Societal Resilience: an assessment of the vulnerability of Scottish society to the effects of climate change.

How vulnerable is Scottish society to a changing climate?

A changing climate will have significant and wide-ranging effects on all sectors of society, with the potential to cause significant economic and social disruption. Our understanding of the risk (exposure and vulnerability) to the material fabric of society can be relatively easily quantified – the number of households at risk of a significant flood event, for example. It is possible therefore to begin to take action to mitigate those risks and, where necessary, to adapt to their impacts.

Societal Resilience, provides an assessment of the current state of resilience of Scottish society, covering both social and economic measures, which establishes a baseline of vulnerability and exposure (*risk*), calibrated against actual *impacts* (where these exist) and any risk mitigation *actions* that have been identified in the policies and proposals cited in the Scottish Climate Change Adaptation Programme (SCCAP).

A lot of the responsibility for developing a more resilient society lies with public bodies as required by Section 44 of the Climate Change (Scotland) Act 2009. Their involvement in developing capabilities (knowledge and skills) will be critical in building resilience. The extent to which social capital can help improve resilience is considered in the ***Capability and Capacity*** assessment. Improvements in capabilities should be reflected in improved societal resilience.

Additionally, each of the public bodies is required to develop their own climate change risk assessment and adaptation plans. Many of these are in the initial stages of development (SFRS, 2015) or are being substantially refreshed (HFS, 2012) and, consequently, data from these have not been available for this assessment. Public bodies reporting[1] will become mandatory for the year 2015/16, the first report being made available to Scottish Ministers in October 2016. Data from these sources will provide a more complete view of **Societal Resilience** in the future.

Other drivers of change include factors such as social cohesion[2] and inequality, some of which can be addressed to a greater or lesser extent with appropriate policy levers, while others - oil price, for example, an important determinant in the rate of fuel poverty - are macroeconomic and, therefore, outside of Scottish Government's direct control. None of these drivers has been considered in the SCCAP and they are therefore out of scope for this assessment.

Adaptation options

The legislative landscape is complex.

Adaptation planning is identified as an obligation for national and local government in both the UK Climate Change Act 2008 (*Part 4: Impact of and Adaptation to Climate Change*) and the Climate Change (Scotland) Act 2009 (*Part 5: Other Climate Change Provisions Chapter 1, Adaptation*) (Scottish Government, 2009a).

The Scottish Act establishes responsibilities for all public bodies in *Part 4: Duties of Public Bodies*

[1] Public Bodies reporting will supersede a number of voluntary reporting arrangements: Scotland's Climate Change Declaration (SCCD), Universities and College Climate Commitment for Scotland (UCCCfS), Public Sector Sustainability Reporting (PSSR).

[2] A concept first proposed by the sociologist Emile Durkheim which has subsequently lead to much theoretical and empirical research, see Bruhn, 2009 for a useful overview of the changing conception of social cohesion from Durkheim (1897) to Moody & White (2003).

Relating to Climate Change. *Public Bodies Climate Change Duties* provides guidance on reporting and fulfilment of these obligations under Section 44(1) of the Climate Change (Scotland) Act 2009 (Scottish Government, 2011).

Scottish Government policies designed to improve resilience are considered here under three broad headings: *Prepare*; *Respond*; Recover (Scottish Government, 2013).

1. Prepare: assess the risks

Climate related risks frequently manifest as extreme weather events: extreme temperatures, flood, storms and high winds. The impact of these events on the material fabric of society – residential and non-residential properties at risk of flooding, for example - is clearly of concern. So too is the socio-economic distribution of the risks - physical health, mental wellbeing, age, employment, financial health, mobility, social isolation, etc. – individually and collectively (multiple deprivations).

The **Flood Risk Management (Scotland) Act 2009** requires that the impact of flooding is assessed in terms of potential adverse consequences on human health, economic activity, the environment and cultural heritage (Scottish Government, 2009b). It places duties on SEPA to prepare flood risk assessments for each flood risk management district.

Scotland's Flood Risk Management Strategies (FRM Strategies) coordinate efforts to tackle flooding. They set the national direction of future flood risk management, helping to target investment and coordinate actions across public bodies. Each of Scotland's 14 Local Plan Districts has an FRM Strategy, which is used as a basis for better decision-making across flood risk management organisations.

Local Flood Risk Management Plans are due to be published in June 2016 and will provide local detail about flood management actions between 2016-2021. Both Local Flood Risk Management Plans and Flood Risk Management Strategies will be updated every six years.

Climate-related information is already included in **Preparing Scotland: Warning and Informing** (Scottish Government, 2013). Warnings and alerts are made available to the public through SEPA's ***Floodline*** service. SEPA also collaborates with the Met Office to provide a more detailed ***Scottish Flood Forecasting Service*** integrating hydrological and metrological data, specifically for Category 1 and Category 2 Responders as defined in the Civil Contingencies Act (Scotland) 2004.

The SCCAP also uses recommendations from **Good Places Better Health** (Scottish Government, 2008) to evaluate (some of) the risks associated with societal preparedness, including, for example, an assessment of climate resilient housing stock against benchmarks provided by the Scottish Housing Quality Standard (SHQS)[3]. The *Tolerable Standard* is a set of 12 criteria defining the absolute minimum standard for habitability with requirements covering household energy, repair and facilities. It provides the foundation for the full assessment based on 64 criteria identified in the SQHS.

These risk reduction measures are important components of preparation. Innovation in demand-side efficiencies, for example - the uptake of energy efficient goods and services - and accelerating the development of new energy efficient technologies all contribute to building adaptive capacity. Two decades of Government support for energy efficiency have sought, through socio-economic targeting, to establish co-benefits in addressing economic disadvantage.

[3] Progress against the SHQS is reported annually in the Scottish Housing Condition Survey (SHCS): http://www.gov.scot/Topics/Built-Environment/Housing/16342/shqs/progress

2. Respond: to threats and realised impacts

Response is, in part, a matter of developing knowledge and skills (capability) and providing the resources (capacity) required to deliver. This element of response is considered in the context of the **Capability & Capacity** assessment.

There are also areas where appropriately targeted interventions can result in systemic improvements to resilience. Risks associated with fuel poverty, for example, can exacerbate climate disadvantage and, consequently, lead to increased (social) vulnerability. In this context, demand-side energy efficiencies can contribute to improved outcomes: a decrease in fuel poverty rates leading to a reduction in vulnerability and thereby an improvement in overall resilience.

Since 2009, Scottish Government has spent over £500M on fuel poverty and energy efficiency Programmes[4]. HEEPS, the most recent of these, provides £65M of grant funding in financial year 2015 for eligible householders. This scheme will be developed further in the ***Scotland's Energy Efficiency Programme (SEEP)***, which will see energy efficiency in both residential and non-residential building stock designated a National Infrastructure Priority from 2017. [5]

The most recent versions of these schemes have only been running for a couple of years, with little data available against which to assess their impact. The Energy Company Obligation (ECO) requiring suppliers to address demand side efficiencies, for example, replaced the earlier CERT (*Carbon Emissions Reduction Target 2009-2012*) and CESP (2009-2012), EEC (*Energy Efficiency Commitment 2005-2008*) and EESoP (*Energy Efficiency Standards of Performance, which ran in 3 phases between 1994 and 2002*) programmes.

While the on-going realignment of programme outcomes with the needs of the most vulnerable socio-economic target groups is a broadly positive characteristic, it makes comparative analysis and rigorous evaluation difficult. Here as elsewhere, *ex post* evaluations tend to focus on performance against targets often in isolation from what are perceived to be second order social and economic impacts, but may in fact be more significant (Wade, 2015).

3. Recover: by developing and applying coping strategies

Recovery is the primary goal of resilience. It can be protracted, particularly where a series of events occur in succession. There is a danger that the capacity of both those affected and those supporting the recovery process can be overwhelmed.

Economic resilience is an important element of the recovery process for many of those affected. It will almost inevitably involve finance, which is frequently predicated on insurance cover. Where businesses are affected, broader economic issues can be at stake as they typically involve the livelihood of more people than the business owner alone. The business itself may well provide services to the broader community within which it exists. Hospitals, pharmacies and post offices, for example, are recognised as Community Services in the SEPA **National Flood Risk Management**

[4] Interventions are derived from obligations defined in UK and Scottish climate change legislation, as noted previously. These are typically made through (a) *Orders and Regulations* (e.g. Gas & Electricity (Carbon Emissions Reduction) Order 2008) which introduce policy measures and implement parliamentary Acts; (b) *Plans and Strategies* (e.g. Green Deal, EMF), which are non-legally binding measures intended to stimulate reform; and (c) *Programmes & Schemes* which inject public spending into the market (e.g. *Home Energy Efficiency Programme Scotland [HEEPS] Area Based* and *HEEPS National* schemes, *Affordable Warmth* & *Energy Assistance Scheme*, collectively *Home Energy Scotland*).

[5] Current fuel poverty risk assessment equates fuel poor households with income and heating costs. However, an unsatisfactory heating regime also has negative outcomes for health and wellbeing. Co-benefits are therefore apparent.

Strategies. Other types of business, particularly food retailers and their supply chains, part of the Critical National Infrastructure[6], may become increasingly important for community cohesion, especially where recovery is protracted.

The means of recovery can be a complex issue. Policies like UK-wide **Flood Re**[7] have been proposed by the UK government using the provisions of the Water Act 1986. After considerable delay, and even now excluding certain types of property, this scheme is scheduled to start imminently at a cost of around £100 million per year for *reinsurance* protection, a cost-benefit analysis that was subject to a ministerial decision in June 2015. It is designed to keep the flood insurance element of home insurance available and affordable to homeowners at risk of repeat flooding, an event that may become increasingly common, given the projections of increased precipitation and heavy rainfall events. The impacts of storms in the winter of 2015/16 – Desmond, Eva and Frank in the new Met Office Climate Services vernacular - may see this strategy revisited.

Additionally, while it is the consensus view that vulnerable groups are less resilient to climate change, our understanding of how different elements of vulnerability - employment, income, health, access to services, etc. – affect resilience is less well developed. Indeed, the measures adopted frequently prevent direct comparison between conclusions drawn from different methods: SEPA's use of the Social Flood Vulnerability Index (SFVI) (Tapsell et al, 2002), for example, considers 2 dimensions of vulnerability - social characteristics and financial indices – while Scottish Government studies frequently use the 7 domain Index of Multiple Deprivation (SIMD)[8] (Kazmierczak et al., 2015).

Furthermore, the dominance of quantifiable research methods frequently leads to the commissioning of work that inevitably fails to engage with the qualitative assessments of adaptive capacity. One objective of the SCCAP (S1-2) is to *'(conduct) research to identify and develop an understanding of communities, in particular vulnerable groups to the impacts of climate change (sic)'*. It continues: *'the research will use the most up to date data and will help local authorities, Scottish Flood Forum, emergency responders and others to better understand the needs of people at flood risk. The research will finish in Summer 2015'*. The Scottish Government commissioned study (Kazmierczak et al., 2015), cited in the SCCAP Progress Report (Scottish Government, 2015) as evidence of progress against this objective, does indeed further quantify the risk of flooding to vulnerable groups. Using the same assessment framework as earlier work by Lindley and O'Neill (2013), it shows an 11% increase in the number of elderly and a doubling of private tenants over the two years between the two studies, although it notes that it cannot be used for direct comparative studies as a number of the underlying parameters have changed.

While this analysis continues to elaborate situational risk – the exposure of vulnerable groups – much more remains to be done to 'better [understand] the ***needs*** of people at flood risk'. This might include, for example, access to flood insurance for properties built after 2009, businesses and those unable to afford property level protection.

Quantitative analysis may continue to improve our understanding of cause and effect but it does little to build (meaningful) adaptive capacity at scale. Supplementary, qualitative research methods may be beneficial here, designed to recognise and promote transformational change.

What do the indicators tell us?

[6] Critical National Infrastructure (CNI): see http://www.scotland.gov.uk/Publications/2011/03/21095856/3, for example
[7] www.floodre.co.uk
[8] SIMD: http://simd.scotland.gov.uk/publication-2012/introduction-to-simd-2012/overview-of-the-simd/what-is-the-simd/

Progress towards a society in Scotland that is resilient to climate change might be summarised as broadly positive with (much) more work required in some areas of policy to build adaptive capacity; distributional (geographical) and differential (socio-economic) variations are apparent everywhere.

When considered only at national scale, current and projected effects of climate change on Scottish society as a whole could be considered to be relatively slight. However, this would fail to recognise the distributed nature of risks and impacts, which will be exacerbated by the effects of climate change over the rest of this century, effects which themselves are almost certain to be distributed, as discussed in the Met Office's climate projections (Met Office, 2009).

Three primary areas of resilience are considered here: resilience to extreme weather (flooding); domestic energy use; and economic impact. In other areas there are no data on which to base an assessment: our preparedness to respond to extreme heat and the importance of insurance cover as a factor in recovery, for example. These are considered separately below.

1. Extreme weather (flood)

Using modelled data, SEPA's baseline assessment of flood hazards indicates that just over 3% (79,200) of residential properties are at risk from a 1 in 200 year flood event (*Property at risk of flooding* **[BB1/BB3] [CRS10]**). Only 5.6% of Community Services – hospitals and care homes, GP and dental surgeries, education facilities, emergency services - are at risk in a similar return period - around 350 of a total of 6,240 Services identified in the baseline (*Community Services at significant risk of flooding* **[CRS12]**). Nonetheless, *any* disruption to community services, as a result of flooding for example, will have consequences for health and wellbeing, increasingly so where recovery takes a long time and/or several events occur in succession.

The number of flood events attributable to weather of sufficient severity to require intervention by the Scottish Fire and Rescue Service is typically less than 20 annually (Number of flood incidents attended by the SFRS each year **[CRS20]**). The risk to Infrastructure assets – electricity sub-stations; wastewater and water treatment works; and the transport networks – is similarly low (see *Major substations at flood risk* **[BE5];** *waste water* **[BW4]** *and water* **[BW5]** *treatment works; Risk of disruption to railways from flooding* **[BT9]***, for example*)**.**

Even though the actual risk is small, the perceived risk as measured by the number of registrations for flood warnings and alerts has shown a steady increase year-on-year since the ***Floodline*** service was introduced in 2011 (*Number of registrations for flood warnings* **[CRS34]**).

During Storm Desmond in December 2015, the Floodline website received over 100,000 user sessions (250,000 page views) in the space of 6 days, exceeding the previous record of 95,000 in August 2014. 550 new people registered for the service. The water level web page alone was viewed over 100,000 times and 64 notifications of flooding were notified through 'Report a Flood', a feature added recently[9]. At the height of the event 15 Alerts and 75 Warnings had been issued (including 2 Severe, the first time since the launch of the system that this level of risk had been identified). Over 70,000 messages were sent via a variety of channels (email, fax, pager, SMS and voice messages).

How this translates into practical action is difficult to determine, as there is no comprehensive source of information on the uptake of property level protection at national scale (*Uptake of defensive measures* **[CRS36]).** The Scottish Flood Defence and Asset Database (SFDAD), now out of date, estimated that 4,723 properties across Scotland 'benefit from flood defences' with annual

[9] Report a Flood: http://www.floodlinescotland.org.uk/report-a-flood

damages avoided of around £232M in 2007, the last date for which figures were available (*Flood defences data availability* **[CONTEXT DOCUMENT]**). The *Local Flood Risk Management Plans* required by Flood Risk Flood Risk Management (Scotland) Act 2009 will improve on this situation in the future with a requirement for asset inventories to be maintained by Local Authorities.

While risk may be assessed for some infrastructure – transport and energy for example, as noted above – there are no data against which an assessment can be made of the potential impact on society of disruption to other infrastructural assets and services – interruption to the functioning of local government, emergency services, food distribution or telecommunications (*Number of CNI assets at significant risk of flood* **[CRS13]**; *Proportion of critical national infrastructure protected against extreme weather events* **[CRS14]**). Further, neither the effectiveness nor efficiency of defensive measures can be assessed in order to better target interventions, whether physical, systems-based, or procedural. (*Cost benefits of defensive measures, all assets: Residential Property; Non-Residential Property; Critical National Infrastructure* **[CRS15]**).

More significantly, these data mask the fact that risks and impacts are spatially distributed, as are the projected changes to extreme weather events over the rest of this century. Small changes to the assumed parameter values in the models – pluvial, fluvial and coastal return values, planning and construction assumptions, population growth – can change outcomes significantly (Pettit et al., 2014). In any case, even the relatively small number of properties at risk - the 3.2% residential properties at risk of a 1 in 200 year return event - equates to some 79,200 properties and 150,000 people potentially affected.

Localised effects are also apparent in the distribution of private (off-grid) water supplies. In full or in part, these provide water to around 6% of the population in Scotland. Over a half (55%) of the 157,000 properties relying on surface or groundwater sourced supplies that are at risk of flooding and, therefore, present a potential health risk, are located in the Highland and Argyll or Tay 'Local Plan Districts' (*Off-grid water supplies at risk of extreme weather events* **[CRS54]**).

This suggests a need for more detailed local analyses to support policy development that takes account of and establishes place-specific capacity building strategies and planning. It is frequently not possible to disaggregate data sufficiently to be able to do this effectively.

In considering the effects of flooding on vulnerable communities, for example, disaggregation of different aspects of the social vulnerability of an area to datazone level is not possible. Even though the data have been used in the development of the National Flood Risk Assessment [NFRA], the detail has yet to be carried through the baseline appraisal to the Flood Risk Management Strategies.[10] Consequently, some indicators cannot be populated, limiting any consideration of the differential impacts of climate change on disadvantaged communities (*Number of households within most deprived communities at significant risk of flood* **[CRS11]**; *Number of people within most deprived communities at significant risk of flood* **[CRS30];** *Number of vulnerable people at significant risk of flood* **[CRS31];** *Number of households within most deprived communities flooded each year* **[CRS22]**).

This is becoming increasingly important as, despite concerted efforts, some of the underlying causes of vulnerability continue to show year-on-year increases with economic disadvantage being a critical differentiator.

[10] Potentially Vulnerable Areas (PVAs) are identified through the use of Sub-Catchment Units (SCUs), a modified version of Inter Catchment Confluence (ICC) data used in the National Flood Risk Assessment (NFRA). SCUs aggregate 7 NFRA grid outputs (1km^2). These include two measures of risk associated with human health: People (the risk to residential properties weighted by Social Flood Vulnerability Index) and Communities (the risk to Community Services, weighted by the importance of each Service).

2. Domestic energy use

The Scottish Housing Quality Standard (SQHS) assesses the quality of the fabric of residential properties in Scotland, an important measure of overall societal resilience. It was established in 2004 with the objective that *all* Registered Social Landlords (RSLs) should meet the standard by 2015, a target that will not now be met.[11]

Amongst the 55 criteria covered in the SQHS assessment, there are 10 measures of demand-side energy efficiency and energy management including thermal insulation (lofts and walls), efficient heating systems and repair to dilapidated building fabric. In 2013, around 2 million people lived in the 1.2 million dwellings that failed the Scottish Housing Quality Standard; 49% of dwellings across the entire housing stock. A large proportion (36%) of these were as a result of failures associated energy efficiency measures – SAP 2001 ratings below 50 (gas) or 60 (other fuels) as discussed in *Number of households/people falling below the SHQS and Tolerable Standard* **[CRS58]**.

Distributional differences are apparent across urban, rural and island Local Authorities with the poorest quality housing stock located in the Western and Northern Isles with 60% - 65% failure rates, a distribution reflected also in consideration of households in fuel poverty.

In the same year, 940,000 households in Scotland (39% of the total housing stock) were in fuel poverty, the highest proportion ever recorded: *Number of households in fuel poverty* **[CRS61]**.

Improving energy efficiency is one way to reduce fuel poverty rates, contributing to an overall improvement in the material fabric of housing and thereby contributing to a more resilient society. The uptake of domestic energy efficiency measures by householders eligible under the Area Based or Energy Assistance Schemes, for example, has resulted in around 30,000 measures being implemented in 2013/14 – principally loft and wall insulation but also including installing more efficient heating systems – supported by £42M of grant funding. Overall, over a fifth (22%) of Scottish households have benefited from support from these schemes with 1 in 3 (700,000) households having measures installed since 2009 at a cost to the Scottish Government of some £500M.

As discussed above, fuel poverty is a difficult problem to address as household income and fuel prices are not directly under the control of Scottish Government.

The number of customers in debt to the energy utilities provides a proxy for household income. This continues to show a downward (positive) trend in the decade since 2005 for both gas and electricity customers (*Domestic debt held with energy companies for the supply of electricity and gas* **[CRS62]**). Treatment strategies have also improved with fewer than 10 customers disconnected in 2013. While the use of pre-payment meters has been very effective in maintaining supply for the vast majority of customers in debt, this is the most expensive way of delivering these fuels, paradoxically affecting the most financially vulnerable. Accurate data on 'self-disconnection' as a result of inability to pre-pay are not readily available, for obvious reasons.

Notwithstanding these challenges, the importance of demand side efficiencies in heating and cooling homes is emphasised by the inclusion of energy efficiency as a National Infrastructure Priority that will be implemented through Scotland's Energy Efficiency Programme (SEEP) from 2017/18. (*Uptake of domestic energy efficiency measures* **[CRS64]**).

[11] Private owners and private landlords are currently under no obligation to meet the standard.

3. Economic impacts

The economic consequences of these events can only be assessed approximately, usually through modelled data. Modelled data from SEPA estimates the economic impact of flooding on residential and non-residential properties based on annual average damages (AAD) at some £252M[12], primarily as a result of fluvial flooding (£141M) with roughly equal impacts from coastal (£53M) and pluvial (£58M). In terms of absolute numbers, distributional differences between Local Plan Districts are very apparent: AAD from all sources of flooding of £66.6 million in Clyde and Loch Lomond (LPD11), two orders of magnitude less (£436,000) on Shetland (LPD4) for example. Work to normalise the data by property type and Local Authority is ongoing (*Potential economic impact of residential properties flooded each year* **[CRS25]**; *Potential economic impact of non-residential properties flooded each year* **[CRS26]**).

The actual cost of annual flood damages in Scotland ranges from around £210 million for property damage (Scottish Government, 2014a; JBA Technical report) to £780 million for all property plus agriculture (SEPA, 2011). Individual flooding events can result in a significant cost in their own right - losses of £30 million were estimated for the Tay/Earn flood in 1993 and £100 million for the Strathclyde flood in 1994 (Scottish Executive, 2002) (*Flood risk to property* **[BB1/BB3]**).

The economic damage of the winter storms of 2015/16 are reportedly in the region of £2Bn to £2.8Bn with insured losses of between £1Bn and £1.3Bn for claims across the UK as a whole (LSE, 2016). Although significant, the economic impact is well below the £3.2Bn of insured losses resulting from the summer floods In England in 2007 (EA, 2010).

4. Constraints

There are a number of areas in the development of society adaptation indicators where data are simply unavailable, making it difficult to draw definitive conclusions. The lack of disaggregated insurance data for Scotland for example, means that it is not possible to calibrate the modelled data used by SEPA to assess flood risk with actual event data held by the Association of British Insurers (ABI) (*Coverage of flood insurance* **[CRS37]**; *Insurance claims for residential property* **[CRS38]**; *Insurance claims for non residential property* **[CRS39]**; *Insurance claims for consequential loss* **[CRS40]**).

Similarly, as Scotland currently has no formal heatwave plan (cf. *Safe Summer in Scotland*), there is no definition of a heatwave against which an assessment can be made of the *Number of people within most deprived communities at risk of heat stress* **[CRS1]** or *Number of vulnerable people at significant risk of heat stress* **[CRS2]**. The completeness of the assessment is constrained accordingly.

The following ten indicators therefore were not populated due to data availability/quality issues:

i. Number of (vulnerable) people at significant risk of heat stress
ii. Number of households/(vulnerable) people at significant risk of flooding
iii. Number of households (within most deprived communities) flooded each year
iv. Uptake of flood defensive measures – property level prevention and protection
v. Cost benefit of defensive measures for all assets: residential, non-residential, critical infrastructure

[12] Economic damages incorporates: direct damages to non-residential and residential properties, indirect damages (drying out, temporary accommodation) to residential properties, additional emergency services costs, vehicle damages associated with residential properties, damages to arable agriculture, damages to roads surface caused by floodwater

vi. Coverage of flood insurance
vii. Insurance claims for residential properties resulting from flooding and other extreme weather events
viii. Insurance claims for non-residential properties resulting from flooding and other extreme weather events
ix. Insurance claims for consequential loss resulting from flooding and other extreme weather events
x. Number of school days lost each year due to flooding and other extreme weather events

Other relevant indicators

Risks and impacts of flooding on the infrastructure network are discussed in the **Flooding of Buildings** narrative in relation to a range of indicators covering energy, transport, water as well as residential and non-residential property, all of which are relevant to society as a whole.

Other elements of the SHQS are considered in the *Buildings & Infrastructure Network* theme: rising and penetrating damp (Tolerable Standard element 2 is tracked through **BB17**); condition of the building fabric and disrepair (SQHS Annex B is tracked through **BB16**); condensation in housing stock (Tolerable Standard element 3 and SQHS element 42, tracked through **BB18**)

Ecosystem based adaptation approaches establish value in natural flood management solutions. The value of alleviating flood by slowing water run-off through peatland restoration projects, which have the co-benefits of maintaining water quality in the face of peat degradation could be demonstrated by projects funded through the SNH Peatland Action Programme, for example: *Extent of Deep Peat* **(NB11)**; *Area of Modified Deep Peat* **(NB13)** and the benefits of restoration: *Peatland Restoration* **(NB22)**; *Natural Capital Asset Index* **(NB14)**.

Water quality is considered further in the **Quality of Soils**, **Water Quality & Availability** and **Ecosystem Goods & Services (freshwater)** narratives.

Improved **Societal Resilience** is the key outcome from the programmes discussed in the **Capability and Capacity** assessment and the indicators that underpin it.

An estimate of the efficiency of defensive flood measures may be informed once the Local Authority asset inventory, required by the Flood Risk Management Act 2009 (Scottish Government, 2009b), has been developed, using the methods described in the Flood Hazard Research Centre's 'Multi-Coloured Handbook' to assess economic impact (Penning-Rowsell, 2013).

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Version Control

v. 0.6 DRAFT	3rd February 2016	M. Bonaventura	Final draft (internal)
v. 0.7 DRAFT	5th February 2016	M. Bonaventura	Corrections following internal QA
v. 0.8 DRAFT	18th February 2016	M. Bonaventura	Corrections following review by SG Climate Hub and SG Sustainable Housing
v. 0.9 DRAFT	14th March 2016	M. Bonaventura	Corrections following final internal review
v. 0.10 DRAFT	21st March 2016	M. Bonaventura	Final for distribution

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