

# Counting the costs of extreme events – an Aberdeenshire case study

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## Executive summary

### Background

Extreme weather events can result in significant costs across a range of local authority services. Research indicates that extreme events will increase both in frequency and intensity with a changing climate, so it is critical to explore the cost and benefit of different adaptation responses.

As a first step in this process ClimateXChange has been working with Aberdeenshire Council to explore the economics of adaptation, and how the Council might use cost information for practical decision-making and planning processes across local authority responsibilities.

This report draws on lessons learnt from dealing with the flooding of winter 2015/2016. The flood had significant impacts across Aberdeenshire, and were in some cases unprecedented. At the time of writing it is too early to estimate the total cost. The project explores the costs of dealing with the impact of the flooding, and suggests possible tools to support better informed decision-making. Evidence was gathered at a workshop with Council staff and analysed in the context of current literature.

### Key findings and recommendations

- Understanding current costs is an essential starting point in identifying future trends and planning adaptive action for a changing climate in the longer term.
- There are different approaches to climate change adaptation, but climate change affects (almost) all departments and should be considered consistently across all services.
- 'Event-specific' financial cost centres are a useful way of linking tasks (and their costs) to events, although robust processes are required to avoid double counting and to ensure that indirect costs are not overlooked.
- We recommend that public bodies establish an 'event-specific' financial cost centre when an extreme weather event occurs. At a minimum this should include the action category; a brief description; and an indication of expected cost.

## Introduction and rationale

Research from the Met Office has confirmed that there is a strong link between climate change and recent extreme weather (Met Office 2016), and projections shows that these events will increase in frequency and ferocity (IPCC, 2012). Local authorities need to understand how much these events cost them and how they could invest to reduce that future cost. The aim of this research was to explore how the economics of climate change adaptation might help public bodies in Scotland to plan effectively for the future. Improving how we capture information can help us to understand how to best react to extreme weather and improve our resilience.

ClimateXChange is supporting Aberdeenshire Council in considering how they might adapt to a changing climate. This second phase builds on earlier work (Wreford et al., 2016) that focused on understanding how current expenditure on weather-related events can be quantified. We found that while such events can be very expensive, calculating a full estimate was impossible due to the lack of available data.

Initial analysis of the December 2015 rainfall in the UK shows that the influence of climate change made the record rainfalls 50-75% more likely than without climate change (climateprediction.net, 2016). And flooding is not the only risk - projections for Scotland suggest a higher likelihood for heat waves, droughts and cold snaps. Given this evidence, many vulnerable countries, regions and cities have accepted that (some) adaptation is inevitable (Swart et al., 2014), the key aim of which is to reduce vulnerability by addressing '...the ability or capacity or resilience of the system to cope, adapt or recover from the effects of those conditions', Smit ((2006), p. 286).

An important consideration, however, is how we manage uncertainty. Understanding current impacts helps us generate more reliable forecasts, in turn informing estimated costs of the adaptive action, and clarifying potential benefits that may only be realised in the distant future. Compiling data on the costs of extreme weather events can help frame the scale and extent of the challenge and inform adaptation decision making.

### This project

We used the case of the severe flooding in winter 2015/2016 in Aberdeenshire to explore the real costs of an extreme weather event in real time. Well-designed responses can protect against future damage; particularly as more frequent and more intense events are expected.

Our aim was to explore:

- 1) How data on the impact of weather-related events might be collected and costed for further analysis. The purpose here was to provide a tangible illustration of current and potential climate change impacts.
- 2) How such data might be used to support the development of an adaptation strategy and decision-making on adaptation action.

We held a workshop with Aberdeenshire Council staff, where participants shared their insights on how their department was impacted by the flooding, how they dealt with the impacts in the short-term, and possible approaches for preventing damage in the future.

## The flooding of winter 2015/2016 in Aberdeenshire

December 2015 was the UK's wettest month on record, with more rain than any other month since 1910. Heavy rain continued into January, falling onto already saturated ground (MetOffice, 2016). This caused flooding in many parts of the country, with some areas in Scotland being hit particularly hard. Aberdeenshire was severely affected: flooding was in some places the worst on record. The rivers Don, Dee and Ythan burst their banks, and there was a severe impact on transport systems in urban and rural areas, and on a wide range of services.

*Figure 1 show examples of the flooding in Aberdeenshire with roads being inaccessible, houses flooded and vehicles being washed away (Images from Aberdeenshire Council.)*



## Lessons from dealing with the flooding

The workshop and subsequent discussions with individual staff confirmed that the Council acted quickly to support the inhabitants of Aberdeenshire and protect infrastructure and assets. All departments across the Council were affected to some extent, and incurred costs for which data could be collected. The Housing Service evacuated two care homes (near the River Deveron and in Aberdeen) and residents in Council housing, finding temporary accommodation such as Bed & Breakfast providers. The Roads and Landscape Service

inspected bridges and roads as the event progressed, working with the police to prevent access where there might be a danger to life.

Flood water receded slowly through January but dealing with the aftermath continued to require significant staff time. By mid-February, one department estimated that they spent 75 per cent of their time on flood related work. For example, houses needed to be repaired for tenants to move back into and for 200 bridges that were affected, the degree of damage had to be evaluated individually. Private water supplies were tested to ensure they were safe to use and debris swept downstream to wash-up on the city beaches had to be removed by the Aberdeen City Council. Insurance claims for damaged Council assets had to be filed and the multitude of questions asked by citizens on what to do and what not to needed to be answered. Rivers were surveyed for significant changes in course and options for replacement paths and embankments prepared.

These are only a few examples of how the Council was involved. However, all departments were impacted in some way. Impacts might have been felt directly such as in the Housing Department with their housing stock, or in the department for Protective Services and Waste Management who were responsible for water quality for private wells. More indirect effects include staff postponing core work or those unable to come to work as their children's schools were closed due to flooding. Front-line and back-office staff were equally affected – websites had to be set up to support communications and manage applications for grant support, and several services deployed resource to assist businesses and advise the wider public on health issues. The positive response from staff was acknowledged by management and elected members but the effort had a significant impact on routine tasks.

### **Costing the impacts of flooding**

To gauge the financial impact of these extreme events we explored the sources of costs to the Council and how these might be captured. The focus here is on flood-related costs but it is important to be aware of potential costs of other weather events such as droughts and cold spells. We identified challenges in capturing all costs, partly because of the urgency of emergency spend, and partly because major reinstatement takes time to plan and implement after the event is over.

It is important to distinguish between capital cost and operational cost, which includes labour cost (i.e. wages, taxes and benefits paid by the Council). The latter can be challenging to record as it is sometimes difficult to differentiate between work that would have been carried out on a day to day basis and that specifically due to a weather-related event. This is particularly difficult for administrative and management staff, although we found that front-line staff in some services already record time at a 'job-level'. It is more straightforward where labour is required for repairs, for instance, but questions arise when attempting to capture the impacts of weather events more generally. Does a culvert need to be replaced because its normal lifetime is over or has it been worn out faster due to extreme weather? How would one attribute the amount of damage that is due to weather events? In practice, staff used their experience to decide whether certain repairs can be directly linked to extreme events (or changes in climate patterns over time) or normal wear and tear, although it may be possible to design a consistent approach for reference in future.

The most significant challenge lies in defining how staff spend their time. Job descriptions provide some insight into work duties but this is not sufficient to identify sub-tasks or the flexibility required for an emergency response. In addition, staff are generally not required to record the time spent on specific tasks – in normal

circumstances this would be an unnecessary bureaucratic burden. Also, in the case of the flood events, staff had the choice of claiming the extra hours worked or taking time off in lieu, with the latter not explicitly counted as working hours. Additionally, postponement of routine tasks also incurs an extra cost. Staff might not have been able to come to work because they were flooded themselves or schools were closed, thus their staff time is lost. At the same time, there is the risk that some costs are double-counted.

The Scottish Government provides retrospective support through the Bellwin Scheme<sup>1</sup>, which reimburses local authorities for some of their costs over a pre-defined threshold (see Wreford et al 2016, 10). This means that processes have been developed for capturing some costs, but the terms of the scheme are tightly defined and not all expenditure will qualify under a claim. Workshop participants – particularly staff involved with compiling insurance and Bellwin claims – agreed there was potential to improve how costs are recorded, but this must not be time consuming. It was also observed that the process for gathering cost data appears to have improved substantially since a previous claim was made following the 2012 flood event.

### **Event specific cost-centres**

Several departments such as Housing, and Protective Services and Waste Management had introduced ‘event-specific’ cost centres (i.e. codes to which specific tasks are attributed that can be specifically related to extreme weather events). These cost centres were kept open while the departments grappled with the impacts of those events.

In response to the scale of the event, a spreadsheet for the total costs to the Council was developed as a priority by Business Services. It was completed by all departments to collate all costs related to the flooding, and an attempt was made to differentiate between costs that were eligible under Bellwin and those that were not.

Based on analysis of the workshop discussions, and a review of the Bellwin claims, the table below lists possible data in an ‘event-specific’ financial cost centre. The aim should be to capture the full cost of reacting to an extreme weather-related event to understand the breadth and depth of the impact on an authority’s business and operations.

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<sup>1</sup> (<http://www.gov.scot/Topics/Government/local-government/17999/Bellwin>)

<b>Service</b>	<b>Capital and Operational Costs</b>
Infrastructure	Labour and materials dedicated to fix capital assets, including repair of roads, drains, bridges and culverts; removal of landslides and deployment of flood barriers
Housing	Time and materials dedicated to fix capital assets, including repair of council housing
	Provision of temporary accommodation for evacuated tenants
Economic Development	Time dedicated to help businesses to reopen and apply for assistance
	Economic impact assessment of event
Education	Time dedicated to reorganisation of school transport on disrupted bus routes
Planning	Time and materials dedicated to survey damages to path routes, repair paths and river banks and gather research data
	Time dedicated to develop guidance for citizens in coordination with other organisations
Property	Time and materials dedicated to fix capital assets, including stripping out, drying and reinstatement of Council properties
Business services	Time dedicated to coordinate Council's response to the event
	Time dedicated to legal support for the event
	Time dedicated to procure equipment relevant to the event
Social Work	Evacuation and support of tenants of Council property
Transport	Bus driver time for shuttle buses for relocation of residents
	Time dedicated to inspect the damages
	Time and materials dedicated to fix capital assets, such as repair and replacement of vehicles and equipment
Protective services	Advice to petrol filling stations for flood events
	Visits to properties with affected water supply or debris washed up on the property
	Recovery of items from the river
Finance	Time dedicated to coordinating the financial response and the overall cost of an event to the Council

*Table 1: A sample of the costs identified during the workshop*

It is unlikely that all climate change impacts, whether of extreme events or of changes in average temperature or precipitation, can be captured through a slight modification of a recording system. Yet, by compiling a significant portion of the costs, it may be possible to identify a trend without necessarily being able to specify the precise magnitude. It is also useful to be aware that analysis suggests that the recording process will deliver underestimates of real costs, and decision-making processes need to recognise any figures as conservative.

To understand climate impacts, we suggest that local authorities should have a dedicated cost centre for an extreme weather event collecting the following details as a minimum:

- The action category
- A brief description
- An indication of expected cost

The more data departments can collect on weather-related costs, both capital and operational, the more complete a picture the Council will gain. This is helpful in the short-term for Bellwin claims but also in the long-term to make informed decisions on adaptation investments. Extra work may be incurred by departments that do not normally record how staff time is 'spent' and the Council may therefore also seek to establish a data collection process that combines both interests.

Going forward, opening such 'cost centres' could be adopted as good practice across the authority, and extended to include other weather-related costs such as clearing roads from trees fallen on the road. It is worth noting that staff identified interesting differences in impact compared to the extreme weather event in 2009/10 which was caused by prolonged low temperatures and snow, and there may be further useful insights that can be gleaned here.

### **How cost information can be used**

The workshop discussions gave useful insight into the decisions that were needed soon after the event, as repairs were carried out. The Housing Service detailed reinstatement of housing with flood resistant measures such as routing wiring at a higher level and using 'waterproof' vents. This had an additional cost, but some elements were required to comply with new regulations and would save money should flooding reoccur. The footpath network suffered significant damage in some places, and while regular repair and maintenance may be justifiable, alternative adaptation options (such as moving sections to higher ground) may be required in the medium to longer term depending on the risk of recurrence.

### **Economic appraisal methods and climate change adaptation**

Using cost-benefit analysis (CBA) allows the costs of damage to be compared with prevention. Put simply, if the benefits of preventing flood damage (avoided damage) are greater than the cost of preventing it (adaptation measures), there is a strong argument that such measures should be implemented. These might include investments to improve the resilience of housing stock, and developing disaster risk plans and long-term strategies for climate change adaptation through flood management measures or managed retreat. However, we recognise that such decisions are set in a complex context of competing priorities and highly constrained finances. : Gathering the costs of flood events can be used as estimates for the expected benefits of the described strategies. .

Costing the impacts also helps the Council to communicate flood-related expenditure to the Scottish Government, which then has a better understanding of how severely local authorities are affected by extreme events, informing budget allocations on the national level. There is an added benefit of openness with the wider public on the cost of such events can also positively contribute to the transparency and accountability of the Council.

The workshop discussions considered the potential for adaptation actions, including long-term options for flood risk management measures to reduce the risk from flooding. We discussed the potential for culverts of a sufficient size for increased rainfall, and subsequent management of run-off on impermeable surfaces. In future, access to detailed data will improve understanding of the available options and support decision-making.

## Conclusion

This report recognises how difficult it can be to fully record the range and extent of the costs of damage from extreme events and the costs of adaptive action. Improving how we capture this information can help us understand both short and long term responses and adaptation to such events and improve our resilience in future.

The flooding of winter 2015/2016 caused significant damage in Aberdeenshire, impacting significantly on the Council's physical assets and services, and the staff responsible for their maintenance. This research has highlighted the importance of establishing 'event-specific' financial cost-centres for weather-related events as a first step, to develop a more comprehensive dataset of climate change impacts to assist decision-making. These results may benefit from a further phase of work examining the adaptation options that have been identified and analysing their potential costs and benefits to the Council.

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