Climate Change Adaptation Position Paper

A Dorset Local Nature Partnership Position Paper

Aim

Dorset Local Nature Partnership (DLNP) wants Dorset to adapt to inevitable climate change by making timely, far sighted and well-informed decisions to address the risks and opportunities posed by a changing climate and ensure the natural environment, local economy, infrastructure and communities are resilient to such change.

Dorset Local Nature Partnership therefore makes the following recommendations:

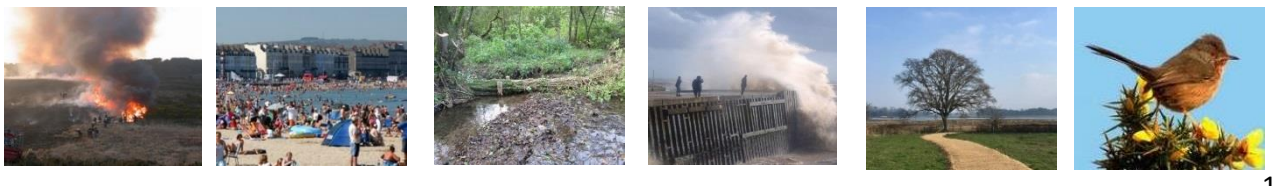
Recommendations

Strategic

1. Develop a strategic and co-ordinated approach to climate change adaptation across Dorset:
    - Interpret the forthcoming UKCP18 scenarios and develop agreed climate change projections for Dorset as a basis of future risk assessments.
    - Identify the key climate change risks for Dorset's natural environment, businesses, infrastructure and communities based on the UKCP18 scenarios, the 2017 National Climate Change Risk Assessment and forthcoming Climate Change Adaptation Programme 2018.
    - Identify the climate change adaption actions to respond to the identified risks and as part of this review existing adaptation actions already committed.
2. Ensure that through any Local Government Re-organisation local authorities in Dorset are strongly encouraged to continue to act in their role as community leaders to adapt to climate change both across the local area and internally within their own estate and operations.

Specific

3. Managed realignment initiatives, especially in Poole Harbour / Bay, to compensate for the loss of intertidal habitats should be facilitated
4. Pioneering landscape scale conservation ambitions to increase the resilience of the county's most important ecosystems be should adopted
5. Strong bio-security measures to limit the spread of invasive non-native species, pests and diseases should be adopted and implemented
6. Strong fire management protocols to ensure prevention of and readiness for major fires should be developed and implemented
7. Improved natural flood management solutions should be developed
8. Climate change adaptation should be incorporated into planning decisions (including Green Infrastructure) across the county



Why look at climate change?

There is virtually unanimous scientific agreement that climate change is already happening and that it is significantly driven by human action. Climate change will affect the entire world – land and ocean. Indeed it is already impacting negatively on Dorset's environment, economy, infrastructure and communities – we therefore need to take action urgently. As a relatively wealthy community which uses more than our equitable share of greenhouse gases, we (public, private, voluntary and community sector organisations and residents) have a responsibility to play our part in adapting to climate change.

DLNP wants to promote more effective action to enable Dorset's natural environment to be richer in quality and diversity, and more resilient to change in urban and rural areas and in the marine environment; and enable the county's wildlife sites to be bigger, better and more joined up, giving them greater resilience in the face of future change and challenges. These aspirations are set out in DLNP's Strategy and Vision[1] and Natural Value Report[2].

DLNP has published two position papers on climate change – this one focused on adaptation and another on mitigation. While these are fundamentally linked and should be read in conjunction with each other, they contain different solutions and recommendations. Both papers reflect an agreed consensus among the different interests represented on the DLNP.

DLNP is not in a position to influence the larger climate trends nor indeed to make the decisions which affect how Dorset adapts to its effects. However we can seek to raise awareness of the adaptation risks and opportunities; disseminate good practice from within and outside the county; and inform understanding and action by decision makers, policy makers and practitioners who influence Dorset's social, economic and environmental future. There are some impacts and opportunities which DLNP believes are particularly relevant to our county, given our abundance of potentially vulnerable habitats and land uses. This paper proposes a series of recommendations which Dorset residents, decision makers and partnerships can take in order to adapt to climate change.

Flooding
Photo: M.Simons, DCC

[1] www.dorsetlnp.org.uk/hres/DORSET-LNP-STRATEGY-Update-2016.pdf
[2] www.dorsetlnp.org.uk/Natural_Value_Report

Definition Climate Change Adaptation: Adjustment in natural or human systems to a new or changing environment. Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation. (IPCC). Examples include: flood defences, drought tolerant crops, setting aside land – SANGS (suitable, alternative, natural greenspaces).

National context

In 2008 the UK Government passed the Climate Change Act which commits to reducing greenhouse emissions by at least 80% of 1990 levels by 2050. This target was derived as a contribution to a global emissions path aimed at keeping global temperature rise to around 2°C above pre-industrial levels. The Climate Change Act also puts in place a policy framework to promote adaptation action in the UK consisting of:

- The UK Climate Change Risk Assessment – five yearly assessment of the major risks and opportunities from Climate Change to the UK
- The National Adaptation Programme – the Government's long-term strategy to address the main risks and opportunities identified in the Risk Assessment (also produced every five years).
- UK Adaptation Reporting Power – grants the Secretary of State the power to require public service organisations to produce reports on what they are doing to.

In November 2016, the UK Government ratified the Paris Agreement which aims to put the world on track to avoid dangerous climate change by limiting global warming to well below 2°C and to pursue efforts to limit it to 1.5°C. Limiting warming to 1.5°C is recognised to help reduce some key significant impacts from climate change but not all. In terms of adaptation the Paris Agreement aims to:

- Hold the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;
- A global goal on adaptation: enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change

Commissioned by the Government, the Commission on Climate Change's Adaptation Sub-Committee (ASC) produced an Evidence Report to inform the second UK Climate Change Risk Assessment[3] (which was subsequently published in January 2017). The Commission on Climate Change published a synthesis report based on the Evidence Report in 2016[4].

The Evidence Report sets out the top six areas of inter-related climate change risks for the UK (see figure 1). These are the most important risks because of their magnitude now and in the future and because of the need for additional co-ordinated steps to be taken in the next five years. However, the report also identifies over 50 other specific risks to the natural environment, infrastructure, people and the built environment, business and industry and international dimensions.

[3] www.gov.uk/government/publications/uk-climate-change-risk-assessment-2017
[4] www.theccc.org.uk/wp-content/uploads/2016/07/UK-CCRA-2017-Synthesis-Report-Committee-on-Climate-Change.pdf

Figure 1: The UK Climate Change Risk Assessment - Adaptation Sub-Committee's assessment of the top six areas of inter-related climate change risks for the UK

NB: see the full document to link to the chapter's noted above.

The ASC's Evidence Report[5] also highlighted three opportunities of climate change:

- Milder winters should reduce the costs of heating homes and other buildings, helping to alleviate fuel poverty and reduce the number of winter deaths from cold.
- UK agriculture and forestry may be able to increase production with warmer weather and longer growing seasons.
- Economic opportunities for UK businesses may arise from an increase in demand for adaptation-related goods and services.

West Bay
Photo: DLNP

[5] UK Climate Change Risk Assessment 2017 Synthesis report: priorities for the next five years

What are the implications for Dorset?

Climate change is a reality which is already affecting our landscapes, wildlife, economy, infrastructure and people and will in the future have an even greater impact. The heatwave in the summer of 2003, for example, resulted in over 35,000 deaths in Europe[6] and 2,000 in the UK[7], a cost of 13.1 billion Euros to European farming[8], as well as more fires across Dorset's heathlands than normal[9]. There has also been a recent increase in erratic and extreme weather events causing severe flooding in parts of Dorset and significant increase in coastal erosion and serious landslips. Whilst these cannot necessarily be directly linked to climate change these are the sort of extreme events that are predicted and likely to become more frequent.

Although the scale and details of predictions may change, as more information is known and modelling becomes more effective, an average global temperature rise of at least two degrees centigrade is predicted by around 2040 – unless the welcome commitments made in the Paris Agreement are fully implemented. Climate change will also result in changes in average rainfall as well as a shift in the range and frequency of extreme events such as floods, droughts and strong winds.

A warmer climate is already resulting in melting icecaps causing rising sea levels globally. Sea levels globally and around the UK have risen by 15 – 20cms since 1900, and are projected to rise between 11 and 76cm by the end of the century. In the worst possible case, rises up to 1.9m are possible but highly unlikely[10].

The United Kingdom Climate Projections 2009 (UKCP09)[11] are currently the most recent set of climate change scenarios released by the UK Climate Impacts Programme – the next set of climate change scenarios are due to be published in 2018. UKCP09 describe how the UK climate might change during the 21st century using leading science developed at the Met Office Hadley Centre.

The Met Office has interpreted the UKCP09 for Dorset as part of developing Dorset County Council's Comprehensive Climate Change Risk Assessment[12]:
In Summary, by 2050, according to the medium emissions scenario of the UKCP09 projections, Dorset will experience hotter summers with an increase in average summer temperature of between 1.3 - 4.6 °C on the current average summer temperature. The hottest summer days could rise by as much as 7°C although it is more likely to be more like 4°C. Average winter temperatures are also set to rise with an expected increase of between 1.1 - 3.6 °C on that which is currently experienced today.

In terms of precipitation, the total annual rainfall is unlikely to change, however, the patterns of rainfall could shift with total summer rainfall likely to decrease by around 20% and winter rainfall predicted to rise by a similar amount.

Projections also indicate there will be an increase in frequency and intensity of extreme events, whether of wind, rainfall or temperature.

[6] www.newscientist.com/article/dn4259-european-heatwave-caused-35000-deaths.html#.U0v80KzPpSM
[7] www.theccc.org.uk/uk-climate-change-risk-assessment-2017/synthesis-report/
[8] www.metoffice.gov.uk/education/teens/case-studies/heatwave
[9] www.dorsetecho.co.uk/archive/2003/08/26/5376598.Wildlife_fears_as_fire_wipes_out_heathland/
[10] Warming, Climate Change the facts – Met Office
[11] www.ukclimateprojections.metoffice.gov.uk
[12] Comprehensive Climate Change Risk Assessment: Dorset County Council & Dorset Districts & Borough Councils, September 2010

Areas in Dorset which are already at risk of flooding will become more vulnerable to long term climate change. The change in rainfall may lead to more short duration, but high intensity, rainfall events leading to flash flooding and also more frequent periods of long duration rainfall.

It is accepted that not all extremes in weather are the result of climate change. For example it is thought that the run of wet summers in the UK between 2007 and 2012 was due to natural variability in the Earth's atmosphere[13] rather than climate change.

The implications for Dorset can be summarised under four interlinked areas:

- Impacts on Local Authority operations
- Natural environment
- Communities and health
- Economy

Impacts on Local Authority operations in Dorset

The Comprehensive Climate Change Risk Assessment for Dorset (Dorset County Council and the six district/borough councils) undertaken in 2010 set out how the impacts of climate change will affect their services, staff, infrastructure, operations and the wider community. It established the need to ensure that they are sufficiently prepared to manage the risks, build resilience and take advantage of any opportunities presented from the predicted climatic changes.

Six priority risks were identified as needing additional investigation: 1) Green Infrastructure and the Natural Environment, 2) Highways Asset Management and Maintenance, 3) The Built Environment, 4) Health, 5) The Local Economy, 6) Planning Policy.

In total 97 high level weather and climate specific service risks were identified within Dorset County Council in terms of service delivery. Six of these were in the near-term up to 2015 and the rest in the mid-term up to 2050 – over half of these risks being identified by services within the Environment Directorate. These high level specific service risks relate to an acute vulnerability of a service to a single weather or climate variable such as intense rainfall and flooding or hotter summers.

Within the Districts and Boroughs the most commonly seen as at risk services related to the management of the natural environment and green infrastructure such as grounds maintenance, arboriculture and parks and open spaces.

Fires on heathland may increase
Photo: DWT

Upton SANG (Suitable Alternative Natural Greenspace)
Photo: BoP

[13] www.theccc.org.uk/uk-climate-change-risk-assessment-2017/synthesis-report/

Natural environment

Climate change will have significant, variable and uncertain effects on natural ecosystems. Nature conservation management, agricultural management and fire management are among the many activities that need to adapt to these changes. Impacts are most likely to be significant where farming is already difficult or marginal, where habitats are already stressed (for example drying out of wet heathlands or fires in forest and heath) or areas such as our coast where inundation might be caused by a change of just a few centimetres rise in sea level or one extreme event.

Dorset's marine environment will also be affected as the oceans warm. Sea level rise estimated at around 3mm/annum will squeeze coastal intertidal habitats and rapid acidification (estimated at 100x background rates of change) will affect species composition. Changes in composition of algae and plankton will have consequent effects on the rest of the food chain, including seabirds and commercial fisheries.

Since 2000 eleven new marine and 43 new terrestrial invertebrates[14] have been recorded for the first time in Dorset, although it is difficult to say that climate change is the only contributing factor. Increased sightings of many warm water species have been recorded in the English Channel and a number of non-native invasive species are spreading. Conversely others, for example, the acorn barnacle have undergone sharp declines.

The RSPB has assessed the likely potential impacts on some priority bird species across the UK as figure 2 demonstrates. These figures are based on the best current evidence and come with the strong caveat that benefits are only liable to occur if available habitats exist and other ecological conditions are favourable. For example the turtle dove has continued to decline and almost disappeared from Dorset despite the possible benefits of climate changes.

Figure 2: Likely potential impact of climate change on example species across the UK

Risk / benefit*	Species
High benefit	Dartford warbler, lesser-spotted woodpecker, nightjar, woodlark, dark-bellied brent goose (wintering), grasshopper warbler
Medium benefit	Turtle dove
Limited impact	Corn bunting, redshank
High risk	Willow tit, marsh tit, grey partridge, lesser redpoll, redstart, lapwing, tree pipit

* Benefits are only liable to occur if available habitat exists and other ecological conditions are favourable.

Dartford Warblers may benefit from climate change
Photo: DWT

Leaky Dam: Natural Flood Management
Photo: DWT

[14] Dorset Biodiversity Indicators Report, March 2015 DERC

There is no systematic assessment for other taxonomic groups – so further research is needed. Some threatened species in Dorset may do well under climate change scenarios if the negative impacts can be contained. For example heathland species such as sand lizard, southern damselfly and Purbeck mason wasp stand to gain if habitats can be protected and reconnected and if fires and summer drying do not markedly increase.

To understand the likely impacts of changes in climate on individual species, it is important to understand the mechanisms by which changes in climate are likely to affect these species and their habitats. As well as changes in the location of suitable climatic conditions, there may be changes in seasonal timings, exposure to extreme or unseasonal weather, changes in ecological associations through community change, and indirect impacts such as through land use change.

These changes will result in winners and losers. The winners are likely to be competitive, adaptable and highly dispersive species that are able to successfully colonise areas as they become climatically suitable. This is likely to include non-native existing or new pests, whether arriving naturally or, more likely through the traffic in people and their goods and services. These may be economically costly and in turn encourage changes in farming and forestry practices away from monocultures.

The main losers will probably be species with a poor dispersal ability, where the current and future climatic envelopes show little or no overlap and a shift in distribution is needed to maintain populations. Species with more specialist requirements are also likely to be at greater risk. For some of these species, tough decisions may have to be made as to whether it is worth continuing to invest in conservation effort for them in the face of evidence of long term declines towards local extinction.

The most likely impacts of climate change on wildfire behaviour is that we can expect that that the 'fuel load' will grow more abundantly during warm wet spells and will burn readily during drought conditions. This is likely to result in more frequent, more intense and larger wildfires than we have had in the past.

There may also be an expected rise (or at least change) in the number of plant pest and diseases. Some of these could lead to widespread loss of certain habitats, plants and forest crops. This will result in an increase in the amount of dead dry fuel in the environment which, in turn, will increase both the intensity and severity of wildfires. Existing examples of this include Heather Beetle infestations in the south of England where large areas of lowland heath have very high percentages of dead dry material.

There are environmental impacts such as loss of valuable habitats and species, loss of crops, reduced air quality due to smoke plumes, reduced water quality due to runoff, large amounts of carbon being liberated from sequestrated stores such as peat etc. and there is the physical risk to life and property. The Upton Heath fire in 2011 required 30 fire engines and 12 land rovers to extinguish it. This is more than 50% of the firefighting resources available in Dorset at the time.

Communities and Health

Climate change is not only impacting on the natural environment but our health and wellbeing.

The Sustainable Development Unit (NHS England and Public Health England) published it's 'Under the Weather Toolkit'[15] as a guide to 'Improving health, wellbeing and resilience in a changing climate'. The report sets out the 'significant seven' effects of climate change on health, wellbeing, and the health and social care system and adaptation examples (figure 3).

[15] www.sduhealth.org.uk/areas-of-focus/community-resilience/community-resilience-copy.aspx

The Dorset Comprehensive Climate Change Risk Assessment highlighted health as one the six areas of highest risk:

- Adult care - with particular focus on the vulnerability of the elderly, the disabled and infirm and to the range of weather and climate variables
- Children's health – the increasing future susceptibility to heat stress, sunstroke/sunburn and dehydration due to the changing climatic conditions and the potential impacts that Hotter Summers and Heatwaves will have on existing conditions including asthma, through poorer air quality, and obesity
- Environmental Health – focussing on the increasing likelihood of food poisoning from rising summer temperatures, the growth in numbers of pest species surviving in warmer winters and potential risk of disease from flood events

Figure 3: Significant seven effects of climate change on health, wellbeing, and the health and social care system

Climate change health impact	Adaptation examples
1. **Increase in heat related illness and death** – increased morbidity and mortality from respiratory and cardiovascular diseases [3]	Planning of the built environment; indoor heat reduction measures and behavioural change
2. **Flood related illness and displacement** – as well as injury and infection, the effect of flooding on mental health is well documented, and a considerable part of the overall health burden [4]	Flood defences; flood preparedness plans; building controls/restrictions
3. **Pressure on health care providers to keep services running in the face of extreme weather** – extreme events such as floods, heatwaves and storms may impact on service delivery as they become more common in the future. [5] [6] This includes the ability to deliver services in the community.	Building and infrastructure design; all hazards risk assessment; business continuity and emergency planning
4. **Increase in health inequalities** – between different population groups. For example increase fuel and food prices, reduced access to heating, cooling, health services, education and food security.[7]	Identify and involve vulnerable groups; targeted/tailored information to at risk groups
5. **Health impacts relating to air quality and aeroallergens** – high temperatures are linked to poor air quality with high levels of ozone which are formed more rapidly in strong sunlight; fine particles (PM_{10}, $PM_{2.5}$) that damage health may also become more prevalent in the future. Climate change may result in earlier seasonal appearance of respiratory symptoms and longer duration of exposure to aeroallergens (e.g. pollen). [8]	Monitoring, alerting, green infrastructure, education programmes
6. **Increase in food, water and vector borne diseases** – an increase in incidences of infections may be seen due to higher temperatures, drought, flooding, changes in habitat and rainfall patterns. [9]	Surveillance and monitoring programmes; local educational programmes
7. **Skin cancer and sunburn** – excessive exposure to ultraviolet (UV) light may have consequences ranging from premature aging of the skin to skin cancer. Malignant melanoma incidence rates in the UK have more than quadrupled over the last thirty years[10]	Monitoring; provide shade; educational programmes

Economy

Extreme rainfall events have the potential to exacerbate problems of both water scarcity and flooding, which will impact on the local businesses. Water scarcity may impact business productivity, for example in agriculture and food production.

Within Dorset 77 percent of the land is farmed. Changes in climate may resulting is longer growing seasons but these may be more unpredictable. In early 2017 there was a shortage of some vegetables in the UK due to heavy rainfall and severe cold weather in Southern Europe leaving only 30% of Spain's Murcia region's growing fields being useable. Supporting and encouraging the consumption of local seasonal produce will support the local economy and contribute to local resilience.

There may be direct implications to business through flooding of premises but also indirect implications through loss of materials in the supply chain or loss of access to products / customers if transport links are flooded.

There may be opportunities in terms of tourism in Dorset if hotter summers encourage more UK 'staycations' and visitors from other countries. This has economic growth potential but needs to be balanced with the likely increased transport and resultant carbon emissions. Sustainable tourism therefore needs to be encouraged, including avoiding additional pressure on sensitive sites such as heathlands. Sea level rise will impact our coastal areas in the longer term. Planning and adaptation actions will be needed to avoid negative impacts on tourism opportunities.

What are we doing locally?

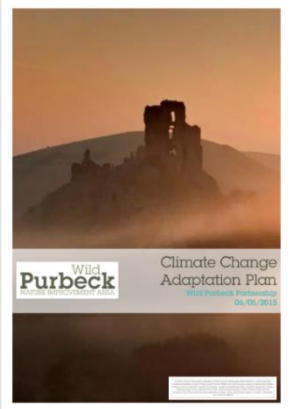
Compared with climate change mitigation there has been less direct action on adaptation across Dorset, but a range of organisations and projects have developed strategies, plans and guidance on adaptation. The following section sets out some of these plans/initiatives across Bournemouth, Dorset and Poole for climate change adaptation.

Local Authorities

- Dorset County Council, as the Lead Local Flood Authority, has a duty to produce and maintain a Local Flood Risk Management Strategy for flooding from surface water, groundwater and ordinary watercourses. The current Strategy, produced in 2014, considers the potential impact of rainfall driven climate change on flood risk in Dorset.
- Dorset County Council's Highways Service has undertaken a very detailed climate change risk assessment of the highways asset which included looking at specific weather threshold data, for high and low temperatures, precipitation and drought for each decade up to the 2080's. They have also been instrumental in helping to develop the 'Highways Infrastructure Resilience Assessment Modelling Tool' (HIRAM) which helps to identify and quantify extreme weather and climate risks to the highways network. They are currently using the tool to identify flooding hotspots and future programmes of work with the overall aim of working towards network resilience.
- BoP expanded cycle lane on Gravel Hill (A349), Poole an undertook a range of improvements to stabilise the carriageway and improve the road's surface drainage capacity to deal with heavy rain storms by with coppicing/ thinning of trees and vegetation in the adjacent mixed woodland, slowing down water flow, reducing soil erosion and creating more effect storage areas for the additional rain flow.
- Poole Quay Flood Defences have been partially implemented (completion due in May 2019). The works involve joining up existing sea defence schemes carried out previously in the Old Town area as to prepare for flooding in and around coastal areas. Climate change adaptation measures to raise the land near to the edge by building walls assists in adaptation to climate change impacts.
- Borough of Poole produced and adopted the "Sustaining Poole's Seafront" – supplementary planning document (SPD) in 2015. The SPD guides development coming forward on the seafront setting out the principles for improvement on each beachfront location at Sandbanks, Shore Road, Flaghead, Canford Cliffs, Branksome and Branksome Dene. Conserving the natural environment and improving facilities to create a self-sustaining beach environment will help Poole adapt to climate change including:
    - Promoting design responses for new development that take account of flood risk.
    - Increasing areas of soft landscape, trees and encouraging biodiversity.
    - Sensitively managing new development on/adjacent to SNCI and SSSI which has the potential to affect protected species e.g. retaining south facing banks for sand lizards.

Natural Environment

- The Wild Purbeck Nature Improvement Area (NIA) developed a Climate Change Adaptation Plan[16]. Land management advisory notes were produced for the NIA on: Heathland; Woodland; Wetland; Arable Farming and Grassland Farming.
- The SANG (Suitable Alternative Natural Greenspace) at Upton Country Park is helping Poole to adapt and increase resilience to climate change by creating an additional 11 hectares (25 acres) of new grassland, woodland and water meadow, improving biodiversity and offsetting the impact on the Upton Heath SSSI and other important heathland sites where increased use can have an impact on the fragile local habitat and species.
- The Dorset AONB Strategy 2014-19[17] includes the following adaptation policies and actions:
    - Ensure resilience and adaptation to change, such as the effects of incoming disease and pests, at a landscape scale
    - Promote raised awareness of coastal change and appropriate adaptation responses
    - Co-ordinate and target advisory support and grant aid to enable adaptation to environmental change and funding uncertainty while maximising the benefits to the AONB
    - Maintain skills, allow adaptation and encourage new entrants into appropriate land/sea-based sectors
    - Develop climate change adaptation plans with farmers and fishermen in the AONB
    - Promote sustainable construction and the consideration of climate change mitigation and adaptation in all development and infrastructure management in the AONB
- The Cranborne Chase AONB Management strategy includes:
    - Promote and work with relevant organisations on climate change mitigation and adaptation measures that are appropriate for the AONB landscape and communities
    - Promote good practice for climate change adaptation to businesses in the AONB.
- Natural England undertook a Character Area Climate Change Project for the Dorset Downs and Cranborne Chase (one of four national pilots). *Responding to the impacts of climate change on the natural environment: Dorset Downs and Cranborne Chase* 2008 sets out the likely impact of climate change on the areas and potential adaptation options, such as:
    - Re-establishing pollard regimes to reduce the susceptibility of trees to drought and storms by reducing the root to crown ratio.
- Install or restore water storage on farms, particularly dewponds.



Wild Purbeck NIA Adaptation Plan
Dorset AONB

Adaptation advice to farmers
CLS Dorset

[16] www.dorsetaonb.org.uk/our-work/wildpurbeck/146-researchplanning/572-climate-change-adaptation
[17] www.dorsetaonb.org.uk/assets/downloads/ManagementPlan/2014-2019-DAONB-MP.pdf

- The Jurassic Coast World Heritage Site Management Plan[18] includes the cross-cutting theme:
    - Implementation of policies and actions must respond to the need to mitigate for and adapt to environmental change, primarily climate change. This is as much about the carbon footprint of the activities as any direct physical changes that might need to be considered, and will vary significantly from project to project.
- The planning system has an important role and statutory duty in helping to adapt to climate change. There are basic principles included within Local Plans about where to build (for example avoiding floodplains) and the incorporation of green spaces, shading trees and sustainable urban drainage components, through green infrastructure strategies. For example:
    - The South East Dorset Green Infrastructure Strategy[19] was published in 2011 and includes the objective: 'to prepare for climate change through mitigation & adaptation' as one of its six strategic objectives. The strategy includes mitigation themes of: water and flood management; and greening the urban environment. Actions include: extending Stour Valley Park, expanding Upton Country Park to create a large SANG and enhance the Castlemain Trailway.
- *Shifting shores: playing our part at the coast*[20] was published by the National Trust in 2015. The report summarises the approach being taken by the National Trust to manage the 775 miles of coastline it owns. The report, originally published in 2005, committed the Trust to working with natural processes and adapting to climate change rather than continuing to build or shore up coastal defences. The updated report states "*Where we can, recreating a naturally functioning shoreline will free us from the sea defence style of construct, fail and reconstruct we need to lead by example and step up to the challenges of coastal change management*."

Communities and Health

- The Communities Living Sustainably in Dorset (CLS) Project undertook a number of activities to support communities to adapt to climate change. This included:
    - Vulnerability mapping to identify potential future vulnerability to climate change by combining geographical flood risk information and future temperature projections with census data for a range of vulnerability indicators including health, age, income etc. In combination, these provided an indication of the local population's ability to prepare, respond and recover from severe weather event like floods and heat waves
    - Developing user friendly scenarios describing how Dorset's climate could change in the medium term (2033). This was based on the UK Climate Projection 2009 (UKCP09) medium emissions scenario and developed in conjunction with the Met Office. A workshop was undertaken Bridport in July 2014 attended by community members, representatives of risk management agencies (e.g. Environment Agency), local elected members and others which used the scenario as a tool for stimulating discussion of how climate change could affect the community and what could be done to adapt to those impacts. At the workshop participants identified a range of options for what could be done locally to increase resilience to climate change and how to take them forward.
    - Delivering two of the community resilience seminars in partnership with the Dorset Civil Contingencies Unit (CCU) which included using the scenarios as a focus for discussion around the impact of extreme weather events.
    - Public Health Dorset commissioned a study into adaptation to enable older people to cope with extreme temperatures[21].

[18] http://jurassiccoast.org/wp-content/uploads/2015/10/Jurassic-Coast-World-Heritage-Site-Management-Plan-2014-%E2%80%93-2019-Approved.pdf
[19] www.dorsetforyou.gov.uk/greeninfrastructure
[20] www.nationaltrust.org.uk/documents/shifting-shores-report-2015.pdf
[21] www.clsdorset.org.uk/userfiles/files/Public%20Health%20-%20Complex%20Challenges%20%20Public%20Engagement_SM.pdf

- The Dorset Local Resilience Forum[22] (LRF), which covers Dorset county, provides the framework for the effective delivery of the statutory duties under the Civil Contingencies Act 2004. The Dorset Civil Contingencies Unit (CCU) manages the day to day running of the business of the LRF and ensures it delivers against the strategy. The Community Risk Register[23] (CRR) which provides a tool which underpins the work of the LRF identifies risks using the National Risk Register of Civil Emergencies (which includes a consideration of climate change), local knowledge and professional judgement of the LRF area. Addressing these risks includes planning for events such as flooding, storms gales and rain, ice and snow, cold weather, heatwave and drought.
- The CCU undertook five community resilience workshops across Dorset to encourage town and parish councils to develop community emergency plans to address emergencies including extreme weather events. Two plans have so far been completed and reflect the risk of flooding. The CCU have also been working with Dorset Police in developing an overarching "Dorset prepared" website[24] and work in progress on further development by the CCU.
- A number of initiatives are already underway in Dorset to enhance the opportunities for people to experience the natural environment as part of efforts to enhance their wellbeing, for example Natural Choices[25] (a green prescription service). Better protection and enhancement of our natural environment will enhance their resilience and maintain and increase their availability to serve as sources of wellbeing enhancement. Sensitive and climate proof green infrastructure initiatives, in particular, will be an important part of maintaining the quality of living spaces in the light of climate change.

Weymouth Beach
Photo: M.Simons, DCC

Economy

- The Dorset Communities Living Sustainably Programme assessed the vulnerability of five farms in Dorset to climate change and developed farm specific resilience plans detailing their level of resilience and vulnerability to climate change and setting out advice on what each farm could do to improve their resilience to severe weather risks and future climate change. Based on the discussion and advice given at the five farm visits two leaflets were produced outlining steps farmers can take to improve dairy farm resilience and soil resilience to climate change: *Building Resilience to Climate Change on Dairy Farms*[26] and *Building Soil Resilience to Climate Change*[27].

[22] http://dorsetprepared.org.uk/
[23] www.dorsetforyou.gov.uk/emergencies/community-risk-register
[24] http://dorsetprepared.org.uk/
[25] www.dorsetlnp.org.uk/Natural_Choices
[26] www.clsdorset.org.uk/userfiles/files/CLS%20Farming%20Advice%20Fact%20Sheet_Dairy.pdf
[27] www.clsdorset.org.uk/userfiles/files/CLS%20Farming%20Advice%20Fact%20Sheet_Soil.pdf

- Dorset County Council, as the Lead Local Flood Authority[28], has a duty to produce and maintain a Local Flood Risk Management Strategy for flooding from surface water, groundwater and ordinary watercourses. The current Strategy, produced in 2014, considers the potential impact of rainfall driven climate change on flood risk in Dorset. Additionally the Lead Local Flood Authority carries out local flooding (surface water, groundwater and local watercourses) investigations and identify improvement schemes. Local flooding due to climate change (more intense rainfall, wetter winters) and associated flood alleviation schemes identified to adapt to these climate change effects.

What more do we need to do?

There is still more work to be undertaken on climate change adaptation and there are opportunities for further action.

- Adaptation should be integrated into all policies, plans and programme whether Local Development plans, site management plans, operational programmes, sustainability risk assessments etc. Bournemouth Borough Council already has a robust tool for this that could be shared.
- Land Use planning should play a facilitating role towards appropriate infrastructure that helps to adapt to climate impacts on the human and natural environment.
- Many individual sites are building adaptation into their management planning, for example ponds to counter drought and fight fire, firebreaks, enhanced hydrological management etc.
- Managed realignment projects and the development of natural flood management programmes; and to make provision for the developing ecological connectivity across landscapes[29].
- Ensure that existing habitats are well protected and managed. Their resilience can be increased through restoration of new or damaged habitat around and connecting these remaining places, making sites bigger and better in line with the principles established by the *Lawton Review*. Guidelines for three important Dorset habitats – heathlands, wetlands and woodlands were developed as part of the Wild Purbeck NIA programme.
- More efficient use of water as well as measures to improve its quality and slow its movement through the water cycle, working with Catchment Partnerships (see also the DLNP Position Paper on Water Management[30]). Measures may include:
    - Improving natural infiltration of catchment soils and percolation to groundwater, by restoring soil organic matter levels and avoiding soil compaction and capping.
    - Creating semi-natural vegetation such as woodland and grassland along critical run-off pathways to slow surface water run-off and aid infiltration of water into the soil.
    - Making sure that crops grown and farmed are appropriate to the erosion sensitivity of the land to minimise erosion and siltation of water courses.
- The human responses to climate change are likely to have at least as much impact as the ecological responses. Farmers and other land managers will make decisions about land use based on a variety of economic and environmental factors, many of which will be influenced by climate change, though they may not see it as a climate influenced decision. These choices in turn will affect native wildlife.
- The Forestry Commission is particularly concerned about the impact on both native and commercial forests. Adaptation measures will include good biosecurity and contingency planning and careful monitoring so that we can respond quickly to identify problems. In future this may affect more fundamental choices such as how we manage nature reserves, what crops are grown and our ability to sustain certain tree species or forestry types.

[28] Bournemouth and Poole Unitary Authorities are also lead local Flood Authority for their administrative areas

[29] Making Space for Nature, Sir John Lawton et al 2010 www.gov.uk/government/news/making-space-for-nature-a-review-of-englands-wildlife-sites-published-today

[30] www.dorsetlnp.org.uk/hres/water-management-in-dorset2.pdf

- Natural England and RSPB jointly published a climate change adaptation manual[31] to support nature conservation in a changing climate. For each habitat, the following are included: introduction, habitat description, potential climate change impacts, adaptation responses, relevant environmental stewardship and woodland grant options, further information and advice and relevant case studies.

Final Words

Continued climate change adaptation in Dorset is essential. Progress is already being made but more action is needed. Climate change adaptation needs to remain a priority for Dorset as a whole. Adaptation can easily fall down the priority list without a clear national lead but greater recognition needs to be made to the wider benefits adaptation can make to health and economic priorities.

DLNP believes that climate change adaptation needs to be embedded in both development planning but also for service delivery planning. Robust climate impact assessments need to be undertaken and adaptation measures must be included in associated strategies and action plans. DLNP through its constituent members will challenge those that have not been through this process but will show support where appropriate.

Whatever the outcome of the current local government reorganisation proposals, the positive initiatives to address climate change that the majority of Dorset's councils have already put in place must be carried forward to the new organisations. Bournemouth and Poole Councils have joined the global Compact of Mayors initiative – the world's largest coalition of city leaders addressing climate change by pledging to reduce their greenhouse gas emissions, tracking their progress and preparing for the impacts of climate change. It would show genuine commitment if all Councils in Dorset did the same, or made similar commitments, in any future governance arrangements.

By working together across Dorset, we can adapt to climate change by reviewing, monitoring and amending land management practices on farmland, woodland, nature reserves and in inhabited to ensure that we predict and respond to events such as sea level rise, fires, flooding, drought and the introduction of new pests and disease.

If we can do these things, then the county can continue to retain its high quality environment for the benefit of residents and visitors. Dorset can become a role model for how to respond to climate change which can inform and inspire people elsewhere to follow our example.

Storm at West Bay
Photo: M.Simons, DCC

[31] http://nepubprod.appspot.com/publication/5629923804839936

For more information

Please contact the Dorset Local Nature Partnership for further information: info@dorsetlnp.org.uk or see the website: www.dorsetlnp.org.uk

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Thank you

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Acronyms

BBC: Bournemouth Borough Council; BoP: Borough of Poole Council; DCC: Dorset County Council; DLNP Dorset Local Nature Partnership

Appendix 1: Guidance documents

- Wildfire officially recognised as a major UK hazard[32]
- Forest Research – How is climate change affecting the incidence of forest fires?[33]
- Keeping the Country Running – natural hazards and infrastructure – Cabinet Office 2015[34]
- National Risk Register for Civil Emergencies 2015[35]
- Climate UK – Building a resilient environment[36]
- Climate Ready – Guidance for making the case for climate change adaptation in the built environment[37]
- Forestry Commission climate change action plan: a strategy for the Forestry Commission estate in England[38]
- Forestry Commission information on climate change impacts and adaptation in England's woodlands[39]
- Farming futures website: contains factsheets and films about climate change and agriculture[40]
- Natural England climate change farm resilience planning[41]
- Committee on Climate Change report managing the land in a changing climate – Adaptation Sub-Committee progress published July 2013[42]
- Making Space for Nature – the 'Lawton report' – for bigger, better, more and more connected wildlife sites[43]
- The Living with a Changing Coast (LiCCO)[44] website contains resources on coastal and climate change which suggest ways in which individuals and communities can prepare themselves for the possible impacts of climate change, and adapt to future changes in climate.
- A guidance document *Climate Ready Councils*[45] to support councils on adaptation has been published.

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[32] www.seed.manchester.ac.uk/research/research-with-impact/wildfire/
[33] www.forestry.gov.uk/fr/INFD-5ZYJW8
[34] www.gov.uk/government/publications/keeping-the-country-running-natural-hazards-and-infrastructure
[35] www.gov.uk/government/publications/national-risk-register-for-civil-emergencies-2015-edition
[36] http://climateuk.net/resource/building-resilient-environment-%E2%80%93-sector-tools-and-resources
[37] https://connect.innovateuk.org/documents/3239554/6021573/Climate%20Change%20Adaptation%20Business%20Case%20Guidance
[38] www.forestry.gov.uk/pdf/InternetCCAP.pdf/$FILE/InternetCCAP.pdf
[39] www.forestry.gov.uk/fr/INFD-837EZY
[40] www.farmingfutures.org.uk/your-sector/choose-your-sector
[41] http://publications.naturalengland.org.uk/publication/5656542258921472
[42] www.theccc.org.uk/publication/managing-the-land-in-a-changing-climate/
[43] www.gov.uk/government/news/making-space-for-nature-a-review-of-englands-wildlife-sites-published-today
[44] www.licco.eu/resource-library
[45] www.local.gov.uk/documents/10180/49936/EA+-+Business+Case+for+Adaption+-+May+15+-+v12+Low+res+FINAL.pdf/d266040c-51cf-41d2-baac-0d5555b1e706