Climate Change Risk and Opportunity Assessment

Executive summary

Perth and Kinross Council

June 2023

Introduction

Perth and Kinross Council are fully committed to addressing the climate change emergency and have already made good progress in mitigating by setting ambitious reduction targets and implementing their climate action plan.

However, Scotland's climate is already changing. Over the last century temperatures have increased, sea levels have risen, and rainfall patterns have changed, with increased seasonality and more heavy downpours. Specifically, within Perth and Kinross, there have been increasing incidences of both flash flooding in urban areas and river flooding. This has caused damage to properties and assets as well as causing landslips and scour to bridges. These changes are projected to continue and intensify over the coming decades, and we can expect future changes in climate to be far greater than anything we have seen in the past.

Perth and Kinross and its communities will need to become more resilient to climate change. Climate resilience relates to the ability to anticipate, prepare for, respond and recover from climate induced events. Taking early action to adapt will therefore help increase resilience and reduce risks. There is also strong evidence that investing in adaptation can save money in the long term. To adapt in the best and most efficient manor a good understanding of how climate will change and what risks or opportunities this might bring is paramount.

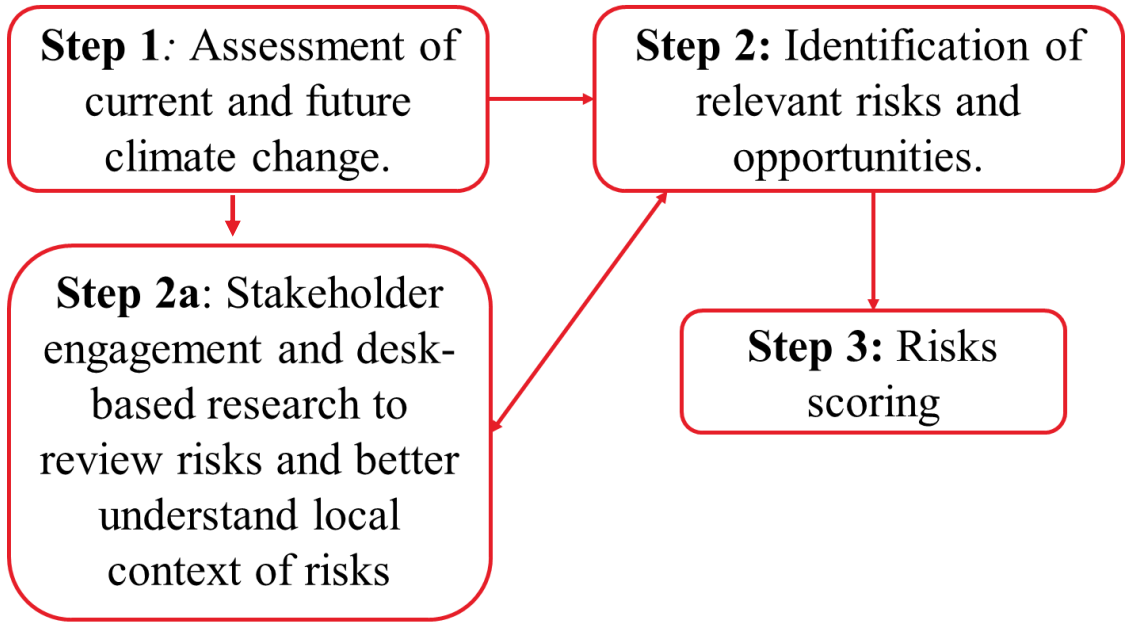
There are also national drivers for understanding climate risk. The Climate Change (Scotland) Act 2009 places a legal duty on public bodies such as Perth & Kinross Council (PKC) to adapt to the impacts of climate change. Statutory climate change reporting requirements also include provision for public bodies to report on how they are contributing to national objectives for climate change adaptation and resilience.

To support their existing Climate Action Plan Perth and Kinross Council commissioned Arup to develop their first Climate Change Risk and Opportunity Assessment (CCROA) and risk and opportunities register. Climate risk assessments identify the likelihood of future climate hazards and their potential impacts for cities and their communities. This information is fundamental for informing the prioritisation of climate action, investment in adaptation and supporting community resilience groups. This executive summary provides a short overview of the key findings of this work.

Approach

To identify and understand the key risks and opportunities that climate change brings to Perth and Kinross 4 steps were taken. Firstly, the Met Office's UKCP18 climate projections and SEPA flood maps were used to fully understand how the climate is changing in Perth and Kinross. Step 2 involved identifying risks and opportunities; this was done using the climate change results from step 1 as well as a literature review and engagement with stakeholders. Finally, in step 3, the risks were scored to help understand the likelihood and impact and to inform future prioritisation of action.

The risks were categorised into 5 different themes. These themes cover 1. Health, communities, and the built environment, 2. Business and Industry, 3. Infrastructure, 4, Nature, and an additional chapter highlighting risks and opportunities that are relevant to Perth and Kinross Council. These risks and the key information found are summarised in a full technical report.



Climate change in Perth & Kinross – current and future

Current

There has been an increase in rainfall over Scotland in the past few decades (with an increasing proportion of rainfall coming from heavy rainfall events). As a result, within Perth and Kinross, there have been increasing incidences of both flash surface water flooding in urban areas and river flooding. These floods have caused significant damage to properties, impacted multiple communities and businesses as well as assets. With serious secondary impacts also occurring such as landslips and increased scour to bridges. The annual average damage of these risks is estimated at around £11.4m (Tay District FRM, covering most of P&K and a small area of adjoining councils).

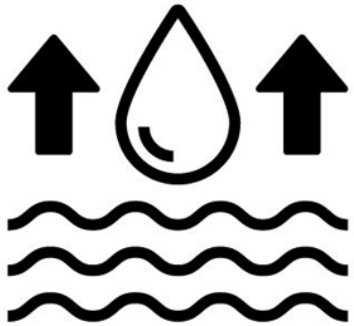
Additionally, there has been a recent increase in temperature. Scotland's 10 warmest years on record have all occurred since 1997. The average temperature in Scotland in the last decade (2010-2019) was 0.69°C warmer than the 1961-1990 average. Heatwaves are becoming more frequent and intense and can cause heat related illness and mortality. Temperature impacts have already been experienced in Perth and Kinross.

Changes to the Perth and Kinross climate are already impacting the region

Intense Rainfall

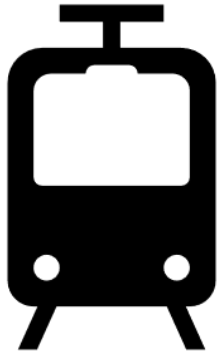
Low Rainfall

High Temperatures

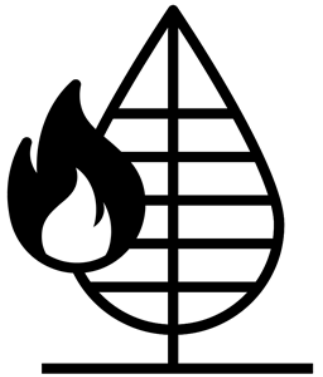


Flooding

Bridge damage



Transport disruption



Wildfires

Climate change in Perth & Kinross – Current and future

Future – precipitation

Precipitation rate anomaly which represents the total precipitation, is projected to vary significantly seasonally for Perth and Kinross. In general, more precipitation is projected to occur during the winter months with less precipitation occurring during the summer months. There are also spatial differences in precipitation rate anomaly projections; the greatest changes in winter rainfall are expected in the south and east parts of the local authority.

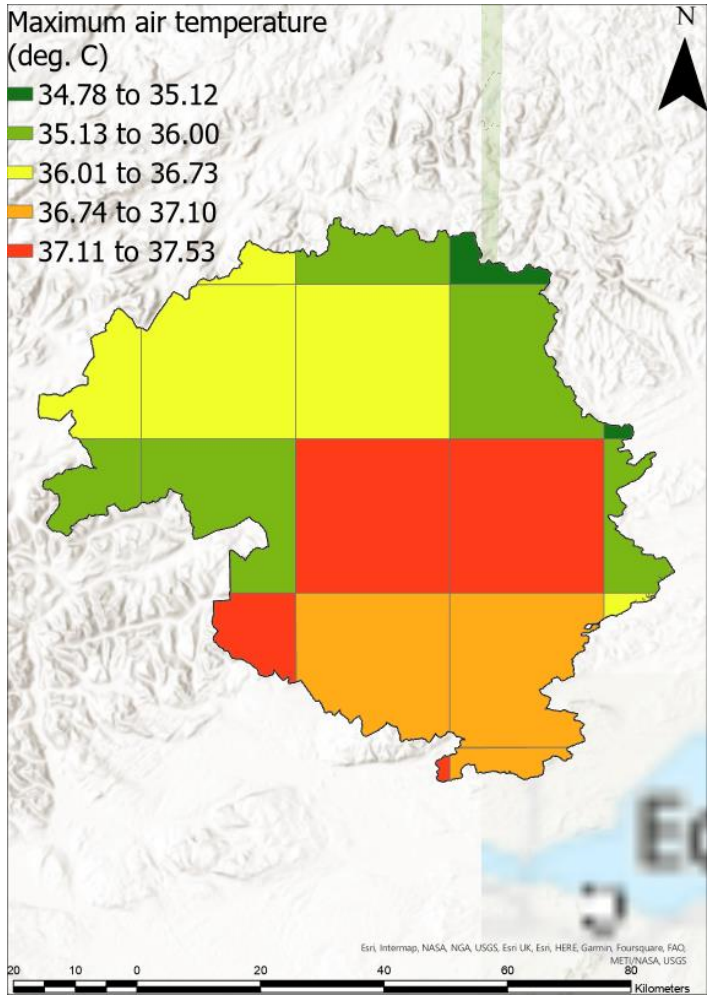
Short-term prolonged intense precipitation is expected to increase in both warming scenarios, although the increase is much lower the low emissions scenario compared to the high emissions scenario. It is still expected that interventions to reduce the risk of flooding will be required under the low emissions scenario, as flooding is already an issue in Perth and Kinross. Increased temperatures leading to drier ground, combined with more intense rainfall, is expected to make surface water flooding more frequent and severe, particularly in urban areas.

Climate change in Perth & Kinross – current and future

Future – temperature

Winter minimum, mean and maximum temperature are projected to increase under all scenarios in Perth and Kinross. The increase in these climate variables is unevenly distributed across the local authority, with the greatest change projected in the east and north.

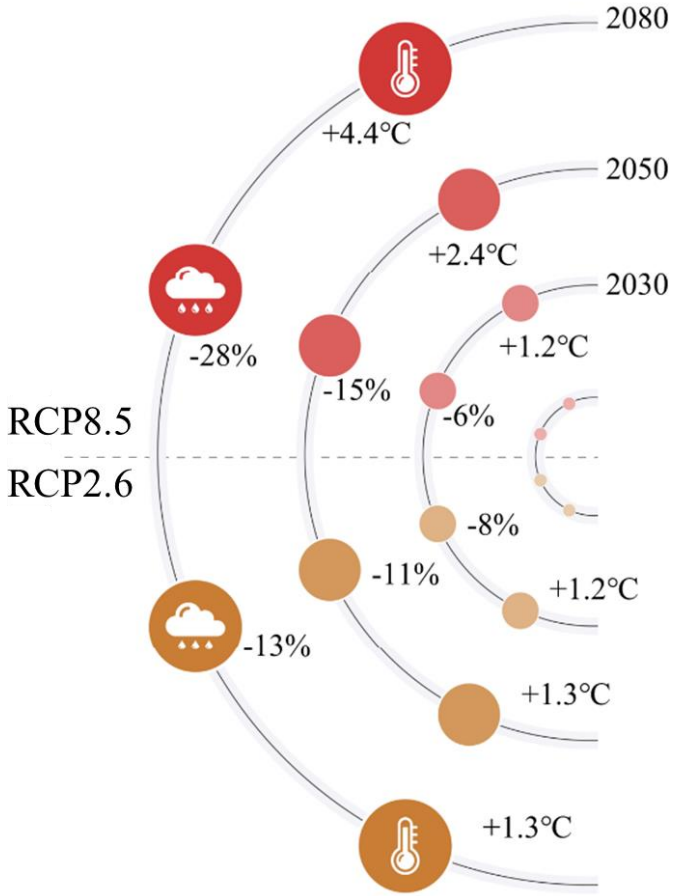
Summer minimum, mean and maximum temperature are projected to increase in both warming scenarios in Perth and Kinross. All three metrics show similar patterns both across the century and when comparing emissions scenarios. The degree of increase varies spatially in the local authority, showing a similar distribution to winter temperatures. Perth and Kinross has a maximum projected temperature of 37.5°C and will also experience heatwaves more frequently.



Map showing projection results for Perth and Kinross at 25km grid cells. This shows the absolute summer maximum projections for 2080 under RCP 8.5

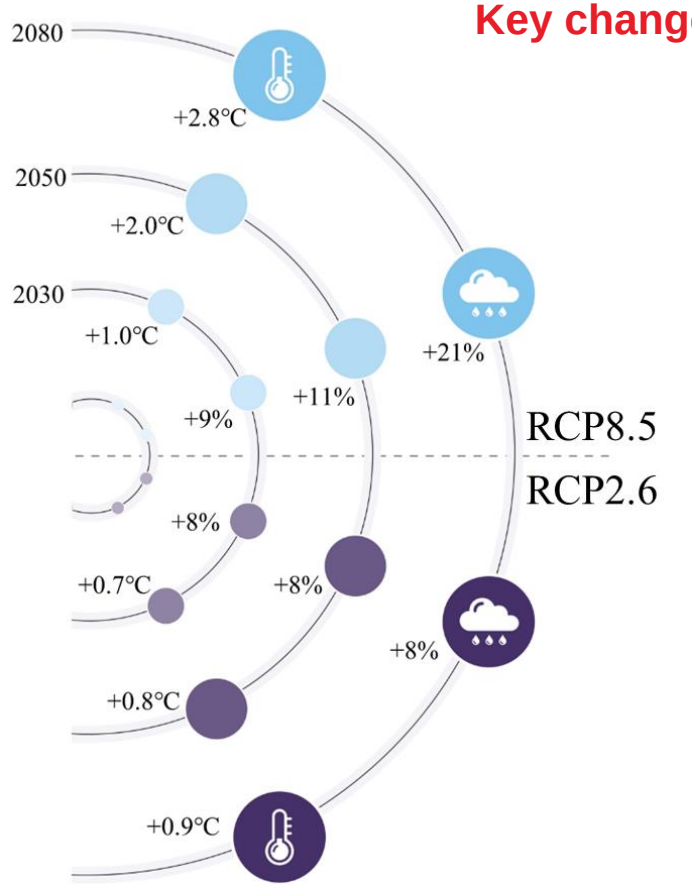
Climate change in Perth & Kinross – current and future

Key changes – summer



Summary of climate change effects for temperature and precipitation, summer.

Key changes – winter

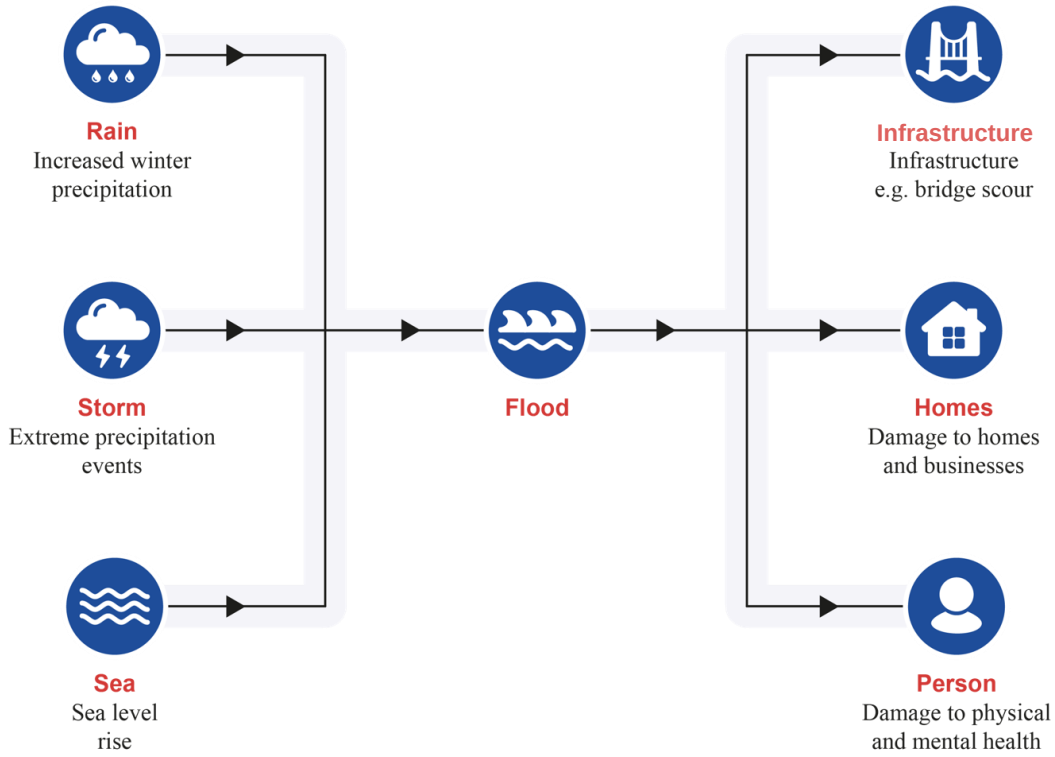


Summary of climate change effects for temperature and precipitation, winter.

Climate change in Perth & Kinross – current and future

Flooding

Flooding already affects Perth and Kinross; current projections suggest the extent and severity of flooding are likely to get worse. Flooding will be affected by changes to precipitation and sea level rise. Increased winter precipitation is likely to increase flooding. Furthermore, although summer precipitation is expected to decrease, high-intensity short-term precipitation events make flash flooding more likely, particularly in periods of higher temperatures where run-off capacity is reduced. The National Flood Risk Assessment states that approximately 9,000 homes and businesses are currently at risk in Perth and Kinross, and this is projected to increase to 13,000 by 2080 due to climate change.



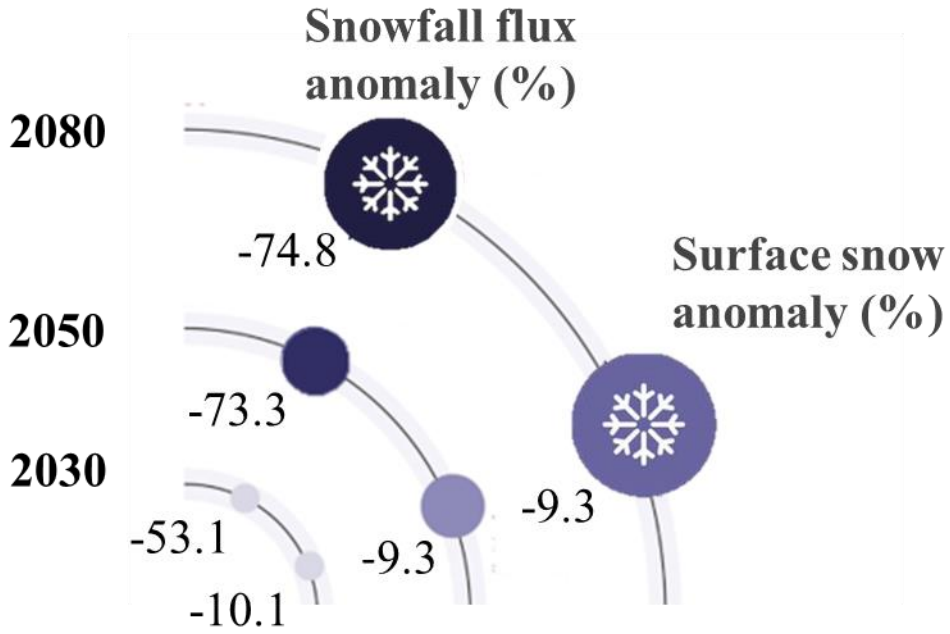
Causes and effects of flooding.

Climate change in Perth & Kinross – current and future

Wind, snowfall, and sea level rise/storm surge

Changes to wind speed for Perth and Kinross vary seasonally. Overall, wind speed is expected to increase slightly in the winter by 0.1ms-1 and decrease slightly in the summer by a maximum of 0.3 ms-1. The greatest change in wind speed is projected in the southern, western, and eastern extents of the local authority.

Baselining snowfall is particularly difficult due to a lack of reliable, consistent observed data. However, snowfall is predicted to decrease progressively through the century across the entire region. The areas of greatest decrease are in the northeast and northwest (upland) regions of Perth and Kinross.

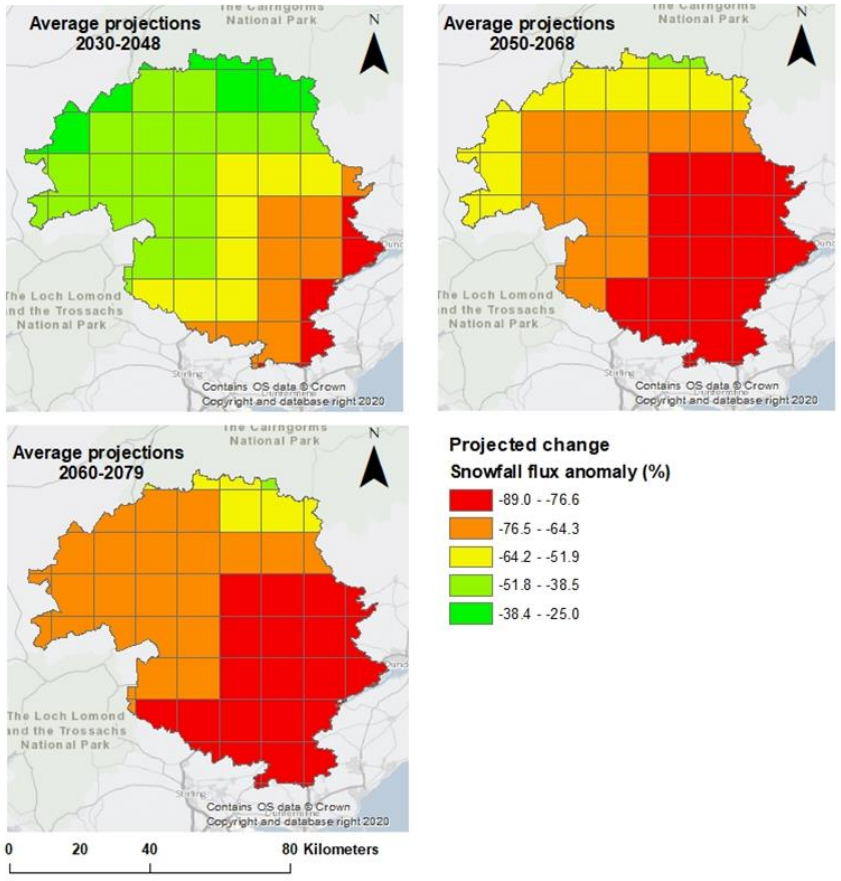


Summary of climate change effects for snowfall flux and surface snow – both show the projected changes at RCP 8.5

Climate change in Perth & Kinross – current and future

Wind, snowfall, and sea level rise/storm surge

There is no consensus on the effect of climate change on storm surge levels. Currently, current storm surge levels are combined with sea level changes. Perth and Kinross does not have open areas of coastline, but sea level rise will affect the Tay Estuary. This will affect tidal areas such as Perth and Invergowrie.



Spatial variation of snowfall flux % change, RCP8.5, in winter.

Climate change in Perth & Kinross – current and future

What are the major increased or additional risks these changes will bring?

The changes to the current and future changes to the climate of Perth and Kinross will have subsequent impacts, some of these will be positive and opportunities arising from Climate change are discussed below. However, many will be negative and bring significant risks to the area.

Overall, 52 risks to Perth and Kinross were identified. The top risks for each sector are presented below. Overall flooding and its impacts are the most pressing climate change threat for Perth and Kinross and affects all sectors. Flooding is happening now and will continue to be a threat through the century as rainfall intensity increases.

Heat is likely to cause impacts for Perth and Kinross mid to late century as summer temperatures increase and heatwaves become more regular and extreme. Heat poses significant health impacts especially to those most vulnerable.

Many of the risks posed to nature are categorised as high impact, nature in Perth and Kinross is diverse and important to both tourism and some of the key industries.

Climate change in Perth &Kinross – current and future

What are the major increased or additional risks these changes will bring?

Sector	Top risks
Risks to Health, communities, and the built environment	Higher temperatures: direct health risks (heat stroke/heat stress), increase in disease prevalence due to higher temperatures, buildings overheating, reduction in air quality. Increased precipitation: flooding impacting people and communities, and an increased occurrence of water damage, condensation, and damp in homes.
Risks to Business and industry	Higher temperatures: possible increase in energy costs due to cooling needed in the reduced productivity for employees during times of high temperature. Precipitation changes: flooding, drought especially for agriculture, possible water scarcity Supply chain risks – global climate impacts causing supply problems Transition Risks- climate will impact transition to net zero.
Risks to Nature	Higher temperatures: Species currently at upper temperature limits (especially in higher areas) may not be able to survive in Perth and Kinross in the future. Reduced snowfall is likely to have large impacts on upland wildlife as well as hydrology within Perth and Kinross. General: Threats to both specific species and habitats from pests, pathogens, and invasive non-native species - which thrive more due to changes in climate.
Risks to Infrastructure	Higher temperatures: cooling demand during high temperatures causing energy requirements to increase, roads melting during times of extreme heat. Increased precipitation: flooding, scour to bridges, landslips all potentially damaging infrastructure directly. Decreased precipitation: private water supplies drying up.

Climate change in Perth &Kinross – current and future

Risks to council assets, operations, and net-zero transition

Risk	Description
Risks to council-maintained community spaces from flooding	Some community spaces which the Council maintain lie within flood zones – this brings potential large financial cost and impact on residents.
Risks to PKC estates from flooding	Potential large financial cost and impact on residents of social housing. Council offices or could also be equipment damage can affect service operation. There are also 5 schools and HMP Perth at risk of flooding.
Risks to road infrastructure from flooding	Some council-maintained roads lie within in flood zones and are at risk of scour which will result in significant cost of repair.
Risks to housing and housing provision from flooding	Financial cost of protecting and repairing flooding-affected housing, with associated physical and mental effects. There are 940 council properties at risk of flooding.
Risks to PKC key supply chains	Difficult to quantify, but potentially significant effects on service provision and operation if supply chains disrupted
Risks to leisure facilities from flooding	Some leisure facilities lie within flood zones – potential large financial cost and impact on residents.

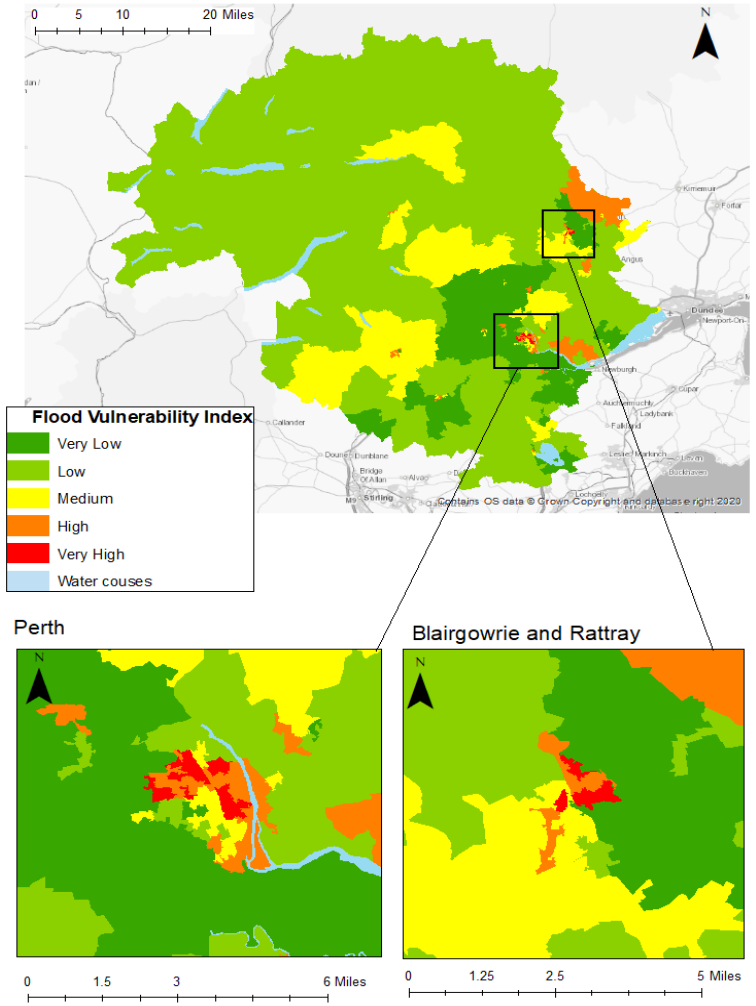
Climate change in Perth &Kinross – current and future

Who is most vulnerable to these risks?

People are not equally impacted by climate change; some individuals are more vulnerable to its effects:

- Older individuals are more vulnerable to heat, due to specific physiological characteristics. Older people would also be more vulnerable if exposed directly to flooding or to the impacts of flooding.
- Young children are also vulnerable to heat, this is mainly due to their lack of ability to understand heat dangers and their reliance on carers.
- Most deprived members of the population are often more vulnerable to climate change due to a lower financial ability to adapt.

As part of this work these data was used to see how these characteristics varies across Perth and Kinross and where vulnerable people were most concentrated.



Flood vulnerability across Perth and Kinross, taken from the Neighbourhood Flood Vulnerability Assessment (Joseph Rowntree Foundation). Vulnerability categories refer to the scores across Perth and Kinross, the top 20% being classed as High risk. These maps are by Data Zone.

Climate change in Perth & Kinross – current and future

What are the potential opportunities?

As well as the risks, opportunities were also identified, where climate change might bring improvements to people's lives, and or create opportunities for economic growth or cost savings. The key opportunities found were:

- Opportunities for improved health and wellbeing from warmer summers and warmer winters.
- Opportunities for lower energy demand – e.g., winter heating both for domestic and non-domestic buildings helping reduce fuel poverty and costs to organisations.
- Longer growing seasons – possibility of new crops and increased agricultural productivity.
- Opportunities for the Perth and Kinross council to lower running costs in some areas – less gritting from warmer winters, less energy demand in buildings during winter, opportunities for more renewable generation.

It should however be noted that risk from climate change far outweigh any opportunities.

Next steps

This climate change risk and opportunity assessment has provided a solid understanding of how the climate in Perth and Kinross is likely to change and what the probable risks will be, and which of these risks would cause the most impact. However, this is only the first step in adapting to climate change and making Perth and Kinross climate resilient. The key next steps for Perth and Kinross Council are:

- Share the results of this work and continue engage with key stakeholders.
- Continue engagement with community councils and community resilience groups to strengthen resilience.
- Using the risks assessment to prioritise actions and build on existing adaptation plans.
- Create a plan structure to regularly review this work to ensure it is up to date and that it considers for new evidence. Ensure this plan is appropriately integrated into current governance structures.