



Department  
for Environment  
Food & Rural Affairs



Llywodraeth Cymru  
Welsh Government

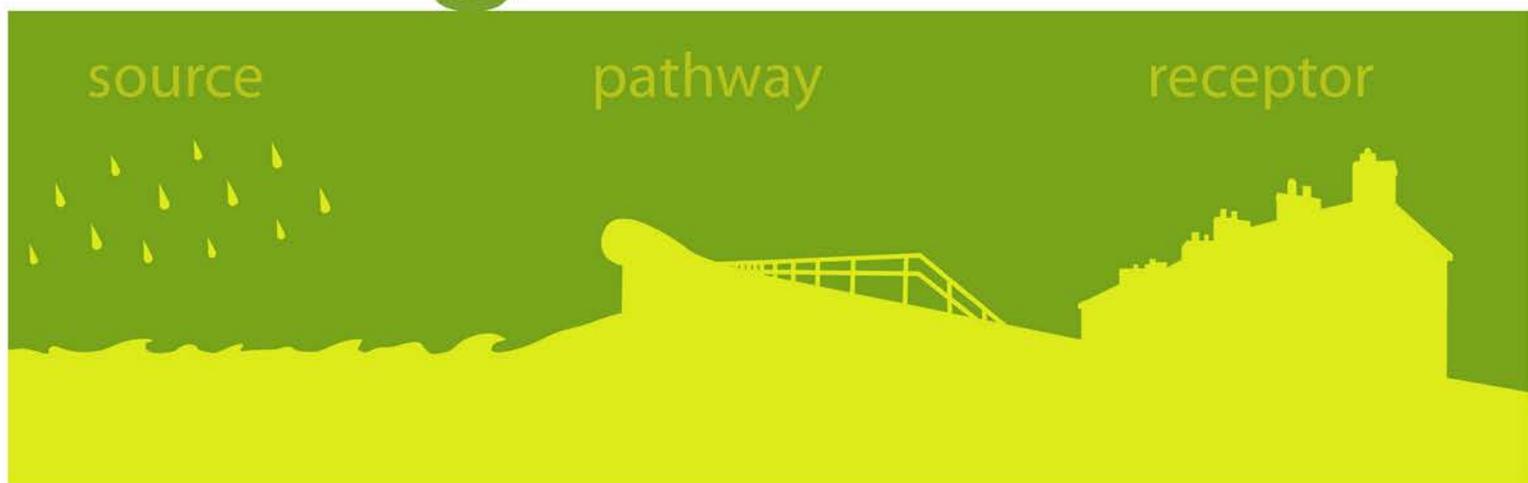


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# delivering benefits through evidence



## The costs and impacts of the winter 2013 to 2014 floods

Non-technical report - SC140025/R2

We are the Environment Agency. We protect and improve the environment and make it a better place for people and wildlife.

We operate at the place where environmental change has its greatest impact on people's lives. We reduce the risks to people and properties from flooding; make sure there is enough water for people and wildlife; protect and improve air, land and water quality and apply the environmental standards within which industry can operate.

Acting to reduce climate change and helping people and wildlife adapt to its consequences are at the heart of all that we do.

We cannot do this alone. We work closely with a wide range of partners including government, business, local authorities, other agencies, civil society groups and the communities we serve.

This report is the result of research commissioned by the Environment Agency's Evidence Directorate and funded by the joint Flood and Coastal Erosion Risk Management Research and Development Programme.

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# Evidence at the Environment Agency

Evidence underpins the work of the Environment Agency. It provides an up-to-date understanding of the world about us, helps us to develop tools and techniques to monitor and manage our environment as efficiently and effectively as possible. It also helps us to understand how the environment is changing and to identify what the future pressures may be.

The work of the Environment Agency's Evidence Directorate is a key ingredient in the partnership between research, guidance and operations that enables the Environment Agency to protect and restore our environment.

This report was produced by the Scientific and Evidence Services team within Evidence. The team focuses on four main areas of activity:

- **Setting the agenda**, by providing the evidence for decisions;
- **Maintaining scientific credibility**, by ensuring that our programmes and projects are fit for purpose and executed according to international standards;
- **Carrying out research**, either by contracting it out to research organisations and consultancies or by doing it ourselves;
- **Delivering information, advice, tools and techniques**, by making appropriate products available.

Miranda Kavanagh  
**Director of Evidence**

# Acknowledgements

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# Executive summary

This report quantifies the damages caused by flooding in England and Wales between December 2013 and March 2014. To calculate the damages the study team collected information through desk based research and engagement with a range of stakeholders.

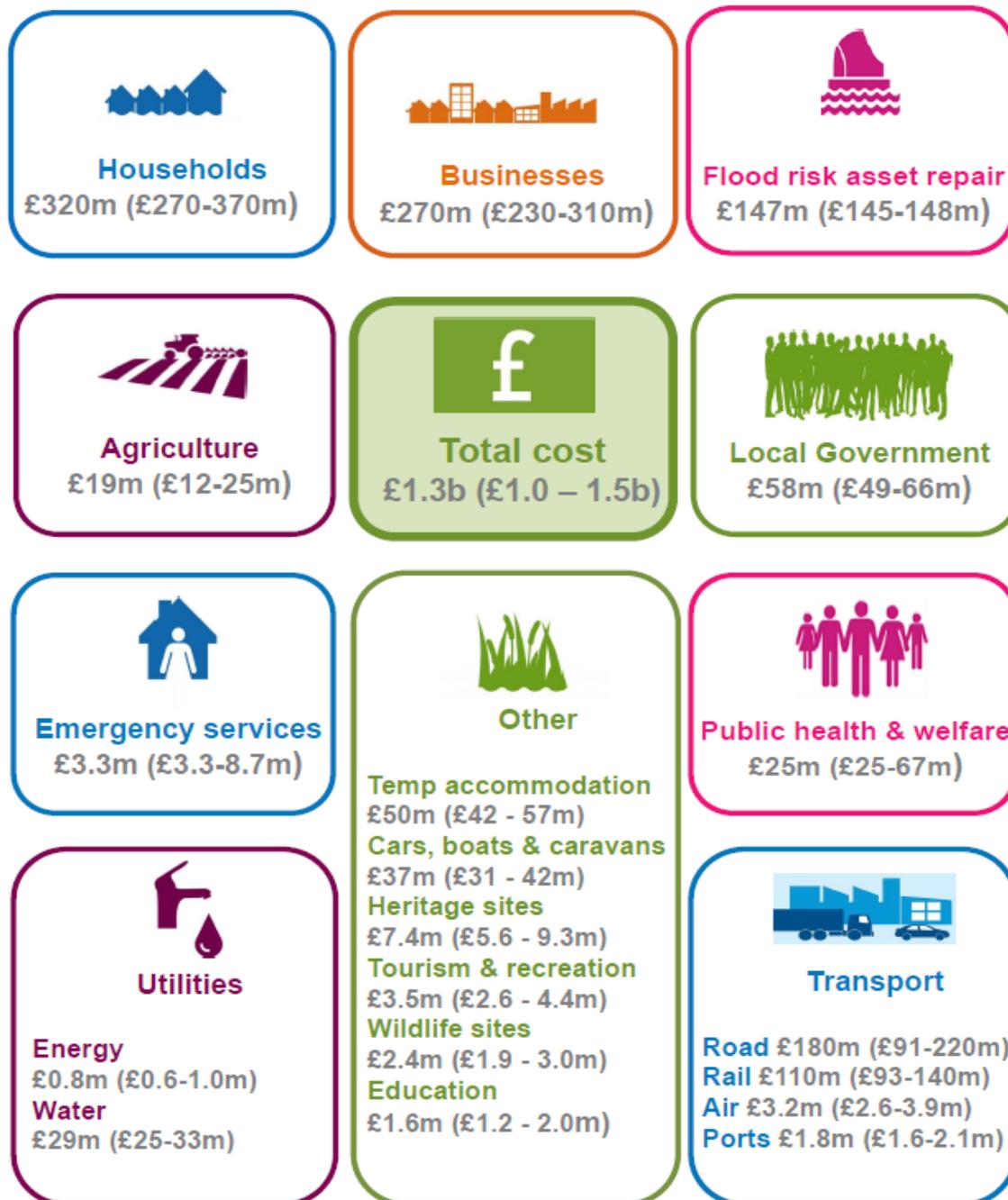
The **best estimate for the total economic damages is £1,300 million** in England and Wales, with a range to take account of uncertainty of £1,000 million to £1,500 million.

Damages in England accounted for 91% (£1,200 million, with a range of £930 to £1,400 million) and in Wales for 2% (£28 million with a range of £23 to £33 million).

A breakdown of the damage estimates by impact category is provided in the table below. The greatest proportion of damages was felt by residential property holders, with £320 million worth of damage incurred by up to 10,465 households.

## Damage estimates by impact category

### How much did the winter 2013-2014 floods cost England & Wales?



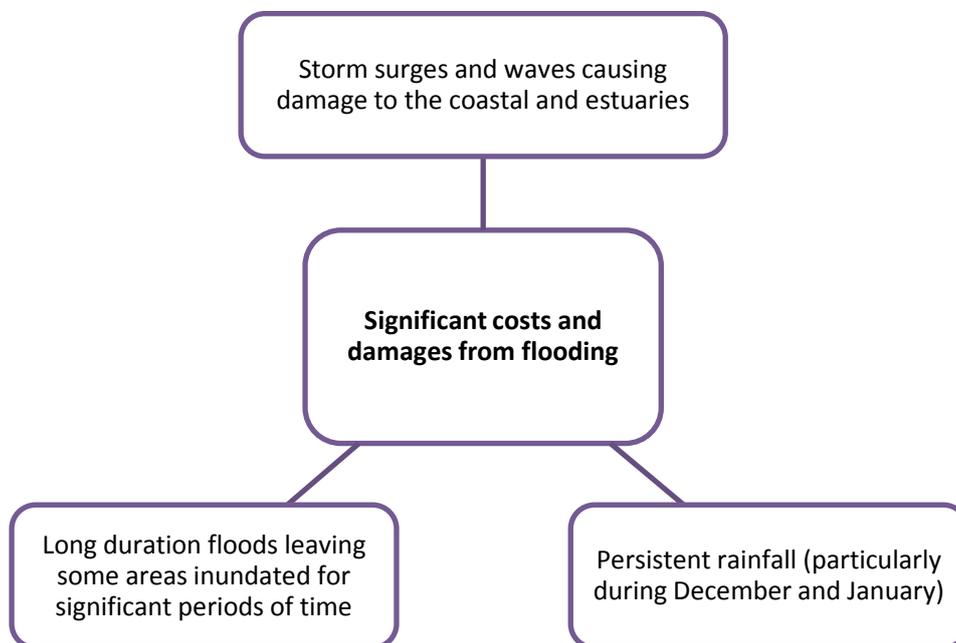
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# 1 Introduction

From December 2013 through to March 2014, England and Wales experienced a sustained period of flooding. Key features of the floods included:



This report provides a non-technical summary of the costs of these floods. It includes the following sections:

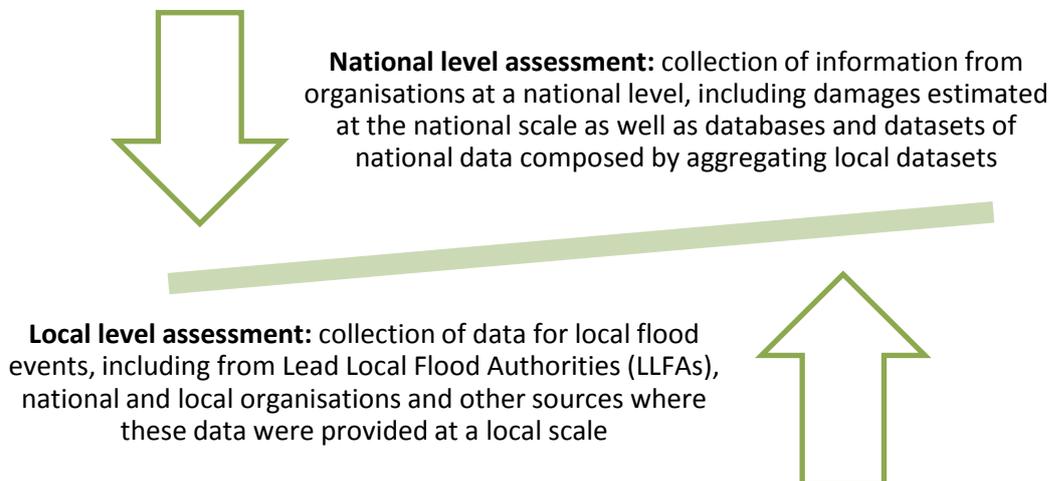
- Section 2 summarises the approach used to estimate the damages
- Section 3 is an overview of the costs incurred by each impact category
- Section 4 describes the damages which were avoided
- Sections 5 to 24 describes the damages incurred by each impact category
- Section 25 describes the conclusions and recommendations from this study

For each of the damage categories we provide a comparison between the damages estimated for the winter 2013 to 2014 floods and the 2007 floods. The 2007 damage estimates have been updated to 2014 values. A detailed comparison of damages incurred during the two flood events is included in the technical report.

For more detailed information on the approach used to estimate the damages for each impact category, including the data used, individual method statements and a full list of references see the detailed technical report for this study and Annex 1 which includes the method statements.

## 2 Approach to the study

This study covers damages incurred in England and Wales from December 2013 to March 2014, including damages from the tidal surge and fluvial flooding. The diagram below summarises how data was collected to undertake the cost estimate.



The damages caused by the winter floods were then grouped to reflect who or what was affected by the floods. The categories used in the study are based on those from the 2007 floods report (Environment Agency 2010) and are listed in Table 2.1.

**Table 2.1 Impact categories used in this study**

| Impact categories                                     |                                       |                        |
|---|---------------------------------------|------------------------|
| Residential properties                                | Flood risk management infrastructure  | Agriculture            |
| Private businesses                                    | Utilities (energy/power and water)    | Wildlife               |
| Temporary accommodation                               | Transport (road, rail, ports and air) | Heritage sites         |
| Motor vehicles  | Other communications                  | Tourism and recreation |
| Local authorities and local government Infrastructure | Public health                         |                        |
| Emergency services                                    | Education                             |                        |

To ensure high quality, consistent data, the study involved:

-  A strict quality assurance protocol
-  Conversion of financial estimates in to economic values
-  Extrapolation of data in cases where there are data on number/length/area of assets affected but no damage data

An uncertainty level then was assigned to the data based on quality and availability.

### 3 Damage estimates

The overall estimated damages of the winter 2013 to 2014 floods are **£1,300 million**. Table 3.1 shows the damages in millions by category, each category is covered in detail in Sections 5 to 24.

This table also shows the split between England and Wales, and suggests that 91% of damages were incurred in England and 2% in Wales (the remaining 7% could not be separated between England and Wales). There is uncertainty associated with this split as there was less information available for Wales.

**Uncertainty codings**

|               |
|---------------|
| Low           |
| Low-moderate  |
| Moderate      |
| Moderate-high |
| High          |

The colour coding in the table relates to the level of uncertainty associated with the figures, this is based on data quality and availability.

**Table 3.1 Damage estimates by impact category**

| Impact category                        | Best estimate (£ million) | % of total | Possible range (£ million) | England (£ million) | Wales (£ million) | Basis for estimate      |
|--|---------------------------|------------|----------------------------|---------------------|-------------------|-------------------------|
| Residential properties                 | £320                      | 25%        | £270–370                   | £310                | £6.6              | Insurance data          |
| Businesses                             | £270                      | 21%        | £230–310                   | £270                | £4.0              | Insurance data          |
| Temporary accommodation                | £50                       | 3.9 %      | £42–57                     | £49                 | £1.0              | Insurance data          |
| Vehicles                               | £37                       | 2.9 %      | £31–42                     | £36                 | £0.76             | Insurance data          |
| Local government                       | £58                       | 4.5 %      | £49–66                     | £58                 | No data           | Local level data        |
| Emergency services                     | £3.3                      | 0.26 %     | £3.3–8.7                   | £3.3                | No data           | Local level data        |
| Flood risk infrastructure and response | £147                      | 12%        | £145–148                   | £137                | £9.5              | Environment Agency data |
| Utilities: energy                      | £0.82                     | 0.06 %     | £0.63–1.0                  | £0.81               | £0.006            | Local level data        |
| Utilities: water                       | £29                       | 2.3 %      | £25–33                     | £29                 | £0.02             | Local level data        |
| Transport: road                        | £180                      | 14%        | £91–220                    | £180                | No data           | Local and national data |
| Transport: rail <sup>1</sup>           | £110                      | 9.0 %      | £93–140                    | £18                 | £4.2              | Network Rail data       |
| Transport: ports                       | £1.8                      | 0.14 %     | £1.6–2.1                   | £1.8                | No data           | Local level data        |
| Transport: air                         | £3.2                      | 0.25 %     | £2.6–3.9                   | £3.2                | No data           | Local level data        |
| Other communications                   | No data available         |            |                            |                     |                   |                         |
| Public health                          | £25                       | 1.9 %      | £25–67                     | £24                 | £0.51             | Local level data        |
| Education                              | £1.6                      | 0.13 %     | £1.2–2.0                   | £1.6                | No data           | Local level data        |
| Agriculture                            | £19                       | 1.5 %      | £12–25                     | £19                 | £0.21             | ADAS data and other     |

| Impact category        | Best estimate (£ million) | % of total | Possible range (£ million) | England (£ million) | Wales (£ million) | Basis for estimate                |
|------------------------|---------------------------|------------|----------------------------|---------------------|-------------------|-----------------------------------|
|                        |                           |            |                            |                     |                   | national level data               |
| Wildlife               | £2.4                      | 0.19 %     | £1.9–3.0                   | £2.3                | £0.12             | Local level data                  |
| Heritage               | £7.4                      | 0.59 %     | £5.6–9.3                   | £7.4                | No data           | Extrapolation of local level data |
| Tourism and recreation | £3.5                      | 0.28 %     | £2.6–4.4                   | £2.9                | £0.65             | Extrapolation of local level data |
| Total                  | <b>£1,300</b>             |            | <b>£1,000–£1,500</b>       | £1,200              | £28               |                                   |

Notes: Values are presented to 2 significant figures.  
Totals may not be equivalent to the breakdown due to rounding.  
<sup>1</sup> Only possible to disaggregate damages for England and Wales for the direct damages/costs for the rail category

## 4 Damages avoided

In many locations, flood defence assets and actions taken by organisations and individuals helped to reduce the impacts of flooding. All the damages that were not incurred as a result of these actions are referred to as 'damages avoided'. They can be divided into two types:

Damages avoided that result from an area not flooding due to flood defence assets or temporary defences

Damages avoided that result from actions taken to minimise the impacts of flooding

Nationally, the number of properties protected was around 1.4 million compared with up to 10,465 households flooded. The area of agricultural land protected by flood defences was around 250,000ha compared with around 45,000ha which flooded.

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**Key facts on damages avoided from the winter 2013 to 2014 floods**

Around 720,000 properties were protected from the tidal surge.

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Around 220,000ha of agricultural land were protected in Lincolnshire.

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Around 34,000ha of agricultural land were protected in Wales from the January floods.

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The Thames Barrier was closed 50 times between December 2013 and February 2014.

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Between 1 December 2013 and the end of February 2014, the Environment Agency issued 155 severe flood warnings.

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In Somerset, more than 100 pumps were used to remove floodwater. It is estimated that the equivalent of 60 Olympic sized swimming pools of water were being pumped every day.

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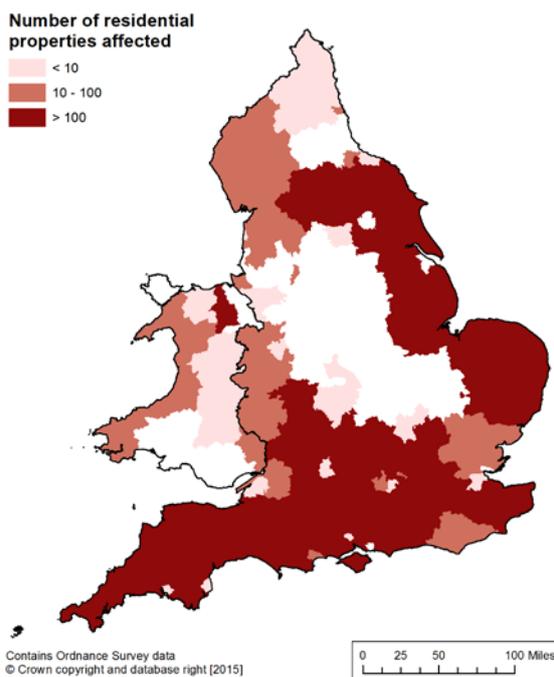
# 5 Impacts on residential properties



The best estimate of damages to residential properties from the winter 2013 to 2014 floods is **£320 million** (25% of the total damages). This is based on insurance claims information for residential properties affected by flooding between 23 December 2013 and 28 February 2014. This figure is adjusted and extrapolated to include the estimated damages caused by coastal flooding from the December 2013 tidal surges.

The Department of Communities and Local Government estimated 8,300 residential properties flooded. Local information from LLFAs suggests this figure could be as high as 10,465 properties. The map shows the distribution of flooded residential properties for the 72 LLFAs. The average unit cost for damages to individual properties is

estimated at £23,000, though this varied by location and flood types.



The best estimate for damages to residential properties is £320 million. This is lower than for the 2007 floods for which damages were £1.5 billion. This is because 10,465 properties flooded in 2013 to 2014 compared to 55,000 in 2007.

### Damages by flood type

Fluvial/groundwater: £190 million, 60%  
Coastal: £130 million, 40%

### Damages by country

England: £310 million, 98%  
Wales: £6.6 million, 2%

### Important uncertainties

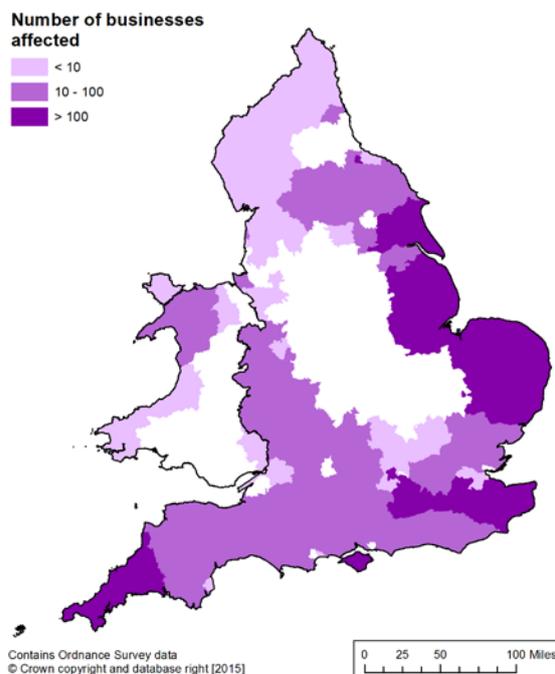
- Insurance data not available for the entire period of the study and there may have been under-reporting
- Some data sources do not differentiate between residential and business premises
- Adjustments to economic estimates use generic assumptions and adjustments for uninsured property is uncertain

# 6 Impacts on businesses



The best estimate of damages to business properties from the winter 2013 to 2014 floods is **£270 million** (21% of the total damages). This figure is based on insurance claims information for businesses affected by flooding between 23 December 2013 and 28 February 2014. This figure is adjusted and extrapolated to include the estimated damages caused by coastal flooding from the December 2013 tidal surges.

The National Audit Office indicated that 3,100 businesses were affected, although the Department of Communities and Local Government estimated this could be up to 4,900. An average unit cost of £82,000 was estimated for each business damaged, though there is variability between businesses. The map shows the distribution of flooded businesses for the 66 LLFAs for which data were available.



The best estimate for damages to businesses is £270 million. This figure is lower than for the 2007 floods for which damages were estimated at £910 million. This is because fewer businesses flooded in 2013 to 2014 than in 2007 when as many as 7,300 businesses flooded.

### Damages by flood type

Fluvial/groundwater: £100 million, 37%  
Coastal: £170 million, 63%

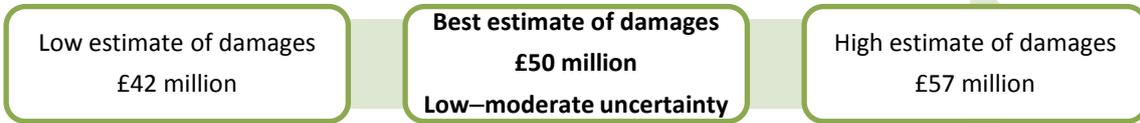
### Damages by country

England: £267 million, 99%  
Wales: £4.0 million, 1%

### Important uncertainties

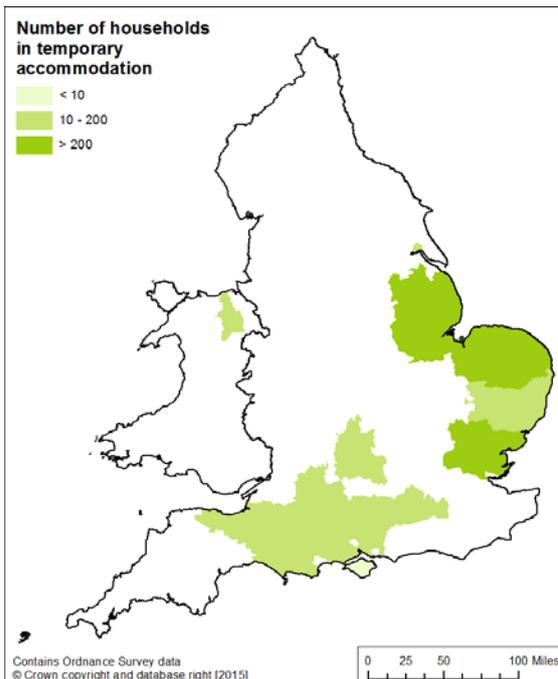
- Insurance data cover only a small period of the floods and there may be under-reporting of insurance information
- Some sources do not differentiate between residential and business premises, not always clear what is included in a business
- Adjustments to economic estimates use generic assumptions
- Local level data are based largely on grants which are not equivalent to damages

# 7 Impacts on temporary accommodation



The best estimate of losses due to temporary accommodation costs from the winter 2013 to 2014 floods is **£50 million** (3.9% of total damages). This is based on insurance claims information for temporary accommodation costs due to flooding between 23 December 2013 and 28 February 2014. This figure is adjusted and extrapolated to include the estimated damages caused by coastal flooding in December 2013.

It was hard to obtain data on the number of people using temporary accommodation as a result of their properties flooding. The local level assessment indicates that 760 households were received at rest centres. The Department of Communities and Local Government reported that over 790 households had still not returned to their properties by November 2014. However, additional information suggests that by August 2014 7,000 households were still not back in their properties (personal communications). The estimated average unit cost of a household requiring temporary accommodation is £10,000. The map shows the distribution of households requiring temporary accommodation for the for which data were available.



Based on our knowledge of the numbers of properties flooded in the South West it is reasonable to assume between 10 – 200 households required temporary accommodation in the South West. The best estimate for losses due to temporary accommodation costs is £50 million. This is lower than for the 2007 floods for which costs were estimated at £120 million.

### Damages by flood type

|                      |                  |
|----------------------|------------------|
| Fluvial/groundwater: | £30 million, 60% |
| Coastal:             | £20 million, 40% |

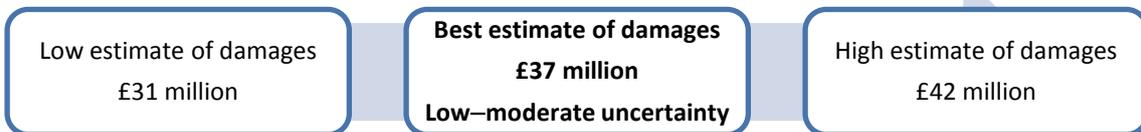
### Damages by country

|          |                  |
|----------|------------------|
| England: | £49 million, 98% |
| Wales:   | £1.0 million, 2% |

### Important uncertainties

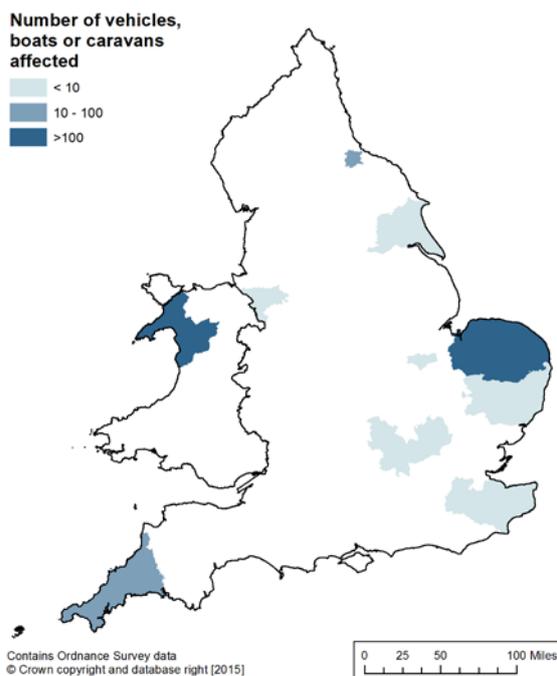
- Insurance data cover only a small period of the floods
- Significant data gaps exist in terms of numbers of households evacuated
- Unclear whether VAT and service charges would be applied to temporary accommodation, so no adjustments made to convert figures to economic values

# 8 Impacts on motor vehicles, boats and caravans



The best estimate of damages to motor vehicles, boats and caravans from the winter 2013 to 2014 floods is **£37 million** (2.9% of total damages). This is based on insurance claims information for motor vehicles affected by flooding between 23 December 2013 and 28 February 2014. This figure is adjusted and extrapolated to include the estimated damages caused by coastal flooding from the December 2013 tidal surges.

The local assessment of the number of vehicles damaged by the floods indicated 750 vehicles were affected. A higher estimate of 5,400 represents the number of insurance claims received for this period from flooding. The high estimate is likely to be the most accurate. The map shows the distribution of affected vehicles for those LLFAs (13) for which data were available.



The best estimate for damages to vehicles, boats and caravans of £37 million is lower than for the 2007 floods for which damages were estimated at £98 million.

### Damages by flood type

Fluvial/groundwater: £22 million, 60%  
Coastal: £15 million, 40%

### Damages by country

England: £36 million, 98%  
Wales: £0.76 million, 2%

### Important uncertainties

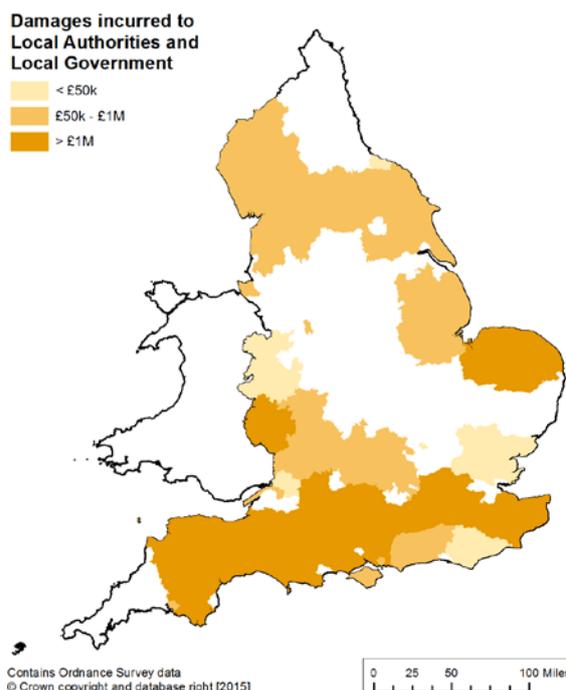
- Insurance data cover only a small period of the floods
- Adjustments to economic estimates use generic assumptions (details in the technical report)

# 9 Impacts on local authorities and local government



The best estimate of costs to local authorities and local government from the winter 2013 to 2014 floods is **£58 million** (4.5% of total damages). This category includes estimates of the damages caused to local authority assets (buildings and other infrastructure), costs of responding to and dealing with flood incidents, government grants (Bellwin Scheme and Severe Weather Recovery Scheme) to help local authorities deal with flooding impacts and costs associated with assisting households affected by flooding.

Those damages that can be specifically related to roads, flood risk infrastructure, recreational and educational facilities are included in their respective impact categories to avoid double counting.



The distribution of damages is shown in the map for the 73 LLFAs for which data were available.

The damages incurred by local authorities and local government in the winter 2013 to 2014 floods are lower than for the 2007 floods for which damages were estimated at £170 million.

### Damages by flood type

Fluvial/groundwater: £20 million, 35%  
Coastal: £37 million, 65%

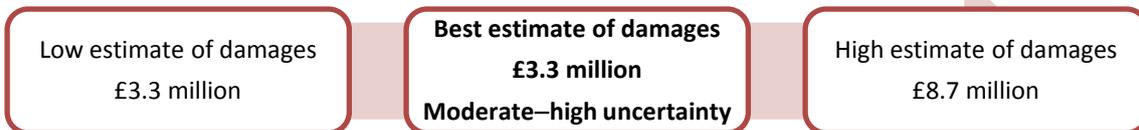
### Damages by country

England: £58 million, 100%  
Wales: No information

### Important uncertainties

- Data on the numbers of assets affected are limited
- Extrapolation across LLFAs was not generally possible due to the high level of variation in both impact types and numbers affected

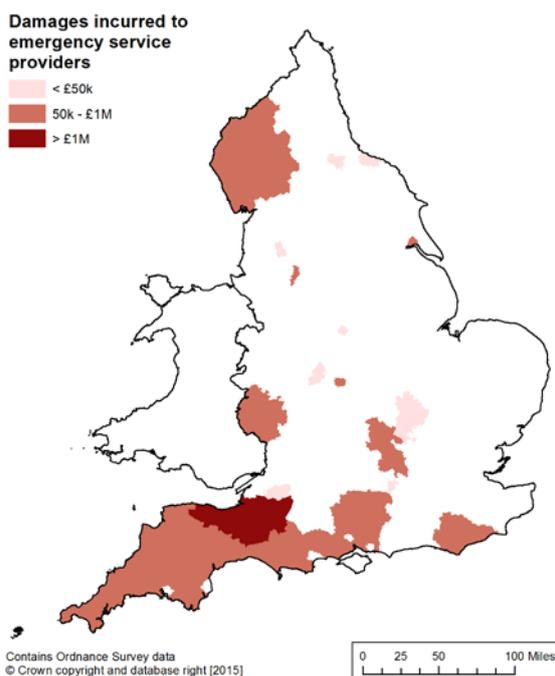
# 10 Impacts on emergency services



The best estimate of damages to the emergency services from the winter 2013 to 2014 floods is **£3.3 million** (0.26% of total damages). This is based on information collected from the local level assessment and data on costs of responding to emergencies provided by the fire and rescue services and ambulance services for. Costs include deployment of specialist equipment, increased staffing requirements and rapid use of supplies. In addition, emergency service assets such as fire stations can be flooded, incurring further costs and disruption.

While not included in the estimate, the Environment Agency spent between 27,000 and 35,000 8-hour shifts responding to the flood events

The map shows the distribution of damages to emergency services for the 21 LLFAs for which data were available.



Information from emergency service providers indicates that the emergency services attended 993 incidents related to the floods.

The best estimate for damages to the emergency services is £3.3 million. This is lower than for the 2007 floods for which damages were estimated at £5 million.

### Damages by country

England: £3.3 million, 100%  
Wales: No information

### Important uncertainties

- Data are limited and not available for all emergency services across the country
- No adjustment made for VAT for damages as assumed that the emergency services are exempt

# 11 Impacts on flood risk infrastructure



The best estimate of damages to flood risk management infrastructure from the winter 2013 to 2014 floods is **£147 million** (12% of the total damages). This is based on information from the Environment Agency, Natural Resources Wales and other flood risk management authorities. It relates to the amount allocated to undertake infrastructure repairs resulting from flood damage.

Damages to LLFA flood risk management infrastructure are included in this category and not in the 'local authorities and local government' category to avoid double counting. The map shows the distribution of damages to flood risk management infrastructure.

The figure of £147 million for damages to flood risk infrastructure is higher than for the 2007 floods for which damages were £19 million. This is one of the few categories for which damages are higher and could be due to the impacts of the coastal surge.

## Damages by flood type

Fluvial/groundwater: £37 million, 25%  
Coastal: £110 million, 75%

## Damages by country

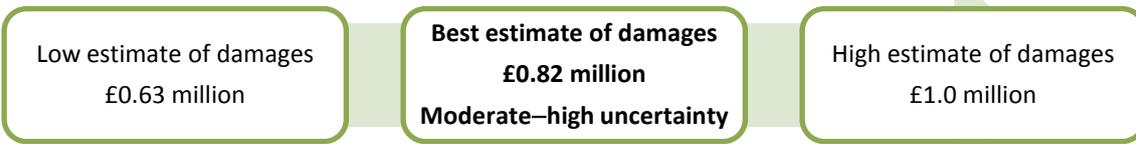
England: £137 million, 94%  
Wales: £9.5 million, 6%

## Important uncertainties



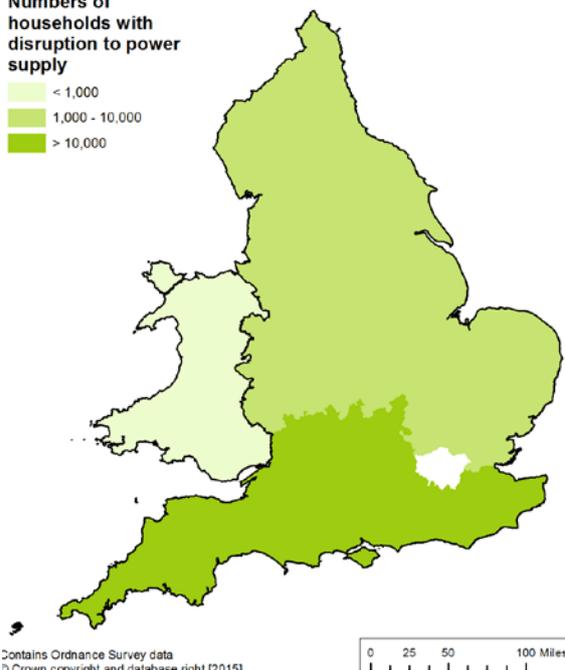
For LLFA infrastructure repair there is a risk of double counting in the impacts on local authorities and local government category

# 12 Impacts on utilities: energy



The best estimate of damages to the energy sector from the winter 2013 to 2014 floods is **£820,000** (0.06% of total damages). This figure is made up of £44,000 of direct damages and £780,000 of welfare impacts due to disruption to the power supply. This is based on information from the local assessment, energy companies and additional research.

Numbers of households with disruption to power supply



Local level information indicated 120,000 customers were affected by power cuts. A higher estimate of 1 million was obtained from the Department of Communities and Local Government. This wide range demonstrates the lack of reliable data.

The map shows the number of households disrupted due to power cuts across the 24 LLFAs for which data were available. The figure of £820,000 for damages to the energy sector is much lower than for the 2007 floods for which damages were £139 million.

### Damages by country

England: £810,000 (£40,000 direct damages, £770,000 welfare damages)  
 Wales: £5,600 (£3,700 direct damages, £2,000 welfare damages)

### Important uncertainties

- Direct damages to the energy sector are uncertain due to a lack of data
- Difficult to distinguish between power loss due to flooding from power loss due to bad weather, so figures may include damages from wind
- Welfare costs are based on the average number of hours for which customers were without supply – information was not available for all areas

# 13 Impacts on utilities: water

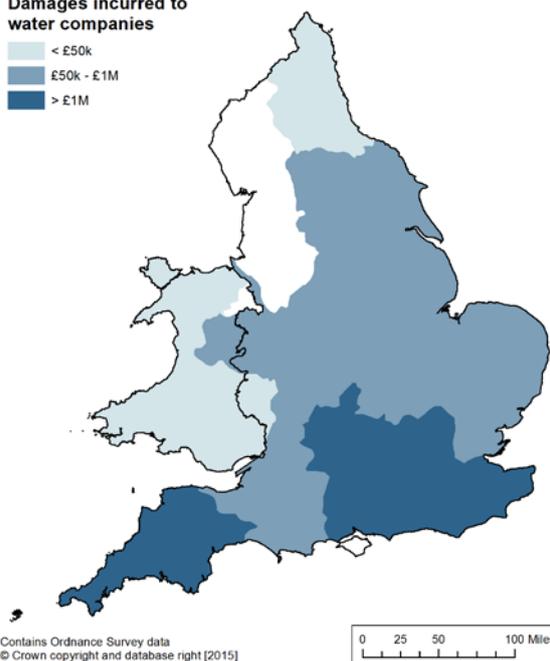
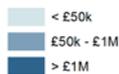


The best estimate of damages to the water sector from the winter 2013 to 2014 floods is **£29 million** (2% of total damages). This figure includes direct damages to water companies from the flooding and is based on water company data.

Direct costs include damage to pumps, additional operational costs due to increased pumping and manpower costs. In addition, there are impacts on customers where flooding leads to disruption to supply. This in turn can put pressure on water companies through more calls from people concerned about their service provision. It was not possible to estimate welfare impacts for this sector, though the relatively low damage figure suggests few people lost their water supply.

Information from the local level assessment indicates that 36 water company assets were affected by the floods. The map shows the distribution of damages to water companies for the 21 LLFAs for which data were available. The figure of £29 million for

Damages incurred to water companies



damages to the water sector is lower than for the 2007 floods for which damages were £110 million. This may be due in part to the measures put in place by water companies following the 2007 floods.

### Damages by flood type

Fluvial/groundwater: £28.5 million, 99%  
Coastal: £0.38 million, 1%

### Damages by country

England: £28.9 million, 99.9%  
Wales: £0.02 million, 0.1%

### Important uncertainties

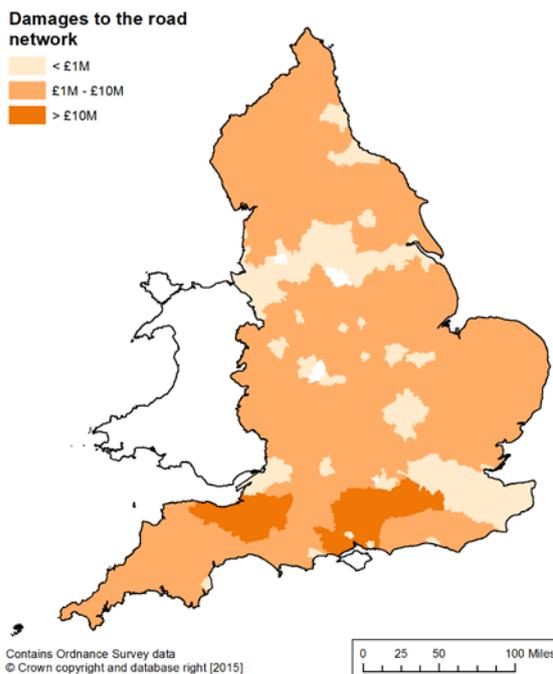
- Not clear whether data provided capture all damages incurred by water companies
- Data on the number of assets affected were not available from many water companies

# 14 Impacts on transport: road



The best estimate of damages to the road network from the winter 2013 to 2014 floods is **£180 million** (14% of total damages). This figure is based mainly on the funds provided to local authorities by the Department for Transport for severe weather recovery, with an additional £7 million of damages identified from other sources. The Severe Weather Recovery Fund sought to cover damages from flooding which occurred from the beginning of December up to early February. In addition, it is estimated that £1.3 million of welfare damages were felt by members of the public related to the cost of delays caused by the flooding.

The map shows the estimated damages to the road network for those LLFAs (115) for which data were available.



Information from the Highways Agency indicated there were over 1,000 flood incidents between 5 December 2013 and 31 March 2014. The average Flood Severity Index for these incidents was 2.52 on a scale of 1 to 10 (10 being the most severe).

The figure of £180 million for damages to the road network is lower than for the 2007 floods for which damages to roads were £230 million.

### Damages by flood type

Fluvial/groundwater: £110 million, 61%  
Coastal: £70 million, 39%

### Damages by country

England: £180 million, 100%  
Wales: No information

### Important uncertainties

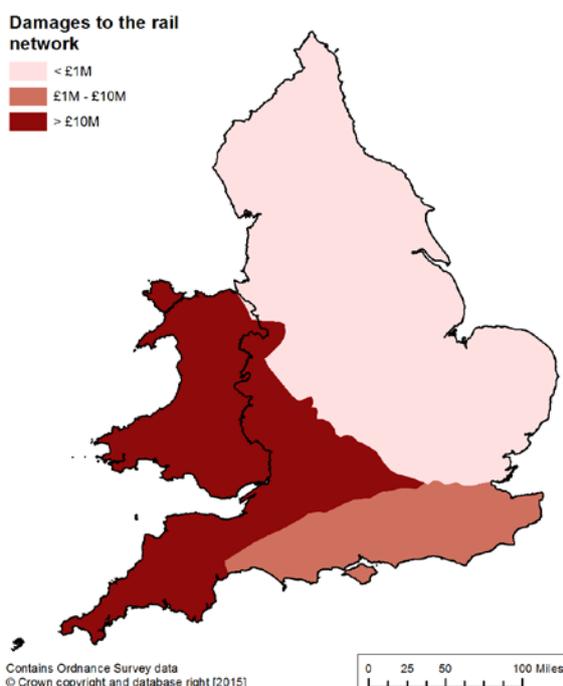
- Information on length of road flooded or damaged not available for many areas
- Some of the information used relates to grants whose use is not always clear

# 15 Impacts on transport: rail



The best estimate of damages to the rail network from the winter 2013 to 2014 floods is **£110 million** (9% of the total damages). This figure is made up of £22 million direct costs for reinstatement of infrastructure following water related landslides and flooding, £36 million in compensation/revenue costs to Network Rail operators and loss of revenue, and £56 million of welfare costs to rail users relating to the disruption to services and loss of time caused by the flooding. This data was provided by Network Rail.

The map shows the distribution of damages to the rail network across the main routes.



The figure of £110 million for damages to the rail network is higher than for the 2007 floods for which damages were £44 million. This may be due to the effects of the coastal damage which occurred in 2013 to 2014. It was not possible to distinguish between erosion impacts and flooding impacts and so both may be included here.

### Damages by flood type (only possible for £22 million direct damages)

Fluvial/groundwater: £5.8 million, 26%  
Coastal: £17 million, 74%

### Damages by country (only possible for £22 million direct damages)

England: £18 million, 81%  
Wales: £4.2 million, 19%

## Important uncertainties

- Differentiation between flooding and erosion damage not always possible
- Assumptions used in estimating the damage estimates, especially those relating to compensation and welfare costs increase the level of uncertainty in the figures
- Adjustments to economic estimates use generic assumptions (see technical report)

# 16 Impacts on transport: ports

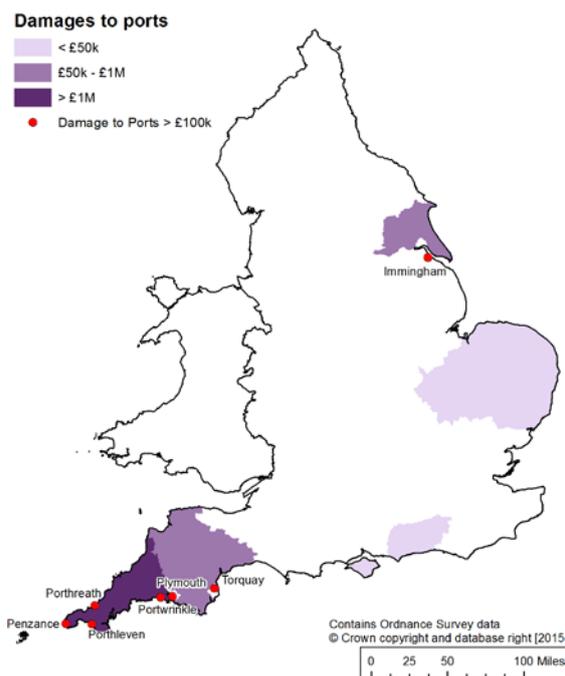
Low estimate of damages  
£1.6 million

**Best estimate of damages**  
**£1.8 million**  
**Moderate uncertainty**

High estimate of damages  
£2.1 million

The best estimate of damages to ports from the winter 2013 to 2014 floods is **£1.8 million** (0.14% of total damages). This figure relates mainly to grants received from the Department for Transport's small ports fund to repair the damage caused to port and harbour infrastructure and additional damages to other infrastructure. Additional evidence suggests the overall costs to ports businesses resulting from the disruption are in the region of £40 million. This reflects a loss to regional businesses but was not included in the damages estimate because it does not reflect the loss at the national level as business could have been transferred or delayed.

The government gave grants to 21 small ports and harbours. The large Portsmouth hovercraft terminal and Immingham port were also affected, giving a total of 23 ports affected by the flooding. The Port of Immingham suffered economic direct damages of £10–£15 million, although much of this was felt by private port businesses and was therefore included in the businesses category rather than in ports to avoid double counting.



The map shows the distribution of damages to ports for the 8 LLFAs for which data were available.

Damages to ports were not considered separately in the 2007 floods and so it is not possible to compare the two events for this category.

### Damages by flood type

Fluvial/groundwater: £1,200, 0.1%  
Coastal: £1.8 million, 100%

### Damages by country

England: £1.8 million, 100%  
Wales: No information

## Important uncertainties

Grants used as surrogates for damages but do not cover full cost of the repair works

Some affected facilities may not be included in the assessment

Damages from Immingham Port are included in the 'Businesses' category, though there were significant impacts on the port itself which have not been separated

# 17 Impacts on transport: air

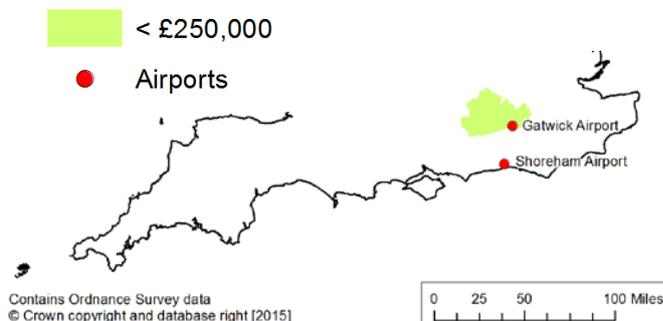
Low estimate of damages  
£2.6 million

**Best estimate of damages**  
**£3.2 million**  
**Moderate uncertainty**

High estimate of damages  
£3.9 million

The best estimate of damages to air transport from the winter 2013 to 2014 floods is **£3.2 million** (0.25% of total damages). This figure is made up of £250,000 of direct costs to Gatwick Airport as a result of disruption and £3 million of welfare costs to Gatwick passengers for disruption. These welfare costs are based on over 16,000 passengers being affected by flight cancellations and a £183 payment for cancelled/delayed flights of less than 1,500km (for delays of 2 hours or more). However, it is not known whether all these payments were made.

## Damages to airports



Local level information shows that two airports were flooded – Gatwick and Shoreham (see map). Flooding of electrical systems supplying Gatwick’s North Terminal led to cancellation of 72 departing flights and 73 arriving flights. There were also impacts at Newcastle and services to the Isles of Scilly were disrupted.

Damages to airports were not considered separately for the 2007 floods and so it was not possible to compare the two events for this category.

## Damages by flood type

Fluvial/groundwater: £3.2 million, 100%  
Coastal: No information

## Damages by country

England: £3.2 million, 100%  
Wales: No information

## Important uncertainties

- No data available on the impacts on other airports (Shoreham, Newcastle) known to have been flooded or affected
- Damages for Gatwick Airport do not include the cost of repairing assets as these were not estimated by the airport
- Compensation payments used to estimate welfare costs, but the extent to which these reflect the impacts are not known

## 18 Impacts on other communications (telecom)

A lack of information meant it was not possible to determine a quantified or monetised estimate of damages for this category. For telecommunications, a study by Ofcom into the impact of the winter floods on fixed and mobile sector networks and services suggests that service providers were generally prepared and able to cope with severe weather. Although there was an increase in the average duration of incidents, there was no increase in the average number of incidents over the winter floods period.

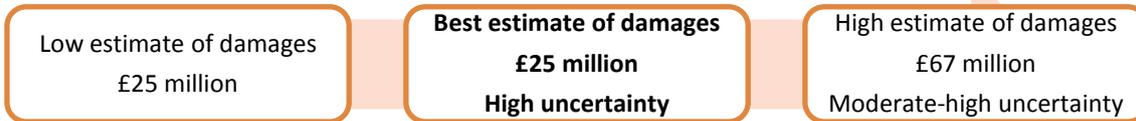
Telecommunications and data operators worked to keep their assets safe from floodwaters, and also tried to maintain or restore services where the flooding occurred. Direct impacts on utilities were caused by floodwaters and the tidal surge, but there is no obvious correlation between the locations of telecommunications incidents and levels of rainfall.

Assets can be affected in other ways. For example, saturated ground conditions affected the vulnerability of trees to storm conditions. Telephone lines were pulled down, for example, at Temple Lock in Buckinghamshire. Part of the village of Great Shefford in West Berkshire was without landline phones in March 2014 due to the BT infrastructure being affected by groundwater.

Discussions with Openreach suggest that the losses due to flooding were very small. It is therefore likely that the improved resilience of its infrastructure to flood related damage reduced the impacts from the 2013 to 2014 event.

Although every effort was made to obtain data on damages to the telecommunications sector, no monetary estimates were provided. Similarly, no quantitative information was obtained on the impacts of flooding to this sector. As a result, there are no monetary estimates of damages for this impact category. Some impacts were described in qualitative terms, so it is likely some damage did occur.

# 19 Impacts on public health and welfare



The best estimate of damages to public health and welfare from the winter 2013 to 2014 floods is **£25 million** (1.9% of the total damages). This figure is based on 10,465 households being affected by the flooding and nearly 4,000 of these being potentially affected by mental health impacts (based on Paranjothy et al. 2011).

A value of £6,400 per household over 50 years with a discount rate of 3.5% was used to reflect the distress caused by flooding (based on the methods used for the 2007 flood review). This is likely to be an underestimate and does not include the stress felt by households that were not directly flooded, as well as secondary stresses such as dealing with insurance companies and carrying out recovery activities.

There were no fatalities directly associated with the flooding, although deaths did occur due to storms and high seas. There were also a small number of injuries.

The figure of £25 million for damages to public health and welfare is lower than for the 2007 floods for which damages to public health and welfare were £340 million. This reflects the fact that there were 13 fatalities in the 2007 floods, but none caused by the 2013 to 2014 floods.

## Damages by flood type

|                      |                   |
|----------------------|-------------------|
| Fluvial/groundwater: | £15 million, 60%  |
| Coastal:             | £9.8 million, 40% |

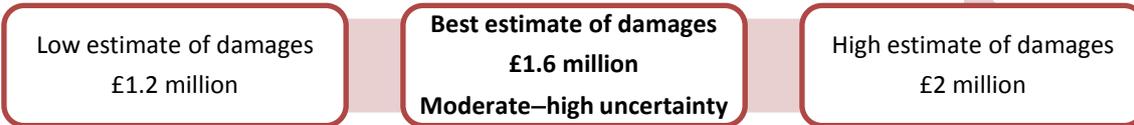
## Damages by country

|          |                   |
|----------|-------------------|
| England: | £24 million, 98%  |
| Wales:   | £0.51 million, 2% |

Data availability and inconsistencies mean there are inherent uncertainties in the data. An important uncertainty for this public health and welfare category is the damage caused to physical and mental health from flooding. Ongoing studies by Birmingham University, Cardiff University, Exeter University, Public Health England and Lancaster University may provide a better indication of these impacts once published.

In addition to peoples wellbeing information from mapped flood extent data suggests that up to 20 public health assets may have flooded. Though there are no damage estimates recorded for these assets and the presence of these assets within the flood outline does not confirm they were flooded.

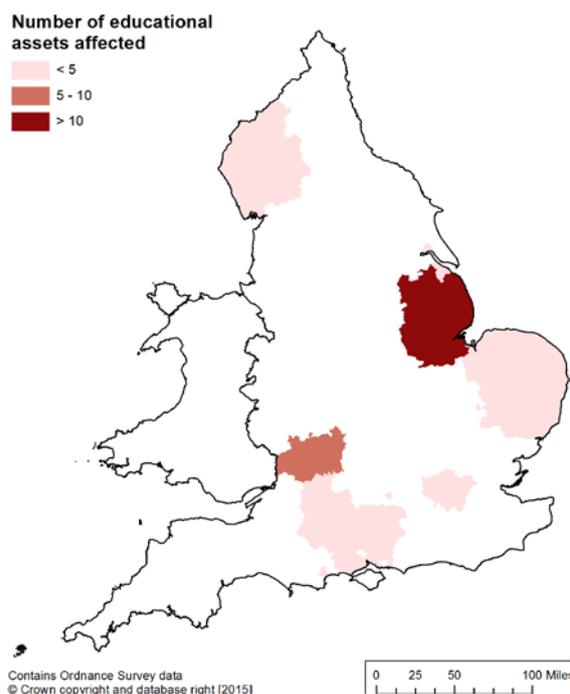
# 20 Impacts on education



The best estimate of damages to education from the winter 2013 to 2014 floods is **£1.6 million** (0.13% of total damages). This figure is based on extrapolation of local data by applying a damage per asset value of £42,000 to the number of educational assets such as schools and colleges affected by flooding. To avoid double counting, these were separated out where possible from local authority costs.

Local level information suggests that 39 educational assets were affected by the winter 2013 to 2014 floods. Some of these were directly flooded and most of them were closed due to access roads being flooded or other impacts. Impacts are thought to have been limited by the fact that much of the flooding occurred during school holidays.

The map shows the distribution of educational assets affected for the 12 LLFAs for which data were available.



The figure of £1.6 million for damages to education is lower than for the 2007 floods for which damages were £14 million. These figures are not directly comparable because the 2007 study considered the costs due to loss of pupil days while this study considers damages to assets. There was no significant increase in the number of school absences in the period of the winter 2013 to 2014 floods.

### Damages by flood type

Fluvial/groundwater: £0.71 million, 44%  
Coastal: £0.92 million, 56%

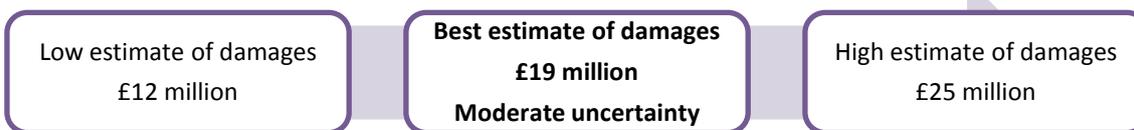
### Damages by country

England: £1.6 million, 100%  
Wales: No information

### Important uncertainties

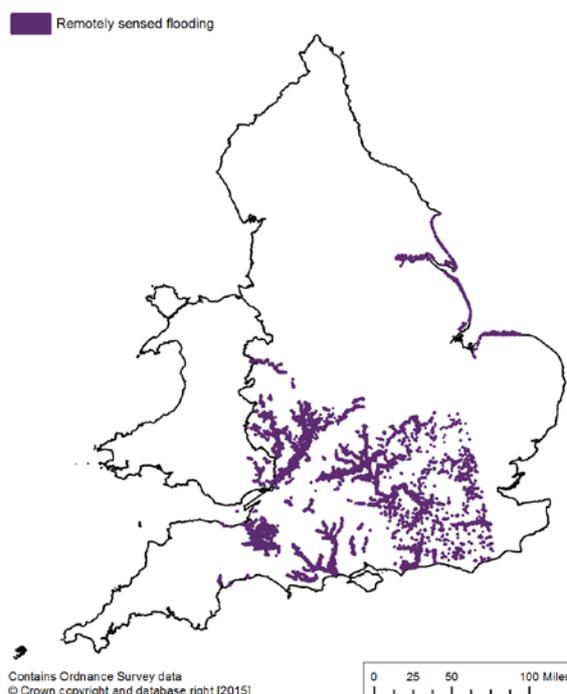
- Not clear from flood outline data whether educational assets were directly flooded or if impaired access prevented operations
- Damages per asset may differ from the figure of £42,000 used

# 21 Impacts on agriculture



The best estimate of damages to agriculture from the winter 2013 to 2014 floods is **£19 million** (1.5% of total damages). This figure was reported by ADAS (2014) and supplemented with local level assessments. It includes damages to farming business, arable (or horticultural) crop production, grass production, livestock production and miscellaneous costs. These costs were felt predominantly by land owners, land managers, insurance companies and agricultural supply and service agents.

The map shows the extent of flooding from aerial photographs and is likely to represent agricultural areas flooded.



ADAS reported 44,000ha of agricultural land affected by the floods. Local information gives a higher estimate of 46,000ha. Based on figures from the ADAS report, the costs of the floods per hectare were £425.

The figure of £19 million for damages to agriculture is lower than for the 2007 floods for which damages were estimated to be £59 million. This difference is likely to be related to the floods happening in different seasons. Also in 2013/2014 some of the coastal areas flooded are maintained as wet grasslands which are more resilient to flooding.

## Damages by country

England: £18 million, 99%  
Wales: £0.21 million, 1%

## Important uncertainties

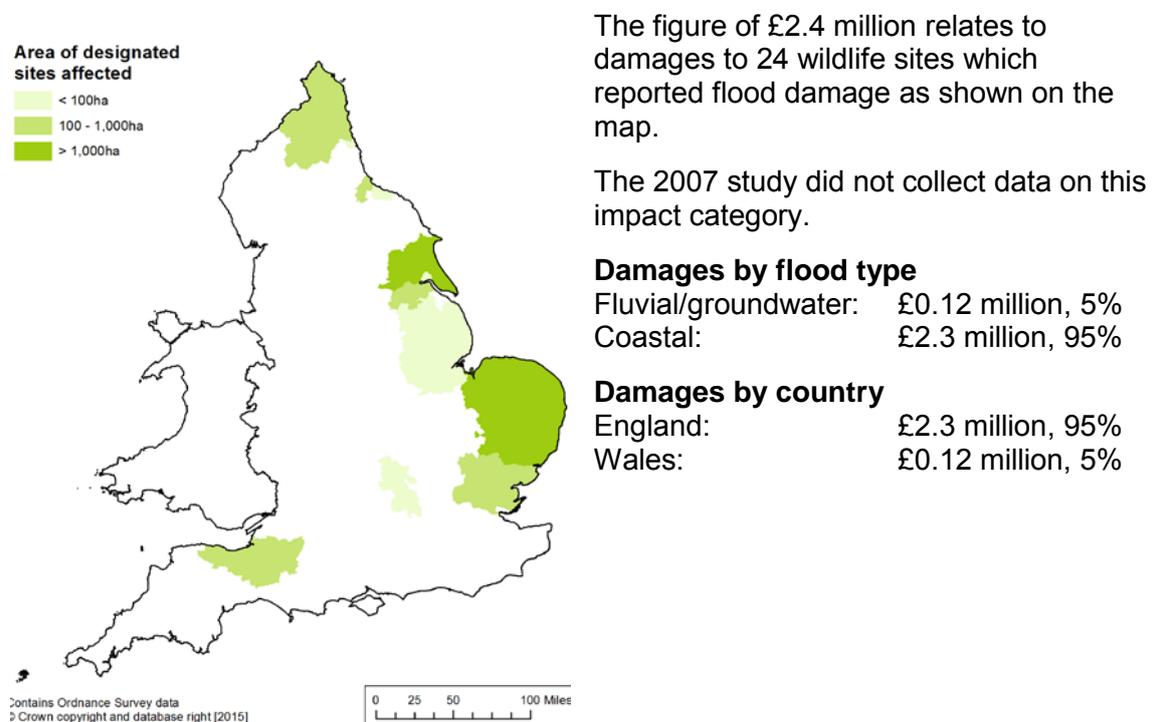
- Uncertainties for the agriculture category relate primarily to the fact that estimates are based on high level assessments of flooded areas, flood duration, land use and standard estimates of damage to crops, livestock and farm assets and services
- Interviews with 11 affected farmers in Somerset and 8 in the Upper Thames catchment were used to validate the ADAS data

# 22 Impacts on wildlife sites



The best estimate of damages to the wildlife sector from the winter 2013 to 2104 floods is **£2.4 million** (0.19% of total damages). These damages result from flooding of wildlife sites themselves and the assets that support them (e.g. visitor centres and facilities).

The impacts of flooding were determined through research and discussions with Natural England, National Trust, Wildlife Trusts and the RSPB. Damages were particularly high in Lincolnshire where the Wildlife Trust incurred £1.3 million in damages, mainly due to the loss of visitor and educational facilities.



The figure of £2.4 million relates to damages to 24 wildlife sites which reported flood damage as shown on the map.

The 2007 study did not collect data on this impact category.

### Damages by flood type

Fluvial/groundwater: £0.12 million, 5%  
Coastal: £2.3 million, 95%

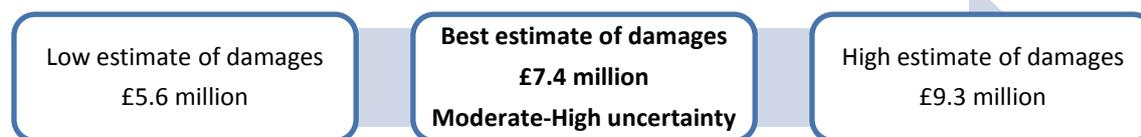
### Damages by country

England: £2.3 million, 95%  
Wales: £0.12 million, 5%

### Important uncertainties

- Limited data on the area of wildlife sites directly impacted
- Storm and flood damage occurred concurrently, making it impossible to distinguish between damages from wind in the costs
- Double counting was avoided where possible, but some damages may have been included more than once where information was not clear

## 23 Impacts on heritage sites



The best estimate of damages to the heritage sector from the winter 2013 to 2014 floods is **£7.4 million** (0.59% of total damages). This is based on an extrapolated damage per asset value of £290,000 per asset obtained from a local level assessment. Damages ranged from structural damage to listed harbours and damage to designated UNESCO World Heritage Site features. While these reports indicate the varied nature of the impacts on heritage sites from floods, it was not possible to quantify many of these damages, this is why this figure has a high uncertainty rating. The 2007 report does not give a figure for cost damages to the heritage sector.

### Damages by flood type

|                      |                   |
|----------------------|-------------------|
| Fluvial/groundwater: | £1.6 million, 21% |
| Coastal:             | £5.9 million, 79% |

### Damages by country

|          |                    |
|----------|--------------------|
| England: | £7.4 million, 100% |
| Wales:   | No information     |

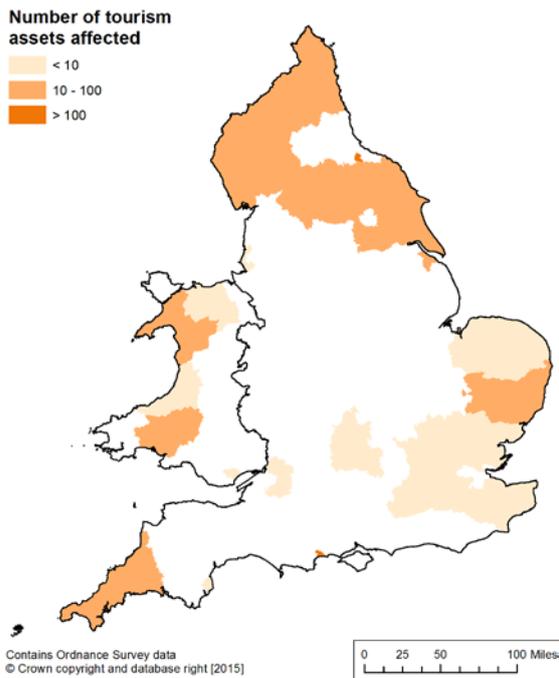
### Important uncertainties

- No national level information available
- Where possible, wind related storm damage to trees and erosion was excluded from damages but this was not always clear
- Significant differences between heritage sites mean a 'willingness to pay' value for visitors was not applicable and so a cost could not be placed on welfare impacts

# 24 Impacts on tourism and recreation



The best estimate of damages to the tourism and recreation sector from the winter 2013 to 2014 floods is **£3.5 million** (0.28% of total damages). This is based on an extrapolated damage per asset value of £3,800 obtained from a local level assessment. This relates primarily to repair costs of recreational assets such as coastal paths, National Trust sites, holiday parks and beach huts. The map shows the distribution of tourism assets affected for the 29 LLFAs for which data were available. These assets included mooring wharf/marinas, sports and leisure centres, sports grounds and playing fields, amusement arcades/parks, beach huts, boarding houses, football grounds, golf courses, hostels, hotels, museums and theatre/cinemas.



The number of tourism and recreation assets flooded was estimated at 1,072 from flood outline maps.

Visit England information indicated that 6.4 million visitor trips were disturbed due to the flooding and bad weather. However potential losses to the country as a whole for these disrupted visits were not estimated (see recommendations and conclusions). There is no figure reported for damages to the tourism and recreation sector in the 2007 report.

### Damages by flood type

|                      |                   |
|----------------------|-------------------|
| Fluvial/groundwater: | £1.5 million, 44% |
| Coastal:             | £2.0 million, 56% |

### Damages by country

|          |                    |
|----------|--------------------|
| England: | £2.9 million, 82%  |
| Wales:   | £0.65 million, 18% |

### Important uncertainties

- Some assets counted as flooded because they were within the flood outline may not have actually flooded
- Average damages per asset used where no estimate of damages was provided – but variability of tourism assets means this is unlikely to be an accurate representation
- Number of trips disturbed may include non-flood related disruption

# 25 Conclusions and recommendations

Having high quality data upon which to base a flood damage estimates is vital. For some of the damage categories in this study it was hard to obtain high quality, reliable data. This study recommends how data sharing during a flood event could be improved and also makes recommendations on future research needs.

## 25.1 Enable data sharing

A crucial source of uncertainty is the lack of primary and disaggregated data. The development of data sharing agreements and use of data champions within national organisations would mark an important step in enabling the easier sharing of data during flood damage estimates.

One approach to support data sharing agreements could be to develop 'post disaster needs assessments' as used in mainland Europe. These are based on a template showing the information needed.

Another area which could be used to reduce uncertainty with data is to have on-the-ground checking of mapped data. Mapped information offers the chance to obtain a rapid picture of the extent of flooding and could be used to estimate damages. However, in order to use mapped data with confidence it needs to be ground truthed.

## 25.2 Future research needs

Many local authorities identified impacts on their local economies due to the effects of the winter 2013 to 2014 floods. These included areas in Cornwall and Devon that were affected by the erosion of the rail line at Dawlish, or in Somerset where extensive and prolonged flooding was perceived to have resulted in a reduction in the number of visitors. There is no evidence available on the extent to which these local impacts may have had a knock-on effect at national level. Hence, it was not possible to quantify the additional effect of predicted local damages for the country as a whole. The consideration that these damages are likely to result in transfers, where other areas of the country benefit due to people visiting there rather than the affected areas, may underestimate national losses. Further study is needed to investigate the extent to which the local losses may be important at the national level.

A number of on-going studies are surveying the communities that experienced flooding in 2013 to 2014. These studies were not completed during the timescales of this report, and therefore it was not possible to draw conclusions from the work. During future damage estimates, the methodology used in section 19 could be updated to reflect current science which may provide a better understanding of the social, psychological and health impacts of flooding.

There were many areas in the winter 2013 to 2014 floods which were protected either by flood defences or through people taking action to reduce the risk of flooding. However, it was hard to accurately estimate the damages which were avoided. Further research is needed to establish a methodology which enables the damages avoided to be calculated more accurately.

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