

Aberdeen City Council

Local Climate Impacts Profile

2014-2019

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1.0 Introduction

The objective of a Local Climate Impacts Profile (LCLIP) is to understand how the Council's assets and operations are affected by severe weather. By carrying out an LCLIP, Aberdeen City Council (the Council) can build understanding the impact of previous severe weather events and inform how response could be improved in the future.

The Council conducted a first <u>LCLIP</u> in 2013, to determine the impacts of severe weather events on the various functions of the council between 2008 and 2013.

The study found that the north east of Scotland was affected by 59 severe weather events in the five-year period. For the Council, some events incurred up to £200,000 of related costs and 9,000 staff hours spent responding to them. 80% of the reported severe weather events affecting Aberdeen were frost, ice, snow; followed by storm, wind; and excessive rainfall and flooding. The main impacts of this report were damage to infrastructure; changes in the use of facilities and services; and damage to buildings and subsidence.

This evidence helped to inform the development of Council actions to meet Public Bodies Duties requirements under the Climate Change (Scotland) Act 2009. In particular, work to adapt to climate change. The following recommendations came from the 2013 study:

- i) better information sharing
- ii) increased data collection
- iii) creation of an Aberdeen Climate Adaptation Plan.

Since 2013 the Council has:

 Assessed strategic climate risks affecting the Council. produced Climate Risk Guidance and climate change is included in the Council's Corporate Risk Register.

- Aberdeen Adapts: Climate Adaptation Framework was approved in 2019. This aims to set the approach for long term local partnership working on climate change adaptation.
- Governance has been established for work on emission reduction and climate adaptation, covering Council assets and operations

About this LCLIP

Since the initial LCLIP, Aberdeen has been affected by a number of severe weather events. This subsequent report, details how severe weather affected the Council between 2014 and 2019.

During this period, Aberdeen was affected by 62 further severe weather events. Identifying and understanding the council's vulnerability to these weatherrelated events and capturing information on the consequences and response will help to further inform appropriate climate adaptation measures and manage current and future climate risks.

Purpose of this LCLIP

- Determine whether any changes in severe weather patterns occurred during 2014-2019, such as a shift in either the type, frequency, or magnitude of weather events.
- Explore if the recommendations from the previous LCLIP were put in practice; or if similar concerns or issues have become more apparent.
- Explore whether any follow-up discussions or policies from the previous LCLIP resulted in an increase in resilience or vulnerability to weather events.

2.0 What is a Local Climate Impacts Profile (LCLIP)?

While individual past weather events cannot specifically be linked to climate change, improving understanding of how the Council managed the impacts from severe weather will help us prepare for future events.

An LCLIP is a study of the impact of severe weather events during a set period. It looks at how services were affected by such weather events.

2.1 Why carry out an LCLIP?

The climate is increasingly changing, with evidence of increased severe weather events being recorded globally. These events can cause significant impacts through economic disruption, damage to local infrastructure, agricultural production losses, and the potential for loss of human life.

Duties under the Climate Change (Scotland) Act 2009 require the Council to:

- contribute to the delivery of Scotland's carbon emissions reduction targets;
- contribute to climate change adaptation; and
- act sustainably.

This report is relevant to the duty to adapt. Adaptation is defined as making adjustments in response to actual or expected climate events and their impacts. Broadly speaking adaptation covers 2 aspects:

- adapting to current weather/ climate.
- making changes based on future projected changes in climate.

The LCLIP gives an indication of how the Council is prepared for and managing current weather events. By understanding the current situation, we aim to better inform the development of a Council Energy and Climate Plan; and prepare our assets and operations for future changes in climate.

An Intergovernmental Panel on Climate Change (IPCC) 2018¹ report indicates that it is still possible to limit global temperature rise to 2 degrees Celsius by 2100, through immediate actions to reduce emissions. However, even a 2 degree temperature rise is predicted to result in changes to the global climate including droughts, floods and heat waves and these risk will need to be managed.

Information under UK Climate Projections (UKCP18)² indicates that the north east of Scotland will likely experience an increase in mean daily minimum and maximum temperatures, as well as an increase in autumn and winter rainfall intensity; a decrease in spring and summer rainfall; and a reduction in snow, ice and frost events, although the potential for a significant snow fall event will remain. Information on future climate projections for Aberdeen and strategic climate risks affecting the city is summarised in an Evidence Base document which supports, Aberdeen Adapts. The severity and frequency of weather events will increase in future years.

The Council's purpose is aligned to the Local Outcome Improvement Plan (LOIP) vision of "A place where all people can prosper" and relates to the LOIP theme of a prosperous place, to protect the people and place from harm. Specifically, information in this report is relevant to stretch outcome 14, addressing climate change.

¹ Intergovernmental Panel on Climate Change <u>https://www.ipcc.ch/sr15/</u>

² UKCP18 Derived Projections of Future Climate over the UK, Met Office.

3.0 Methodology

The LCLIP tool was developed to assist local authorities and organisations assess their exposure and vulnerability to severe weather events as a step towards preparing for future climate risk.

This study, led by the Environmental Policy Team, with information collated by Johannes Schamp, a student of the University of Aberdeen, working on an MSc in Environmental Partnership Management. It was carried out using the toolkit provided by the UK Climate Impacts Programme (UKCIP).

Severe weather events are defined by the United Nations and World Health Organisation as something that causes 'a serious disruption of the functioning of a community or society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources.'

For the purpose of this LCLIP, a severe weather event is defined as an event

which causes a financial or resource cost to the Council. If the event becomes newsworthy and is published online or in printed media it will be considered a severe weather event, since it may have impacted the council's reputation.

A media review was carried out to identify occurrences, impact, consequences and responses to severe weather events that affected Aberdeen (2014 - 2019). The information collated was categorised and collated in a spreadsheet format, from the UKCIP toolkit. Using the spreadsheet, the researcher identified key functions within the council affected by severe weather events. Interviews were conducted with representatives from the most affected services to gather further information on the impact and consequences of severe weather on the Council.

Qualitative and quantitative data from the media review and interviews was used to produce the LCLIP.

4.0 Summary of key weather events affecting Aberdeen

There were 62 separate reported articles on severe weather events in Aberdeen 2014 - 2019. Where incidents were so severe as to have multiple reports, they were only counted as a separate incident if the impacts were different.

Information was compared and contrasted against the frequency of weather events recorded in the last LCLIP 2008-2013, *Figure 1*. This showed an increase in days of stormy and hotter weather, including a spell of hot, dry weather in the summer of 2018.

Similarly, there was an increase in the number rainfall and flooding events. The impact of Storm Desmond and Storm Frank in December 2015 and January 2016 respectively, saw record water levels on the River Dee and the Don and significant flooding in the region.

A reduction in days of frost, ice and snow was noted from the previous period, with the exception of the "Beast from the East" extreme snow event, which occurred in 2018. A small increase in impacts was noted from storms and lightning.

A comparison of weather-related impacts between the two periods is outlined in *Figure 2*. While a reduction in "damage to buildings and infrastructure" and "changes to services" was indicated from the previous report, there was a significant increase in "disruption to process". Staff indicated there can be a range of contributing factors causing damage to buildings and infrastructure, such as age, condition and maintenance factors. As such impacts are not specifically attributed to weather.

New impacts indicated in this period include "fires", "reduced water supply" and impacts from "heat".



Figure 1: compares the days of weather events in Aberdeen during 2008-2013, against weather events during 2014-2019.



4.1 Excessive rainfall, flooding

Key impacts: damage to homes and businesses, damage to infrastructure, power outages, transport disruptions, surface water flooding, damage to vegetation, litter and debris, people evacuated from homes.

Significant flood events were Storm Desmond in December 2015 and Storm Frank in January 2016. Both resulted in extensive flooding, with the Rivers Dee and Don experiencing record water levels. During Storm Frank there was 24 hours of heavy rain, with more than 100mm of precipitation on already saturated catchments. Record water levels were seen on the River Dee (estimated to be the highest level over the 87 year period of records) and the River Don (highest level over the 45 year record period).

Communities along the rivers experienced extensive damage, as did the harbour, roads, bridges, and several parks and greenspaces. The effects of the storm were significant outside the city, with rural communities experiencing flooding and power disruptions.

In Aberdeen, residents of Riverside Drive and Bridge of Dee Court sheltered housing complex, as well as care homes in the Persley area were evacuated. A number of city businesses along the Dee were affected by flooding.

A multi-agency emergency response was required by Emergency Planning partners. Storm Frank required extensive repair and follow up investment in flood defences.

4.2 Snow, ice and frost

Key impacts: school closures, school transport disruptions, road closures, air, rail and bus travel disruptions, power outages, demands on staff to grit and clear snow on pavements.

There was a decrease in the number of snow, ice, and frost weather events in the past 5 years, compared to the 2014 media review. However, this period did include one significant snowfall event, 'The Beast from the East' snowstorm early in 2018, which had impacts across the UK.

In Aberdeen, the storm had an amber warning from the Met Office and resulted in closed schools, transport disruptions including cancelled flights, buses and trains; as well as closed or hazardous roads, traffic accidents and several power outages.

4.3 Storms, high winds

Key impacts: public safety, damage to buildings, travel disruptions, power disruptions, event cancellations.

Storms and high winds can affect coastal conditions, this period included fatalities at the coast in summer 2016, during stormy sea conditions and high winds. Recorded incidents during 2014-19 included road closures and damage to a house due to fallen trees. There was a temporary closure of the Beach Esplanade in August 2014 during recorded wind speeds of 50mph. Further temporary closures of retail premises due to high winds and stormy conditions occurred in March 2018. Travel disruptions were recorded including flights cancelled due to strong winds in January 2015, with gusts of up to 60mph. Power disruptions were also noted.

Cancellation of major city events was necessary to ensure public safety, including Aberdeen's Firework Display in 2016 and In Town without my Car Day event in 2018. There was also a temporary closure of the Christmas Village in 2016 and 2017.

4.4 High temperature, heatwave

Key impacts: water scarcity, wildfire, increase in outdoor activity, damage to vegetation.

There was also a notable increase in heat related events. However, this was primarily centred around the summer of 2018, which saw high temperatures and reduced rainfall.

Water levels in the Dee were notably low during summer 2018; further north in northern Aberdeenshire and Moray Scottish Water urged businesses and residents to use water wisely. Contingency arrangements were put in place for private water supplies.

In Aberdeen, during the hot dry conditions there were wildfires which required

emergency response and which damaged vegetation. Fire services were called out 38 times and spent over 80 hours in response to fires at Kincorth Hill in September 2018. While the fires were not a direct result of the weather, the dry conditions meant any fire took hold quickly.

4.5 Lightning

Key impacts: power outages

There were 2 reports of lightning strikes: one in 2015 and another in 2017, which resulted in investigations into a power outage.





5.0 Impacts on the Council

The interviews asked about the significance of weather impacts on team workload, financial cost, service delivery and reputation (*Figure 3*). The majority of responses indicated a high impact.

Figure 3: Significance of weather events



Perception on the frequency of severe weather varied between teams depending on their work area, roles and responsibilities, with 73% indicating an increase or no change in the effects of severe weather events (*Figure 4*). Those indicating a perceived decrease in severe weather, were teams usually affected by frost, ice and snow.

Figure 4: Perception of severe weather frequency



The responses were broken down by category on team workload, financial cost, service delivery and reputation (*Figure 5*).

Figure 5: Breakdown of impacts across teams



5.1 Summary of key issues and lessons learned

	Issue	Lessons learned
Workload	 Response to severe weather can have a significant impact on workload. Operational staff responding to severe weather events, such as flooding and storms maintained their capacity to respond. However, there was a knock-on impact to planned work programmes and in maintaining the overall quality and effectiveness of services, especially following severe events such as Storm Frank. A longer growing season was noted which increased workload. Storms caused increased workload for arboricultural staff. Heavy rainfall and flooding caused an increase in workload for roads and environmental services teams. Roads and infrastructure were affected by hot and cold temperatures, damaging surfaces. Apart from the Beast from the East there was a notable reduction in snowfall this period. However, temperatures were still low requiring surface gritting by roads, environmental services and facilities. 	 The use of accurate weather forecast data is informing day to day decision making and has helped to provide an earlier response which can limit damage. Severe weather had a high impact on workload. In some teams resources were focused on responding to complaints. Financial pressures, reductions in staffing, workload demand and additional costs were stated as areas that could reduce team capacity to respond to future severe weather incidents.
Cost	 Costs were experienced for cancelled events including Aberdeen Fireworks event in 2016 and In Town without my Car Day 2018, as well as temporary closure to the Christmas Market because of high winds. Cost impacts from additional staff hours for roads operations and waste and recycling collections during the "Beast from the East". Staff costs to respond to flood risk affecting roads and infrastructure during Storm Frank. Costs to repair damage to roads, infrastructure and buildings, as a result of flooding and storms. Increase in insurance claims. 	 Investment in flood protection schemes helped to limit flood risk in the city when Storm Frank occurred. Changes to weather patterns may require the different equipment (grass cutting) or specifications (roads and buildings) in the medium to long term. There is a need to learn more to inform decisions.

Service delivery	 Changes in weather patterns were observed by staff, specifically less snow, ice and frost; and spells of hotter, drier weather. While these conditions presented new challenges to service delivery, they were managed during 2014-19. Understanding on the implications of climate change on operations and assets varied between teams. Delays to work programmes and cancelled council events were highlighted. A reactive rather than proactive response in responding to weather events was noted by several teams. Extreme rainfall caused park and facility closures in July 2015, as well as traffic light failures. Disruptions to waste collections. Heat is already having a greater impact on teams, with predicted increase in temperature - this could impact service delivery in the future. 	•	There was evidence that lessons learned from previous severe weather events had helped to improve planning and response. Teams considered communication had improved on cross cluster response. There was evidence that some teams had put in place changes as a result of previous weather conditions, including policy, procedure and specifications. Measures to adapt to climate change, including the introduction of flood schemes and the consideration of different road materials resilient to future climate are being developed. In general, teams were able to respond to weather events, or operate under the effects of a weather event, even if at a limited capacity.
Reputation	 With the exception of Storm Frank, weather events have been within the council's capacity to respond effectively. Few of the teams stated that their core strategic goals were seriously affected. Public safety remains a priority. There was a number of school closures due to severe weather, but numbers were not as significant as in neighbouring authorities. Street bins caused damage to cars in extreme winds resulting in insurance claims. Waste and recycling collection delays and disruptions during heavy snowfall resulted in complaints. There were complaints about the condition of grass following heatwave in 2018. 	•	Teams worked with communications and this helped to provide updates and issue timely warnings through the Council's communication channels ahead of and during severe weather events. Response benefited from contribution from communities offering support with contingency arrangements. Such as, offers of assistance at evacuation centres during Storm Frank; and participating in the clean up of city parks following flooding.

Data	• There is a lack of available data on	• There has been an increase in
	weather impacts. Costs from increased	the use of smart technology
	overtime, maintenance and damage to	such as, real time sensors and
	buildings was generally not categorised	cameras, as well as improved
	under weather. This makes it difficult	flood models. The Council is
	to fully understand the implications of	also part of the EU Score
	weather on council budgets, workload,	project using data to improve
	service delivery and reputation.	flood protection.

5.2 Breakdown of Impacts

5.2.1 Flooding and Coastal Management

The Flooding and Coastal Management team is responsible for flood risk management, maintaining flood schemes and working with emergency services in response to severe flooding.

Impacts

The team has had to respond to a number of significant flooding events during this period. Learning from a 2012 flood event had informed flood planning, as a result, the team were better prepared for the impacts of Storm Desmond and Frank in the winter of 2015/16.

Response

Significant flood risk management work has been led by the team in the past 5 North East Flood vears. Α Risk Management Plan was developed through partnership working and was approved in 2016. This has mapped city areas potentially vulnerable to flood and identified a significant risk of future flooding. The team has established links with Scottish Environmental Protection Agency (SEPA) and Scottish Water to help develop flood solutions.

In addition, measures were put in place following Storm Frank to reduce the impact of future events. These include:

- Installation of flood schemes including a storm bypass at Leggart Terrace, flood prevention work at Watson Street and Cornhill areas, as well as measures installed in Peterculter.
- Construction of a flood detention pond at Stronsay Park, suitable to handle a 1 in 200-year flood.
- A green infrastructure, flood alleviation, project at Maidencraig as part of the EU BEGIN project.
- Collaborative project with Scottish Water to prevent city centre sewer flooding.

- Wetlands creation in Seaton park.
- Creation of a grant scheme of £1,500 (per applicant) to buy flood protection equipment, such as flood doors. Over 60 residents have taken advantage of the scheme at the time of writing.
- There has been an increase in the use of smart technology such as, real time sensors and cameras, as well as improved flood models. The Council is also part of the EU Score project using data to improve flood protection. Putting sensors in gives more accurate information on water levels at points in the city.
- Aberdeen North Beach Coastal Defence Study

5.2.2 Roads Operations

Responsible for the maintenance, construction, and operation of roads within Aberdeen.

Impacts

- Over 200 extra staff hours are directly associated with responding to weather events.
- Costs of £60 million in staff wages, materials, and contractor bills and a knock-on short-term effect of decreased service delivery.
- Severe weather events can divert staff resources to respond to road closures and road and infrastructure repairs.
- Staff had noticed an increase in severe weather events, particularly in the frequency of thunderstorms, heavy rain and flooding. Extreme rainfall events and flooding can cause transport disruptions and damage to road surfaces and infrastructure.
- There has been a notable increase in localised flooding.
- Blocked gullies have been an issue, there is knock on impact when

vegetation is washed into gullies and blocks them. Increased response to flood events has also had an impact on business as usual regimes, such as gully cleaning.

- Snowfall events tend to create shortterm damage, although they have workload and cost implications for gritting and winter maintenance on 560 miles of road and more than 1,200km of pavement. Roads have also acquired an additional 180 hectares of road.
- Further impacts also include pothole repair. Marginal conditions, around 0°C with patchy developing frost can make maintenance tricky, since it is difficult to know when and where to intervene with salt.
- Apart from the prolonged snowfall event in 2018, there has been a notable reduction in snow, ice and frost this period. However, temperatures still dropped below zero and surfaces required gritting. With increased rainfall, salt is being washed away so the team have to go out more frequently. The same quantity of salt is still being used. As a result, no savings on winter maintenance have been achieved through changes to temperature in this period.
- Road temperatures can get very hot on a sunny day. The hotter a road gets, the more likely the chance that there will be some warping or damage to surfaces, although just occasional damage from heat was noted in this period.
- A smaller team size has meant there is less time for preventative measures, with resources primarily reactive responding to issues such as flooding or complaints.

Response

- Upgrading and installation of some drainage systems, changes to road gradients and flood prevention measures installed. Roads staff work closely with the Flooding team. Around 600 sandbags were issued by Roads Operations during flooding in July 2015.
- Work with Scottish Water to improve sewer drainage.
- SEPA warnings enable preparations to be put in place, although there has been more yellow warning there has been opportunity to prepare for these. Experience from past events guides decision making and response.
- The team closely monitor 36 areas and address if water levels start to rise
- Weather forecasts are closely monitored throughout the day and night. Gritters and ploughs can be out 24/7. Stockpile of 12,000 tonnes of salt and approval of a budget for winter and emergencies.
- А Winter Maintenance Plan is produced each year. There are 8 dedicated road gritters with snow plough attachment, 14 demountable road gritters with pavement attachments, 21 pavement gritters with snow plough attachments. 120 staff over winter to do cover maintenance.
- The Council spend on winter maintenance 2017/18 in was £2.33million, £606,000 over the initial budget due to difficult conditions, including response to the Beast from the East extreme snowfall event. There was an increase of £375,000 on salt supplies in comparison to the previous year.
- Large community salt bins are available at locations in the city and there are also around 900 grit bins for residents to use.

 There has been a reduction in snow, ice and frost in this period however temperatures have still dropped below zero and surfaces have still needed gritting.

5.2.3 Events

Responsible for organising 16 public events throughout the year and facilitating the organisation of other city events by private firms. The events range from parades, fireworks, fun runs, and festivals.

Impacts

- Severe weather has a significant impact for the team. Events have a safety threshold and extreme wind, snow, or rain, can result in the event being cancelled. In the last 5 years, 2 council events were cancelled, along with others that were run by external partners; such as the Christmas Market.
- Extreme wind often has the largest impact, with many event infrastructures like gazebos, inflatable entertainments, portacabins having wind ratings beyond which they are unsafe to use.
- The financial costs of a cancelled or reduced event can be significant as payment for contractors, infrastructure and goods still has to be made. Event cancellation insurance is available but is often too costly to be feasible.
- There are significant reputational impacts to the council if events are cancelled.
- A reduction in attendance levels.

Responses

• All events have contingency plans in place for potential scenarios such as high wind, heat and flooding.

- Health and safety guidance for conditions and various event infrastructure is adhered to.
- Weather conditions are assessed, and appropriate mitigation measures put in place.
- Events are rarely completely cancelled but aspects can be changed, removed, or extra provisions are made. For example, if hotter weather is forecast there is increased provision of water, as well as recommendations for items such as hats and sunscreen.
- Wind guidelines are provided for event infrastructure.
- Decisions are dictated by industry practice and service experience.
- The team has made extra provisions to increase event weather resilience, such as the use portacabins over gazebos since they have a higher wind threshold of 50-60 mph, compared to 15-18 mph. These provisions often come at an increased cost but decrease the likelihood of a cancelled or reduced event.

5.2.4 Council Housing

The team maintain council housing stock, this includes, ensuring the energy standards are met by installing insulation; changing and maintaining heating systems; and controlling energy supply.

Impacts

- Temperature fluctuations in Aberdeen's climate make it difficult to maintain a comfortable internal climate in tenements.
- In this period it was noticed that some building materials, such as window seals, appeared to have shorter lifespans than in previous years.
- Impacts from temperature fluctuations caused more expansion and contraction of the product, reducing its lifespan.

- Less snow, ice and frost during winter were noted.
- Frozen and burst pipes can be a huge issue during severe cold spells such as the Beast from the East.
- Weather events can impact work such as surveys of social housing.
- There can be indirect impacts with some past project requiring longer construction periods.

Responses

- Remediating weather damage to housing stock.
- The team decide if it is safe to work in weather conditions.

5.2.5 Facilities Management

Responsible for managing the council's main office buildings, as well as running the janitorial and catering staff for schools in the city.

Impacts

- Weather can increase workload for facilities. Schools and buildings may need temporary closures and school events such as concerts, and parents' nights may be cancelled if facilities are unable to respond to severe weather events quickly enough.
- Heavy snow events require gritting at school premises for a safe access route. Snowfall clearance is difficult to achieve before a school opening. If this is not completed there can be temporary school closures. However, there has only been a few instances of severe or sustained snowfall in the last 5 years.
- Extreme rainfall events may require sandbags at certain premises.
- Heavy rainfall has affected one school, Fernielea School, which due to its location in a natural bowl is particularly vulnerable to heavy rainfall and flooding.

 Indication of heat events becoming a greater concern, especially with ensuring comfortable working temperatures for employees. Catering staff can be affected in kitchen temperatures during heat waves, such as the summer.

Responses

- Weather forecasts are monitored and serious weather events are planned for.
- Winter events are planned for in terms of available grit, salt and equipment.
- Servicing of snowploughs before winter to ensure they are operational.
- Gritting of roads and surfaces, as well as snow shovelling and ploughing around schools during snow events ensuring that they are safe for pupils.
- During heavy rainfall sandbags are used to reduce flooding, blocking doorways and entrances.
- At Fernielea School, flood doors have been installed at the entrance to the kitchens to minimise flood impacts.
- Facilities have a rolling program to upgrade school kitchens to help maintain lower temperatures, at the rate of completing one new kitchen a year.

5.2.6 Asset Management

Responsible for maintaining council buildings and involved in the construction of new buildings and building upgrades. This includes schools, waste processing sites and council offices.

Impacts

- Staff had observed an increase in the frequency of severe weather events, especially heat events.
- The team only tend to be affected if weather events are severe enough to cause damage to buildings.

- There is no reporting system or available data for any impacts or repairs on assets from weather events, making it difficult to determine damage and associated costs.
- Public and staff, health and safety, is a priority therefore, repairs are always done promptly to ensure people are not put in danger.

Responses

- There has been a few cases of retrofit in buildings in response to high temperatures. Such as, solar film being applied to windows at Bucksburn Library to help reduce solar heat gain.
- Use of the Aberdeen City Council, Building Performance Policy in new ACC building. The Policy Checklist includes a climate risk assessment to mitigate against severe weather and consideration of building orientation for weather exposure.
- National Building Standards are followed. Many newer buildings tend to have a greater consideration of solar capture.

5.2.7 Environmental Services

Responsible for the maintenance of parks and green spaces, grass cutting, street cleaning, waste removal, Countryside Rangers Service, and community partnership and volunteering.

Impacts

 Weather has a high impact on workload. City parks suffered from significant impacts due to Storm Desmond and Frank, with extensive cleaning and resilience work required when flood water had subsided. Walls were washed away in Duthie Park due to unsuitable materials, Seaton Park was submerged by flood water and paths were eroded at locations across the city. The financial cost for increased workload, repair, clean-up and new equipment was high.

- Response to storms resulted in delays to non-emergency work, such as path repairs.
- Changes in temperature have markedly extended the length of the growing season and this has increased the workload for grass cutting and greenspace maintenance.
- This increased workload had an impact on work capacity and service delivery, with some work needing to be postponed. It also resulted in higher costs.
- Park access can be cancelled, and the Countryside Rangers may cancel events if weather becomes hazardous.
- There was an increase in complaints about brown grass and other vegetation, during the dry summer of 2018.
- Fires also became a problem during 2018, with more than 2 weeks of daily callouts to fires on Kincorth Hill.

Responses

- Operational staff have extensive experience in responding to weather impacts and are well-trained and knowledgeable.
- Response to weather events, prioritises public health and safety, ie dealing with damaged trees that could fall. Issues that do not pose immediate hazards are postponed.
- After every event there is also an assessment to determine how future responses could be improved; if there is any extra training required, if there is a missing type of equipment or if existing equipment needs to be upgraded.
- Warmer summers and heat waves have created concern over staff health and safety. New policies on sunscreen

and water consumption have become more necessary.

- Operational staff may assist the flooding team and emergency services in a severe weather event. Communication is improving between teams.
- Grass cutting has been reduced in many areas and suspended entirely in others due to staff resources and longer growing seasons. Complaints and negative press have occurred.
- Staff and resource cuts have resulted in a change in the work capacity. Work is now primarily based on complaint response, as opposed to pre-planned schedules.

5.2.8 Arboricultural

Responsible for tree planting projects; maintenance of Aberdeen's trees; and removal of fallen or damaged trees.

Impacts

- Operations are primarily affected by extreme wind events, particularly in summer when trees have foliage and therefore are more vulnerable to wind gusts. Older, mature trees tend to be more vulnerable to windy conditions.
- A marked increase in the frequency in the number of moderate wind events was indicated. Gusts of over 40mph caused downed trees, crew callouts and increased costs in staff hours to clear roads and trees damaging buildings.
- There are safety risk factors when working in windy weather.
- Every incident requires a minimum of a 4-hour callout along with more office hours later to organise insurance claims. Larger events with sustained high winds and extreme wind gusts especially can have a serious impact on service delivery, with a big event

creating months or more of backlogged work.

- Trees were considered to look "thin" in 2019, following the heat and dry spell in the summer of 2018. There is a possibility that tree health could be affected in the long term after such an event however, it is too early to determine if there have been any further impacts. These conditions weakening trees and making them more susceptible to wind damage.
- Water stress and increased • temperatures have allowed tree diseases to proliferate in the UK, with a northward movement of pests and disease noted. So far this has not affected city tree populations enough to have an impact on service delivery. An increase in pest and disease is projected through climate change and this would add to workload for tree and woodland management, as well as create a new trigger for downed trees or branches.

Responses

- The planting of almost 210,000 trees in 2010-12 under 'A Tree for Every Citizen', will help to sequester carbon and absorb rainfall as the trees mature.
- Planting of approximately 1,000 street trees and 10,000 woodland trees during 2014-19.
- The Council is aiming to improve tree risk assessment, moving to the Quantified Tree Risk Method. This applies risk management principles, quantifying values to help assessors balance the risk of harm from tree failures with their benefits to make informed decisions.

5.2.9 Waste Management

Responsible for the collection, processing, and disposal of waste in Aberdeen. This also includes responsibility of Aberdeen's recycling program.

Impacts

- When severe weather causes any collection cancellations this often needs to be compensated for through overtime work and extra hours for vehicles on other collection days, which has an impact on budgets.
- Snow and ice are the biggest disruption to collections. Routes may not be completed or collections cancelled entirely due to snow or ice. Collections may be delayed until gritters have gone out.
- Ice can cause slip hazards for staff. The 'Beast from the East' was the most significant snow event serious enough to affect waste collections 2014-19.
- While wind can disrupt collections, more often it will cause problems with communal bins. These can blow into cars if not secured and cause damage, resulting in insurance claims.
- Transport disruptions can also affect waste processing with waste and recycling sometimes being trapped at a depot due to weather and causing back-ups.
- Collection delays and disruptions can affect the council's reputation.
- Heat has had a minimal impact, so far. Increased sunscreen, water and caps have been provided for staff safety.

Responses

- Use of weather forecast data to support decision making. Staff are aware of what action to take based on the weather forecast.
- A co-ordinator is on the ground at 7 am to decide if weather conditions are safe for the crew to operate in.

- Work taking place to transition to the use of concrete blocks to secure communal bins. These are seen to be more effective in windy conditions at a lower cost.
- Increased availability of grit at depots to help vehicle movement in snow and ice.
- Missed waste collections are categorised by cause (i.e. staff shortage, extreme wind or snow) into a database.
- Risk assessments take place to make sure the crews are properly protected.
- Opportunities to increase data sharing with roads operations have been discussed. This is to access a system so staff are aware which roads have been gritted, are safe to drive.

5.2.10 Emergency planning

Responsible for co-ordinating responses to significant incidents; and supports emergency response to a wide range of incidents, including severe weather.

The team works with all category 1 emergency response units including: Police Scotland, Scottish Fire and Rescue Service, Scottish Environment Protection Agency, the Coast Guard, and NHS.

Impacts

- Staff attended Local Resilience Partnership meetings and activated response from other teams which helped to limit the impacts for the city.
- Public goodwill and contribution during the clean-up process also mitigated the impact of this event.
- Storm Frank resulted in significant flooding and infrastructure damage in Aberdeenshire.
- Severe weather events can qualify for relief funding from the Scottish Government.

 Reactive to severe weather events. Focused on maintaining safety and protecting the environment, liaising with other infrastructure issues, supporting emergency services and members of the public.

Responses

- Continuously improve policies and planning. There has been a review of the inter-agency emergency response plan and a review of all response policies to heat and flooding.
- Response to events will change depending on the event type, but there are internal policies in place that govern actions.
- Storm Frank had a significant impact on staff workload with teams from across the Council contributing to emergency response:
- Roads and Infrastructure staff deployed sandbags, managed road closures and maintained road and bridge infrastructure.
- Housing and Social Care managed evacuation and support for people at risk from flooding.
- Communications team helped to keep people informed
- Education and facilities staff were involved in the setup of a potential rest centre.
- Environmental Services staff remediated areas affected by flooding and dealt with debris washed up as a result of the floods.

5.2.11 Corporate insurance team

Responsible for corporate insurance policies for both Aberdeen City Council and Aberdeenshire Council, including cover for procurement, assets, and handling claims.

Impacts

- Severe weather events have a high impact for the insurance team. As a small team, increased claims from weather events place demands on workload. Severe weather events can create a backlog of claims that result in pay out delays.
- The insurance industry is aware of the impacts of climate change and the companies are keen to work with the public sector to address the challenges.
- Insurance companies will investigate adaptation measures that have been put in place to reduce the chance of heavy impact from weather events.
- There has not been a noticeable increase in frequency of weather events requiring claims but there has been a change in types. There was an increase in the number of insurance claims from the "Beast from the East" snow event. Some heat insurance claims have been made due to damaged road surfaces.
- There were no claims over 2014-19 for subsidence. There is a high excess for subsidence and insurers will expect organisations to be active on this.

Responses

- The team depend on other services to make the necessary changes to infrastructure, procedures etc, that will reduce the risk of claims from severe weather events in future.
- The team rely on other services to get information to them as soon as possible, so claims can be processed. To improve this, there has been increased liaison and the Insurance team has been added to the distribution list for initial emergency information.
- A system with an online form for claims was developed which has

increased efficiency and improved customer service.

- The team works closely with other council teams. Any loss of contacts and experience in those teams can affect the efficient processing of claims.
- Efforts to ensure lower insurance premiums is helping to drive infrastructure investment in areas such as roads, this is helping to avoid increases in policy premiums.

6.0 Conclusion

The LCLIP has identified the consequences of severe weather events for the Council. It helps to build a snapshot of impacts and response; and collates information from across teams to build a wider picture of weather impacts across Council assets and services, where these are known.

It should be noted, climate indicates a long term trend and this study is focused on the current exposure to weather. However, a trend of more intense rainfall, hotter temperatures, drier summers and warmer winters is indicated by climate projections, with the severity and frequency of events around these increasing in future years. Because of this, information from an LCLIP can help inform planning on future changes to climate.

Following recommendations in the initial LCLIP (2008-2013) the Council has implemented a range of actions around climate adaptation. Current and future climate risks were considered in climate risk assessment, included in the Corporate Risk Register.

The North East Flood Risk Management Plan was approved in 2016 and Aberdeen Adapts; a Climate Adaptation Framework was approved in 2019. A Council Energy and Climate Routemap, covering emission reduction and climate resilience for Council assets and operations was approved in May 2020 and governance put in place to support this work. A range of measures were put in place including flood schemes and strengthened emergency planning policy.

Actions to adapt to weather impacts and the ability to demonstrate understanding of weather and climate risks is expected to be increasingly required by insurers and investors; and environmental considerations are relevant to Moody's annual credit rating.

In the period covered by this LCLIP study, a number of significant severe weather events took place. Ongoing review of policy, procedure, alongside the use of scenario planning enabled collaborative informed and emergency planning. response and recovery. In addition, the introduction of equipment, such as, sensors and cameras, has increased understanding of risk and vulnerability, enabling earlier action. The use of forecast data was also indicated by some teams, with more accurate weather forecasting supporting short term decision making on appropriate action.

Findings highlighted information sharing between teams, including between waste

and roads teams, was helping to improve response in severe weather events. However, the level of information sharing on weather response varied between teams across the Council.

Overall, while the Council was prepared for and managed most severe weather conditions; a knock on impact on costs, workload, reputation and delays to business as usual services was highlighted Difficulties during interviews. in documenting and attributing costs, staff hours, damage or the information on the disruptions to severe weather was indicated across teams. Climate projections indicate an increase in the frequency and severity of severe weather events and monitoring for change, as well as improved recording of data could identify any emerging trends and inform effective targeting of resources.

Information gathered in this LCLIP will be taken into account in the development of the Council Energy and Climate Plan which will cover emission reduction and adaptation for Council assets and operations.

Appendix 1 - Media Review

Source	Headline	Date	Weather type	Summary of story/news
BBC News	Fallen trees block roads.	11/08/2014	Storm	After a period of heavy rain and strong winds, including the aftermath of Storm Bertha, a number of trees fell onto Aberdeen roads.
Evening Express	Aberdeen's Beach Esplanade closed due to high winds	11/08/2014	High wind	Aberdeen's Beach Esplanade was closed temporarily because of high winds.
Evening Express	Aberdeen road closed because of fallen tree	13/08/2014	High wind	Countesswells Road was closed in both directions due to a fallen tree.
Press and Journal	Aberdeen woman's lucky escape as tree blows onto Mastrick house	11/09/2014	Wind gusts	A womanhad a lucky escape after a 25-foot tree fell on to her house in Mastrick.
Press and Journal	Aberdeen trains cancelled after severe weather warning.	08/01/2015	Wind and heavy rain	Train services from Aberdeen to Inverness were cancelled.
Evening Express	18 Aberdeen flights cancelled due to strong winds	12/01/2015	Winds with gust of up to 60 miles per hour	Travel disruptions due to cancelled flights from Aberdeen to Shetland. 10 inbound flights also cancelled. Yellow warning from Met Office for strong winds.
Evening Express	Freezing temperatures cause havoc for morning commuters	19/01/2015	Frost/ice/snow	Freezing conditions and drifting snow. Temperatures dropped as low as -10.5C (14F) in parts of the North-east during the night.
Press and Journal	Aberdeen roads hit by flash flooding as torrential rain, thunder and lightning return	07/07/2015	Excessive rainfall/flooding	Torrential rain led to severe flooding in parts of Aberdeen.
BBC News	Torrential rain causes flooding in Aberdeen	07/07/2015	Excessive rainfall/flooding	Downpour, accompanied by thunder. Many streets were left under deep water.
Evening Express	Flooding causes chaos across Aberdeen	07/07/2015	Excessive rainfall/flooding	Summer storm - torrential rain, thunder, lightning and severe flooding. Warnings for motorists. Council delivered sandbags.
Daily Record	Aberdeen floods cause traffic chaos as submerdged Granite City Street grind to a halt	7/07/2015	Excessive rainfall/flooding	Met Office yellow weather warning. SEPA flood warnings for the city. Flooding to a number of city roads. Traffic lights failed. In some areas the force of water lifted manhole covers.
Northsound 2	Over 600 sandbags handed out during Aberdeen floods	8/07/2015	Excessive rainfall/flooding	Over 600 sandbags were handed out to residents and business owners the previous day during major flooding in Aberdeen. The Council also set up a pick up point at Tullos Depot for people who needed sandbags.
Evening Express	Busy Aberdeen road out of action for weeks after storm	23/06/2016	Excessive rainfall/flooding	A road linking the A96 to Inverness road and the airport to Kingswells was closed for 3 weeks for repair, after storm damage.
Evening Express	Fallen trees close north-east roads	09/12/2015	High wind	South Deeside Road was shut in both directions due to a fallen tree.
Evening Express	Fallen tree blocks north-east road	22/12/2015	High wind	A tree fell on the A947 Aberdeen to Turriff road.

Evening Express	1,700 north east homes without power as Atlantic Storm passes	30/12/2015	Excessive rainfall/flooding	Storm Frank. Extreme winds resulted in extensive power outages across Aberdeen and further afield. Aberdeen International Airport recorded wind speed of 61mph. SEPA flood alert. Fallen trees.
Press and Journal	Storm Frank impacts Aberdeen and Aberdeenshire	30/12/2015	Excessive rainfall/flooding	Storm Frank. A day of total chaos in the north east of Scotland
Evening Express	40 OAP's rescued from Aberdeen homes due to Storm Frank	31/12/2015	Excessive rainfall/flooding	Storm Frank: 40 people rescued from a sheltered housing complex after the River Dee bursts its banks. Firefighters and Coastguard teams entered the building to evacuate residents.
Evening Express	Aberdeen Christmas village closes temporarily due to weather	03/01/2016	Excessive rainfall/flooding	Heavy rain and high winds result in the closing of the Christmas Market.
Evening Express	Aberdeen roads shut as River Dee close to bursting banks	04/01/2016	Excessive rainfall/flooding	Storm Frank. Riverside Drive, Milltimber Brae, Inchgarth Road in Aberdeen have been closed in anticipation of the River Dee bursting its banks
The Guardian	Heavy rain swells Aberdeen's river Don to highest levels on record	08/01/2016	Excessive rainfall/flooding	Storm Frank: Extreme rainfall resulted in damage to part of the airport runway, flights cancelled. Road closures, trains south of Aberdeen cancelled, school closures, residents were warned that Don might break its banks. River Don reached 5.5 metres at Parkhill, Aberdeen.
Evening Express	Flooding wreaks havoc at Aberdeen gym and for local businesses along the Dee	11/01/2016	Excessive rainfall/flooding	Flooding causes significant damage to the Garthdee area, with impacts for a number of local businesses. All 10 of the 5 a side pitches at Goals were underwater.
Evening Express	North-east schools closed due to flood damage and power problems	11/01/2016	Excessive rainfall/flooding	In Aberdeen, Kirkhill School remaineds closed, teachers were due to meet council staff to agree an appropriate course of action for the future.
Evening Express	Roads update: North-east roads blocked due to fallen trees.	29/01/2016	Excessive rainfall/flooding	Engineers and police were called to deal with two fallen trees on a north-east road caused by high winds.
Evening Express	Flood-hit Aberdeen park to create special wetlands area	18/02/2016	Excessive rainfall/flooding	A section of an Aberdeen park that is prone to flooding is to be transformed into a special wetland attraction.
Evening Express	Sandbags issued to Aberdeen homeowners	15/06/2016	Excessive rainfall/flooding	Council issued sandbags to residents in Peterculter. Indication the Culter Burn would burst it's banks due to persistent rain.
Press and Journal	Mother and Son killed as fierce winds and high waves hit UK coasts	21/08/2016	Wind	Treacherous sea conditions and high winds.
ACC News	Aberdeen fireworks cancelled because of high winds	05/11/2016	High wind	Major fireworks cancelled as a result of high winds. The event usually attracts 12,000 spectators. Could not be rescheduled to another date because of cost and time to organise.
BBC News	Power Cut engineers probe lightning link	05/02/2017	Lightning	Homes in the Kingswells, Hazlehead, Airyhall and Pitfodels areas of Aberdeen lost electricity.
Press and Journal	Six inches of snow and 75mph winds: Storm Doris expected to	23/02/2017	High Wind	Winds of up to 75mph battered parts of the northern Highlands yesterday will be followed by heavy snowfall in many areas today, according to forecasters.

	arrive in the north			
Evening Express	Aberdeen set to be hottest in Scotland as temperature tipped to hit 24C	17/07/2017	High temperature/ heatwave	Aberdeen was the hottest city in the Scotland, preceded by a very warm weekend.
Evening Express	Heavy rain causes flash floods on Aberdeen roads	20/07/2017	Excessive rainfall/flooding	A sudden large outburst of rain hit the city in the morning and caused rapid street flooding on Wellington Road. Westburn Road flooded and a stretch of Anderson Drive.
Scotsman	Storm Ophelia: Aberdeen shrouded in darkness before 3pm	16/10/2017	Storm	Effects of Storm Ophelia brought a mixture of dust from the sahara desert and from wildfires in Portuugal and Spain causing yellow/ orange skies.
Evening Express	Council's 1.7 million budget ensures it has the right stuff to deal with the city's white stuff this winter	11/11/2017	Frost/ice/snow	Launch of the city Winter Maintenance Plan.
Sky News	Schools shut as snow affects North Yorkshire and Aberdeen	30/11/17	Frost/ice/snow	Snow and ice hit parts of the UK, forcing dozens of schools to shut and causing disruption for drivers.
Guardian	Storm Caroline forces the cancellation of all trains in Scottish Highlands	06/12/2017	Storm	Scotrail suspended services from Aberdeen to Inverness.
Evening Express	More schools affected as winter weather hits North-east.	08/12/2017	Frost/ice/snow	A number of schools were shut across the north-east due to snow and ice
Evening Express	Snow and ice in Aberdeenshire force schools to change or cancel transport.	13/12/2017	Frost/ice/snow	Ice and snow continued to affect roads across the region, a number of schools were forced to cancel or change some of their normal transport arrangements.
Evening Express	Aberdeen roads hit by flash flooding - heavy rain and winds hit the city.	30/01/2018	Excessive rainfall/flooding	Localised flooding in parts of Aberdeen. Baillieswells Road and Kingswells to Bucksburn Road (surface water). Wind speeds 50mph at airport. 11.8mm of rain recorded in Aberdeen, 5 times more than usual according to SEPA data.
Evening Express	Beast from the East: More than 150 schools shut, 27,000 properties lose power and flights cancelled.	28/02/2018	Frost/ice/snow	4 city schools shut, several delayed opeining due to adverse weather conditions or lack of power in the building. Power outages reported in Springhill, Old Aberdeen and Berryden - loss of electricity in 27,000 homes. Traffic lights withour power. Power issue solved within 1 hour of the first report.
Evening Express	Christmas village shut due to Storm Caroline	28/02/2018	Storm	Christmas Village, Broad Street shut for the day to protect public safety during high winds.
Evening Express	Four Aberdeen schools to shut early due to bad weather.	01/03/2018	Storm	Beast from the East. A number of Aberdeen schools shut early due to the forecast of bad weather. Several more had delayed openings. 27,000 homes in

				the city left without power for an hour due to power outages. Transport accidents.
Evening Express	Schools remain closed and buses, trains and flights cancelled as heavy snow continues	01/03/2018	Frost/ice/snow	Amber Met Office warning. Council staff involved in round the clock gritting, "full complement of employees out in road and pavement gritters and on foot to spread salt on routes and pavements across the city."
Evening Express	Schools remain closed and buses, trains and flights cancelled as heavy snow continues	01/03/2018	Frost/ice/snow	After the snowstorm the Aberdeen region remained under an amber warning from the Met Office and a number of schools were closed. Cancelled flights, trains, and buses. Travel warnings in place. Lemon Tree gig affected.
Press and Journal	Schools and roads across the north-east were closed yesterday as the region succumbed to the Beast from the East.	01/03/2018	Frost/ice/snow	Extensive impacts as a result of serious snowfall in the regions, including power cuts, closed schools, closed roads, restricted public transport.
Press and Journal	NHS 24 operating at only 50% during difficult snow storms	01/03/2018	Frost/ice/snow	The service has been badly affected by severe weather, meaning many of its staff have been unable to get to work
Press and Journal	Beast from the East takes a bite - updates	01/03/2018	Frost/ice/snow	Amber weather warning extended. Commuters warned not to travel.
Evening Express	Aberdeen shopping center shut due to high winds	01/03/2018	High wind	Union Square did not open due to stormy weather conditions, primarily high wind to ensure customer safety.
Evening Express	These North-east schools have made changes to their opening times and transport due to weather	05/03/2018	Frost/ice/snow	Extensive snow and ice forced a large number of schools to either close, change school times, or change provided transport.
Evening Express	North east roads melting as tarmac temperatures hit 51.8c	29/06/2018	High temperature/ heatwave	Mercury topped 30°C in parts of the north east, with tarmac temperatures reaching 50°C in parts of Aberdeenshire.
Press and Journal	Burning Gorse Aberdeen. North- east residents (northern Aberdeenshire and Moray) urged to conserve water amid heatwave conditions	06/07/2018	High temperature/ heatwave	Firefighters called out to burning gorse between Bucksburn and Kingswells, Aberdeen for the third day in a row. Emergency services also called to Royal Aberdeen Golf course to tackle a 27,000 sq feet blaze.
Evening Express	Aberdeen restaurant forced to close due to severes weather conditions	28/07/2018	Excessive rainfall/flooding	Miller & Carter Steakhouse, Union Street closed after water got into the restaurant's electrical supply overnight due to heavy rain.
Evening Express	Aberdeen residents express disgust as hot weather causes 'rancid' smell	25/07/2018	High temperature/ heatwave	Extreme heat resulted in a bad odour in an area, coming from an unknown source. Complaints to Scottish Water and SEPA.

Evening Express	Aberdeen fun day axed due to concerns over high winds	17/09/2018	Wind	In Town Without My Car Day event, part of European Mobility Week, was cancelled by the Council after forecasts caused concerns about gust speeds and public safety considerations.
Press and Journal	Social workers could be drafted in to keep casualty departments moving during winter in Aberdeen	06/10/2018	Frost/ice/snow	Vulnerable people of all ages struggled previous winter. Icy weather caused a huge surge in the number of people visiting accident and emergency departments. In Aberdeen, there was a 42% increase compared to the previous year.
Aberdeen Harbour News	Storm Frank remedial work completed.	31/10/2018	Excessive rainfall/flooding	Aberdeen Harbour completed remedial work to damage caused by Storm Frank, at the end of 2015.
Evening Express	Firefighters spent more than 80 hours battling fires at Aberdeen Nature Reserve	05/11/2018	High temperature/ heatwave	Fire services were called out 38 times in the month of September to fight fires in the nature reserve, proven difficult due to warm temperatures and high winds.
Evening Express	Flooding in Aberdeen as rain and strong winds take toll	30/11/2018	Excessive rainfall/flooding	Heavy rain and winds. Around 20 reports of localised flooding in Aberdeen.
Evening Express	Road closed in Aberdeen due to a fallen tree	08/01/2019	Wind	Countesswells Road shut between Countesswells Avenue and junction with Cults Road. Overhead power lines brought down, closure of part of the road near the Craigton junction. Met Office recorded wind of over 60mph in the north east.