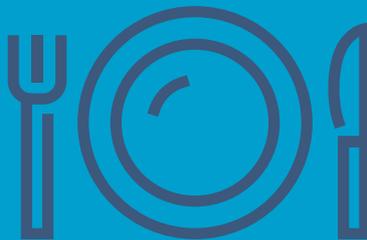
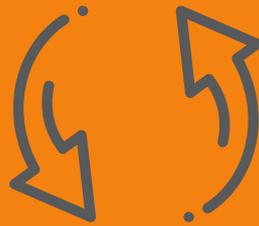




Adapting to the reality of climate change

A guide for Ireland's Food and Beverage Manufacturing sector



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About SustainabilityWorks

SustainabilityWorks is a mission driven sustainability consultancy. We work with businesses, public sector bodies, and non-profits to accelerate Ireland's shift to a sustainable future.

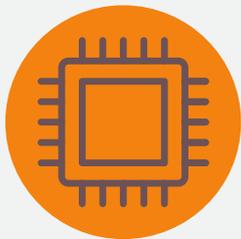
We make sustainability simple. We make it actionable. We make it work.

www.sustainabilityworks.ie

About this guide

This guide aims to help Irish companies in the Food and Beverage (F&B) Manufacturing sector prepare for the impact that climate change will have on their business. It is designed to help businesses understand the key climate change risks and opportunities facing the sector so they can take steps to adapt and build resilience.

The guide was developed by SustainabilityWorks as part of **Climate R|O** – a one-year research project funded by the Environmental Protection Agency, which looked at the climate risks (R) and opportunities (O) facing five sectors of the Irish economy:



**Computer and
Electronics
Manufacturing**



**Food and
Beverage
Manufacturing**



**Chemicals and
Pharmaceuticals
Manufacturing**



**Hospitality and
Tourism**



Retail

These sectors were chosen because they are economically important to Ireland and are not currently covered in detail by national sectoral adaptation plans, such as those in place for agriculture, forestry, and transport infrastructure.

Climate R|O also considered the role of the finance and energy sectors in enabling businesses to adapt to the impacts of climate change. Insights from these sectors are shared on pages 12 and 13.

Climate change realities

In the coming decades, climate change will impact every business in every sector of the economy. As the planet heats up, extreme weather events - from intense storms, to heatwaves, to flooding - will cause disruptions to operations and supply chains and affect the lives of workers and their communities. There will also be significant impacts from changes to policy, regulation and market dynamics as governments ramp up their efforts to meet ambitious climate change targets, in line with the Paris Climate Agreement.

In addition to rapidly cutting their carbon emissions ('mitigation'), companies need to

take steps to prepare for the impact that climate change will have on them ('adaptation'). In order to do this, they first need to be aware of the risks that climate change poses. Only when these are understood can concrete steps be taken to prepare and adapt so that the business remains resilient.

On the flip side, there are also commercial opportunities for companies that get ahead of the curve and innovate their products, services, business model and supply chain in line with a low carbon future. Now is the time for businesses to identify these opportunities and start acting on them.

"If this sector is to adapt to climate change then it needs to be an approach that is agreed across the value chain - from Farm to Fork, and from primary producer to shop shelf."

Project Interviewee

"We've noticed an increase in the use of air conditioning across all of our offices and sites in all regions (globally). Temperatures are increasingly unpredictable and changeable - it might not be just a cold day or a hot day but a mix of both. Air conditioning systems do not respond well to this type of fluctuation."

Project Interviewee

03

Predictions for Ireland

Ireland's climate is changing in line with global climate change trends. According to the EPA¹, there has been a temperature increase of 0.8°C on average in Ireland, compared with 1900.

By the middle of this century (2041 - 2060) average annual temperatures are projected to increase by between 1-1.2°C and 1.3-1.6°C². As a result of this, we can expect to see both gradual and sudden changes in our weather.

Gradual changes:

- Higher average temperatures
- Rising sea levels
- Changes in rainfall patterns

Sudden changes:

- More intense downpours of rain
- More intense storms
- More river and coastal flooding

There will be regional variability, for example the East of Ireland is expected to suffer more from droughts, while the West is likely to experience increases in rainfall.

¹ <https://www.epa.ie/environment-and-you/climate-change/what-impact-will-climate-change-have-for-ireland/>

² <https://www.epa.ie/publications/research/climate-change/research-339-high-resolution-climate-projections-for-ireland.php>

Every degree matters

Part 1 of the sixth assessment report from the Intergovernmental Panel on Climate Change (IPCC), published in August 2021, was an update on the science of climate change. It explained that to keep the planet habitable we need to limit global average temperature rise to 1.5°C. If we go past this, to 2°C or beyond, we will see more extreme changes in our weather and climate system, with catastrophic consequences for human life.

Part 2 of the IPCC's report, published in February 2022, looked at the vulnerability of human society and nature to climate change impacts, and our ability to adapt. While we in Ireland have not yet experienced the kind of extreme weather seen elsewhere in the world, we are still experiencing significant storms and flooding that have an impact on our communities and businesses. Irish businesses that are reliant on global supply chains will face increasing disruptions to raw material supplies and transport routes from more extreme weather in the future. It will become more difficult to adapt to climate change with every increment of warming. Every fraction of a degree matters.

For further information on the likely impact of climate change in Ireland see list of resources in Appendix 2.

Climate change risks and opportunities

When thinking about the risks and opportunities posed by climate change, it's important that companies approach the task in a structured way. The Taskforce on Climate-related Financial Disclosures (TCFD) has developed a framework to

enable companies to do this. While most commonly used by large listed companies and financial institutions, TCFD's concepts of physical risks, transition risks, and climate opportunities are applicable to businesses of all sizes.



Physical risks relate to changes in the weather as a result of climate change, for example greater frequency of wildfires, severe storms, and flash flooding. These events will disrupt business's ability to operate, causing difficulties in sourcing raw materials, damaging buildings and infrastructure, and delaying transport and logistics.



Transition risks relate to changes that will happen as we transition to a low carbon economy. They include policy and legal risk, technology risk, market risk and reputation risk. These risks will have many implications for businesses, for example increased cost of compliance with new regulation, or reputational damage if a company is seen as contributing to the worsening climate crisis.



Opportunities can come from a number of sources including resource efficiency (e.g. energy, water, waste), switching to renewable energy, innovating new low-carbon products or services, and collaborating with suppliers or partners to access new markets or develop new revenue streams.

In the Climate R|O project, we used the TCFD framework to assess the climate risks and opportunities for Ireland's F&B Manufacturing sector. The results of this assessment are shared on the next page.

Climate risk assessment for the Food and Beverage Manufacturing sector

To determine the priority risks for the F&B Manufacturing sector, we assessed each individual climate risk from the Climate Risk Register on two dimensions:

Vulnerability: this is a combination of the likelihood of the risk occurring, and the impact of the risk – how it would impact F&B Manufacturing business’s operations, supply chains, logistics and sales.

Adaptive capacity: this is our assessment of how easy or difficult it would be for businesses in the sector to adapt to the risk if it happened.

The matrix on page 6 shows the result of our climate risk assessment. It captures both physical risks and transition risks. The risks in the dark orange high priority zone are those we believe the sector is most vulnerable to and is likely to find it difficult or costly to adapt to. These are the risks that F&B Manufacturing businesses should focus their efforts on addressing.

“Our enterprise risk management system incorporates climate risk, but we need to do more to expand on climate risk and opportunity to be sure that everything is captured.”

Project Interviewee

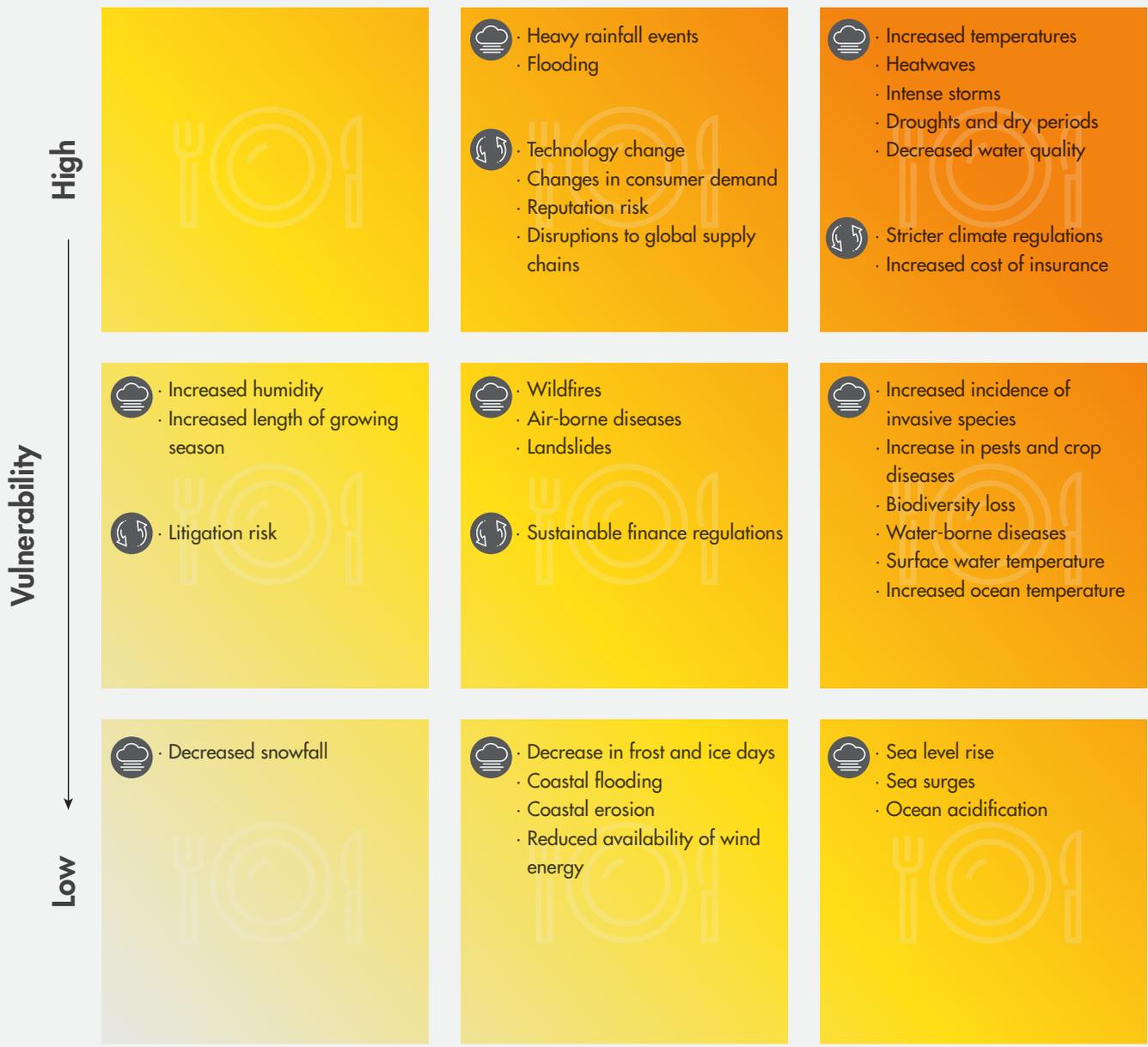
“The full sector value chain needs to work together. It’s pointless if retailers are taking action but processors and farmers are doing nothing.”

Project Interviewee

Climate Risk Register

As part of the **Climate R|O** project, SustainabilityWorks developed a **Climate Risk Register** for Ireland comprising 28 physical risks and 8 transition risks. Drawing on scientific research, we assigned a ‘likelihood score’ of low, medium or high to each risk based on our assessment of the likelihood of the risk occurring in Ireland.

Climate risk matrix for the F&B Manufacturing sector



- Physical Risks
- Transition Risks

High

Low

Adaptive Capacity

High priority

- Heavy rainfall events
- Flooding
- Technology change
- Changes in consumer demand
- Reputation risk
- Disruptions to global supply chains
- Increased temperatures
- Heatwaves
- Intense storms
- Droughts and dry periods
- Decreased water quality
- Stricter climate regulations
- Increased cost of insurance
- Increased incidence of invasive species
- Increase in pests and crop diseases
- Biodiversity loss
- Water-borne diseases
- Surface water temperature
- Increased ocean temperature

Medium priority

- Increased humidity
- Increased length of growing season
- Litigation risk
- Wildfires
- Air-borne diseases
- Landslides
- Sustainable finance regulations

Low priority

- Decreased snowfall
- Decrease in frost and ice days
- Coastal flooding
- Coastal erosion
- Reduced availability of wind energy
- Sea level rise
- Sea surges
- Ocean acidification

Managing the risks

Honing in on the high priority climate risks for the F&B Manufacturing sector, we describe below the operational and financial implications for businesses if

these risks play out. Understanding the implications is the first step in being able to adapt.

Physical risks

MORE INTENSE STORMS, FLOODING AND HEAVY RAINFALL

With climate change expected to bring more intense storms, heavy rainfall and flooding, F&B manufacturing sites will face increased storm, water and flood-related damage, particularly

those sites located in areas that are vulnerable to flooding. In addition, storms, flooding and heavy rainfall can affect the supply of ingredients to F&B manufacturers.

OPERATIONAL IMPLICATIONS

- Power outages to electricity generation/ transmission system and service outages to ICT/ communications services
- Damage to buildings from storms or floods and progressive deterioration to buildings/ infrastructure that is not repaired
- Increased wear and tear on buildings/ assets (heavy rainfall)
- Damage to products stored in buildings
- Disruption to logistics (shipping, rail and road)
- Disruption to supply chains
- Reputational damage if don't keep pace with change
- Disruptions to agricultural supply chain due to damage to farmland, crops and livestock; waterlogging of soil, inhibiting cultivation; soil erosion

FINANCIAL IMPLICATIONS

- Assets - reduced valuation or they become stranded assets
- Interruption to business/ loss of earnings due to damage to buildings/ infrastructure/ workforce
- Capital cost of response, relief and repair (repair on damage/ wear and tear on buildings)
- Jeopardise investments if the location is perceived to be high-risk
- Liabilities if commitments to customers in the supply chain are not fulfilled
- Increased cost of insurance/ withdrawal of risk coverage
- Loss of natural capital

Physical risks

INCREASED TEMPERATURE AND HEATWAVES

Businesses will likely have to adapt their facilities to manage the impact of increased temperatures and heatwaves. There are also potential

disruptions to the supply chain as these physical risks can damage crops, be a danger to livestock and disrupt logistics.

OPERATIONAL IMPLICATIONS

- Higher energy demand for cooling buildings/ lower energy demand for heating in buildings
- Reduced output capacity and efficiency of gas-fired combustion turbines
- Impair asset/ equipment life/ rating
- Loss of productivity (staff, machinery)
- Disruption to logistics due to thermal expansion of roads and rail lines leading to degradation and disintegration
- Disruptions to agricultural supply chain due to increased water demand for growing crops and the increased insect infestation of crops
- Changes to supply and demand for goods and services

FINANCIAL IMPLICATIONS

- Interruption to business/ loss of earnings due to disruption to operations/ temporary impairment of infrastructure
- Loss of productivity of the workforce
- Capital cost of response, relief and repair
- Increased operating costs (e.g. for energy, water)
- Liabilities if commitments to customers in the supply chain are not fulfilled

“We’ve recently put a rapid communication system in place so that when a storm or flood hits, staff can be notified not to come in before 9am and our head office in the US can also be notified.”

Project Interviewee

Physical risks

INCREASED PRESSURE ON WATER RESOURCES

Climate change will have widely differing effects on Ireland's water. It will lead to a range of issues, from increased droughts and dry periods, which in turn can lead to low water levels and less dilution of contaminants, contributing to decreased surface water quality. Increased temperatures/ heatwaves could also increase the viability of pathogens in water.

For the F&B Manufacturing sector, water quality issues could disrupt the supply of ingredients – for example, plants and leafy greens are vulnerable to microbiological contamination from poor quality water. Dry, cracked soil could mean that pesticides reach ground water.

OPERATIONAL IMPLICATIONS

- Shortages of water for operational use, including cooling purposes
- Impairment to water quality (low water levels can mean less dilution of contaminants/ pathogens)
- Disruption to agricultural supply chain due to: lower crop yields; land degradation/ erosion; livestock deaths; increased likelihood of wildfires
- Changes to supply and demand for goods and services
- Disruption to operations if cooling water is not suitable
- Disruption to operations (e.g., cleaning, cooling) due to decreased water quality/ pathogens
- Exacerbate risk of water-borne disease being transferred to staff/ product
- Reduced productivity of ocean ecosystem/ distribution of fish

FINANCIAL IMPLICATIONS

- Increased cost to ship/ treat/ store water
- Jeopardise investments if location is perceived to be high-risk
- Increased cost of insurance
- Interruption to business/ loss of earnings due to reduction in productivity of agricultural supply chain
- Increased energy costs to 'cool' cooling water
- Increased cost to treat/ access clean water
- Loss of natural capital, including fish stocks
- Increased costs for fishing industry to source/ access stock
- Interruption to businesses dependent on clean water supplies leading to loss of earnings

Physical risks

INCREASED INCIDENCE OF INVASIVE SPECIES AND INCREASED INCIDENCE OF PEST & CROP DISEASE

Increased temperatures will likely lead to an increase in the number of non-native species, pests and crop diseases arriving in Ireland. These hazards can impact on wildlife, ecosystems (e.g. riverbank stability) and act as a pest for crops.

Controlling invasive species and pests once they are established can be costly and has the potential to disrupt raw material supply to the F&B Manufacturing sector.

OPERATIONAL IMPLICATIONS

- Damage to farmland/ crops, and therefore disruption to the F&B supply chain
- Increased need to treat pest/ diseases
- Crop failure/ losses due to increased pests/ crop diseases
- Effectiveness and time needed to control invasive species may be disruptive to supply chains (i.e. cause delays)

FINANCIAL IMPLICATIONS

- Cost of managing control of pests and disease
- Cost due to crop losses/ failure of control

BIODIVERSITY LOSS

The biodiversity crisis has direct and serious implications for the F&B Manufacturing sector, given the sectors' reliance on the land and oceans to produce raw ingredients. In addition, given the

sectors' connectivity with biodiversity, there may be reputational impacts if businesses are not seen to take action on the issue of biodiversity or natural capital loss.

OPERATIONAL IMPLICATIONS

- Disruption to agricultural supply chain due to:
- Changes in phenology (timing of events)
 - Degraded coastal and upland habitats
 - Displacement/ loss of native species
 - Introduced pest species e.g. weeds, exotic fauna
 - Ocean acidification
 - Loss of amenities
 - Reduced productivity in farming/ growing crops

FINANCIAL IMPLICATIONS

- Loss of natural capital
- Lower crop yield/ production

Transition risks

STRICTER CLIMATE REGULATIONS

Businesses will have to adapt to stricter climate regulations, including those that stem from the EU's Circular Economy Action Plan, and sectoral

targets arising from Ireland's climate action policies and legislation.

OPERATIONAL IMPLICATIONS

- Risk of assets becoming 'stranded assets'
- Increased costs and/or reduced demand for products and services resulting from fines and judgments
- Changes in operational practices
- Changes in business models to adapt to regulations
- Need to upskill employees
- Increased requirement to disclose non-financial information
- Loss of competitive advantage if don't keep pace with change
- Lose favour with investors and with large B2B customers

FINANCIAL IMPLICATIONS

- Write-offs, asset impairment, and early retirement of existing assets
- Increased costs to comply with regulations
- Restriction on licenses required to operate
- Increased operating/production costs due to higher price on GHG emissions, resource use (e.g. energy, water) and outputs (e.g., waste)
- Increased cost of capital
- Liabilities - legal claims; regulatory fines; reclamation liabilities

INCREASED COST OF INSURANCE

The insurance industry will be an increasingly important partner for the F&B Manufacturing sector in managing the impacts of climate change, such as crop failure leading to ingredient

(commodity) shortages. However, insurance is not the panacea for solving food security issues as they must be addressed in a holistic way.

OPERATIONAL IMPLICATIONS

- Data availability and inability to predict extreme events limits the ability of the insurance sector to assess how best to underwrite assets/ activities impacted by climate change

FINANCIAL IMPLICATIONS

- More expensive insurance coverage or withdrawal of risk coverage by insurers
- Increased reserves required by self-insured companies

Transition risks

DISRUPTIONS TO GLOBAL SUPPLY CHAINS

Although the Irish F&B Manufacturing sector sources the majority of its raw materials and services from Irish suppliers, there is still an important part of the supply chain located

in other countries. Climate impacts in these trading partner countries could lead to disruptions or delays in the import of these products to Ireland.

IMPLICATIONS FOR DAY-TO-DAY OPERATIONS

- More frequent and extreme weather events will:
 - Damage assets (e.g water, energy systems)
 - Damage buildings/ production facilities
 - Affect shipping/ transport/ logistics systems
 - Damage products
- Limit access to resources/ raw materials
- Create export restrictions

FINANCIAL IMPLICATIONS

- Interruption to operations/ loss of revenue
- Increased cost of resources/ raw materials
- Cost of sourcing alternative suppliers

CHANGES IN CONSUMER DEMAND

As customers become more aware of the dangers of climate change, they will increasingly seek

products that either address or, at the very least, do not contribute to the climate crisis.

IMPLICATIONS FOR DAY-TO-DAY OPERATIONS

- Increased demand for climate-friendly goods and services
- Less demand for existing product or service offering
- Rising cost of food in general, as well as food shortages, which could alter the demand for non-essential items

FINANCIAL IMPLICATIONS

- Increased revenue from greater demand for climate-friendly goods and services
- Loss of revenue from lower demand for existing offering

Transition risks

TECHNOLOGY CHANGES

In the F&B Manufacturing sector, adapting to climate change will require investment in new technologies. Companies are considering technologies to improve efficiency in factories

and processes; low carbon technologies in logistics, and technologies like blockchain to respond to increased consumer demand for full traceability of products.

IMPLICATIONS FOR DAY-TO-DAY OPERATIONS

- Failure to keep pace with technology change could lead to loss of market share or competitiveness

FINANCIAL IMPLICATIONS

- Increased cost to implement new technologies/ unsuccessful investments

REPUTATION RISKS

Companies in this sector are often consumer facing, so reputation may become an issue if they

are not managing climate risk appropriately.

IMPLICATIONS FOR DAY-TO-DAY OPERATIONS

- Decreased demand for goods/services
- Delayed planning approvals
- Supply chain interruptions
- Negative impacts on employee attraction and retention
- Reduction in capital
- Increased shareholder concern or negative feedback

FINANCIAL IMPLICATIONS

- Reduced revenues
- Reduction in capital
- Increased shareholder concern or negative feedback

Seizing the opportunities

Businesses that adapt early and decisively to climate change can take advantage of opportunities and reap rewards. Our research found that there are significant opportunities for businesses in the F&B Manufacturing sector related to climate change adaptation. These are described in Table 1 below.

Bord Bia market research of over 11,000 consumers from key global markets found that 61% say it will become more important to them to buy more sustainably produced products in the next 3 years. In addition, 75% of trade buyers say that sustainability is important to their business. Beyond this, consumers are also seeking new products, such as plant-based foods, alternative proteins (e.g. meatless meats), and food that has high nutritional value.

“I want this decade to be the Roaring Twenties of climate action and climate investment. Europe must lead this change. It’s our last chance to stop climate change.”

Ursula von der Leyen,
President of the European Commission
(March 2021)

Adapting their process to become more resource efficient will deliver real cost savings for F&B manufacturers. Many are already doing this but as technology advances, so too will opportunities to make further savings. The sector has a unique opportunity to adopt circular economy principles in how it manages and values waste streams. Indeed, it is one of the sectors with the most potential for circular transformation.

“The rapid pace of technological change is a risk to business. But we also see it as an opportunity. We are actively working on new climate-aligned projects and are continually assessing policy changes that might impact this development..”

Project Interviewee

Table 1: opportunities related to climate adaptation for the F&B Manufacturing sector

Resilience and business continuity	<ul style="list-style-type: none">- Improving supply chain resilience e.g., by sourcing alternative/ low carbon raw materials and robust, low-carbon logistics.- Improving operational resilience e.g., securing fixed assets such as buildings or critical utility infrastructure/networks.
Cost savings through using clean energy and less resources	<ul style="list-style-type: none">- Designing processes to use less raw materials, resulting in lower costs.- Making operations more efficient and cost effective by using less energy and water.- Switching to lower-emission sources of energy e.g., wind, solar, etc, which can in turn improve resilience by reducing exposure to future fossil fuel cost increases and changes in the price of carbon.
Competitive advantage	<ul style="list-style-type: none">- Increasing sales due to increased demand for 'climate-friendly' goods/services.- Developing/ launching new low carbon goods/ services and attracting new customers.- Future-proofing the business's supply chain by sourcing environmentally sustainable raw materials.
Access to markets	<ul style="list-style-type: none">- Adapting to regulatory change quickly and seamlessly, enabling the business to continue to participate in all markets.- Maintaining / increasing access to capital, including new sources of 'green' finance due to being able to prove robust climate risk management to banks and investors.- Continuing commitment from shareholders/ investors due to their trust in how the business is managing climate risk.- Forming new partnerships (e.g. with suppliers) to access new markets/customers.
Reputation	<ul style="list-style-type: none">- Maintaining the business's social licence to operate.- Building reputation and being regarded as a good corporate citizen.- Ability to transparently disclose information to shareholders, investors or customers.

Insights from the Energy and Finance sectors

The **Climate R|O** project considered the important role played by the energy and finance sectors in enabling businesses to adapt to climate change.

Energy sector insights

Decarbonising the energy sector will contribute to the decarbonisation of all other business sectors. While some larger companies may be able to reduce their dependence on the energy sector by installing their own on-site renewables, smaller companies will for the most part, remain dependent. Therefore, the speed with which they can reduce their emissions will depend on how quickly the energy sector as a whole decarbonises.

The extreme weather events we will see as a result of climate change pose threats to physical energy infrastructure such as power lines and wind turbines. But the energy sector is experienced in business continuity planning, as it is used to managing the risk of outages and interruptions. This means that the sector

is well placed to manage climate risk and continue to provide a secure supply of increasingly decarbonised energy/electricity to businesses.

Finance sector insights

Banks, insurers and investors are indirectly exposed to climate change risks through the businesses they lend to, insure or invest in. They depend on companies managing risks well in order to stay in business and be able to repay their loans and generate solid financial returns. In the future, failure to demonstrate good climate risk management may create challenges for businesses in securing a loan, getting investment, or achieving insurance cover at a reasonable cost.

“According to German reinsurance company Munich Re, US\$5,200 billion has been lost since 1980 as a result of natural disasters. This gap appears to be widening because of slow adaptation action, and more frequent extreme weather events in the absence of higher climate insurance penetration rates.” **(Munich RE, 2020)**

Banks: Banks will increasingly require information from their business customers to allow them to assess climate risk across their loan portfolios. Businesses can expect to see more questions on climate risk (and opportunity) as part of banks due diligence in lending decisions. There may also be supports and incentives offered by banks, such more attractive loan rates, for businesses investing in low carbon technologies or climate adaptation measures.

Investors: The increasingly common practice among investors of assessing a company's environmental, social and governance (ESG) performance is becoming mainstream. While this is currently focused on large corporates, the effects will trickle down to the SMEs in their supply chains. With an eye on a low carbon future, investors want to invest in companies whose business models are climate-resilient and who can offer products and services that are aligned with the low carbon transition.

Insurers: The insurance sector has greater exposure to physical climate risks, because of its role in insuring physical assets such as property. In the coming years, insurers will seek more data on climate risk from businesses to allow them to construct better models and to manage and price insurance premiums appropriately.



"In the insurance industry.... with climate change, the past is no longer a good predictor of the future. There is a fundamental shift in the industry to emphasise uncertainty. Businesses need to prepare for a range of possible outcomes."

Project Interviewee

There was €4,617 million of losses and 71 fatalities in Ireland due to the impacts of extreme weather and climate related events from the period 1980 to 2019 (European Environmental Agency, 2021).

"We should make no mistake about it: Achieving net zero requires a whole economy transition. Every company, every bank, every insurer, every investor will have to adjust business models. But doing so will turn an existential risk...into the greatest commercial opportunity of our time" Mark Carney, UN special envoy on climate finance and former Governor of the Bank of England

Get your business climate ready

**A simple step-by-step guide to help you do
a climate risk assessment for your business**



Get your business climate ready

The aim of the **Climate R|O project** was to give businesses a head start in understanding the risks and opportunities that climate change creates for their sector.

Even with this sector overview, every individual business should do its own climate risk and opportunity assessment,

taking into account the business's unique business model, geographic location, and other circumstances.

On the following pages we outline a five-step process for doing a climate risk assessment. It's very like a health and safety risk assessment, so it might be something you're already familiar with.

Climate risk assessment process

- ① Step 1 **Identify climate risks**
 - ② Step 2 **Evaluate the vulnerability of your business to each climate risk**
 - ③ Step 3 **Evaluate your business's capacity to adapt to each climate risk**
 - ④ Step 4 **Evaluate if your business can take advantage of opportunities**
 - ⑤ Step 5 **Develop a climate adaptation plan**
-

Step 1

Identify climate risks



Through the **Climate R|O project** we have identified the climate-related risks relevant to your sector. Now you can assess if these same risks are relevant to your particular business.

Figure 1 is a table of all climate risks - we call it the Climate Risk Register. Your first step is to simply read down through the list and tick the risks that are relevant to your business.



As with any strategy or plan it is critical to evaluate and review things periodically. This is even more important for climate change, as regulations, approaches and innovations are evolving at a rapid pace, and there will always be new data and information to consider.

Step 2

Evaluate the vulnerability of your business to each climate risk



Step 2 involves evaluating your business's vulnerability to each risk. The evaluation has three parts:

i. Likelihood score

First, you need to understand the likelihood of the risk occurring. We have already scored each risk for the likelihood of it occurring in Ireland, based on published scientific research. So this first part is done for you!

ii. Impact score

Second, you need to assess the impact that the risk might have on your business.

Taking each risk that you ticked as being relevant, ask yourself the following questions:

- How will this risk affect our premises?
Hint: Has your site ever experienced a flood event? Remember to use local knowledge for physical risks.

- How will this risk affect our people?
Hint: would people be prevented from getting to work or be at risk of injury? Would their productivity be affected?
- How will this risk disrupt our supply chain and logistics? **Hint:** Have you had difficulties accessing raw materials in your global supply chain due to extreme weather events? Have deliveries in Ireland been affected?
- How will this risk impact our sales and revenues? **Hint:** would it affect customer's ability to access your premises?

Give each risk a score of High, Medium or Low impact, and write your score in the Impact column of your climate risk register.

Impact Score	Description
Low	If the risk occurs, it will have little or no impact on business activities and business can continue at an acceptable level.
Medium	If the risk occurs, it will have a moderate impact on business activities. If there is an impact, business can continue but certain activities will be affected.
High	If the risk occurs, it will have a significant impact on the business, causing serious disruption and affecting business performance.

For a full list of questions to think through when evaluating risks, see appendix 1.

iii. Overall Vulnerability score

The third and final part is to do a simple calculation to work out the overall vulnerability score for each risk. To do this, multiply the likelihood score by the impact score for each risk. The following table is a handy ready reckoner to complete the calculation.

Likelihood	x	Impact	=	Vulnerability
H	x	H	=	H
H	x	M	=	M
H	x	L	=	L
M	x	H	=	H
M	x	M	=	M
M	x	L	=	L
L	x	H	=	M
L	x	M	=	L
L	x	L	=	L

Capture your overall High, Medium or Low vulnerability rating in the Vulnerability column of your Climate Risk Register.

Step 3

Evaluate your business's capacity to adapt to each risk



Adaptive capacity is the business' ability to adapt to climate change.

As with the vulnerability scoring, you need to give each risk an adaptive capacity score of High, Medium or Low. When deciding on your score, think through these questions:

- How costly would it be to have to deal with the consequences of this risk (e.g. repairing flood or storm damage)?
- How prepared are we currently?
- Do we have continuity plans or defences in place?
- Are there things we can do to adapt to the risk and increase our resilience?

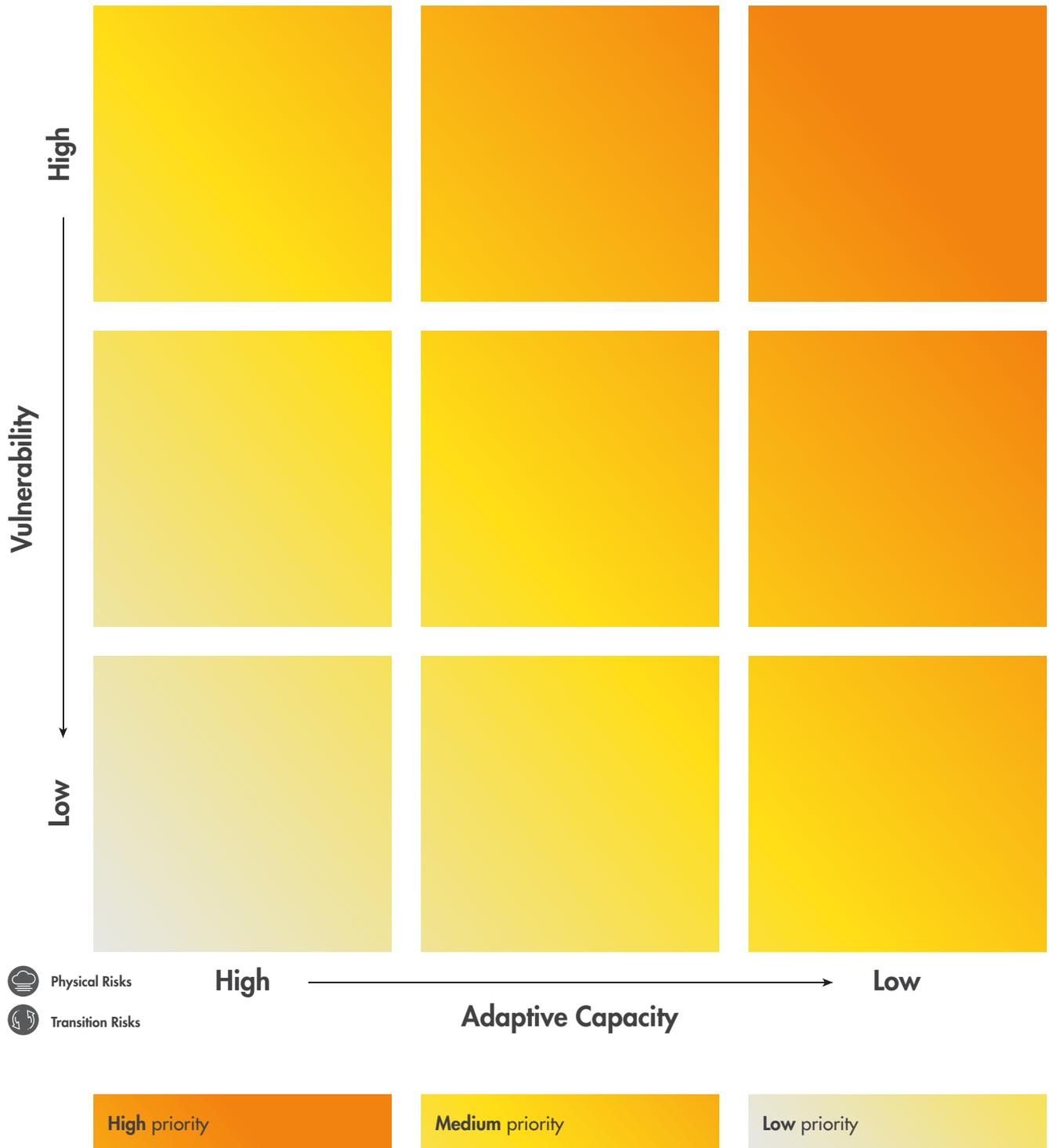
Capture your High, Medium or Low adaptive capacity score in the Adaptive Capacity column of your Climate Risk Register.

With all of the risks scored you're now ready to plot them on your Climate Risk Matrix. For example if a risk was high vulnerability and low adaptive capacity it would go in the top right hand box of the matrix. If a risk was medium vulnerability and medium adaptive capacity it would go in the middle box

Adaptive capacity rating	Description
Low	If a risk is to occur, the business is not ready or in a position to adjust to the potential damage, to take advantage of the opportunities or to respond to consequences due to a particular risk.
Medium	If a risk is to occur, the business is somewhat ready or has moderate ability to adjust to potential damage, to take advantage of opportunities or to respond to consequences.
High	If the risk is to occur, the Business is highly ready or has the ability to adjust to potential damage, to take advantage of opportunities or to respond to consequences.

For a full list of questions to think through when evaluating risks, see appendix 1.

Figure 2: Your Climate Risk Matrix



Step 4

Evaluate if your business can take advantage of opportunities



By adapting early and decisively to climate change your business can take advantage of potential opportunities and reap rewards. On page 11, we have outlined some opportunities relevant to your sector.

Thinking about your particular business, brainstorm potential opportunities in relation to:

- **Energy efficiency** and switching to renewable energy sources in order to reduce energy costs and the amount of carbon tax you need to pay
- **Resource efficiency** to design processes that use less raw materials and to enable your products to be reused or recycled

- **Development of new product and service offerings** or innovations that could set you apart from competitors
- **Access to new markets** that could open up new revenue streams
- **Increase your business's resilience** and ability to respond to change

Take note of all the business opportunities identified and create a list of climate opportunities. The opportunities should be prioritised and included in your in-house innovation process, with people assigned to investigate their commercial potential.

Step 5

Develop a climate adaptation plan for your business



Having assessed the climate risks and opportunities specific to your business you now need to write up a list of actions and assign responsibilities and timelines for

implementation. You can use a simple template like the one below to create your climate adaptation plan.

Action	Owner	Measure of Success	Completion	Progress

Share your plan with senior management to get their sign-off. Then, it's about turning your plan into action, which might involve the following activities:

what you're doing to your colleagues, suppliers and customers so they can be confident that your business is climate ready.

Training

- Equip employees with the skills and knowledge they need to deliver on your adaptation plan.

Engagement

- Get ready to be able to talk to your investors, your bank and your insurance provider about how you're managing climate risk.
- Be sure to proactively communicate

Governance

- Incorporate high priority climate risks into your overall enterprise risk register and monitor them on an ongoing basis.
- Consider all systems, processes and premises and how they must be adapted to reduce risk exposure.
- Assess implications for your corporate strategy. It's important to check whether your strategy takes account of climate risks and opportunities.

Well done! You have kick started your business's climate adaptation journey. You are now more prepared for the reality of climate change, which will help your business remain resilient.

Appendix 1

Checklist of questions for vulnerability assessment

The issues mentioned in this checklist are not exhaustive but are intended to initiate a conversation on the vulnerability of your business to climate change.

Management

Who is responsible for your organisation's climate change strategy, including the assessment and management of risk and opportunity?

Operations: Premises and people

Establish the scope of the climate-related risks and opportunities that you would like to consider, i.e., are you considering one premise, multiple premises or third-party manufacturers across different geographic locations? Or if your business model is to lease/ rent products to customers, how do you assess the risk of where they are physically located?

How prepared are your buildings, utilities and services to cope with extreme weather events:

- Do you have a flood defence system in place e.g., barriers, green infrastructure?
- Back-up energy/ water/ telecoms resources?
- Require equipment/ resources for clean-up after an extreme event?
- What happens if employees cannot get to work?
- Have to you an alert system to communicate with employees during extreme weather e.g., advising them not to travel to work unless it is safe to do so?

If your premise(s) is (are) in a highly vulnerable area e.g., prone to flooding, have you considered:

- Operating from an alternative premise, including switching manufacturing to sister sites or third-party manufacturers?
- Access to and from warehousing (raw materials/ finished products)?
- How to get employees to and from temporary premises?
- Regulatory licenses required?
- Permanently relocating to a location that is less vulnerable?

Are any processes or products sensitive to temperature change, and if so have you considered:

- Redesigning the process or product so that it is less sensitive to temperature change?
- Retrofitting temperature control systems to maintain suitable temperature?

Is the equipment and technology that you use/ plan to purchase future-proofed for stricter climate regulations e.g., lower GHG emission standards?

As well as productivity implications, have you considered the health and safety implications of extreme weather? Consider: are your staff vulnerable to extreme temperatures (heat and cold)? Are there areas where they could have slips and falls due to ice, snow, rain?

Operations/ Supply Chain

Do you source essential raw materials from global locations that will be impacted by climate change? Do you have a back-up plan to source materials from less vulnerable areas?

Sales/ Customers

How prepared are your third-party manufacturers for climate-related risks (regulatory, financial, physical)?

Are your warehouse/ distribution centres and customers in areas that are vulnerable to extreme weather?

Do your warehouse/ distribution partners have plans, resources and equipment in place to deal with extreme weather e.g., back up energy sources?

Where are your global customers/ markets located, and if they are located in an area that is likely to be impacted by climate change, does that affect their purchasing habits? Is there scope to develop new markets?

How do you track regulatory changes that might impact your product or service? This could include regulations designed to reduce emissions, ban the use of certain materials, limit generation of waste etc. Do you track these changes across all markets?

How do you innovate to keep your product/ service aligned with customer interests and regulatory drivers?

Do all your employees understand how to talk about the positive climate-aligned benefits of your product/ service to customers, especially your sales teams?

Logistics

Have you assessed if your methods of transporting raw materials/ finished products are exposed to climate risks? Consider:

- Road - can route be blocked by falling trees, landslides and flooding?
 - Rail - can route be blocked by falling trees, landslides and flooding? Or will service be impacted by extreme temperatures, i.e. heat will buckle lines while cold can lead to snow/ ice build up?
 - Shipping - is port infrastructure vulnerable to storms/silting, are shipping lanes in areas that are vulnerable to storms/ typhoons, will navigation channels be vulnerable to silting, or will new shipping lanes open?
 - Air transport - are flight routes and transit & logistics hubs vulnerable to extreme weather events?
-

Have your logistics partners considered climate risks? What are their business continuity plans?

Are you tracking regulatory and compliance changes, and if they will impact the service provided to you e.g., increased costs?

Finance

How have recent extreme weather events impacted your business's finances? While difficult to predict, how would a future extreme weather event impact on your business's finances?

Does your insurance policy cover climate-related risks e.g., floods, storms, business continuity? What limits are included in your insurance policy i.e., does it only cover clean-up, clean-up and repair or clean-up and replacement?

Does your insurance policy specify resilience measures that you need to have in place to mitigate against damage e.g., sandbags, flood barriers etc.?

Have you discussed your climate-risk assessment with your bank, investors, or insurance providers?

If your business is interrupted due to climate change, how do you plan to bridge (short-term) any additional/ unforeseen costs?

Have you included the cost of climate-risk back-up plans in your budget?

Have you a process in place to regularly assess future taxes or price increases due to regulatory change into your budget? Consider doing 'scenario planning' to help you anticipate future changes.

Appendix 2

Further resources

Climate R|O resources

- The detailed Final Report for the Climate R|O project can be viewed on the EPA website: <https://www.epa.ie/publications/research/climate-change/research-4O2.php>
 - The full set of sector guides, as well as the Final Report can also be found on the SustainabilityWorks website: www.sustainabilityworks.ie
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Irish resources

- **EPA.** For the most recent research on the physical impacts of climate change in Ireland, see this EPA published report by Paul Nolan and Jason Flanagan. <https://www.epa.ie/publications/research/climate-change/research-339-high-resolution-climate-projections-for-ireland-.php>
- **Met Éireann** measures Ireland's past and current climate, as well as helping to predict Ireland's future climate. <https://www.met.ie/climate/climate-change>
- The **Office of Public Works (OPW)** provides real-time access to data about water levels. Other data, such as water temperature is also available. <http://waterlevel.ie/>
- **Geological Survey of Ireland (GSI)** publishes the Coastal Vulnerability Index (CVI), which maps the impacts of sea-level rise in Ireland. The first phase of mapping (2019-2021) maps areas from north Co. Louth to Co. Wexford, inclusive of Dublin city and region. <https://www.gsi.ie/en-ie/programmes-and-projects/marine-and-coastal-unit/projects/Pages/Coastal-Vulnerability-Index.aspx>
The GSI also published research on ground water flooding in Ireland. It provides details on historic floods due to ground water, identifies areas at risk from groundwater flooding, models potential flood scenarios, as well as providing some predicative flood maps. <https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/activities/groundwater-flooding/gwflood-project-2016-2019/Pages/default.aspx>
- **Climate Ireland** is a collaborative initiative that brings together a wide range of informational resources and practical how-to guides to support the public sector, businesses and communities in their process of adapting to climate change. <https://www.climateireland.ie/#!/>
- **Department of Environment Climate and Communications (DECC).** The Government of Ireland has published a range of policies and guidance documents, including the National Adaptation Framework Planning for a Climate Resilient Ireland (2018), <https://www.gov.ie/en/policy-information/37d691-adapting-to-climate-breakdown/>. Nine sectoral adaptation plans have been developed for: Agriculture, Forestry and Seafood; Biodiversity; Built and Archaeological Heritage; Transport infrastructure; Electricity and Gas Networks; Communications Networks; Flood Risk Management; Water Quality and Water Services Infrastructure; and Health. To read and download the sectoral plans go to <https://www.gov.ie/en/collection/51df3-sectoral-adaptation-planning/>

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- **Climate Action Regional Offices (CAROs)** were established under the National Adaptation Framework to coordinate local government to deliver climate action at a local and regional level. There are four CARO regions in Ireland. For more information go to <https://www.caro.ie/>
 - **Climate Northern Ireland** is a cross-sectoral network focused on increasing the understanding of climate change impacts and risks within Northern Ireland and promoting the adaptation actions necessary to address these. <https://www.climatenorthernireland.org.uk/>

European and Global resources

- The **Task Force on Climate-related Financial Disclosures (TCFD)** is a market-driven initiative, set up to develop a set of recommendations for voluntary and consistent climate-related financial risk disclosures in mainstream filings. It provides clear recommendations on how to structure disclosures, and has mainstreamed climate risks and opportunities in the financial sector. <https://www.fsb-tcfd.org/>
TCFD has published specific guidance on scenario analysis for developing climate risk strategies, which can be found here. <https://assets.bbhub.io/company/sites/60/2021/03/FINAL-TCFD-Technical-Supplement-O62917.pdf>
- **Climate-ADAPT** is a European Climate Adaptation Platform developed in partnership between the European Commission and the European Environment Agency (EEA). It provides data and information on expected climate change in Europe, current and future vulnerabilities of European regions and sectors, case studies and tools to support adaptation. <https://climate-adapt.eea.europa.eu/>
- **UK Climate Impacts Programme (UKCIP)** provides expertise in climate adaptation and impacts, climate science, and vulnerability analysis, knowledge exchange, training and communication. <https://www.ukcip.org.uk/>
- **World Bank Climate Knowledge Portal (CCKP)** provides global data on historical and future climate vulnerabilities and impacts, including country level information. For more information, and a link to an overview on Ireland go to <https://climateknowledgeportal.worldbank.org/country/ireland>

About SustainabilityWorks

SustainabilityWorks is a mission-driven consultancy working with organisations across the public and private sector to accelerate Ireland's shift towards a sustainable future.

We make sustainability simple. We make it actionable. We make it work.

www.sustainabilityworks.ie

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