produced the most emissions were the transport, commercial and residential sectors, producing 38.9%, 32.4% and 24.4% respectively, of the total emissions in South Dublin. From this analysis, these three sectors should be the main targets of energy and emission reduction initiatives.

Figure 22 illustrates the total CO_2 emissions in tonnes of CO_2eq by sector and fuel type. Waste and wastewater were not broken down by fuel type, as the data provided was in terms of emissions.

From this analysis, Codema found that the commercial sector uses the most electricity in South Dublin, and also had the highest emissions from electricity (69%). This may be due to the number of industrial uses in South Dublin with a high electricity demand. Natural gas had the highest CO_2 emissions in the residential sector, accounting for 63% of total gas emissions in the County. Meanwhile, the transport sector accounted for 99.6% of all diesel emissions in South Dublin.

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

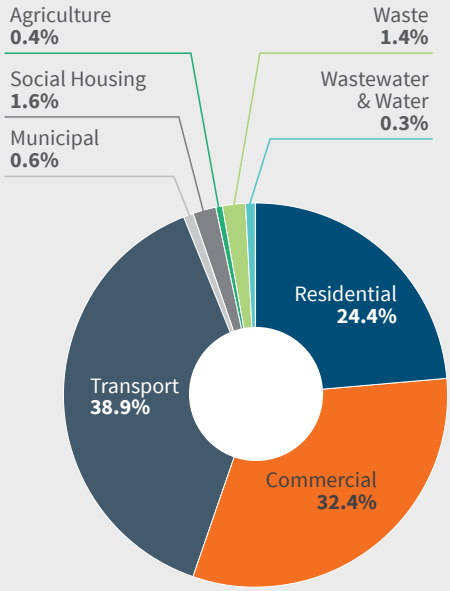


Figure 21 Share of Total Emissions in South Dublin

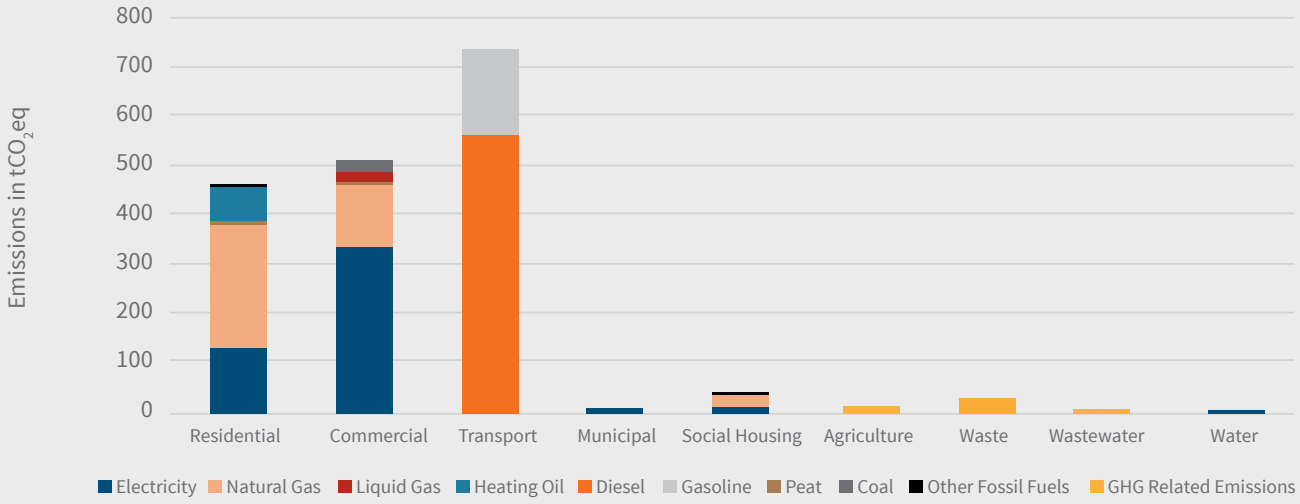


Figure 22 Total tCO_2eq Emissions in Different Sectors

Table 8 South Dublin's 2016 Energy & Emissions Inventory in the Covenant of Mayors for Climate & Energy

SECTOR		FINAL ENERGY CONSUMPTION (MWh)															
		ELECTRICITY	HEAT/COLD	FOSSIL FUELS								RENEWABLE ENERGIES					TOTAL
				NATURAL GAS	LIQUID GAS	HEATING OIL	DIESEL/GAS OIL	GASOLINE	LIGNITE	COAL	OTHER FOSSIL FUELS	PLANT OIL	BIOFUEL	OTHER BIOMASS	SOLAR THERMAL	GEO-THERMAL	
BUILDINGS, EQUIPMENT, FACILITIES AND INDUSTRIES																	
Municipal buildings, equipment/facilities		7,056	-	8,007	370	1,534	-	-	-	-	-	-	-	-	-	-	**16,966**
Tertiary (non municipal) buildings, equipment/facilities		493,798	-	433,337	12,381	371,432	-	-	-	-	-	-	-	42,096	-	34,667	**1,387,711**
Residential Buildings		300,089	-	1,340,079	3,665	261,456	-	-	131	3,480	9,844	-	1	1,114	-	-	**1,919,859**
Public Lighting		11,861	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**11,861**
Industry	Non-ETS	226,324	-	203,315	28,098	62,028	-	-	265	60,968	-	-	795	55,136	-	-	**636,931**
	ETS (not recommended)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**
SUBTOTAL		**1,039,127**	**-**	**1,984,739**	**44,514**	**696,451**	**-**	**-**	**397**	**64,448**	**9,844**	**-**	**797**	**98,346**	**-**	**34,667**	**3,973,328**
TRANSPORT																	
Municipal fleet		-	-	-	-	-	3,542	105	-	-	-	-	-	-	-	-	**3,647**
Public Transport		1,127	-	-	700	-	785,776	266,945	-	-	-	-	-	-	-	-	**1,054,548**
Private and commercial transport		1,864	-	-	1,158	-	1,299,994	441,636	-	-	-	-	-	-	-	-	**1,744,652**
SUBTOTAL		**2,991**	**-**	**-**	**1,858**	**-**	**2,089,311**	**708,686**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2,802,847**
OTHER																	
Agriculture, Forestry, Fisheries		577	-	-	-	107	5,674	-	-	-	-	-	-	-	-	-	6,358
TOTAL		**1,042,695**	**-**	**1,984,739**	**46,372**	**696,558**	**2,094,985**	**708,686**	**397**	**64,448**	**9,844**	**-**	**797**	**98,346**	**-**	**34,667**	**6,782,532**

SECTOR		CO_2 EMISSIONS										CO_2 EMISSIONS					
		ELECTRICITY	HEAT/COLD	FOSSIL FUELS								RENEWABLE ENERGIES					TOTAL
				NATURAL GAS	LIQUID GAS	HEATING OIL	DIESEL/GAS OIL	GASOLINE	LIGNITE	COAL	OTHER FOSSIL FUELS	PLANT OIL	BIOFUEL	OTHER BIOMASS	SOLAR THERMAL	GEO-THERMAL	
BUILDINGS, EQUIPMENT, FACILITIES AND INDUSTRIES																	
Municipal buildings, equipment/facilities		3,299	-	1,639	85	401	-	-	-	-	-	-	-	-	-	-	**5,423**
Tertiary (non municipal) buildings, equipment/facilities		230,851	-	88,704	2,839	95,458	-	-	-	-	-	-	-	-	-	-	**417,852**
Residential Buildings		140,292	-	274,314	839	67,194	-	-	47	1,187	2,598	-	-	-	-	-	**486,470**
Public Lighting		5,545	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**5,545**
Industry	Non-ETS	105,807	-	41,619	6,443	15,941	-	-	94	20,766	-	-	-	-	-	-	**190,670**
	ETS (not recommended)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**
SUBTOTAL		**485,792**	**-**	**406,276**	**10,194**	**178,988**	**-**	**-**	**141**	**21,977**	**2,598**	**-**	**-**	**-**	**-**	**-**	**1,105,959**
TRANSPORT																	
Municipal fleet		-	-	-	-	-	935	26	-	-	-	-	-	-	-	-	**962**
Public Transport		527	-	-	160	-	207,445	67,270	-	-	-	-	-	-	-	-	**275,402**
Private and commercial transport		872	-	-	265	-	343,198	111,292	-	-	-	-	-	-	-	-	**455,627**
SUBTOTAL		**1,398**	**-**	**-**	**426**	**-**	**551,578**	**178,589**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**731,991**
OTHER																	
Agriculture, Forestry, Fisheries		270	-	-	-	28	1,498	-	-	-	-	-	-	-	-	-	1,795
OTHER NON-ENERGY RELATED																	
Waste Management																	**26,530**
Waste water management																	**6,411**
Other non-energy related (Agriculture GHG emissions)																	**5,228**
TOTAL		**487,460**	**-**	**406,276**	**10,619**	**179,015**	**553,076**	**178,589**	**141**	**21,977**	**2,598**	**-**	**-**	**-**	**-**	**-**	**1,877,914**

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ABBREVIATIONS

AAMP	Ambient Air Quality Monitoring Programme
AEP	Annual Event/Exceedance Probability
BER	Building Energy Rating
CARO	Climate Action Regional Office
CCAP	Climate Change Action Plan
CCC	Conscious Cup Campaign
CFRAM	Catchment Flood Risk Assessment and Management
CFRMP	Catchment-Based Flood Risk Management Plan
CMT	Crisis Management Team
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2eq	Carbon Dioxide Equivalent
COP	Conference of the Parties
DAFM	Department of Agriculture, Food and the Marine
DCCAE	Department of Communications, Climate Action and Environment
DEC	Display Energy Certificate
DMURS	Design Manual for Urban Roads and Streets
DHPLG	Department of Housing, Planning and Local Government
DLAs	Dublin Local Authorities
DTTAS	Department of Transport, Tourism and Sport
EIA	Environmental Impact Assessment
EMRW	Eastern Midlands Regional Waste
EPA	Environmental Protection Agency
EPC	Energy Performance Contract
ETS	Emissions Trading Scheme
EU	European Union
FRMP	Flood Risk Management Plan
GDA	Greater Dublin Area
GHG	Greenhouse gas
GLAS	Green Low Carbon Agriculture Environment Scheme
GWh	Gigawatt hour
ICLEI	International Council for Local Environmental Initiatives
IPCC	Intergovernmental Panel on Climate Change
km	Kilometre
KPI	Key Performance Indicator
LAPN	Local Authority Prevention Network
LECP	Local Economic and Community Plan
M&R	Monitoring and Reporting
MEM	Major Emergency Management
MOVA	Microprocessor Operated Vehicle Actuation
MWh	Megawatt hour
NAF	National Adaptation Framework
NEEAP	National Energy Efficiency Action Plan
NMP	National Mitigation Plan
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxide
NPF	National Planning Framework
NREAP	National Renewable Energy Action Plan
NTA	National Transport Authority

nZEB	nearly Zero Energy Building
OPW	Office of Public Works
PES	Principal Emergency Service
PM_{10}	Particulate Matter
$PM_{2.5}$	Fine Particulate Matter
PRA	Principal Response Agency
PV	Photovoltaic
QBC	Quality Bus Corridor
RD&D	Research, Demonstration and Development
SBIR	Small Business Innovation Research
SCOOT	Split Cycle Offset Optimisation Technique
SDCC	South Dublin County Council
SDZ	Strategic Development Zone
SEAI	Sustainable Energy Authority of Ireland
SEAP	Sustainable Energy Action Plan
SECAP	Sustainable Energy and Climate Action Plan
SEDA	Spatial Energy Demand Analysis
SEU	Significant Energy User
SO_2	Sulphur Dioxide
SPC	Strategic Policy Committee
SuDS	Sustainable urban Drainage Systems
tCO_2	Tonnes of carbon dioxide
UCD	University College Dublin
UNDP	United Nations Development Programme
UTC	Urban Traffic Control
VOICE	Voice of Irish Concern for the Environment
WFD	Water framework Directive
WMO	World Meteorological Organisation

Comhairle Contae
Átha Cliath Theas
South Dublin County Council

Codema
Dublin's Energy Agency