Indicators and trends

Monitoring climate change adaptation

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Scotland's centre of expertise connecting climate change research and policy

Indicator name				Version
BB17 Dampness in housing stock **BB18 Condensation in housing stock**				**May 2018**
Indicator type:	**Risk/opportunity**	**Impact**	**Action**	
		X		

SCCAP Theme	SCCAP Objective	CCRA risk/opportunity
Buildings and Infrastructure Networks	B1: Understand the effects of climate change and their impacts on buildings and infrastructure networks B3: Increase the resilience of buildings and infrastructure networks to sustain and enhance the benefits and services provided	BE13 Rainwater penetration; BE31 Increase in damp, mould and insect pests in buildings

At a glance

- Dampness in dwellings leads to increased condensation, mould and insect pests, all of which may have negative effects on building condition, and the health and well-being of occupants.
- Climate change will increase the frequency and severity of wind-driven rain, which may increase penetrating damp. Rising damp may increase in areas prone to waterlogging.
- Levels of dampness and condensation have improved since the early 1990's and have been relatively stable since 2002. It is unknown how this may change in future.
- Building Regulations set standards aimed to protect dwellings from damp and condensation. These standards and guidance are kept under review so as to reflect best practice and adapt to changes in climate. A 2011 review improved the guidance relating to wind-driven rain. Regulation of the social housing sector helps to maintain standards for this sector.

Latest Figure	Trend
2016: Dwellings with Penetrating Damp: 3.7% Dwellings with Rising Damp: 0.4% Dwellings with Condensation: 8.5% (SHCS 2016: Key findings)	There has been no significant trend in either dampness or condensation over the period 2002 – 2016.

Why is this indicator important?

The penetration of rainwater into buildings has long been a concern in Scotland, where the exposure to wind-driven rain ranges from 'Moderate' (some east coast areas) to 'Very Severe' along much of the west coast and Scottish Islands (categories are defined within British Standard number BS 8104: 1992). Rainwater penetration can lead to internal dampness, increased condensation, mould and insect pests, all of which have implications for human wellbeing and health as well as for the building fabric itself. Penetrating damp is usually the result of a defect in the building fabric, such as damage to the walls or roof, water ingress due to damaged seals on doors or windows or damp as a result of leaking plumbing.

Rising damp is far less of a problem but is included here as any source of dampness will have implications for human health. Rising damp is the result of defective or missing damp proof coursing leading to water leaching into the building fabric.

Related Indicators:

- **BB16** Building Condition and Disrepair
- **CRS58** Number of households falling below the SHQS Tolerable Standard

What is happening now?

In 2016, 3.7% of the household stock (around 91,000 dwellings) showed some degree of penetrating damp, while only 0.4% of dwellings showed signs of rising damp. Condensation was observed in 8.5% of surveyed properties (247,000 dwellings). In 1% of dwellings (26,000) both condensation and damp were recorded. Table 1 below shows figures for these factors from 2014 to 2016.

Table 1. Presence of Damp and/or Condensation in 2014 to 2016[1]

	2016		2015		2014	
Defect	000s	%	000s	%	000s	%
No Damp or Condensation	2,171	88.6%	2,179	89.5%	2,144	88.6%
Condensation	209	8.5%	214	8.8%	226	9.3%
Penetrating damp	91	3.7%	58	2.4%	67	2.8%
Rising damp	10	0.4%	3	0.1%	11	0.5%
Condensation and any damp	26	1.0%	20	0.8%	24	1.0%
Total	2,452		2,434		2,420	
Sample		*2,850*		*2,754*		*2,682*

Source: Scottish House Condition Survey, 2017

[1] The survey was conducted on a small proportion of Scottish housing stock ('Sample') but the survey and table also provide the equivalent number of the 'Total' housing stock in 000s. See Limitations section.

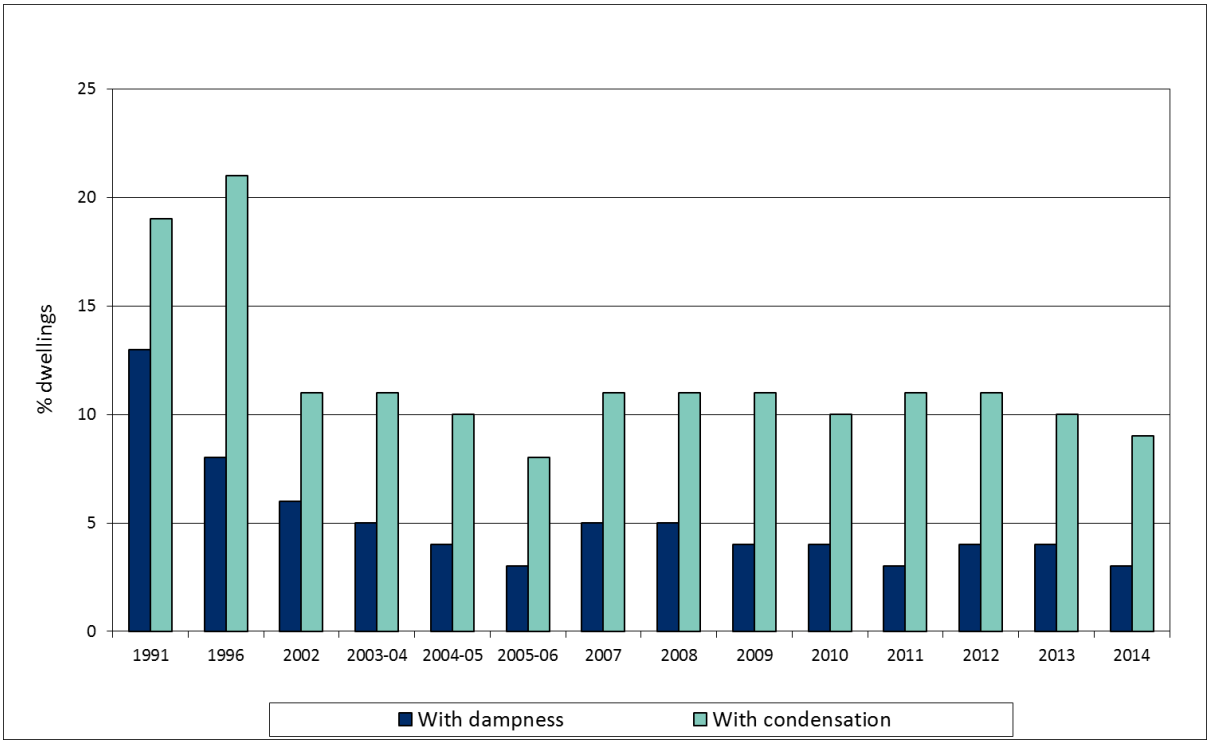
Dwellings not being free from rising or penetrating damp was the most common reason for being recorded as Below Tolerable Standards in the 2016 SHCS.

Traditionally constructed (or historic) buildings are particularly threatened by increased rainfall which causes water penetration into masonry, and can lead to an increased risk of dampness, condensation and mould growth and, at worst, structural collapse. Increased extremes of wetting and drying may also lead to accelerated decay of stonework and other traditional materials. Even changes in the distribution of pests and biogenic growth such as lichen can threaten the integrity of historic buildings (Historic Scotland, 2012). Evidence from the Scottish House Conditions Survey (SHCS) indicates that traditionally constructed housing is poorly prepared for climate change, with 67% of pre-1919[2] buildings surveyed as being in a critical state of disrepair (SHCS, 2017).

What has happened in the past?

Surveyed levels of damp and condensation showed a very significant drop between 1991/1996 and the start of annual surveying in 2002 (see Figure 1). Since then, there has not been a significant trend in either factor.

Figure 1. Trends in dampness and condensation 1991 – 2014 (% of dwellings)



Source: Scottish House Condition Survey 2016

What is projected to happen in the future?

Winter rainfall is predicted to increase in Scotland and this could increase the incidence of rainwater penetration in existing building stock. Wind predictions are too uncertain to factor in at present. However given the anticipated increase in rainfall, it is likely that rainwater penetration will increase if no adaptive action is taken to counter the additional exposure.

[2] Pre-1919 properties represent approximately 20% of the total housing stock in Scotland

Regulation and Research

Dampness is one of the 55 criteria assessed in the Scottish Housing Quality Standard (SHQS). Since 2015 all social landlords must ensure that all their dwellings pass the SHQS, so this will be acting as a significant driver to reduce levels of dampness in this sector (though private owners and private landlords are currently under no such obligation).

In anticipation of climate change effects, Scottish Government (2011) commissioned work to assess whether masonry walls constructed in accordance with the historical rainfall data and mapping in British Standard 8104, would still achieve the level of performance required by the Technical Standards for preventing precipitation penetrating to the inner face of buildings. As a result of this research, an additional method of assessing wind driven rain has been introduced into Building Standards (see below).

Design guidance and standards are available in the Scottish Building Standards Technical Handbooks (Scottish Government, 2013). Since October 2013 these have included both the (older) British Standard BS 8104: 1992 (which uses historic rainfall data from the 33 year period from 1959 to 1991), and the newer British Standard BS EN ISO 15927-3: 2009, which is based on the present weather code. Both of these provide methodologies for the assessment of wind driven rain on the walls of a building.

Section 3.10 of the Domestic Handbook states the requirement for domestic buildings as follows: "*Every building must be designed and constructed in such a way that there will not be a threat to the building or the health of the occupants as a result of moisture from precipitation penetrating to the inner face of the building*."

Scottish Government (2013) also has plans in place for 'Research to identify necessary resilience measures for buildings including ….

- Effects of wind driven rain on external fabric (for new buildings)
- Physical effects on buildings of changing weather patterns and profiles (existing buildings)'
- Research to create a simple assessment methodology for gutters and rainwater pipes.

An increased emphasis on energy efficiency measures is likely to reduced incidences of condensation and damp. The Scottish Government has designated energy efficiency measures as a national infrastructure priority (CXC 2018).

Patterns of change

Levels of damp and condensation have remained largely similar over the past decade. It is not known if this will change over the next decade. Geographical differences in rainfall are anticipated.

Regional variations have been observed for the period 2014-16. Analysis over this period shows that two Local Authorities (Aberdeen City and Orkney Islands) have percentages of damp affected dwellings significantly above the national average; and four Local Authorities (Aberdeen City, Midlothian, Angus and Dundee City) have percentages of condensation affected dwellings significantly above the national average (Scottish Government, 2017).

Interpretation of indicator trends

Penetration of rainwater and penetrating damp is influenced by building fabric and design, the state of repair / disrepair and by the influence of regulations, as well as by climatic factors. All these factors must be considered when interpreting any trend.

Condensation levels are noticeably affected by occupant behaviours (e.g. internal drying of laundry, bathroom usage, cooking, window usage) as well as ventilation features and rising and / or penetrating damp. Again, all these factors must be considered when interpreting any trend.

Limitations

The SHCS records a dwelling as having damp or condensation even when just a small area is affected, so this marker does not indicate a serious housing quality issue in all cases.

In addition, levels of dampness and condensation may vary depending on recent weather conditions, therefore measurement based on a single time point may not necessarily be representative of the extent of any problems.

Robust data is only available for dwellings and does not cover trends in dampness in the workplace and other commercial buildings. Employers have a legal duty under the Health and Safety at Work Act 1974 to ensure a safe working environment. Issues with dampness should be addressed by this.

The SHCS is a sample survey. All survey figures are estimates of the true prevalence within the population and will contain some error associated with sampling variability.

References

British Standards Institution (BSI) 2009, *Hygrothermal performance of buildings. BS EN ISO 15927-3: 2009*. Available at: http://www.iso.org/iso/catalogue_detail.htm?csnumber=44281 (accessed 15 January 2014)

ClimateXChange (CXC) (2018) *Incorporating climate change adaptation in housing policy delivery – lessons from three case studies*. Available at:https://www.climatexchange.org.uk/media/3073/incorporating-climate-change-adaptation-in-housing-policy-delivery-lessons-from-three-case-studies.pdf (accessed May 2018)

Historic Scotland (2012) *Climate Change Action Plan for Historic Scotland 2012-2017*. Available at: http://www.historic-scotland.gov.uk/climatechange (accessed 15 January 2014)

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Scottish Government (2013) *Building Standards Technical Handbook – Domestic - Environmental.* http://www.gov.scot/Resource/0046/00460617.pdf (accessed 11 February 2015)

Scottish Government (2017) *Key results from the Scottish House Condition Survey (SHCS) Local Authority tables 2014-2016*. Available online at: http://www.gov.scot/Topics/Statistics/SHCS/keyanalyses

Scottish House Condition Survey: 2016 Key Findings (2017). Directorate for Housing and Social Justice Communities Analysis Division, Scottish Government. Available at http://www.gov.scot/Topics/Statistics/SHCS/Downloads (accessed April 2018)

Further information

British Standards Institution (BSI) 1992, British Standard Code of Practice for Assessing the Exposure of Walls to Wind-driven Rain, BS8104, British Standards Institution, London, 1992. Available at http://shop.bsigroup.com/ProductDetail/?pid=000000000000273071

Scottish Government Building Regulations – Precipitation. See http://www.gov.scot/Resource/0046/00460617.pdf and http://www.gov.scot/Topics/Built-Environment/Building/Building-standards/publications/pubtech/th2013domcomp

Scottish Government Building Regulations. All handbooks related to Scottish Building Regulations are available at: http://www.gov.scot/Topics/Built-Environment/Building/Building-standards/techbooks/techhandbooks

Scottish Government (2014) *Scottish House Condition Survey 2013* Available at: http://www.gov.scot/Topics/Statistics/SHCS See also SHCS Downloadable Reports, available at:- http://www.gov.scot/Topics/Statistics/SHCS/Downloads

SHCS coverage of Housing Quality and of the Scottish Housing Quality Standard is available at http://www.gov.scot/Publications/2012/12/4995/7

Scottish Housing Quality Standard. Guidance is available at http://www.gov.scot/Topics/Built-Environment/Housing/16342/shqs/guidance
Scottish Government (2013) *Technical Annex to the SCCAP*. Available at: http://www.gov.scot/Publications/2013/06/8970/3

Acknowledgements

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Appendix One: Indicator metadata and methodology

Table 1: Indicator metadata

	Metadata
Title of the indicator	BB17 Dampness in Housing Stock BB18 Condensation in Housing Stock
Indicator contact: Organisation or individual/s responsible for the indicator	ClimateXChange
Indicator data source	Scottish House Condition Survey
Data link: URL for retrieving the indicator primary indicator data.	http://www.gov.scot/Topics/Statistics/Browse/Housing-Regeneration/TrendData http://www.gov.scot/Topics/Statistics/SHCS/Downloads

Table 2: Indicator data

	Indicator data
Temporal coverage: Start and end dates, identifying any significant data gaps.	Data collected in 1991 and 1996, then annual data from 2002
Frequency of updates: Planned or potential updates	Annual updates from 2002
Spatial coverage: Maximum area for which data is available	Scotland
Uncertainties: Uncertainty issues arising from e.g. data collection, aggregation of data, data gaps	Levels of dampness and condensation vary depending on recent weather conditions, so measurement based on a single time point may not necessarily be fully representative
Spatial resolution: Scale/unit for which data is collected	Data for individual dwellings is not available. The data has been extrapolated for a national picture of housing, and while no spatial data is available, requests can be made for data corresponding to Local Authority areas
Categorical resolution: Potential for disaggregation of data into categories	Access to the dataset is not possible except through requests directly to the SHCS department.
Data accessibility: Restrictions on usage, relevant terms & conditions	At a national level, the data is free and publicly accessible. Reports are free on the Scottish Government website under

	the Open Government License (pdf). Ad hoc data requests can be made free of charge for bespoke data sets (Excel).

Table 3 Contributing data sources

Contributing data sources Data sets used to create the indicator data, the organisation responsible for them and any URLs which provide access to the data.

Table 4 Indicator methodology

Indicator methodology The methodology used to create the indicator data
Data was generated by physical surveys carried out under the SHCS, which undertakes an annual survey of circa 15,000 homes in Scotland, concerning their physical condition* and the experience of occupants of their home. This indicator is based on data recorded by SHCS surveyors who inspected dwellings for signs of penetrating damp, rising damp and condensation (each of these is recorded separately). The sample size is small in comparison to the overall housing stock, but it is published as a National Statistics report, and is therefore robust**. *Data collected includes dwelling age, type, condition, tenure, urban/rural split, fuel use, EPC rating, CO2 emissions, household income, insulation measures, fuel poverty metrics, Scottish Housing Quality Standard and condition of the dwelling (damp, condensation, disrepair). Data is also compared to previous years to identify trends. **In 2009, the SHCS was designated as a National Statistics product by the UK Statistics Authority (UKSA). This demonstrates that the SHCS statistics are accurate, trustworthy and compliant with the high standards required of National Statistics.