

Section 4

Climate change

The evidence for climate change

1. This plan for the Chilterns is based on the conclusion of the scientific community, as stated by the Intergovernmental Panel on Climate Change (IPCC)¹, that the climate is changing and is largely caused by mankind.
2. In April 2002 a report, called UKCIP02, based on research by the IPCC, was released showing climate scenarios for the UK. These four scenarios ('Low Emissions', 'Medium-Low Emissions', 'Medium-High Emissions' and 'High Emissions') present different possibilities of how our climate might change.
3. They took into account possible changes in technology and lifestyles over the next 100 years. The scenarios do not claim to

be definitive - the climate may not change in exactly the same way as is predicted. The four UKCIP02 climate change scenarios forecast changes in temperature and precipitation as follows:

Temperature

- Annual average temperatures to rise by between 2°C and 3.5°C by the 2080s. The south and east of the UK will most likely see the largest rise.
- Most of the warming will be in summer and autumn.
- Summer rises in southern England are expected to be the highest.
- Temperatures in the south east may rise by as much as 5°C on average, by the 2080s, according to the 'high emissions' scenario and over 4°C with the 'medium-high emissions' scenario.



Extreme weather events will become more frequent

¹ IPCC Fourth Assessment Report: Climate Change 2007

Precipitation

- Precipitation in winter will increase.
- The increase is predicted to range from between 10% and 20%, depending on the area of the country, for the 'low emissions' scenario. For the 'high emissions' scenario the range increases to between 15% and 35%.
- Precipitation in the summer will decrease.
- The 'low emissions' scenario predicts the country will become up to 35% drier. The 'high emissions' scenario forecasts 50% less rainfall by the 2080s.
- The largest changes are predicted for southern England.
- Less snow will fall throughout the UK - a decline of up to 90%.

These are all long term scenarios with the likelihood of considerable variability over the short term to medium term.

Impacts in the Chilterns

4. The Chilterns Conservation Board has undertaken an initial assessment of some of the most likely impacts on the Chilterns. Inevitably any such assessment can only be based on the best available information and an interpretation at a local level (see Table 1 at end of Section). Any predictions are in the context of the increasing variability and unpredictability of the weather as experienced in the last few years.
5. Some of the most likely impacts on the natural beauty of the Chilterns include:
 - Gradual shrinkage of the range of beech woodland, but it is unlikely to disappear altogether.
 - Higher winter rainfall will recharge the aquifer to maintain higher flows during the year.

- More flash flooding with run off from fields.
- More rapid growth of scrub on downland due to the longer growing season.
- Gradual appearance of new crops which are better suited to the changing climate.
- Disappearance of wildlife which needs damper cooler conditions in the summer.
- Appearance of species adapted to new climatic conditions.
- Changes in the design of houses to cope with higher summer temperatures.

Taking action - mitigation and adaptation

6. The UK Government's Climate Change Bill will make carbon dioxide reduction (against a 1990 baseline) targets binding:
 - 26 to 32% reduction by 2020
 - 60% reduction by 2050
7. This Management Plan for the Chilterns AONB is an important local strategy in helping to raise awareness of the issues and the potential impacts of climate change and in helping to stimulate mitigation and adaptation measures. A clear message is that taking no action is not an option.
8. A double-headed strategy is needed to both adapt to the changes which are already happening and to mitigate the causes of climate change which are largely related to the emission of harmful greenhouse gases. The increase in gases such as carbon dioxide is already so great that the climate will continue to change for decades irrespective of how much

emissions can be reduced in the short term.

9. Some activities have longer timescales than others. Whereas farmers can make changes over a comparatively short timescale, often annual, foresters need to think 80 -100 years ahead. Will the species they select now be suitable for the conditions in 2100? It is certainly the case that most tree species found in the Chilterns now, such as beech, oak and ash, can be found growing well in continental Europe which currently has a similar climate to that the UK will experience in the future.
10. It is not known whether the combination of soils, climate and genetic origin of the current stock is also capable of tolerating significantly changed climate. If good quality timber is to be grown in the Chilterns to be harvested in 100 years time it may be necessary to carefully select different strains of familiar species, or even to begin planting currently less familiar species which are known to be tolerant of the climate which will prevail in 100 years time.
11. The Chilterns Conservation Board urges everyone to play their part in mitigating the causes of climate change. The



Sustainable travel

reduction of greenhouse carbon dioxide is largely achieved by using less energy generated by fossil fuels. This can be achieved, for example, by reducing miles travelled by car, insulating buildings, using renewable forms of energy appropriate to the Chilterns such as wood fuel, ground source heat pumps and solar and using material with lower levels of embedded energy.

Leading by example

12. In 2007 the Conservation Board set itself a target to become carbon neutral by 2011. Within one year it:
 - Reduced CO2 emissions due to gas and electricity use by 24.7%. This was achieved by improving loft insulation, replacing faulty radiator thermostats, repairing drafty windows and removing unnecessary lighting.
 - Installed solar panels which generate 15% of its electricity.
 - Reduced the distance travelled by car by each staff member by 14%.
 - Reduced the distance travelled by car by each Board member by 20%.
13. The Board technically achieved carbon neutrality in 2008 by offsetting some of its emissions. This took the form of giving away low energy light bulbs to parish councils and churches, and planting trees. Although some offsetting schemes are controversial the Board was faced with a position of not being able to reduce its direct energy use significantly any further. The outstanding carbon balance was reduced by helping others to reduce their energy use and therefore emissions of greenhouse gases.

Next steps

14. The Conservation Board will work with its many partners to investigate in detail the changes happening to the environment of the Chilterns which can be attributed, even partly, to changing climate. These changes and the consequences for the natural beauty of the Chilterns will be assessed and if necessary action will be taken and guidance issued. Identification of these changes and the longer term trends will take time. Longer term climatic impacts on wildlife, for example, can be masked by variation in short term weather patterns.

15. The Board will publish information as it becomes available on how the climate is changing locally and its impacts and will publish guidance on appropriate measures to adapt to those changes and to mitigate the causes.



Chilterns wood - a renewable energy source

Table 1

Initial assessment of potential impacts of climate change on key characteristics of the Chilterns

This assessment is based on the predicted medium to long term changes in climate - hotter drier summers and warmer wetter winters. In practice the climate is likely to show considerable variation within each year and between years.

Special Features and Qualities of Chilterns AONB	Relevant Aspects of Climate Change	Nature of Impact	Impact		Response		CCB role
			Short Term	Long Term	Mitigation	Adaptation	
Chalk Grassland	Hotter and drier summers	Changed growing seasons	low	medium		Provision of water supply to enable grazing.	Monitoring Support for grazing related infrastructure Support for site planning and management Promotion of appropriate reversion techniques Review areas suitable for habitat recreation and reversion
	Earlier spring	Disrupted ecological relationships				Link sites to facilitate species migration	
	Wetter and warmer winters	Changed species composition				New varieties of grazing stock	
		New species of invertebrates				New habitat management regimes for 'new species'	
		Grass fires				Improve site linkages to enable species migration	
		Year round breeding of rabbits - increased grazing pressure Changes in micro climates					

Special Features and Qualities of Chilterns AONB	Relevant Aspects of Climate Change	Nature of Impact	Timescale		Response		CCB role
			Short Term	Long Term	Mitigation	Adaptation	
Woodland	<p>Earlier spring</p> <p>Hotter and drier summers</p> <p>Fewer frosts (timing)</p> <p>More frequent gales</p> <p>Wetter winters</p> <p>Increased CO₂ in atmosphere</p>	<p>Drought stress/soil moisture deficits</p> <p>Periodic water logging</p> <p>Windblow</p> <p>Reduced growth rates/crown and root die back</p> <p>More disease/pests</p> <p>Change in species composition - reduced suitability for beech in particular</p> <p>Changing associated flora and fauna - both losses and gains</p> <p>Increased risk of scrub fires</p> <p>CO₂ concentration will affect growth rates of some species</p> <p>Warmer and wetter summers may lead to higher growth rates for some species</p>	low	high	Woodland creation	<p>More careful species selection</p> <p>Promote demand for wood fuel</p> <p>Link woods to facilitate species migration</p>	<p>Information (e.g. potential impacts according to soil types)</p> <p>Monitoring</p> <p>Promote and assist with preparation of long term management plans</p> <p>Promote adherence to the Forestry Commission's guidance on managing ancient and native woodland</p>

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Water Resources/ Chalk Streams	Variable rainfall patterns but probably wetter winters and drier summers Hotter Summers	Erratic Flows More frequent and unpredictable periods of drought and flood Longer growing seasons may reduce percolation to the aquifer Variable impact on selected species - ecological balance will be affected Reduced water quality (e.g. due to heating, lower oxygen levels, pollution run off) Changed species balance and growth rates Changed channel profiles	high	high		Reduce demand for water Reduce Abstraction Protect stream bed and banks Channel and floodplain restoration Flood management Promote water storage Promote use of grey water systems	Information Lobby for reduced abstraction and demand reduction Help protect channel in times of prolonged drought Promote flood prevention plans Promotion of design of development to reduce run off, including Sustainable Urban Drainage Systems

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			Short Term	Long Term	Mitigation	Adaptation	
Economy	Seasonal variability Hotter summers Milder winters	Opportunity to introduce new crops and livestock breeds Expanded demand for wood and other biofuels More visitors in winter Promotion of local food Promotion of local building materials Trend for more UK based holidays Possibility of disruption to economic activity and loss of assets			Promote local produce Develop tourism profile as an alternative to long distance destinations Develop wood fuel market Develop markets for new crops/ breeds	Give greater weight to uncertainty of weather in business activity	Promotion of the issues

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Farmland	Hotter Summers	Longer growing seasons	medium	medium	Reduce use of fertilisers	New crops	Monitor changes Support promotion of local markets and procurement policies Provide guidance on growing biofuels
	Milder, wetter Winters	Variable and unpredictable yields			More targeted use of fertilisers	Avoid crops requiring irrigation	
	Fewer frosts	Opportunities to grow new crops including biofuels			Conserve soil organic matter	Water storage	
	Drought	New pest species and greater abundance of pests			Reduce food miles - seek local markets	Reduce vulnerability to erosion and leaching	
	Winter run off	Summer drought stress for crops			Grow biofuels and biomass	New production methods	
	Variable weather with more extreme weather events	Soil erosion (winter run off) and water logging at any time of year				Different breeds of livestock	
		Leaching of nutrients from soils				Target agri-env support to increase ecological connectivity	
		Summer drought stress for livestock					
		Possibility of more insects, which may support more farmland birds					
		Demand for water to irrigate crops					
	Hedgerows and field trees subject to drought stress						

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Wet Grassland	Hotter and drier summers	Soil moisture deficits Changed species composition Changed hydrology	medium	high		Safeguard sites in times of drought	Monitoring Advice Site identification
Acid Grassland/Heath	Hotter and drier summers	Associated species may benefit e.g. reptiles Heath fires	low	medium		Encourage spread of heath	Monitoring Advice Site identification

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Built Environment	Hotter summers	Buildings will be hotter in summer	low	medium	Enhanced energy efficiency	Change design of houses/all buildings	Guidance Lobbying for higher building standards - aiming for carbon neutrality for new buildings Promotion of energy efficiency Promotion of local building materials Promotion of water conservation and "blue infrastructure" and grey water systems Promotion of Sustainable Urban Drainage systems
	Heavy rain	Winter damp may be more of a problem			Reduced energy demand	Retro fitting of energy efficiency measures	
	Milder winters	Vulnerability to flooding			Installation of renewable energy capacity	Bigger rainwater goods	
	Increased number of extreme weather events	Response to climate change will result in further environmental impact, e.g. design of housing and installation of renewable energy technology Installation of solar panels and wind turbines Increase in timber boring insects. Increase in subsidence especially on clay soils Drainage capacity/flooding Demand for air conditioning Flooding of roads More pollution events from run off Road verge fires Storm drains overwhelmed resulting in pollution incidents			Use of building materials with low embodied energy	Rainwater storage	
					Use of permeable surfacing to reduce run off	Re-design gardens to use less water	
						Porous surfaces	
						Use of vegetation to provide shade/cooling	
						Cutting of road verge vegetation to reduce fire risk	
						Storm drains with bigger capacity	
						More regular maintenance of drains to remove blockages	
			Promote garden designs which are more tolerant of climate change e.g. require less or no irrigation				

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Historic Environment	Hotter Summers	Erosion of soil covering	low	low		May need to import soils and divert recreation uses	
	Heavy rain	Windblown trees damaging sites					
	Extreme weather events	Growing more cereals and biofuels may result in more ploughing damage					
		Appearance of historic parks may change if significant trees die					
		May not be possible to maintain water features in historic parks and gardens					
	All year breeding by rabbits resulting in more burrowing						

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Enjoyment and Understanding	Hotter Summers	Hot summer weather may deter visits	high	high	Promote visits without use of car - close to home	Give greater weight to weather dependency at planning stage of events, e.g. avoid hottest months, provide under cover areas	
	Milder winters	Mild winter weather may lead to increased number of visits					
	Unpredictable weather	Some sites and routes will be damaged -water logging in winter and erosion in summer					
		May be more holidays taken in UK					
		Unpredictability of weather may deter holding of outside public events			Promote public understanding of how their actions can lead to the way they use and enjoy the natural environment	Hold events in, and visits to, shady woodland.	
						Cover may be needed because of heavy rain events	
						Water logged ground may affect site suitability for public events	