

Institution: University of Hull
Unit of Assessment: C17: Geography, Environmental Studies and Archaeology
Title of case study: Assessing the Hull Floods of 2007: establishing future flood management and protection strategies for the UK and the region
<p>1. Summary of the impact</p> <p>Exceptional rainfall in June 2007 led to widespread flood damage in the UK; Hull was particularly badly affected with 8600 houses and 1300 businesses flooded, the closure of schools and cancellation of many events. At the instigation of the City Council, Hull University geographers produced two influential reports that explained how and why the flooding happened and what might be done to improve flood readiness for the future.</p> <p>The reports had impact at a national scale. They fed into the findings of the House of Commons Select Committee on Environment, Food and Rural Affairs (published 7 May 2008) and the Pitt Report (a Government Independent Review, published 25 June 2008), which were both tasked with addressing the summer 2007 floods. Significant elements of 'The Flood and Water Management Act' (2010), which was enacted subsequently, were informed by our research.</p> <p>The reports also impacted at the regional scale. Their findings were adopted by Hull City Council, the Environment Agency and Yorkshire Water. Therefore, our research also shaped several practical strategies to improve flood prevention policies and minimise danger, damage, distress and expense in future floods.</p> <p>2. Underpinning research</p> <p>The underpinning research addressed how the floods developed so quickly and why the structures designed to prevent flooding in the region failed. It combined the insights of physical and human geographers to establish what went wrong and to propose how water management can be improved for future flooding events. From the start the research was designed to be academically rigorous and relevant in policy terms: it had clear impact as a result.</p> <p>In July 2007 Hull City Council approached the University because of its established reputation in fluvial systems and environmental management and because they sought an independent, expert opinion on the flooding. An Independent Review Body (IRB) into the cause and effects of the June floods was the result. The Hull staff involved were:</p> <ul style="list-style-type: none"> • Tom Coulthard (Professor of Physical Geography, from 2005) who chaired the IRB; • Lynne Frostick (Professor of Physical Geography, 1996-2010; Research Professor, 2010-14); • Greg Bankoff (Professor of Modern History, from 2007). <p>The IRB also included representatives from the city council, community organisations and local industrial and commercial sectors. The research involved 30+ interviews, panel meetings, reviews of literature and reports, and field and site visits. The interim findings (24 August 2007) and the final report (21 November 2007) were edited and 80% written by Coulthard (Coulthard et al. 2007a, 2007b). The first report impacted particularly as it was the first research on the floods.</p> <p>At the regional scale, the key finding was that flooding was mainly caused by problems conveying drained water in sewers, plus the poor performance of three key pumping stations. In particular, an £200 million extensive re-design of the drainage system in 2001 had increased flood storage, but <i>reduced</i> pumping capacity. Further, a 2004 re-modelling of the 2001 system under-predicted flood volumes by 100%. The IRB research showed that the drainage system functioned sub-optimally in 2007 – causing much of the flood damage (Coulthard and Frostick 2010; Coulthard et al. 2007b).</p> <p>This research was also highly influential because it revealed a series of weaknesses in the systems for managing urban drainage nationally. The IRB reports demonstrated that:</p> <ol style="list-style-type: none"> 1) the UK had no robust warning system for localised pluvial flooding following heavy rain. The Environment Agency set up a warning system for fluvial flooding (due to increasing river flow) in 2000, but <i>pluvial</i> flooding was not addressed before 2007. The IRB exposed this oversight and proposed a suitable warning system for pluvial-flooding based on modelling rainfall patterns. 2) the '1 in 30 year events' average, usually used in UK urban flood planning, is not appropriate in all regions – and especially not in low lying regions with little natural drainage like Hull, where

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additional measures are required.

- 3) the structure of the UK water industry (with local authorities, the Environment Agency and privatised water utility companies controlling separate parts of the system), left no single agency with overall responsibility for managing urban flooding. This dispersed management also hinders the development of better flood responses (Coulthard et al. 2007b).

All three findings contributed to the 2008 Pitt Review that, in turn, shaped 'The Flood and Water Management Act' (2010) and a series of government initiatives to improve flood prevention and mitigation across the country.

In addition, this research evolved into four RCUK-funded projects, which explore the policy and practical problems that the floods exposed. Developed along with former colleague Graham Haughton (Professor of Human Geography, 2000-2010), these projects address the social, political and technical issues exposed by the IRB reports. They propose solutions to living with flood risk and the engineering limitations of flood management (Bankoff 2012; Haughton et al. 2010; Helsloot et al. 2012). They also demonstrate the quality of the underpinning IRB research and they promise to deliver future impact for this continuing work.

3. References to the research

Key research outputs:

- Bankoff, G. (2012) The "English Lowlands" and the North Sea Basin System: A History of Shared Risk, *Environment and History*, 19, 3-37.
- Coulthard, T. and Frostick L. (2010) The Hull floods of 2007: implications for the governance and management of urban drainage systems, *Journal of Flood Risk Management*, 3, 223-231.
- Coulthard, T., Frostick, L., Hardcastle, H., Jones, K., Rogers, D., Scott, M. and Bankoff, G. (2007a) *The 2007 floods in Hull. Final report by the Independent Review Body*, 21 November 2007. Hull City Council, 68pp. <http://www2.hull.ac.uk/science/PDF/geogfloodsinhull3.pdf>.
- Coulthard, T., Frostick, L., Hardcastle, H., Jones, K., Rogers, D. and Scott, M. (2007b) *The 2007 floods in Hull. Interim report by the Independent Review Body*, 24th August 2007. Hull City Council, 36pp. <http://www.coulthard.org.uk/downloads/floodsinhull1.pdf>.
- Haughton, G., Bankoff, G. and Coulthard, T. (2010) Flood risk management, regions and the environment, in *Regions and Environment* conference proceedings, Bibby-Larsen, L. (ed.) Regional Studies Association, Sussex.
- Helsloot, I., Bankoff, G. and Groenendaal, J. (2012) Dealing with Citizen Response and Evacuation during Large Scale Flooding in Industrial Societies, in Bierens, J. (ed.) *Handbook on Drowning*, Dordrecht: Springer.

Grants awarded:

- Coulthard, T., *Flood Prevention via Sustainable Solutions for Roadside Gully Cleansing*; £58,000, EPSRC CASE, Partner: Univar Ltd., (2009-2012).
- Haughton, G., Coulthard, T. and Bankoff, G., *Sub-Contracting Risk: Neoliberal Policy Agendas and the Changing Nature of Flood Risk Management*; £90,000, ESRC research grant (2008-2011).
- Haughton, G., Coulthard, T. and Bankoff, G., *Rethinking the spaces and institutions for the governance of flood management*, £58,000, ESRC CASE, Partner: Hull City Council (2008-2011).
- Haughton, G., Eden, S. and Gibbs, D., *Flood Risk and Economic Development*, £58,000, ESRC CASE, Partner: Environment Agency (2008-2011).

4. Details of the impact

The Independent Review Body (IRB) research [1] impacted upon legislation and policies, and upon strategies for flood prevention and response, at both the national and regional scales.

In national legislative contexts, the research impacted with significance and reach:

Coulthard briefed Pitt and his team formally, at length and in person on their Hull visit in 2007. The IRB reports fed directly into the subsequent Pitt Review (2008) [2]. Coulthard also influenced legislation via evidence to a House of Commons select committee on flooding (on 14 November 2007) [3]. As a result of this input, IRB recommendations can be traced through 'The Flood and Water Management Act' (2010) and into subsequent government initiatives. In particular:

- the formation of the £7.7 million National Flood Forecasting Centre (FFC) in April 2009 provided

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a mechanism for warning of surface water (pluvial) flooding. The IRB's first recommendation highlighted the lack of a robust national system for pluvial flood warning [1, p.3]. This recommendation was repeated in the Pitt Report and then addressed by the creation of the FFC. In December 2008 the Government also provided £8.5 million to improve the Environment Agency's flood warning and mapping, and £7 million for other flood protection [4];

- the Flood and Water Management Act (2010) also gives the Environment Agency overall responsibility for all flooding (including surface water flooding) in the UK. Local authorities are now responsible for the control of regional surface water drainage (under the Environment Agency's auspices). This change responded to the IRB's third recommendation that there should be one lead agency for flood events [1, p.3]. This shift in responsibilities is implemented through the production of 'Surface Water Management Plans' (SWMPs): coherent, integrated plans to address flood risk and management in areas of high flood-risk [5]. The Government's December 2008 funding package also provided £15 million to improve coordination between local authorities in flood response [4].

The beneficiaries of these changes are potentially all communities and infrastructure at risk of any kind of flooding. Indeed, public interest in this topic is considerable and the IRB attracted significant national media attention including coverage by the BBC 1 *6 o'clock* and *10 o'clock News* (24 August 2007; 21 November 2007); three documentaries, including Channel 4's *Dispatches* (3 December 2007); and BBC 1 *Look North* (25 September 2009; 25 June 2010; 13 June 2011). This coverage also demonstrates the reach of this research's impact.

In term of flood prevention and response strategies, the IRB research also impacted with both significance and reach at the regional scale.

- Hull City Council adopted all recommendations of the final IRB report, with implementation from 1 January 2008 [6]. New measures include regular meetings by stakeholders in regional flood risk (including Hull City Council, adjacent local authorities, the Environment Agency and Yorkshire Water). Hull City Council consulted the IRB authors extensively about this process and Coulthard participated in early rounds of this local flood governance and management.
- The IRB also shaped a report into the floods by OFWAT - the national water regulator. The OFWAT report drew heavily on the IRB research and noted that it was "committed to review the issues that the Hull Independent Review Body report raised" [7]. OFWAT therefore demanded responses from Yorkshire Water about their failure to prevent the flooding. This public scrutiny, and the explanation, accountability and actions that OFWAT demanded from Yorkshire Water, were driven by the IRB research [7].
- In turn, Yorkshire Water had advance sight of the final IRB report and, on 23 November 2007, two days after it was published, they made a public promise of a £16 million investment to improve Hull's pumping stations (investment began in February 2008) [7]. We believe our scrutiny of Yorkshire Water in the high profile IRB report prompted this quick response.
- The Surface Water Management Plans (SWMPs) required by 'The Flood and Water Management Act' (2010) also generated local impacts. Hull was one of five SWMP trial areas (and Coulthard sat on the steering committee) [8]. SWMPs responded to the call for connected governance and planning that the IRB advocated (and which informed Pitt and the 2010 Act). As a result, the Hull SWMP is a robust plan for regional flood risk and management [9]. The document includes information directed at investors and developers so that they may incorporate flood risk into their planning. The SWMP also notes the projected savings in future floods, if the SWMP recommendations are adopted. For the Derringham Ward in Hull alone these savings range from £1 million to £15 million [9: Hull SWMP 2009, p.40].
- The IRB also recommended creating 'Aqua Green' sites of open space that would temporarily retain surplus water in flood scenarios. Hull City Council adopted this recommendation and commenced a £330,000 pilot project to produce these sites in December 2008 [10].

The UK floods of 2007 damaged over 55,000 homes and cost an estimated £3 billion in insurance claims and costs [2]. In Hull, one person died and the community, public and business sector all suffered financially. Damage to council houses and schools totalled £200 million, 1,300 businesses were affected and school closures cost an estimated £2.4 million for 114,400 lost school days [1, p.5, p.16]. The changes to regional flood defences and pumping stations recommended by the IRB resulted in more than £16 million being invested into Hull's water-management infrastructure.

These measures reassured the insurance sector and, by extension, development can continue in this flood-risk area. This will all benefit local communities and businesses - but this very significant impact is outweighed still more by the savings promised by preventing future floods and their costs.

Although the IRB research might at first appear limited to the region, it nevertheless impacted on national policy and legislation. This happened due to the IRB identifying deficiencies in the structures of UK-wide flood management, and due to its recommendations being included in the Pitt Report and leading to major changes in national flood risk management and governance. The IRB research was designed to be policy relevant. Our impact therefore stretched across the national and regional scales and had both reach and significance at each.

5. Sources to corroborate the impact

[1] Independent Review Body (2007) The June 2007 floods in Hull, Final Report:

<http://www2.hull.ac.uk/science/PDF/geogfloodsinhull3.pdf>.

[2] Pitt, M. (2007) *Learning lessons from the 2007 floods*, [Interim Report](#) [shows how the IRB fed into the Pitt Review: p46 (lack of coordinated flood management); p51 (plans for '1-in-30 year' floods as insufficient for areas like Hull); p51 (lack of integrated flood plans and management systems); p92 (conceptual frames from the IRB about 'hard' and 'soft' infrastructure, and 'essential services' that were adopted by the Pitt Review); p103 and 105 (the IRB's critique of Yorkshire Water's lack of a backup plan for pumping stations under strain from severe flooding). Pitt, M. (2008) *The Pitt Review: Lessons learned from the 2007 floods*: [Pitt Review Final report](#) [shows how IRB findings fed into the Pitt Review: p97 (on the lack of adequate planning and the IRB's role in exposing Yorkshire Water's role); p408 (on the IRB's role in exposing the inadequate design, maintenance and operation of Hull's flood-water pumping system); and acknowledgements (the role of Hull University and Coulthard in contributing to Pitt's understanding of the 2007 floods).

[3] House of Commons EFRA select committee (2008) *Flooding* :

<http://www.publications.parliament.uk/pa/cm200708/cmselect/cmenvfru/49/49.pdf> [proving that the IRB report was taken into account in proceedings (p36), and that Coulthard was a witness (p50)].

[4] National Flood Forecasting Centre: www.fcc-environment-agency.metoffice.gov.uk/about/

[showing the FFC was set up due to the Pitt Review]; on new government funds, December 2008: <http://archive.defra.gov.uk/environment/flooding/documents/risk/govtresptoppitt.pdf> [pp.18-20].

[5] DEFRA archive *SWMP pilot studies - Hull* :

<http://archive.defra.gov.uk/environment/flooding/manage/surfacewater/swmppilothull.htm> (the final report ([Hull SWMP](#)) shows how the IRB's recommendation on 'aqua greens' were adopted nationally (pp 5 and 7) and the role of the University in establishing and advising on the SWMP)].

[6] Chief Planning Officer, Hull City Council, will confirm the Council adopted all the IRB's recommendations. Establishing political impact is difficult. To this end Alan Johnson MP (Hull West and Hessle) and Diana Johnson MP (Hull North) have indicated that they will be pleased to corroborate our impact in the region and nationally through Parliament.

[7] OFWAT's page on the Hull floods: www.ofwat.gov.uk/sustainability/prs_web_hullfloodstate, including the WRc plc (2008) *Hull Flooding June 2007: Expert Opinion for OFWAT*:

[http://www.ofwat.gov.uk/legacy/aptrix/ofwat/publish.nsf/AttachmentsByTitle/rpt_com_hullflood2007wrc.pdf/\\$FILE/rpt_com_hullflood2007wrc.pdf](http://www.ofwat.gov.uk/legacy/aptrix/ofwat/publish.nsf/AttachmentsByTitle/rpt_com_hullflood2007wrc.pdf/$FILE/rpt_com_hullflood2007wrc.pdf) [corroborating the pivotal role of the IRB in informing the debate on responsibility for the floods (see especially p53)].

[8] DEFRA archive *SWMP pilot studies - Hull* :

<http://archive.defra.gov.uk/environment/flooding/manage/surfacewater/swmppilothull.htm> [The 'Final Report' ([Hull SWMP](#)) shows how the IRB's recommendation on aqua greens were adopted and the role of the IRB in establishing and advising on the SWMP].

[9] Hull City Council page on flood responses [including the SWMP in section: 'The surface water management plan and appendices']:

www.hullcc.gov.uk/portal/page?_pageid=221,638936&_dad=portal&_schema=PORTAL.

[10] Hull City Council (2008) *Finding a solution to flooding*:

http://static.hullcc.gov.uk/hullinprint/archive/december2008/finding_a_solution.php [corroborating that the City Council adopted Recommendation 3.11.4 on 'aqua greens'].