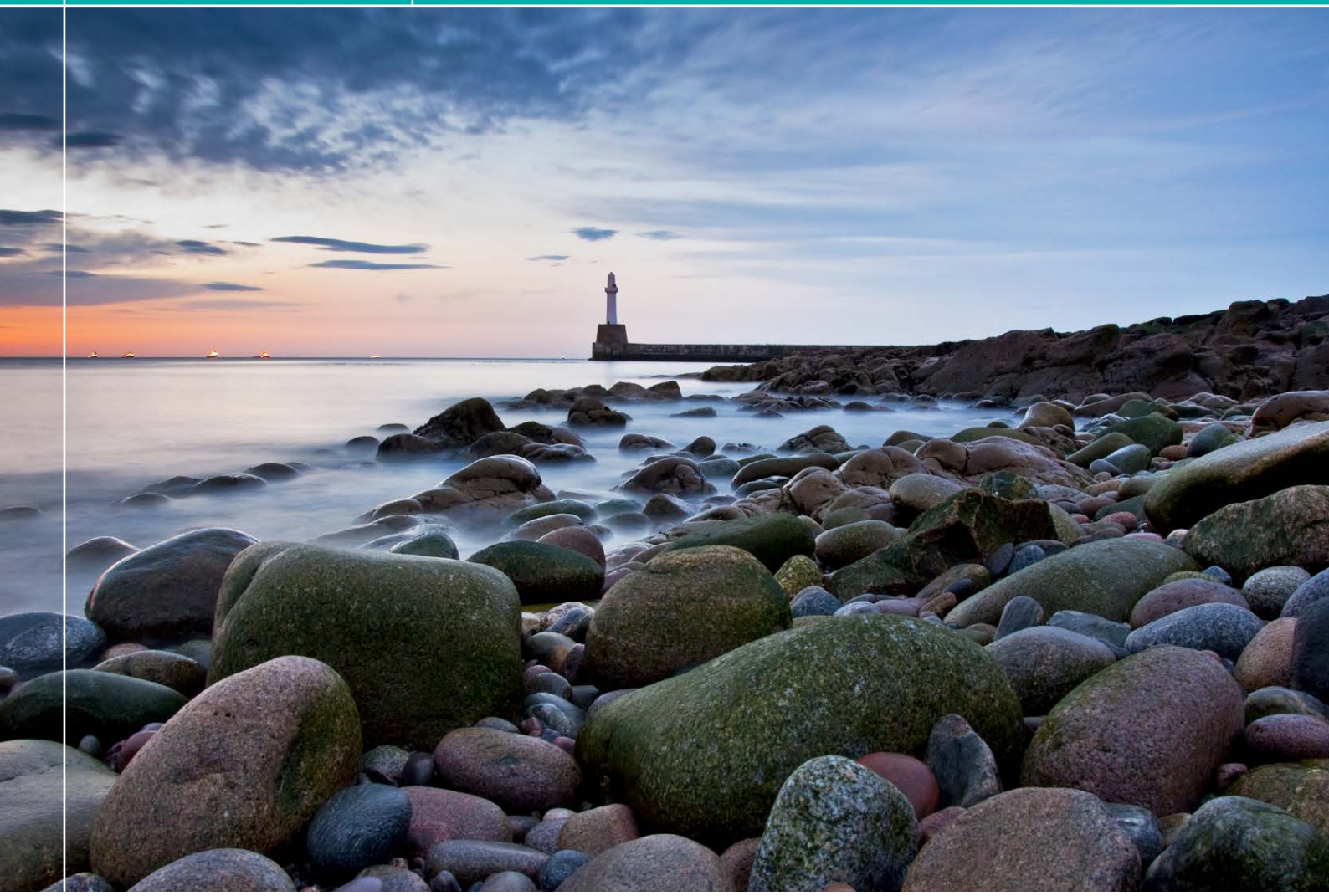
2014

Weather Impacts

Local Climate Impacts Profile (LCLIP) Report



ABERDEEN
CITY COUNCIL

Foreword

Councillor Jenny Laing, Council Leader

I am pleased to present the Aberdeen City Council Local Climate Impacts Profile (LCLIP) Report. This LCLIP presents findings and recommendations following an investigation of how extreme weather affects Aberdeen City Council and how we can be better prepared to manage extreme weather in the future.

As a public body the Council is required by law to adapt to climate change. Therefore, during 2014/2015 the Council's Climate Change Action Plan (2002) will be replaced by a Climate Change Framework. This Framework will include measures to address both the risks and opportunities presented by climate change and in doing so reduce our greenhouse gas emissions and adapt to the predicted changes in our climate. This LCLIP will act as a starting point to inform our future climate change adaptation work.

I am proud to support the recommendations in the LCLIP. Implementing these proposals will help to make Aberdeen more resilient to our changing climate.

Jennifer Laing

Angela Scott, Chief Executive

Local weather events are an example of the consequences we can experience from a changing climate. These changes can provide opportunities, such as warmer weather leading to increased productivity of land, and threats, such as heavy rain events increasing flood damage.

Completing this LCLIP has shown that a variety of Aberdeen City Council services have been affected by extreme weather either directly, such as through road closures, or indirectly though the delay of planned work schedules. Severe weather also affects services in a wide variety of ways, such as the clearance and gritting of roads in snowy/icy conditions, cancellation of events during snow or rain, and clearance of fallen trees during stormy weather. Although the services affected were able to cope with the extreme weather experienced, there were implications with regards to cost, service delivery and reputation.

The recommendations within this LCLIP will help Aberdeen City Council to look ahead and adapt to the expected changes to our climate of warmer and wetter weather. The insights in this report provide an opportunity for Aberdeen City Council services to work together to be better prepared for extreme weather.

Angela Scott

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Executive Summary

From 2008-2013 Aberdeen City Council (ACC) has been affected by 59 weather-related incidents, ranging from the effects of flooding on our road networks, to travel distruption and school closures caused by prolonged snow fall and icy conditions.

Some incidents have incurred costs of up to £200,000 and have resulted in up to up to 9,000 staff hours spent responding to the incident (See Service Responses section 3.2).

These figures, and the qualitative results behind them, emphasise the importance of identifying our vulnerabilities to weather today. This allows us to plan ahead in order to minimise the expense and damage of future climate change.

Town House, Aberdeen

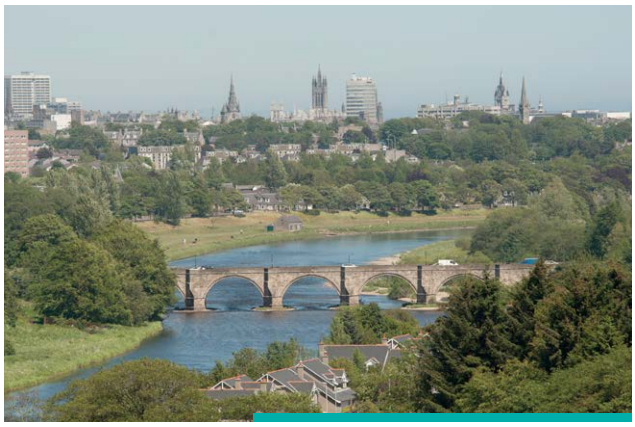
This LCLIP was completed by ACC in 2013/2014 with the aim of assessing the impact of extreme weather on ACC and how to respond to future risks. A media review of weather related incidents was completed from 2008-2013. From this review ACC services which had been affected by extreme weather were identified and invited to take part in an interview. Interviews took place early in 2014 which informed this report and the following recommendations:

- Better data recording of extreme weather events and impacts.
- Form a climate change adaptation subgroup or similar.
- Development of an Adaptation Plan for ACC.
- Raise awareness of climate change adaptation throughout the city and sectors.
- Share information on climate risk and adaptation plans between Council services and other public sector organisations.
- Review of strategies, policies, plans, projects and processes to ensure climate change adaptation is addressed and integrated.
- Identify adaptation training needs in ACC.

1. Introduction

Sunrise at Aberdeen Harbour

Extreme local weather events are perhaps the best examples of the consequences we might experience of a changing climate. These changes bring both opportunities, such as increased tourism through warmer weather and threats, for example flood damage caused by heavy rain or the impact of rising sea levels on coastal communities. Aberdeen is in an isolated geographical location and therefore could be vulnerable to having its arterial transport routes disrupted through an extreme weather event which could have an impact on the delivery of essential food and supplies.



View of Riverdee, Aberdeen

The Intergovernmental Panel on Climate Change (IPCC) 2014 report indicates that it is still possible to limit global temperature rise to 2 degrees celsius by 2100 using a wide range of technological measures and changes to behaviour. However even a 2 degree temperature rise is predicted to result in changes to the global climate including droughts, floods and heat waves. In Scotland we are predicted to have drier summers, wetter winters and more heavy rain events. Although ACC may be able to cope with occasional extreme weather, we will need to adapt to cope with increasing changes in the future.

If ACC is to withstand the threats and realise the opportunities associated with a changing climate it is vital for us to first understand the consequences of extreme weather for our city and start to investigate necessary adaptations.

ACC has used a Local Climate Impacts Profile (LCLIP) to look at how extreme weather has affected services, people and infrastructure across the City over the past 6 years.

The LCLIP is the starting point in understanding why and how the organisation should adapt to future changes; both as a service provider, a large corporate body and a community leader and, as such, informs the development of actions to meet statutory requirements of the Public Bodies Duties under the Climate Change (Scotland) Act 2009.

To date ACC has concentrated work on mitigation (actions to limit the magnitude and/or rate of long-term climate change) through the Council's Carbon Management Programme. Some actions on adaptation are taking place in Aberdeen but more joined up working and focus is needed. The Public Bodies Duties requires all public bodies, in exercising their functions, to act in the way best calculated to deliver any statutory adaptation programme. It recognises the need for all public bodies to be resilient to the future climate and to plan for business continuity in relation to delivery of their functions and the services they deliver to the wider community.

As a public body the Council has a statutory requirement to adapt to climate change. Therefore, during 2014/15 the Council's Climate Change Action Plan (2002) will be replaced by a Climate Change Framework which includes both carbon dioxide reduction and adaptation measures. This LCLIP will act as a starting point to inform our future climate change adaptation work.

Climate Change Explained

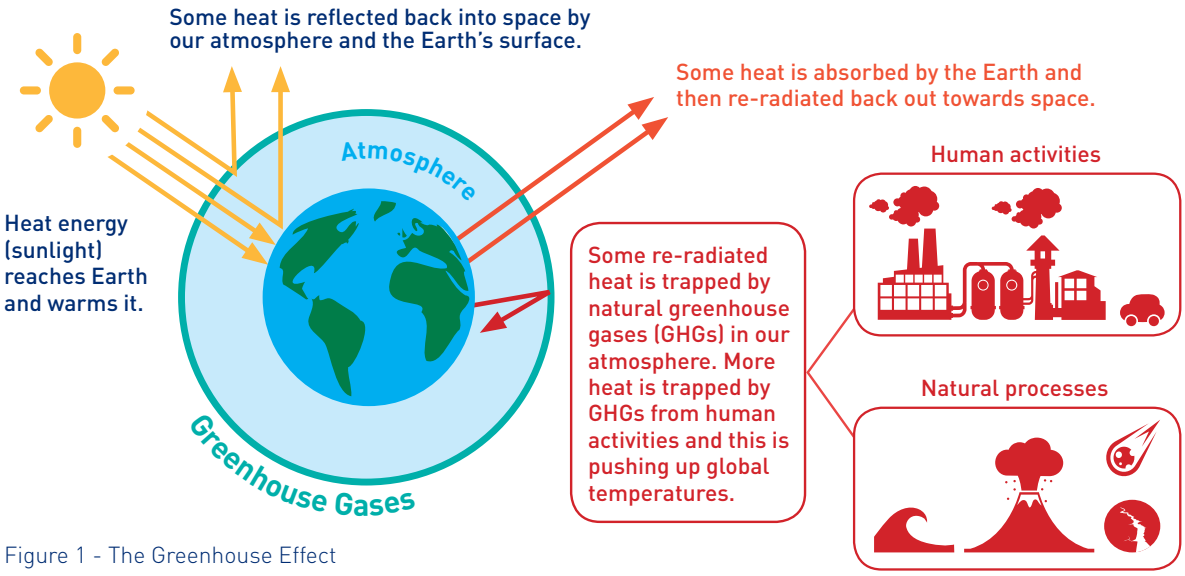


Figure 1 - The Greenhouse Effect

Weather affects us all. It is localised and can change quickly. Long-term patterns in our weather define our regional climate. The term climate change refers to the changes observed in our climate over longer periods of time; from tens to thousands of years. It is not possible to predict our weather, or define our climate, from one or a few events. Our climate is one of many processes that shape and regulate our planet. A big or on-going change in one of these processes will interact with and have impacts on others. It is only from longer-term observations that we can understand their relationship.

Our planet is kept warm by a process known as 'the greenhouse effect'. Greenhouse gases (GHGs), such as carbon dioxide and methane, are found naturally on earth and in the atmosphere. They are regularly released and absorbed by our planet's natural processes – usually in balance with each other. They can be released from volcanoes and wild fires and absorbed into oceans and forests. The GHGs in our atmosphere act like a blanket, trapping the incoming heat from the sun and keeping our planet warm enough for life to thrive.

Since the industrial revolution, our activities have resulted in the release of large amounts of additional GHGs from the earth into the atmosphere, mostly through activities such as burning fossil fuels. Our planet's natural processes are not able to re-absorb these additional GHGs at this rate of release. Most of the world's climate scientists agree that this rise in GHGs in the atmosphere is escalating the greenhouse effect and pushing up global temperatures, affecting regional climates and local weather patterns. These changes are impacting on all of us.

Average global temperatures have already risen about one degree Celsius from pre-industrial levels. This rise has shown severe impacts for our Polar Regions and small island nations. The Arctic is warming at about twice the global average and sea ice in the region has declined dramatically over the past 30 years. Limiting this temperature rise to below two degrees is the internationally agreed target to prevent dangerous changes to our climate.

In Aberdeen and the rest of the UK, scientists predict that we will likely witness more extreme weather events, such as flooding, sea level rise and drought, as well as wetter, warmer winters and hotter, drier summers.

The impacts of further warming of four degrees or more are likely to include significant changes to food production and water availability in some regions, affecting millions of people across the world, mass movement and extinction of wildlife and sea levels rising by several metres.

There are currently two main approaches to dealing with climate change; Mitigation and Adaptation. Mitigation involves reducing excessive GHG emissions from our activities, through the use of low carbon energy from solar power for example. Adaptation involves changing the way we build and do things, such as coping with increased rainfall through replacing concrete with grass to absorb water. Used properly, these approaches give us the means to reduce the likely impacts, and adapt to the predicted changes of our future climate.

Drought affecting reservoir supply

1.1 What is a Local Climate Impact Profile?

An LCLIP is a project through which weather events over the last 6 years in Aberdeen are examined in order to gauge the Council's vulnerability to them.

Events and their consequences were researched both through local press archives and through interviewing key staff in affected services. The intention was to collect both qualitative information and quantitative data about weather events and what impacts they have on our infrastructure, services and communities.

Hazardous driving conditions for drivers

1.2 Why carry out an LCLIP?

Adaptation is an essential part of addressing the impacts and opportunities created by our changing climate. Adaptation means making changes to the way we do things in response to expected changes to our climate.*

Despite efforts to limit the man-made causes of climate change, a level of change in our climate is unavoidable.

Adaptation is vital in reducing the risks of climate change impacts on our wellbeing, business and society as well as allowing us to take advantage of the opportunities a changing climate could provide.

This LCLIP aims to raise awareness of the impacts of severe weather events and will increase understanding of where ACC needs to adapt existing strategies, policies, plans and procedures to meet these changes. It will help to inform the Council's emerging Climate Change Framework which includes an Adaptation Plan.

Union Street, Aberdeen

The objectives of this project are to:

- provide an understanding of significant weather events in Aberdeen between 2008 and 2013
- assess the Council's vulnerability to weather events
- inform decision making on effectiveness of responses
- assist awareness raising
- inform the Adaptation Plan

* Footnote:The Intergovernmental Panel on Climate Change (IPCC) defines adaptation as "adjustments in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderate harm or exploit beneficial opportunities".

2. Methodology

The LCLIP has been led by the Environmental Policy team within the Enterprise, Planning & Infrastructure directorate and was carried out using the toolkit provided by the UK Climate Impacts Programme (UK CIP).

The purpose and objectives of the LCLIP were defined which were to assess the Council's vulnerability to weather events and to inform ACC climate change adaptation work (see Figure 2).

The research stage of the project involved using a range of media sources to identify severe weather events that affected Aberdeen City, as well as the impact, consequences and response to the events. A graduate placement volunteered to undertake the initial data collection and media review (see appendix 5.3). Media searches were carried out using search terms such as extreme weather, heavy rain, snow, storms and flooding. Online resources were used such as news websites and newspapers on microfiche in local libraries. The data collected from the media review was collated in a Microsoft Excel spreadsheet from the UK CIP toolkit. The data was analysed and helped identify the Council services most affected and therefore who to interview on the subject

Interviews were conducted with officers across the Council in order to gather further information on the impact and consequences of extreme weather on Council services (See interview questions in appendix 5.2). Qualitative and Quantitative data from the media review and interviews were then used to write the LCLIP report and recommendations which could then be promoted widely to raise awareness and engage with key stakeholders on climate change adaptation.

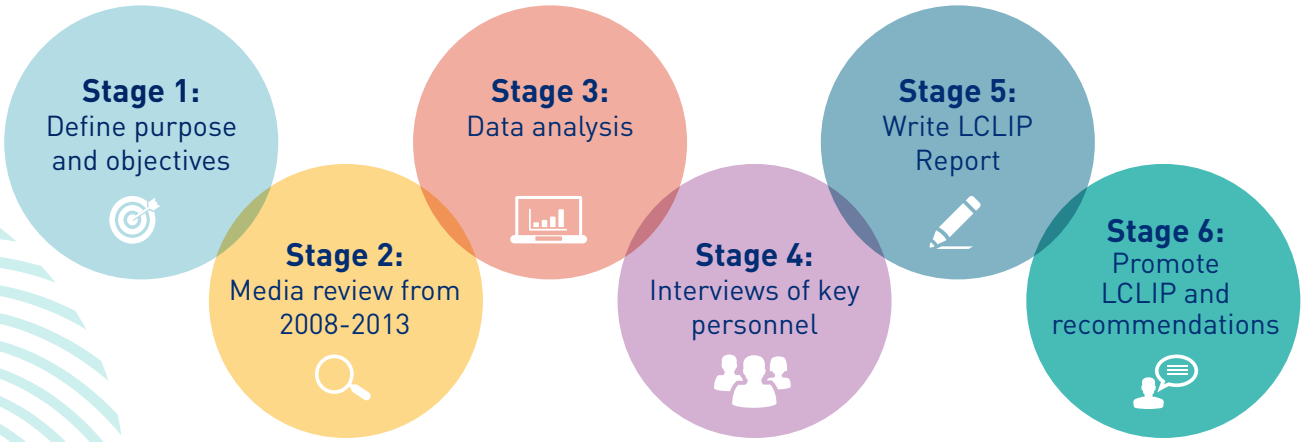


Figure 2 - The LCLIP Process

3. Results

Rainfall increases reservoir levels

3.1 Scottish Context

A "Handbook of Climate Trends Across Scotland 1961-2004" outlining observational data collected by the scientific community has been published by the Scotland and Northern Ireland Forum for Environmental Research (SNIFFER). This shows that the Scottish climate has warmed while altered precipitation patterns have led to drier summers, wetter winters and an increased frequency of heavy rain events.

Climate change and severe weather events can and have impacted on many aspects of society, including buildings and property, health, agriculture, transport, water resources and energy demands. Given the climate projections for the next century these types of impacts will likely continue and intensify.

3.2 Aberdeen Weather Events

Figure 3 illustrates the variety of weather events observed from the Aberdeen media review from 2008 to 2013. As indicated, severe weather events involving frost, ice and/or snow were the most frequently observed for Aberdeen followed by rainfall and flooding. However, storms and wind events were also recorded frequently.

Icy road being treated by gritter

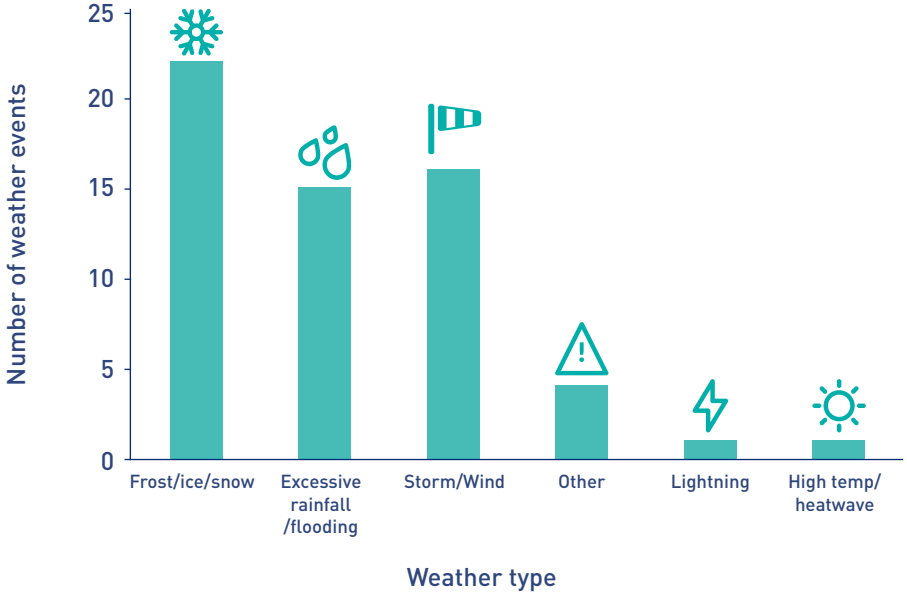


Figure 3 - Frequency of weather events in Aberdeen city from 2008-2013

Figure 4: illustrates the frequency and variety of climate-related impacts in Aberdeen from 2008-2013 from the media review. As depicted, the most frequent impact is damage to infrastructure, followed by changes in use of facilities. Damage to buildings is also a significant impact, as well as surface water flooding. In conclusion, weather events in Aberdeen are causing damage to hard infrastructure such as roads, railways and buildings, as well as disrupting daily routines.

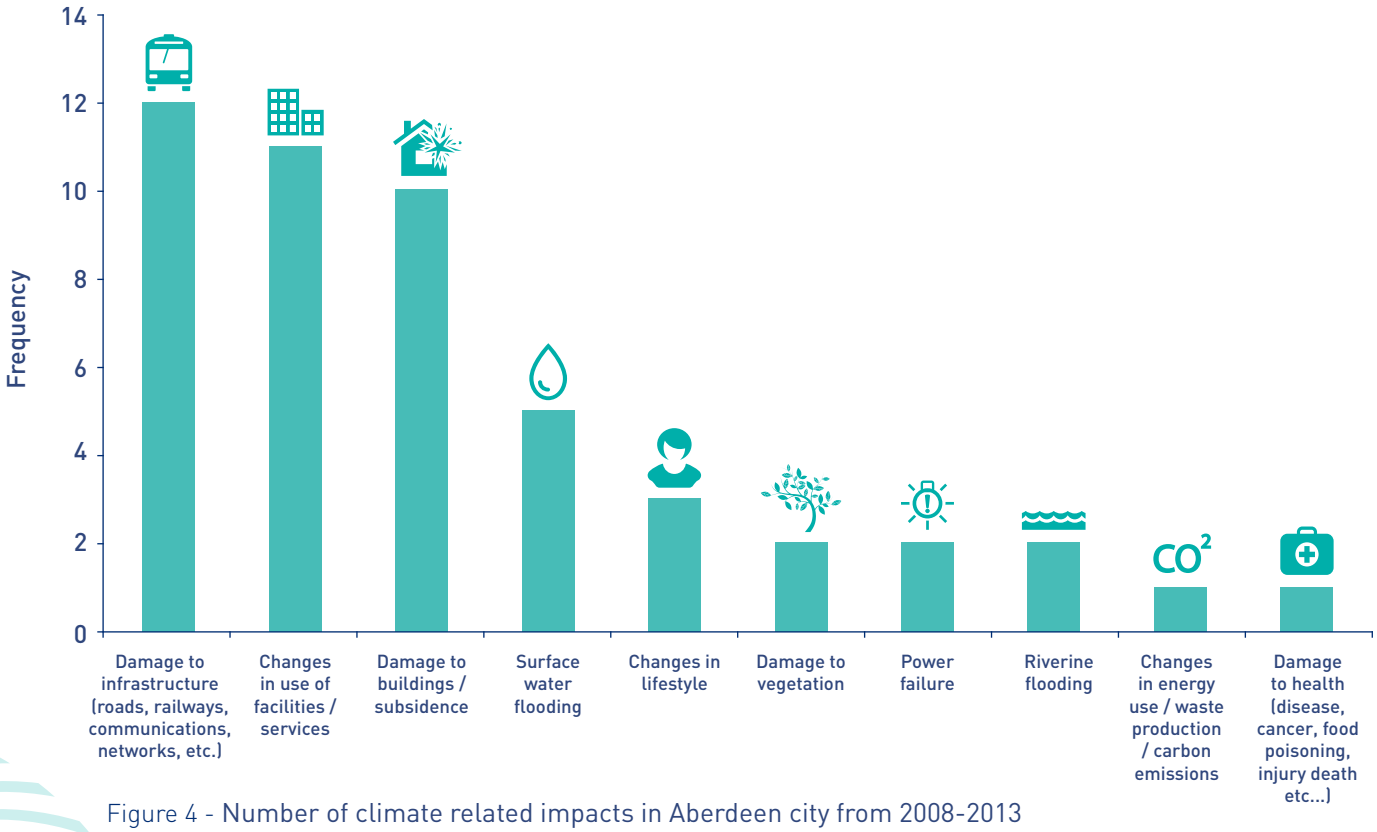


Figure 4 - Number of climate related impacts in Aberdeen city from 2008-2013

Rain showers off the coast of Aberdeen

Snow showers impacting on traffic flow

3.3 Aberdeen City Council Service Responses

3.3.1 Roads Operations

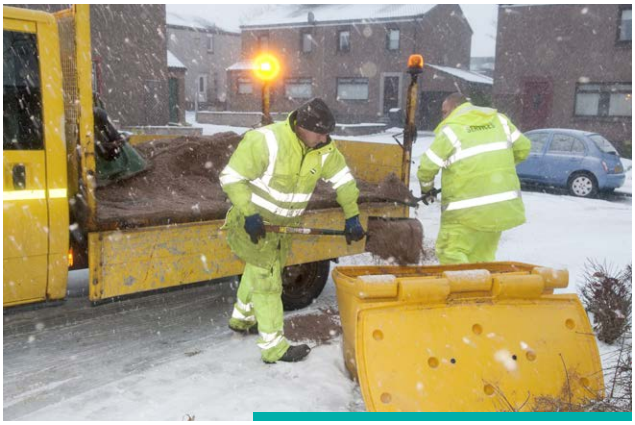
The Roads Operation team is responsible for operational responses to weather events.

The most common weather events that the team deals with are snow/ice (winter maintenance), flooding events and less frequently, wind events.

ACC is responsible for providing winter maintenance on 550 miles of road and more than 1200 miles of footways. The Winter Maintenance Plan (WMP) (See appendix 5.1.1) is designed to cope with an average winter whilst having the capability to be extended or adapted when winters are either more severe or are of a longer duration than average. This requires having sufficient staff as well as specialist vehicles and equipment to respond in advance to forecasts, ice prediction reports or specialist road and weather monitoring information.

Part of the WMP is to ensure sufficient supplies of salt are available at the start of the winter season. This is generally based on previous experience, however, as can be seen in the winter of 2010/2011, prolonged severe weather conditions can result in the need for additional supplies being required, leading to problems with procurement and increased cost. This highlights one of the main difficulties the Council has in balancing the requirements of predicted warmer wetter winters in the longer term with those severe prolonged winters which occur occasionally. In addition, prolonged severe weather requires staff to only carry out winter maintenance activities resulting in other non-essential duties being postponed. Grounds maintenance teams are also called into help with winter maintenance activities during prolonged periods.

In recent years a public website has been developed showing live information on which roads/routes have been treated. The local press has been made aware of this and uses it for travel bulletins. Also, a community scheme has been set up to provide free tonne bags of salt to help communities help themselves through the winter. Approximately 40 have been distributed during winter 2013/14.



Workers filling grit boxes in preparation for icy conditions

3.3.2 Structures, Flooding and Coastal Engineering

The Structures, Flooding and Coastal Engineering team is responsible for the long-term assessment and implementation of flood defence schemes throughout the city. Therefore this team is mostly concerned with rainfall and the resulting river and urban flooding as well as drainage issues.

Scottish Environment Protection Agency (SEPA) has predicted that Aberdeen could see a 20% increase in rainfall and up to a 1/2 meter sea level rise over the next century with the annual cost of flood damage in Aberdeen estimated at £17million.

At present, flood predictions are revised as and when events happen in the city as there is less than 100 years of flood data, some of which is limited. Areas at risk from flooding have been identified. After a flooding event, a local plan for flooding is drawn up to highlight any previously unidentified areas.

However, the team is currently working to develop a North East local plan for flooding for the next 6 years, which is due to be published in 2015 in collaboration with SEPA, Scottish Water, Moray and Aberdeenshire Council. This flood risk management report commits Aberdeen City Council to actions within 6 years. This is more detailed than the bi-annual reports required by the previous Flood Protection Act. During the 6 year reporting cycle all areas at risk of flooding will be considered and actions will be taken where cost/benefit is viable.

Effects of excessive rainfall

The Scottish Government launched an online map viewer to show properties at risk of flooding in 2014. In addition, more detailed maps are being produced through the Council's Geographical Information System (GIS) which will give a better idea of areas at risk from flooding.

3.3.3 Events

The Events Team is responsible for the planning, co-ordination and delivery of the Council's annual Festivals and Events programme in Aberdeen.

High winds, torrential rain and deep snow can result in cancelled or amended events. Two events were cancelled between 2008 and 2013 which were the Nativity Scene Launch in November 2010 due to snow and the Santa's Grotto Launch in December 2013 due to torrential rain.

When events are cancelled service delivery is affected through increased workloads before and on the day due to the amount of organising required to cancel an event, including communication with the media, participants, traders and the audience. When events are cancelled contracts are paid and staff are on duty regardless. However, staff time is lost through the preparation time which has gone in to planning and cancelling the event. When events are not cancelled during bad weather, there is often poorer attendance and participation. This has an effect on the impact of the event and efforts to boost cultural provision in Aberdeen.

When events are cancelled the city events team refers to it's internal contingency plan and takes advice from Police Scotland. A multi-agency response is required involving internal agencies such as city events, roads services, traffic management, and environmental services. External agencies involved include Police Scotland, agency contractors and sub contractors.

In response to extreme weather leading to events being cancelled, the city events team has developed a more robust event plan (see appendix 5.1) which includes advance weather checks at least seven days prior to events.

Aberdeen International Youth Festival during the summer

Lifeboat at Aberdeen Harbour

3.3.4 Grounds Services

Grounds Services deals with grass cutting, municipal gardening, grounds maintenance, grave digging, litter clearance and other related activities.

Rainfall events are the main weather event affecting this service, with resulting flooding, drainage and ground maintenance issues, although snowfall can also impact on service provision.

Some changes to policy and operations have been made in response to rain events for example:

- More robust grass cutting equipment has been purchased at a cost of £150,000. These new machines can cut long wet grass and also disperse grass more effectively.
- Seaton Park floods regularly. Locals have been consulted and have agreed that the flooded area of the park should be managed as a pond which will provide space for wildlife and help the overall drainage of the park.
- Hazlehead Park has a new Management Plan designed to make it a Climate Change Park. This involves a shift from the way parks are usually managed with regards to planting, buildings and water. This is a pilot project and if successful will be applied to other Aberdeen parks.
- Hazlehead flooding issues have been addressed through cleaning drains, adding new drains and steering the water away from problem areas such as the playing field.
- Budget has been safeguarded to undertake path repairs and annual maintenance as well as to deal with drainage issues. Localised flooding has led to path damage in the region of £100,000. In future, the specification of paths will be improved to withstand more frequent rain events, however this increases capital costs.

Heavy rainful leads to flooding of river

3.3.5 Arboricultural Services

The Arboricultural Services team is responsible for maintaining Council owned trees and removing dead or dangerous trees.

The most common weather event that the team deals with is stormy weather resulting in tree damage and fallen trees.

Severe windy weather experienced in May 2011 caused £200,000 of unplanned tree work for six months for a team of 10 tree surgeons. In this situation, clearing trees to make roads safe is the top priority, so all other planned work is delayed. A multi-department response was required involving the Roads Team and Grounds Maintenance Team which was very successful.

Past events had helped prepare for the 2011 storm in an evolving process including formalised storm procedures, updated contact numbers, and standby procedures. ACC has an internal policy on Storm Damage Priorities and adheres to legislation such as Duty of Care and the Roads Act.

One member of the Arboricultural Services Team recognised that there has been a trend over the last 30 years towards more intense and frequent storms as well as an increased likelihood of storms throughout the year in Scotland. If this trend continues it could make Aberdeen City Council more vulnerable to impacts of tree damage.

Strong winds causes damage to trees

In response to stormy weather additional training was provided on how to take down trees safely. Certain streets are repeatedly affected by losing trees. Removal of trees and pollarding (removal of branches) are strategies used in these high risk areas. A good inspection regime and good maintenance was already in place to prepare for storms and this continues to be improved upon.

3.3.6 School Estate

Aberdeen schools are most affected by snowfall causing school closures, however heavy rain can also cause structural damage.

Heavy rain floods children's playground

There is no local monitoring of how many teaching days are lost due to snow. Although not all weather related, it has been estimated that over the past 5 years (2009-2013), schools closures have been recorded approx 600 times (includes each day of full and partial closures) via the school closure web application (See appendix 5.1.6). School closures caused by snow can have a significant impact due to loss of teaching time, exam cancellations & food wastage.

Responses to snow are influenced by what has been done in the past by the Council. Decisions are informed by the corporate bad weather policy, Scottish Government guidance: Winter Weather Resilience Arrangements as well as weather and police reports.

There is a cross sector planning group which meets in late autumn each year to discuss the past winter and the following winter with regards to gritting and road clearance. This group includes the roads team and service providers such as education. As a result, all schools now have special equipment for spreading grit and more secure storage for grit bins.

3.3.7 Grampian Emergency Planning Unit

Co-ordination of emergency planning across the three North East Councils in Grampian is delivered by the Grampian Emergency Planning Unit (GEPU) a joint team based in ACC.

The team works with internal and external partners to plan for, and assist in the response to, emergencies (as defined by the Civil Contingencies Act 2004).

GEPU and its partners develop a Community Risk Register based on criteria set by UK and Scottish Government together with locally identified hazards.

Severe Weather and flooding is one of the key hazards identified for the North East of Scotland although Aberdeen City has not had to deal with the effects of significant events similar to those experienced in recent years in Elgin, Huntly, Stonehaven and coastal communities within in recent years.

The specific and generic plans produced by GEPU and its partners consider the effects of different types of emergency and describe the advisory and supportive role the team would take during an emergency event. The team will coordinate the initial response to any emergency with operational services providing any physical response required. In a prolonged emergency event the Council will establish an Incident Management Team to coordinate the emergency response and recovery.

Arrangements exist through partners including SEPA, the Met Office, Police and Fire Services to notify and update on potential severe weather. GEPU participates in regular multi agency meetings to discuss forecasts and responses.

Multi agency emergency planning training and exercising events take place regularly. Guidance on Emergency Planning is available on the Council's intranet.

Plans and policies are regularly reviewed in light of debriefing of exercises and actual events.

Approaches have been made to Community Councils (CC) offering support in developing Community Resilience plans. At this stage only Culter CC has developed such a plan.

Control room

Dusk at Aberdeen Harbour

3.3.8 Waste Collection Services

The Waste Collection Services team manages both domestic and commercial waste collection for the Aberdeen City area.

Excessive snow has the highest impact on the service as underfoot conditions can be treacherous for Waste Collection operatives as well as risks from dangerous driving conditions and delays from resulting traffic. The service is also affected by high winds as landfill sites are regularly closed due to windy weather resulting in vehicles being directed to alternative sites increasing travel cost and time.

During snowy weather the team cannot work to the same productivity levels. When work is delayed due to snow the team catches up over a number of days and work on a Saturday if necessary. Around £232,000 is spent on overtime by the service per year. Not all of this overtime relates to weather as delays to service delivery can be affected by breakdowns and vehicle maintenance. The service reputation has been affected during snowy weather an example of this is that during December 2010, when exceptional snowfall was experienced, 800 complaints were received compared to an extremely mild December in 2011, when just over 200 complaints were received for the month.

Within the last 10 years the service has only stopped running once due to snow which resulted in numerous complaints. To avoid a repeat of this, the service tries to keep running at all times and continues with any missed pick ups from the previous day. During the 2010/2011 winter with excessive snow, shoe covers with additional grips were issued for staff. Drivers have also been empowered to make their own judgement about whether a street is safe to drive on as it is potentially not only the Council's liability if damage is caused but also the driver's license could be affected. Snow clearance priority is given to arterial routes, whereas refuse collection takes place from streets that are treated as a lower priority. An annual risk assessment review is carried out to address issues arising from bad weather.

Waste collection in Aberdeen

3.3.9 Building Services

The Building Services Team maintains 22,500 Council owned housing properties, public buildings, such as schools and libraries, and Council offices.

The service can be affected by high winds causing building damage and high winds, snow and rain delaying external work. Excessive snow during the 2010/2011 winter resulted in workloads increasing four-fold. When the snow began, 100 enquiries per hour were being received, with Council housing tenants often reporting burst or frozen pipes. These emergency call-outs must be responded to within four hours and this was adhered to whether it was a plumber or office staff who attended in the first instance. Extra costs were incurred by the service in overtime and in purchasing emergency supplies of water and temporary heaters. There was a positive effect on reputation as tenants were grateful that staff came within four hours to defrost pipes and deliver water and heaters in treacherous conditions and during the Christmas holidays. Non-emergency work must be complete within 24 working days but is usually complete in seven days. This work was delayed due to the increase in emergency calls but was still completed within the limit of 24 working days.

The service adheres to Scottish targets as set out in the Housing Scotland Act 2001 and the Scottish Secure Tenancy (Right to Repair) Regulations 2002 (see appendix 5.1.9). Figures are submitted to ACC Committee and Audit Scotland monthly. In response to difficulties during the winter of 2010/2011 the service now monitors annual leave to ensure there is a full complement of staff during December when bad weather can occur and a manager is on call 24/7. Temporary heaters and bottled water are now kept in stock in case of bad weather.

High rise flats at Seaton

3.3.10 General

All of the Council services mentioned in this section face a variety of impacts from extreme weather. Some of the general impacts which affect all services include a loss of time when staff time is directed to immediate impacts from a weather event. This has an affect on service delivery and often results in planned work being delayed. Weather events often have an economic impact on Council services through costs for repairs or new machinery and additional staff costs. The reputation of Council services can be affected by extreme weather. When services are delayed more complaints from the public are often received. The wellbeing of the public can be affected when essential services are disrupted due to weather. The wellbeing of staff can also be affected through additional workloads.

3.4 Summary of Key Vulnerabilities

3.4.1 Key Issues

- Damage of trees and resulting road closures from stormy weather impacting on roads, arboricultural services and grounds maintenance.
- Heavy rain causing flooding, erosion of paths and disruption to grounds maintenance work.
- School closures during snowy/icy conditions.
- Clearance of roads, road repairs and availability of ample salt during winters with severe snowy/icy conditions affecting the roads team and potentially all Council services through loss of staff time.
- Cancellation of events due to snow, wind and torrential rain.
- Building maintenance during snow, rain and high winds.
- Waste collection during excessive snow, rain and wind.

3.4.2 Risk Management

- SEPA has predicted that Aberdeen could see a 20% increase in rainfall and up to a 1/2 meter sea level rise over the next century which could result in increased flooding and costs in emergency response, re-housing of tenants, buildings, roads and grounds maintenance.
- It is predicted that Aberdeen will generally experience warmer and wetter winters in the coming years which could result in less school closures, and less requirements of gritting and road clearance during snowy/icy weather. However services should remain well prepared for ice and snow as severe winters are still expected.

Town House, Aberdeen

3.4.3 Service Provision

- Severe stormy weather has caused major impacts on arboricultural services due to the resulting emergency work of clearing trees to make roads safe, increasing workload and increasing complaints and enquiries with concerns about unsafe trees. In one instance this caused 6 months of unplanned work for 10 tree surgeons.
- Severe rain has caused major impacts on grounds maintenance service provision such as delayed grass cutting schedules, resulting in increased complaints, further contributing to workloads.
- Snowy and icy conditions have caused loss of school days and staff time due to school closures.
- Snowy and icy conditions have caused increased workloads for the roads team and shortages of salt during prolonged snowy winters.
- Snow and rain have resulted in cancelled events which require staff time to communicate with the media, participants and traders.
- Snow, ice and high winds have caused difficult conditions for waste collection.
- Snow, wind and rain have an impact on buildings maintenance schedules.

3.4.4 Costs

- Stormy weather caused £200,000 extra costs due 6 months of unplanned work for a team of 10 tree surgeons.
- SEPA has predicted that Aberdeen could see a 20% increase in rainfall and up to a 1/2 meter sea level rise over the next century with the annual cost of flood damage in Aberdeen estimated at £17million.
- More robust grass cutting equipment has been purchased at a cost of £150,000 to help grounds maintenance cope with severe rain in the future.
- Heavy rain resulted in severe erosion of paths, which had recently been improved with £100,000 of investment, around Aberdeen.
- Costs in staff time were experienced by the grounds maintenance team due to increased workload and complaints during rainy weather and resulting disruption to grass cutting regimes.
- During snowy conditions school closures took place in Aberdeen resulting in costs in loss of staff time and teaching days.
- During snowy and icy conditions the Roads team experienced costs in extra staff time and extra salt required.
- During excessive snow the Waste Collection team incurred costs in additional overtime to cope with delayed schedules.
- During snow, Building Services experienced increased costs in overtime and the provision of additional heaters and bottled water for tenants with frozen pipes.

3.4.5 Reputation

- During stormy weather and resulting tree damage hundreds more reports than usual were received by the arboricultural team.
- During severe rain around 150 additional complaints were received by the grounds maintenance team due to disruption to grass cutting. Overall reputation was not affected in the long term.
- Overall reputation was not affected due to school closures as the public accept some closures due to snow are unavoidable.
- Reputation was not significantly damaged through cancelled events as the public accept this is sometimes unavoidable.
- Waste Collection Services received 600 more complaints during a December with heavy snow.
- Buiding Services reputation was positively affected during snow as tenants were grateful that staff provided assistance with burst pipes within four hours and during the festive holidays.

Riverside, Aberdeen

4. Recommendations & Next Steps

Snow covered
Saint Machar's Cathedral

4.1 Conclusions

Completing the LCLIP has shown that a variety of ACC services can be affected by extreme weather either directly, such as through road closures or indirectly though the delay of planned work schedules. Severe weather affects services in a variety of ways, such as the clearance and gritting of roads in snowy/icy conditions, cancellation of events during snow or rain, clearance of fallen trees during stormy weather, and disruption to grounds maintenance regimes during heavy rain. Although services affected were able to cope with extreme weather there were implications with regards to cost, service delivery and reputation.

During interviews some managers recognised risks associated with climate change and observed trends in weather, such as towards more extreme and frequent stormy weather and warmer wetter winters. More can be done to increase awareness of climate change risks and the work of LCLIP can be used as a starting point to develop climate change adaptation work within Aberdeen City Council. Furthermore the impacts of severe weather should be systematically recorded to identify vulnerability and target resources.

A "Handbook of Climate Trends Across Scotland 1961-2004" outlines observational data collected by SNIFFER. This shows that the Scottish climate has warmed while altered precipitation patterns have led to drier summers, wetter winters and an increased frequency of heavy rain events.

The Intergovernmental Panel on Climate Change (IPCC) 2014 report indicates that it is still possible to limit global temperature rise to 2 degrees celsius by 2100 using a wide range of technological measures and changes to behaviour. However, even a 2 degree temperature rise is predicted to result in changes in the global climate including droughts, floods and heatwaves. Although ACC may be able to cope with occasional extreme weather in the meantime, we will need to adapt to cope with increasing changes in the future.

Challenging waves

4.2 Recommendations

4.2.1 **Better data recording –** Investigate developing a system for all ACC services to record extreme weather events and impacts. e.g. Type of event, impacts, service response, complaints, closures, costs and loss of service provision.

4.2.2 **Form a climate change adaptation subgroup** or similar.

4.2.3 **Development of an Adaptation Plan** for ACC.

4.2.4 **Raise awareness** of the impacts of severe weather and the need for climate change adaptation throughout the city and sectors.

4.2.5 **Share information** on climate risk and adaptation strategies between Council services and other public sector organisations to increase knowledge and improve responses.

4.2.6 **Review of strategies,** policies, plans, projects and processes to ensure climate change adaptation is addressed and integrated.

4.2.7 **Identify adaptation training needs** in ACC.

4.3 Next Steps

4.3.1 **Taking Action:** During 2014 the Council's Climate Change Action Plan (2002) will be replaced by a Climate Change Framework which includes both mitigation and adaptation measures. This LCLIP will act as a starting point to inform our future climate change adaptation work.

4.3.2 **Looking Forward and Assessing Risk:** Incorporating climate change/weather related risks into existing risk assessment frameworks and strategies. LCLIP findings, along with UK climate projections, will be used to identify thresholds for vulnerabilities and their probabilities in future periods.

4.3.3 **Collecting More Evidence:** Establish a shared resource for all services to record extreme weather events and formulating further methods of analysis.

4.3.4 **Communication:** Submit a committee report to Aberdeen City Council elected members; Circulate this LCLIP report to Aberdeen City Council staff, partners and the public; Circulate a press release on LCLIP findings.

5. Appendices

Wellington Road, Aberdeen

5.1 Teams and related policies/documents referred to in interviews

5.1.1 Roads Operations

- Well Maintained Highways – Appendix H (National Guidance)
  www.ukroadsliaisongroup.org/en/UKRLG-and-boards/uk-roads-board/wellmaintained-highways.cfm
- Aberdeen City Council Winter Maintenance Policy
- Winter Maintenance Operations 2010 – 2011 [p545]
  http://committees.aberdeencity.gov.uk/documents/s13900/Winter%20Maintenance%20Report%202010-2011.pdf
- Aberdeen City Council Roads Winter Service Plan 2012-2013
  www.aberdeencity.gov.uk/web/files/Roads/winter_service_plan.pdf

5.1.2 Structures, Flooding and Coastal Engineering

- Flood Risk Management Act (Scotland) 2009
  www.scotland.gov.uk/Topics/Environment/Water/Flooding/FRMAct
- SEPA National flood risk assessment – identifies potentially vulnerable areas
  www.sepa.org.uk/flooding/flood_maps.aspx
- Enterprise, Planning and Infrastructure Committee flood report 21st Jan 2014.
  http://committees.aberdeencity.gov.uk/documents/s34755/EPI.13.245-Flood
- Flood events mapped in ArcGIS from late 1990s.
- North East Scotland Flood Liaison and Advice Group (NESFLAG)
  www.aberdeenshire.gov.uk/flooding/nesflag.asp

5.1.3 Events Team

- Internal Event Manuals/Contingency plans.

5.1.4 Grounds Services

- Figures on number of complaints provided for an average year (310) and during heavy rain resulting in delays to grass cutting regimes (480).

5.1.5 Arboricultural Services

- Tree Policy (2011)

5.1.6 School Estate

- Figures were provided from the Aberdeen City Council web team of 634 approximate number of school closures from 2008-2013.
- Aberdeen City Council Bad Weather Policy.
- Scottish Government guidance on Winter Weather Resilience Arrangements.

5.1.7 Grampian Emergency Planning Unit

- Emergency planning webpages
  www.readygrampian.org
  www.aberdeencity.gov.uk/Emergencies/emg/emg_major.asp
- Emergency Planning Policy and Procedures – generic response

5.1.8 Waste Collection Services

- Environmental Protection Act 1990, Section 45
  www.legislation.gov.uk/ukpga/1990/43/section/45
- Audit Scotland figures on complaints about ACC Waste Collection Services during mild and snowy winters.

5.1.9 Building Services

- Housing Scotland Act 2001
  www.legislation.gov.uk/asp/2001/10/contents
- Scottish Secure Tenancy (Right to Repair) Regulations 2002
  www.legislation.gov.uk/ssi/2002/316/contents/made

Calm sea at Aberdeen Beach

Storms can cause damage to infrastructure

5.2 Interview questions

Name			
Position		Service	
Telephone		E-mail	
Responsible for:			
Introduction: As part of a Local Climate Impacts Profile, we have been researching weather related incidents that have affected Aberdeen City Council since 2008. In particular we are researching the Council's vulnerability to past weather events in order to inform how the authority can be better prepared for future events.			
CONSEQUENCES			
1(A) How would you rate the significance of this weather event [or type of weather event] for your service/ work area?			
High / Medium / Low			
1(B) What were the consequences of this event [or type of event] for your work area, in terms of workload, costs, service delivery and reputation? Which units were involved?			
Area	**Consequences (include financial figures / quantitative data, where possible)**		
Workload			
Costs			
Service Delivery			
Reputation			
1(C) Which specific units were involved/ affected?			

RESPONSES	
2 (A) What was Aberdeen City Council's response to the event?	
2 (B) What influenced your response to the event, e.g. past responses, policies, legislation or advice?	
Past responses	
Internal policy	
Legislation	
Advice	
Other	
2(C) Were any of your strategic goals affected by the incident?	
Yes /No	
PREPARATIONS / ADAPTATIONS	
3 (A) Have any extra provisions been made should this sort of event/s occur again?	
Research	
Training	
New policy/s	
Change to infrastructure	
Change to operations	
3 (B) Do you think any additional provisions could be made to help you deal with this sort of event?	
Yes /No	

Autumn day at Johnstone Gardens

FURTHER INFORMATION	
4 (A) Are there any documents/data available on this event/type of event?	
Yes /No	
4 (B) Do you know if any other agencies or departments were affected by the event or involved in the response?	
Yes /No	
4 (C) Are there any other ways that weather affects your service?	
Yes /No	
4 (D) Who else should we speak to about this?	
Name	
Unit	
Name	
Unit	
Name	
Unit	
4 (E) Can we contact you again if we have any further questions?	
Yes /No	Phone / E-mail:
4 (F) Any other comments	

5.3 Media Review

1. Source	2. Headline	3. Date of the story dd/mm/yy	4. Summary of news story
Evening Express	Wettest winter in 99 years	26/02/2014	River burst banks and park flooded
Evening Express	Wind and rain causes travel chaos in Aberdeen	24/12/2013	Flooding reported in Bridge of Don at Persley Bridge and on Great Southern Road in Aberdeen. Tree fell on Hazledene Road.
Aberdeen City Council News	Festive fun event cancelled due to bad weather	06/12/2013	winter wonderland event [Fri 06 Dec] in Aberdeen's Union Terrace Gardens has been cancelled on the grounds of public safety.
STV News	Nineteen flood warnings issued as storm surge hits east coast	05/12/2013	Flood warnings issued throughout Scotland. River Dee burst its banks as stormy weather hits.
BBC News	Workers off Talisman Sinopec oil platform Buchan Alpha over bad weather forecast	05/12/2013	Dozens of workers have been taken off a North Sea oil platform due to the forecast of severe weather. Talisman Sinopec Energy UK said a total of 85 people had been down manned from the Buchan Alpha installation, 83 miles north east of Aberdeen.
Scottish Express	Scots to bask in 24C July heatwave	04/07/2013	The Weather Outlook team forecast Britain's best spell of July weather since 2006's heatwave, when temperatures reached sweltering 31C highs in Scotland and Aberdeen experienced its hottest temperature since records began in 1942.
Daily Record	Schools closed and roads blocked as snow hits Aberdeen	14/01/2013	Schools closed and roads blocked as snow hits Aberdeen. 14 Jan 2013 14:52. WIDESPREAD disruption was caused to the area after the snow fell
Evening Express	Spate of crashes as snow hits North-east	27/10/2012	Car hit parked heavy goods vehicle
Guardian	Foam Covers Aberdeen Fishing Village	26/09/2012	Power cut & travel problems as storm hit yesterday
The Huffington Post	UK Weather: Foam Engulfs Aberdeen Village As Floods Sweep Britain	25/09/2012	Covering village with foam
BBC News	Foam swept in as gales hit Scotland	25/09/2012	Train suffers minor damage & damage to property

Sunset, Aberdeen Beach

Mail Online	Snow gritters out in Aberdeen as figures reveal wettest summer in 100 years knocked £1bn off economy thanks to spoilt crops and cancelled events	10/09/2012	Crops failed, festival cancelled due to rain. Hot temps followed by freezing temps the next week.
Evening Express	Video: Floods hit Aberdeen homes, cars and businesses	27/08/2012	Fernielea School stayed closed due to flash flooding
STV News	Businesses count the cost after flash floods cause chaos in Aberdeen	27/08/2012	Dizzy's restaurant and Polmuir Road was flooded and closed.
BBC News	Heavy downpours cause flooding in Aberdeen	25/08/2012	Roads and properties have been affected by flooding
STV News	Cars swept away as Aberdeen city centre hit by flash flooding	25/08/2012	road closed and downpour inundated buildings
BBC News	Blackouts for Aberdeenshire householders hit by storms	14/08/2012	Power dip in the transmission
STV News	Aberdeen charity's stock destroyed after summer deluge floods premises	19/07/2012	Somebody Cares was hit by flood
Evening Express	Heavy rain floods Aberdeen businesses	19/07/2012	homes and business flooding and difficult driving condition
Met Office	Winter storms	08/01/2012	Fallen trees, train disruption
BBC News	Scotland storm: Oil vessels broke anchors in winds	09/12/2011	Secure two linked oil vessels, trees fallen & air disruption
BBC News	Scotland storm: Work to restore power to homes	09/12/2011	Two families were evacuated from a tenement in Kincorth
STV News	60,000 without power as storm turns to blizzards	08/12/2011	Train disruptions
BBC News	Scotland storm blackout hitting thousands	08/12/2011	Heavy wind causes travel disruption

BBC News	Damage as high winds hit north east of Scotland	08/12/2011	Part of a main wall of a building collapsed and christmas lights came down
BBC News	Report: Scotland's winter winds	07/12/2011	Slow train service throughout Scotland due to high wind
BBC News	Flood-risk Huntly residents allowed home	08/08/2011	Scotrail trains were delayed due to flooding
BBC News	Flights cancelled as ash cloud heads towards UK	24/05/2011	Many airlines closes due to volcanic ashes
STV News	Aberdeen power cut hits 1100 homes	29/12/2010	1,000 homes without electricity
Essential Travel	UK airports closed due to snow	22/12/2010	Flights are delayed or in subject to cancellations.
Guardian	Snow and ice cause chaos as Christmas rush hit by transport delays	17/12/2010	Heavy snowfall made traffic a standstill and flights were disrupted
Guardian	Snow may prevent Christmas presents arriving on time, freight firms warn	17/12/2010	Postal deliveries will be delayed due to bad weather
STV News	North and north east in gridlock as snow takes over	17/12/2010	School closure and airport shut until 9.30am
BBC News	Snow problems in north east Scotland into 14th day	07/12/2010	14th day snowfall and school closed today
BBC News	Ninth day of snow problems in north east of Scotland	02/12/2010	School closures in the city.
Airplane Pictures	Scottish airports are closed due to snow – Edinburgh, Glasgow, Inverness, Aberdeen	28/11/2010	Airport closed for partial day.
Evening Express	Snow closes roads in Aberdeen area	26/11/2010	Road closures
Press and Journal	Snow causes Chaos on North-East roads	26/11/2010	Car Parking issue
BBC News	More than 160 north east schools affected by heavy snow	26/11/2010	School Closure
Daily Mail	Britain shivers as winter bites with widespread frost in the South and another cold snap just around the corner	21/10/2010	Disruption in traffic
UMAL News	Efficient recovery limits flood damage at Aberdeen College	10/10/2010	Flood in college

Heavy rain fall can cause flooding

Evening Express	Torrential rain and thunderstorms hit Aberdeen	10/08/2010	Flood in Bridge of Don and Clifton
BBC News	Aberdeen drivers warned of roadworks disruption	05/07/2010	Start of road repair
Evening Express	Aberdeen airport closed for third day	17/04/2010	Flights operation closed
STV News	Heavy snow to continue into weekend	29/01/2010	Cars stuck in a long queue at the South of Aberdeen
BBC News	Snow and ice disrupt UK travel ahead of Christmas	22/12/2009	Road and airfield disruption
Evening Express	Snow chaos closes roads and delays Aberdeen flights	21/12/2009	Closure of Aberdeen airport until 9am and disruption on roads
Evening Express	Aberdeen road closed after mystery hole opens up	10/12/2009	Hole appeared in George Street
Guardian	Floods hit Scotland, closing roads and forcing residents to evacuate	02/11/2009	River flood occurred in Aberdeen area
BBC News	Rain causes roads and homes chaos	04/09/2009	Heavy rain fall in the city
Telegraph	Excessive rain causes storm surges	08/08/2009	Persistant heavy rainfall lead to increased flooding as a result of storm surges
BBC News	Snow affects schools and travel	12/02/2009	School closure and road affected
Guardian	Snowy weather's latest wave brings delay and disruption	05/02/2009	Airport closed and congestion
Press and Journal	Two badly hurt after black ice chaos on roads	08/12/2008	Man cut free from Renault Clio after it crashed with a Volvo on South Deeside Road
Press and Journal	Traffic chaos as snow & ice hit roads around North East	29/10/2008	String of schools forced to close due to snow
Press and Journal	Gusts of up to 70mph hit the North East	27/10/2008	Gusts caused damage to homes forcing roads to shut
Press and Journal	Gusts of up to 70mph hit the North East	27/10/2008	Severe winds snapped tree on Skene Street & in Duthie Park. Fallen trees also closed roads near Airport
Evening Express	Wild weather hits for Easter Weekend	22/03/2008	High winds and snow batter north-east cancelling event
Evening Express	Spate of crashes as snow falls	03/01/2008	Accident on B9077 South Deeside Rd blocked westbound lane

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www.sniffer.org.uk, SNIFFER (accessed 19/02/2014).

Newspapers / Media Review (See dates and articles in Appendix 5.3)

Airplane Pictures

BBC News

Daily Mail

Daily Record

Essential Travel

Evening Express

Guardian

Mail Online

Met Office

Press and Journal

Scottish Express

STV News

The Huffington Post

UMAL News

Storm-force winds bring flooding, travel disruption and power cuts

7. Glossary

ACC - Aberdeen City Council

Adaptation – Changing the way we do things in response to expected changes in our climate

Adaptation Plan – A plan which identifies climate change adaptation needs and implements strategies and programmes to address those needs

CC – Community Councils

Climate Change – The term climate change refers to the changes observed in our climate over a longer time period. Most of the world's climate scientists are now sure that a rise GHGs in the atmosphere from humans burning fossil fuels is escalating the greenhouse effect and pushing up global temperatures, affecting our regional climate and local weather patterns

Community Risk Register – Assessment of risks in the emergency planning process

Fossil Fuels – Fuels such as coal, oil and gas, which were formed in the geological past from the remains of living organisms. These fuels release GHGs when burned and are finite so will run out

GHG - Greenhouse Gases warm the earth by reflecting heat back to the earth's surface. The main GHGs are carbon dioxide, methane and nitrous oxide and one way they are released is through burning fossil fuels

GEPU – Grampian Emergency Planning Unit

GIS – Geographic Information System

Industrial Revolution - The Industrial Revolution was the transition to new manufacturing processes in the period from 1760 to 1840. This transition included going from hand production methods to machines and the change from wood to coal.

IPCC – Intergovernmental Panel on Climate Change

LCLIP – Local Climate Impacts Profile

Qualitative – Descriptions or distinctions based on some quality rather than quantity

Quantitative – Of a measurement based on quantity or number rather than some quality

SEPA – Scottish Environment Protection Agency

SNIFFER – Scotland and Northern Ireland Forum for Environmental Research

Subsidence – The process by which land or buildings sink to a lower level

UK CIP – United Kingdom Climate Impacts Programme

WMP – Winter Management Plan

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