Flooding in Perth: History, Impacts and Management

Background

Perth is a city located in the heart of Scotland and provides an important transport link between the Highlands in the North, Aberdeen and Dundee in the East and the cities of Glasgow and Edinburgh to the South. Perth was created a Royal Burgh between 1124 and 1127 by King David I and was given its status as a city in 2012.

The location of Perth on the banks of the River Tay was integral to its development in goods production and export. In the 16th and 17th centuries goods transported included animal hides, timber and fish but an increase in manufacturing related to agriculture facilitated the export of woollen cloth, leather goods and products made from horn. Through the 16th and 17th centuries metalwork and linen industries became established as the town grew. The industrialisation of Perth followed in the 19th century, while more recently the city has expanded westwards. Modern day Perth has become a centre for services and administration with employers such as Scottish and Southern Energy (SSE), NHS Tayside, AVIVA, and Royal Bank of Scotland locating here. Perth Museum and Art Gallery, The Fergusson Gallery, Perth Concert Hall, The Black Watch Museum and the RSGS’s visitor centre are key attractions, and a variety of retail outlets (both independent and chain stores) and range of cafes, restaurants and pubs can also be found in the city centre.

History of Flooding

The River Tay has been the source of a number of significant floods throughout the history of Perth, with 34 events recorded between the years 1210-1993. A varying degree of magnitudes can be attributed to these events. Some of the higher magnitude, low frequency events (1-in-100 year/1-in-200 year) and their impacts have been detailed below (Table 1). Details about the earliest events is limited. However, there are accounts of bridges being destroyed on two separate occasions (1210 and 1648). The highest impact events were in 1814 and 1993. The event of 1993 is the best documented of those recorded as it is the most recent of the major events during this period and has been the subject of more accurate and detailed studies.
Table 1 - Impacts of Selected Significant Floods 1210-1993

<table>
<thead>
<tr>
<th>Year of Flood</th>
<th>Flood Details</th>
<th>Impacts</th>
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<tr>
<td>1210</td>
<td>Heavy rainfall swelled the Tay, added to by spring tide. Melting of snow in the mountains also contributed to flood.</td>
<td>Bridge destroyed. Perth Castle destroyed</td>
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<tr>
<td>1648</td>
<td>Heavy rainfall.</td>
<td>Bridge destroyed</td>
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<tr>
<td>1774</td>
<td>Ice jammed under Perth Bridge, causing the water level to rise behind it, and rapid snow melt</td>
<td>Significant flooding within Perth, such as North Inch, South Inch, Blackfriars and part of the High Street. Damage to ships at Quay.</td>
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<td>1814</td>
<td>Ice blockage under Smeaton’s Bridge caused high flood levels with a 7m rise in water levels.</td>
<td>North Inch, Rose Terrace, Barossa Street, North Port, Castle Gable, South Inch all impacted by floods. Ships washed inland.</td>
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<td>1993</td>
<td>Heavy rain, and rapid simultaneous melting of snow in Tay and Isla catchments. Flow speed: 2,269m³/s. 6.48m rise in water levels.</td>
<td>Approximately 780 properties affected, railway damage and disruption, landslips caused by the saturation of soils. Total damage in excess of £10million (Black and Anderson, 1993). Socio-economic impacts e.g. stress, loss of business and property. YouTube Clip - 1993 flooding: <a href="http://youtu.be/jBQpxa3pOE">http://youtu.be/jBQpxa3pOE</a></td>
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Physical impacts caused by the flooding are detailed in all the major events, but the 1993 event also gives an insight into the socio-economic issues associated with major floods. A lack of preparedness for a flood was one of the first problems encountered, with residents feeling let down by insufficient warning and a lack of information on what to do in the event of a flood. In some cases certain groups of home owners felt left out by emergency services as assistance (Scottish Executive, 2007). Temporary housing had to be provided for many of those whose homes were extensively damaged in the floods. Organisation of re-housing and reconstruction and the family support services that were provided following this event were noted as having been gender-specific, with women taking on the burden of these roles (Enarson and Fordham, 2001). This led to psychological issues, including stress and depression. Some residents later commented that their elderly neighbours never fully recovered from the impacts of the flooding. A lack of communication and understanding in an event such as this can lead to the spread of rumours and panic, which is unhelpful when people are already under stress.

Finally, as well as having their homes damaged, many also experienced the loss of sentimental and irreplaceable items. As well as losing the physical items this, of course, can also have an impact on mental health.
Current Flood Risk Management

What are the main flood management techniques?

Following the 1993 flood local people soon realised that lessons should be learned in order to be better prepared to mitigate against potential flooding in future. Construction of improved flood defences was completed in 2001, which cost £25million. The work included culvert improvements, embankments, walls, 84 flood gates (including one main set of gates next to Smeaton’s Bridge (below)), raised ground levels, pipes, ponds and pumping stations. The flood protection scheme was built to provide protection from fluvial flooding of a 1-in-200 year level as well as a 1-in-100 year high tide. Perth also uses the natural environment as part of its protection from flooding, with parts of North Inch allowed to flood as part of the natural floodplain without major consequences. Utilising green spaces and natural landforms provides good practise for soft engineering mitigation. Land use planning also plays a key role in reducing flood risk with development limited in areas with a chance of a 1-in-200 year flood, while flood risk assessments are required to be carried out for developments in locations with a chance of a 1-in-500 year event.
Smeaton’s Bridge (left) and markings representing the height of previous flood events (right)

Elevated embankment at North Inch (left) and reservoir pump at South Inch (right)

Example of a flood gate near the Craigie Burn at South Inch Reservoir
Who is in charge of flood risk management in Perth?

Perth and Kinross Council work in conjunction with Tayside Fire and Rescue, Tayside Police, Scottish Water and Scottish Environment Protection Agency (SEPA) to reduce the impacts of flooding in Perth to properties, businesses and residents. While primary responsibility of property still lies with the individual, the council provides assistance and advice where appropriate whilst also working on flood risk plans. A pilot scheme in operation allows individual homeowners to buy products from the council which can help reduce the risk to their property. These products includes floodgates, airbrick covers, non-return valves, sump pumps for water removal and waterproofing sealant for property walls. In the event of a flood the council may also place sandbags, divert water flows and pump flood water away.


The Scottish Environmental Protection Agency (SEPA) play an important role in managing flood risk across Scotland. In recent years SEPA have carried out a National Flood Risk Assessment, launched interactive online flood risk maps and introduced a flood alert system which can provide warning of flooding in a given area. Floodline is a 24 hour telephone service provided by SEPA, which can provide advice on what to do before, during and after a flood.


As part of the Flood Risk Management (Scotland) Act 2009, Perth and Kinross Council are producing Local Flood Risk Management Plans to be published in June 2016 with the aim of reducing flood risk.
Climate Change and Flooding in Future

UK Climate Projections 2009 (UKCP09) was developed by the Meteorological (MET) Office as a tool for assessing UK-specific climate projections, providing in depth detail about the future climate in the UK both nationally and regionally. Projections for UK Climate are based on low, medium and high emissions scenarios with percentage probabilities of 10%, 50% and 90% for 2020s, 2050s and 2080s (produced by the Intergovernmental Panel on Climate Change (IPCC)). According to these scenarios, it is expected that summers in the UK will be warmer and drier, while winters will be wetter. An increase in the intensity of precipitation would also have an impact on flood risk. This means that Perth may see increased flooding during winter months in future. These projections are only models and as such should only be seen as a possible guide to future changes. Actual differences in climate may be different.

For more information on climate change please visit:

- IPCC - [http://www.ipcc.ch/index.htm](http://www.ipcc.ch/index.htm)
- UKCP09 - [http://ukclimateprojections.metoffice.gov.uk/](http://ukclimateprojections.metoffice.gov.uk/)

The use of Geographical Information Systems (GIS) has become an important tool in mapping flood risk. GIS is a computer system which allows large datasets to be captured, stored and displayed. GIS maps are divided into layers, beginning with a background map of an area onto which features such as contour lines and individual buildings can be added. Information can then be input into the system to model different scenarios of flood risk, for example, a 5m rise in river levels. Maps can be analysed and interpreted to inform policy decisions, planning and can help to identify and prepare vulnerable communities. Flood maps are increasingly being made available online for free to the public, such as those accessed through SEPA.

Conclusion

Perth has a history of extreme flood events with particularly severe events in 1814 and 1993. Impacts of these events included infrastructure damage, loss of property and belongings, movement to temporary accommodation and psychological impacts. The event in 1993 caused a change in the way flood risk was managed in Perth and current mitigation techniques incorporate flood defences built in response to the flood. Perth and Kinross Council provide flood protection products to homeowners as well as advice and support. SEPA monitor water levels and provide map information for current flood risk. Future projections suggest an increase in flooding in Perth, particularly in winter months. In response, Perth and Kinross Council are continually working with relevant authorities to reduce the impacts of flooding and Local Flood Risk Management Plans to be published in 2016 will provide more information on the ways in which Perth can reduce flood risk and prepare for potential flooding.
References


Useful websites

Perth and Kinross Council (Flooding) - http://www.pkc.gov.uk/flooding

SEPA - http://www.sepa.org.uk/

Scottish Government (Flooding) - http://www.gov.scot/Topics/Environment/Water/Flooding

Scottish Flood Forum - http://www.scottishfloodforum.org/

MET Office (Climate) - http://www.metoffice.gov.uk/climate-guide

Contact

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