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BRIEFING



Natural

ASSETS NORTH

FLOODING IN THE NORTH

Jack Hunter

December 2019

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Registered charity no: 800065 (England and Wales),
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This briefing paper was first published in December 2019. © IPPR 2019

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ACKNOWLEDGEMENTS

This is the third report in IPPR North's Natural Assets North programme, which has been jointly co funded by United Utilities, Yorkshire Water, Hull City Council, Natural England, and the Environment Agency.

The Natural Assets North programme explores the interaction between natural assets, people and the economy in the North, identifying the North's natural capital assets and identifying opportunities to demonstrate and increase their value.

The author would like to thank everyone who took part in our 'walk-and-talk' roundtable in Hull to discuss issues of flooding and the work done by the Living with Water partnership. Thanks also to those at United Utilities, Yorkshire Water, and Hull City Council who have offered comment and feedback on early drafts. The views in this report are those of the author alone.

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Citation

If you are using this document in your own writing, our preferred citation is:
Hunter J (2018) *Natural Assets North: Flooding in the North*, IPPR.
<http://www.ippr.org/research/publications/natural-assets-north-flooding-in-the-north>

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INTRODUCTION

Natural Assets North is an IPPR North project that investigates the natural potential of the north of England, including its landscape, water and coastlines. The natural capital of the North is immense, but its full potential is not yet being realised. This work is part of IPPR North's work on a Great North Plan.

This is the third in a series of Natural Assets North briefings. It considers the increasing risks posed by flooding to the Northern economy, which are being exacerbated by climate change and historical decisions about development and land use.

It draws on conversations from a series of walk-and-talk events that took place across the North; in particular, a visit to Hull to learn about the Living with Water partnership.

Lessons from this briefing paper will inform an overarching final report, which will set out in-depth recommendations for policymakers.

Flooding is a devolved matter and this briefing paper covers England only, although there may be relevant lessons for other UK nations.

FLOODING IN THE NORTH

Flooding in the north of England is an urgent and important issue. The month before this report was published, parts of South Yorkshire, as well as Derbyshire, Nottinghamshire and Lincolnshire experienced very high levels of flooding that led to widespread damage and disruption.

This flooding began in early November, after many parts of the region had experienced significantly elevated rainfall. For example, Sheffield had 84mm of rain in just over 36 hours – almost the equivalent of the monthly average for Yorkshire.¹ Reports of disruption included shoppers forced to spend the night inside Meadowhall shopping centre in Sheffield and the closure of railways, parks, and roads, including junction 34 of the M1.

These floods are the latest demonstration of an unavoidable fact: many parts of the north of England are highly vulnerable to flooding. In recent years, parts of the north of England have seen several significant flooding events that have had major effects on people's lives and the North's economy.

2007 SURFACE WATER FLOODS

On the 15 and 25 June 2007, two separate days of intense rainfall overwhelmed drainage systems across many parts of the country and led to extensive surface water flooding. In some places, areas of land were submerged for weeks until the drainage system had the capacity to process the extremely high volume of water.

Of the 48,461 homes that were flooded nationally, nearly half were in Yorkshire and the Humber and 8,600 were in Hull alone.

Effects in Kingston upon Hull

- 92 out of 99 schools were affected (65 primary schools, 13 secondary schools, 10 special education units and three nurseries).² The timing of the flood occurring in June meant that the school year was almost over and so recovery and repair could be carried out over the summer school holidays.
- Over 1,300 business were affected. Some, where only building fabric was impacted, were able to recover more quickly, but many struggled to continue operating, especially where stock and production facilities were impacted.
- The Hull Flood Fund was established to help residents recover from the damage caused by flood waters in their homes. In total £305,000 was raised to help people buy essential household items like carpets, sofas and kitchen appliances. £1 million was also charitably donated and the Red Cross donated £720,000 to Hull as part of the National Flood Appeal, which was used to fund essential support services and physical labourers to remove damaged items from flooded homes.

Couthard et al (2007)

1 See: <https://www.theguardian.com/environment/2019/nov/12/flooding-caused-by-poor-management-and-floodplain-building>

2 Across the Yorkshire and the Humber region, the total number of schools affected was 198.

2013 NORTH SEA TIDAL STORM SURGE

On 5 December 2013, a storm surge moved southwards down the North Sea along the eastern coast of the UK, which caused tidal flooding in many coastal areas in the North East and Yorkshire, including Scarborough. The storm surge moved into the Humber estuary that evening, and caused flooding of large areas of low-lying land across the Humber region.

The Hull tidal barrier prevented the surge from moving up the River Hull, protecting the city and the river's wider catchment from potentially devastating flooding; the barrier had only 40cm to spare from being overtopped. The surge did still manage to overtop existing flood defences along the Humber estuary and flooded 400 homes in Hull and East Riding of Yorkshire (Hull CC 2007). The areas in Hull that were affected by tidal surge flood waters were predominantly around the Albert and William Wright docks, with an estimated 115 businesses affected. This flood event occurred in the evening when most people had left work and hence were out of harm's way. Given the speed of flooding, it is anticipated that, if this event had occurred during the day, many people would have been caught in dangerous flood waters.

Long-term effects were experienced by business across the Humber region; for example, the cement works Cemex in South Ferriby, in North Lincolnshire, south of the Humber, was out of operation for a full year while it recovered. In other business premises, they were able to dry out and clean up relatively quickly, but where stock had been damaged then they also suffered long-term financial losses. Given the scale and size of the Humber region as a main economic area, there was a significant economic loss following this flood event.

WINTER FLOODS 2015/16

In December 2015, a succession of severe storms brought extremely high levels of rain across many parts of the north of England. Rainfall was particularly heavy in Cumbria – where new records were set for daily rainfall at several measuring stations (Barker et al 2016). Following a wet November, soils in many areas were already saturated, leading to high levels of run-off and record high river flows (Barker et al 2016; Burt 2016).

Flood defences in the region successfully protected 10,900 properties against flooding, however around 7,000 properties were reported as flooded.

On 24 December, following Storm Eva, a further 9,000 properties were reported as flooded over the Christmas period in Yorkshire, Lancashire, Greater Manchester and Merseyside, with an estimated 12,500 properties protected by Environment Agency flood defences (Environment Agency 2018). Carlisle was among the worst hit, with 1,930 properties affected while in Kendal, 2,140 were flooded (Marsh et al 2016).

The response to the flooding involved a huge range of organisations, including the Environment Agency, utility providers, fire, police, and other emergency response staff, military personnel, and the voluntary sector, who worked together to help those affected. A flood relief fund set up to assist people in Cumbria affected by the floods received donations of more than £10 million – of which £1.25 million went to help repair facilities not covered by insurance.³

3 See: <https://www.cumbriafoundation.org/2017/12/04/making-difference-cumbria-flood-recovery-fund-2015/>

However, despite these efforts, the 2015/16 flooding caused substantial economic, social and environmental damage.

- There were three fatalities associated with the floods.
- Approximately 21,000 properties were damaged by flooding, of which 16,000 were residential and 5,000 were businesses. A minimum of 3,600 households were forced to seek temporary accommodation. 50,000 people were without power across Cumbria and Lancashire.
- Travel by both road and rail was disrupted. In addition to disruption to important intercity links – such as the West Coast main line – many rural communities were effectively cut off by road closures, including collapsed bridges.
- Schools were closed, as was Lancaster University, with an estimated loss of 120,000 education days (Environment Agency 2018).
- There was considerable environmental damage as well as damage to agriculture (valued at a cost of £7 million).
- Insurance claims totalling £480 million were paid out to households affected by the winter flooding. This gives an average financial residential insurance claim of approximately £50,000 (ibid).
- The government committed about £200 million additional investment in repair and recovery work across the North, including work to rebuild bridges and transport links, funds for communities and businesses affected, and repairs to flood defences (Priestley 2018).

Overall, the Environment Agency estimate that the direct economic damage of the 2015/16 floods was likely to be in the range of £1.3 billion to £1.9 billion. This includes physical damage to residential and business property (approximately half of all economic costs), damage to utilities and transport infrastructure, costs to local authorities, and the costs of emergency response, temporary accommodation and temporary flood management measures.

Even this figure is likely to be a significant underestimate of total costs, because it does not include indirect disruption to the wider economy. One early estimate put the potential costs at up to £5 billion.⁴

COMMON THEMES: THE COST OF FLOODING

The flooding events of 2007, 2013, and 2015/2016 differ significantly in terms of their causes, and the areas in which they are most likely to occur. However, they demonstrate that high levels of flooding in areas of low resilience can incur significant costs to local communities, the taxpayer and the northern economy, including the following.

- **Economic costs:** In addition to the direct financial costs of damage to infrastructure and housing, the disruption caused by flooding can have a significant negative effect on local economies. One estimate of these costs, which are not always factored into the overall costs of flood management, suggested that twice as much is spent on dealing with the after effects of a flood than is spent on hard flood defences (Wheeler Francis and George 2016). This represents a wildly inefficient, and unjust, allocation of spending.
- **Health and social costs:** A study by Public Health England (PHE 2017) found that flooding can have long-term impacts on physical and mental health.⁵ Damage to people's houses, possessions and livelihoods can have significant and lasting effects on their financial security, particularly if they are uninsured.
- **Environmental costs:** Extreme flooding is associated with damage to natural ecosystems and loss of wildlife.

⁴ See: <https://www.blmforum.net/mag/flooding-economic-impact-will-breach-5bn-says-kpmg/>

⁵ See: <https://news.sky.com/story/people-living-in-storm-damaged-homes-50-more-likely-to-experience-mental-health-issues-11802555>

CLIMATE CHANGE IS INCREASING THE RISK OF FLOODING

We are now entering an age of environmental breakdown (Laybourn-Langton et al 2019), which is likely to have a widespread and significant effect on weather patterns in the UK. Alongside efforts to drastically reduce global carbon emissions, there is also a need to increase resilience to the forecast effects of climate change that is already occurring. The projected effects over the coming decades are likely to include hotter and drier summers, cooler and wetter winters, and increasing exposure to extreme weather events (ibid).

As explored in our second Natural Assets North briefing paper (Hunter 2019), this is forecast to lead to overall reduced water availability in the North, which will increase pressures on the supply of water for consumption by the public and industry, as well as the natural environment.

But, at the same time, climate change will also increase risk of flooding, particularly during winter (Watts and Anderson 2016), because of periods of sustained and heavy rainfall, and extreme weather events leading to tidal surges, and ultimately through projected sea level rises.

- Met Office analysis suggests that, although yearly total rainfall in many parts of the UK is decreasing, incidents of heavy rainfall are increasing. For example, the highest rainfall totals over a five-day period are 4 per cent higher during the most recent decade (2008–2017) compared to 1961–1990. Furthermore, the amount of rain from extremely wet days has increased by 17 per cent when comparing the same time periods. In addition, there is a slight increase in the longest sequence of consecutive wet days for the UK (Met Office 2019).
- The Environment Agency has identified that climate change is likely to increase flood risk in England from the four main types of flooding: fluvial (river), coastal, surface water, and groundwater.⁶
- The Committee on Climate Change estimates that, at a national level, a growing population and climate change mean that the cost of damage associated with flooding could increase by about 40 per cent by the 2050s if current management approaches continue as they are (Homes 2018).

INVESTMENT IN FLOODING RESILIENCE IS AN ESSENTIAL FOUNDATION OF THE NORTHERN ECONOMY

In the face of increasing flood risk, establishing a higher degree of flood resilience across the North should be considered central to policymaking in the region.

This is particularly true in the context of increased strategic discussions about the future of the region. The north of England has considerable and undeniable potential across a wide range of sectors that, with the right strategic planning and investment, will improve the lives of people in the region and benefit the UK economy. Now, after decades of underinvestment, there is a renewed interest from central government in the potential to improve living standards and rebalance the UK economy through investment in the North's £300 billion economy, including under the 'Northern Powerhouse' brand.

However, unless flood risk is managed appropriately, the potential for further economic, social and environmental costs of flooding may undermine the confidence of the North's leaders, its businesses, and those who want to invest in the region – with negative impacts on the overall health of the region's economy, and its population.

⁶ See: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/292928/geho0609bqds-e-e.pdf

A thriving northern economy depends on measures to build flood resilience. But there are other reasons to invest in flooding prevention and resilience, which can generate significant economic, social and environmental benefits. For example, major 'hard' flood infrastructure projects can provide jobs opportunities and stimulates skills demand. With the right design principles and engagement with the community, they can also provide a focal point for tourism and leisure. And natural flood management schemes, which are generally less well understood and implemented, can deliver a wide range of additional environmental and economic benefits, including improvements to water and soil quality, carbon sequestration and increased biodiversity, as well as increased tourism and recreation opportunities.

Achieving this will require understanding how a wide range of human activity – including land use, agriculture practices, urban development, architectural design – impacts on the overall flood risk of an area.

Therefore, ensuring a high level of flood resilience across the north of England is essential to ensuring the health of the North's people, its economy and its natural environment.

FLOOD MANAGEMENT FOR THE 21ST CENTURY

Flooding is a natural phenomenon that cannot, nor should not, be completely eliminated. Water must always go somewhere when it rains.

There are even considerable benefits to natural flooding. Flooding on flood plains, assuming it does not cause excessive damage to property and agriculture, can be hugely beneficial in terms of overall flood management across an entire river catchment; allowing these areas to flood naturally can reduce flood risk further downstream. Likewise, and although extreme flooding events can have a negative impact on natural ecosystems, the variation in water levels associated with flooding and drought conditions can be beneficial to natural ecosystems, not least by replenishing soil nutrients and providing lush habitats such as wetlands.

The aim of policy should therefore be to increase the overall flood resilience of households, businesses and the natural environment across the North as a whole – including seeking to mitigate damage when flooding does occur. There needs to be a shift in perspective: we need to learn to ‘live *with* water’ rather than against it. Policy can form one step towards achieving this.

To do so, we need a more comprehensive and system-wide approach to flood resilience in the North, which is not simply based on building barriers and other ‘hard’ infrastructure, but that addresses the whole range of factors undermining flood resilience.

THE FACTORS UNDERMINING FLOOD RESILIENCE IN THE NORTH OF ENGLAND

The shape of the land – including the contours of valleys, the shape of rivers and the height of land above sea level – plays a major role in determining the flood risk profile of different areas. This, alongside the weather, is hard, if not impossible, to change. However, alongside these factors, human activity also plays a huge part. In particular, the following factors play a significant role in undermining flood resilience in the region.

1. Land use in rural and upland areas

The ways that we use land has a significant effect on flood risk across a river catchment. Deforestation, overgrazing and intensive agriculture practices dramatically reduce the ability of the land to absorb water and increase soil erosion, leading to increased run-off during periods of heavy rainfall. Likewise, the straightening and dredging of rivers and streams for agricultural and development purposes increases the flow of water downstream, leading to an increased flood risk further down in catchments.

Further upstream, land management techniques in upland areas – including intensive stock grazing, peat farming and grouse farming, including the burning of heather moorlands – also have a significant and detrimental effect on the overall flood resilience of a river system.

On the other hand, a radical re-appraisal of land use, informed by the need to dramatically increase flood resilience, has the potential to bring significant benefits. Although evidence for natural flood management techniques at scale is still scant, there are many examples of its effectiveness through smaller projects

(Environment Agency 2017). For example, one Environment Agency modelling of flood risk in the River Don catchment area suggested that changes in agricultural land management at scale had the potential to decrease river flows by up to 10 per cent (ibid 2007).

There are also significant additional benefits associated with many natural flood management techniques such as tree planting and rewilding, including increased carbon sequestration, improved biodiversity habitats, and a more beautiful natural environment.

2. Spatial planning

The overall flood risk of a region, in terms of numbers of properties likely to experience a flood event, is determined by where homes and business are located. Over recent decades, decisions about housebuilding and development have been made with little consideration of the flood risk of the area in question, meaning that significant amounts of development has taken place in areas prone to flooding.

Local planning authorities should undertake a Strategic Flood Risk Assessment to fully understand the flood risk in the area and to inform local plan preparation. The National Planning Policy Framework,⁷ which sets out government's planning policies for England, states that "inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere".

Despite this, government figures suggest that, at a national level, the proportion of land changing to residential use that falls in the areas of highest flood risk⁸ has remained unchanged for decades.⁹

Spatial planning inevitably involves trade-offs between the costs and benefits of any proposed development. However, significant levels of housing development in high flood risk areas suggest that flood resilience is under-valued within the current framework.

3. Urban development

The way we design and build in urban areas tends to pay scant attention to how to become more flood resilient and not exacerbate flooding elsewhere. The proliferation of hard, impermeable surfaces such as tiled roofs, paved roads and concrete playgrounds has a highly negative impact on flood resilience, because it increases the volume and rate of surface run-off into wastewater and drainage systems at times of heavy rainfall.

There is no impediment to this within the current planning system: outside of certain designated areas (including areas of natural beauty and national parks), home- and landowners are allowed to pave over areas of gardens and driveways under 5m² without gaining planning permission. In addition, local authorities' enforcement of permitted development rules for larger projects is highly variable, primarily because of funding and capacity issues.

There has been very little integration of measures to mitigate the impact of run-off at times of heavy rainfall – through the use of sustainable drainage systems (SUDS), for example – because current policy does not put emphasis on it or prioritise it in new development, and it is therefore treated as an afterthought.

7 See: <https://www.gov.uk/government/publications/national-planning-policy-framework--2>

8 Land assessed, ignoring the presence of flood defences, as having a 1 per cent or greater annual probability of fluvial flooding, or a 0.5 per cent or greater annual probability of tidal flooding.

9 See: <https://www.gov.uk/government/statistical-data-sets/live-tables-on-land-use-change-statistics>

4. 'Hard' flood infrastructure

Measures such as river barriers, pumps, sluices, and culverts are designed to act as a final defence – along with property-level measures – that can direct water away from areas that would otherwise flood. This includes wastewater infrastructure (such as drains and sewers), which helps to carry away excess run-off at times of high rainfall, and which is managed and maintained by the respective water company for each northern region. These hard engineering structures are reaching their full capacity in some locations and other solutions are needed, including natural flood management schemes, to help alleviate the growing flood risk nationally.

Successful long-term flood management depends on a coordinated and strategic approach across a wide area – one that makes sense in terms of the geography of river catchment areas as well as political boundaries. The main features should include the following.

- A focus on increasing the **overall flood resilience of the entire catchment system**, rather than focussing solely on protecting the properties considered at highest risk. Within this, efforts should be focused upon preventative measures that reduce the overall flood risk.
- A **partnership approach** to ensure efforts to manage flood risk are coordinated and draw upon the resources and assets of a wide range of stakeholders, including those with statutory duties with regard to flooding such as the Environment Agency, local authorities and utilities companies. Consideration for flooding should also be built into decisions made by a wide range of institutions and people, including those with responsibility for strategic planning, developers, large and small businesses, and households.
- A consideration of **land use**. How land is used plays a critical part in both causing and helping to alleviate flooding. This includes land management in both rural and urban areas. As part of this, there should be far greater focus on – and investment in – natural flood management processes.
- Maximising the **economic, social and environmental opportunities** of all of the above.

However, the way that flood management is organised and undertaken in England undermines this approach. Various reports (Helm 2016; Wheeler et al 2016) have suggested that the way that funding is allocated, and accountability organised, is heavily skewed towards short term and reactive responses. This actively discourages a more systematic and strategic approach to flood management with natural flood management at its centre.

Likewise, the second statutory assessment of the National Adaptation Programme (2017) found that, although some action has been taken to address the risks from climate change, including important steps to fund and improve river and coastal flood defences, the UK was failing to tackle the risks of surface water flooding. It also found that the state of the natural environment was worsening, reducing its resilience to climate change.

There are many reasons why this is the case. Some of the main obstacles to more sustainable, comprehensive and effective flood management are explored below.

OBSTACLES TO BETTER FLOOD MANAGEMENT

The responsibility for flood protection in England is fragmented

There is a range of different organisations with legal duties regarding flooding in England, as defined by the Flood and Water Management Act 2010. To some extent, this is because flooding impacts on a range of different activities. However, the fact that responsibility for flood management is split between different agencies makes it hard to navigate and can skew incentives away from a more systematic approach.

Those with legal responsibility for elements of flood protection include the following.

- **The Environment Agency**, which manages the government’s investment to reduce flood risk from main rivers and coastal erosion and is accountable to the secretary of state in Defra. Since 2014, the Environment Agency has delivered its work across 14 operational areas that cover the whole of England – of which four are in the North (North East, Cumbria and Lancashire, Yorkshire, and Greater Manchester, Merseyside and Cheshire).
- **Local authorities (county and unitary councils)**, which, as ‘lead local flood authorities’, are responsible for local flood risk management, including surface and ground water flooding.
- **Water and sewerage companies**, which manage the risk of flooding within water supply and sewerage systems. Water and sewerage companies are regulated by OfWat, in accordance with the relevant legislation, and are legally obliged to maintain their sewers to ensure that their area is effectively drained.
- **Highways England**, which is responsible for providing and managing roadside drainage.
- **Property owners** (households and businesses) are responsible for looking after their own property, including drainage pipes that lie under gardens and driveways. In addition, those with land to rivers and streams are responsible for the maintenance of the watercourse itself and the flow within it. The financial liability for any flood damage also lies with property owners – with variable take-up in flood insurance across income groups.
- In low-lying areas, **internal drainage boards** manage water levels and undertake works to reduce flood risk to agricultural land, people and property.
- **Regional flood and coastal committees (RFCCs)** are strategic partnerships comprising members appointed by lead local flood authorities and independent members with relevant experience who are appointed by the Environment Agency. They work across a regional footprint (in the North there is one RFCC in each of the government regions of the North (North West, North East, Yorkshire and the Humber) and are intended to coordinate plans and spending to tackle flood and coastal erosion risks between different partners. The Environment Agency must consult with RFCCs about flood and coastal risk management work in their region and take their comments into consideration.

This patchwork of different agencies with varying geographies, remits, responsibilities, and accountability mechanisms makes collaborative approaches difficult. There is no single body that can coordinate this activity; although the Environment Agency is charged with ensuring a strategic overview to flood management across local areas, it lacks any powers to enforce this.

But this is changing. There has been significant progression in the levels of partnership-working between statutory partners in the past decade (Defra 2018), promoted through catchment partnerships,¹⁰ which build collaboration between different partners towards a single objective. And the legal framework is also shifting – for example, the water industry regulator, OfWat, has recently introduced a new focus on collaboration as part of its new strategy.

However, there are also limitations to the current approaches to partnership working. First, in most areas there is limited engagement with wider stakeholders, including those with powers over strategic planning (see next section). Second, decisions about investment can still be hamstrung by the fact that different organisations remain accountable for their own spend only. And finally, tensions over the responsibility for assets and liability in cases of flooding can make relationships between different organisations hard to develop further.

¹⁰ See: <https://catchmentbasedapproach.org/>

In the north of England, the institutional landscape also includes several metro mayors, who between them represent over half of the North's population. Most mayoral areas are predominantly urban, however most include some rural and upland areas. The geography of the North of Tyne mayoral combined authority is unique to the extent that it includes the predominantly rural authority of Northumberland, which includes within its borders the Northumbria National Park.

Mayors are important local figures who wield considerable 'soft' power to convene stakeholders. As democratically elected leaders, many mayors are also a figurehead for the local area more generally, and have begun developing wide-ranging strategies for their local economy and its population that encompass many areas of policy. With regard to flood resilience, mayors could help to build a broad coalition of different organisations, including anchor organisations such as universities and major employers, around a vision for how to reduce flood risk through collective action.

Strategic decision-making often overlooks issues related to flood management

As explored above, the flood risk of any given area is determined by a wide range of activities. There is always a large group of institutions and groups whose activities have a significant impact on the overall flood profile of their local area, but who do not have a legal duty to comply with concerns regarding flood resilience. Major public decision-making is often done in a way that is flood risk neutral at best – including spatial planning.

There is a growing interest in strategic planning and coordination at a northern level. This includes Transport for the North, which oversees strategic transport planning at a northern scale, as well as the N11 group of local enterprise partnerships (LEPs), and the N8 group of universities. There is also growing momentum behind the development of a spatial planning framework for the region – the Great North Plan – as well as spatial planning led at a combined authority level by mayors.¹¹

Treasury rules and the Green Book

In central government, the Department for Environment, Food and Rural Affairs (Defra) is the policy lead for flood and coastal erosion risk management in England. HM Treasury allocates funds to Defra for revenue and capital expenditure – which is evaluated for value for money according to the Treasury's Green Book criteria. This informs how the Environment Agency can allocate funds.

For example, the Green Book approach applies to specific projects on a stand-alone basis, rather than river catchments and water systems. Within this, projects are rated on measures which are focussed on those properties at most physical risk, therefore it does not provide a sensible way of evaluating what resources should be deployed where and to whose benefit (Helm 2016). There is also a bias towards capital investment, rather than revenue spending to maintain existing assets.

Current funding rules also do not consider more than one source of flood risk. This is a key issue for benefit apportionment in areas that are at risk from multiple sources of flooding. For example, if 100 homes which are at risk from fluvial and surface water risk are used to justify a capital scheme for a fluvial defence, these homes cannot be 'double-counted' and used to also justify a surface water scheme. This shows that not only does policy need updating to account for catchment scale schemes and benefits, but also to account for multiple flood risk sources.

The Green Book approach is also strictly economic in its focus – there is very little scope to account for the social and environmental impacts of investment. This is

¹¹ See: <https://www.ippr.org/publications/blueprint-for-a-great-north-plan>

important in a flooding context, given that different types of flood management techniques can have very different impacts upon the local area. At worst, they can disrupt natural river flows and negatively impact on the environment; at best, they can yield a number of positive benefits to health, recreation, and biodiversity.

The government's planned spending on flood defences heavily favours London and the south-east of England – constituencies in London and the South East account for 60 per cent of the government's planned funding.¹² Following the December 2013 tidal storm surge, the government initially only offered the 'repair and renew' grants in southern England, which was extensively covered by the media, and the North only received the grants after pressuring central government to issue aid fairly across England.

Austerity and local government funding

Despite several serious flooding events in recent years and the impact of climate change on the overall flood risk in many areas, funding for flood management has been substantially scaled back.

Government spending on flooding has decreased in real terms over the past decade. From 2010/11 to 2013/14, total Environment Agency spending on flood and coastal erosion management fell from £780 million to £622 million (2018 prices).¹³ In 2017/18, spending had increased to £741 million, which, accounting for inflation, still remains below its 2011 peak.¹⁴

As a result of cost-saving measures, the Environment Agency has shed 20 per cent of its workforce – equivalent to 2,500 full-time jobs. At the same time, Environment Agency staff have also transferred into Defra to provide corporate services, or to work on matters such as Brexit contingency planning.

The impact of austerity on local government has also undermined effective flood management measures. Revenue and non-grant eligible expenditure on flood management by local authorities is funded through the Revenue Support Grant, which is non-ringfenced, meaning individual councils can decide how much to spend, subject to limits on overall budgets and the need for investment in other priorities. The dramatic reductions in the Revenue Support Grant from central government have put pressure on local authority spending across the board – and has made it very difficult for councils to continue to invest the same amounts into flood management as they have done historically. Local authorities are legally obliged to fulfil their statutory duties regarding flood management – however, there is a substantial risk that local authorities will have to cut back on non-essential flood defence expenditure.

The North has been disproportionately affected by austerity cuts – with a knock-on effect for investment in flood management because other important issues like social care are prioritised.

In addition, plans to increase the proportion of council funding through retention of business rates mean that local tax revenues will become increasingly important funding stream for flood and coastal risk management activity. Although there is considerable variation within the North as a whole in terms of the local tax base, the impact of moving to the business rates retention scheme is likely to leave many councils in the North out of pocket – with knock-on effects for their ability to fund flood management activities.

¹² See: <https://www.carbonbrief.org/mapped-where-four-point-four-billion-being-spent-flood-protection>

¹³ Capital and revenue, adjusted for inflation.

¹⁴ See: <https://www.gov.uk/government/publications/spend-information-for-flood-and-coastal-erosion-risk-management-environment-agency/environment-agency-actual-spend-figures-2005-2006-to-2017-2018-england-only>

Agricultural land use and associated incentives

Given the importance of land use to the overall flood risk profile of an area, there is a strong case to ensure that the substantial financial subsidies that support the farming industry are designed in a way to incentivise, wherever it is beneficial, good land management practices that improve flood resilience.

In particular, funds directed through the Common Agricultural Policy (CAP) pillar 1 – which is given to landowners to keep land in productive agricultural use – strongly discourage farmers and landowners from employing natural flood management techniques. Subsidies also go to grouse farming. While there is support through CAP pillar 2 to support farmers who take measures to improve the environment on their land – some of which would have a positive effect in terms of flood resilience – this fund is significantly less than the funding available through pillar 1.

If the UK leaves the EU, there will be an opportunity to design a replacement for the CAP which addresses some of the issues with the current system.

It is also worth noting that issues around land use are also complicated by the question of who owns land. Public data on land ownership is incomplete, however it is estimated that the majority of land is controlled by a relatively small group of people (Shrubsole 2019).

The North is blessed with vast areas of upland, including the Peak District, the Lake District, large parts of Northumberland and the Yorkshire moors – which are – with the exception of Dartmoor and Exmoor – almost unique to England. With the correct management, upland areas can play a vital role in effective and sustainable flood management, as well as carbon sequestration, water supply and tourism and recreation (Longlands and Hunter 2018). However, much of the North’s uplands are in a poor condition. Certain land management practices in upland areas, including intensive stock grazing and grouse farming – the latter being associated with heather burning – have kept levels of natural vegetation artificially low. This has led to high levels of erosion and poor soil quality – both of which negatively impact the ability of the land to slow water flows.

Faced with these obstacles, the government acknowledges the need for change – to some extent. The requirement for a more comprehensive approach to flood management was identified as part of the government’s 25 year environment plan, in which one of the stated goals is “reduced risk of harm from environmental hazards such as flooding and drought” (HM Government 2018). As part of the policy measures intended to achieve this, the government stated its intention to reduce risks from flooding and coastal erosion by:

1. expanding the use of natural flood management solutions
2. putting in place more sustainable drainage systems
3. making ‘at-risk’ properties more resilient to flooding.

However, although these aims are welcome and laudable, the government’s environment plan lacks tangible commitments to making this happen. The Environment Agency is currently developing its National Flood and Coastal Erosion Risk Management Strategy for England, which will develop this further. However, the Environment Agency on their own, have limited powers to compel others to take action. Without engagement from across wider stakeholders it will be hard, if not impossible to overcome the numerous and serious obstacles to greater flood resilience in the face of a changing climate.

HOW TO ACHIEVE GREATER FLOOD RESILIENCE IN THE NORTH OF ENGLAND

In the face of the likely impacts of climate breakdown, there is a growing need for more a strategic and comprehensive approach to flood management based on an acknowledgement of the many ways that economic activity can impact on flood risk.

Such an approach should involve:

- a **strategic and system-wide approach** to flood risk management, drawing on a range of assets and behaviours, with a view to maximising the overall resilience of an entire catchment area
- a **broad partnership approach**, recognising that decisions made across the entire economy depend upon, and have repercussions for, the overall flood risk of the local area. Issues related to flood management should be a consideration in spatial plans at a regional and sub-regional level, and resource should be dedicated to building relationships with anchor organisations and to shifting public attitudes to water and flooding
- a **radical rethink of land use**, including much greater investment in and maintenance of natural processes for flood management.

There are already efforts taking place, including collaborative partnerships such as Living with Water in Hull and East Riding of Yorkshire, to develop a more integrated and comprehensive flood strategy at the local level (see box).

The Living with Water partnership, Hull and East Riding of Yorkshire

- Living with Water is a partnership initiative for Hull and East Riding of Yorkshire, intended to develop collaborative and innovative approaches to tackling flood risk across the region. The partnership, which is comprised of East Riding of Yorkshire Council, the Environment Agency, Hull City Council and Yorkshire Water, was formalised to incorporate a joint decision-making board in 2017, building on collaborative arrangements have been in existence since 2007.
- Hull and its surrounding area are unique in the extent and nature of its flood risk. The area is home to 260,000 people, as well as major national industries including for example Siemens wind turbine blade factory, Croda chemicals manufacturer, and nearby Drax power station, the biggest single site renewable generator in the UK and the largest decarbonisation project in Europe. However, 90 per cent of properties in the area are below sea level, posing particular challenges from coastal, fluvial and surface water flooding. Outside of London, it is the most vulnerable city for flooding in the UK.
- In addition, the city has lots of social housing, and pockets of high deprivation, low income and low education attainment – all of which further undermine the overall resilience of households because of low insurance take-up.

- In 2007, the city saw extensive flooding across a large area when heavy rainfall overwhelmed the drainage system. Consequent flooding caused widespread disruption, with damage to 7,208 residential properties and over 1,300 businesses, and the temporary closure of 91 out of 95 schools in the area. The Environment Agency estimated the economic costs of the flooding across all areas affected, including Hull and Humberside as well as wider parts of South and East Yorkshire, Worcestershire, Gloucestershire and Oxfordshire, totalled about £4 billion, of which insurable losses were reported to be about £3 billion.
- The Living with Water partnership is intended to align investment decisions between its four partners to help to build increase flood resilience across the entire water catchment, as well as to boost the city's economy and enhance health and wellbeing.
- As the name implies, the underlying philosophy of its approach is to develop ways to work with water, rather than against it. In practical terms, this means developing 'green' flood infrastructure such as flood plains and water storage lagoons alongside 'grey' infrastructure such as walls and flood barriers. It also entails working with businesses and communities to increase awareness and consideration of water across all walks of life. This includes the development of a new narrative for how Hull – which, as a maritime city, has always had a relationship with water and the sea – can make the most of the opportunities of water.
- To date, the partnership approach has coordinated £126 million of investment, with a further £66 million still to come. The Living with Water partnership is now considering how to use its power as an anchor to leverage greater business support for flood resilience. It is also working with schools and colleges on how to meet the future skills needs of the region, with regard to flood infrastructure and sustainable urban planning and design. It is also exploring avenues to self-fund its work and is considering setting up as a community interest company (CIC) to do so.
- One of the main factors in its success is the extent of senior-level engagement with the process. While other areas also have partnership arrangements in place for flood management, they are usually staffed by those with responsibility for the flooding portfolio – whereas in Hull, the Living with Water partnership board includes executive members with strategic decision-making powers.

The Living with Water partnership has successfully coordinated investment between different partners towards a single strategic aim of a more water-resilient Hull. It is also growing its influence, by bringing on board a wider range of stakeholders and exploring its future governance with a view to greater autonomy in future.

However, there are several features of the current policy framework, not least England's over-centralised system of governance, which make these efforts harder than they need to be. In order to move forward, we need to see change at multiple scales, including at the local, northern and national level. This are likely to include the following.

1. A recognition of the importance of flood resilience to the North

This should include consideration of how to ensure a more flood resilient North at a pan-regional level. The North has a distinctive physical and economic geography, as well as a post-industrial legacy, that makes it unlike most other parts of the country. In many parts of the North, people, businesses, industry and water are tightly clustered together in river valleys, separated by sparsely populated, often

modified, uplands. Conversations about the future of the North should include consideration of how to ensure its future resilience to flooding, in order that the region's economy, its people, and its natural environment are best placed to make the most of the opportunities of the 21st century.

Northern leaders should set out in unambiguous terms a commitment to embedding flood resilience into decision-making across the region, and at all scales. This should include an overarching strategic vision for the North to be an exemplar of flood resilience into the 21st century, with collaborative working arrangements at its core, alongside a pan-regional spatial plan regarding integrated land use management.

2. Greater local flexibility in funding for flood management

The way that flood management is funded in England is clearly not fit for purpose. We spend less money on preventing floods than we do fixing the damage that they cause – and the highly centralised nature of how funding is awarded, and accountability is maintained mitigates against the need for collaborative working at a system level. Future investment in the North's infrastructure should make the most of opportunities to boost flood resilience and, conversely, new flood schemes should be designed to maximise wider public benefits, rather than just as separate single purpose assets.

In order to overcome this, we need greater flexibility in funding for flood management. To address this, the government could consider the potential role for devolution of relevant funding streams to both a pan-regional and local level.

3. Aligned incentives for land use

How we use our land plays a significant role in the overall flood resilience of a catchment area. Many land management practices are exacerbating flood risk, as well as having a negative impact on water and soil quality and damaging natural habitats.

The Common Agriculture Policy (CAP) is clearly unfit for purpose and needs reform in order to encourage natural flood management, including rewilding at scale, and more generally to ensure that subsidies regarding land use are used for the public good.

In addition, policymakers should also consider ways to give communities a say and a stake in the natural environment around them, to ensure that their interests, and those of the North as a whole, are reflected in the way that land is used.

NEXT STEPS FOR NATURAL ASSETS NORTH

Full recommendations for how to develop a more joined-up and system-wide approach to the North's natural assets, as part of a thriving northern economy, will be set out in detail in our final report.

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