

Monaghan County Council

Climate Change Adaptation Strategy

2019-2024



Foreword – Chief Executive and Cathaoirleach

Message from Chief Executive of Monaghan County Council Eamonn O’Sullivan.



Climate change is one of the most critical challenges facing the world today. It is important to acknowledge that whilst we continue in our attempts both at local level and international level to mitigate against climate change, we must also now adapt to the impacts of climate change. This Climate Change Adaptation Strategy considers the impacts of recent severe weather events experienced in the county and are likely to face in the future and proposes a range of actions to be delivered at County Level to allow us to adapt better to such events in the future.

The Climate Change Adaptation Strategy for Monaghan County Council will further strengthen Monaghan County Council’s ability to be climate resilient in our day to day operations and in our dealings and interactions with all stakeholders

Message from Cathaoirleach of Monaghan County Council Seamus Coyle.



I am delighted to present the Monaghan County Council Climate Change Adaptation Strategy 2019-2024. Climate Change is the defining issue of our time and it is both a local and global challenge. The people of Monaghan are only too aware of the damaging weather events that have occurred in recent years and which have impacted our county significantly. In the face of the real climate challenge that we are all facing it is now necessary to put in place climate adaptation measures that will allow Monaghan County Council to better prepare, better respond to, and better adapt to the impacts of climate change. This strategy will help ensure that we can continue to deliver the many services and functions across the administrative and geographical area of County Monaghan and will assist Monaghan County Council in becoming more resilient to the impacts of climate change and help ensure that we plan in a considered way for how we adapt to climate change impacts going forward.

Executive Summary

The impacts of climate change are becoming increasingly apparent at both a local and global level and the scientific evidence suggests that these impacts will intensify over the coming decades. Such extreme events present real and difficult challenges for Monaghan County Council in how the local authority delivers its services along with impacting local enterprises and businesses as well as local communities.

This Climate Change Adaptation Strategy for Monaghan County Council will allow the local authority to plan for, respond to, and adapt to Climatic events. It aims to make Monaghan County Council and the communities that it serves more sustainable and climate resilient.

This Adaptation Strategy is based around six thematic areas below that are developed as High Level Goals. They are supported by specific objectives and adaptation actions to achieve their desired outcomes:

Theme 1: Local Adaptation Governance and Business Operations

Theme 2: Infrastructure and Built Environment

Theme 3: Land use and Development

Theme 4: Drainage and Flood Management

Theme 5: Natural Resources and Cultural Infrastructure

Theme 6: Community Health and Wellbeing

In order for Monaghan County Council to achieve these goals, this Climate Change Adaptation Strategy sets out the current and future climate change impacts in the County through the development of adaptation baselines. It also examines the future impacts and risks that climate change may have on the County and sets out a framework of actions to reduce our vulnerability to the effects of these impacts.

The adaptation baseline has identified that the effects of climate change are already impacting the Monaghan area at a significant rate and are very likely to increase in their frequency and intensity into the future.

In very recent times, Monaghan County Council has experienced extreme temperatures, severe winds, extreme precipitation and drought conditions. All these extreme weather events clearly demonstrate the need to reduce the impact that climate change is having on the citizens, environment and the economy of County Monaghan, and on the service delivery capability of Monaghan County Council.

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Chapter 1 - Introduction & Background

1.1 Introduction:

The Earth's Climate is changing. While natural fluctuations in climate are considered normal, emerging research and observational records from across the world show rates of change that are far greater than those experienced in recent history. Global temperatures have risen and are projected to rise further bringing changes in weather patterns, rising sea levels and increased frequency and intensity of extreme weather. Ireland's climate is changing in line with global patterns and these changes are bringing significant and wide ranging economic, environmental and social impacts.

Climate change is now recognised as a global challenge with policy responses required in terms of both mitigating the causes of climate change and in adapting to the now inevitable consequences of our changing climate. Action at local level is vitally important to help reduce the risks and impacts of climate change across communities.

This Monaghan County Council Climate Change Adaptation Strategy is the start of the process of adaptation planning in Co. Monaghan and is the first step in increasing knowledge and understanding of our changing climate, growing resilience, and enabling effective responses to the threats posed by climate change.

1.2 Purpose of this strategy:

The Monaghan County Council Climate Change Adaptation Strategy 2019-2024 forms part of the National Adaptation Framework (NAF) which was given statutory authority by the provisions of the Climate Action and Low Carbon Development Act 2015.

As the level of government closest to local communities and enterprise and as first responders in many emergencies, we here in Monaghan County Council are uniquely placed to effect real positive change with respect to delivery of the national transition objective to low carbon and a climate resilient future.

The local authority adaptation strategy takes on the role as the primary instrument at local level to:

- (i) ensure a proper comprehension of the key risks and vulnerabilities of climate change
- (ii) bring forward the implementation of climate resilient actions in a planned and proactive manner
- (iii) ensure that climate adaptation considerations are mainstreamed into all plans and policies and integrated into all operations and functions of Monaghan County Council.

This adaptation strategy serves Monaghan County Council in its two capacities namely:

- As a business organisation or entity with an obligation towards customer service, a focus on effectiveness in business, improving efficiencies and maintaining staff welfare and
- In the delivery of services and functions across the administrative and geographical area of County Monaghan.

In accordance with the provisions of the Climate Action and Low Carbon Development Act 2015 this adaptation strategy is required to be adopted by members of Monaghan County Council before the 30th September 2019.

1.3 The Challenge of Climate Change

Climate is described as the average weather over a period of time. *Climate Change* is a significant change in weather patterns such as rainfall, temperature, and wind, which continue over an extended period of time (i.e. over decades or longer). The Earth's climate is constantly changing. Climatic fluctuations are known to occur from natural causes including the Earth's orbit and tilt, volcanic eruptions, variations in solar energy and other phenomena such as the El Nino effect¹. However, in more recent times, there are growing concerns that natural fluctuations in climate are being overtaken by rapid human-related activities which are negatively influencing climate variability and giving rise to serious implications for the rate of global warming.

Scientific evidence for warming of the climate system is unequivocal. According to the Intergovernmental Panel on Climate Change (IPCC)² warming of the climate system is attributable to human activities as a consequence of greenhouse gas emissions³ from:

- Burning of fossil fuels such as oil, gas, peat, and coal resulting in carbon dioxide emissions
- Agricultural activities that lead to methane and nitrous oxide emissions
- Emissions from changes in land use such as urbanization, deforestation, and desertification

Emissions from these activities are proven to impact the atmosphere by trapping the sun's radiation and reflecting back to the earth giving rise to global warming. The term greenhouse effect has been coined to describe this occurrence.

The effects of global warming are observed through reductions in snow and ice in polar regions, increase in global mean surface temperatures, rise in sea levels and changes in some

¹El Nino is a climate cycle in the Pacific Ocean with a global impact on weather patterns.

² The IPCC was created in 1988. One of its key objectives is to provide governments at all levels with scientific information that they can use to develop climate policies. IPCC reports are a key input into international climate change negotiations.

³ Greenhouse Gases include: water vapour, carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O) and industrial gasses: Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulphur Hexafluoride (SF₆), and Nitrogen Trifluoride (NF₃). Carbon Dioxide emissions in the atmosphere are the main greenhouse gas caused by human activity

climate extremes i.e. weather events. Scientists state these changes are occurring rapidly, are considerable, and will have consequences for this and future generations. Some impacts of global warming such as sea level rise and coastal flooding are already locked in and unavoidable. The full impacts of current warming have not yet been seen, since ice sheets and oceans take many decades to fully react to higher temperatures.

Climate change is one of the most pressing global policy challenges facing governments needing immediate commitment to action.

1.4 The challenge for Ireland

There is evidence that Irelands climate is changing in line with global trends of climate change. Over the last few decades our climate has warmed, sea-levels have risen, rainfall patterns have changed and we have been impacted by frequent, intense and more extreme weather events. Temperatures have increased by 0.8°C since 1900 and sea level rises of about 3.5cm per decade have been observed since 1990. Climate change has diverse and wide ranging impacts on Ireland's economic and natural resources including:

- More intense storms and rainfall events giving rise to disruption to society
- Increased river and coastal flooding
- Water shortages in summer
- Increased risk of new pests and diseases
- Adverse impacts on water quality
- Changes in the distribution and phenology of plant and animal species on land and in the oceans

Nationally, climate projections for the next century indicate that the climate trends observed over the last century will continue and intensify over the coming decades. These climate projections include:

- Increase in average temperatures across all seasons. Heat waves are expected to occur more frequently.
- Significant reductions are expected in average levels of spring and summer rainfall with a substantial increase in the frequency of heavy precipitation events in Winter and Autumn
- Decrease in wind speed and an increase in extreme wind speeds. The number of very intense storms is projected to increase over the North Atlantic region.
- Sea levels will continue to rise for all coastal areas. The south of Ireland will likely feel the impacts of these rises first. Sea surface temperatures are projected to continue warming for the coming decade.

This local authority adaptation strategy is set against the background of increasing risks associated with climate change and seeks to reduce and manage these risks at local level through a combination of mitigation and adaptation responses.

All local authorities including Monaghan County Council provide a wide range of services, many of which are already and will increasingly be affected by climate change. It is most likely that we will continue to play a critical role in responding to the impacts of extreme weather events and other impacts that are likely to emerge over the coming decades through various implementation tools available as a local authority⁴.

1.5 What is Climate Adaptation ?

Climate Adaptation can be best described as planning proactively to take action and make adjustments to minimise or avoid the existing and anticipated impacts from climate change. The Intergovernmental Panel on Climate Change (IPCC), in 2014, defined climate adaptation as:

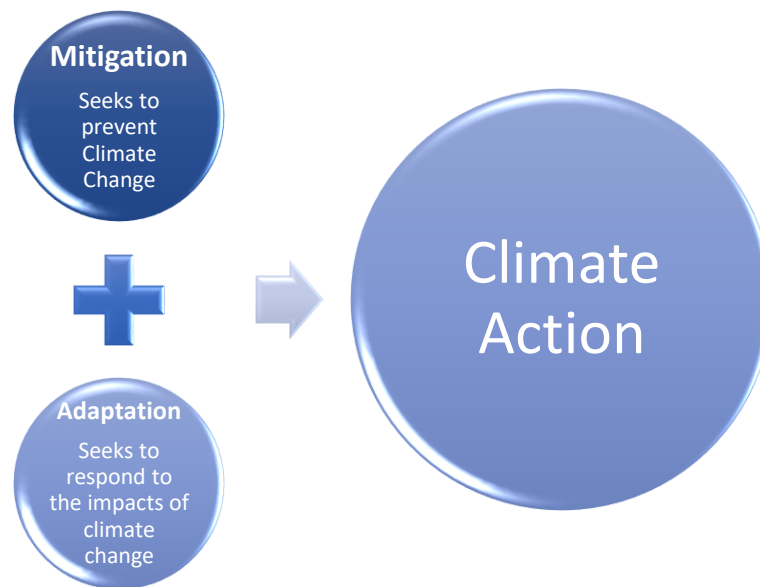
“The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.”

Climate adaptation aims to build climate resilient communities, to protect people, ecosystems, businesses, infrastructure and buildings from the negative impacts of climate change. As a Local Authority, Monaghan County Council plays a pivotal role in planning for, and responding to, emergency situations. We are best placed to react faster and more effectively to local climate events given our close relationship with communities and extensive knowledge of the local natural and built environment. This is demonstrated by our prompt and unrelenting emergency responses to varying and more frequent extreme weather events as was demonstrated in recent years.

Our climate is changing and we as a local authority need to ensure that we adapt to climate change. It is crucial that climate change adaptation is mainstreamed into our decision making processes and implemented proactively in the performance of our duties. In addition, the benefits and opportunities that may arise as a result of climate change must be capitalised upon in respect of cost savings and new ways to foster environmental sustainability.

⁴ Including: spatial planning, development consent, asset management and natural resource protection

1.6 Adaptation and Mitigation



This local authority climate change adaptation strategy forms part of Ireland's national strategy for climate adaptation as set out in the National Adaptation Framework (NAF) which was given legislative backing through the Climate Action and Low Carbon Development Act 2015.

It is tasked with mainstreaming climate change adaptation over time into all functions, operations and services of the local authority. It seeks to inform or 'climate proof' existing plans and policies produced and implemented by the local authority. This ensures a considered, consistent and coherent approach for facing head on the challenges of a changing climate and for building resilience within the local authority organisation itself as well as across all communities.

Adaptation refers to efforts to manage the risks and impacts associated with existing or anticipated change.

While there is strong emphasis on local authorities to develop and implement adaptation measures and actions, mitigation measures are also crucial considerations.

Mitigation refers to the efforts to reduce the emission of greenhouse gases and reduce the severity of future climate change impacts

There are positive interactions between adaptation and mitigation measures. Employing both adaptation and mitigation measures represents a robust climate action response in addressing the challenges associated with climate change at local level. The actions set out in Chapter Five of this strategy reflect both adaptation and mitigation measures as a considered, relevant and integrated approach to combating the effects of climate change in County Monaghan.

1.7 Adaptation Policy Context

This local authority adaptation strategy is set within a policy framework at International, European and National level.

1.8 International Context

The United Nations Framework Convention on Climate Change (UNFCCC) is an international environmental treaty adopted in May 1992. The framework's objective is "to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." The framework set non-binding limits on greenhouse gas emissions and contained no enforcement mechanisms. However, the framework outlined how specific international treaties may negotiate further action towards its key objective. **The Paris Agreement 2015** is a protocol set within the context of the UNFCCC (ratified by Ireland on 4th November 2016) and it is aimed at:

- limiting global warming to less than 2°C above pre-industrial level and pursue efforts to limit the temperature increase to 1.5°C
- Increasing the ability to adapt to the impact of climate change and foster climate resilience

The agreement states the need for Parties to formulate and implement National Adaptation Plans.

In 2015, countries also adopted the **2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals** (SDGs). The SDGs are a blueprint to achieve a better and more sustainable future. They address global challenges related to poverty, inequality, climate, environmental degradation, prosperity, and peace and justice. The Goals interconnect and are interdependent. Goal No. 13 addresses Climate Action with an objective to: **Take urgent action to combat [climate change](#) and its impacts by regulating [emissions](#) and promoting developments in [renewable energy](#)**

The Goal recognizes Climate Change as a global challenge that does not respect national borders and requires solutions that need to be coordinated at the international level to help developing countries move toward a low-carbon economy.

1.9 EU Context

The 2013 EU Strategy on Adaptation to Climate Change encouraged all Member states to adopt comprehensive adaptation strategies. It sought for better informed decision making through the identification and addressing of gaps in knowledge about adaptation. The European Climate Adaptation Platform, Climate-ADAPT, was developed as a resource mechanism to help users access and share information on adaptation.

1.10 National Context

The 2012 National Climate Change Adaptation Framework (NCCAF) was Ireland's first step in developing a national policy on adaptation actions to combat the impacts of climate change.

The National Policy Position on Climate Action and Low Carbon Development 2014 restated the policy position of the NCCAF, 2012. Greenhouse gas mitigation and adaption to the impacts of climate change were to be addressed in parallel national plans under an evolving climate policy to 2050.

The Climate Action and Low Carbon Development Act 2015 was a landmark national milestone in the evolution of climate change policy in Ireland. It provides the statutory basis for the national transition objective laid out in the National Policy Position (as per above). It also gave statutory authority to the National Mitigation Plan (2017) (NMP) and the National Adaptation Framework (2018) (NAF). This Local adaptation Strategy forms part of the National Adaptation Framework.

The Local Authority Adaptation Strategy Development Guidelines 2018 provides the framework for Local Authorities to develop their own Climate Action Adaptation Strategy. In developing this adaptation strategy Monaghan County Council has been consistent with these guidelines.

The Climate Action Plan 2019 – To Tackle Climate Breakdown

The Plan clearly identifies the nature and scale of the challenge and clearly recognises that Ireland must significantly step up its commitments to tackle climate disruption. The leadership role both the Government and public bodies can play in taking early action on climate is fundamental to achieving our decarbonisation goals.

1.11 The Climate Action Plan 2019 – To Tackle Climate Breakdown

The all of government Climate Action Plan 2019 - *To Tackle Climate Breakdown* was published on Monday 17th June 2019. The plan sets out 183 individual actions over 12 sectors and charts an ambitious course towards decarbonisation. It acknowledges the failure to meet emissions targets to 2020, failure to address efforts to decarbonise particularly during the period of the economic downturn and failure in breaking the link between emissions and economic growth. In light of this, the ambition is clearly set out to deliver a step-change in emission performance

over the coming decade to meet 2030 targets and to set a trajectory to meet 2050 objectives. There is strong commitment under new governance arrangements to update the plan annually, to track performance of targets and revise or update the actions as necessary. To drive the successful and practical implementation of Climate Action towards achieving 2030 and 2050 targets, the Minister for Communications, Climate Action and Environment will bring forward a legislative framework through a new Climate Action Act. Within the 12 Sectors described in the Plan, the Public Sector is identified as having a significant role in 'Leading by Example'⁵ to not only just reduce their own emissions but to inspire climate action across communities and society. Local Government in particular is recognized for its pivotal role in stimulating climate action at community level. The Plan speaks also to the role of the Climate Action Regional Offices (CARO) in assisting local authorities in building capacity to engage effectively with climate change. There are a range of actions that are specific to and/or relate to local authorities as well as the CAROs.



Local authorities will be required to undertake an annual

13.2 Targets

To meet the required level of emissions, by 2030 we will:

- Reduce CO₂ eq. from the sector by 30%
- Improve the energy efficiency of public sector buildings by 50%
- Set a target to demonstrate leadership in the adoption of low emission transport options
- In 2019, have a Climate Mandate adopted by every Public Body, making the sector a catalyst for climate action
- In 2019, agree a Climate Action Charter with Local Authorities
- All Public Buildings to reach BER 'B' Rating

programme with measurable impact particularly with actions to focus on, inter alia;

- Reducing emissions by 30% and Improve energy efficiency of local authority buildings by 50% under the guidance of a new Public Sector Decarbonisation Strategy.
- Setting a target to demonstrate leadership in the adoption of low emission transport options
- Developing and implementing a Climate Action charter
- Public buildings (all) to reach BER 'B' Rating
- Building capacity through upskilling and knowledge dissemination
- Supporting and delivering projects that include strong ambition on climate action through funding resources from Project Ireland 2040
- Developing robust community engagement on climate action by linking to existing and new networks and clustering initiatives using the National Dialogue on Climate Action and local authority structures.
- Working with communities to expand Sustainable Energy Communities.

⁵ Chapter 13

- Continue to implement Adaptation Planning with emphasis on building Climate Resilience and delivering the objectives of the National Adaptation Framework.

On Climate Change Adaptation, the Plan is very strong on the need *to address the current and future risks posed by a changing climate... Adaptation is both urgent and essential to successfully transition to a climate resilient economy and society by 2050⁶*. It cites examples of extreme weather events to explain that the cost of inaction to the effects of climate change are simply too significant to discount.

It is acknowledged that much of the focus for the local authority sector to date, has been on Adaptation Planning. Local authorities are now prescribed to widen their scope and act as a catalyst for much wider change. Since 2018 Climate Action Regional Offices (CAROs) have been coordinating the Local Authority response to Climate Change. The structures deployed have proved highly effective and can be utilised to direct local authority actions within the Climate Action Plan. The CAROs will lead a step up in climate action within local authorities to pursue mitigation measures to reduce emissions, activate meaningful citizen engagement, encourage community leadership and capacity building using the National Dialogue on Climate Action linking in with existing and new local authority structures.

The Climate Action Plan is notably focused on mitigation measures to achieve emission targets to 2030. However, there is full commitment to provide clear leadership in promoting Adaptation. Recognising that Climate Change is a hugely complex issue that requires a range of responses from every sector in society all measures collectively represent a coherent approach to dealing with the challenges ahead.

Local Authorities, through the process of Adaptation Planning are gaining a clear understanding of the risks presented by climate change and the current levels of vulnerability to such risks. Actions identified in the adaptation strategies are aimed at building climate resilience and integrating adaptation into effective local level decision making. This is crucially important. Building on this work, local authorities will undoubtedly need to expand their role to take on actions and measures from the Climate Action Plan to respond to and meet obligations set out.

Monaghan County Council recognizes the purpose of the Climate Action Plan and the role intended for Local Authorities to meet targets and contribute to the national climate ambition. To reflect this, the following action has been included in the strategy:

Building on adaptation planning actions set out in this strategy, support and compliment the practical implementation of actions arising from the National Climate Action Plan – to Tackle Climate Breakdown (as revised and updated annually), across the broad range of functions of the local authority to achieve the national climate ambition i.e. decarbonisation targets to 2030 and objectives to 2050.

⁶ Chapter 16

1.12 Methodology

The Environmental Services section of Monaghan County Council was tasked with the preparation of the strategy. To facilitate this the senior management team in the Council nominated staff members from each of their respective departments and divisions to assist Environmental services in gathering the salient data and information required to facilitate preparation of the strategy.

A Climate Change workshop, facilitated by the Climate Action Regional Office (CARO), was subsequently held in Monaghan County Council offices in late November 2018 and from this workshop a significant amount of very useful information was obtained which helped provide the basis for the strategy. Environmental Services staff also attended regional meetings and workshops facilitated by the CARO and also attended the launch of the Local Authority Climate Change Adaptation Plan Guidelines in Athlone in December 2018.

During the development of the strategy further meetings and discussions took place during January and February 2019 with staff from the CARO office as well as staff tasked with preparing the strategy in neighbouring counties to consider potential local climate change adaptation actions for inclusion in the strategy.

There was a wide range of reference sourced material used in the preparation of this plan, including the Monaghan County Council Development Plan 2019-2025, River Basin Management Plan for Ireland 2018-2021, Connacht-Ulster Regional Waste Management Plan 2015-2021, Monaghan County Council Corporate Plan 2014-2019, National Adaptation Framework- Planning for a Climate Resilient Ireland 2018, Local Authority Adaptation Strategy Development Guidelines December 2018, Met Eireann website, and the Climate Ireland website.

A pre-draft strategy was brought before the Monaghan County Council Environment Strategic Policy Committee on 28th March 2019 and to the Corporate Policy Group meeting on April 16th 2019. Following this, the pre-draft strategy was then brought before the full council on May 13th. Consultation with prescribed environmental authorities for the purposes of Strategic Environmental Assessment took place from April 17th to May 20th 2019, undertaken in accordance with the provisions of the European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations 2004 (S.I. 435 of 2004 as amended by S.I. 200 of 2011). Public consultation on the draft strategy took place from May 27th to June 26th 2019. Following public consultation a Chief Executives report on the submissions received was prepared and the draft strategy was revised and sent for final Appropriate Assessment and Strategic Assessment Screening on July 16th. The Climate Change Adaptation Strategy was then brought for consideration to the August 2019 Corporate Policy Group Meeting and adopted at the September 2019 meeting of Monaghan County Council.

1.13 Environmental Assessment:

Screening Overview for SEA

Under the European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations 2004 (S.I. 435 of 2004 as amended by S.I. 435 of 2011), all plans which are likely to have a significant effect on the environment must undergo screening to

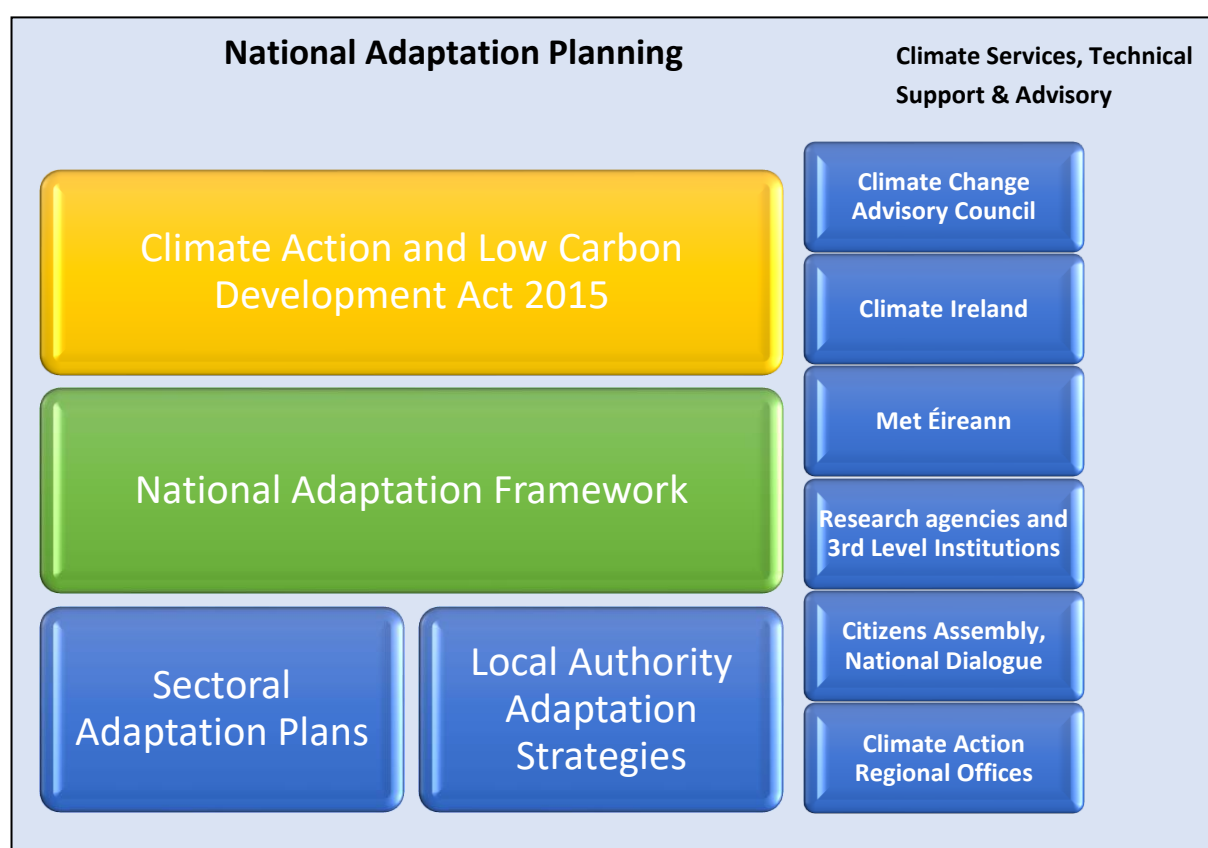
determine whether a Strategic Environmental Assessment (SEA) is required. “Screening” is the process for making a determination as to whether a particular plan, would be likely to have significant environmental effects, and would thus warrant SEA. This strategy has been screened for SEA and it is determined that full SEA is not required. The draft screening report accompanies this draft strategy.

Screening overview for AA:

Screening of this strategy has been undertaken in accordance with the requirements of Article 6(3) of the EU Habitats Directive (directive 92/43/EEC) to determine if the Climate Change Adaptation Strategy is likely to significantly affect Natura 2000 sites (*i.e.* Special Areas of Conservation (SAC) and Special Protection Areas (SPA)) within or surrounding the strategy area. It is determined that a stage 2 Natura Impact Report is not required. The draft screening report accompanies this draft strategy.

1.14 Relationship with other key climate related plans/strategies:

This adaptation strategy is set within the context of a national framework for adaptation planning which is prescribed in the Climate Action and Low Carbon Development Act 2015 and elaborated upon in the National Adaptation Framework.



This adaptation strategy commits to aligning with national commitments on climate change adaptation. It must be noted that the process of making 12 sectoral adaptation strategies (identified in the NAF) is running concurrently with the making of local authority strategies. Once published, however, any relevant recommendations or actions will be incorporated into this strategy. For both the preparation of this strategy and the implementation of actions, opportunities will be advanced to align with and collaborate with adjoining local authorities including Meath, Louth and Cavan County Councils and any relevant cross border agencies.

Chapter 2 - Local and Regional Context

2.1 Introduction to local and regional context

Monaghan County Council is located within the Eastern and Midlands Climate Action Region (CARO) and is one of 17 Local Authorities in the region. The Eastern and Midland CARO has assisted and supported Monaghan County Council in the development of this climate change adaptation strategy.

2.2 Background to the Eastern and Midland Climate Regional Office

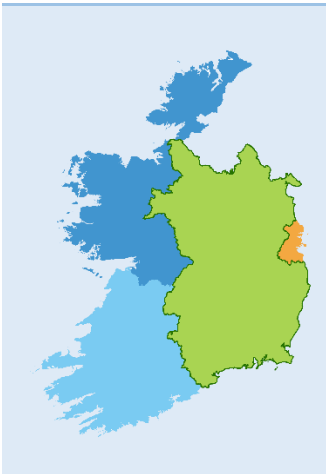
The Eastern & Midland CARO is one of four regional climate action offices set up in 2018 in response to Action 8 of the 2018 National Adaptation Framework (NAF) – *Planning for a Climate Resilient Ireland*.

The four CAROs have been established to drive climate action at both regional and local levels. In recognition of the significant obligation to develop and implement climate action measures, the four regional offices are mandated to co-ordinate engagement across the varying levels of government and help build on experience and expertise that exists in the area of climate change and climate action.

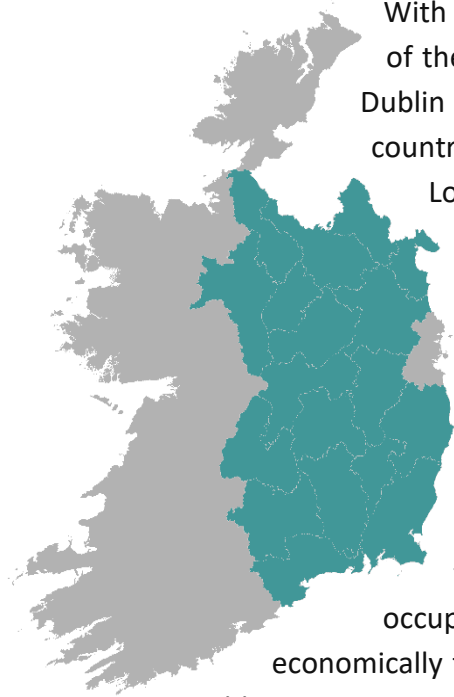
The composition of the four Climate Action Regions has been determined by the geographical and topographical characteristics, vulnerabilities and shared climate risks experienced across local authority areas. The climatic risks associated with the Eastern and Midlands Climate Action Region include Fluvial Flooding, Pluvial Flooding, Groundwater Flooding and Coastal Flooding.

The four CARO regions and constituent local authorities are illustrated in table 2.1 as follows:

Table 2.1 CARO Regions

	Climate Action Region	Local Authority function area	Lead Authority
	Midlands and Eastern	Carlow, Cavan, Kildare, Kilkenny, Laois, Leitrim, Longford, Louth, Meath, Monaghan, Offaly, Roscommon, Tipperary, Waterford, Westmeath, Wexford, Wicklow	Kildare County Council
	Atlantic Seaboard North	Donegal, Sligo, Mayo, Galway City & County	Mayo County Council
	Atlantic Seaboard South	Clare, Limerick, Kerry, Cork City & County.	Cork County Council
	Dublin Metropolitan	South Dublin, Fingal, Dun-Laoghaire-Rathdown, Dublin City	Dublin City Council

2.3 Profile of Eastern and Midland Climate Action Region



With 17 local authority areas, the Eastern and Midland region is the largest of the four Climate Action Regions in Ireland. The region, exclusive of the Dublin Metropolitan Area, occupies the eastern and central aspects of the country. The Region borders Northern Ireland to the north through counties Louth, Cavan, Monaghan and Leitrim. The River Shannon flanks the western aspect bounding along its course, counties Leitrim, Roscommon, Longford, Westmeath, Offaly and Tipperary. The Irish Sea bounds the region to the east. Counties Louth, Wicklow, Wexford and Waterford are located to the east and south east of the region all with extensive coastlines along the Irish Sea.

The region with its extensive pattern of settlement areas and rural areas and has a population of almost 1.8 million people accounting for 37.7% of the total population of the state⁷ and at 32,542 sq.km occupies 46.3% of the area of the state⁸. The region plays a significant role economically to the country hosting a range of sectors inclusive of multinationals, public service, private and small-medium enterprises. Agriculture remains the prevailing sectoral landuse in the region.

There is a rich variety of landscapes and topographies across the region. A mostly flat low lying landscape sweeps through the midland counties. Significant areas of raised bogs occupy this central location in the country as well as the Curragh Plains extending towards the Curragh Plains in County Kildare. The Drumlin Belt across the northern aspect of the region, the Wicklow Mountains, Galtee Mountains and Slieve Bloom Mountains offer variation and punctuation in the landscape of the region.

21 prominent Rivers rise and flow (with tributaries) through the Region. The most prominent of these include the River Shannon, River Barrow, River Suir, River Nore, River Liffey and River Boyne. Counties Louth, Wicklow, Wexford and Waterford occupy coastal locations to the east and south east of this region while County Leitrim extends to occupy a distance of 4.6km along the western coast of the country.

The region offers an extensive and crucially important network of critical infrastructure. The road network in the region typically radiates from the metropolitan Dublin Region. The Rail Network is significant with the Dublin-Cork, Dublin-Limerick, Dublin-Waterford and Dublin-Galway/Mayo lines. Rosslare Europort in Wexford is a gateway to Wales and greater Europe through France. Electricity and communications infrastructure is widespread throughout the region.

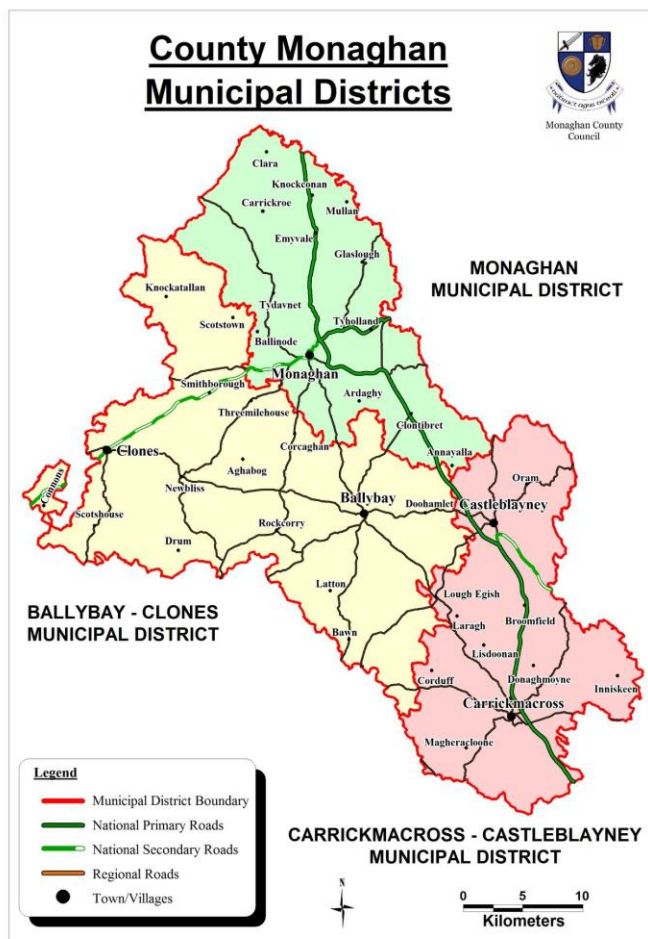
⁷ Total population of E&M Region is 1,796, 923 persons. The state population is 4,761,865 persons (CSO, 2016).

⁸ Total area of state is 70,282 sq.km

The Ireland's Ancient East proposition best represents the vast array of tourism products on offer in the region as a cultural and tourist destination.

2.4 Local Context

Monaghan is a relatively small county of approximately 1295km² making it the 5th smallest of Ireland's thirty-two counties. Monaghan is bounded by counties Cavan, Meath, Louth, Fermanagh, Tyrone and Armagh. It shares 108 miles of border with Northern Ireland giving the county the longest share of border between Northern Ireland and the Republic of Ireland counties. Monaghan is a landlocked county characterised by rolling drumlins, lakes and wetlands with its topography shaped during the last ice age. Monaghan's area of 1295km² represents 1.9% of the total area of the Republic of Ireland. 69% of the county area is dedicated to agriculture with 4% to forestry and 1.7% covered by lakes.



The county comprises of 3 municipal districts, namely, Monaghan MD, Ballybay-Clones MD, and Carrickmacross-Castleblayney MD. There are 5 towns in the county these being Monaghan, Castleblayney, Carrickmacross, Ballybay, and Clones. Monaghan is still a predominately rural county with approximately 80% of the population living in population centres of less than 1,000 people. Census 2016 results indicate that the population of Monaghan has only grown modestly since the previous census of 2011 increasing to 61,386 persons, an increase of 906 persons. Population is relatively evenly spread throughout the Municipal Districts with the MD of Carrickmacross/Castleblayney having a slightly larger population than the other districts.

A rational assumption taking into consideration recent demographic trends and increased economic activity both locally and nationally is that an annual population growth of approximately 1.04% per annum can be expected. Based on this assumption the population of County Monaghan is expected to reach 67,253 by the year 2025. Further data with respect to County Monaghan population projections to 2025 is provided in Table 2.2

Table 2.2 – Projected Population Increases 2019-2025

Level	Location	2016 Population	Projected additional Population	Projected Population by 2025
Tier 1 Principle Town	Monaghan	7,678	1,737	9,415
Tier 2 Strategic Town	Carrickmacross Castleblayney	5,032 3,607	1,021 629	6,053 4,236
Tier 3 Service Town	Clones Ballybay	1,680 1,241	338 306	2,018 1,547
Tier 4 Village Network	Ballinode Emyvale Glaslough Inniskeen Newbliss Rockcorry Scotshouse Scotstown Smithborough Threemilehouse	470 701 453 273 327 316 220 361 395 156	96 119 95 77 82 81 72 85 88 65	566 820 548 350 409 397 292 446 483 221
Tier 5 and 6	Remaining Rural Areas	38,476	976	39,452
County Monaghan		61,386	5,867	67,252

2.4.1 Agriculture, Business and Employment

Monaghan has traditionally been a county that has built up a reputation for its strong work ethic and entrepreneurial drive. Throughout the county there is a mix of international companies along with established indigenous enterprises. Agriculture in Co. Monaghan is of huge importance with the County being leaders in Intensive Agricultural enterprises such as poultry production. The agricultural sector in the county is well supported by a strong agri-food sector with major companies operating locally such as Monaghan Mushrooms, Lacpatrick, Greenfield Foods Ltd, Silverhill Foods, Allied Beef Processors and Kerry Group. Together the agricultural sector and the agri-food sector make up 60% of the total employment in the County. A statistic of note is that 14 of the country's top 100 food producing companies are based in the county. With over 90% of the food being sold abroad, the sector's strong export emphasis relies on the strategic location and transport distribution network between the islands two largest cities. The ports of Belfast, Larne and Dublin are all within an hour and forty-five minute drive.

Monaghan is also home to Ireland's largest independent temperature control and logistics firm, Castlecool and to Combilift a recognised global leader in the long load handling market. There is a strong entrepreneurial spirit which has seen the successful development of a significant number of Small and Medium Enterprises (SMEs) in key sectors including engineering, ICT, tourism, culture and business support services. Within the five towns and an array of villages in Monaghan, the county offers a variety of locations to work and live. It

is important also to acknowledge the significant and important contribution of rural areas to the county and its population. This is reflected in the County Development Plan 2019-2025 through the Council's commitment to promoting the regeneration of rural areas and the promotion of rural services and enterprises.

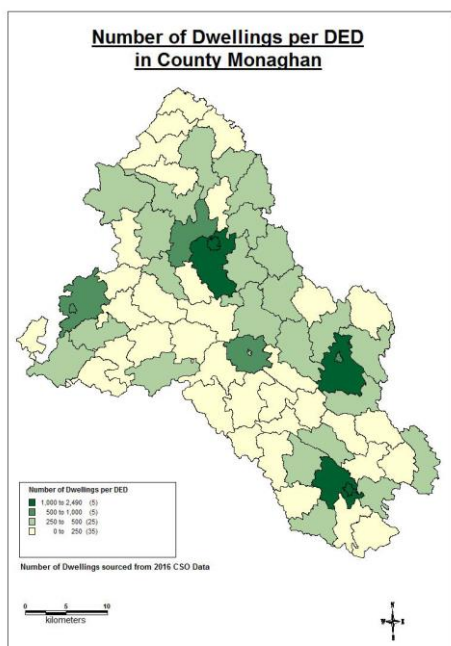
2.4.2 Tourism

The County's tourism sector has significant potential for future growth, but in order to optimally develop same, it is essential to promote a sustainable approach, in line with the recommendations of the Regional Planning Guidelines (RPGs) 2010-2022. Paramount to this is creating a tourism package that appeals to likely consumers. To this end, Monaghan has a wide range of historical, cultural and landscape interests that, if sensitively managed, have the potential to raise the County's profile as a significant tourist destination that will strengthen the County's offering under the Ireland's Ancient East destination brand.

2.4.3 Community

Monaghan has a very strong sense of community as is evident by the array of community services, initiatives and the vast number of community, voluntary and sporting groups throughout the county. The community and voluntary sector play a crucial role in the development of the County and are vital in fostering a sense of community identity and well-being. Monaghan County Council also has a long history of involvement in community initiatives and service provision at local level. These include libraries, leisure, recreation, arts and amenity facilities and services as well as estate management and urban and village renewal. It is an objective of the local authority to improve existing facilities and make provision for new facilities in order to enhance access to education, recreation, healthcare and cultural infrastructure. This infrastructure is essential to social cohesion and provides for a sense of community.

2.4.4 Housing



The census of 2016 Monaghan recorded that a total of 25,311 housing units exist in County Monaghan, of which 2,884 were vacant. This represents a 4% reduction from the number of vacant properties registered in 2011. The census also recorded that less than 40% of the population live in an urban community which is considerably lower than the national figure of 62%. In the Monaghan County Development Plan 2019-2025 the aim is to enable every household to avail of an affordable, quality dwelling suited to its needs, in a good environment and as far as possible at the tenure of its choice. The Council is both the Housing Authority and the Planning Authority for County Monaghan and in these roles, has the capacity to influence the supply and location of new housing within the County. The key challenge in this regard is the creation and maintenance

of sustainable communities where people want to live and work now and into the future. It

has been estimated that the County Development Plan will have to provide for 5,979 persons between 2019 and 2025, and that 1,935 housing units will be required to accommodate this estimated population increase

2.4.5 Heritage and Biodiversity

Together Special Protection Areas (SPAs) and Special Areas of conservation (SACs) make up a European network of sites known as the Natura 2000 network. These sites are designated under the EU Habitats Directive (1992) and the Birds Directive (1979). The Directive lists certain habitats and species which must be protected due to their significance. These Directives are transposed into Irish Law through the European Union (Natural Habitats) Regulations 1997 and 2011. SACs are prime wildlife conservation areas that require designation and protection for habitats in accordance with the EU Habitats Directive 1992. SPAs refer to the designation and protection of endangered species of wild birds in accordance with the EU Birds Directive 1979. Legislation requires that appropriate steps are taken to avoid the deterioration of these unique habitats. Table 2.3 provides information on the designated sites in Monaghan.

Table 2.3 SAC and SPA Sites in County Monaghan.

Designation Type	Location	Qualifying Interest
Special Area of Conservation (SAC)	Kilroosky Lough Cluster, Clones.	White Clawed Crayfish
Special Protection Area (SPA)	Sliabh Beagh	Hen Harrier

At national level designated sites are called Natural Heritage Areas (NHAs) and proposed NHAs (pNHAs). To date there is one designated National Heritage Area in County Monaghan -Eshbrack Bog on Sliabh Beagh, which is an important area of blanket bog. This area also has SPA status as it is a breeding area for the hen harrier which is a protected species under the EU Birds Directive. Sliabh Beagh and the associated bog habitat is an overwintering area for Greenland White Fronted Geese. There are other important species which inhabit the bog including the critically endangered Curlew, Snipe and Golden Plover. The conservation of this natural habitat for a range of flora and fauna is vitally important.

The National Parks and Wildlife Service has proposed 40 additional NHAs in County Monaghan. NHAs are sites that contain elements of our natural heritage which are unique or are of significant importance at a national level. The process of designation of NHAs is ongoing, with new sites being added or existing sites being upgraded as more information becomes available.

County Monaghan contains a wide range of wetlands which provide a habitat for a range of species of national and international importance. These wetland habitats include cutover raised bog, blanket bogs, fens, marshes, rivers, lakes, turloughs, springs and wet woodland. Monaghan County Council has undertaken extensive wetland surveying and mapping as part of implementation of the heritage plan. This has resulted in new important wetland areas

being recorded and mapped in order to improve wildlife knowledge and conservation of biodiversity.

It is also an objective of Monaghan County Council to prepare a Green Infrastructure Strategy for the County which will identify, connect and protect green infrastructure resources and enhance their environmental and human benefits. The achievement of this objective will require partnership and stakeholder engagement from state agencies, local communities and interest groups. Green infrastructure is a network of green spaces, habitats and ecosystems within a defined geographical area which can vary in size from the local level to the county level and incorporates wild, semi natural and developed environments and can include features such as uplands, bogs and wetlands to urban parks, canals etc. The Green Infrastructure approach can provide a range of benefits to quality of life and the maintenance and improvement of ecosystems including; biodiversity management, water management, recreational and tourism opportunities, regulation of climate change and the promotion of sustainable movement patterns.

2.4.6 Transport and Infrastructure

Currently road transport is the only form of transport available in County Monaghan so the continued investment, maintenance and improvement of our existing road infrastructure and the protection of the carrying capacity of our national road network is of key importance to the economic and social development of the county. The results of the 2016 census revealed there has been a 10% increase in the number of mechanically propelled vehicles taxed in 2016 compared to 2011 in County Monaghan. The average journey time to work is just under 25mins which is below the national average of 28 minutes. As 63% of County Monaghan's population is living in the rural area outside towns and villages car ownership is essential. Four National Routes traverse County Monaghan passing through the settlements of Monaghan, Clones, Emyvale, Tyholland and Smithborough and provide important quality linkages between the larger towns in County Monaghan and the wider rural hinterland; these being:

- N2 Dublin- Derry National Primary (63.9 km)
- N12 Monaghan - Armagh National Primary Road (6.9 km)
- N54 Monaghan- Cavan National Secondary Road (25.4 km)
- N53 Castleblayney- Dundalk National Secondary Road (7.7 km)

Regional roads provide important routes between the five county towns and the villages within the county to towns and villages in other counties. They are essential to gain access to local services, retail, educational facilities, and employment in centres within the county and beyond. Monaghan County Council will continue to maintain and improve the 289 km of regional roads through realignment and reconstruction as funding opportunities arise.

Each of the three Municipal Districts are responsible for the maintenance and improvement of the 2,082 km of local roads throughout the county. Local roads, which make up 84% of the overall road network in the county are critical to the economic and social activity within the county given the County's low level of urbanisation and dispersed settlement pattern.

In Monaghan, towns in close proximity to the N2 National Primary Route are well served by national bus routes operating the Dublin-Letterkenny/Derry route and private operators along the Monaghan to Dublin route. Some of these routes provide a public transport service to the villages located along their route. East – West routes and inter local village routes are not well served by public transport. Bus Eireann offers limited services from Monaghan to Galway, Cavan and Dundalk, while Ulster Bus operates routes to Belfast City. A number of private bus operators provide services to other towns in the region, particularly for students attending third level institutions.

Cavan Monaghan Transport Co-ordination Unit (CMTCU) also known as Local Link was established in 2014 as part of the National Restructuring Programme by the National Transport Authority (NTA). It replaces Cavan's 'CART' and Monaghan's 'BALTI' local service bus schemes. The CMTCU currently operate approximately 70 services in the Cavan/Monaghan region. The Local Link provides an invaluable support service to individuals without access to a private car or who live in remote or isolated locations

The provision of quality cycling and walking facilities is key to an integrated transport system in towns and villages in the County where the potential for short trips by foot or on bicycle can provide an economical, non-polluting and flexible form of transport which can deliver improvements to overall health and wellbeing. The provision of cycling infrastructure such as designated cycle paths, greenways, walking paths and trails also supports recreation and tourism. The enhancement of such provision and the promotion of a modal shift away from the use of the private car is a key objective of the Smarter Travel Document operated by the Department of Transport, Tourism and Sport

Monaghan County Council published its first walking and cycling strategy in 2012 with a second Strategy published in 2017. This Strategy provides a high-level framework for a modal shift from car travel to cycling and walking in response to the Smarter Travel Programme. The Walking and Cycling Strategy provides an analysis of existing cycling and walking infrastructure in the County and outlines a policy framework to enhance existing and future cycling and walking projects to create a coherent network of sustainable infrastructure.

The first phase of the Ulster Canal Greenway project opened in 2013. The 4.5km route travels from the east to west of Monaghan Town along the disused Ulster Canal. Phase 2 of the Ulster Canal project was launched in September 2017. This cross border project is being led by Waterways Ireland and is being carried out in partnership with Monaghan County Council, Armagh City, Banbridge & Craigavon Borough Council and the East Border Region. The €4.95 million project will extend over a distance of 22km between Smithborough in County Monaghan to Middletown, Co. Armagh and is due for completion in 2021. Fundamental to this project is the cross border commuting dimension. A significant volume of commuter journeys takes place between the border Counties, and the commuter journeys between Armagh and Monaghan are the third highest in the border region. This project aims to affect a 4.5% modal shift to walking/cycling for cross border journeys by 2023, reducing CO2 emissions and promoting sustainable transport.

Chapter 3 – Adaptation Baseline Assessment

3.1 Introduction to Adaptation Baseline Assessment

Monaghan County Council has prepared this adaption baseline assessment in line with the Local Authority Adaptation Development Guidelines issued by the Department of Communications, Climate Action & Environment in December 2018. The aim of the baseline assessment is to identify and document past severe weather events that impacted County Monaghan and to identify the risks associated with such events. In addition, the baseline assessment will also assist in highlighting the need for emergency planning to be continually reviewed and updated to deal with severe weather events that impact County Monaghan. From the baseline assessment Monaghan County Council can then assess current and future risks associated with severe weather events that may impact the County and consequently put in place appropriate actions to help ensure that the county is able to adapt to changes in climate by attempting to develop a more climate resilient County. Before progressing any adaption baseline assessment, it is important to first identify and summarise the major climatic or severe weather events that have impacted County Monaghan over the past 30 years.

3.2 Major Past Climatic Events.

Fig 3.1 provides a Timeline of severe weather events whilst Table 3.1 provides specific information and details of each of the events identified. It can be surmised from the timeline of events and from other historical data that although severe weather events have always impacted Monaghan, the County has experienced an increase in major climatic or severe weather events in more recent times. Although we cannot definitely say that climate change was the cause of all these events, such events are the most likely consequence of climate change. In County Monaghan the effects of these events are wide ranging and include heavy rainfall resulting in flooding, damaging winds, periods of extreme heat resulting in damaging and dangerous heat waves, and extreme cold resulting in extreme frost conditions and/or heavy snowfall. Even within the past 3-5 years Co Monaghan has experiences a variety of extreme weather events some of which are summarised in Fig 3.1 and in Table 3.1. In March 2018 County Monaghan experienced its most significant snowfall since the great snowfall of 1982 attributed to the Beast from the East which also impacted a huge swathe of Europe. This event led to Met Eireann issuing a red warning for snow nationwide which led to significant disruption throughout the county including the closure of all public offices and schools with many businesses also forced to close. In addition, this event placed additional demand on the public and private water supplies throughout the county albeit this being less severe in Monaghan than experienced in other parts of the country. Monaghan's level of rainfall is also changing. Winter 2015/2016 saw a series of storms impact County Monaghan the most severe being Storm Desmond which impacted the county severely in early December 2015. This particular severe weather event saw significant flooding in the towns of Clones and Monaghan and severe damage to the county's infrastructure particularly the regional and

local road network throughout the county. Data from Met Eireann indicates that in the last decade, the number of days with rainfall greater than 10mm is increasing. In addition, Met Eireann datasets also indicate that for the period 1961-2010 there was a 20% increase in average yearly rainfall. [\[6\]](#)

Monaghan being a county located in the North-East of the country is also prone to severe windstorms. Storm Ophelia in October 2017 saw a nationwide red alert being issued and although the impacts of Ophelia were less severe than those experienced in other parts of the country this event nevertheless had a major impact with public offices and schools closed and Monaghan's emergency services and outdoor staff called out to deal with a number of incidents. This was closely followed in early January 2018 when storm Eleanor crossed the country which saw a number of roads in the county closed due to fallen trees as well as localised damage to properties in the county.

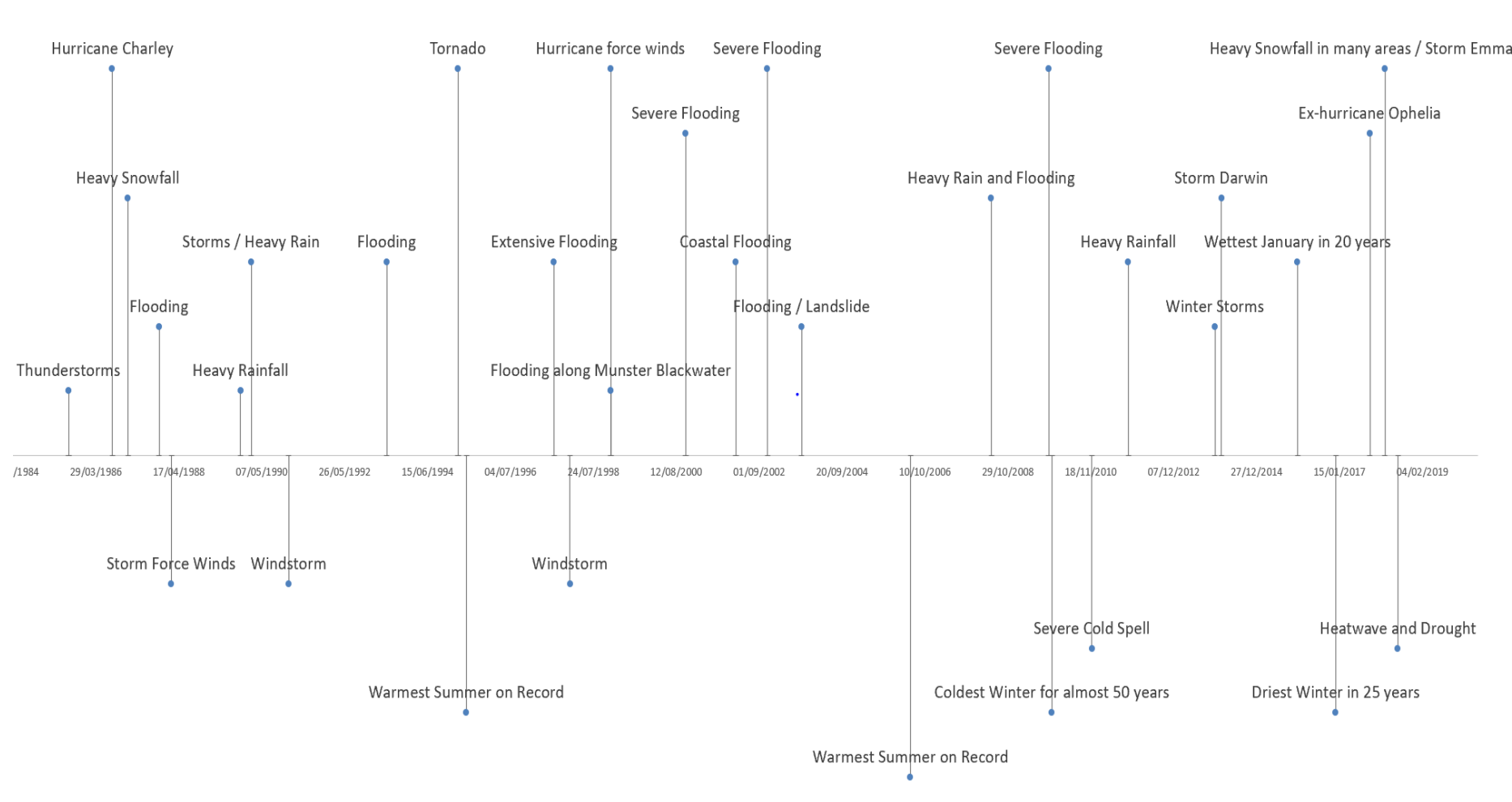
Fig 3.1 : Severe Weather Event Timeline for County Monaghan.

Table 3.1 Severe Weather Events that have impacted County Monaghan

Year	Date	Event Type / Name	Outline Description	Severe Weather Event				
				Strong Wind	rainfall Extreme	Heavy Snowfall / Low Temp	Low rainfall / Drought	High Temp
2018	11 th October	Storm Callum	Orange wind warning – gale force winds up to 130km/hr- A lot of fallen trees disruption to power lines, roads, business, infrastructure, travel					
2018	September	Storm Ali	Orange Wind Warming – gale force winds of up to 120km/h, stormy conditions					
2018	Summer	High Temperatures, Heat wave & Drought	High Temperatures, Heat wave and drought – distribution to water supply, issues with road maintenance etc...					
2018	February / March	Storm Emma & Beast from the East	Blizzard / Heavy Snowfall / widespread heavy snow drifting. Disruption to business, emergency services, power cuts etc...					
2018	January	Storm Eleanor	Orange Wind Warming – gale force winds of up to 120km/h, stormy conditions					
2017	16 th October	Storm Ophelia (Ex-Hurricane Ophelia)	Red warning – gale force winds, heavy rain and storm surges along some coasts (flooding). Disruption to business, power cuts etc and a fatality in County Louth...					
2016	January	Heavy Rain	Wettest January of record – 126% of monthly long term average					
2014	12 th February	Storm Darwin	Orange warning for strong winds – classified as a 1 in 20 year event					
2013/14	Winter	Winter Storms	Winter storms – serious coastal damage and widespread, persistent flooding					
2010	Nov / Dec	Winter Cold Spell	Lowest temperatures on record in Dublin Airport (-8.4°C) and Casement Aerodrome (-9.1°C)					
2009/10	Winter	Winter Cold Spell	Coldest winter in almost 50 years (Met Éireann)					
2009	November	Severe flooding	Rainfall totals were highest on record, extensive flooding					
2008	August	Heavy Rain and Flooding	Heavy rain and extensive flooding					
2006	Summer	High Temperature / Heat Wave	Warmest summer since record breaking 1996 (may have been exceeded by 2018)					
1997	24 th December	Windstorm	Windstorm					
1995	Summer	High Temperatures, Heat wave & Drought	Warmest Summer on record. Mean temperatures over 2°C above normal. Temp rises to 30°C over a number of consecutive days					
1993	11 th November	Severe Flooding	In excess of 100mm of rain in 24 hour period in eastern and midlands					
1987	12-13 th January	Heavy Snowfall	12-19cm snow in the east and midlands					
1986	August	Hurricane Charley	Strong winds and rain, worst flooding in 100 years					

3.3 Assessment of Current Adaptation Baseline.

To facilitate the assessment of the current adaptation baseline a collaborative workshop was held in December 2018 with staff from the various internal sections within Monaghan County Council and CARO staff. This was followed by further one-to-one meetings and discussions with individual staff members. Further information was gathered from other sources including historical data from Monaghan County Council, Met Éireann, the Environmental Protection Agency, and the Office of Public Works. During the workshop and in subsequent discussions with staff, consideration was given to the likely impact that climate change would have on County Monaghan. Based on climate change projections it is considered that County Monaghan can expect the following long-term climate change hazards ^[2]

- Increase in the frequency and intensity of summer heat waves with extreme temperatures and drought conditions.
- Increase in the frequency of extreme wind events particularly during the winter months.
- Increase in precipitation during the winter months resulting in milder and significantly wetter winters.
- Increase in temperatures during the winter months with associated reduction in the frequency of frost and snowfall events. In this climate change adaption strategy, the impact of such cold/snow events such as of those experienced in December 2010 and in March 2018 will be assessed even though scientific evidence suggests that climate change will lead to a reduction in the frequency of such events)
- Increase in the duration of the growing season.

In the following sections the impacts of the climate change hazards listed above on the delivery of services and functions provided by Monaghan County Council are assessed.

In addition, for each of the climate hazards considered, details of specific extreme weather events are presented as case studies to assist in identifying the impacts and consequences of such events.

3.3.1 Increase in the frequency and duration of summer heatwaves.

Case Study 1 – The high temperature and low rainfall of summer 2018

The heat and drought conditions experienced in Summer 2018 affected the majority of the country. Met Éireann weather stations throughout the island recorded rainfall levels at well below normal whilst temperatures were well above normal. From late June to mid-July absolute drought conditions prevailed in the eastern midlands, west, and south of the country. In June rainfall totals were below their long-term averages whilst the highest temperature recorded was 32



Gorse Fire on Bragan Mountain

degrees Celsius on June 28th at Shannon Airport. In July high temperatures and drought conditions were experienced in most parts of Ireland, these being most prolonged in the South and East. During August monthly rainfall totals remained well below the long-term average whilst the highest air temperature recorded was 26.6 degrees Celsius in Co Carlow.

3.3.2 Increase in the occurrence in extreme precipitation events.

Case Study 2 – Winter Storms of December 2015 (Storm Desmond and Storm Frank)



The month of December 2015 will be recorded as the wettest December since records began across many parts of Ireland. Rainfall recorded for December at Ballyhaise Weather Station, the closest weather monitoring station to Monaghan, was 270.9mm, a 265% increase on the 3 Year Average. In addition, rainfall was recorded on every day of the month. Within this period there were 2 severe storm events which

impacted Monaghan, Storm Desmond and Storm Frank. These storms saw intense rainfall across the county over short time durations. With many water courses already close to capacity from a wetter than average November the resultant flooding was unprecedented with many roads impassable for weeks. Major flooding occurred in Monaghan Town with the N2 closed at the traffic lights in the town. Significant flooding occurred on the N54 on the approach to Clones town and a house on 98 Avenue Clones town also suffered flood damage.



Flooding in Monaghan Town following Storm Desmond

During these events, assistance was provided by Municipal District outdoor staff, fire services, civil defence, and local volunteers. Throughout the county approximately 50 roads were affected by flooding resulting in significant inconvenience for road user and lengthy traffic delays. One death was attributed to storm

Desmond when a car entered flood waters on the R185 road outside the village of Glaslough. Following the winter storms of December 2015 engineering staff from the three Municipal Districts carried out an assessment of the road infrastructure in the county that was affected by Flooding. This revealed that the damage to the road infrastructure in the county from these

storms was approximately €1.31 Million. It was further estimated that the cost of carrying out works to prevent similar flooding again occurring on these roads was in the region of €9.8 Million.

3.3.3 Likelihood of Cold Weather Events.

Case Study 3 – Storm Emma in March 2018 and the Winter of 2009/2010.

Whilst evidence suggests that climate change will lead to less cold winters there remains the possibility of sporadic cold events and snow events as experienced in Monaghan during the winter of 2009/2010 and in early March 2018 when Storm Emma impacted the county. The winter of 2009/2010 was the coldest since the winter of 1962/1963 with the lowest temperatures recorded over the period from Christmas to January 9th. At the Ballyhaise weather station, which is the station closest to Monaghan, the mean monthly temperature for December was -1.4° C whilst the daily maximum temperature of -9.4°C recorded on December 21st was the lowest daily maximum value on record at Ballyhaise. In Co. Monaghan there was significant disruption to the transport network with many roads impassable. The winter of 2009/2010 also saw significant disruption in water supplies due to frozen pipes and burst mains which in turn led to significant pressure on water supplies throughout the county.

In late February 2018, a ridge of high pressure extended into Ireland resulting in easterly winds which pushed polar air across the country. Snow showers crossed the country at the end of the month which led to accumulations across Monaghan although the conditions were somewhat less severe than experienced in other parts of the Country. In late February a depression 'Storm Emma' developed over the Bay of Biscay and tracked northwards across the country with its associated frontal systems which produced significant low temperatures, ice, and snow across Monaghan. The conditions had a significant impact across the County although they were still not quite as severe as experienced in other parts particularly in the east of the country. Again there was significant disruption throughout the county with many local roads impassable. This event also led to the closure of all County Council offices on March 1st and 2nd 2018.



Council Staff clearing roadways following Storm Emma

Following storm Emma Monaghan County Council subsequently carried out a report on the Council's response to the storm taking into consideration the works which were undertaken during and after the severe weather. From a financial point of view the main costs associated with this snow event was in respect of labour costs particularly overtime costs for outdoor municipal district staff and Fire Services staff. A summary of the responses by both Fire Services/Civil Defence and by municipal district/roads staff is as follows:

- Civil Defence provided transportation to the HSE and Voluntary groups and for critical staff and services during the storm period. This service was coordinated between the Civil Defence Officer and local HSE manager. Civil Defence scheduled in excess of 130 trips during the storm period.
- During the Red Alert storm period the fire service and civil defence responded to 5 callouts to assist the ambulance service and Gardai with 4x4 Vehicle support and medical support.
- Crewing levels maintained at fire stations for duration of storm allowed for safety of crews and enhanced turn-out and attendance at scene.
- 8 drivers and helpers per shift Wednesday through to Sunday. Total of both shifts 8 lorries, 16 drivers and 16 helpers.
- Approximately 45 outdoor workers deployed in the Districts on Friday 2nd and Saturday 3rd.
- Approximately 1600 man hours were worked outside of normal basic hours.
- 1078 tonnes of salt were spread on roads during the event by gritter lorries plus substantially more by local district crews.

A summary of the costs incurred by Monaghan County Council in dealing with Storm Emma is provided in Table 3.3

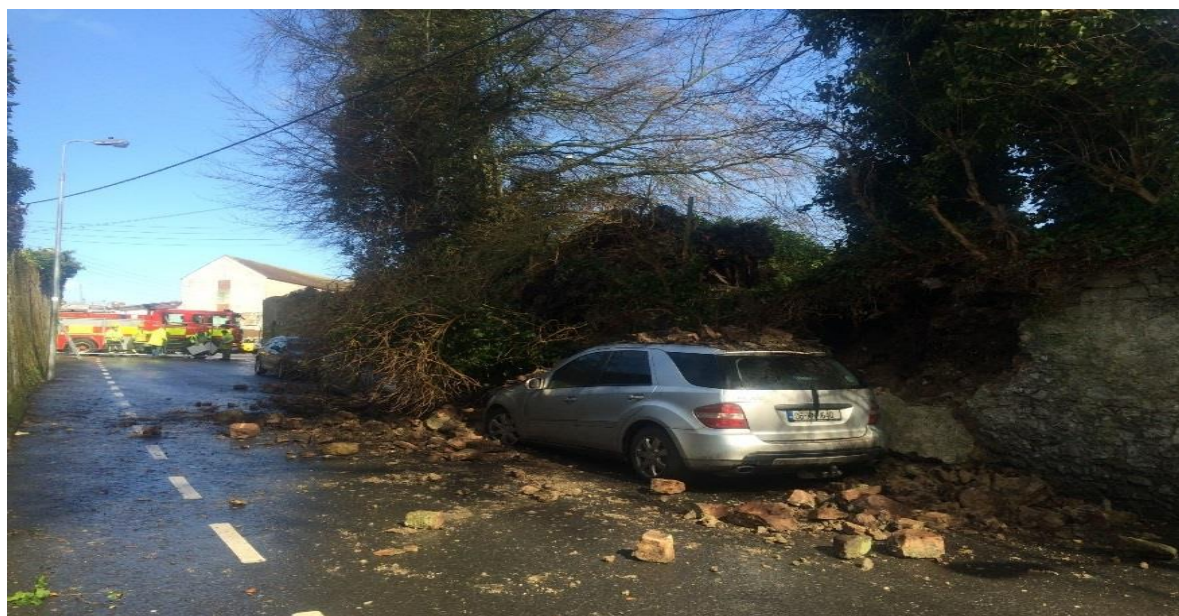
Table 3.3 Costs Incurred by Monaghan County Council in dealing with Storm Emma.

Item	Cost
Staff overtime - Roads	€61,842.30
Hire of Plant/Contractors	€ 5,306.55
Materials - Roads	€ 475.26
<i>Sub-total Roads/MDs</i>	€67,624.11
Staff overtime – Fire & Civil Defence	€41,174.48
Materials – Fire & Civil Defence	€ 2,370.36
<i>Sub-total Fire & Civil Defence</i>	€43,544.84
Total for Monaghan Co. Council	€111,168.95

3.3.4 Increase in the frequency of Extreme Wind Events.

Case Study 4 – Storm Ophelia 2017 and Storm Eleanor 2018.

Storm Ophelia hit Ireland on October 16th 2017. Ophelia was the farthest east Major Hurricane (Category 3 or higher) on record in the Atlantic Basin. It made landfall over Ireland as an extra-tropical storm resulting in observed wind speeds of up to 156 km/h, in a (3-second mean) gust, at Roche's Point station, County Cork.



A nationwide red status Severe Weather Warning was issued by Met Éireann, such a warning is only used in circumstances where the weather conditions are deemed severe enough to endanger life.

The storm caused major power outages, lifted roofs, felled countless trees and caused coastal flooding in Ireland. The tragic loss of three lives was also attributed to Storm Ophelia. All schools and many businesses closed for the day while the nation weathered out the storm.

Whilst the impact on Ophelia was not as severe in Monaghan as those experienced particularly in the south of the country it nevertheless demonstrated that even short-lived climatic events such as wind storms like Ophelia have the potential to significantly impact the country.

The following table details the staff costs that were incurred as a result of Storm Ophelia.

Table 3. Staff costs Incurred by Monaghan County Council in dealing with Storm Ophelia.

Description	Cost
Municipal District's Staff Costs	€4,628.25
Fire Services	€7,361.41
Total	€11,989.66

3.3.5 Baseline Assessment Table for climatic events likely to impact Co. Monaghan.

As demonstrated by the case studies presented, a local level profile of the climatic profile would indicate that the main climatic hazards likely to impact County Monaghan are as follows:

- Increase in summer heat wave events with extreme temperatures and drought conditions.
- Increase in extreme wind events particularly during the winter months.
- Increase in precipitation during the winter months resulting in milder and significantly wetter winters.
- Sporadic prolonged cold events and snow events.

An initial assessment of these hazards on the main operational areas within Monaghan County Council was carried out and the results presented in Appendix 1. The findings from these initial assessments facilitated the further development of the main baseline assessment as provided in the tables below.

Baseline Assessment of the Impacts of Climate Hazards on the delivery of services/functions of Monaghan County Council.

Services/Functions	Climate Hazard Impacts	Consequences
Business Operations, efficiency, effectiveness, and emergency Response.	<ul style="list-style-type: none"> Building Closures – storm, snow, extreme rainfall. Building damage, impacts on servers – storm events. Electricity supply affected – storm events Risks to staff welfare, public safety, local business and tourism assets - storm, snow, rainfall events. 	<ul style="list-style-type: none"> Service disruption to customers: motor tax, housing applications, scheduled meetings, arts/cultural events etc. Inability to meet statutory deadlines e.g. planning applications – financial/reputational consequences. Resources stretched to deal with various impacts from extreme weather events above and beyond the performance of daily duties. Increased pressure on emergency response and recovery operations. Consequence to local/regional economies Financial implications to local authority in clean-up operations, staff overtime, unable to perform normal duties. Economic impacts – longer term consequence to local economy and local authority in terms of rate collection.
	<ul style="list-style-type: none"> Capitalising on potential opportunities arising from addressing the impacts of climate hazards. (e.g. Funding opportunities) 	<ul style="list-style-type: none"> Positive

Services/Functions	Climate Hazard Impacts	Consequences
Roads/footpaths, bridges, culverts, and capital projects.	<ul style="list-style-type: none"> Changes in rates of deterioration - faster rate of deterioration in areas subject to flooding, sustained high temperatures, combination events. Infrastructure collapse, significant damage – sustained duration and frequency of extreme events. Blocked roads – storm, snow, rainfall events Impact on construction projects – all extreme weather events. 	<ul style="list-style-type: none"> Nuisance Risk to public safety Financial implications for unscheduled maintenance, repair, upgrade, new construction, staff overtime costs. Reduced economic efficiency of road network for commuting traffic and emergency transport routes disrupted. Time delays and cost implications in delivery of infrastructure.
Building Stock – LA Buildings and social housing stock	<ul style="list-style-type: none"> Damage and deterioration of housing stock – Storm, rainfall, snow and heatwave events (combination events) Increased need for heat – extreme cold events Closure of Local Authority buildings – storm, snow, rainfall events Need for mechanical ventilation systems and cooling systems – Heatwave events 	<ul style="list-style-type: none"> Cost of maintenance, safety implications to public, possible rehousing of tenants Cost of fuel (negative or positive) Service disruption Pressure on housing staff to rectify reports issues.
Community Infrastructure	<ul style="list-style-type: none"> Deterioration of community infrastructure e.g., playgrounds, public parks, swimming pools, public realm spaces - sustained weather extreme events. Impacts on recreation amenities and tourism activities – storm, rainfall, snow events. Reduced water for swimming pools, irrigation of open spaces, parks etc - drought conditions. Risk to public safety in times of high temperatures for unsecured lakes, water spots (quarries). 	<ul style="list-style-type: none"> Cost of maintenance/upgrade. Loss of revenue locally/regionally – tourism. Closure of community infrastructure – short term. Injury, illness or potential loss of life.

Services/Functions	Climate Hazard Impacts	Consequences
Spatial Planning and landuse	<ul style="list-style-type: none">• Inappropriate location of urban expansion areas• Increased uncertainty in long term landuse planning and infrastructure design i.e. location of future developments, suitability of infrastructure designs to cope with impacts of weather events.• Loss of private property and community assets – extreme rainfall events,• Early retirement of capital infrastructure - all extreme weather events	<ul style="list-style-type: none">• Increased insurance costs• Increased pressure on disaster management and response resources• Long term economic cost to area and to general public.• Impact on quality of life

Services/Functions	Climate Hazard Impacts	Consequences
Surface Water Drainage	<ul style="list-style-type: none"> • Exceedance of drainage capacity – localised and larger scale flooding, rainfall, combination events. • Reduction in drainage capacity – rainfall. • Inflow/infiltration into wastewater networks – extreme rainfall event • Reduced pressure on surface water drainage systems - drought conditions 	<ul style="list-style-type: none"> • Blocked roads, flooding/damage to roads properties/business – impact on insurance costs. • Operating challenges of waste water infrastructure – knock on effects for wider community. • Stretch on staff resources. • Financial implications for increased maintenance, repair
Stormwater /sewerage	<ul style="list-style-type: none"> • Inundation of stormwater and sewerage infrastructure – rainfall events. • Increased peak flows – rainfall events • Changes in groundwater levels – drought conditions • Changes in floodplains – rainfall events • Reduced dry weather sewerage flows • Reduced/unreliable power supply for pumping and treatment – storm events • Changes in mean and peak stream and river flows – rainfall and drought events. • Uncertain water availability – drought conditions. 	<ul style="list-style-type: none"> • Disruption to communities • Negative Environmental consequences - draw on staff resources to investigate/rectify. • Local surface water flooding events.
Wastewater	<ul style="list-style-type: none"> • Inflow and infiltration to wastewater network – rainfall events. • Interruption to anaerobic process – heatwave events • Interruption to process – freezing events. 	

Water Supply	<ul style="list-style-type: none"> • Increase in water demand and reduction in receiving water assimilative capacities during drought conditions – drought events • Flooding and inundation of wastewater treatment and water abstraction plants – rainfall events • Reduced availability of water supply sources during low rainfall and drought events • Loss of power supply during intense storm events • Increased potential for water contamination – rainfall and drought events • Changes in availability of groundwater – drought events • Quality of water diminished – rainfall, drought, heatwave events. 	<ul style="list-style-type: none"> • Nuisance to householders. • Impact on economic development i.e. businesses and tourism. • Health consequences with inadequate water quality. • Additional demand on LA staff working under the SLA with Irish Water • Requirement for hose pipe bans and impacts on local communities incl Local Authority parks and sports facilities • Water pollution issues relating to reduction in surface water flows • Network disruptions due to loss of power supplies.
Water Quality	<ul style="list-style-type: none"> • Ground movement, in high temps, resulting in cracking of old wastewater pipe networks • Increased flooding mobilising runoff from land, including contaminants into surface waters • Changes in species distribution and phenology of river systems – heatwaves, rainfall and cold events. • Low flows resulting in deterioration of water quality – low rainfall/drought events 	<ul style="list-style-type: none"> • Increased discharges from drainage systems to ground-waters • Increased pollution of surface water systems • Changes to surface water habitats • Spread of pathogens and other contaminants

Services/Functions	Climate Hazard Impacts	Consequences
Cultural/Heritage	<ul style="list-style-type: none"> Damage to cultural and heritage assets and cultural landscapes – storm and rainfall events. 	<ul style="list-style-type: none"> Negative impact on tourism – economic consequence locally/regionally. Loss of assets of intrinsic historical importance.
Biodiversity	<ul style="list-style-type: none"> Shift in distribution of plant and animal species from heat and cold stress- heatwaves and cold events. Loss of bio-diversity - all sustained extreme weather events. Increased risk of disturbance to population and species leading to extinction – heatwave events Reduced ecosystem resilience to stress – all extreme weather events Increased ecosystem and species heat stress – heatwave events. Increased bog and fires – heatwave and drought events. 	<ul style="list-style-type: none"> Inability to meet objectives to protect and conserve important habitats. Negative consequence on health and wellbeing of communities. Stretched emergency services in dealing with bog fires, fires on sand dune areas. Economic impact – reduced tourism.
Weed/pest Management – Area Offices	<ul style="list-style-type: none"> Changes in rate of coverage and spatial distribution of invasive species – change in average mean temperatures 	<ul style="list-style-type: none"> Cost and staff resources required to manage and deal with invasive species.

Services/Functions	Climate Hazard Impacts	Consequences
Community Development	<ul style="list-style-type: none"> • Increase isolation and disconnect of communities through inaccessibility – rainfall, snow, heatwaves i.e. bog, gorse, commonage fires) • Damage to properties, streetscapes and community assets – storm and rainfall events • Contaminants to waterways and drinking water supplies – rainfall (flooding), • Pressure on drinking water supplies – heatwave and extreme cold events 	<ul style="list-style-type: none"> • Abandonment of vulnerable rural areas • Impact on local economies, reduced interest in settlement • Cost of repair, replacement of street surfaces, public realm • Disadvantaged communities.

Chapter 4 – Climate Risk Identification.

4.1 Introduction to Climate Risk Identification.

Chapter 3 presented a baseline assessment to identify past severe weather events that impacted County Monaghan and to document the risks associated with such events. An important consideration in the preparation of this strategy is to further consider how climate hazards are likely to evolve in the future so as to facilitate the identification of potential further risks from such events. To achieve this it is necessary to look at some scientific and expert evidence in respect of climatic projections and trends and following consideration of these projections and trends to then develop a Climate Risk register. Whilst there is a significant amount of Information available on future projections the information used to consider the future climatic trends has been based on 2 national sources namely www.climateireland.ie and www.met.ie

4.2 Climate Projections

4.2.1 Temperature

Observations indicate that since 1900 the surface temperature for Ireland has increased by 0.8° C. In addition, the number of warm days has increased while the number of frost days has decreased. Future predictions suggest that average surface air temperatures are expected to increase across all seasons with an increase in the intensity and duration of heatwaves expected. Over the period 2041-2060, projections indicate an increase of 1–1.6°C in mean annual temperatures, with the largest increases likely in the east of the country. Warming is enhanced for the extremes (i.e. hot or cold days), with highest daytime temperatures projected to rise by 0.7–2.6°C in summer and lowest night-time temperatures to rise by 1.1–3°C in winter. Averaged over the whole country, the number of frost days (days when the minimum temperature is less than 0°C) is projected to decrease by up to 62%. The projections indicate an average increase in the length of the growing season by mid-century of up to 40 days per year.^{[3][4]}

4.2.2 Precipitation

Projections of precipitation are less certain than those for temperature. Research indicates significant projected decreases in mean annual, spring and summer precipitation amounts by mid-century. The projected decreases are largest for summer, with reductions potentially in the region of 20%. However, as global temperatures increase, the hydrological cycle is expected to intensify leading to high rainfall events during the winter. The projection frequencies of heavy precipitation events show notable increases of approximately 20% during the winter and autumn months. The number of extended dry periods is projected to increase substantially by mid-century during autumn and summer. ^[6]

4.2.3 Windstorms

Studies have shown significant projected decreases in the energy content of the wind for the spring, summer and autumn seasons, with the projected decreases largest for summer. Whilst the overall number of North Atlantic cyclones is projected to decrease by approximately 10%, research also indicates that the paths of extreme storms will extend further south, bringing an increase in extreme storm activity over Ireland. In addition, projections also indicate an increase in the intensity of extreme wind storms. [\[6\]](#)

4.2.4 Hydrology

A 20% increase in the amount of water flowing through rivers is expected for the majority of catchments in Ireland by mid-late century while for summer decreases of over 40% have been simulated for the end of the century. Projected increases in winter flows coupled with likely increases in extreme precipitation events are likely to lead to an increased flood risk. However, catchment response time will be critical in determining the changing nature of extremes and those catchments with fast response times are likely to be most at risk. [\[2\]](#)

4.2.5 Phenology

Observations at the Valentia phenological garden, Co. Kerry, indicate that the beginning of the growing season is occurring approximately 10 days earlier now than when compared to the early 1970s which has resulted in an extension of the growing season. Projected changes in temperature are expected to result in a lengthening of the growing with spring occurring earlier .

4.3 Future Climate Risks to Monaghan County Council.

Table 4.2 presents a Climatic Risk Register that details the future climatic hazards that are expected to effect Co. Monaghan and assesses the likely future impacts associated with the future hazards. It should be noted that the impacts may also be exacerbated by a combination or sequence of events such as e.g. drought followed by extreme rainfall.

Table 4.1 – Key To Climatic Symbols.
























Symbol	Description
	all weather events
	Extreme Heat/Drought Conditions
	Heavy Rainfall
	Biodiversity/Environment
	Wind Storms
	Phenology

Table 4.2 – Climate Risk Register

Monaghan County Council Climate Change Risk Register		
Climatic Hazard	Impact area	Future Climate Risks to Monaghan County Council
 All Extreme Climatic hazards	LA Assets	More frequent and intense extreme events i.e. rainfall, wind and snow events will damage local authority buildings, housing stock, equipment and facilities (machinery yards, storage facilities etc) giving rise to increased costs for maintenance, repair and replacement and increased demand on staff resources .
 All Extreme Climatic hazards	Business Operations & Continuity	More frequent and intense extreme events will see more closures impacting the local authority in performing normal daily tasks, exercising statutory duties and organising events. This will interrupt work flows and efficiencies, disrupt scheduled events and increase staff costs in dealing with extreme events.
 All Extreme Climatic hazards	Business Operations & Continuity	Increased frequency of flooding and inundation, storm and extreme cold events (snow) will give rise to general service disruption presenting difficulties for business continuity and the delivery of projects locally, as a consequence of staff being unable to travel to work.
 Wind	Business Operations & Continuity	Projected increases in storm intensity will see a higher risk of service disruption due to closure of local authority buildings, damage to LA communications infrastructure, impact on road networks from debris and impact on utility networks e.g. Electricity supply, directly impacting Local Authority's ability to operate.
 Precipitation	Critical Infrastructure Flood/ Water Management	Extreme rainfall events could affect critical infrastructure such as roads, water, sewerage, storm water, housing and communications through flooding and inundation. Damage to critical infrastructure will impact the economic function of transport routes, will give rise to flooding impacts to properties and communities resulting in increased costs of clean up and maintenance, repair and insurance costs and a wider economic impact .
 Precipitation	Environment, Bio-diversity	Extreme rainfall events will give rise to flooding of habitats and wash nutrients and sediment into watercourses. This will result in changes to geomorphology and cause contamination of watercourses . Landscape may become more vulnerable, ecologically sensitive and may result in habitat loss.
 Heatwaves	Environment, Bio-diversity	Heatwaves and/or sustained drought conditions will result in significant and serious degradation of the natural environment and biodiversity with loss to/of important species/habitats, impact on important landscapes and reduction in water quality.

 Heatwaves	Community	Higher temperatures and more hot days could result in heat exhaustion and increased heat-related stress with vulnerable people within communities increasing the need for emergency response. Remote communities are particularly vulnerable.
 All Extreme Climatic hazards	Infrastructure Structural, community, cultural	More frequent and intense weather events and combination events will undermine the integrity of critical infrastructure, community infrastructure and cultural assets giving rise to increased costs to repair, reinforce, or replace with potential for loss of these assets.
 heatwaves  Phenology	Emergency services Environment Infrastructure	Higher temperatures and longer dry seasons will increase risk of bog, sand dune, gorse or forest fires in some areas, will impact on the integrity of road composition in these areas and water supply in such areas. This will impact on resources of the fire services, result in road closures, threat to public safety and potential local economic impact through loss of tourism potential. Increased disease prevalence and increase in invasive species. Climate change will lead to changes in plant/crop growth patterns.
 All Extreme Climatic hazards	Infrastructure Structural, community, Heritage	More frequent and intense weather events and combination events will undermine the integrity of Community, Heritage and Cultural Infrastructure, giving rise to increased and significant costs of repair, reinforcement or replacement and possibly rendering assets unviable (note: some assets of heritage or cultural significance, by their nature and historical importance, cannot be replaced).
 Precipitation  Heatwaves	Bio-diversity Environment	More climate extremes - changes in rainfall variability and increased frequency of heatwaves will impact on native species, encourage diseases, weeds, pests and invasive species which will need to be managed appropriately.
 Precipitation  heatwaves	Environment Bio-diversity Water Services	Extreme rainfall events, and heatwave/drought events will increase the risk of impacting water quality and the ability of the local authority to meet the requirements of the WFD.
 All Extreme Climatic hazards	All Services	Failure by the local authority to plan for, respond effectively and appropriately adapt to the impacts of Climate Change will encourage a negative perception of ability and will impact the reputational status of the area (damage/loss of critical assets, degradation of the natural and historical environment, local economic impact, community abrasion).

Chapter 5 – Adaptation Goals, Objectives and Actions.

5.1 Thematic areas.

Having considered the climatic hazards that have impacted Monaghan County Council to date and also considered how climate hazards are likely to evolve in the future, the next step in the preparation of the local climate Change adaptation strategy is to identify appropriate high level goals and supporting objectives and actions to help the local authority improve its climate resilience capability. To progress this it is first necessary to identify thematic areas within Monaghan County Council that are most appropriate to target. The six thematic areas identified below were developed from the assessment of climatic hazards and risks identified in earlier chapters and through regional discussions facilitated by the CARO regional office.

Theme 1: Local Adaptation Governance and Business Operations

Goal: Climate Change adaptation considerations are mainstreamed and integrated successfully into all functions and activities of the local authority ensuring operational protocols, procedures and policies implement an appropriate response in addressing the diversity of impacts associated with climate change.

Theme 2: Infrastructure and Built Environment

Goal: Increased capacity for climate resilient structural infrastructure is centred around the effective management of climate risk, informed investment decisions and positive contribution towards a low carbon society

Theme 3: Landuse and development

Goal: Sustainable policies and measures are devised and implemented to influence positive behavioural changes, support climate adaptation actions and endorse approaches for successful transition to a low carbon and climate resilient society.

Theme 4: Drainage and Flood Management

Goal: Great understanding of risks and consequences of flooding and successful management of a co-ordinated approach to drainage and flooding

Theme 5: Natural Resources and Cultural Infrastructure

Goal: Fostering and implementing meaningful approaches to protecting natural and key cultural assets through an appreciation for the adaptive capacity of the natural environment to absorb the impacts of climate change.

Theme 6: Community Health and Wellbeing

Goal: Empowered and cohesive communities with strong understanding of climate risks, increased resilience to impacts of climate change with capacity to champion climate action at local level

5.2 - Local Climate Change Objectives and Actions

To achieve the high-level goals identified in each of the 6 thematic areas a wide range of adaptation actions will have to be implemented throughout the various sections of the local authority over a range of timeframes. In addition, the progression and implementation of these actions will require the provision of appropriate resources including finance and allocation of staff resources.

The following table outlines the range of actions to be progressed. As these adaptation actions may involve a mixture of grey, green and soft measures, the progression and implementation of these actions will require the involvement of different sections within the organisation. In the Tables presented in this chapter for each thematic area the relevant section of the council best placed to deliver each action (*i.e. the “Lead”*) is identified along with the section(s) of the council whose support may be required to help deliver on each action (*i.e. the “partner”*). An estimate of the timeframe that is likely to be required to deliver on each of the actions is also provided.

Timeframes are defined as Short term 1-3 years, Medium Term, 4-5 years, Long Term 5+ years

G1: Local Adaptation Governance and Business Operations

Objective 1: To ensure the progression and implementation of local climate change adaptation actions in Monaghan County Council.

No.	Action	Lead & Partner(s)	Timeframe S/M/L
1	Establish an adaptation Steering Group with appropriate staff representatives from across all key departments of Monaghan County Council to ensure the successful implementation of the actions of this Climate Change Adaptation strategy and to report on progress.	Environmental Services Management Team	Short
2.	Ensure that Climate Action is listed as a standing item on the agenda of the Management Team meetings.	Management Team	Short-Medium
3	Appoint a designated Climate Action officer	Management Team and Human Resources	Medium
4	Explore the possibility for Monaghan County Council to expand its service delivery to include Climate Action as a new core function which would inform on Climate action measures, progress awareness raising campaigns, and manage funding for potential local climate change action projects.	Management Team, Environmental Services.	Medium
5	Building on adaptation planning actions set out in this strategy, support and compliment the practical implementation of actions arising from the National Climate Action Plan – to Tackle Climate Breakdown (as revised and updated annually), across the broad range of functions of the local authority to achieve the national climate ambition i.e. decarbonisation targets to 2030 and objectives to 2050.	Management Team and Heads of Section	Short-Long

G1: Local Adaptation Governance and Business Operations

Objective 2: To ensure that climate change adaptation actions are mainstreamed into all activities of Monaghan County Council.

No.	Action	Lead & Partner(s)	Timeframe S/M/L
6	Embed Climate Adaptation as an integral consideration in the objectives of the new Monaghan County Council Corporate Plan.	Corporate Services	Short
7	Embed Climate Adaptation into the Annual Service Delivery Plan, Team Operational plans, individual Personal Development Plans, and section risk registers to ensure the delivery of climate actions across all departments.	Management Team and Heads of Section	Short
8	Promote green procurement for goods, services and works to support environmental and wider sustainable development objectives to assist in balancing cost effectiveness and sustainable development, representing both short term and long term value for money.	Procurement Steering Committee and procurement leads.	Short-Long (and ongoing)
9	Support The Climate Action Steering Group in overseeing the effective mainstreaming of Adaptation measures into all plans, programmes, strategies and policies of Monaghan County Council:	Management Team, Heads of Section, Climate Action Steering Group.	Medium-Long
10	Liaise, collaborate and work in partnership local communities and with the sectors identified in the NAF, subject to funding, in the delivery of the Government approved sectoral adaptation actions, where they relate and are relevant to the functions and activities of the council at local level/in local communities.	Lead Government departments responsible for the 12 sectoral Plans and the Climate Action Steering Group	Medium -Long
11	Support Waste Management policies for the reduction of waste and other initiatives that promote the transition to a circular economy and as per the objectives of the Connacht Ulster Regional Waste Management Plan.	Environmental Services.	Short- medium

G1: Local Adaptation Governance and Business Operations

Objective 3: To respond effectively to severe weather events through building increased capacity within Monaghan County Council.

No.	Action	Lead & Partner(s)	Timeframe S/M/L
12	Build expertise, capacity and increase the knowledge base within Monaghan County Council through targeted and relevant training programmes on Climate Change and its implications on the operations and functions of the council. Training programmes could for example include the delivery of Climate Change awareness training to staff, Councillors and community groups.	Human Resources, Climate Action Steering Group.	Short-Medium
13	Establish a centralised reporting system for all information relating to extreme weather events. Information supplied to this repository system could include: <ul style="list-style-type: none"> • Description of Impacts on service delivery • Reports of incidents supported by photographic evidence and location details. • Estimates of repair costs incurred. • Details of resources deployed during the event and post event • Details of any departmental funding sourced and recouped for repair or preventative works. 	Roads section, Fire section and Finance section.	Short-medium

G1: Local Adaptation Governance and Business Operations

Objective 4: To Build resilience in Monaghan County Council to support service delivery.

No.	Action	Lead & Partner(s)	Timeframe S/M/L
14	<p>Amend action to read as follows:</p> <p>Develop a Business Continuity Plan to identify and address specifically, the impacts associated with extreme weather events on all council buildings and on all functions/services of the local authority and explore potential opportunities to increase resilience. This will involve:</p> <ul style="list-style-type: none"> - Preparing for critical services disruptions, - Assessment of the Local Authority's back-up system's infrastructure and review of power outage back-up procedures to ensure resilience. - Assessment of staff working environments during extreme temperatures. - Developing a network access contingency plan for identified essential key staff to be able to access all essential council systems remotely. - Ensuring contingency and response measures are in place for energy shortages, power outages, and damage from extreme weather. 	Roads, IT Dept. Climate Action Steering Group	Short
15	Assess Monaghan County Council's vehicle policy and undertake vehicle suitability assessments for effective operation in challenging conditions.	Machinery Yard + individual depts	Short / Medium
15	Develop an internal communication protocol and travel protocol for extreme weather events.	Roads, Fire Services Health and Safety	Short

G1: Local Adaptation Governance and Business Operations

Objective 5: To Identify and progress opportunities from the pursuing of climate change adaptation efforts in Monaghan County Council.

No.	Action	Lead & Partner(s)	Timeframe S/M/L
17	Identify and source funding streams (e.g. Leader Program) for the implementation of adaptation actions and measures across County Monaghan.	Climate Action Steering Group Heads of Section CARO	Short
18	Through the work of the LEO, support businesses in integrating climate change considerations into existing business practices and operations and in developing existing and new ideas seeking to capture opportunities associated with environmental and technological advances that support low carbon transition.	LEO Economic Development	Short (Medium – Long)

G2: Infrastructure and the Built Environment

Objective 1 : To increase the resilience of road infrastructural assets in County Monaghan.

No.	Action	Lead & Partner(s)	Timeframe S/M/L
1	Integrate climate considerations into the design, planning and construction of all road infrastructural projects undertaken by Monaghan County Council.	Road Section TII, MD offices.	Medium to Long
2	Undertake a Risk Assessment of existing road infrastructure in vulnerable areas to identify the severity of climate change risks on their function and condition.	Road Section TII, MD offices.	Medium
3	Record and document severe weather events and impact on road infrastructure as a baseline approach to future planning. Represent the information visually through GIS mapping (potential app for wider use) to help identify future diversionary routes and quickly mobilize action and a prepared response.	Roads Section, IT.	Medium
4	Explore ways to minimise the expected increase in maintenance requirements and costs to road infrastructure from climate stress: <ul style="list-style-type: none"> • Integrate climate change considerations at design stages. • Explore the climate resilience of materials used in road construction and maintenance. • Examine options to reduce road settlement due to severe weather events • Assessment of gulley clearing and maintenance plans with aim to become more proactive to reduce costs in the future 	Roads Section	Short

G2: Infrastructure and the Built Environment

Objective 2: To increase the resilience of Monaghan County Council owned building assets including housing stock

No.	Action	Lead & Partner(s)	Timeframe S/M/L
5	<p>Increase the resilience of Monaghan County Council buildings and housing stock through:</p> <ul style="list-style-type: none"> • the identification and assessment of the integrity of old and derelict buildings to reduce the threats posed. • the assessment of buildings occupied and owned by Monaghan County Council after extreme events to ensure structural integrity 	Corporate assets	Short-Medium
6	<p>Apply a robust risk assessment to Local Authority housing stock to identify and protect against the impacts of climate change and mitigate against service disruption.</p>	Housing Section.	Short
7	<p>Review ways to improve house building and maintenance plan standards to reduce the impacts of climate change on occupants taking into consideration the proposed Public Sector Decarbonisation Strategy.</p> <p>This may include:</p> <ul style="list-style-type: none"> - Assessing the need to increase repair standards and maintenance frequency to mitigate against the expected increase in structure deterioration during extreme events and expected plant growth during growing season. - Exploring the need and benefit of updating or installing new technologies in new builds and when retrofitting including energy efficient technology, water harvesting systems, plumbing technology, and heating and cooling systems 	Housing Section	Short

G3: Landuse and Development

Objective 1: To Integrate climate action considerations into landuse planning policy in Monaghan County Council

No.	Action	Lead & Partner(s)	Timeframe S/M/L
1	Identify and integrate climate change as a critical consideration and guiding principle informing core strategy, strategic objectives, policies and development control strategies of the County Development Plan.	Planning Section	Short-Long
2	Promote climate-smart building and urban design performance outcomes in development standards through the planning and development process.	Planning Section	Short-Long
3	Promote the integrated planning, design and delivery of green infrastructure (e.g. parks, green areas, tree provision) to promote the wider benefits of green infrastructure such as the provision of shading to alleviate heat stress, the supporting of urban biodiversity, the provision of water retention and flood alleviation, and improving air quality.	Planning, Community Development, Tourism, Economic Development, Heritage, Housing.	Short - Long
4	Incorporate measures in accordance with section 10 (n) of the Planning and Development Acts 2000 (as amended) for: (n) the promotion of sustainable settlement and transportation strategies in urban and rural areas including the promotion of measures to— (i) reduce energy demand in response to the likelihood of increases in energy and other costs due to long-term decline in non-renewable resources, (ii) reduce anthropogenic greenhouse gas emissions, and (iii) address the necessity of adaptation to climate change; in particular, having regard to location, layout and design of new development.	Planning Section	Short
5	Promote the regeneration of town and village centres and support property owners in the reuse/repurposing of existing buildings and densification of town centres	Planning Community and Economic Development.	Short-Long

G3: Landuse and Development			
Objective 2: To Explore policies to assist Monaghan County Council transition to a climate resilient low carbon society.			
No.	Action	Lead & Partner(s)	Timeframe S/M/L
6	Promote development in County Monaghan that encourages clean electricity, minimises fossil fuel consumption, encourages sustainable land-use and promotes community energy cooperatives.	Planning Section	Short-Long
7	Encourage policy to support and develop Electric Vehicle (EV) charging Infrastructure on: <ul style="list-style-type: none"> Sites owned and occupied by Monaghan County Council. Private sites through supportive policies and development control standards of the County Development Plan. 	Planning Section, Corporate assets	Medium

G4: Drainage and Flood Management

Objective 1: To Support the management and mitigation of the risk and impact of flooding in Co. Monaghan.

No.	Action	Lead & Partner(s)	Timeframe S/M/L
1	Work with the OPW In progressing the CFRAM Flood risk management plans in Co Monaghan to prioritise projects to reduce flood risk and provide for detailed mapping of areas prone to surface water and groundwater flood risk.	Planning Roads Dept IT section	Medium-Long
2	Incorporate considerations of the impact of climate change into proposals submitted under the OPW Minor Works Programme to ensure that measures proposed are adaptable to future climatic changes.	Road Section, MD Offices, OPW	Short-Long
3	Develop a severe weather event maintenance plan, to ensure, for example: <ul style="list-style-type: none"> • an appropriate stock of sand bags and other flood minimisation supplies. • gulley maintenance and cleaning programs. 	Roads Section, MD Offices.	Short
4	Ensure that flood event emergency response plans are reviewed annually to ensure the appropriate resource capacity is in place to provide an effective emergency response.	Roads section, Fire Services.	Short

G4: Drainage and Flood Management

Objective 2: To Support the provision of effective drainage systems to mitigate the risk and impact of flooding

No.	Action	Lead & Partner(s)	Timeframe S/M/L
5	Incorporate the requirement for Sustainable Urban Drainage Systems where appropriate in local authority projects and private development sites.	Planning Section, Roads Section, Environmental services.	Short
6	Ensure that potential future flood information is obtained by way of a Flood Risk Assessment (FRA) and used to inform suitable adaptation requirements within the Development Management process in line with the Guidelines for Planning Authorities on Flood Risk Management (DoECLG & OPW, 2009).	Planning Section	Short-long
7	Ensure that appropriate urban storm water drainage systems for new developments provide for the future potential impacts of climate change.	Roads section, Planning Section, Environmental Services	Short

G5: Natural Resources and Cultural Infrastructure

Objective 1: To provide for enhancement of natural environment to work positively towards climate action.

No.	Action	Lead & Partner(s)	Timeframe S/M/L
1	Develop a strategy to undertake and implement an active native Tree Planting programme in collaboration with community groups in the context of climate adaptation in conjunction with an awareness campaign that informs of the benefits to communities of improving air quality, offsetting carbon emissions, promoting biodiversity, protecting surface waters against eutrophication, limiting flood risk, reducing urban heat, as well as aesthetic value, whilst ensuring appropriate trees are provided in appropriate locations	Environmental services, Community Development, Planning, MD Offices, Heritage.	Short-medium
2	Promote Green Infrastructure through the protection and nurturing of existing and natural ecosystems and make provision for the integration of appropriate landscape and planting schemes in infrastructural and community projects delivered by Monaghan County Council.	All sections	Short-Long
3	Promote the integration of biodiversity into private developments through the planning process.	Planning section	Short-Long
4	Integrate natural borders/buffers as an integral component of the design of greenways, tracks and trails, and amenity areas to promote natural enhancement. <i>(NPWS to be consulted to ensure that buffer zones are provided, maintained, and protected to avoid potential impacts on designated habitats or protected species and habitats and to protect and enhance wider biodiversity)</i>	Roads Section, Planning Section MD Offices, Bio-diversity dept.	Short-Long
5	Develop and implement an awareness campaign around the role of the natural environment and its positive contribution to Climate Adaptation.	Environmental Awareness, Tidy Towns network.	Short-Long
6	Examine methods or new technologies for the watering of plants/trees (i.e. gator system) and promote the selection of suitable native species that require minimal watering.	MD Offices.	Short
7	Explore ways to decrease siltation debris during periods of high run-off periods to reduce eutrophication. (such as promotion of integrated constructed wetlands, swales and other sustainable drainage systems.	Environmental Services, MD Offices.	Short-Long

G5: Natural Resources and Cultural Infrastructure

Objective 2: To promote effective bio-diversity management and enhance protection of natural habitats and landscapes

No.	Action	Lead & Partner(s)	Timeframe S/M/L
8	Review the actions and objectives of the Bio-diversity Plan to ensure: <ul style="list-style-type: none"> that risks from adverse climate change have been identified; that future changes are assessed, and measures to address issues identified promotion of the National Pollinator Plan 	Heritage Section. NPWS	Short-Long
9	Explore more environmentally friendly methods to control weed growth and to reduce the spread of invasive species.	Planning, Environmental Services. Roads Section, MD Offices.	Short-Long
10	Explore ways of protecting wetlands and sensitive sites from inappropriate infilling activities, drainage activities and eutrophication .	Environmental Services Heritage section.	Short-Long
11	Work closely with communities, landowners, state agencies to progress the conservation of wetland areas and other sensitive biodiverse sites as appropriate and promote awareness of the environmental benefits of such sites. (e.g. through the Ballybay Wetlands Centre)	Environmental Services Heritage section.	Short-Long

G5: Natural Resources and Cultural Infrastructure

Objective 4: To protect Heritage and Cultural Infrastructure

No.	Action	Lead & Partner(s)	Timeframe S/M/L
12	Undertake a review of the key Heritage and Cultural Assets in the county to assess their vulnerability from the impacts of climate change and to help build resilience and to identify and progress remedial measures for these important assets.	Heritage Officer, MD offices.	Medium
13	Identify resilience measures to weather extremes of historical/heritage buildings owned and operated by Monaghan County Council.	Corporate Assets, Heritage Officer, Planning.	

G6: Community Health and Wellbeing

Objective 1: To build capacity and climate resilience within communities

No.	Action	Lead & Partner(s)	Timeframe S/M/L
1	Develop targeted climate change public awareness campaigns and training programs to increase knowledge, encourage behavioural change, and build resilience in communities around climate change and severe weather events.	PPN, Tidy Towns Forum. Environmental Services.	Short
2	Explore ways in which Monaghan County Council can assist vulnerable and isolated people and communities in becoming more climate resilient.	Community Development, PPN	Short-Long

G6: Community Health and Wellbeing

Objective 2: To liaise and work with communities to deliver local climate change projects.

No.	Action	Lead & Partner(s)	Timeframe S/M/L
3.	Identify funding opportunities to deliver local climate action projects.	Community Development Environmental Services. Tidy Towns SEAI	Short
4	Encourage all community groups (e.g. Tidy Towns group)s to consider climate change adaptation in their multi annual plans and programs	Environmental Services Community Development PPN, MD Offices, Tidy Towns	Medium
5	Encourage more communities to actively pursue projects to reduce energy consumption and reduce their carbon footprint.	Energy section, Community Development, Environmental Services, PPN.	Short-Long

G6: Community Health and Wellbeing			
Objective 3: To Protect and Promote climate resilient community infrastructure.			
No.	Action	Lead & Partner(s)	Timeframe S/M/L
6	For future community development projects ensure that climatic resilience is incorporated at design stage.	Community Development Planning, Building Control.	Short-Long
7	For future community projects seeking public funding through Monaghan County Council, integrate climate change and biodiversity considerations as criteria for assessment in order to promote climate resilience.	Community Development, Environmental Services.	Short-Long
8	For any significant festivals / events in the County, integrate climate change and biodiversity considerations at the planning and development stage.	Fire Services, Planning, Environmental Services, Community Development	Short-Long
9	Promote walking, cycling, active participation and healthy living and the development of infrastructure to support this.	Community Development Planning	Short-Long

Chapter 6 : Plan Implementation, Monitoring and Evaluation.

6.1 - Introduction

Goal one, Local Adaptation Governance and business operations endeavors through its first objective to establish a framework within the organisation to support the successful and practical implementation of adaptation actions. Given that this strategy represents all functions and operations of Monaghan County Council, it is important that the Climate Action Steering Group brings together representatives from all key functional areas with various technical, operational and management expertise who can successfully carry out the necessary tasks and implement the actions contained within strategy. The Management Team will nominate representation to the Climate Action Steering Group and assign its Chair. The Climate Action Steering Group will meet quarterly.

The tasks of the group are as follows:

- Prioritise actions within the short, medium and long term delivery timeframes,
- Develop an approach and initiate implementation of the actions,
- Liaise with other stakeholders and sectors, both locally and regionally, where required for the implementation of actions,
- Monitor and evaluate implementation of the actions and,
- Report on Progress to the new Climate Change and Environment SPC and subsequently to full council.

The Eastern and Midland Climate Action Region Offices (E&M CARO) will continue to assist and provide guidance where possible in the practical implementation of the actions of this strategy. Monaghan County Council will continue the positive relationship, collaborate and engage with the E&M CARO as is necessary throughout the lifetime of this strategy. This will include submitting the annual progress report to the CARO if required. Monaghan County Council will also collaborate with the Eastern and Midland Regional Assembly to ensure that climate change adaptation is integrated within local authority planning in the Eastern and Midland region.

6.2 – Prioritise Actions

The purpose of this task is to prioritise adaptation actions for delivery within the short, medium and long term timelines as defined in the strategy document. Actions are to be assigned timeframes for implementation and furthermore assigned owners for delivery. Progress reporting will be aligned to this prioritisation.

6.3 – Develop an Approach and Initiate Implementation

The purpose of this task is to break down the adaptation framework into what actions will be taken and when, and who will carry out the actions by way of an Implementation Plan. The steering group will devise a methodology for implementation that includes:

- Who is responsible for implementing the adaptation actions,
- Identify funding required for the adaptation measures,
- Identify/establish key indicators or targets as mechanisms for measuring outcomes
- Collaboration required with other stakeholders,
- Identification of where adaptation measures could be incorporated into existing plans, policies and budgets,
- Timeframe that measures will be implemented,
- Identify risks to the implementation of actions.

It is recommended to expand out the actions into the implementation plan. Once complete, key personnel can assume responsibility and begin implementing the adaptation actions. The implementation plan shall consider the requirements of the SEA Directive and Habitats Directive, as relevant and appropriate.

In implementing the actions of this strategy Monaghan County Council will seek to ensure that any potential environmental impacts are minimized. Actions will be examined in the context of potential co-benefits including measures such as human health, biodiversity enhancement and protection, improvement in water quality, management of areas at risk of flooding and sustainable landuse zoning and development practices. It would be important that actions yielding multiple environmental and societal benefits are prioritised.

Likewise consideration of potential adverse cumulative and in-combination environmental effects must be accounted for in selecting and implementing specific actions. Consideration of environmental sensitivities under the Habitats Directive and Water Framework Directive for example are important in the context of potential adverse cumulative or in-combination effects.

For the purposes of monitoring and reporting on progress, maladaptation will be identified and approaches to counter this will be explored thoroughly and put in place.

6.4 – Liaise with other Stakeholders/Sectors

At times, the local authority will be required, as considered necessary, to liaise with other key stakeholders to provide for the delivery of actions. Conversely, the sectors, as identified in the National Adaptation Framework, will engage and liaise with Local Authorities in the delivery of sectoral adaptation actions stemming from their respective adaptation plans.

6.5 – Monitor and Evaluate Implementation

Monitoring and evaluating the implementation of actions is critical to ensure the long-term success of climate adaptation actions. It is essential in tracking the performance of activities within the lifetime of this strategy, in determining whether planned outcomes from adaptation actions have been achieved and in determining whether new adaptation actions should be undertaken.

The climate action steering group is encouraged to use results from the monitoring and evaluating program to:

- Revisit vulnerability and risk assessments conducted as part of adaptation actions,
- Make changes where appropriate based on monitoring results,
- Update observed changes,
- Include new climate science and recent extreme climatic hazards/events,
- Factor in changes to exposure and/or adaptive capacity, and
- Evaluate the success or outcome of completed actions.

This ensures an iterative process and allows actions to be informed by latest climate change data and projections. In this way monitoring, and evaluation can help improve the efficiency and effectiveness of adaptation efforts in the council.

6.6 – Report on Progress

The Climate Action Steering Group should develop and agree appropriate and continuous timeframes and mechanisms to report on the progress of the practical implementation of actions of this strategy to the Management Team, the Environment and Climate Change Strategic Policy Committee and the full council as considered appropriate.

Reporting on progress i.e. Climate Change Adaptation Progress Report should be prepared annually, (based on the initial date of the adoption of the strategy), for input by the Management Team and SPC and review by the Elected Members.

The progress report should provide for, inter alia:

- Progress achieved on actions to that point (including key indicators as established)
- Extent to which actions have achieved and build new relationships with key stakeholders, agencies, communities and identified new or emerging opportunities.
- Identification of funding streams used
- Inspired or encouraged positive community engagement
- Reports on the outcomes of efforts to change behaviour

The requirement to report on progress on an **annual** basis is also informed by the following:

Under section 15 of the Climate Action and Low Carbon Development Act 2015, local authorities may be required to report on progress in meeting the terms of the National Adaptation Framework and Sectoral Adaptation Plans.

Local Authorities have been identified by many national sectors under the National Adaptation Framework as a key stakeholder responsible for implementing adaptation actions in their local area and ensuring coordination and coherence with the sectors identified in the NAF. Cooperation and collaboration between Local Authorities and the sectors is encouraged strongly. Under Section 14 of the Climate Action and Low Carbon Development Act 2015, Sectors may be required report on progress made with adaptation actions and present annual sectoral adaptation statements to each House of the Oireachtas by the relevant Minister or by the Minister for DCCAE.

The National Adaptation Steering Committee, chaired by the DCCAE maintains a role to ensure a coordinated and coherent approach to implementing actions under the NAF. This steering committee with representation from Local Authorities and the CAROs has a role in promoting cross sectoral coordination.

The High Level Climate Action Steering Committee, chaired by the Minister for Communications, Climate Action and Environment has a role in monitoring progress by sectors and local authorities in delivering on climate change adaptation actions.

Under Section 13 of the Climate Action and Low Carbon Development Act 2015, the Advisory Council has a role, at the request of the Minister, in conducting periodic reviews of the implementation of the National Adaptation Framework and sectoral adaptation plans and to report on its findings and recommendations.

Chapter 7: Climate Change Mitigation in Monaghan County Council.

7.1 - Introduction

Whilst this is primarily a Climate Change Adaptation strategy it not possible to develop this strategy without also considering some of the measures being progressed by Monaghan County Council pertaining to climate mitigation. Section 1.6 defines mitigation as the efforts made to reduce the severity of future climate change impacts by reducing the emission of greenhouse gases.

As previously detailed, **The Climate Action and Low Carbon Development Act 2015** made provision for, and gives statutory authority to, both the **National Mitigation Plan (NMP)** which was published in 2017 and the **National Adaptation Framework (NAF)** published in 2018. The national policy context is to achieve a deep decarbonisation of the economy by the year 2050.

Although this adaptation strategy proposes a range of actions to be delivered at County Level to allow us to adapt better to climate change, it is important to acknowledge the leadership role that Monaghan County Council can play locally in terms of climate mitigation and the council's commitment to this role as demonstrated through energy reduction targets achieved to date and the mitigation activities being progressed by the local authority, some of which are highlighted in this chapter.

7.2 - Monaghan County Council Energy Reduction Targets

The Government of Ireland has committed to wider climate change goals whereby one of these goals is to achieve a 33% energy efficiency improvement by all Irish public bodies by the year 2020. This target was reinforced in 2017 through the publication of the "Public Sector Energy Efficiency Strategy". In its latest performance report entitled "Annual Report 2018 on Public Sector Energy Efficiency Performance", the Sustainable Energy Authority of Ireland (SEAI) have credited Monaghan County Council 24.91% energy savings against its 2009 energy usage baseline, 0.91% ahead of the end 2017 target.

7.3 - Monaghan County Council Mitigation Activities

The Council is corporately committed to mitigating the causes of climate change and to decreasing the organisations dependency on fossil fuels and reduce energy consumption. This goal is defined in supporting strategy 2.4 of the Monaghan County Council Corporate Plan 2015-2019 as follows:

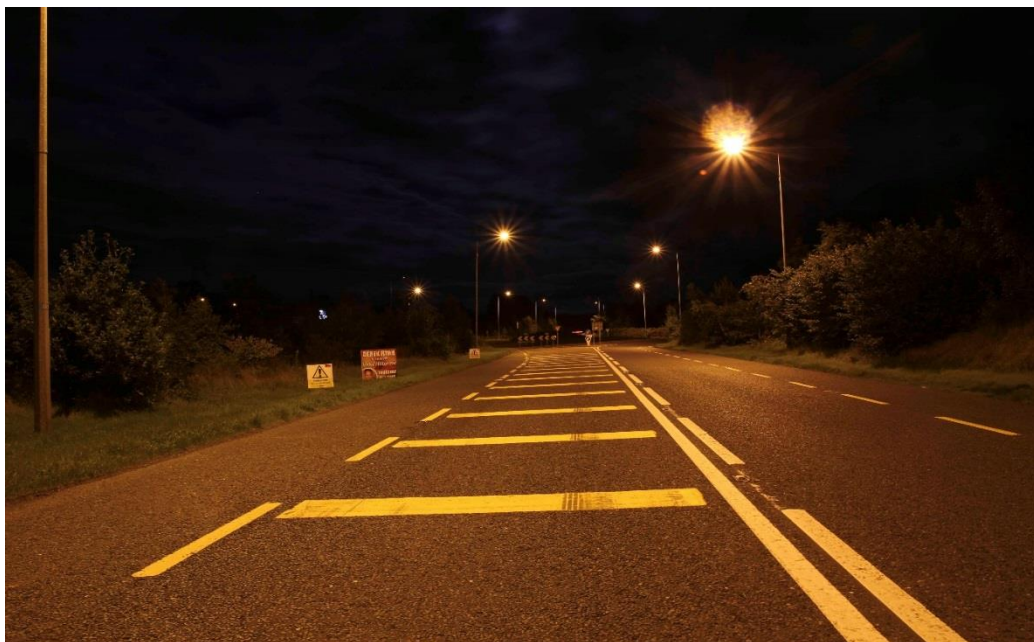
2.4 Promote the sustainable use of energy by assisting Monaghan County Council and local communities in reducing their energy consumption in line with national targets.

Over the past number of years, Monaghan County Council has developed an extensive portfolio of mitigation related works and will endeavour to build on this activity, in addition to developing new and innovative policies to promote activity within the county, Monaghan County Council has progressed a number of projects in order to reduce the dependency on fossil fuel energy generation across the county. The local authority manages its mandatory energy reporting through the SEAI Monitoring & Reporting system. The in-house Energy Team has been trained to EnergyMap standard and has developed an Energy Register of Opportunities from which are selected projects for including in the next energy reduction projects or programmes. Described in the following section are just some of the climate mitigation projects that Monaghan County Council has been involved in. This is by no means an exhaustive listing of mitigation projects but has been included to demonstrate the work that Monaghan County Council is carrying out with respect to climate mitigation.

- Participation in the SEAI administered Better Energy Schemes Energy 2015 - 2018.
- Large Scale retrofit of public lighting with high efficiency LED's.
- Participation in the Transport Infrastructure Ireland Energy Retrofit Scheme for lighting on National Primary and National Secondary routes.
- Working with local community groups to expand the number of Sustainable Energy Communities in collaboration the Sustainable Energy Authority of Ireland.
- Participation in National Procurement Frameworks for the procurement of electrical energy, heating fuel and transport fuel – which contain a renewable component as per national guidelines.
- Inclusion of the NZEB (Near Zero Energy Building Standard) requirement for all new-build construction projects and incorporation of energy efficiency considerations for refurbishment of older or historic buildings.
- Progression of walking and cycling strategies in the County.
- Provision of 15 bicycle shelters and 40 bicycle racks throughout the county through a smarter travel initiative.

Public lighting in particular is a major user of energy as it makes up 34% of Monaghan County Council's energy usage and is crucial element in the Council achieving its energy efficiency target. The upgrading of all Public Lighting in the county is included in the Capital Programme 2018-2020 and is a strategic objective of Monaghan County Council. In addition to reducing energy demands this project will provide a better quality of lighting throughout the County.

Over the past three years, Monaghan Co Council has participated in the TII Energy Retrofit scheme on National routes. These projects reduce energy consumption on road lighting by up to 50%, reduce wasted light, prevent upward illumination and glare, and provide enhanced illumination for all road users.



Annahagh Roundabout on N2– Prior to LED retrofit



Annahagh Roundabout on N2– Following LED retrofit

In recent times, Monaghan County Council has been very successful in carrying out energy saving works through funding secured through the SEAI Better Energy Communities (BEC) scheme. A summary of some of the projects progressed by Monaghan County Council under the BEC is provided below.

BEC 2015

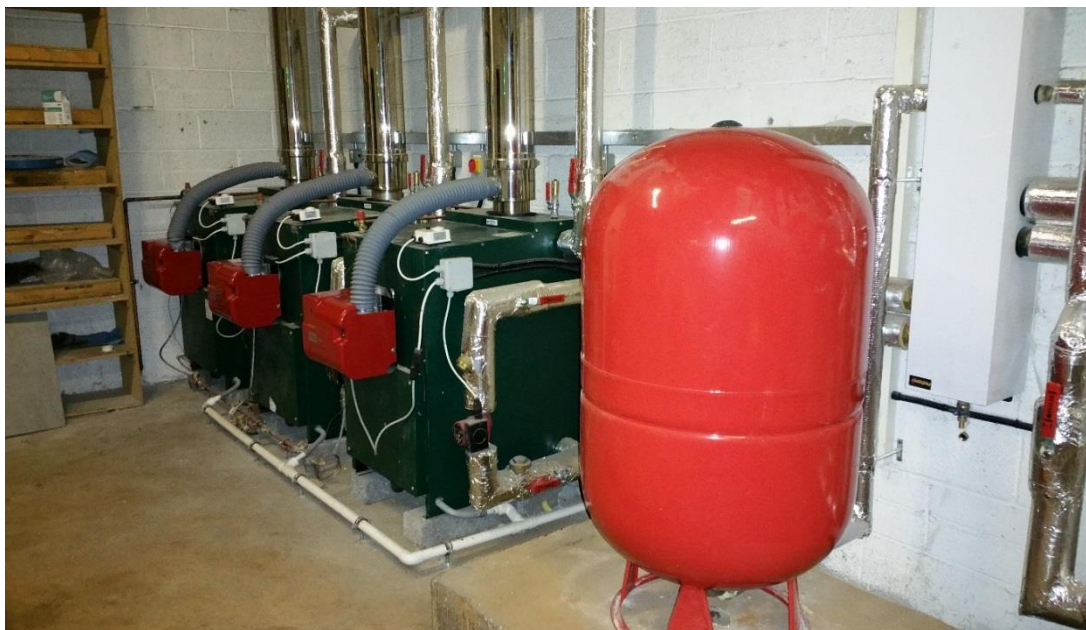
- Clones TC Offices – Insulation / Lighting / Oil Burner Upgrade
- Clones Library – Heat Pump Upgrade
- Ballybay Library – Lighting Upgrade
- Carrickmacross Civic Offices – 10kWp Solar PV panels
- Monaghan Leisure Complex – Lighting / BMS Upgrade

BEC 2016

- Scotch Corner Landfill – Lighting Upgrade
- Monaghan TC Building – Lighting / Oil Burner Upgrade
- Monaghan Museum – Lighting / Insulation / Oil Burner Upgrade
- Clones Peace Link – Solar Panels (water) / 10.9kWp Solar PV panels

BEC 2017

- Clones Library – Lighting Upgrade
- Clones Town Public Area – Smart Lighting with WIFI
- County Offices, Glen Road – Insulation / Oil Burner Upgrade
- Monaghan Fire Station – 10.9 kWp Solar PV panels
- Monaghan Town Library – Windows & Doors / Lighting / Oil Burner Upgrade



New High Efficiency Oil Burner installed in Council HQ under BEC 2017 – Glen Offices

BEC 2018

- Clones Fire Station – Lighting Upgrade
- Monaghan Fire Station – Lighting Upgrade
- Gortakeegan Halting Site – Lighting Upgrade
- Scotch Corner Landfill – 10.9kWp Solar PV panels

In 2018 Monaghan County Council completed its 4th 10.9kWp Solar Photovoltaic (PV) installation, which was located at Scotch Corner Landfill and it was a ground-mounted installation. These PV panels cause no emissions to air, soil or water. The PV panels will further reduce Monaghan County Council's consumption of non-renewable energy helping to meet its energy reduction targets.



Solar PV Installation at Scotch Corner landfill provided under the 2018 BEC Scheme

Monaghan County Council's Housing Section has also been active in climate mitigation measures in recent years with upgrades to the social housing stock in the county.

Typical works to maximise the energy efficiency of the council dwellings includes the replacement of windows or doors, dry lining of walls, more efficient heating systems, and enhanced cavity and attic insulation. Monaghan County Council has successfully completed Energy Efficiency upgrade retrofit works to 1400+ Housing Stock properties.

Any newly constructed dwellings being provided by Monaghan County Council will have an A3 Building Energy Rating to comply with the current Building Regulations.

References

2. O'Dwyer B, Alexander PJ.- Essential Climate Information
3. Nolan, P. 2015. EPA Report: Ensemble of Regional Climate Model Projections for Ireland. EPA climate change research report no. 159. EPA: Wexford.
4. O'Sullivan, J., Sweeney, C., Nolan, P. and Gleeson, E., 2015. A high-resolution, multi-model analysis of Irish temperatures for the mid-21st century. *International Journal of Climatology*.
5. Gleeson, E., McGrath, R. & M, Treanor, eds. 2013. [Ireland's climate: the road ahead](#). Dublin, Ireland: Met Éireann [Online].
6. www.met.ie

Appendix 1

Baseline Assessment Table No 1 : Increase in summer heat wave events and drought conditions.

Climate Hazard (Event): Heat Wave Conditions						
Operational Area Area	Impact	Exposure & Sensitivity	Existing Adaptive Response	Consequence		Other Relevant Actors
				Level	Description	
Road Section	Deterioration of road surfaces (rutting) due to prolonged exposure to high temperatures.	Local roads situated across the county, comprising of tarred and chipped surfaces.	Chipping and emergency works.	2	Increased maintenance costs and staff overtime.	Deterioration of road surfaces (rutting) due to prolonged exposure to high temperatures.
	Increased deterioration of roads as a result of ground movement/shrinkage	Roads situated across the county.	Engineered solutions to reduce effect of ground shrinkage/movement	2	Increased repair costs	Department of Transport, Tourism and Sport, TII
Fire and Emergency services	Increase frequency and intensity of fires	Forestry area, upland areas, gorse and bog areas and amenity/ recreational areas.	Emergency response by fire services.	3	Increased callout of fire services.	Adjacent Fire services.
	Reduced availability of water sources to combat fires.	Areas with limited water supplies particularly in rural areas where waterbodies may go dry.	Securing water from alternative waterbodies.	2	Increased costs	Inland Fisheries Ireland EPA Adjoining local authorities.
Housing						
Health and Wellbeing	Increased levels of sunburn and heat stress (heat stroke/dehydration) as a result of prolonged exposure to high temperatures.	Outdoor (particularly in urban areas due to UHI), Council Staff	Provision of Water and sunscreen stations.	2	Increased costs for protection of staff from heat stress and/or Staff fatigue. Staff on subsequent sick leave.	HSE Unions
	Increased levels of heat stress in staff working inside council buildings due to inadequate ventilation or heat controls	Indoor staff with respiratory issues.	Provisional of fans / cooling equipment	3	Staff fatigue Staff on subsequent sick leave. Increased energy costs for cooling	HSE Unions
Environmental Services	Increased demand for bathing waters	Popular bathing areas in the County.	Continuation of the non-designated bathing waters sampling program.	2	Reduction in in the quality of bathing waters due to increased usage and reduced water levels.	EPA Sampling and analysis contractor.
	Reduced flow in rivers and streams.	Waterbodies sensitive to reduced flow conditions.	Monitoring and sampling of designated rivers and lakes in Monaghan	2	Reduced assimilative capacity in rivers and lakes to handle polluting matter.	EPA, Irish Water, Inland Fisheries Ireland, EPA, LAWPRO
Biodiversity	Wild fires in areas of high biodiversity and habitat value.	Upland areas, comprising of gorse, forest and bog particularly in the Bragan area.	Emergency response by fire services. Fire breaks.	3	Loss of priority habitats and species. Increased callouts of emergency services.	NPWS, Department of Cultural, Heritage and the Gaeltacht, Coillte.
	Increase in Invasive species best suited to higher temperatures and drier conditions.	Sensitive flora and fauna	Liaison with National Parks and Wildlife	3	Loss of native species and priority habitats in the county.	National Parks and Wildlife.

Appendix 1

Baseline assessment Table No 2: Increase in precipitation during the winter months resulting in milder and significantly wetter winters.

Climate Hazard (Event): Extreme Precipitation Events						
Operational Area Area	Impact	Exposure & Sensitivity	Existing Adaptive Response	Consequence		Other Relevant Actors
				Level	Description	
Road Section	Increase in damage to transport infrastructure including flooding of roads and damage to bridge structures and potential landslides.	Roads and bridges in low lying vulnerable areas throughout Monaghan	Maintenance of road drainage systems. Provision of warning signage and sandbags as needed by outdoor MD staff. Implementation of severe weather Plan. Engage contractors to carry out minor works on site to open channels to alleviate flooding and remove debris.	3	Increased costs and staff overtime. Isolation of families/communities. Reputational damage of transport disruption. Increased maintenance and repair costs	Dept of Transport, Tourism and Sport, TII Civil Defence Army
Fire and Emergency services	Increased attendance and response to flooding events.	Dwellings, business, and community and public facilities located in vulnerable areas in Monaghan.	As per existing Emergency response	2	Increased staff overtime costs. Increased H&S considerations	Roads staff Neighbouring fire services
	Increased need for additional equipment (e.g. additional pumps, booms)	Dwellings, business, and community and public facilities located in vulnerable areas.	Having well stocked and maintained equipment in place	2	Increased equipment costs	MD Staff. Civil Defence. Neighbouring Fire Authorities
Housing	Requirement to Rehouse families impacted by flooding.	Families living in areas prone to flooding.	Provision of suitable short-term alternative accommodation for affected families.	2	Increased costs associated with provision of alternative accommodation.	
Environmental Services	Increased surface run-off resulting in nutrients being washed into rivers, streams, and lakes .	At risk waterbodies in the Monaghan.	Enforcement of the Water Pollution Act and the Good Agricultural Practice Regulations.	2	Pollution of our waterbodies and increase in risk of waterbodies failing to achieve good status as per requirements of the Water Framework Directive. Reputational damage.	Department of Communications Climate action and environment. EPA, LAWPRO Dept of Agriculture. IFI Public and Group water Supply Schemes
	Changes to River morphology (e.g. Bank erosion) caused by increased flow rates.	At risk waterbodies in the Monaghan.	None in place	2	Pollution of our waterbodies and increase in risk of waterbodies failing to achieve good status as per requirements of the Water Framework Directive. Reputational damage.	Department of Communications Climate action and environment. EPA, LAWPRO Dept of Agriculture.
Biodiversity	Loss of biodiversity and habitats in flooded areas.	Wetlands and low-lying lands	None in Place	2	Loss of locally important habitat and biodiversity.	

Appendix 1

Baseline assessment Table No 3: Increase in extreme wind events particularly during the winter months.

Climate Hazard (Event): Extreme Wind Events						
Operational Area Area	Impact	Exposure & Sensitivity	Existing Adaptive Response	Consequence		Other Relevant Actors
				Level	Description	
Road Section	Increased frequency of road and bridge infrastructure due to fallen trees and fallen power and communication overhead lines. blocking of roads by fallen trees and debris.	Roads situated across the county. Exposed Bridges. Roads adjacent to power lines	Implement severe weather plan. Emergency response by appropriately trained and competent outdoor staff. Engagement of local contractors. ESB and communication service providers contacted.	3	Increased staff costs/ overtime. Additional repair costs incurred through engaging specialist contractors. Reputational damage of transport disruption Increased potential for serious injury and also loss of life.	Department of Transport, Tourism and Sport, TII ESB networks Eircom. Fire Services
	Increased frequency of wind damage to road signage, street furniture and public lighting.	Exposed locations throughout the county.	Response by outdoor MD staff Response by specialist contractors	2	Increased staff costs/ overtime. Additional repair costs incurred through engaging specialist contractors. Reputational damage of transport disruption & public lighting outages.	Department of Transport, Tourism and Sport, TII Fire Services.
Fire and Emergency services	Increased frequency of responding to accidents caused by debris and falling trees and overhead lines.	Whilst exposed locations likely to be most affected all of the county may potentially be impacted. Likely to have a county wide effect	Emergency response by Fire Services Staff.	3	Increased staff costs/ overtime. Increased potential for serious injury and also loss of life.	ESB networks Eircom networks Roads staff Neighbouring fire services
Housing	Increased frequency of damage to council housing stock	Housing stock particularly in exposed parts of the county.	Response by housing tradesmen and specialist contractors.	2	Increased staff costs/ overtime. Additional repair costs incurred through engaging specialist contractors.	Dept of Housing.
Environmental Services	Increased risk of being unable to carry out sampling of lakes.	EPA Water Framework Directive Program.	Samples taken from lake shoreline rather than open water.	1	Unable to complete the WFD sampling program on behalf of the EPA.	EPA LAWPRO

Appendix 1 – Initial Baseline Assessments

Baseline assessment Table No 4: Extreme cold and/or snow events.

Climate Hazard (Event): Extreme Cold and/or snow events						
Operational Area Area	Impact	Exposure & Sensitivity	Existing Adaptive Response	Consequence		Other Relevant Actors
				Level	Description	
Road Section	Increased frequency of roads closed by snow.	Roads situated across the county particularly in elevated locations.	Snowplough and salt treatments. Severe Weather Response Plan	2	- Increased costs and staff overtime.	Department of Transport, Tourism and Sport, TII, Fire Services & Civil Defence Army.
	Increased road and bridge infrastructure deterioration due to freeze/thaw conditions	All road infrastructure in the county.	Road repair	2	- Reputational damage of transport disruption. - Increased repair costs	Department of Transport, Tourism and Sport, TII Fire Services and Civil Defence. Irish Water
	Damage to underground utility services located under or adjacent to roads	All road infrastructure in the county.	Road reinstatement works via road opening licenses.	1	- Reputational damage of transport disruption. - Increased repair costs	Utility service providers (e.g. ESB, Eircom, Irish Water, Bord Gais.
Fire and Emergency services	Increased vehicular accidents. Increased time to reach call out destinations or destinations may be inaccessible. Water hydrants and/or equipment frozen making it impossible to tackle fires.	county wide effect	Emergency response. Snow socks , snow chains. Water checks on pumps. Hydrant maintenance. Ensuring water supply to stations.	4	Increased costs and staff overtime. - Increased repair and maintenance costs	HSE Roads staff Neighbouring fire services
Housing	Damage to housing stock such as burst pipes	Housing stock particularly in exposed locations.	Repairs by council tradesmen and specialist contractors	2	Increased costs and staff overtime. - Increased repair and maintenance costs	Contractors. Dept of
Environment	Low temperatures will result in an increase in polluting carbon sources being burned which will have a consequence for air quality and public health.	Particularly urban conurbations throughout the county	Enforce smoky coal regulations	2	Increased costs and staff overtime.	HSE. Northern Ireland authorities. EPA

