

- 1. Flooding and coastal erosion risk management**
 - 2. Surface water and sewer flooding**
 - 3. Development in flood risk areas**
 - 4. Resilience of buildings to extreme wind and rain**
 - 5. Water demand in the built environment**
 - 6. Design and location of new infrastructure**
 - 7. Resilience of infrastructure services:**
 - a) Energy networks – generation, transmission and distribution**
 - b) Public water supply**
 - c) Ports, airports and ferry services**
 - d) Roads and the rail networks**
 - e) Digital infrastructure**
 - 8. Infrastructure interdependencies**
-

- ◌ This slide pack:
 - Is the technical annex to **Chapter 3: Buildings and Infrastructure networks theme** in the ASC's first statutory report to Parliament on the Scottish Climate Change Adaptation Programme, available at www.theccc.gov.uk/publications
 - Provides the latest trend information on indicators of exposure, vulnerability, action and realised impacts that informed the ASC's assessment. Many of these were developed by ClimateXChange, which were published on their website: <http://www.climateexchange.org.uk/adapting-to-climate-change/indicators-and-trends/>
 - Will be updated periodically as new data becomes available.
 - Highlights indicators that would be useful but where the necessary datasets have not yet been identified.
 - Follows the structure of the buildings and infrastructure networks chapter in the ASC's progress report, which is based on the 'adaptation priorities' the ASC has identified for buildings and infrastructure networks

Buildings Scorecard

Adaptation priority	Is there a plan?	Are actions taking place?	Is progress being made?
1. Flooding and coastal erosion risk management	Amber	Green	Amber
2. Surface water and sewer flooding	Green	Green	Amber
3. Development in flood risk areas	Green	Red	Grey
4. Resilience of buildings to extreme wind and rain	Amber	Green	Amber
5. Water demand in the built environment	Green	Green	Amber

1. Flooding and coastal erosion risk management

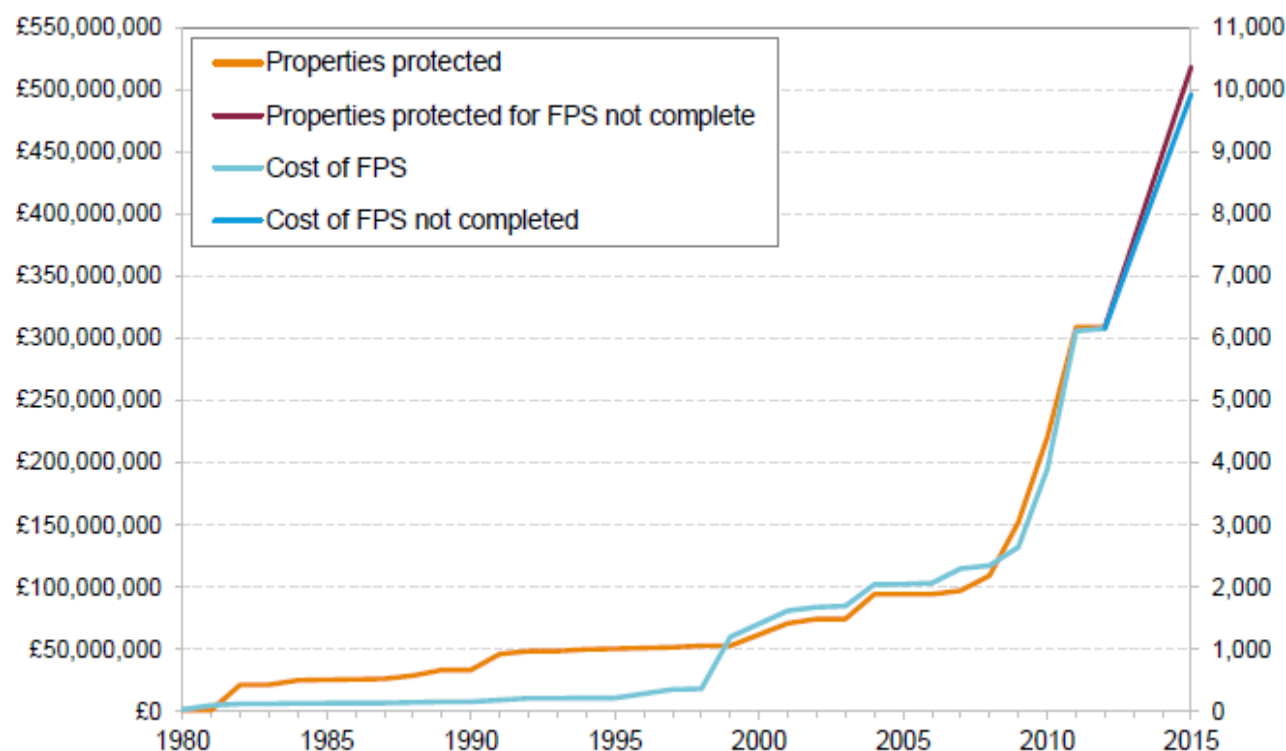
Indicator	Data series	Source	Trend	Implication
Number of residential properties at risk of flooding >1:200	N.A.	National Flood Risk Assessment	N.A.	No trend available.
Properties protected by flood defence schemes	1980-2011	JBA	↑	The number of properties protected by flood defences has increased, but it still covers only 10% of the properties at risk.
Local Government capital expenditure on flood defences, land drainage and coastal protection	2010-2015	SG website	↑	An increase in capital expenditure since 2012/13
Local Government revenue expenditure on flood defences, land drainage and coastal protection	2010-2015	SG website	↓	Reduction in maintenance expenditure since 2012/13
Uptake of PLP	2014	JBA survey	N.A.	No trend is available, but the 2014 survey shows that over 26 local authorities responding (out of 32), 10 had a PLP scheme; and about half of the 40 residents responding had PLP.

1. Flooding and coastal erosion risk management

**Properties protected
by flood defence
schemes**



The number of properties protected by flood defences has increased, but it still covers only 10% of the properties at risk.



Notes: the number of properties protected in 2015 was calculated assuming that all the schemes planned or under construction in 2014 were going to be completed.

- According to JBA (2014b), the number of properties protected by flood defences has increased from about 2,000 in 2005 to 10,400 in 2015.
- However, the Scottish Flood Defence Asset Database (JBA, 2007) shows that about 4,500 properties were protected in 2005.
- This means that by 2015, about 13,000 properties have been protected by flood defences.
- This equates to 10% of the estimated total number of properties currently at risk of flooding and 16% of properties currently at a 1-in-200 annual chance.

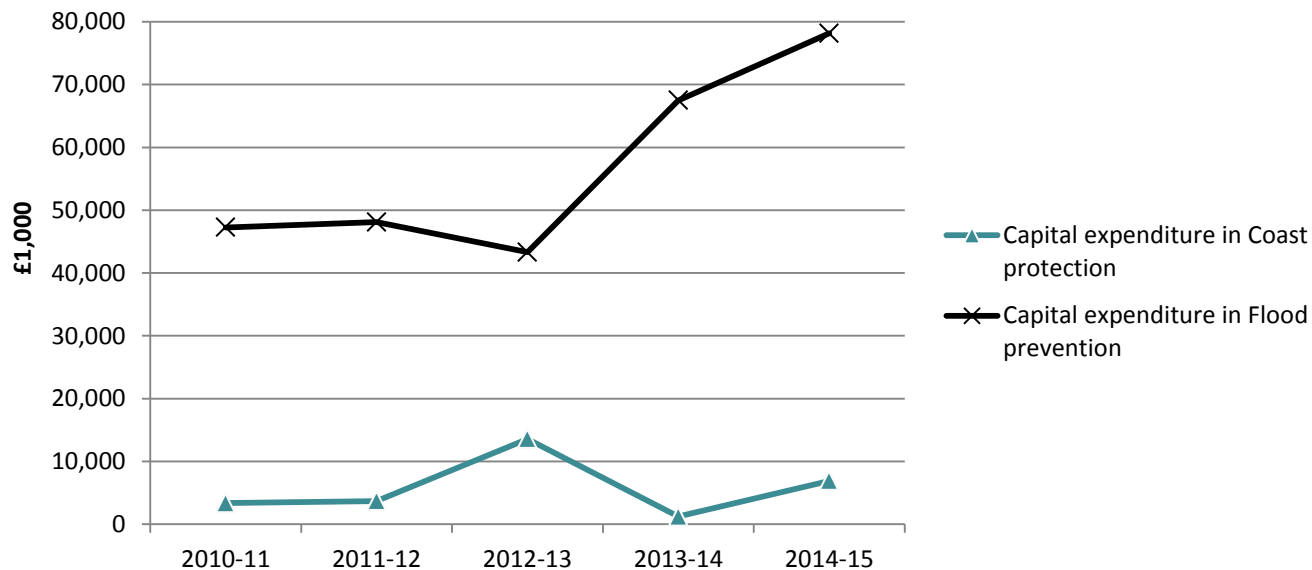
1. Flooding and coastal erosion risk management

Local Government capital expenditure on flood defences, land drainage and coastal protection



An increase in capital expenditure since 2012/13

Scottish Local Government Financial Statistics on capital expenditure on flood defence, land drainage and coastal protection



Notes:

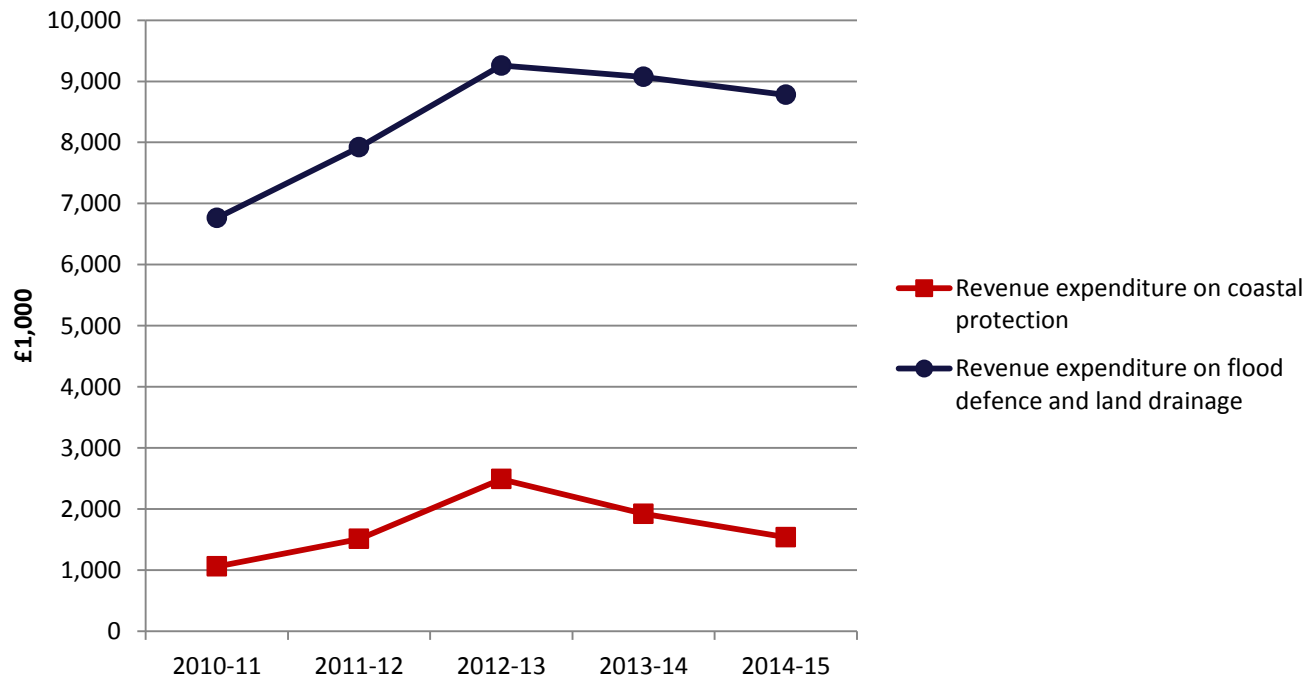
- Capital expenditure on flood defence has been increasing, from about £43 million in 2012-2013 to over £78 million in 2014-15.
- This funds partly came from Scottish Government, which has allocated £42 million of capital funding for flood defences per year between 2011 and 2016.
- Scottish Government allocated further expenditure following major flood events, for example the 2014 flooding.
- Is at discretion of individual Local Authorities to re-direct funding toward flood risk management.

1. Flooding and coastal erosion risk management

**Local Government
revenue expenditure on
flood defences, land
drainage and coastal
protection**



**Reduction in maintenance expenditure since
2012/13**



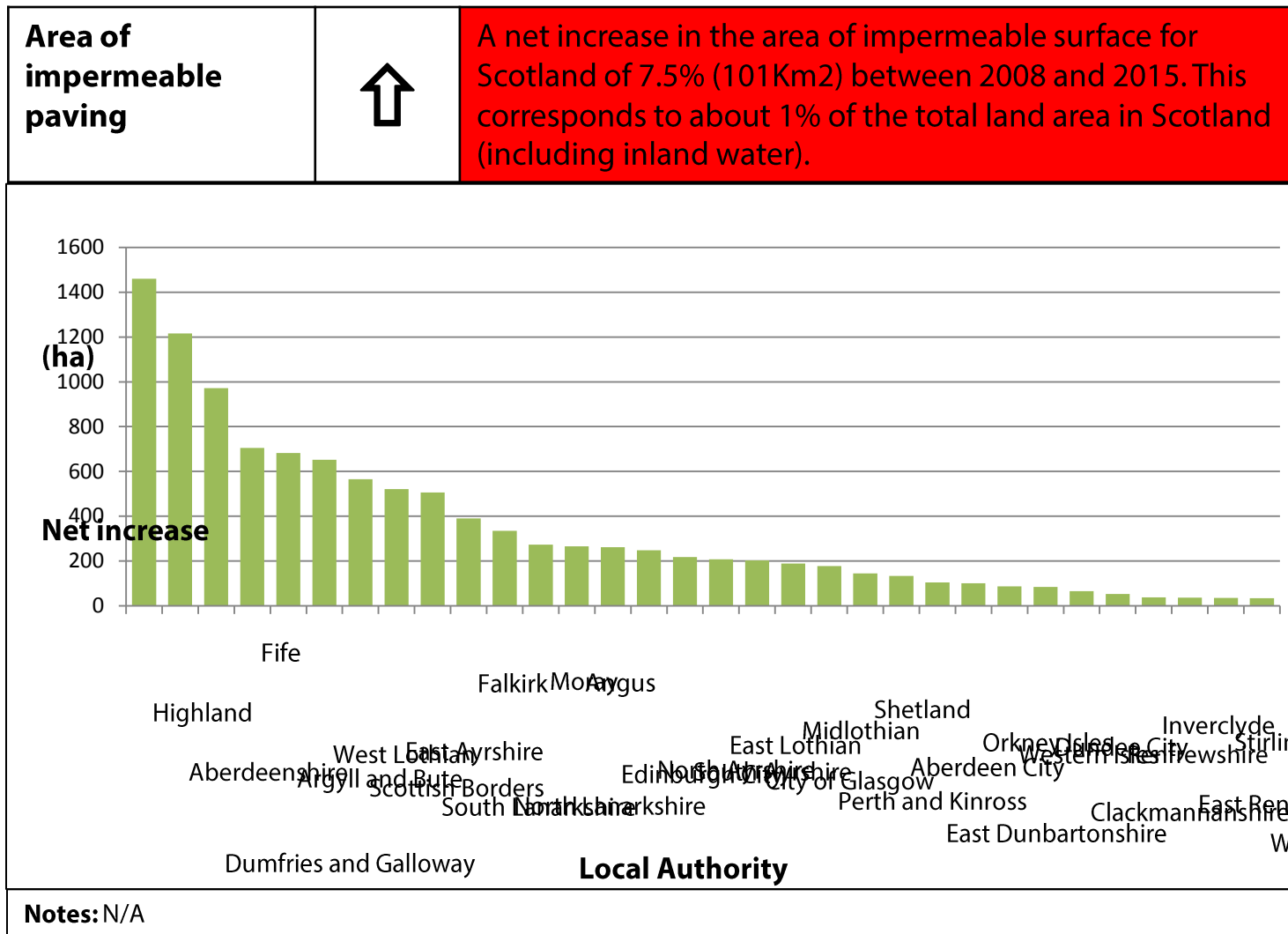
Notes:

- Revenue expenditure on flood defences (i.e. maintenance) has slightly declined, from just below £12 million in 2012-2013 to £10 million in 2014-2015.
- However, investment is still well above the 2010 level (less than £8 million).
- This might reflect the substantive increase in flood defence assets created over the last decade

2. Surface water and sewer flooding

Indicator	Data series	Source	Trend	Implication
Uptake of SUDS in new development	2002	SUDS database	N.A	No trend available
Area of impermeable paving	2008 compared to 2015	CXC	↑	A net increase in the area of impermeable surface for Scotland of 7.5% (101Km ²) between 2008 and 2015. This corresponds to about 1% of the total land area in Scotland (including inland water).

2. Surface water and sewer flooding



- Between 2008 and 2015, the area of impermeable surfaces in Scotland increased by more than 101 km².
- No local authorities have seen a net decrease in impermeable surfacing.
- This includes local authorities at high risks of surface water flooding, such as Glasgow.
- The impermeable surface in Glasgow City increased of 202ha, corresponding to a 3% increase of the impermeable surface area.

3. Development in flood risk areas

Measure	Data series	Source	Trend	Implication
Number of planning applications accepted despite flood risk issues.	N.A.	CxC (2016)	N.A.	For 40 planning applications in areas at flood risk, nine were supported by Flood Risk Assessment (FRA) despite all sites necessitating at least some level of consideration of flood risk. Similarly, SEPA is not being consulted as often as it should be on sites at risk of flooding.
SEPA advice is followed.	N.A.	CREW (2012)	N.A.	2012 data shows that SEPA advice is reflected in decision: 28 of 528 (5%) (2012), application granted contrary to advice: 21 of 528 (4%) (2012).
Number of Local Development Plans supported by SFRM	N.A.	CxC (2016)	N.A.	An analysis of 16 planning authorities has shown that only over half of these authorities have undertaken a Strategic Flood Risk Assessment for their Local Development Plans, despite being requested by SEPA in all but two cases. However, the plans were judged considering flood risk appropriately following the adoption of SEPA flood risk information at the Examination stage
Rate of development in the flood plain	2009-2014	CxC (2016)	-	Report not released.

4. Resilience of buildings to extreme wind and rain

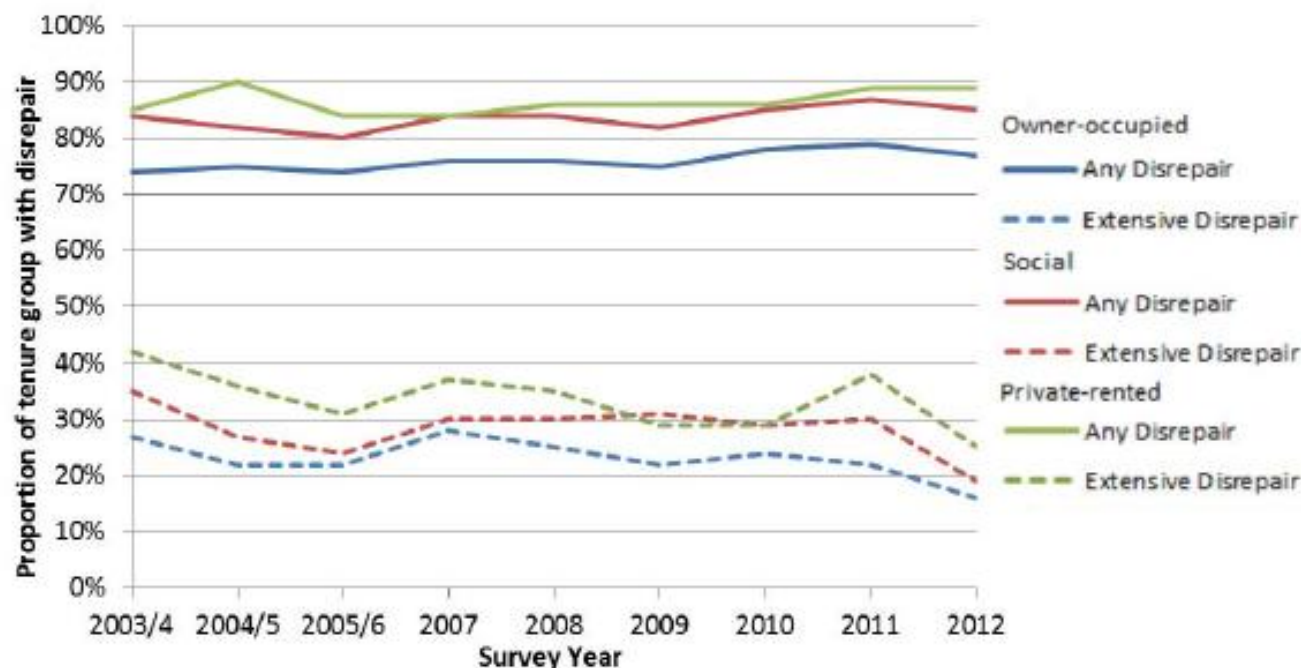
Indicator	Data series	Source	Trend	Implication
Condition of Building Fabric and Disrepair (dwellings) (CBFD)	2003/04-2012	CXC	↓	There is a slight decrease but the numbers are still high.
Increase in penetrating damp and rising damp in housing stock	1991-2012	Scottish Housing Condition Survey	↔	No significant changes since 2002. In 2012, 2.8% of the Scottish housing stock showed signs of dampness, and 9.3% of condensation

4. Resilience of buildings to extreme wind and rain

Condition of Building Fabric and Disrepair (dwellings) (CBFD)



There is a slight decrease but the numbers are still high.



Notes: 'Disrepair' is measured by assessing the conditions of a range of elements both internal and external. For each of the elements, the assessment includes the extent of disrepair, the urgency of disrepair (for external and common elements only), and in some cases the residual life of the element. Extensive disrepair is recorded if the building has any element with either an overall disrepair score exceeding 20% by area or needs urgent repairs or replacement; or rot is recorded in two or more rooms.

- Owner-occupied dwellings with some form of disrepair has increased from about 75% in 2003/4 to about 78%, although more recent data show that the percentage has decreased from 78% in 2013 to 73% in 2014 .
- Owner-occupied buildings with extensive disrepair has decreased from about 28% in 2003/4 to about 18% in 2012.
- Nearly three-quarters (72%) of pre-1919 buildings are in a critical state of disrepair.
- In 2014, 53% of dwellings were found to have disrepair to 'critical elements', defined as aspects central to weather-tightness, structural stability and preventing deterioration of the property.

4. Resilience of buildings to extreme wind and rain

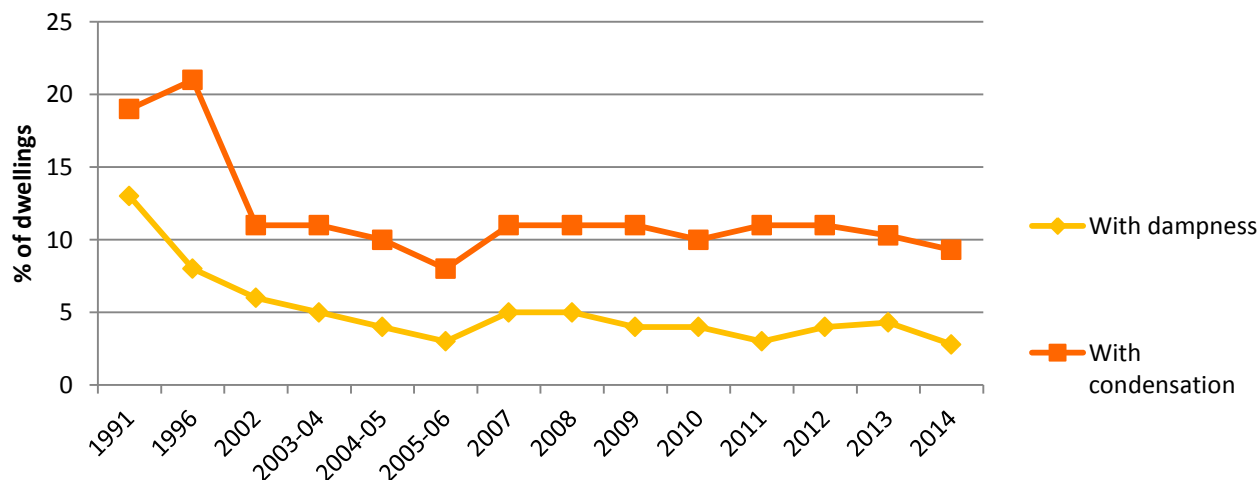
Increase in penetrating damp and rising damp in housing stock



No significant changes since 2002. In 2014, 2.8% of the Scottish housing stock showed signs of dampness, and 9.3% of condensation.

- In 2014, 2.8% of the household stock showed some degree of penetrating damp, a slight decrease from 2013.
- A very small percentage (0.5%) showed signs of rising damp.
- Just over 9.3% had condensation.
- These numbers have remained more or less constant since 2003/4.

Dampness and condensation in the Scottish housing stock



Notes: Dampness includes both penetrating and rising damp. Penetrating damp is usually the result of a defect in the building fabric. Rising damp is the result of defective or missing damp proof coursing, leading to water leaching into the building fabric. Condensation is the build-up of moisture inside a dwelling, which may be the result of insufficient or ineffective ventilation.

5. Water demand in the built environment

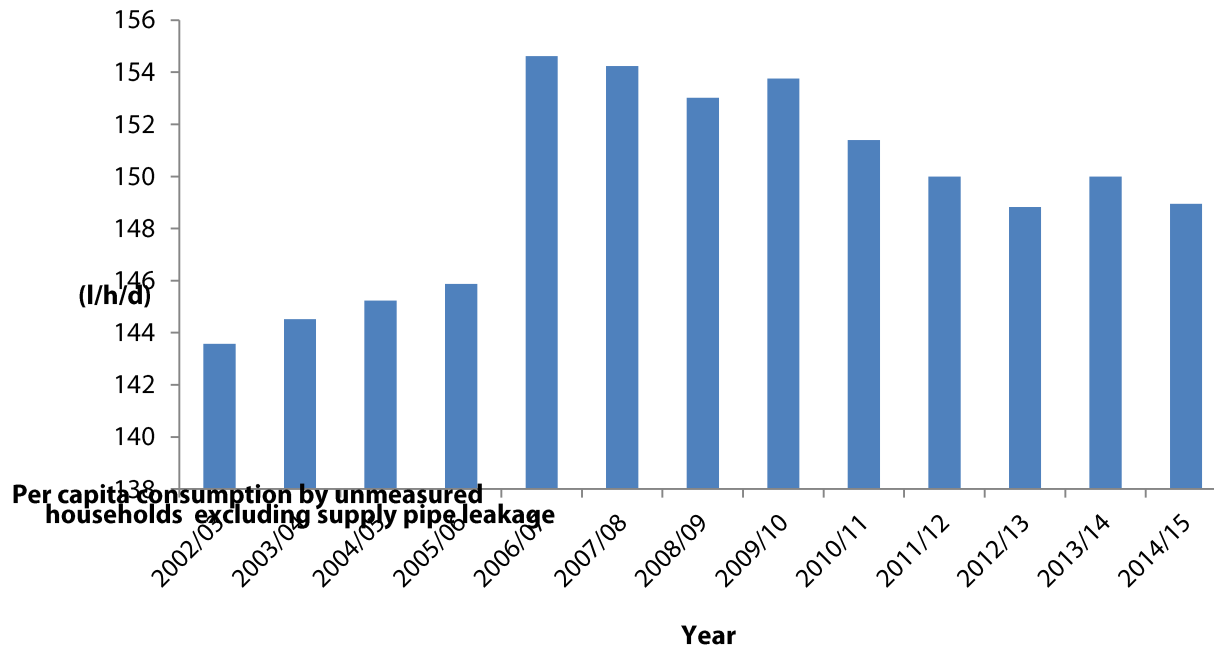
Indicator	Data series	Source	Trend	Implication
Domestic water consumption per person	2002/03 – 2014/15	Scottish Water's Annual Returns to the Water Industry Commission for Scotland.	↓	Domestic water consumption per person has decreased since 2006/07 but is still higher than earlier in the decade and than previous estimates for several North-Western European countries.
Leakage from the public water supply	2002/03 – 2014/15	Key Environmental Statistics 2015	↓	Leakage and leakage as a proportion of the public water supply have decreased since 2002/03. However, leakage as a proportion of public water supply remains higher than in England.
Uptake of water metering by domestic properties	2002/03– 2014/15	Scottish Water's Annual Returns to the Water Industry Commission for Scotland.	↔	Of approximately 2.4 million domestic properties served by Scottish Water, fewer than 500 have water meters installed. In England the proportion of domestic properties with meters installed is approximately 45%.

5. Water demand in the built environment

**Per capita
consumption by
unmeasured
households**



Domestic water consumption per person has decreased since 2006/07 but is still higher than earlier in the decade.



Notes: These values exclude supply pipe leakage.

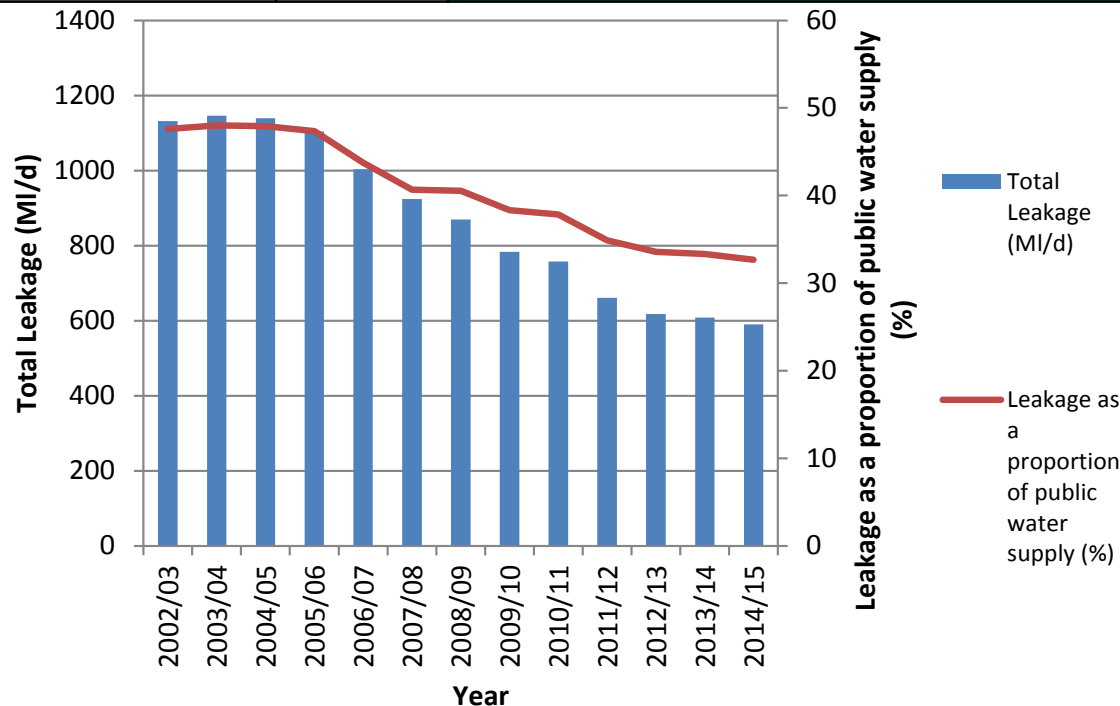
- At approximately 149 l/h/d, per capita consumption remains higher than previous estimates for Belgium, Denmark, England, Germany and the Netherlands.

5. Water demand in the built environment

Leakage from the public water supply



Leakage and leakage as a proportion of the public water supply have steadily declined since 2002/03.



Notes: Total Top Down Leakage is the summation of Scottish Water distribution network losses and customer supply side leakage, as calculated using ISO9001. This method is different than the one used to calculate the leakage figure included in the annual Water Industry Output Monitoring Group report and as such, the figures differ slightly each year. Public water supply is based on treated water produced.

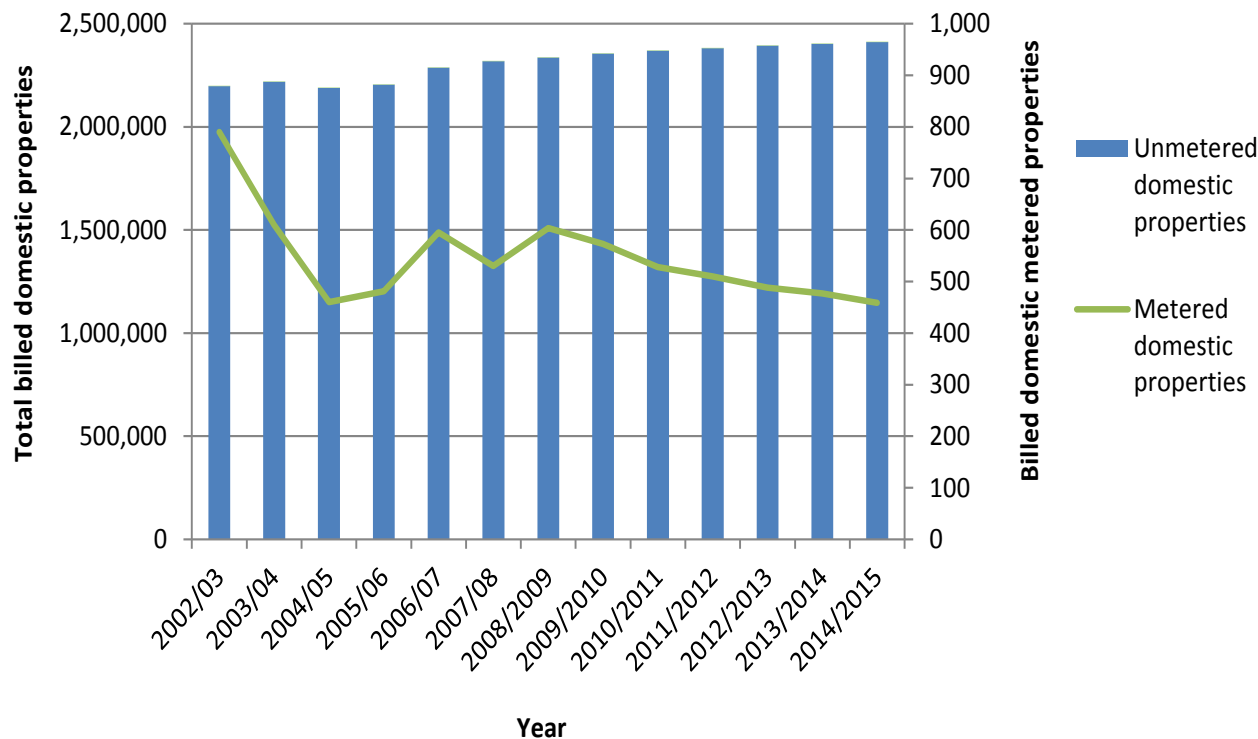
- Scottish water in their 2015-21 Business plan proposes to decrease leakage to below 500ml/d.
- However, leakage as a proportion of the public water supply remains higher in Scotland (~33%) than in England (~20%).

5. Water demand in the built environment

Uptake of metering by domestic properties



The number of domestic properties with water meters installed remains at a very low level.



Notes: This figure shows data for billed properties rather than connected properties, although numbers from the two measures are similar.

- Of approximately 2.4 million domestic properties served by Scottish Water, fewer than 500 have a water meter installed.
- In England the proportion of domestic properties with a water meter installed is approximately 45%.

Infrastructure Networks scorecard

Adaptation priority	Is there a plan?	Are actions taking place?	Is progress being made in managing vulnerability?
6. Design and location of new infrastructure	Green	Amber	Grey
7. Resilience of infrastructure to extreme weather	Green	Amber	Grey
a) Energy networks - generation, transmission and distribution	Green	Amber	Green
b) Public water supply	Green	Green	Amber
c) Ports, airports and ferry services	Amber	Amber	Grey
d) Roads and the rail network	Amber	Green	Green
e) Digital infrastructure	Amber	Grey	Grey
8. Infrastructure interdependencies	Green	Amber	Grey

6. Design and location of new infrastructure

Indicator	Data series	Source	Trend	Implication
Number of nationally significant infrastructure project (NSIP) applications in flood risk areas	-	-	-	No data available
Number of nationally significant infrastructure project applications in flood risk areas approved contrary to SEPA advice, or with SEPA conditions	-	-	-	No data available

7.a Energy networks - generation, transmission and distribution

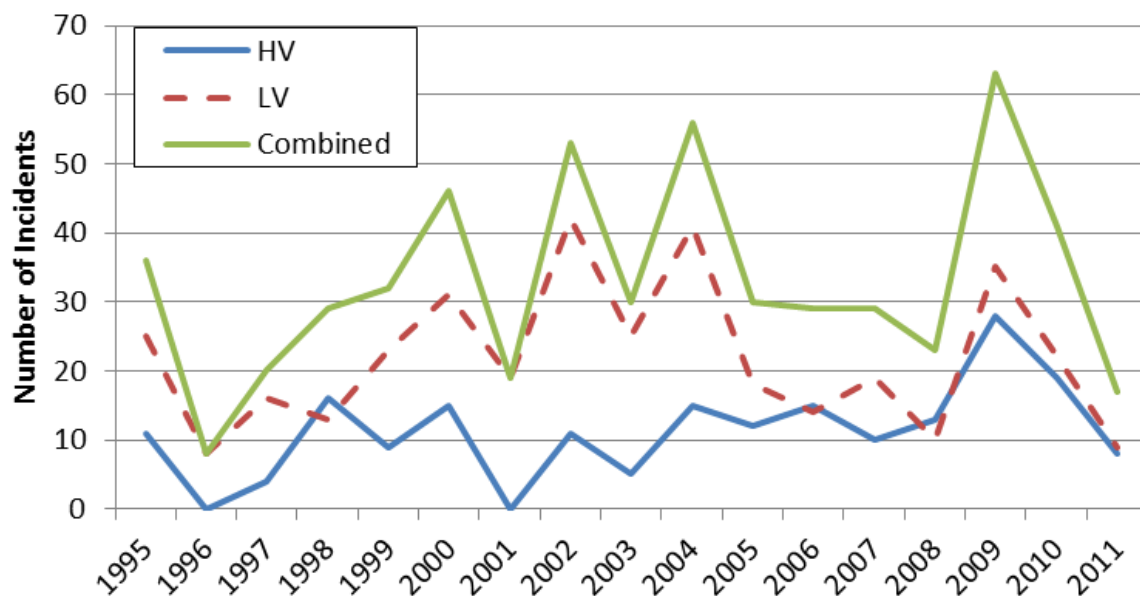
Indicator	Data series	Source	Trend	Implication
Number of interruptions to distribution networks by flooding	1995-2011	Ofgem	↔	The number of incidences has been variable with no significant pattern of change. Most recently the number of disruptions has fallen in each of the two years since the peak in 2009.
Customer minutes lost as a result of interruptions to supply caused by flooding	1995-2011	Ofgem	↓	The number of incidences has been variable. However there has been a decline since 2006.
Customer minutes lost as a result of interruptions to supply caused by severe weather	1995-2011	Ofgem	↔	The number of incidences has been variable with no significant pattern of change. Most recently the number of disruptions increased again from 2010.

7.a Energy networks - generation, transmission and distribution

Number of interruptions to distribution networks by flooding



The number of incidences of interruptions has been variable with no significant pattern of change. Most recently the number of disruptions has fallen in each of the two years since the peak in 2009.



Notes: HV = High voltage, LV = Low voltage

Incidents is defined as 'number of customers whose supplies have been interrupted per 100 customers each year, where an interruption to supply lasts for three minutes or longer, excluding re-interruptions'

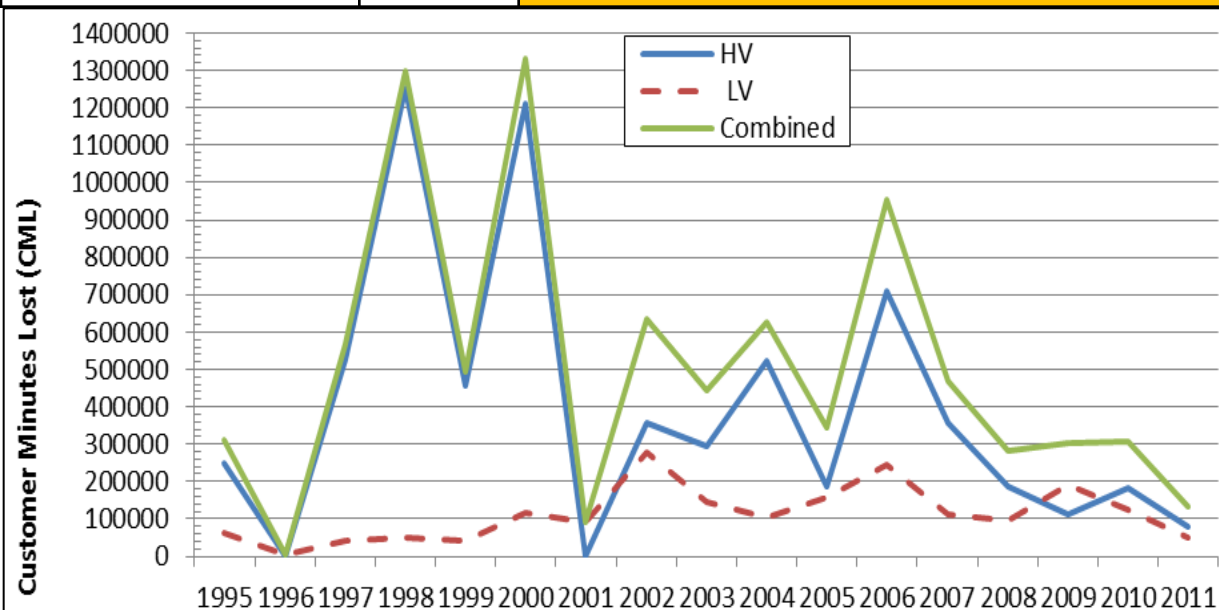
- The number of incidences of interruptions has varied considerably, with the lowest number of incidences seen in 1996 and the highest in 2009.
- In 2011 (the latest dataset available), there were 17 incidences of flooding, resulting in 132,345 Customer Minutes Lost.
- Flooding only accounts for only 0.2% of all interruptions

7.a Energy networks - generation, transmission and distribution

Customer minutes lost as a result of interruptions to supply caused by flooding



The number of minutes lost has been variable. However there has been a decline since a peak in 2006.



Notes: HV = High voltage, LV = Low voltage

Customer Minutes Lost measures the duration of interruptions per customer where an interruption to supply has lasted three minutes or longer.

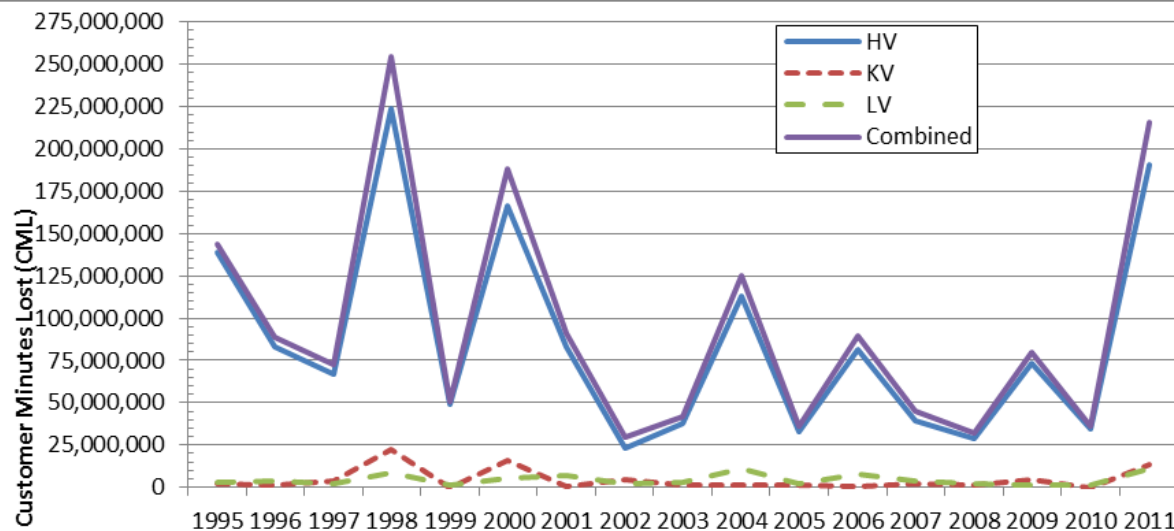
- The number of minutes lost due to disruption caused by flooding has varied with two significant peaks of the combined value in 1998 and 2000 at 1,299,443 CML and 1,331,071 CML respectively. This is compared to lows in 2011 of only 132,345 CML.

7.a Energy networks - generation, transmission and distribution

Customer minutes lost as a result of interruptions to supply caused by severe weather



The number of incidences has been variable with no significant pattern of change. Most recently the number of disruptions increased again from 2010.



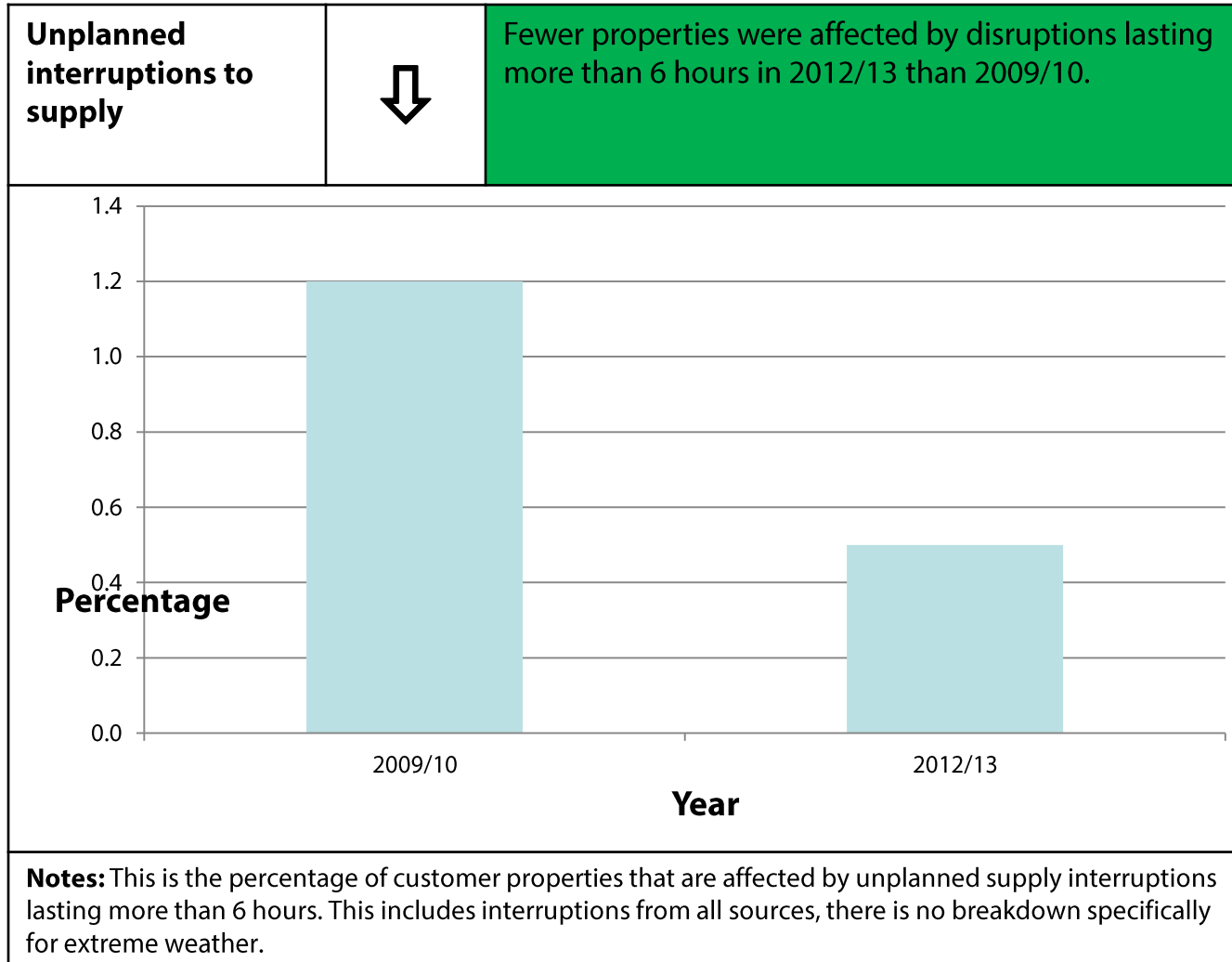
Notes: HV = High voltage, LV = Low voltage, KV = Transmission. Severe weather excludes flooding

- The number of customer minutes lost is generally higher for high voltage networks than for low voltage networks. This suggests that although interruptions are as frequent on the LV networks, interruptions on the HV network have a greater impact on consumers.
- The top three disruptor in 2011 were wind and gales (823million CML), snow, sleet and blizzards (353million CML), lightning (241million CML).

7.b Public water supply

Indicator	Data series	Source	Trend	Implication
Clean and waste water treatment works in areas of flood risk	2012	Scottish Water	N/A	In 2012, 45 (18%) water treatment assets and 429 (24%) wastewater treatment assets fell within SEPA's 0.5% annual flooding probability (1 in 200). Whilst flooding of assets has occurred in the past this more detailed information was not available.
Percentage of water customers served by a single source of supply	2015	Scottish Water	N/A	Scottish Water's initial assessment indicates that around only 15% of their customers can be provided with a normal service from an alternative source of supply in the event of the loss of a critical asset (treatment works, raw water supply or certain strategic trunk mains). No trend information available.
Instances of customers losing supply of drinking water due to severe weather	N/A	Scottish Water	N/A	No data or trend information available.
Customers' properties experiencing unplanned interruptions to supply	2009/10 and 2012/13	Scottish Water	↓	In 2009/10 a total of 28,900 (1.2%) customers' properties experienced an unplanned interruption to supply lasting more than 6 hours whereas in 2012/13 this figure was 12,800 (0.5%). 89,100 (3.5%) customers' properties experienced an unplanned interruption of greater than 3 hours.

7.b Public water supply



- In 2009/10 a total of 28,900 (1.2%) customers' properties experienced an unplanned interruption to supply lasting more than 6 hours whereas in 2012/13 this figure was 12,800 (0.5%).
- 89,100 (3.5%) customers' properties experienced an unplanned interruption of greater than 3 hours.

7.c Ports, airports and ferry services

Indicator	Data series	Source	Trend	Implication
Number of service disruptions as a result of severe weather	-	Transport Scotland	-	No data available

7.d Roads and the rail network

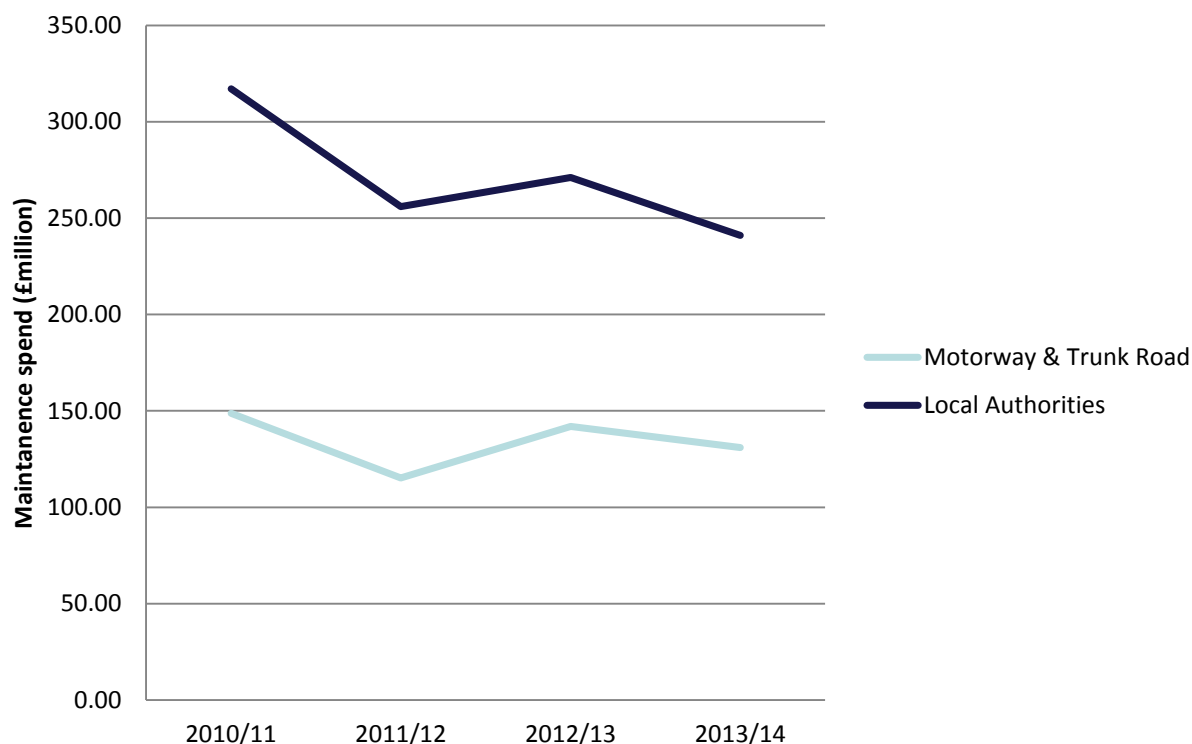
Roads Indicator	Data series	Source	Trend	Implication
Road maintenance expenditure	2011/12 – 2013/14	Transport Scotland	↔	Transport Scotland expenditure on maintenance of the trunk road network (including winter maintenance) has seen a slight decrease.
Number of local roads in 'Red' or 'amber' condition	2008/09 – 2014/15	Transport Scotland	↓	The condition of roads (as defined by the UK's Standard RCI) has improved since 2010 with a lower proportion of all roads been categorised as amber or red (46% to 37%) in 2014. However, the percentage of red roads has remained around 8%.
Number of trunk roads in 'Red' or 'amber/green' condition	2011/12-2014/15	Transport Scotland	↔	The condition of Scottish trunk roads has remained relatively stable since 2011.
Flood events affecting the road network	Jan 2014-Mar2015	Transport Scotland and SEPA. From CxC indicator BT4	-	A total of 567 flood incidences were recorded between January 2014 and March 2015. 51.7% were on sections of the network within Potentially Vulnerable Areas (PVAs) as identified in SEPA'S National Flood Risk Assessment (NFRA).
Landslide events affecting road networks	Jan 2014-Mar2015	Transport Scotland. From CxC indicator BT22/23	-	A total of 12 landslide events were recorded between January 2014 and March 2015. Seven of these were in very remote rural areas. Five of these resulted in road closures.

7.d Roads and the rail network

Road maintenance spend



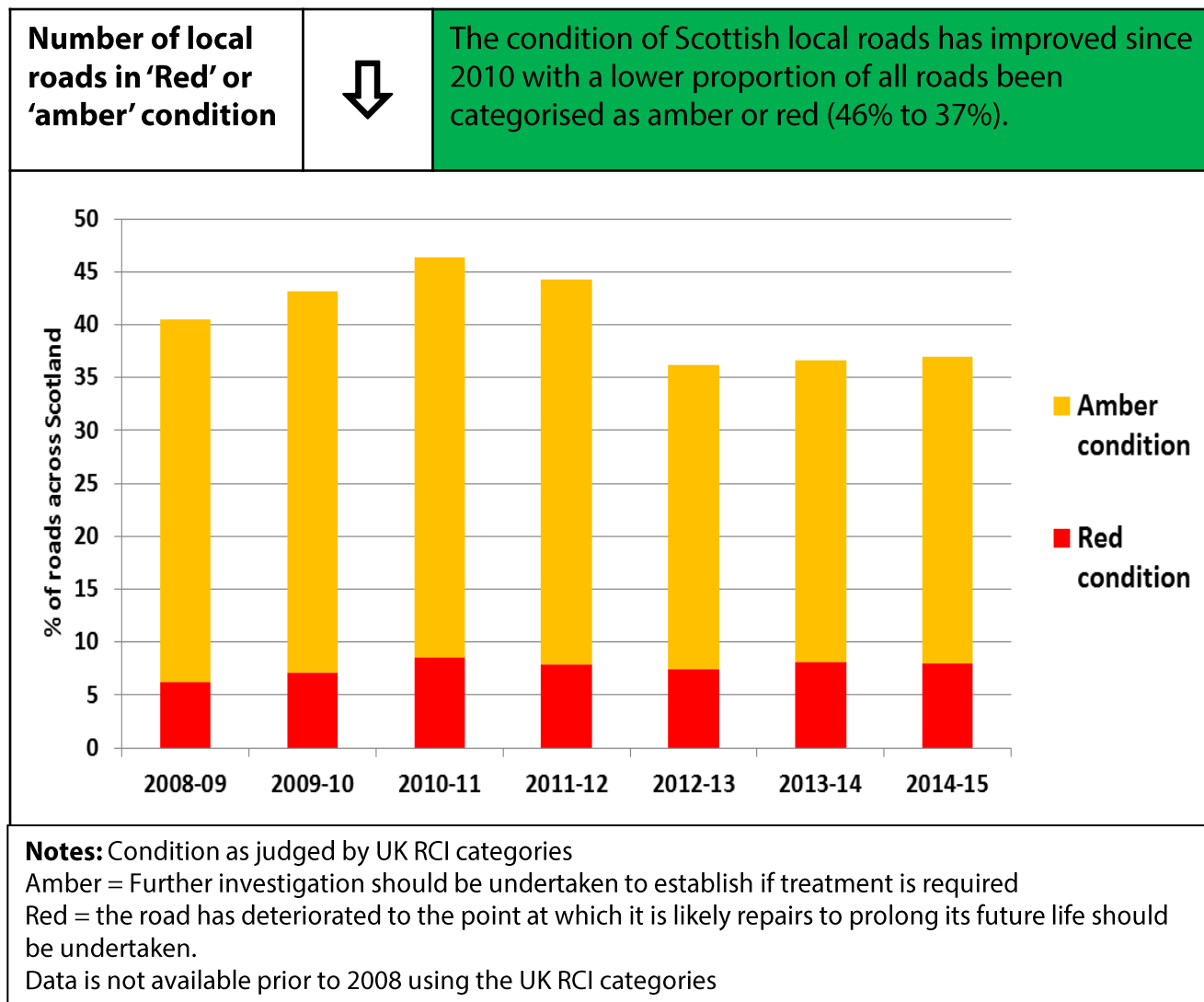
Expenditure on maintenance of both the trunk road and local road network has seen a slight decrease since 2012/13.



Notes: Maintenance spend includes winter maintenance of gritting and snow ploughing.
Taken from latest available data.

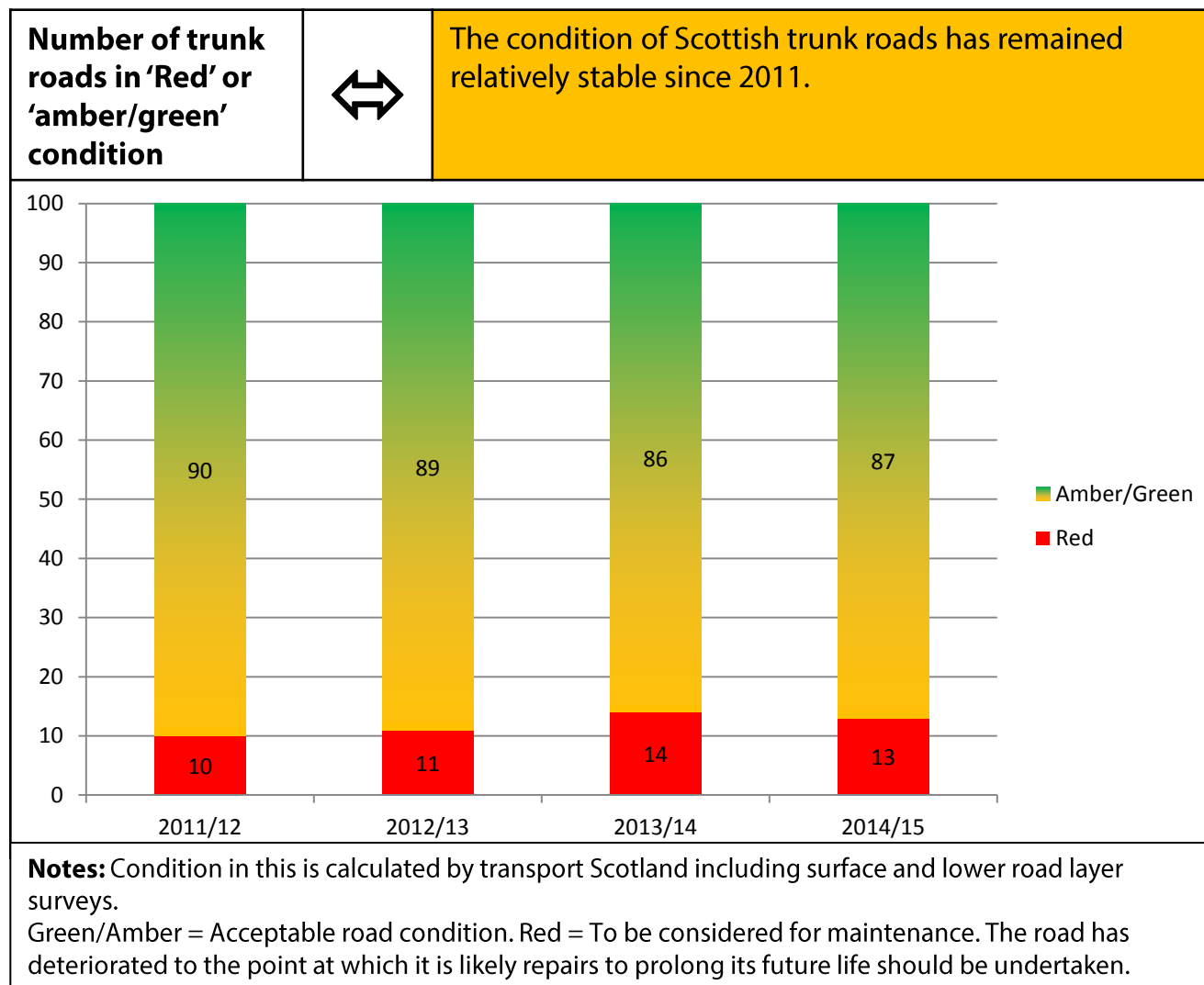
- Road maintenance spend is an indicator of resilience of the road network.
- Maintenance expenditure have decreased since a peak in 2012/13.

7.d Roads and the rail network



- Whilst the condition has increased overall the percentage of roads given a 'red' score for condition has remained around 8%.

7.d Roads and the rail network



7.d Roads and the rail network

Rail Indicator	Data series	Source	Trend	Implication
Scotland Route weather attributed Schedule 8 costs	2006/07 to 2013/14	Network Rail. From ClimateXChange indicator BT12	-	The total Schedule 8 costs for flooding related schedule 8 costs was £9.8 million, with the other largest weather related costs being for snow and wind.
Flood events affecting the railway network	-	-	-	Data not currently available
Number of landslide events affecting rail networks	-	Network Rail	-	Data not currently available

7.e Digital infrastructure

Indicator	Data series	Source	Trend	Implication
Number of data centres at risk of flooding	-	-	-	Not yet available
Number of end users affected by outages over 1 day by severe weather	-	Ofcom	-	Not yet available

8. Infrastructure interdependencies

Indicator	Data series	Source	Trend	Implication
No measures identified yet				

Adaptation Sub-Committee

<https://www.theccc.org.uk>



@theCCCuK

