# Sustainable Energy & Climate Action Plan

## Climate Risk and Vulnerability Assessment

**June 2019**

sustainable DUNDEE

# SECAP: Risk and Vulnerability Assessment

This Climate Risk and Vulnerability Assessment (RVA) was conducted as a prerequisite to developing the city's Sustainable Energy and Climate Action Plan (SECAP).

The assessment was conducted across 10 policy sectors:

- Buildings
- Transport
- Energy
- Water
- Waste
- Land Use Planning
- Environment & Biodiversity
- Health
- Civil Protection and Emergency
- Tourism

Small workshops with Dundee City Council officers and key partners, including NHS Tayside, Scottish Water, SEPA, Scottish Natural Heritage, Urban Foresight, Dundee University, Friends of the Earth Tayside and Tayside Reusers identified climate impacts for each of the climate hazards/scenarios for the policy sectors with an estimate of how likely they are to occur, the level of impact and the timeframe for occurrence, short, medium or long term.

Climate resilience actions were then co-designed with stakeholders. Many of the actions identified were already in progress by the various organisations; some new actions were identified during the visioning event and the remaining actions were devised in partnership with the stakeholders during these RVA workshops. Some actions apply to several different impacts.

| Impacted Policy Sector | Expected Impacts | Likelihood of Occurrence (Unlikely, Possible, Likely, Not known) | Expected Impact Level (Low, Moderate, High, Not known) | Timeframe (Current, ST, MT, L, Not known) | Proposed Indicators | Proposed Actions |
|---|---|---|---|---|---|---|
| **Buildings**<br><br>Refers to municipal, residential, tertiary, public/private) structure or group of structures, surrounding spaces, permanently constructed or erected on its site. | 1. Higher cooling demands in the summer months as temperatures rise | Likely | Moderate | LT | Number of buildings retrofitted for adaptive resilience e.g. ventilation<br><br>Average daily air temperature. | Design brief for new council led developments and infrastructure to take into account whole life costing. This will include analysis of maintenance burdens, end of life use, outputs and performance to ensure resilient, efficient buildings are designed with minimal waste.<br><br>Council led development and infrastructure projects must include early collaboration to ensure opportunities for the project to enhance biodiversity, water management and active travel are considered at the pre-design stage. |

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| | 2. Higher costs associated with higher energy demands for cooling, including capital costs, maintenance and running costs | Likely | Moderate | LT | Costs associated with heating and cooling | Scale up solar PV implementation across Dundee for public and private buildings and ensure all civic buildings have renewables where technically feasible.<br><br>Monitor heating costs and cooling costs to assess impact of changing temperatures. |
| | 3. Additional repair and maintenance costs due to greater runoff e.g. water ingress, improving drainage around buildings | Possible | Moderate | LT | Climate related repair and maintenance costs | Create a business case for rainwater capture and reuse capital investment.<br><br>Design brief for new developments and infrastructure to take into account whole life costing. This will include analysis of maintenance burdens, end of life use, outputs and performance to ensure resilient, efficient buildings are designed with minimal waste.<br><br>Council led development and infrastructure projects must include early collaboration to ensure opportunities for the project to enhance biodiversity, water management and active travel are considered at the pre-design stage. |
| | 4. Flood damage to homes, businesses, schools and community | Possible | High | MT | Number of flood events.<br><br>Number of buildings impacted by flood events.<br><br>Number of people affected by flood events.<br><br>Infrastructure impacted by flood events. | Design a Dundee Surface Water Management Plan/Tayside Integrated Catchment Study that considers measures to reduce flood risk and protect buildings from flooding. Including blue-green infrastructure across the city and/or retrofitting SUDS to store and manage surface water runoff. Where possible, ecological solutions to SUDs will be used.<br><br>Design brief for new developments and infrastructure to take into account whole life costing. This will include analysis of maintenance burdens, end of life use, outputs and performance to ensure resilient, efficient buildings are designed with minimal waste.<br><br>Council led development and infrastructure projects will include early collaboration to ensure opportunities for the project to enhance biodiversity, water management and active travel are considered at the pre-design stage. |
| | 5. Storm damage to homes, businesses, cultural heritage sites, schools and community e.g. roofs and structures | Possible | Moderate | ST | Number of public/residential/tertiary buildings damaged by extreme weather conditions/events | Monitor climate related maintenance cost of buildings and structures.<br><br>Design brief for new developments and infrastructure to take into account whole life costing. This will include analysis of maintenance burdens, end of life use, |

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| | | | | | | outputs and performance to ensure resilient, efficient buildings are designed with minimal waste.<br><br>Develop adaptation engagement tools to support community capacity building, including visual and interactive tools, workshops and collaboration with community organisations.<br><br>Work with Resource Efficient Scotland and the Chamber of Commerce to assist local business planning for climate risk management. |
| | 6. Increased insurance costs | Likely | Moderate | MT | Increase in insurance costs | Work with Resource Efficient Scotland and the Chamber of Commerce to assist local business planning for climate risk management. |
| | 7. Climate impacts on business and local economy e.g. material damage, increased cooling costs | Likely | High | ST | Costs associated with climate adaptation | Work with Resource Efficient Scotland and the Chamber of Commerce to assist local business planning for climate risk management. |
| **Transport**<br><br>Includes road, rail, air and water transport networks and related infrastructure. It comprises an extensive range of both public and private assets and services and excludes all related vessels, vehicles (and related parts and processes). | 1. Flooding impact on road network | Likely | High | ST | Speed restrictions | Design a Dundee Surface Water Management Plan/Tayside Integrated Catchment Study that considers measures to reduce flood risk and protect buildings from flooding and includes blue-green infrastructure across the city and/or retrofitting SUDS to store and manage surface water runoff. Where possible, ecological solutions to SUDs will be used. |
| | 2. Flooding (extreme weather) impact on public transport services | Likely | High | ST | Number of days with public service interruptions. | Dundee Surface Water Management Plan/Tayside Integrated Catchment Study will consider measures to reduce flood risk and protect public transport infrastructure from flooding. Including blue-green infrastructure across the city and/or retrofitting SUDS to store and manage surface water runoff. Where possible, ecological solutions to SUDs will be used. |
| | 3. Flooding (extreme weather) impact on sustainable transport e.g. cycling and walking | Likely | High | ST | % increase in blue/green infrastructure.<br><br>Number of flooding events. | Dundee Surface Water Management Plan/Tayside Integrated Catchment Study will consider measures to reduce flood risk and protect public transport infrastructure from flooding. Including blue-green infrastructure across the city and/or retrofitting SUDS to store and manage surface water runoff. Where possible, ecological solutions to SUDs will be used. |
| | 4. Flooding (extreme weather) impact on the rail network | Likely | Moderate | MT | Number of days with public service interruptions. | Dundee Surface Water Management Plan/Tayside Integrated Catchment Study will consider measures to reduce flood risk and protect public transport infrastructure from flooding. Including blue-green |

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| | | | | | | infrastructure across the city and/or retrofitting SUDS to store and manage surface water runoff. Where possible, ecological solutions to SUDs will be used.<br><br>SMART Mobility to include co-ordinated communication of transport information and quicker demand response options. |
| | 5. Higher maintenance costs for transport infrastructure | Likely | Moderate | LT | Costs associated with climate related transport infrastructure maintenance costs | Review transport management plans |
| | 6. Higher temperatures affecting transport use e.g. less walking and cycling, | Possible | Low | LT | % increase in blue/green infrastructure. | Co-design blue/green infrastructure improvements in partnership with community. Aligning with Dundee City Councils green networks supplementary planning guidance; improvements will into account flooding, heat island effect, active travel, biodiversity and including appropriate planting in urban areas, as well as community cohesion opportunities. |
| | 7. High winds impacting Tay Road Bridge and knock on effect of traffic congestion on alternative routes. | Likely | High | ST | Number of wind-related closures per annum | SMART Mobility to include co-ordinated communication of transport information and quicker demand response options.<br><br>Install traffic signalling at Riverside Roundabout to ensure continued flow of traffic |
| | 8. Extreme weather impact on mobility e.g. flooding, high temperatures, high winds | Likely | High | ST | % increase in blue/green infrastructure.<br><br>Average time taken to disseminate transport updates to multiple channels. | Emergency response plans to include transport. (Covered in civil protection)<br><br>SMART Mobility to include co-ordinated communication of transport information and quicker demand response options. |
| | 9. More water on surfaces generally | Likely | High | ST | % increase in blue/green infrastructure | Increase blue/green infrastructure and/or retrofit SUDS to store and manage surface runoff. Where possible, ecological solutions to SUDs will be used.<br><br>Create a business case for rainwater capture and reuse capital investment. |
| | 10. Poor road conditions leading to increased occurrence of cyclist accidents | Possible | Moderate | ST | % increase in weather related incidents. | Planned road and cycle network maintenance programmes.<br><br>Continue to implement and expand the Councils extensive Active Travel programme to reduce the modal share of car based transport. |

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| | | | | | | Develop strategic active travel/green network between Perth, Dundee and Angus to provide safe, segregated cycling/walking as proposed in the TAYplan. |
| | 11. Warmer, sunnier summers bringing greater numbers of visitors to the City increasing pressure on road and public transport infrastructure | Likely | Moderate | ST | % increase in visitor numbers. | Develop an interactive green map for Dundee to help visitors and residents identify sustainable options and information for travel, food, recreation and resource use.<br><br>Create new off road/segregated active travel networks integrated with green networks where possible.<br><br>Develop strategic active travel/green network between Perth, Dundee and Angus to provide safe, segregated cycling/walking as proposed in the TAYplan.<br><br>Develop car parking model to encourage efficient use of space for coaches and cars. |
| **Energy**<br><br>Refers to the energy supply service and related infrastructure. It includes coal, crude oil, natural gas liquids, refinery feedstocks, additives, petroleum products, gases, combustible renewables and waste, electricity and heat. | 1. Damage to electrical/gas infrastructure and power generation facilities by flooding or storms | Likely | High | ST | Number of service interruptions. | Develop a Persons at Risk Register in partnership with the NHS to help identify members of the community vulnerable to interruptions in supply of power, heating, water and other essential services.<br><br>Continuously review and monitor the plans of the Local Resilience Partnership to ensure changing climatic conditions are factored in. |
| | 2. Damage to IT infrastructure by high temperatures/storms resulting in interrupted business continuity and associated economic impacts | Possible | High | ST | Number of service interruptions. | Regular review and updating of the IT Business Continuity Plan to take account of climatic conditions.<br><br>Increase back up capacity of Council servers or move servers and data to an industrial external data centre. |
| | 3. District Heating failure due to extreme weather | Possible | High | MT | Number of service interruptions. | Formalise support in event of District Heating failure. |
| | 4. Increased viability/generation of renewable energy due to changing climatic conditions | Possible | Moderate | LT | % Increase in renewables | Scale up solar PV implementation across Dundee for public and private buildings and ensure all civic buildings have renewables where technically feasible.<br><br>Develop a regional cluster approach to attract investment, support business growth and create jobs in the offshore wind sector; retaining more graduates and make the city a magnet for new talent.<br><br>Research potential for other renewable energy options e.g. heat pump/cooling integrated systems, geothermal. |

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| | | | | | | Consider integration of heat networks with green networks. |
| | 5. Increased cooling energy demand | Likely | Moderate | LT | % Degree days (cooling) | Research potential for other renewable energy options e.g. heat pump/cooling integrated systems, geothermal. |
| **Water**<br><br>Refers to the water supply service and related infrastructure. It also covers water use (e.g. by households, industry, energy production, agriculture etc.) and (waste-, rain-) water management system, that includes sewers, drainage and treatment systems. | 1. Higher temperatures leading to water shortages and higher water demand | Possible | High | LT | Grey water recycling / rainwater harvesting per % of total consumption. | Scottish Water will continue to review and develop their 25 year Water Resource Plan to ensure it can cope with projected drought conditions; including reinforcement of reservoirs and expanding the supply network.<br><br>Develop a Persons at Risk Register in partnership with the NHS to help identify members of the community vulnerable to interruptions in supply of power, heating, water and other essential services.<br><br>Continuously review and monitor the plans of the Local Resilience Partnership to ensure changing climatic conditions are factored in.<br><br>Regularly review and monitor the Waterwatch Protocol to support homes with a private water supply in times of drought.<br><br>Develop an adaptation engagement strategy to support community capacity building, including visual and interactive tools, workshops and collaboration with community organisations.<br><br>Rainwater harvesting/increase water conservation education |
| | 2. Higher treatment costs/emissions/maintenance due to hotter drier weather in summer | Likely | Moderate | MT | Costs associated with climate related maintenance | Increase blue/green infrastructure and/or retrofit SUDS to store and manage surface water runoff. Where possible, ecological solutions to SUDs will be used.<br><br>Enter shared surface water drainage system maintenance agreements with Scottish Water where appropriate.<br><br>Create a business case for rainwater capture and reuse capital investment. |
| | 3. Flooding of sewers due to heavy rainfall and sea level rise | Likely | High | MT | Number of water quality warnings | Improve Dundee's Public Sewer and Mains Water systems to improve drinking water quality and reduce sewage discharge to the water environment; continued communication of water quality information via the |

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| | | | | | | electronic display at Monifieth, SEPA website and Dundee City Council signage and social media. |
| | 4. Flooding/drought causing water quality problems | Likely | High | MT | Number of water quality warnings | Improve Dundee's Public Sewer and Mains Water systems to improve drinking water quality and reduce sewage discharge to the water environment; continued communication of water quality information via the electronic display at Monifieth, SEPA website and Dundee City Council signage and social media. |
| | 5. Damage to infrastructure due to flooding, storm surges and high winds | Likely | High | MT | Average length (in hours) of supply interruptions | Improve Dundee's Public Sewer and Mains Water systems to improve drinking water quality and reduce sewage discharge to the water environment; continued communication of water quality information via the electronic display at Monifieth, SEPA website and Dundee City Council signage and social media. |
| | 6. Threat of cracked pipes and leakages caused by high temperatures and drought | | | | | Improve Dundee's Public Sewer and Mains Water systems to improve drinking water quality and reduce sewage discharge to the water environment; continued communication of water quality information via the electronic display at Monifieth, SEPA website and Dundee City Council signage and social media.<br><br>Scottish Water to monitor pipes for heat damage as part of the Water Resources Plan, adding in mitigation measures as required. |
| | 7. Reduction of recreational bathing water quality | Likely | Moderate | MT | Number of water quality warnings | Improve Dundee's Public Sewer and Mains Water systems to improve drinking water quality and reduce sewage discharge to the water environment; continued communication of water quality information via the electronic display at Monifieth, SEPA website and Dundee City Council signage and social media. |
| | 8. Risks to business operations from water scarcity | Likely | Moderate | LT | Number of days with water scarcity warnings | Work with Resource Efficient Scotland and the Chamber of Commerce to assist local business planning for climate risk management. |
| | 9. Sea level rise risk on waterfront based businesses | Likely | High | MT | % change in sea level | Undertake coastal and Watercourse inspections and organise repairs and maintenance under current legislation and the Tay Estuary and Montrose Basin Local Flood Risk Management Plan. Managed realignment and soft engineering sea defence options will be considered where possible. |
| **Waste** | 1. Energy from Waste Plant inoperable due to storm or water damage | Possible | High | LT | Number of days with waste service interruptions | Regularly review and maintain waste service operational contingencies for extreme weather events. |

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| Includes activities related to the management (including collection, treatment and disposal) of various forms of waste, such as solid or non-solid industrial or household waste, as well as contaminated sites. | means more waste to landfill | | | | | |
| | 2. Site and access disruption e.g. no access to bulking of recycling leading to more vehicles on the road as need to put forward direct deliveries to reprocesses, increased overtime/staff costs | Likely | Moderate | MT | Number of days with waste service interruptions | Regularly review and maintain waste service operational contingencies for extreme weather events |
| | 3. Facilities damaged due to extreme weather, e.g. flooding, storms | Likely | High | ST | Number of days with waste service interruptions | Regular review and remediation of facilities to ensure secure and watertight. |
| | 4. If site access disrupted, residents need to make multiple trips to different sites and may lead to great incidence of fly-tipping and litter, increasing costs for clean- up and reducing environmental quality | Likely | Moderate | MT | Costs of clean-up and litter picking | Improve infrastructure, including more bins, higher frequency of collection, review DRS, educate and inform through Take Pride in Your City.<br><br>Regular review of Deposit Return Schemes (DRS) to monitor impact on litter<br><br>More bins provided and more litter picking.<br><br>Increase water refill points and access information |
| | 5. Increased food waste – more food damaged | Possible | Moderate | LT | | Food Waste Reduction Officers (ZWS) carry out food waste reduction campaign for schools and businesses. |
| | 6. Interrupted collections due to more extreme events impact on road network | Likely | Moderate | MT | % Change in solid waste collected / recycled / disposed of | Plan co-ordinated, prompt and effective communication to inform residents of service disruptions, alternative options available and estimate of when normal services will resume. |
| | 7. Higher incidence of windblown litter or litter caused by more people being out in warmer weather (increased picnics, barbeques) | Likely | Moderate | MT | Costs of clean-up and litter picking | Improve infrastructure, including more bins, higher frequency of collection, review DRS, educate and inform through Take Pride in Your City. |
| | 8. Decrease in garden waste due to less growth in summer due to hotter, drier conditions leading to vehicle inefficiencies | Likely | Moderate | LT | Volume of garden waste collected | Conduct annual participation surveys to elicit volume of garden waste collected per annum |

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| | 9. Increased storm damage to trees, increased branches and plant debris strewn across city requiring collection and disposal/chipping | Likely | Moderate | ST | Volume of storm damaged vegetation collected | Ensure funding available to cope with extra collection and disposal of windblown vegetation. |
| | 10. Leachate | Possible | Moderate | LT | | Regular review of leachate monitoring regime, taking into account changing climatic conditions such as increased flooding. |
| | 11. Construction waste containment failure | Possible | Moderate | LT | Construction waste quantities | Design brief for new developments and infrastructure to take into account whole life costing. This will include analysis of maintenance burdens, end of life use, outputs and performance to ensure resilient, efficient buildings are with minimal waste. |
| **Land Use Planning**<br><br>Processes undertaken by public authorities to identify, evaluate and decide on different options for the use of land, and the subsequent formulation and promulgation of plans or regulations that describe the permitted or acceptable uses. | 1. Increased surface runoff under normal conditions | Likely | High | ST | % change in runoff of rainwater overflows (due to change in soil infiltration) | Increase blue/green infrastructure and or retrofit SUDS to store and manage surface water runoff. Where possible, ecological solutions to SUDs will be used.<br><br>Flood risk and surface water drainage designs for new developments assessed/reviewed during the planning process with presumption against development in flood risk areas and to ensure surface water drainage systems designed appropriately.<br><br>Create a business case for rainwater capture and reuse capital investment. |
| | 2. Heat island effect impact on air quality | Likely | Moderate | MT | % of grey/blue/green areas affected by extreme weather conditions/events (e.g. Heat Island Effect | Co-design blue/green infrastructure improvements in partnership with community. Aligning with Dundee City Councils green networks supplementary planning guidance; improvements will into account flooding, heat island effect, active travel, biodiversity and including appropriate planting in urban areas, as well as community cohesion opportunities.<br><br>The planning process must ensure that air quality is considered at a very early stage in the development process to ensure that any mitigation can be included at the design stage. |
| | 3. Heat Island effect on water quality | Possible | Moderate | MT | % of grey/blue/green areas affected by extreme weather conditions/events (e.g. Heat Island Effect) | Co-design blue/green infrastructure improvements in partnership with community. Aligning with Dundee City Councils green networks supplementary planning guidance; improvements will into account flooding, heat |

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| | | | | | | island effect, active travel, biodiversity and including appropriate planting in urban areas, as well as community cohesion opportunities. |
| | 4. Coastal Flooding | Likely | High | MT | % of coastline designated for managed realignment | Undertake coastal and Watercourse inspections and organise repairs and maintenance under current legislation and the Tay Estuary and Montrose basin Local Flood Risk Management Plan.<br><br>Latest available climate data used when assessing land for new developments. |
| | 5. Surface Flooding | Likely | High | MT | % change in green & blue infrastructure/areas (surface) | Tay Estuary and Montrose Basin Local Flood Risk Management Plan to be updated in line with flood risk management legislation and Dundee Surface Water Management Plan to be prepared and subsequently updated to reflect Dundee's changing climate.<br><br>Review the Councils Risk Register and include climate-related risks where appropriate. |
| | | | | | | Increase blue/green infrastructure and/or retrofit SUDS to store and manage surface water runoff. Where possible, ecological solutions to SUDs will be used.<br><br>Create a business case for rainwater capture and reuse capital investment.<br><br>Develop adaptation engagement tools to support community capacity building, including visual and interactive tools, workshops and collaboration with community organisations. |
| | 6. Long term positive impact on reduced freeze thaw cycle, therefore less road maintenance and less salt use. | Possible | Moderate | LT | % change in salt use and road maintenance due to freezing conditions | Monitor freeze-thaw related road maintenance requirements. |
| **Agriculture and Forestry**<br><br>Includes land classified or designated for agriculture & forestry use, as well as organisations and industries linked to creation and production within and surrounding the boundaries of the municipality. | e.g. crop yield, degradation, livestock production degradation, forest health and productivity degradation<br><br>Not Applicable – no commercial forestry or agriculture in the city. Any forestry operations fall under Environment and Biodiversity. | n/a | n/a | n/a | n/a | n/a |

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| **Environment and Biodiversity**<br><br>Environment refers to green and blue landscapes, air quality, including urban hinterland; biodiversity refers to the variety of life in a specific region, measurable as the variety within species, between species, and the variety of ecosystems. | 1. Altered flora and fauna due to changes in water and air temperature, increased drought, storm and flood events. | Likely | High | MT | Number of actions implemented from the Biodiversity Duty Plan | Prepare a Biodiversity Plan that includes actions for safeguarding and enhancing existing habitats and species as well as actions on potential sites and projects. The plan should be integrated across sectors and the broader green network and adopted corporate-wide to ensure biodiversity protection and enhancement are prioritised in all relevant projects and developments.<br><br>Contribute to the enhancement and maintenance of the Tay river and coastal habitats in order to ensure resilience. Identify opportunities for soft coastal management /managed realignment habitat creation.<br><br>Work with local natural heritage groups to increase areas of 'wild' habitats, to include biodiversity recording and monitoring schemes and changes to green space maintenance regimes to reduce intensive methods and machine use in parks and green spaces where possible.<br><br>Develop an interactive green map for Dundee to help visitors and residents identify sustainable options and information for travel, food, recreation and resource use.<br><br>Increase blue/green infrastructure and/or retrofit SUDS to store and manage surface runoff. Where possible, ecological solutions to SUDs will be used. |
| | 2. Loss of trees due to increased occurrence of high winds and increasing diseases. | Likely | High | MT | Number of climate appropriate trees planted. | Identify suitable areas for tree planting with climate appropriate species and with consideration of how planting interacts with surroundings e.g. air quality, active transport, biodiversity etc.<br><br>Monitor and review the Urban Tree Policy to include consideration of place making. |
| | 3. Coastal flooding and sea storm surges | Likely | High | MT | % Sea level rise. | Contribute to the enhancement and maintenance of the Tay river and coastal habitats. Identify opportunities for soft coastal management /managed realignment<br><br>Maintain the Beach Award for Broughty Ferry beach.<br><br>Undertake coastal and Watercourse inspections and organise repairs and maintenance under current legislation and the Tay Estuary and Montrose Basin Local Flood Risk Management Plan. |
| **Health**<br><br>Refers to the geographical distribution of dominance of | 1. Increase in illness due to hygiene issues as a consequence of water shortages. | Likely | High | ST | Number of illnesses related to personal and food hygiene related to water shortage events. | Early intervention to prevent/reduce the impact of outbreaks and environmental hazards. Disseminate lessons learned and adjust systems to prevent spread of infection. |

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| pathologies, information indicating effect on well-being of humans linked directly/indirectly to the quality of the environment. It also includes the health care service and related infrastructure. | | | | | | Public health information campaigns to address increase in sun/heat/air and water quality related illnesses. |
| | 2. Increase in water borne illnesses as contaminants entering the system due to flooding events. | Likely | High | ST | Number of water quality related illnesses. | Increase blue/green infrastructure and/or retrofit SUDS to store and manage surface water runoff to reduce flood risk/water accumulation on roads.<br><br>Activate Scottish Water Borne Hazard Plan (Scottish Water)<br><br>Public health information campaigns to address increase in sun/heat/air and water quality related illnesses. |
| | 3. Increase in heat related illness e.g. Lyme Disease, and food poisoning (due to production, storage and preservation issues in higher temperatures and storm events) | Likely | High | ST | Number of climate related illnesses. | Public health information campaigns to address increase in sun/heat/air and water quality related illnesses. |
| | 4. Increased storms leading to higher injury risk e.g. falling branches, roof tiles, debris | Likely | High | ST | Number of A&E attendances related to people injured due to extreme weather events. | Continuous review and update of emergency response plans. |
| | 5. Increased demands on NHS services from all climate related health impacts | Likely | High | ST | Number of calls/bed days. | Regular testing and review of Winter Plan to prioritise services |
| | 6. Access to fresh food/food shortages/food supply interruptions | Likely | High | ST | Number of community growing projects.<br><br>Cost of essential food items. | Work with Greenspace Scotland to develop a Local Food Growing Strategy and expand the number of innovative growing projects and support them with skills training, materials, access to funding opportunities and capacity building.<br><br>Develop adaptation engagement tools to support community capacity building, including visual and interactive tools, workshops and collaboration with community organisations.<br><br>Develop a growing hub at Camperdown that provides social enterprise opportunities. |

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| | 7. Decline in mental health and well-being especially due to life circumstance disruption (flood events etc.), isolation | Likely | Moderate | MT | Mental health illness referrals. | Work with NHS Tayside and Scottish Natural Heritage to develop a Green health partnership, linking health care and greenspace initiatives |
| | 8. Increased sun exposure related illness such as sunburn/stroke and skin cancer | Likely | High | ST | Heat/sun related health care contacts. | Public health information campaign including early warning systems – e.g.readyscotland.org<br><br>Public health information campaigns to address increase in sun/heat/air and water quality related illnesses.<br><br>Develop adaptation engagement tools to support community capacity building, including visual and interactive tools, workshops and collaboration with community organisations. |
| | 9. Increased incidence of air quality illness (indoor and outdoor) | Possible | Moderate | MT | Illness related to poor air quality. | Work with NHS Tayside and Scottish Natural Heritage to develop a Green Health Partnership, linking health care and greenspace initiatives<br><br>Implement 'Cleaner Air for Scotland - The Road to a Healthier Future' strategy and monitor guidance for developers to ensure air quality is taken into account for new developments.<br><br>Improve sustainable transport options. |
| | 10. Increase in atopic disease due to longer pollen seasons | Possible | Moderate | LT | Increase in reported atopic diseases. | Public health information campaigns to address increase in sun/heat/air and water quality related illnesses. |
| **Civil Protection & Emergency**<br><br>Refers to the operation of the civil protection and emergency services by or on behalf of public authorities and includes local disaster risk reduction and management (i.e. capacity building, coordination, equipment, emergency planning etc.). | 1. Increased flooding/storm/extreme weather risk to human health and safety | Likely | High | LT | Number of climate related emergencies that require a response. | Develop a Persons at Risk Register in partnership with the NHS to help identify members of the community vulnerable to interruptions in supply of power, heating, water and other essential services.<br><br>Continuously review and monitor the plans of the Local Resilience Partnership to ensure changing climatic conditions are factored in.<br><br>Review and update High Impact Weather plans/food supply plans<br><br>Continue to update Flood Emergency Plan.<br><br>Increase blue/green |

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| | | | | | | Infrastructure and/or retrofit SUDS to store and manage surface water runoff.<br><br>Develop adaptation engagement tools to support community capacity building, including visual and interactive tools, workshops and collaboration with community organisations. |
| | 2. Increased risk of coastal flooding | Possible | High | LT | Number of climate related emergencies that require a response. | Continue to update Flood Emergency Plan.<br><br>Increase blue/green infrastructure and/or retrofit SUDS to store and manage surface water runoff. |
| | 3. Increased insurance costs | Possible | Low | LT | Increase in climate related insurance costs. | Monitor insurance costs to identify any climate related increases and adjust budgets accordingly. |
| | 4. Loss of services e.g. water, power | Likely | High | LT | Duration without service/utility. | Develop a Persons at Risk Register in partnership with the NHS to help identify members of the community vulnerable to interruptions in supply of power, heating, water and other essential services.<br><br>Continuously review and monitor the plans of the Local Resilience Partnership to ensure changing climatic conditions are factored in.<br><br>Review and update High Impact Weather plans/food supply plans |
| **Tourism**<br><br>Refers to the activities of person travelling to and staying in places outside their usual environment for not more than 1 year for leisure, business and other purposes not related to the exercise of an activity remunerated from within the place visited. | 1. Extreme weather impacting tourist activities due to closure of buildings related to tourism such as museums | Likely | Moderate | MT | % change of tourist activities. | Develop an interactive green map for Dundee to help visitors and residents make sustainable choices for food, travel, recreation and resource use.<br><br>Develop a communication plan to keep visitors informed of disruptions and alternative options available via the Association of Scottish Visitor Attractions and Dundee Cultural Agencies Network.<br><br>SMART Mobility to include co-ordinated communication of transport information and quicker demand response options. |
| | 2. Climate impacts on tourist related businesses such as hotels & hospitality, retail and attractions including weather proofing, transport disruptions, disruption to suppliers, higher | Likely | Moderate | MT | Number of weather related attraction closures. | Update the Green Tourism accreditation to incorporate climate adaptation to ensure businesses are climate ready.<br><br>Work with the Dundee Tourism Action group to help business prepare for climate change.<br><br>Support local community growing hubs and local food businesses. |

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| | maintenance and cooling costs. | | | | | Issue design guidelines for buildings and new builds to incorporate climate adaptation measures e.g. rooftop gardens. |
| | 3. Higher water demand due to drier summers and increased population | Likely | Moderate | MT | % water use increase. | Strategic water refill points installed and promoted. |
| | 4. Higher costs for maintenance and repair due to higher rainfall, extreme heat and storms | Likely | Moderate | MT | Increased maintenance costs for tourism related industry. | Enter shared surface water drainage system and maintenance agreements with Scottish Water where appropriate. |
| | 5. Sea level rise risk on waterfront tourist venues e.g. V&A | Likely | Moderate | MT | % change in sea level. | Maintenance of coastal flood defences (raised sea wall) designed for protection of the waterfront. |
| | 6. Loss of beach cover | Likely | High | MT | % beach cover change | Replenish and recreate dunes as part of the Dundee Coastal Flood Protection Scheme. |
| | 7. Reduction of bathing water quality | Possible | Moderate | MT | Number of water quality warnings. | Improve Dundee's Public Sewer and Mains Water systems to improve drinking water quality and reduce sewage discharge to the water environment; continued communication of water quality information via the electronic display at Monifieth, SEPA website and Dundee City Council signage and social media. |
| | 8. Tourist sector opportunities from increased numbers of visitors due to warmer, sunnier climate. | Likely | Moderate | ST | Visitor numbers.<br><br>Number of Green Tourism Award holders in Dundee. | Update the Green Tourism accreditation to incorporate climate adaptation to ensure businesses are climate ready.<br><br>Work with the Dundee Tourism Action group to help business prepare for climate change. |