

Building resilience to extreme weather and climate change in North Somerset



North Somerset Partnership

Transport, Economy and Environment Delivery Partnership

March 2011



North Somerset
enterprise agency



NHS
North Somerset

This action plan is owned by North Somerset Partnership as part of delivering North Somerset's Sustainable Community Strategy (2008 – 2026): 'Improving Our Communities Together. The foreword to this strategy states:

“Global considerations are having an increasingly significant impact on quality of life in North Somerset. It is not possible to predict how climate change will affect us, but we must plan for the likely damaging effects and encourage the life style changes that will limit its impact.”

One of the Partnership's shared priorities is living within Environmental Limits. An identified aim within this section is to 'assist service providers, businesses and communities to adapt to the effect of unavoidable climate change and to increasing energy costs.'

A Climate Change Adaptation task group was formed from the Transport, Environment and Economy Delivery Partnership to investigate the risks and opportunities presented by a changing climate in North Somerset and agree a way forward to address these over the coming years.

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Executive Summary

The climate is changing and we need to adapt sustainably to the impacts this will bring. There is a national programme of work introduced through the Climate Change Act, which creates a framework for building the UK's ability to adapt to climate change, including:

- A UK-wide climate change risk assessment that must take place every five years.
- A national adaptation programme which must be in place and reviewed every five years to address the most pressing climate change risks to the UK.

This looks at the national scale adaptations only, so we need to consider how a changing climate will affect us locally and what action we can take to reduce the risks and exploit the opportunities a changing climate will bring. The climate change adaptation action plan has been produced to provide detail on how North Somerset Partnership intends to improve the resilience of services and local communities to the impacts of climate change.

Through a series of consultations, we have been able to identify the priority risks and opportunities presented both over the short term, up to 2015 and over the longer term, 2015 - 2050. This will be explained in detail within the report.

The actions that have been identified as a priority are:

1. Adopt a collaborative approach across North Somerset Partnership to raise awareness and take advantage of national initiatives, such as the Green Deal, Feed-in Tariff and the Renewable Heat Incentive in response to anticipated increase in demand due to a changing climate for domestic and business green/renewable and water management technologies.
2. Adopt a programme to review the maintenance regimes for the clearance of the roadside gullies drainage network and amend as necessary in response to the increased risk of existing drainage and sewerage systems unable to cope with increased intensity of rainfall from a changing climate.
3. Adopt a more co-ordinated approach to assessing the location of vulnerable people across the district and ensure that adequate plans are in place for re-housing people if long term damage is sustained to properties from flooding or extreme weather events. This will reduce the risk of communities becoming more vulnerable due to a changing climate.
4. The promotion of measures to improve the sustainability of the existing building stock in North Somerset.¹ Measures will include; installing power sockets higher from the ground to reduce the risk of damage from flooding; the promotion of natural ventilation and passive cooling techniques; installation of shutters to reduce likelihood of over-heating and the installation of green roofs and sustainable drainage systems.
5. Co-ordination and implementation of measures in NHS & NSC Heatwave Recovery Plans. The Department of Health review the national plan annually and expect all NHS & Social Care organisations to base their plans on this. We need to ensure that these measures are readily understood locally and systems are in

place to implement these in times of heatwaves anticipated with a changing climate. If this is done effectively, it will reduce the risk of heat stroke/ sun burn/ food poisoning/ hayfever and asthma which leads to increased pressure on care services/ health services.

6. Adopt a collaborative approach across North Somerset Partnership to raise awareness of the need for water conservation in the home/ for businesses in response to the likelihood of increased water scarcity with a changing climate.

The work contributing to this strategy has shown that there are parallel activities taking place within different organisations of the North Somerset Partnership. Increased collaboration on these activities thereby, ensuring a joined up approach will avoid duplication. This also addresses issues relating to reduced resources and increasing threats posed by a changing climate.

The management of the actions identified in practice will be a decision of the North Somerset Partnership. The risks identified and actions to address may be adopted into strategic risk matrices, if these are judged to be an increasing corporate risk over time.

This report recommends that an annual progress update on actions is compiled and presented to the partnership. We will need to monitor how climate change impacts are evolving and periodically review the risks and opportunities, vulnerabilities and priorities for action under changing circumstances.

¹ Approximately three-quarters of houses and 60 percent of non-domestic buildings in 2050 are likely to have been built before 2010, we therefore need to make adaptations so they are fit for purpose with a changing climate

1. Introduction

Extreme weather events are already having major impacts on the world, climate change projections tell us to expect increasingly extreme weather. A recent study conducted by Oxfam suggested that 21,000 people died globally in 2010 because of extreme weather. This was as a result of flooding and heat wave events in the first nine months of this year; which was double the number for the whole of 2009. World extreme weather events and climatic impacts included the heat waves leading to fires in Russia, floods in Pakistan and Australia and sea level rise in the Pacific island nation of Tuvalu.

The climate of the Earth is not static, and has changed many times in the past in response to a variety of natural causes, but the current change in climate is very unusual as it is not exclusively part of a natural cycle. The term 'climate change' refers to recent changes in climate that have been observed since the early 1900's. The United Nations Intergovernmental Panel on Climate Change in 2007 concluded that it is 'very likely' (more than 90%) to be caused by human activities.

The earth is kept warm by the 'greenhouse effect', which is created by certain gases in the atmosphere absorbing energy that is radiated from the Earth's surface. This is a natural phenomenon without which life on Earth as we know it would not be possible, as the Earth would be approximately 30°C cooler. However, our modern lifestyles have resulted in us releasing large amounts of greenhouse gases, like carbon dioxide and methane into the atmosphere, which have enhanced the 'greenhouse effect' and resulted in pushing up global temperatures, leading to 'global warming.' The Earth's surface has warmed by 0.75°C on average since around 1900 and by around 0.4°C since the 1970s.

It is important to understand that weather and climate are not the same. Climate refers to the average weather experienced over a long period, typically 30 years and weather is the day to day change in temperature, precipitation and wind speeds. This is why, although we are experiencing overall global warming, we have experienced cold winters in the UK over the past few years. The extreme cold temperature conditions experienced in the winters of 2009 and 2010 in the UK led to disruption to service delivery and impacted on most peoples every day activities in some way. We need to ensure that we are as prepared for the consequences of these events as much as we can be, so that the impacts are minimised.

Through the powers of the Climate Change Act 2008, the UK is the first country in the world to have a legally binding, long-term framework to cut carbon emissions and tackle climate change. Whilst it is important to tackle emissions, even if we went carbon neutral today, we would still experience 30-40 years of a changing climate because of historic greenhouse gas emissions, so we must plan for these changes. The Act does create a framework for building the UK's ability to adapt to climate change. The Secretary of State is required to present to parliament, assessments of the risks posed to the UK by climate change every five years, this is the 'UK Climate Change Risk Assessment.'

Sir Nicolas Stern in his 2006 review on the '*Economics of Climate Change*' highlighted the urgency of responding to climate change. "Adaptation is the only means to reduce the now-unavoidable costs of climate change over the next few decades". The report highlights that "the benefit of strong, early action on climate change considerably outweigh the costs."

Whilst national and international progress is made in addressing climate change, we also need to galvanise local action. Around eighty percent of UK carbon dioxide emissions are produced as a result of locally based activities. As we reduce emissions and move to a low carbon society, we need to assess how it will affect residents; the delivery of services; communities; infrastructure; businesses and the natural environment, ensuring that they are resilient to changes and are able to adapt to them. We must ensure that the challenge climate change brings does not further disadvantage the most vulnerable in our society.

Climate change impacts will vary considerably from location to location, and it is at the very local level that many decisions and actions need to be taken. Due to the low lying nature of North Somerset, around thirty per cent of land area is covered by Environment Agency Flood Zone designations. Urban development areas (Weston-super-Mare, Clevedon and Portishead) and critical infrastructure (M5, utilities etc) are often located in these vulnerable areas. With increased flood risk associated with climate change, addressing this will be a major challenge over the coming years. As climate change will in some way impact on almost every aspect of our lives, it should become a key consideration in decision-making and not an optional after thought. Work needs to start now, before we are forced to act by more frequent extreme weather events. Many of the steps that communities can take to adapt can be readily included in existing ways of managing risks or making long term investments, but to do this we need to raise awareness of the issues.

Preparing for climate change today will reduce the costs and damages of a changing climate and allow businesses, public sector, third sector and individuals to take advantage of potential opportunities it presents. For example, the need to reduce emissions brings opportunities for low carbon/ green technologies. There may opportunities in developing new products and services for a warmer climate. We want to ensure that we are able to take advantage of these.

This adaptation action plan sets out how we aim to meet the challenges we face from a changing climate, whilst grasping the opportunities it presents.

2. The impact of extreme weather in North Somerset

Climate change does not mean we will stop having cold winters in England. Our climate is, in part, influenced by natural variations including changes in the amount of energy we receive from the sun, volcanic eruptions and natural cycles such as El Niño. Such variations will mean that despite our warming climate, we may still experience very cold winters like that of 2009/10, although such cold weather is likely to become less frequent.

The extreme cold winter temperatures with resulting snow and ice we experienced in 2009 and 2010, have led to considerable disruption to service delivery and impacts on infrastructure. Following the most recent event in December 2010, the Met Office reported that these extreme weather incidences are independent and not part of the climate trend we should expect. The Secretary of State for Transport has sought advice from the Government's Chief Scientific Advisor on the longer-term implications of the changing climate. We need to understand whether we can expect similar winters in the future to inform future investment decisions. The conclusion of this report may inform decisions made at a local level. However, such events will still occur, even if at the moment, we don't understand the likely frequency.

We have some understanding of North Somerset Council's overall current vulnerability to extreme weather including snow and ice; heavy rain; heatwaves and droughts. This was achieved by the council completing a 'Local Climate Impact Profile' (LCLIP) in July 2010. The study investigated the consequences of extreme weather-related events over the preceding five year period. This was achieved by gathering information from local media and interviewing key officers in the council to gain detail on their experiences of actions taken following these events. Key findings from the report have shown that excessive rainfall/flooding and snow/ice events had the most significant effect on council services between January 2005 and May 2010. Consequences of these events included, school closures; disruption to public transport, waste collection and tourism event cancellations. Impacts on infrastructure were also highly significant which included damage to and closure of roads. The particular impact of snow and ice is wide ranging, including the need for regular gritting regimes; refuse/recycling collections disruption; road vehicle accidents; the need for pavement clearing; difficulties in delivering care services (e.g. meals on wheels); public transport disruption and pot holes repair as a result of weakening of the road elements. The cost of these events, both economic and social are significant and the level of disruption can be very great.

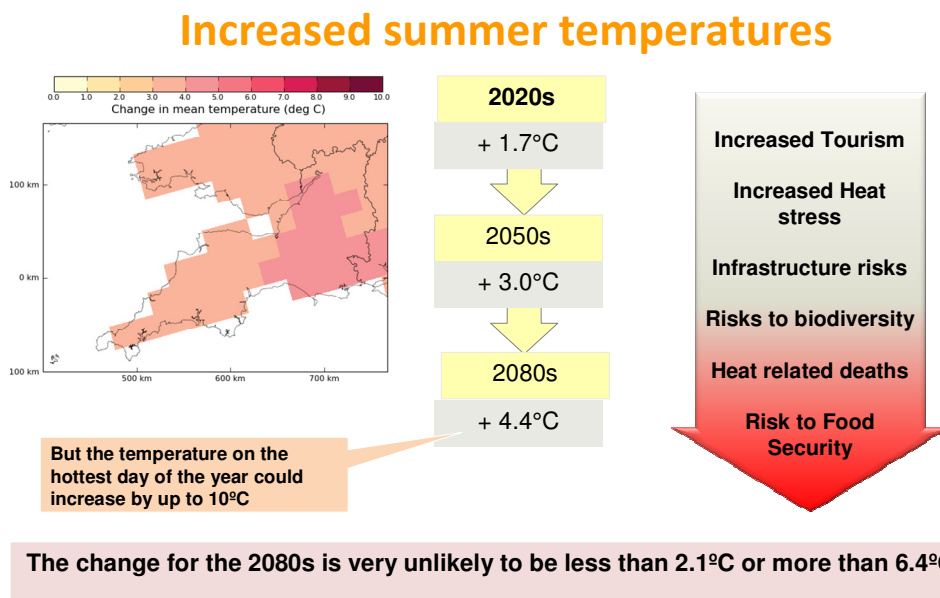
These past events have shown that we are already significantly affected by extreme weather, and with the potential for these events to increase with a changing climate, it makes good business sense to put a system in place to manage the risks these present.

3. What climate can we expect in North Somerset?

The UK probabilistic climate projections released in 2009 (UKCP09) are the fifth generation of UK climate projections. They reflect scientist’s best understanding of how the climate system operates and how it might change in the future under different greenhouse gas emission scenarios during the 21st Century. The projections provide detailed climate probability for each 25km² of land in the UK. They tell us to expect:

- **Hotter, drier summers**
- **Warmer, wetter winters**
- **More extreme weather events** (intense downpours of rain; storms; gales)
- **Sea level rise**

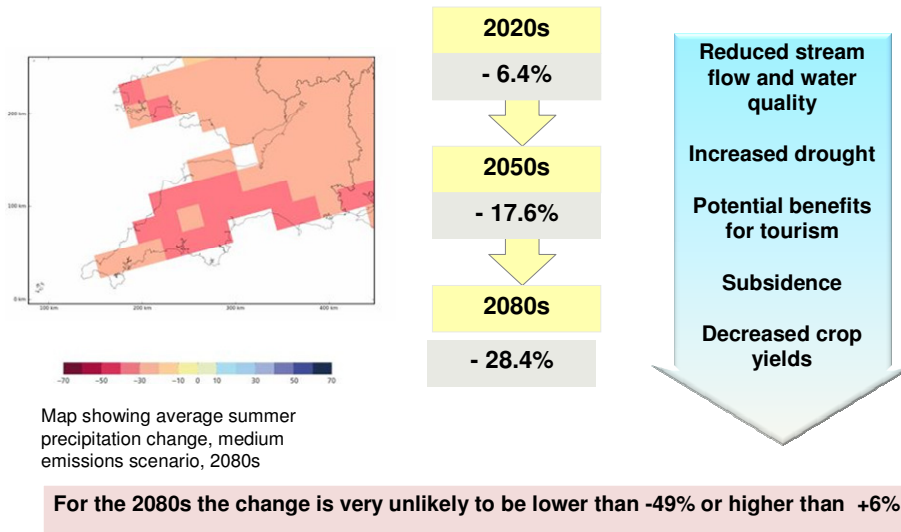
The climate projections specific to North Somerset show the changes we are likely to experience over three time periods, the ‘2020s’; ‘2050s’ and the ‘2080s’. Each time period includes the decade before and after that stated, i.e. the 2020s are indicative for 2010 to 2030. The changes are given for a range of probabilities under low, medium and high greenhouse gas emission scenarios. The most likely change (central estimate) under a medium emission scenario are illustrated below.



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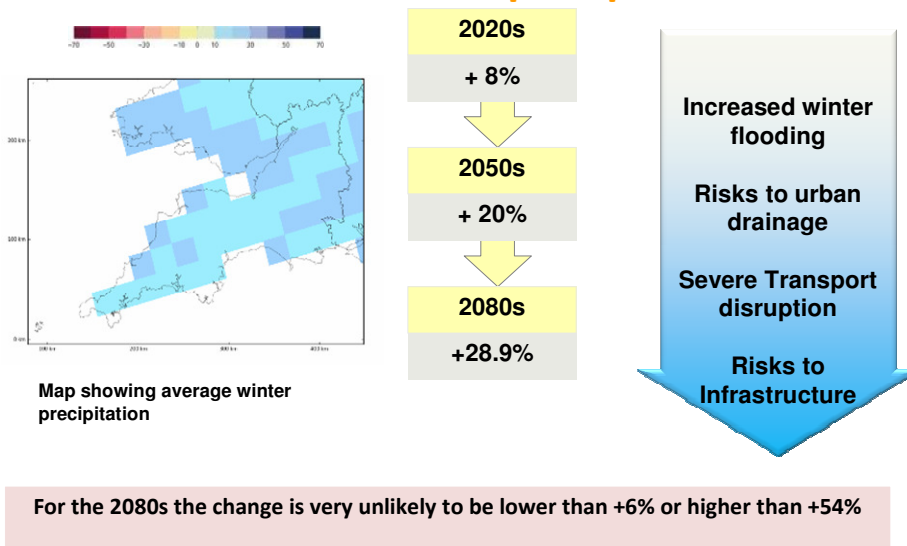
The summer of 2003 was equivalent to 2^oC above the mean temperature in the UK. This heat wave event caused over 2,000 additional deaths in the UK.

Decreased summer precipitation



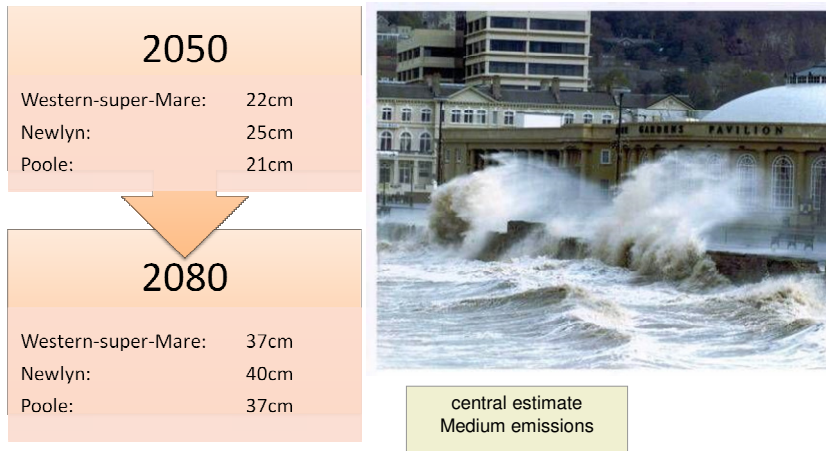
There are potential benefits to tourism in North Somerset to be realised if we have longer, hotter more reliable summers in the future. Whilst we can plan for increased tourism numbers, we must also make contingency plans for experiencing more extreme weather which could disrupt weather-related events.

Increased winter precipitation



In North Somerset, increased precipitation will increase the risk of inland surface water flooding, which may be exacerbated by blockages in culverts, gutters and drains (sometimes due to inadequate maintenance).

Relative sea level rise



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A combination of melting polar ice sheets and thermal expansion of the oceans could cause sea levels to rise by up to two metres by 2100. Along the Severn Estuary, we are advised to plan for a rise of approximately one metre over the next 100 years. This poses a real risk of flooding and increased coastal erosion within the sixty kilometres of coastline of North Somerset. If no action is taken and defences are not maintained or improved, much of this land will flood several times a year, making it difficult to continue present land uses.

The above detail shows that the need to adapt to climate change is clear and we recognise that we should concentrate on delivering adaptation measures that are flexible enough to deal with uncertain future conditions.

4. Identifying the priority risks and opportunities of a changing climate in North Somerset

A 'Climate Change Adaptation Risk Assessment' was conducted by North Somerset Council in 2009/10. This was compiled following consultation with key officers, senior managers and with members of North Somerset Partnership. The risk assessment process highlighted many potential risks and opportunities from a changing climate and the council's risk and opportunities assessment framework was used to assess the likelihood and severity of each, thereby identifying those of priority. Those assessed to be of high risk or good opportunity (scoring more than 12 in risk rating) are those that are taken forward as part of this adaptation action plan.

It is worth noting that extreme weather-related risks are reviewed as part of the Avon and Somerset Community Risk Register under the Civil Contingency Act (2004). In North Somerset, this is prepared by the Local Resilience Forum Risk Assessment Group, coordinated by Avon and Somerset Police. This gives us some confidence that extreme weather-related risks are being managed at the local level. However, this is very much geared towards responding to extreme weather related events, rather than identifying potential consequences and implementing action to manage these. This cannot be relied on to manage longer-term climate change risk and it does not explore the opportunities presented by a changing climate, which we aspire to do through this action plan.

There are various interrelationships between human wellbeing and the natural environment that it is useful to understand when considering longer term climate change adaptation. For example, green infrastructure provides a multifunctional role in respect of addressing issues around the impact of climate change. The provision of green infrastructure to address a specific issue will also mean that other concerns will be addressed. For example, street trees will help cool neighbouring houses by shading, but will also help against localised flooding by absorbing storm water run-off. Additionally, green infrastructure has other social and economic benefits which enhance its presence further. Where green infrastructure has been included in the table, the specific feature of provided service is highlighted, but consideration of these wider benefits is also necessary. In effect the outcomes are wider than just the issue that is described in each row. The issue around green infrastructure improvement is that it takes time for the benefits to be attainable because, for example, trees need to mature to offer the full range of benefits.

5. Extreme weather resilience and climate change adaptation actions

Climate change adaptation doesn't necessarily mean committing a large amount of resources or spending large sums of money now. It's about planning for what changes need to be made and when, based on the risk of impacts.

The main climate risks considered in this plan are:

- 1. General climate change/ extreme weather events
- 2. Inland flooding (fluvial, surface water)
- 3. Coastal flooding/ erosion (tidal/ sea level rise)
- 4. Heat wave
- 5. Drought

It is important to consider how these risks will affect people and places differently. Throughout the schedules we consider the impact on the local population; buildings and structures; activities and the environment as separate categories.

As climate change impacts are likely to become increasingly acute over time, the schedules are split into time frames. There are those that need to be considered in the short term (up to 2015) and those for longer term consideration (2015 to 2050).

There are a number of potential consequences of each of the climate risks, which might include opportunities to exploit. For each consequence, adaptation measures have been identified from officer recommendations, case studies and best practice guidance. They involve a mixture of response strategies:

- building climatic resilience (enhanced design specifications);
- living with risks (increased preparedness and contingency planning);
- acceptance of loss (e.g. managed retreat).

A traffic light system for prioritising actions to address the risks/ opportunities has been used. The Red, Amber, Green status given signifies:

Red	Action to address requires immediate attention and is a priority
Amber	Action to address needs to take place, although not as urgently as red prioritised actions
Green	Action to address either underway, part of business as usual or a lesser priority, although need monitoring

Through consultation we have been able to identify the responsible organisations for delivery of each action; in many cases this will involve more than one organisation.

The resources needed for addressing actions are added to each adaptation measure to identify those which may require additional staff time or have another cost associated with their implementation.

We recognise that the most effective approach is to time the introduction of adaptation measures to coincide with planned maintenance and/or upgrading to take advantage of opportunities as they arise, this will be taken into account when making these decisions.

Climate risk	Category	Impact	Adaptation measure	Organisation/ service areas	Resource required	Timescale	Issues	RAG status	
1. General climate change/ extreme weather events	People	Extreme weather such as snow/ice leading to multiple impacts – inability to access services, transport disruptions.	Improved communications and awareness of emergency planning arrangements and availability of advice. Routine weather reports cascaded.	NSC – EMU coordinate	Effective partnership working	As required.	Are services able to respond to extreme weather events? Are emergency planning procedures in place and understood? Have the needs of vulnerable people been taken into account?	Amber	
			A snow coordination group assess the impact on services/the community to co-ordinate actions. If a situation deteriorates, the corporate emergency Response team will form.	NSC – EMU coordinate		As required.		Green	
			Post-event briefings assess the impact of the event and implementing lessons learned.	NSC – EMU coordinate		As required.		Amber	
		Vulnerable people adversely affected by extreme weather – support disrupted access to facilities more difficult.	Targeting of vulnerable groups and individuals with information – schools, elderly people.	NSC – EMU coordinate		As required.		Amber	
		Increased domestic demand for green/ water management technologies.	Raise awareness of national incentives- i.e. Green Deal and Renewable Heat Incentive.	NSH NSC- ASS&H		In house/ plus Energy Saving Trust expertise		Ongoing and increasing over time.	Red
			Implementing PV project targeting approximately 1,200 homes.	NSH		In house/ plus Energy Saving Trust expertise		March 2011 onwards	Green

Climate risk	Category	Impact	Adaptation measure	Organisation/ service areas	Resource required	Timescale	Issues	RAG status
1. General climate change/ extreme weather events	Buildings and structures	Increased pressure on transport infrastructure if visitor numbers increase.	Improved traffic management, parking and public transport provision (particularly for increased day visitors).	NSC - TP	Long term transport planning - JLTP	2015 onwards	Is the resilience of buildings being increased? Are plans in place to respond to the consequences of damage to buildings?	Green
		Existing buildings design not suitable under changing weather conditions.	Promote and implement sustainable construction techniques in new premises/ homes. Including the Code for sustainable homes/ BREEAM /green/living roofs/ straw bale/ timber frame etc.	NSC-PP / DM W College NSH	Better partnership working	Ongoing Code Levels : 3 – 2012 4 – 2013 5 – 2015		Amber
			NSH Energy Reduction Policy and Revised Asset Management Strategy 2011-2014 to include Climate Change Adaptation measures.	NSH	In house at present	Sept 2011		Green
		Extreme weather events impacting on infrastructure and service provision e.g. schools/ elderly persons' accommodation.	Regular risk assessments to be conducted in schools and other buildings at risk.	NSC- CYPS		Ongoing		Green
		Damage to buildings with changing/extreme weather conditions. Leading to increased demand for assistance in undertaking repairs to homes from people on low incomes.	Continue to provide low cost home loans including flood protection work.	NSC strategic housing service.	Potential need for increased resources to provide low cost loans.	Ongoing		Amber
			Provision of additional advice/information on home maintenance to avoid need for expensive repairs.	Care and Repair	?	Ongoing		Amber

Climate risk	Category	Impact	Adaptation measure	Organisation/ service areas	Resource required	Timescale	Issues	RAG status
1. General climate change/ extreme weather events	Activities	Opportunities for the tourism industry as more people choose to holiday locally.	Ensure adequate facilities and access to shade on seafront (toilets, showers, public info on sun protection and hydration).	NSC - DM/ Seafront & Events. WSAG STA WH&RA LEP	Invest in public realm- private investment	Increasing need over time	Have the opportunities and risks associated with climate change been identified?	Green
		Increased quality visitor accommodation, attractions, and events, entertainments (indoor and outdoor). Effective PR and marketing.	NSC - DM/ Seafront & Events. WSAG STA WH&RA LEP	Invest in public realm- private investment	Ongoing	Green		
		Encourage tourism businesses to adopt sustainable practices.	NSC - DM/ Seafront & Events. WSAG STA WH&RA LEP	Invest in public realm- private investment	Ongoing	Amber		
		Change in patterns of economic activity- such as that seen in European countries- siestas, business opening hours etc.	Awareness raising events with local businesses,	NSEA NSC	Partnership working	Gradual changes over time.	Green	

Climate risk	Category	Impact	Adaptation measure	Organisation/ service areas	Resource required	Timescale	Issues	RAG status
1. General climate change/ extreme weather events	Activities	Increased commercial demand for green/ water management technologies.	Training for green and water management technologies e.g. rainwater harvesting, solar thermal & photovoltaic's, hydroelectric, wind turbines technology.	Weston College NSEA NSC - ED	RegenSW expertise Private enterprise	2011 onwards		Red
		Outdoor events more viable with hotter/drier summers BUT are more likely to be disrupted by extreme weather.	Undertake risk assessments, arranging safe evacuation, traffic management and ambulance services. Where practical put contingency plans in place e.g. provide undercover areas for outdoor events.	NSC- Seafronts and Events/ Health and Safety	In-house and private event organisers	2011 onwards		Green
								Amber
		Opportunity to improve health with increased scope for outdoor activity in hotter/drier summers. This has added benefit of reducing emissions.	Promote cycling and walking, through ensuring cycle paths, roadside seating and services are provided and well maintained to encourage use.	NSC Sustainable travel JLTP Go4life team	Sustainable Travel fund (WoE bid) Development Contributions	Ongoing		Amber
	Environment	Increased threat to trees and fauna in general from extreme weather/ changing climate.	Consider changing species to those more typically found in warmer climates. Specialist advice given to location and species to be planted by National Tree Planting schemes.	NSC- Nat E	Tree officers & network of Parish Tree Wardens	From 2011 onwards	Are species resilient to future climate change?	Green

Climate risk	Category	Impact	Adaptation measure	Organisation/ service areas	Resource required	Timescale	Issues	RAG status
2. Inland flooding (fluvial, surface water)	People	Communities are more vulnerable to flooding with potential public health issues.	Encourage take-up of EA flood line warnings.	EA NSC- EMU NHS - EMO A&S LRF	In house	Ongoing	Are services able to respond to flood events? Are emergency planning procedures in place and understood? Have the needs of vulnerable people been taken into account?	Amber
			Rest centres to house people in the short term are identified in local Flood Plans.	NSC- EMU NHS – EMO NSH	ASS&H / volunteers	Ongoing		Amber
			As part of PPS25, develop and assess flood evacuation and shelter plans and implement the measures to respond to these.	NSC Flood and Evacuation Plans (EMU) NHS- EMU NSH	In house [Defra grant of 2011 = £144,400 2012-2015 = £265,400]	Ongoing		Amber
			Provision for re-housing people if long term damage encountered.	NSC- ASS&H NSH	Uncertain	To be considered		Red
			Project underway to introduce Community Resilience Teams, part of role to engage with communities to raise awareness of flood risk and actions to take in the event of a flood.	NSC- ASS&H	In house	2011 onwards		Green
		Vulnerable people adversely affected by flooding – support disrupted, access to facilities more difficult.	Targeting of vulnerable groups and individuals with information – schools, elderly people.	NSC- ASS&H NSH	Partnership working	Ongoing		Amber

Climate risk	Category	Impact	Adaptation measure	Organisation/ service areas	Resource required	Timescale	Issues	RAG status
2. Inland flooding (fluvial, surface water)	Buildings and structures	Existing drainage and sewerage systems unable to cope with increased intensity of rainfall, leading to property and access roads flooded.	As part of the preparation of a Flood Risk Management Plan, identify flood hotspots and identify actions needed to reduce flood risk in these areas.	NSC Strategic Flood Management Board (EA, IDBs, WW)	Partnership working [Defra grant of 2011 = £144,400	Initial assessment by June 2011 1st cycle = June 2011- June 2015	Are necessary Flood Risk Assessments in place?	Amber
			Review maintenance regimes for clearance of roadside gullies drainage network and amend as necessary.	NSC- highways	2012-2015 = £265,400]			Red
			Design green infrastructure provision to reduce storm water run off etc.	NSC- PP/ Nat E		Ongoing		Green
			Developers need to consider evacuation plans when preparing Flood Risk assessments to accompany planning applications and should take into account mobility of occupants.	NSC- PP / DM/ EMU	Private sector	Ongoing		Green
	Activities	Increased risk of damage to buildings and businesses and disruption to critical infrastructure (utilities, telephony, ICT services).	Ensure that buildings are flood resilient by e.g. installing sockets higher from ground.	NSC- EMU/ ASS&H NSH	In-house	Ongoing	Is critical infrastructure is protected from flooding?	Red

Climate risk	Category	Impact	Adaptation measure	Organisation/ service areas	Resource required	Timescale	Issues	RAG status
3. Inland flooding (fluvial, surface water)	Environment	Exposure of species/ habitats to water pollution e.g. from sewers flooding or diffuse pollution e.g. run off from agricultural land.	Risk assessment to be undertaken and actions identified	NSC- Nat E	Uncertain	Ongoing	What is the impact of water pollution on the environment?	Amber
4. Coastal flooding/ erosion	People	Communities at risk from more frequent storm surges /high tides flooding/ sea level rise in coastal areas.	Project underway to introduce 'Community Resilience Teams.' Part of role will be to engage with communities to raise awareness of flood risk and actions to take in the event of a flood.	EMU/ EA/ NSC/ NHS/ NSH/NSEA	In-house [Defra grant of 2011 = £144,400 2012-2015 = £265,400]	Ongoing	Are services able to respond to flood events? Have the needs of vulnerable people been taken into account?	Amber
		Vulnerable people adversely affected by flooding – support disrupted, access to facilities more difficult.	Vulnerable people mapped across the district. Project underway to develop more coordinated approach.	NSC – ASS&H/ NHS NSH	Partnership working	Ongoing		Amber
	Buildings and structures	Increased risk of flooding to properties and other facilities, including caravan parks.	Publicise the implications of the 'Severn Estuary Shoreline Management Plan.' Policy options are to hold the line; advance the line; managed realignment or no active intervention.	EA lead ND & SAG	In house	Published 2010 Ongoing	Are flood actions agreed and understood?	Green
			NSH to coordinate Flood Action Plan with partnership	NSC – ASS&H/ NSH	In house	March 2012		Amber
		Damage to buildings and infrastructure if tidal defences breached.	Identify how/when tidal defences will be improved/maintained/ realigned.	Defra NSC - PP/ DM EA – Severn Estuary management plan	External	2011 onwards		Amber

Climate risk	Category	Impact	Adaptation measure	Organisation/ service areas	Resource required	Timescale	Issues	RAG status
4. Coastal flooding/ erosion	Activities	Damage and loss of tourist attractions, heritage sites (including beaches).	Publicise the implications of the ' <i>Managing Flood Risk on the Severn Estuary</i> '. To include decisions to be taken on siting of car parks, access roads and other community assets.	Defra NSC - PP/ DM EA – Severn Estuary management	In house	To be kept under review	Has the longer term impact of coastal flooding been taken into account?	Green
	Environment	Loss of intertidal mudflats and salt marsh in Severn Estuary, as an important habitat.	Investigate the potential for replacing/ relocating vulnerable habitats.	Defra NSC - PP/ DM EA – Severn Estuary management plan	External	2015 onwards	Have the environmental implications been fully assessed?	Green
5. Heatwave	People	Increased risk of heat stroke/ sun burn/ food poisoning/ hayfever and asthma, (and potential fatalities) leading to increased pressure on care services/ health services.	Implement measures in NHS & NSC Heatwave Recovery Plans. DH review plan annually and expect all NHS & Social Care organisations to base their plans on this.	NHS – NS NSC- EMU NSC- ASS&H	In-house	2011 onwards In place, with annual review	Are services able to respond to heatwave events? Have the needs of vulnerable people been taken into account?	Amber
		Vulnerable people more at risk from adverse effects.	Vulnerable people mapped across the district. Project is underway to develop more coordinated approach.	NSC – ASS&H/ GIS NHS NSH	Partnership working	Ongoing		Red

Climate risk	Category	Impact	Adaptation measure	Organisation/ service areas	Resource required	Timescale	Issues	RAG status
5. Heatwave	Buildings and structures	Increased likelihood of overheating in homes/ buildings. Need alternatives to traditional air conditioning, so don't add to energy demand and CO ₂ emissions.	Promote natural ventilation/ passive cooling techniques.	NSH NSC – Housing/ ASS&H/ DM /BC	In-house	From 2011 onwards	What is being done to future proof buildings and infrastructure, such as road surfaces?	Red
			Promote renewable technologies, such as air/ ground source heat pumps which can cool properties as well as warm them.	NSH NSC – Housing/ ASS&H/ DM /BC	In-house	From 2011 onwards		Red
			Raise awareness of Renewable Heat Incentive.	NSH NSC – Housing/ ASS&H/ DM /BC	Uncertain	June 2011		Red
			Improvements/ adaptation made to buildings used by vulnerable people (elderly persons, schools etc) to will prevent heat build-up. Could include installing reflective glass/ paint, roof and wall insulation.	NSH NSC – Housing/ ASS&H/ DM /BC	Partnership working	Ongoing		Red
			Revising Asset Management Strategy 2011-2014 to include Climate Change Adaptation Measures	NSH	In house	Sept. 2011		Amber
		Increased likelihood of road surface melting and rail tracks buckling with higher summer temperatures.	Investigate the potential/threshold melting of road surfaces across district.	NSC- HM	Add resources for higher spec of surface treatments?	Ongoing		Amber

Climate risk	Category	Impact	Adaptation measure	Organisation/ service areas	Resource required	Timescale	Issues	RAG status
5. Heatwave	Activities	Risk of disruption to economic activity from over-heating of business premises.	Passive ventilation being encouraged in all new development through building regulations.	NSC- BC	Private sector	ongoing	Have the implications been fully taken into account?	Amber
	Environment	Demand for parks/open space with shaded areas also community woodland areas are likely to increase. (Areas of grass and trees can reduce surface temps by around 15°C, which in turn cools the air).	Enhance green infrastructure in new development of urban areas. Plant trees which can grow to a large size, providing significant areas of shade and absorb UV/provide windbreaks.	NSC - PP /Nat E/ DM	In-house Development Contributions	2011 onwards	What changes to open space provision are likely to be required in the future?	Green
6. Drought	People	Communities affected by water scarcity.	Identify emergency plans to provide water supplies and methods of communication.	NSC- EMU NSH	In house	Ongoing	Are services able to respond to drought events? Have the needs of vulnerable people been taken into account?	Amber
			Promote water conservation in the home. E.g. water saving devices.	NSC- ASS&H NSH	In house	2011 onwards		Red
		Vulnerable people adversely affected by water scarcity – access to and managed use of water.	Need to identify vulnerable groups and individuals to target – schools, elderly people.	NSC- ASS&H NSH NHS	Partnership working	Ongoing		Red
	Buildings /structures	Need to reduce consumption of water.	The application of Code for Sustainable Homes will enforce sustainable water use in new homes-through efficiency.	NSC – PP/ DM/ BC NSH	In-house	Ongoing Code Levels: 3 – 2012 4 – 2013 5 – 2015	This will be subject to viability appraisals.	Amber

Climate risk	Category	Impact	Adaptation measure	Organisation/ service areas	Resource required	Timescale	Issues	RAG status
6. Drought	Activities	Need to monitor use of water and also to provide water at events such as T4.	Need for risk assessment of events, and emergency plans in place.	NSC – Events & SAG	In house	2011 onwards	Have events and activities taken water scarcity issues into account?	Amber
	Environment	Drought vulnerable plant species suffer under new climatic conditions.	Change plant varieties to drought-tolerant types in public spaces e.g. in parks and landscaping schemes.	NSC- Nat E	In-house	Longer term impact		Green

7. Implementation and Monitoring

Improving our resilience to extreme weather and making appropriate adaptations to a changing climate will need to be an ongoing process, if the negative consequences for local communities are to be minimised. It is essential that we continue to integrate measures that will increase resilience into our operational practices. We will need to regularly assess and manage these risks and opportunities and incorporate action into strategic planning via the North Somerset Partnership Transport, Economy and Environment delivery partnership. Potentially, the risks identified as part of this strategy may be adopted into strategic risk matrices, if these are judged to be an increasing corporate risk. At the very least, departmental and service teams should adopt these into their own risk matrices or service plans. When this is done, it will provide a mechanism so they are regularly managed as part of corporate activity, rather than being a separate action to complete.

Those risks and opportunities that have been designated highest priority (red) are those that will be prioritised for action through North Somerset Partnership activity. These will be reviewed on an annual basis. We will need to monitor how climate change impacts are evolving and periodically review the risks and opportunities, vulnerabilities and priorities for action under changing circumstances.

A partnership approach to delivering actions will be important to ensure a joined up approach and to avoid duplication which also addresses issues relating to reduced resources and increasing threats posed by a changing climate.

Glossary

ASS&H	Adult Social Services and Housing
BC	Building Control
BCC	Business Continuity Champions
CYPS	Children and Young Peoples Services
Defra	Department of Environment, Food and Rural Affairs
DH	Department for Health
DM	Development Management
EA	Environment Agency
ED	Economic Development
EMU	Emergency Management Unit
HA	Highways Agency
HM	Highway Maintenance
IDB	Internal Drainage Board
LEP	Local Economic Partnership
LRF	Local Resilience Forum
NatE	Natural Environment
ND&SAG	North Devon & Somerset Advisory Group
NHS-NS	National Health Service-North Somerset
NHS- EMO	National Health Service- Emergency Management Officer
NSC	North Somerset Council
NSEA	North Somerset Enterprise Agency
NSH	North Somerset Housing
PP	Planning Policy
SAG	Safety Advisory Group
STA	Somerset Tourism Association
TP	Transport Planning
Regen	Regeneration
WSAG	Water Safety Advisory Group
WH&RA	Weston Hotels & Restaurants Association
WW	Wessex Water

Useful sources of further information

Websites

Defra: <http://ww2.defra.gov.uk>

UK Climate Impacts Programme: <http://www.ukcip.org.uk/>

Climate South West: <http://www.oursouthwest.com/climate/>

North Somerset Council: <http://www.n-somerset.gov.uk/climatechange>

Environment Agency Flood Warnings:

<http://www.environment-agency.gov.uk/homeandleisure/floods/38289.aspx>

Publications

A changing climate for business Climate change series: General opportunities and challenges General adaptations for farmers and growers	UK Climate Impacts Partnership Farming Futures	June 2010
Expecting the unexpected- business continuity in an uncertain world,	Business Continuity Institute	2003
Managing Flood risk in the Severn Estuary	Environment Agency	Jan 2011
Warming to the idea- 'Building resilience to extreme weather and climate change in the South West'	Climate South West	2010