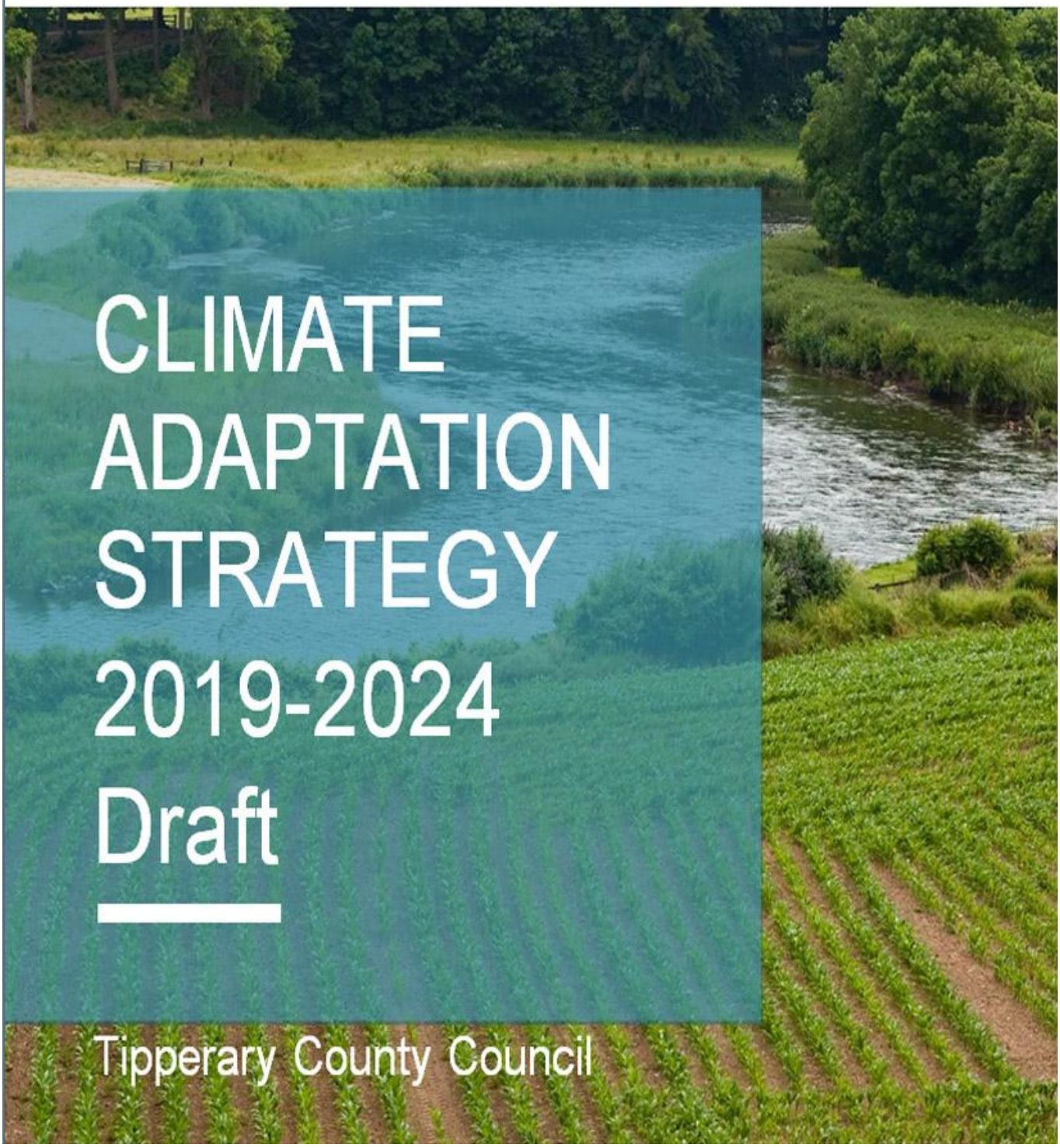
Comhairle Contae Thiobraid Árann
Tipperary County Council

SUSTAINABLE Tipp
YOUR ENERGY, YOUR FUTURE

TIPPERARY energy AGENCY



CLIMATE ADAPTATION STRATEGY 2019-2024

Draft

Tipperary County Council

Foreword

Message from the Chief Executive & Chairperson

Include in final draft

Executive Summary

Tipperary County Council has prepared a Climate Adaptation Strategy in accordance with the provisions of The Climate Action and Low Carbon Development Act 2015 and the National Adaptation Framework (NAF), 2018.

This Climate Adaptation Strategy will allow the local authority to plan for, respond to, and adapt to extreme weather events, while at the same time take advantage of any opportunities that may arise in terms of economic development

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 in how the local authority delivers its services along with impacting local enterprises and businesses as well as local communities.

The approach to how climate change is addressed is based around six thematic areas below

- Local Adaptation Governance and Business Operations
- Infrastructure and Built Environment
- Landuse and Development
- Drainage and Flood Management
- Natural Resources and Cultural Infrastructure
- Sustaining Our Communities

These thematic areas are referred to throughout the document, starting with the assessment of our current baseline of climate impacts and consequences to defining the goals and objectives that will help make our county more resilient to climate change over the next fifty years.

The current baseline details the weather events that have affected the county over the past number of years and the future baseline examines the projected impacts and risks that climate change may pose for the county. A risk register was compiled to examine and prioritise risks associated with the extreme weather events, projected to become more intense.
This Climate Adaptation Strategy proposes a series of objectives and actions to mitigate further changes and adapt to those that are already inevitable.

The strategy is based on extensive review and stakeholder engagement in particular that undertaken between January and March 2019, inclusive of presentations and workshops with various stakeholders. The strategy will be the main instrument to achieve the over-arching commitment by Tipperary County Council towards a low carbon, climate resilient and sustainable environment. Data sources are based on national and international forums and from local sources.

This Climate Adaptation Strategy is the initial step in the process of adaptation planning and in increasing our knowledge and understanding of changing climate, growing resilience, and enabling effective responses to the threats posed by climate change.

The strategy was prepared in accordance with the Local Authority Adaptation Strategy Development Guidelines (DCCAE 2018). These guidelines are based on a previous EPA research.

Contents

1: Introduction & Background

This Climate Adaptation Strategy sets out the roadmap for managing future climate risks, towards making the county more resilient in the face of a changing climate. Adaptation means that all communities and citizen must be prepared to respond to the current and future impacts of climate change. This will require adapting our services, surroundings and lifestyle to meet these challenges.

Each Local Authority is preparing a Climate Adaptation Strategy in accordance with the National Adaptation Framework (NAF), which itself resulted from the Climate Action and Low Carbon Development Act 2015.

The National Adaptation Framework outlines the national strategy for the application of adaptation measures in different sectors, including local authorities in their own administrative areas, in order to reduce the vulnerability of the state to the negative impacts of climate change and to take advantage of any positive effects that may occur.

The Government has identified twelve sectoral levels across seven government departments/agencies for the development of Climate Adaptation strategies. These include actions which will be implemented at a local government level. They are categorised into four themes to foster collaboration and synergies between government agencies and local authorities.

Themes	Sectoral Level	Lead Department for Sectoral Adaptation Strategies
Natural And Cultural Capital	Seafood, Agriculture Forestry	Department of Agriculture, Food & the Marine
	Biodiversity Built & Archaeological Heritage	Department of Culture, Heritage and the Gaeltacht
Critical Infrastructure	Transport Infrastructure	Department of Transport, Tourism and Sport
	Electricity & Gas Networks Communication Networks	Department of Communications Climate Action and Environment
Water Resource and Flood Risk Management	Flood Risk Management	Office of Public Works
	Water Quality Water Services Infrastructure	Department of Housing, Planning and Local Government
Public Health	Health	Department of Health

Table 1: Overview of the four thematic areas covered under the sectoral adaptation strategies.

At local government level, the local authority is the first responder in many emergencies and is uniquely positioned to deliver a climate action plan to ensure a climate resilient future.

The climate adaptation strategy is the primary instrument at local level to:

- Ensure a proper understanding of the key risks and vulnerabilities of climate change.
- Advance the implementation of climate resilient actions in a planned and proactive manner.
- Ensure that climate adaptation considerations are mainstreamed into all plans and policies and integrated into all operations and functions of the local authority.

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

The strategy is consistent with the Local Authority Strategy Development Guide published in December 2018 and is the basis for its preparation. A Strategic Environmental Assessment (SEA) and Appropriate Assessment (AA) were undertaken as required by legislation, as outlined below. Both environmental screening reports form part of this strategy.

Environmental Assessment:

Screening overview for Strategic Environment Assessment SEA

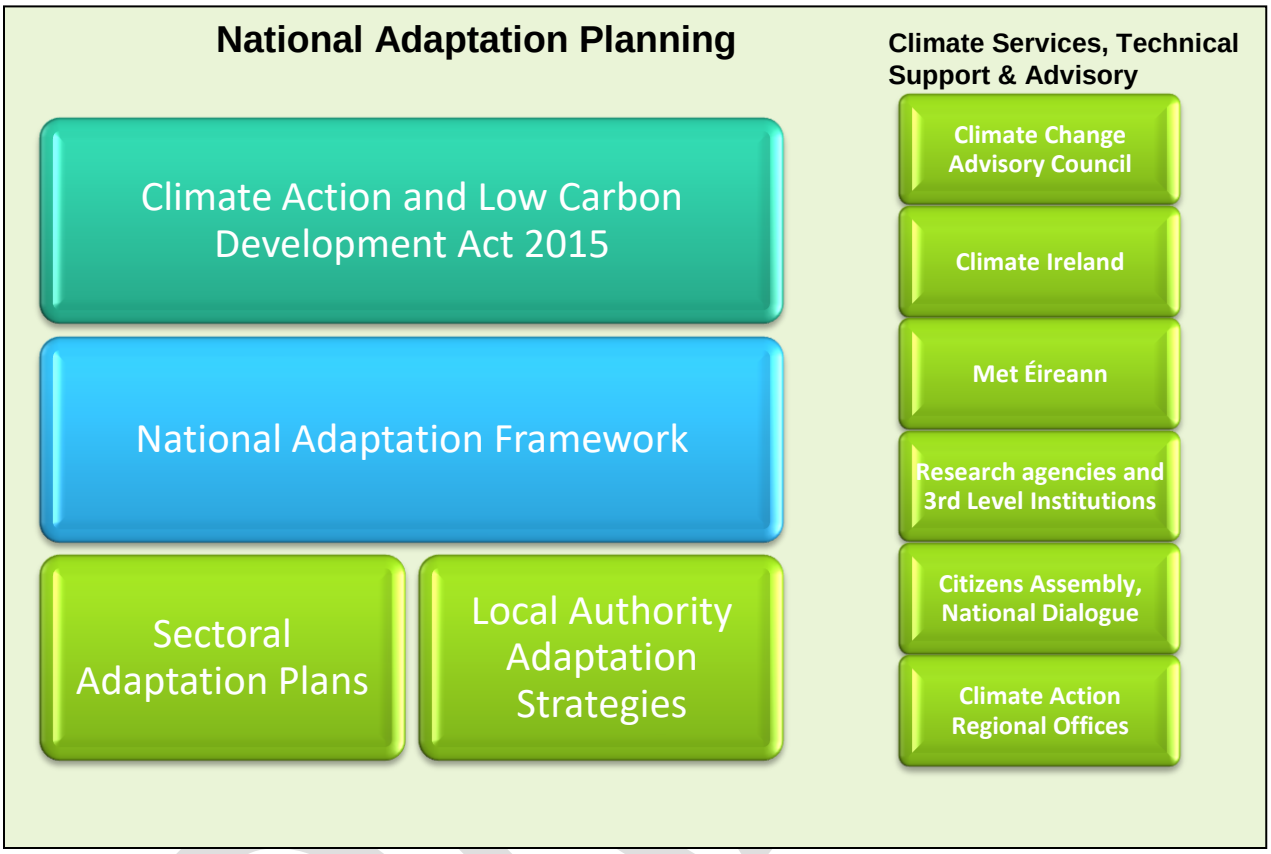
Under the European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations 2004 (S.I. 435 of 2004 as amended by S.I. 200 of 2011), all plans which are likely to have a significant effect on the environment must undergo screening to determine whether an SEA is required. “Screening” 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 an SEA. This strategy was screened for SEA and it is determined that a full SEA is not required.

Screening overview for Appropriate Assessment AA

In accordance with the requirements of Article 6(3) of the EU Habitats Directive (directive 92/43/EEC) an Appropriate Assessment is required to determine if the Climate 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. An AA Screening Report was prepared and confirmed that an AA was not required.

Relationship with other key climate related plans/strategies

This climate 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 Climate adaptation strategy commits to aligning its actions with national commitments on climate change adaptation. Twelve sectoral adaptation strategies indentified in the national adaptation Framework are being prepared simultaneously with those of the local authorities

When these sectoral strategies are published, 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 as listed below.

Adjoining Counties

Kilkenny	Cork	Offaly
Waterford	Limerick	Laois
Galway	Clare	

Adaptation Policy Context

The Climate Adaptation Strategy is set within a policy framework at International, European and National level.

International Policy 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 UNFCC (ratified by Ireland on 4th November 2016) and it is aimed at:

- limiting global warming to less than 2^0C above pre-industrial level and pursue efforts to limit the temperature increase to 1.5^0C
- Building the resilience and increasing the ability to impact against the impacts of climate change

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

2030 Agenda for Sustainable Development

In 2015, countries 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 recognises 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 low-carbon economies.

EU Policy 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.

The Global Covenant of Mayors for Climate and Energy is a voluntary, bottom up, approach for cities and local governments to combat Climate Change and move towards a low emission, resilient society. The Global Covenant of Mayors for Climate and Energy brought the Compact of Mayors and the EU Covenant of Mayors under one international body in January 2017 incorporating over 9,000 cities and local governments. Tipperary County Council is a signatory to the Covenant of Mayors since 2017.

National Policy 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). Further to this, it made provision for and gave statutory authority to both the **National Mitigation Plan** (NMP), published in 2017 and the **National Adaptation Framework** (NAF) published in 2018. This Local adaptation Strategy forms part of the National Adaptation Framework.

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

Methodology

The Local Authority climate adaptation strategy guidelines were developed through a 5 step process (see figure 1 below). This was supported by data gathered through a number of initiatives including workshops, one-on-one interviews, literary research and consultation with invested groups (CARO, Elected Members and the Marine & Renewable Energy Ireland)

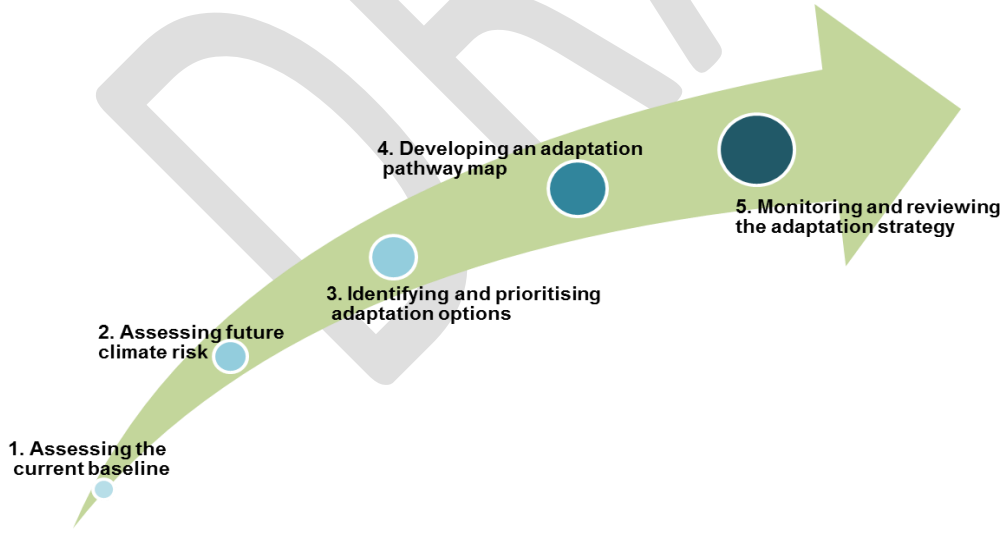


Figure 1: Outline of the 5 step process in the development of the climate adaptation strategy

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 and increased frequency/intensity of extreme weather events. Ireland's climate is changing in line with global patterns and these changes are bringing significant and wide ranging economic, environmental and social impacts.

Figure 2 Tipperary Golden Vale.

Action at local level is vitally important to help reduce the risks and impacts of climate change across communities. This Climate Adaptation Strategy is the start of the process of adaptation planning in Tipperary County Council and is the first step in increasing our knowledge and understanding of our changing climate, growing our resilience, and enabling effective responses to the threats posed by climate change.

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. The local authority 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 emergency responses to recent varied and more frequent extreme weather events.

The challenge for Ireland

There is evidence that Ireland's climate is changing in line with global trends. Over the last few decades our climate has warmed, sea-levels have risen, rainfall patterns have changed and populations have been impacted by frequent, intense and more extreme weather events. Temperatures have increased by 0.80C 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/ animal species on land and in the oceans

This climate 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 Tipperary County Council provide a wide range of services, many of which are already - and will increasingly be more - affected by climate change. Tipperary County Council 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.

Members of the public will be invited to make submissions to the draft climate adaptation strategy in July. The final draft will be placed before Tipperary County Council for adoption before the 30th September 2019.

2: Regional and Local profile

Regional Profile

Tipperary County Council is one of 17 local authorities in the Eastern and Midlands Climate Action Region (CARO). The Eastern and Midlands CARO provided assistance and support in the development of this climate adaptation strategy.

The Eastern and Midland CARO is the largest of the four Climate Action Regions in Ireland. It incorporates counties that identify rainfall and river flooding risks as the major climate-change challenges. The other regions consider coastal erosion or large urban-based risks as their main focus.

The Eastern & Midlands region has an extensive pattern of urban settlements and rural areas, with a population of almost 1.8 million people, accounting for 37.7% of the total population of the state and occupying 32,542 sq.km, representing 46.3% of the area of the state.

The region makes a significant contribution to the national economy. Agriculture remains the prevailing sectoral land use in the region.

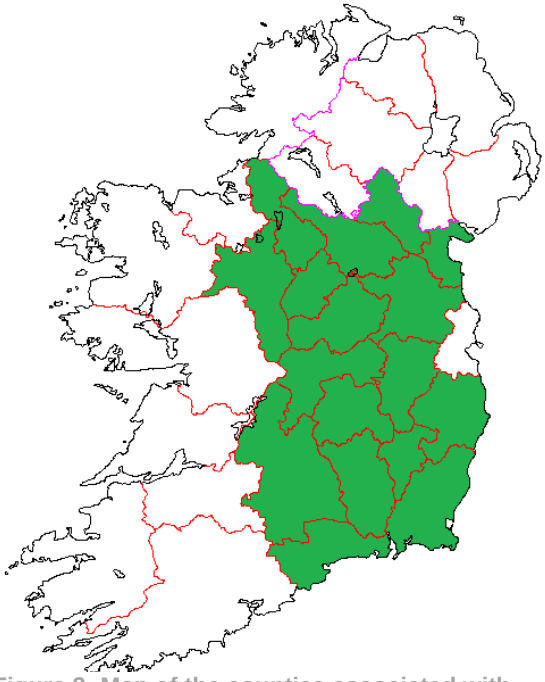


Figure 2: Map of the counties associated with Midlands and Eastern CARO groupings.

Tipperary Profile

A key consideration in the preparation of the climate adaptation strategy is the profile of the county in terms of population demographics, topography, heritage and natural environment. The county has made significant advances in implementing climate mitigation measures and energy efficiencies.

Tipperary County Council and the Tipperary Energy Agency have made significant progress in implementing climate mitigation measures through the Sustainable Energy Action Plan and the council has exceeded its CO_2 emission targets through the Strategic Energy Action Plan. Over the past twenty years, Tipperary County Council has been cognisant of the challenges of climate change through the implementation of a number of strategic initiatives in collaboration with other agencies, this is evident in the funding secured for the Clonmel Flood Relief scheme, developing a 53 Km blueway between Clonmel and Carrick-on-Suir and the implementation of the River Basin Management plan. The local authority is in the process of developing a new County Development Plan 2019-2025 and Corporate Plan 2019-2024, which have regard to this Climate Adaptation Strategy. In developing future adaptation planning, Tipperary County Council will work closely with the OPW in assisting with Flood Risk Management plans for the River Suir and Shannon in order to reduce the risk of flooding in these areas. The Climate Adaptation strategy will be linked to the Major Emergency Plan through the Fire Services. A Business Continuity Plan is currently being drafted which will address the challenges of services

disruption. A severe weather assessment team comprising of staff from the relevant council functions is mobilised in the event of an extreme weather alert from Met Eireann. The team assesses the likely consequences for Tipperary and activates the pre-agreed procedure accordingly.

Other aspects which need to be examined are the population demographics and topography. Tipperary is located within the province of Munster covering an area of c. 4,282 sq.km and is the sixth largest of the 32 counties by area, with a population of over 159,000 people. The main urban settlements are Clonmel, Carrick-on-Suir, Cashel, Nenagh, Roscrea, Thurles, Tipperary Town and Templemore.

The population of Tipperary has seen a continuous growth between 2011 and 2016. A significant percentage of the population resides outside the main urban areas and this poses its own challenges when extreme weather events persist over long periods.

The county has a diverse and notable topography, including several mountain ranges: The Comeraghs, Knockmealdowns, and the Galtees. Mountain lakes are also a feature of the uplands: Lough Curra, Lough Diheen, Lough Muskry and Borheen Lough.

Lough Derg, the third largest lake in Ireland is situated between Tipperary, Limerick, Clare and Galway. Two large rivers, the Shannon and Suir, flow through the county; other areas are drained by tributaries of the Shannon, Nore and Blackwater.

Figure 3: Cahir Castle

Research indicates that climate change could impact significantly on our heritage and biodiversity; therefore it is incumbent on us to take appropriate measures to preserve such sites and habitats.
County Tipperary is abundant in protected Castles, Churches and Towers and has a total of 39 areas of interest (which have been designated by the National Parks & Wildlife Services as Special Areas of Conservation, National Heritage Areas and Special Protection Areas)

Climate Mitigation & Energy Efficiency

Tipperary County Council and Tipperary Energy Agency are spearheading a number of other climate mitigation measures which are tackling climate change. Tipperary's Sustainable Energy Action Plan (SEAP) was formally adopted in 2017. The plan was created following Tipperary's accession to the Covenant of Mayors to reduce CO^2 emissions. The plan incorporates actions across nine sectors including Planning, Agriculture, Residential, Commercial, Renewable Energy, Education, Finance, Transport & the Local Authority. Its mission statement stresses the importance of managing our energy usage to sustain our future. Energy efficiency and Climate Mitigation measures are key components of the Sustainable Energy Action Plan.

A strategic energy management plan is prepared every 5 years to progress projects and initiatives to reduce energy costs, promote energy efficiency and develop renewable sources of energy. The Planning Section prepares a Renewable Energy Strategy which is incorporated into the County Development and local development plans.

Figure 4: Wind turbines a source of renewable energy.

Aligning the Climate Adaptation Strategy with Climate Mitigation and Energy plans is a key factor in tackling climate change, due to the dependencies and synergies between them.
Under the Sustainable Energy Action Plan, a 33% Energy Performance Improvement has been achieved since 2008, with Tipperary County Council leading the way in the country for energy savings.

This was achieved through the following initiatives:

- Upgrade of Leisure Centres Lighting & heating systems
- PV Array Installations at 10 buildings
- Public Lighting Upgrades (1600 LED street lights installed).
- Better Energy Communities Programme (€2 million in 2018)
- Retrofit at 5 libraries
- Renewable Energy projects (80 facilities retrofitted)
- Delivering 278,000 KWh and €42,000 annual savings

3: Assessing the Current Baseline

The baseline assessment examines observed climate change information in terms of the impact of extreme weather events on the county and observed changes in Ireland's climate.
It is the starting point against which projected climate change increases/decreases will be measured. Recent extreme climate events provide the baseline source data and an insight into the level of disruption to services and costs incurred as outlined in the tables covering climate vulnerabilities and climate consequences.

Observed changes in Ireland's climate are in line with global trends.

Parameter	Observed	Projected	Example of Biophysical Impacts
Temperature	▪ Average temperatures have increased by 0.8°C since 1900, an average of 0.07°C per decade. ▪ The number of warm days (over 20°C) has increased while the number of cold days (below 0°C) has decreased.	▪ Projections indicate an increase in average temperatures across all seasons (0.9-1.7°C). ▪ The number of warm days is expected to increase and heat waves are expected to occur more frequently.	▪ Incidences of cold stress are likely to decrease while incidences of heat stress will increase. ▪ The duration of the growing season will increase, occurring earlier and extending farther.
Precipitation	▪ Increase in average annual national rainfall of approximately 60mm or 5% in the period 1981-2010, compared to the 30-year period 1961-1990. ▪ The largest increases are observed over the west of the country.	▪ Significant reductions are expected in average levels of annual, spring and summer rainfall. ▪ Projections indicate a substantial increase in the frequency of heavy precipitation events in Winter and Autumn (approx. 20%).	▪ The increased occurrence of dry spells will result in increased pressure on water supply. ▪ An increase in the frequency of extreme precipitation events will result in increased fluvial and pluvial flood risk.
Wind Speed and Storms	▪ No long-term change in average wind speed or direction can be determined with confidence. ▪ The number and intensity of storms in the North Atlantic has increased by approx. three storms per decade since 1950.	▪ Projections indicate an overall decrease in wind speed and an increase in extreme wind speeds, particularly during winter. ▪ The number of very intense storms is projected to increase over the North Atlantic region. Projections suggest that the winter track of these storms may extend further south and over Ireland more often.	▪ Increases in extreme wind speeds may impact on wind turbines and the continuity of power supply. ▪ Infrastructure will be at risk due to the increased occurrence of intense storms (e.g. winter 2013/2014).
Sea Level and Sea Surface Temperature	▪ Historically, sea level has not been measured with the necessary accuracy to determine sea level changes around Ireland. However, measurements from Newlyn, in southwest England, show a sea level rise of 1.7cm per decade since 1916. These measurements are considered to be representative of the situation to the South of Ireland. ▪ Sea surface temperatures have increased by 0.85°C since 1950, with 2007 the warmest year in Irish coastal records.	▪ Sea levels will continue to rise for all coastal areas, by up to 0.8 m by 2100. 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. For the Irish Sea, projections indicate a warming of 1.9°C by the end of the century.	▪ Significant increase in areas at risk of coastal inundation and erosion. ▪ Increased risk to coastal aquifers and water supply. ▪ Change in distribution fish species; ▪ Implications for fisheries and aquaculture industries.

Table 2 Summary of projected climate changes

Temperatures are increasing, sea levels are rising and seasonal patterns of storms and precipitation are changing (Dwyer, 2013). Projections indicate that this trend will continue and intensify into the future; on average, Ireland's climate is projected to become warmer and drier, rates of sea level rise will increase and the frequency of extreme weather events are also expected to increase (Nolan, 2015; EEA, 2017).

These changes will have a wide range of consequences for Ireland's social, environmental and economic sectors, some positive, others negative. Within individual sectors, a range of consequences both positive and negative may be present. For example, winters will become on average warmer and would likely benefit the agriculture sector due to less frost, but this benefit may be offset by heatwaves/drought during the summer months.

A review of the climate events that have affected Tipperary was undertaken utilising Met Éireann data along with data gathered from workshops and local research.

Date	Type	Description	Climatic Event					
			Strong Winds	Extreme Rainfall	Snowfall/ Low Temps	Sea Level Rise	Low Rain/ Drought	High Temps
Summer 2018	Heat wave	High temperatures, heat wave and drought						
February/March 2018	Storm Emma/ Beast from the East	Met Éireann issued a red warning with school and business closures. Temperatures of -7°C with heavy snowfall.						
October 2017	Storm Ophelia	The storm caused major power outages, lifted roofs, felled countless trees and caused coastal flooding in Ireland. Closure of schools and business. Loss of Life						
February 2014	Storm Darwin	Winds in the region of 80-90 km/h, gusts 130-170 km/h causing wide spread damage.						
Summer 2006	Heat wave	Warmest summer since record breaking 1996						
Winter 2009/2010	Winter Storms	Coldest winter for a 50 year period with temperatures falling below -10°C						
November 2000	Severe Flooding	70-98mm rainfall large areas flooded						
Summer 1996	Heatwave	Temperatures reach 2°C above normal and with daily temperatures exceeding 30°C for a number of consecutive days						
January 1987	Heavy Snowfall	Snowfall of between 6-12cm recorded						

Table 3: Major climatic events in Tipperary (Source: Met Éireann, Flooding.ie & County Council

Figure 5 Consequences of an extreme weather event

Case Study

Brownstown & Woodville Bog threatens Ballaghveny Landfill

On July 25th 2018, due to the continuing dry conditions as part of a prolonged heatwave, a series of fires broke out at Brownstown/Woodville Bog to the north of Ballaghveny landfill.

The fire was first reported to the fire brigade and Tipperary County Council by a local resident. The dry conditions acccelerated the spread of the fire, which in turn hindered the actions of the fire services. As soon as one area was under control the fire spread underground and appeared in another area. This fire event lasted for over two weeks with new fire spots emerging daily. Tipperary County Council Environment and Fire Services were on hand 24hrs a day until the 13th August 2018 at which point they were satisfied that the threat had been neutralised.

One of the main concerns was that the fire would spread to the Ballaghveny Landfill. Emergency funding was allocated to ensure the safety of the landfill site. This was a new challenge not seen to date. Once the fire was under control, a firebreak was created at significant cost to guard against future occurences.

Figure 6: Brownstown & Woodville bog fire

Climate Hazards and Associated Vulnerabilities

This section looks at the climate hazards, areas impacted and associated climate vulnerabilities in Tipperary and takes into account the topography, critical infrastructure and natural built environment of the county.

Tipperary's topography makes it vulnerable to certain types of climatic events. The presence of lowlands, uplands, lakelands and foothills can create microclimates within the county. Larger flood plains around lakes and river basins are an issue during heavy rainfall, bogs are at risk during intense heatwaves, and transport becomes an issue during heavy snowfalls/frosts.

The areas most susceptible to the adverse effects of climate change in the county are:

- Low level lands along rivers where fluvial flooding may increase.
- Bogs and peatlands that may be impacted by drought.
- Road Infrastructure in the upland areas.

The National motorway network is also of strategic importance as both the M7 and M8 have significant stretches within Tipperary; keeping these routes open in extreme weather events is of regional and national importance.

The majority of drinking water supplies are abstracted from surface water sources and these areas will need adequate protection from climate change. Multiple Nautura 2000 sites in the county are also vulnerable to adverse climate change effects. Lough Derg is a significant tourist attraction.

Figure 7: Scohaboy Bog community Project

Climatic Hazard	Impact Area	Climate Vulnerabilities
 **Frequent/Intense Combined Events**	Local Authority Assets	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.
	Business Operations & Continuity	More frequent and intense climate 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.
	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). There is also the financial cost and loss of income.
 **Increased Flooding**	Business Operations & Continuity	Increased frequency of flooding, 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.
 **Increased Storm Intensity**	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.
 **Extreme Rainfall**	Critical Infrastructure Flood/Water Management	Extreme rainfall events could affect critical infrastructure such as roads, housing and communications networks through flooding and inundation. Damage to critical infrastructure will impact the economic function of transport routes, will give rise to flooding which impacts on properties and communities resulting in increased insurance and repair costs.
	Environment, Biodiversity	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 that may result in habitat loss.
 **Heat waves & Droughts**	Emergency Services, Environment, Infrastructure	Higher temperatures and longer dry seasons will increase risk of bog, gorse and forest fires in some areas. This will impact the integrity of road composition in these areas and water supply in such areas. Consequent impacts will include resources of the fire services, road closures, threat to public safety and potential local economic impact through loss business and tourism potential in affected areas.
	Environment, Biodiversity	Heat waves 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. The risk of deteriorating water quality and the ability of the local authority to meet the requirements of the water framework directive.

Table 4: Climate hazards and associated climate vulnerabilities

Consequences of Climate Change

The consequence of extreme climate events were clearly evident from recent storms, including 'The Beast from the East', 'Storm Ophelia', 'Storm Darwin' and the prolonged heatwave of July 2018. These range from economic loss, cultural/community loss, health and safety issues and environmental impacts as outlined below

1. **Economic Loss**: Infrastructural damages (buildings, roads) and work interruptions/stoppages due to extreme events.

2. **Social Loss**: Community and Social facilities.

3. **Environmental and Heritage loss**: Changes to environment, loss of archaeological heritage, habitats and species.

4. **Public Safety**: Harm to human life

Figure 8: Uprooted trees following an extreme storm

Communities that do not meet the challenge of a changing climate could experience economic and social losses due to unemployment. Rural employment, which is often based on agricultural activities such as crop and dairy farming, will be affected by climate change. While unemployment is seen as an economic loss to a community, its impacts can have further consequences.

Unemployment inhibits communities' social functions, increases family stress and has been shown to affect future happiness, job satisfaction and wellbeing (Kelly, et al., 2015). Furthermore urban and connected rural areas have become dependent on infrastructural lifelines such as the transport network, water supply wastewater removal, electricity and gas networks.

Once seen as luxuries, these have become necessities of modern-living and it is imperative that local authorities and communities analyse the effects that extreme events will have on these services. Transport networks often built on asphalt will be affected by increased summer temperatures creating increased micro-climates often referred to as an urban heat island.

In Tipperary many rural and connecting roads are constructed on bogs, which can dry out during sustained high temperatures and/or heatwaves, which may become more frequent. If the underlying structure of a road becomes vulnerable, it will lead to increased stress on the upper layers, resulting in cracking, chipping and the eventual breakdown of the road surface.

The local authority works with many government departments/agencies and adjoining local authorities in instances of extreme weather events, and government departments have also prepared climate adaptation strategies. Referring again to the six thematic areas, which underpin the approach taken by all local authorities in their approach to tackling climate change in this CARO region, an exercise was undertaken under each thematic area to examine the impact and consequences of the climate hazards. This will facilitate collaboration with the adjoining local authorities and with the themes outlined in the sectoral strategies:

Local Adaptation Governance Business operations/continuity (Business operations)

Infrastructure & Built Environment (transport networks, construction and maintenance, community infrastructure)

Land Use and Development (Spatial Planning and land use)

Water, Drainage and Flood Management (water supply and quality)

Natural Resources and Cultural Infrastructure (Biodiversity and heritage)

Sustaining our Communities (Health & Well Being)

Figure 9: Consequences of flooding

Local Adaptation Governance Business operations/continuity				
Services & Functions Affected	Climate Hazard	Impacts	Consequences	Other Actors
Business Services	Storm Events, Snow Events, Extreme Rainfall Events	Building closures Electrical faults Risks to staff welfare, Public safety Loss of Tourism Business disruption	Economic Loss	ESB Dept of Transport, Tourism & Sport. Dept of Commun. Climate Action & Environment
Infrastructure & Built Environment				
Services & Functions Affected	Climate Hazard	Impacts	Consequences	Other Actors
Roads, footpaths, bridges, construction and maintenance	All Extreme Weather Events	Increasing deterioration Collapsing infrastructure Impassable areas	Economic Loss Public Safety	TII Dept of Transport, Tourism & Sport
Building Stock – LA Buildings and social housing stock	Storm, Rainfall, Snow and Heatwave Events	Housing stock damage Heating issues Closure of Local Authority buildings	Economic Loss Public Safety	Dept of Housing, Planning, & Local Government
Community Infrastructure	Sustained Extreme Events	Weakening of community infrastructure Impacts on recreation amenities and tourism activities	Economic Loss Social Loss Public Safety	Dept Rural & Community Development. Dept Agriculture Food & Marine
Cultural & Heritage	Storm, Rainfall, Snow Events.	Damage to cultural and heritage assets	Economic Loss Environmental & Heritage Loss	Dept of Culture, Heritage & the Gaeltacht

Land Use and Development				
Services & Functions Affected	Climate hazard	Impacts	Consequences	Other Actors
Spatial Planning and land use	All Extreme Weather Events	Uncertainty in long term land use planning infrastructure suitability	Economic Loss Social Loss	Dept of Housing, Planning & Local Gov.
Water, Drainage and Flood Management				
Services & Functions Affected	Climate hazard	Impacts	Consequences	Other Actors
Stormwater /Sewerage	Storm Surge Rainfall Events Drought Events	Accumulation of stormwater and pressure on infrastructure Drought events reduce storm water flows	Economic Loss Environmental & Heritage Loss	Irish Water Dept of Comm. Climate Action & Environment
Wastewater	Rainfall/Heatwave Events	Inflow and infiltration to wastewater network Interruption to anaerobic process	Economic Loss Environmental & Heritage Loss	Dept of Comm. Climate Action & Environment
Water Supply	Heatwave Events/ Drought/ Rainfall Events/ Storm	Increase in water demand Reduced availability of water supply sources Increased potential for water contamination Quality of water diminished	Economic Loss Social Loss Environmental & Heritage Loss Public Safety	Dept of Comm. Climate Action & Environment River Basin Mgmt Plan Irish Water
Water Quality	Sustained High Temperatures Rainfall Events	Changes in species distribution and phenology of river systems Deterioration of water quality	Economic Loss Environmental & Heritage Loss Public Safety	EPA Irish Water Inland Fisheries Dept of Commun. Climate Action & Environment

Natural Resources and Cultural Infrastructure				
Services & Functions Affected	Climate hazard	Impacts	Consequences	Other Actors
Biodiversity	Sustained High Temperatures Rainfall Events	Changes in the distribution of flora and fauna species Elevated risk of disturbance to population Possible extinction. Reduction in ecosystem	Economic Loss Social Loss Environmental & Heritage Loss	NPWS Dept of Culture, Heritage & the Gaeltacht
Sustaining Our Communities				
Services & Functions Affected	Climate hazard	Impacts	Consequences	Other Actors
Community Development	Extreme Rainfall Events/Sustained Heatwave Events	Increased isolation Damage to properties, streetscapes and community assets.	Economic Loss Social Loss Public Safety	HSE LEO South Tipp Dev Co

Table 5: Climate Hazards Impacts & Consequences

Figure 10: Carrick on Suir- Clonmel Blueway

4 Identifying Future Climate Impacts, Vulnerabilities and Risks

This section addresses how gradual climate changes are likely to evolve into the future and how the local authority will develop the capacity to deal with such events and reduce the level of risk.

Future weather patterns relating to temperate, precipitation, wind speeds and rainfall, indicate more intense and frequent extreme weather events than those currently experienced. Therefore the impacts and consequences will be greater, and result in further economic social and environmental loss across the county.

Climate Hazards		Observed Climate Changes	Likelihood	Projected Changes
Extreme Events	Extreme Rainfall	The number of days with rainfall greater than 10mm has been gradually increasing.	High	The frequency of extreme rainfall is expected to keep increasing over the years, especially in the autumn and winter seasons.
	Wind Speeds	Wind speeds are increasing slightly in the winter periods and decreasing over the summertime.	Low	Long term trends cannot be determined accurately; although it is anticipated that wind speed will change in a minor way, the frequency of wind storms is expected to increase in the winter periods and decrease in summer.
	Heat Waves	Average air temperatures are increasing and may result in an increase in the frequency and intensity of heat waves.	High	Eight heat waves have been recorded in Ireland over the last 30 years (more than 5 days exceeding 25°C). Projected mean annual temperature increases for 2050 predict temperature and heat wave duration intensification.
	Dry Spells	Precipitation is becoming more seasonal and is likely to cause drier periods in summertime.	High	Ireland as a whole will experience drier summers, with a decrease of up to 20% in summer precipitation. This will result in longer periods without rainfall which will affect water-sensitive regions.
	Cold Snaps	Increasing average air temperatures may result in a decrease in the frequency of cold snaps.	Medium	Projections for 2050 indicate an increase in mean annual temperature, in the range of 1-1.6°C. This will result in milder temperatures and a decrease in the frequency of cold snaps.

Climate Hazards		Observed Climate Changes	Likelihood	Projected Changes
Flooding	Fluvial	Increased rainfall intensity, high river flows and high tides contribute to an increase in fluvial flooding.	High	Projections show both high tides and the intensity of rainfall days are increasing which, in turn, will result in an increase in fluvial flooding.
	Pluvial	Increased rainfall intensity will likely lead to an increase in pluvial flooding.	Medium	It is predicted that the probability of flood events occurring will increase and the number of heavy rainfall days per year is also projected to increase, resulting in a greater risk of pluvial flooding.
	Ground water	High tides and the increase in intensity of rainfall are causing groundwater levels in tidal areas to flood more frequently	Medium	It has been projected that high tides will increase as sea levels rise, as will the intensity of rainfall. Both factors will lead to an increase in ground water levels

Table 6: Climate Variable Projection – 30 year overview

As outlined in the previous section of the strategy, recent climate hazards indicated the extent of the vulnerabilities, impacts and consequences; and form the basis for calculating the levels of projected climate changes and associated increased risks and challenges for the local authority.

There is an increased likelihood of heat waves and decreased rainfall during summer, which will impact on water quality and supply. Incidents of extreme rainfall are expected to become more frequent over the years, especially in the autumn and winter seasons, which will give rise to flooding. Increased temperatures will result in water shortages and loss of flora & fauna. In parallel these climate hazards may create opportunities for more outdoor activities and increased tourist numbers to the county.

Priority Risks

In order to prepare and adapt local authority functions and services to meet the challenges of projected climate changes, it will be necessary for all relevant plans and policies to incorporate Climate Adaptation measures into their future developments. The timing of the risk, the projected change in the level of risk and the priority form the basis for the risk assessment.

As an inland county traversed by large rivers, extreme storms and heat waves accompanied by dry spells are considered to pose the greatest challenges to the county. A risk register showing the risk statements and the areas impacted under these hazards is outlined below.

Risk Register

Climate Hazard	Heat Wave & Dry spells				
Observed & projected information Climate projections indicate an increase in average summer temperature and an increase in the frequency of heat-waves by mid-century.					
Impact Area	**Risk Statements**	**Timing of Risk**	**Projected change in the level of risk**	**Relevant Plans Policies & Objectives**	**Priority**
Business Operations & Continuity	• Increased pressure on the emergency services – Fire & Civil Defence • Increased occurrence of wildfires resulting in increased costs • Risk to outdoor working in extreme heat conditions	Short Medium Long term	Increase	Corporate Plan County Development Plan Major Emergency Plan Health & Safety Management plan	High
Infrastructure, & Built Environment	• Increased temperature damaging road surfaces • Requirement for cooler buildings.	Short Medium Long term	Increase	Building Control Roads Maintenance Programme	Medium
Land Use & Development	• Residential and other infrastructure not climate change ready. • Continual impact on biodiversity and public realm through lack of sustainable planning	Short Medium Long term	Increase	County Development Plan Local Area Development Plans	Low
Water Drainage & Flood Management	• Reduced Water Supply • Increased levels of pollution due to low water levels in rivers	Short Medium Long term	Increase	Water Pollution Monitoring Programme	Medium
Natural Resources & Cultural Infrastructure (Biodiversity & Heritage	• Loss of Flora & Fauna • Flooding of habitats and contamination of water courses leading to habitat loss. • Opportunity to increase tourism capacity	Short Medium and Long term	Increase	Biodiversity & Heritage Plan Green & Blue Infrastructure Masterplan	Medium
Communities	• Loss of business and tourism potential in affected areas • Opportunities for the creation of new enterprises.	Short Medium Long term	Increase	Local Area Development plans.	High

Climate Hazard	Extreme Events (Storm – with high wind & rainfall)				
Observed & projected information The number of very intensive storms is projected to increase over the North Atlantic region in the future					
Impact Area	**Risk Statements**	**Timing of**	**Projected change in the level of risk**	**Relevant Plans Policies & Objectives**	**Priority**
Business Operations & Continuity	• Diversion of funding towards repair and replacement costs • Increased staff costs and disruption to planned work • Disruption to the delivery of services due to travel restrictions.	Short Medium Long term	Increase	Corporate Plan County Development Plan Major Emergency Plan Business Continuity Plan	High
Infrastructure, & Built Environment	• Disruption to electricity & impacting on local authority's ability to operate. • Damage to buildings and critical sites • Road closures due to excessive rainfall and debris.	Short Medium Long term	Increase	Corporate Plan Health & Safety Management plan	High
Land Use & Development	• Demand for increased flood relief systems	Short Medium Long term	Increase	County Dev. Plan Flood Risk Management plans	High
Water Drainage & Flood Management	• Reduced Water supply due damage to abstraction points • Increased levels of pollution	Short Medium Long term	Increase	River Basin Management plan Flood Risk Management plans	Medium
Natural resources & cultural Infrastructure (biodiversity & Heritage	• Damage to amenities & cultural assets e.g. Greenway. • Closure of tourism sites resulting in income losses to businesses	Short Medium Long term	Increase	Heritage Plan	Medium
Communities	• Damage to properties in particular businesses from flooding	Short Medium Long term	Increase	Local Area Development plans County Dev Plans	Medium

5: Identifying Assessing and Prioritising Adaptation Actions

With reference to the impacts of recent climate hazards in the county, and considering how climate hazards are likely to evolve into the future, the next step is to identify appropriate high level goals and supporting objectives and actions to help the local authority improve its climate resilience capability. The Eastern & Midland CARO Regional Office agreed all Local Authorities should develop their goals under the six thematic areas to foster greater collaboration across adjoining counties and also to align with the sectoral strategies.

Thematic Areas

- Local Adaptation Governance and Business Operations
- Infrastructure and Built Environment –
- Landuse and Development
- Drainage and Flood Management
- Natural Resources and Cultural Infrastructure
- Sustaining Our Communities

1. Local Adaptation Governance and Business Operations **GOAL:** Develop a planned and co-ordinated approach to Climate Adaptation	**2. Infrastructure and Built Environment** **GOAL:** Increased capacity for climate resilient infrastructure is based on the effective management of climate risk and informed investment decisions.
3. Land Use and Development **GOAL**: Develop and Implement Sustainable policies and measures supporting climate adaptation actions and endorsing approaches for successful transition to a low carbon and climate resilient society.	**4. Drainage and Flood Management** **GOAL:** Greater understanding of risks and consequences of flooding and successful management of a coordinated approach to drainage and flooding.
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.	**6. Sustaining Our Communities** **GOAL:** Empowered and cohesive communities with a strong understanding of climate risks with capacity to champion climate action at local level.

Table 7: Eastern & Midland CARO Regional Office Themes & Goals

The six goals have been developed with the following guiding principles, in order to provide an understanding of the role of climate adaptation and a coherent approach to the impacts of climate change in the delivery of services.

Mainstream Climate Adaptation:
That adaptation to climate change is a core consideration and to ensure it is mainstreamed into all services and activities across the local authority. This includes informing the development of future policies and plans. Cognisance given to the development of economic and socio economic opportunities, that may arise through a proactive approach to climate change adaptation and community resilience.

In mainstreaming climate adaptation, 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 and must be considered in selecting and implementing specific actions

The built heritage is particularly vulnerable to maladaptation (i.e. actions taken now that will actually increase long term vulnerability) and the selection of the correct skills and materials to maintain, repair and adapt historic structures and sites will be critically important. Where situations arise these will be reported and approaches to the maladaptation will be, identified approaches to counteract it investigated and alternatives identified.

Informed Decision Making:
That effective and informed decision making is based on reliable and robust information of the key impacts, risks and vulnerabilities of the region. This will support long term financial planning, the effective management of risks and help to prioritise actions.

Building Resilience:
That improved awareness and an appreciation of climate change will encourage communities to adapt to anticipated impacts and promote a sustainable and robust action response and that the needs of vulnerable communities are prioritised and addressed. In implementing the actions of this strategy the local authority will seek to ensure that any potential environmental impacts are minimised.

Capitalising on Opportunities:
Actions will be examined in the context of potential co-benefits including measures such as human health, biodiversity enhancement and protection, improvements in water quality, management of areas at risk of flooding, sustainable landuse zoning and development practices. Priority will be given to actions yielding multiple environmental and societal benefits.

Funding
The funding of the actions listed will be included in the annual revenue budgets by the relevant sections; in some instances costs will be absorbed into existing budgets. Business Cases will be developed towards the sourcing of funds for specific projects where there is no current provision

Climate Change Objectives & Actions

Tipperary County Council will address its climate adaption responsibilities for the future wellbeing of its citizens through the following measures:

- Ensuring the effective and efficient delivery of services under changing climatic conditions
- Continue to integrate mitigation and adaptation strategies into all policy and decision making
- Respond effectively to emergency situations and extreme weather events
- Manage climate risks to public assets owned/managed by the council
- Integrate and implement cross-sectoral adaptation strategies at a local level.
- Communicating with communities to build resilience and adaptive capacity.

The actions include a mixture of Grey (Physical Infrastructure), Green (Natural Environment) and Soft (Policy Measures).

The actions were developed from interactions with the local authority staff and interested parties through workshops, meetings and research conducted on a national scale.

Each high-level goal involves the inputs of services/sections and it is important to avoid a silo approach. The Environment and Climate Action section will coordinate the activities of all sections and will monitor progress.

The timeframes associated with each action, determines in which period it will be implemented

- Short 1-3 years
- Medium 4-5 years
- Long 5+ years

The actions proposed in this strategy may be amended following submissions during the public consultation process. It should be noted that while some actions can be implemented as proposed, others will need further preparatory work prior to implementation. The proposed actions may also be augmented to include sectoral actions as they become available from government departments

Communication

Public communication and outreach are essential to local community buy-in to climate mitigation and adaptation measures. A recently-adopted communication strategy will help to build awareness on the challenges of climate change, keep the public informed on the implementation of this strategy and improve information flows during extreme weather events. Raising public awareness on the challenges of climate change is a significant important aspect of the communications strategy.

Local Adaptation Governance and Business Operations

GOAL: Develop a planned and co-ordinated approach to Climate Adaptation

Objective: To ensure that climate adaptation is mainstreamed into all activities and operations of the Local Authority			
No.	**Action**	**Responsible Section**	**Timeframe**
1	Mainstream the Climate Adaptation Strategy into the Annual Service Delivery Plan and the Corporate Plan 2019-2024.	Corporate Services	Short
2	Integrate local authority actions from the sectoral adaptation strategies into this document.	Environment & Climate Action	Short, Medium Long
3	Develop a communication plan to support the strategy.	Environment & Climate Action	Short
4	Review the Health & Safety System to ensure it takes adequate account of the negative impact of climate change	H&S	Short, Medium Long
5	Review use of vacant council lands with a view to enhancing climate mitigation.	Corporate Services	Long
6	Build on current council initiatives to develop Tipperary as a leader in the bio-economy.	Community & Enterprise	Medium
7	Ensure the climate mitigation measures under the Sustainable Energy Action Plan are aligned with the Climate Adaptation Strategy.	Environment & Climate Action	Medium
8	Support the development of local level performance indicators.	Environment & Climate Action	Medium
9	Include provisions for climate related actions in the annual budgets.	Management Team Finance	Medium/Long
10	Liaise, collaborate and work in partnership with the sectors identified in the NAF, subject to funding, in the delivery of the Government approved sectoral adaptation actions, where they relate to and are relevant to the functions and activities of the council at local level/in local communities.	Corporate Services	Long
11	Develop a green procurement strategy.	Finance	Medium
12	Ensure and provide for the effective implementation of relevant regulations, policies, plans and strategies that have a role in climate adaptation and environmental protection.	All Sections	Short, Medium Long
13	Ensure Climate action is incorporated into service delivery plans for each section and is included on management team agendas	All Sections	Medium/Long

14	Each directorate to incorporate climate change into new plans and policies where relevant.	All Sections	Medium/Long
15	Deliver Climate change awareness programmes to all staff members.	Corporate Services	Medium

Objective: To measure the cost factors associated with extreme weather events			
No.	**Action**	**Responsible Section**	**Timeframe**
16	Review council plant and vehicle fleet to determine alternatives to fossil fuel.	All Sections	Medium
17	Support the plan to install Electric charging points in all council offices commencing with Clonmel & Nenagh.	Roads	Medium
18	Develop financial costing models justifying decisions to divert funding to adaptation measures.	Finance	Medium
19	Monitor the costs incurred as a result of extreme weather events.	Finance	Medium

Objective: Undertake and implement a Business Continuity Plan to identify and address specifically, the impacts associated with extreme weather events on all functions/services of the local authority			
No.	**Action**	**Responsible Section**	**Timeframe**
20	Prepare a plan for critical service disruption.	Fire & Emergency Services	Short
21	Build into the Major Emergency Plan the risks identified in this strategy including council offices.	Fire & Emergency Services	Short
22	Develop checklist from previous severe weather events to inform response to future such events.	Fire & Emergency Services	Medium

Infrastructure and Built Environment

GOAL: Increase capacity for climate resilient infrastructure based on the effective management of climate risk and informed investment decisions.

Objective: To ensure and increase the resilience of all future Infrastructural assets and inform investment decisions.

No.	Action	Responsible Section	Timeframe
23	Integrate climate considerations into the design, planning and construction of all roads, bridges, public realm and other construction projects while making a provision to incorporate green infrastructure as a mechanism for carbon offset.	Roads Section	Short, Medium Long
24	Work with communities to highlight the wider environmental and societal benefits of green infrastructure such as microclimate benefits, supporting urban biodiversity, water retention, flood alleviation, recreation and amenity areas	Environment & Climate Action Heritage Sections	Short, Medium Long
25	Consult with NPWS to ensure appropriate, blue ways, natural borders and buffer zones are provided /maintained to avoid potential impacts on protected species and habitats and to protect and enhance wider diversity.	Roads Section	Short, Medium Long
26	Review the potential for cold in-situ road recycling process for non national roads.	Roads Section	Medium
27	Undertake a Risk Assessment of road infrastructure to identify the potential impacts of climate change.	Roads Section	Medium

Objective: Ensure all local authority assets are identified and examined for climate resilience in order to establish an at-risk database.

No.	Action	Responsible Section	Timeframe
28	Establish a complete inventory of all local authority assets (excluding social housing).	Corporate Services	Short
29	Carry out a risk assessment of identified 'at risk' buildings and infrastructure create an at risk database.	Corporate Services	Short

Objective: Carry out a social housing analysis based on climate resilience, public safety and economic impacts.			
No.	**Action**	**Responsible Section**	**Timeframe**
30	Ensure all social housing stock is equipped for current and future climate impacts.	Housing	Short
31	Review Tenants handbook for up to date climate change information for tenants including how to minimise climate emissions	Housing	Short

Landuse and Development

GOAL: Develop and implement sustainable policies and measures supporting climate adaptation actions and endorsing approaches for successful transition to a low carbon and climate resilient society.

Objective: To Integrate climate action considerations into land use planning policy and influence positive behaviour			
No.	**Action**	**Responsible Section**	**Timeframe**
32	Having consideration to Section 10 of the Planning and Development Act 2000 (as amended), the Climate Action and Low Carbon Development Act 2015, and this Climate Change Adaptation Strategy and through collaboration with stakeholders, including the Elected Representatives facilitate the transition to a low carbon, climate resilient and environmentally sustainable economy as a key principle of the County Core Strategy and resulting policies and objectives of the County Development Plan.	Planning Section	Short, Medium Long
33	Through the development management processes and through the appropriate procedures for pre-planning guidance and advice, promote and facilitate climate-smart building and urban design standards in Tipperary.	Planning Section	Short, Medium Long
34	Recognise the importance of and promote the incorporation of green and blue planning and planning for biodiversity through policies, development standards and associated infrastructural, public realm and community projects as opportunities arise.	Planning Section	Short, Medium Long

Drainage and Flood Management

GOAL: Greater understanding of risks and consequences of flooding and successful management of a coordinated approach to drainage and flooding

Objective: To manage and mitigate the risk and impact of flooding.			
No.	**Action**	**Responsible Section**	**Timeframe**
35	Undertake a surface water management plan for the assessment and management of increased pluvial flood risks with the aim of reducing the adverse consequences flooding caused by climate change	Roads Section	Short
36	Review high specification design and construction of urban stormwater drainage systems in all relevant projects	Roads Section	Medium
37	Incorporate climate change impacts into proposals submitted under the Minor Works Programme to ensure that measures proposed are fit for future climate changes.	Roads Section	Short, Medium Long
38	Ensure that potential future flood information is obtained and generated by the 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 (DECLG & OPW, 2009).	Planning Section	Short, Medium Long

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.

Objective: To provide for enhancement of natural environment to work positively towards climate action.			
No.	**Action**	**Responsible Section**	**Timeframe**
39	Develop a strategy to undertake and implement an active native Tree Planting programme in the context of climate adaptation in conjunction with an awareness campaign that informs of the benefits to communities for improving air quality, offsetting carbon emissions, promoting biodiversity, limiting flood risk, reducing urban heat, as well as aesthetic value.	Environment & Climate Action Section	Short

Objective: To Promote effective bio-diversity management and enhance protection of natural habitats and landscapes			
No.	**Action**	**Responsible Section**	**Timeframe**
40	Review and integrate Biodiversity plans/habitat conservation strategies as laid out in the National Parks & Wildlife Service's climate change adaptation strategy.	Library & Cultural Services Section	Short, Medium Long
41	Monitor on an ongoing basis the impacts of climate change on biodiversity.	Library & Cultural Services Section	Short
42	Maintain water quality standards in rivers, lakes and groundwater.	Environment & Climate Action LAWPRO	Medium
43	Continue to implement waste management initiatives that support climate adaptation.	Environment & Climate Action	Medium

Objective: To Protect Heritage and Cultural Infrastructure			
No.	**Action**	**Responsible Section**	**Timeframe**
44	Undertake a risk assessment of the Heritage and Cultural Assets in the county to assess the vulnerability and the risk to the historical environment from the impacts of climate change and to help build resilience of these important assets.	Library & Cultural Services Section	Short
45	Explore the economic opportunities available to allow for the reinforcing of these structures or the opportunities to develop the structures further.	Library & Cultural Services Section	Short
46	Encourage the use of information boards at appropriate amenity locations highlighting the benefits of climate change	All Sections	Short, Medium Long
47	Identify invasive species linked to climate change and prepare appropriate management techniques.	Library & Cultural Services Section	Short, Medium Long

Sustaining Our Communities

GOAL: Empowered and cohesive communities with a strong understanding of climate risks with capacity to champion climate action at local level.

Objective: To build capacity and resilience within communities.			
No.	**Action**	**Responsible Section**	**Timeframe**
48	Raise awareness of the impacts of climate change and ways for communities to increase resilience to these impacts through the Tipperary Public Participation Network.	Community & Enterprise Section	Short
49	Assess communities across the county in the context of their vulnerability to the impacts of climate change. Identify vulnerable communities and the risks to the community.	Community & Enterprise Section	Short
50	For identified vulnerable communities, develop and implement a programme to enhance their capacity to respond to and recover from extreme weather events.	Community & Enterprise Section	Medium

6: Implementing and Monitoring the strategy

The Climate Adaptation Strategy will be monitored on an ongoing basis by the Energy and Climate Action Committee, chaired by the SEO Environment & Climate Action, with representatives from the various Council sections. This Committee is already established, meets quarterly and prepares progress reports and presentations to Senior Management and Elected Members. An Implementation Plan will be developed to support the delivery of the strategy. As the strategy is an iterative process it will be updated as required.

The Energy and Climate Action Committee will produce six-monthly reports to the Senior Management Team, who will review progress in the achievement of the overall goals of the strategy. The Senior Management team includes the Council Chief Executive and all Directors of Service. Progress reports will be made to the 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. Tipperary 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 CARO if required.

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 the adaptation actions stemming from their respective adaptation plans.

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.

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