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Summary of the first ever Thames Basin Vulnerability Report

July 2008



**HSBC
Climate
Partnership**



FreshWaterThinking

Big picture, local scale



More than 14 million people live in the Thames Basin. And the population is growing.

We all know the big picture effects of climate change – melting ice sheets, rising temperatures across the world, unpredictable and extreme weather. But what does this actually mean for our water supply and our rivers and streams? And what, in particular, will be the day-to-day impact for those of us living in the Thames Basin?

Well, for a start, we will pay higher domestic insurance premiums due to the increased threat of flooding. And as well as paying because there is too much water, we will also pay because there is too little. Water bills will rise as water becomes scarcer and harder to supply. Hosepipe bans may become more frequent.

We will have moved away from the lush lawns and flower beds of the typical English garden and we will become as familiar with drought warnings as we will be with flood warnings. We will have become accustomed to a dry pond in our local park and fishing in the local streams will be a shadow of its former self. As the flow in the Thames and its tributaries drop dramatically in hot summers, we will also be aware of the decline in the range of plants and animals we used to see on a Sunday stroll by the river. We will also have noticed that the river is lower and more polluted and that the rolling green countryside of the Thames Valley will now look rather arid and dusty rather than green and pleasant.

Setting the scene



Just over 25% of the Thames Basin is designated as an Area of Outstanding Natural Beauty. It includes nearly 40% of England's ancient woodlands.

The past two years have seen record floods and droughts in the Thames Basin. 2006 saw 18 million people in South East England faced with water use restrictions due to lack of available water. Restrictions also acutely affected agriculture and industry. In contrast, 2007 saw widespread damage to property and loss of life as the Thames broke its banks and floodwater devastated homes and businesses.

Were these isolated extreme events, or are they foretastes of our new and changing climate? What will climate change and changes in our society actually mean for water in the Thames Basin?

There has been much speculation. There have been a number of wild claims. But there has also been a lot of detailed, if low-key, scientific work carried out, investigating specific changes to the local environment from changes in climate. This report aims to bridge the gap between hype and calculated probability. It takes the current scientific assessment of the future of the Thames, and then translates it into an accessible review of the probable impacts on public water supply, ecosystem health, river flows, groundwater levels and flooding.

The overall outcome highlights the risks we face and also highlights how little we know about some of the key threats from extreme events.

The Thames Basin Vulnerability Report is the first in England and Wales to assess the vulnerability of a river to climate change. The report was commissioned by WWF-UK as part of the HSBC Climate Partnership and is being conducted alongside WWF vulnerability assessments for other of the world's great waterways: the Ganges, Yangtze and Pantanal. This leaflet contains a summary of the full and extensive technical report (available on wwf.org.uk/freshwater).

Water supply and drought



The Thames Basin is one of the driest areas in the UK. It receives an average of 690mm of rainfall a year, compared to the national average of 897mm.



Future population growth in the Thames Basin combined with climate change will place further pressure on already stressed water resources.

A combination of population growth, demographics, changes in rainfall and on-going pollution will make public water supply more vulnerable to drought.

It is estimated that the population in the Thames Basin will grow by around 2 million people by 2026. Individual water use continues to rise. In addition we will be living in households with fewer people in, leading to higher demand for water.

Climate change will bring drier summers. This will lead to lower surface water availability at the very time of higher demand, when we need to shower more and water our gardens. Although winters are predicted to be wetter on average, this is not anticipated to offset the impacts of drier summers. Drought years with low winter rainfall will still be possible, and the frequency of these is difficult to predict.

As the climate becomes stormier there will be more pollution run-off from agriculture. This, in turn, will result in more sources of water being polluted, costing more to clean, and occasionally making them unusable.

The risk of constraints to public water supply in the Thames Basin will be greatest if we experience a sequence of dry winters combined with hotter summers. The first will lead to reduced groundwater recharge, whilst the second will up demand, increase pollutant concentrations and reduce surface water flows. Such a situation is now becoming commonplace in the Mediterranean.

Vulnerability 2

Flooding

Any new housing built on the floodplains will put residents directly at risk.



The Thames Basin extends to an area of 13,000km², with 5,330km of river lengths and 896km² of floodplain.



Once upon a time flooding in the UK was a freak of nature. It now affects the lives of millions on almost an annual basis. Projections show that the number of people and properties vulnerable to flooding will continue to rise dramatically as a result of climate change.

The chance of rivers flooding in the Thames Basin may be five times higher by the 2080s. Peak rivers flows are predicted to increase by 20% leading to a significant increase in annual average flood damage.

The greater intensity of rainfall will increase the risk of sewer flooding in our towns and cities. This is a particular problem for the Thames Basin due to its high population density and antiquated drainage infrastructure. More than 50% of drainage and sewage overflow problems in England take place in London.

Do you remember 7 August 2002, when an inch of rain fell in central London in 30 minutes during the evening rush hour? This resulted in sewer flooding and the closure of five mainline railway stations. There was considerable disruption. Water companies are investing a lot to tackle sewer flooding but climate change will place even more pressure on the sewerage network.

The risk of tidal flooding will be increased by rising sea-levels, which are likely to require evermore expensive interventions to prevent a major flooding incident in London and the Thames Estuary.

Case study

The River Kennet: a national treasure under threat



The Kennet rises near Avebury, Wiltshire and flows eastwards for around 40km before joining the Thames at Reading. The upper Kennet is designated as a Site of Special Scientific Interest (SSSI) because of the outstanding richness of its chalk river animal and plant communities, and a tributary of the Kennet, the River Lambourn, is a Special Area of Conservation designated under the Habitats Directive. It is a beautiful and historic part of Britain's landscape.

As a major example of one of the internationally significant chalk-fed rivers of Southern England, the Kennet is one of England's most important natural habitats. However, a combination of pollution from agriculture and urban areas, sediment run-off from farmland and abstraction for public water supply has already resulted in significant declines in the health of the Kennet.

The projected total increase of water demand along the Kennet is approximately 18 million litres per day. This is an average figure for the year but much of the increased demand could come in peaks at the driest times of the year, when the river is already low.

Climate change will affect the river flows. Natural stream flows (not considering net abstraction or removal of water) in the Kennet and elsewhere in the Thames can be seen on the facing page: winter flows are slightly higher and summer flows much lower.

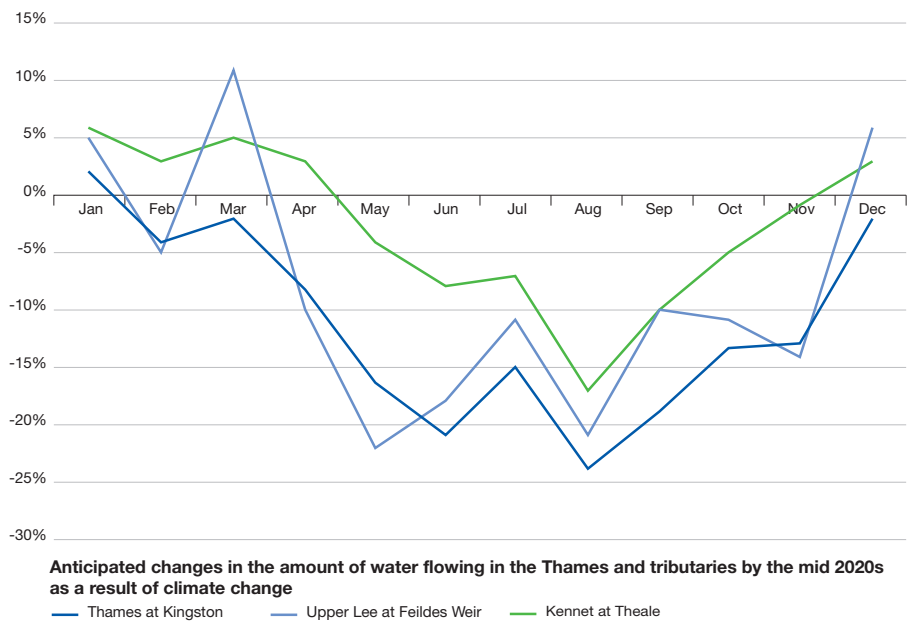
Analysis conducted for this report shows that river flows currently drop below the level required to support good health for plants and animals for three months of the year. As a result of climate change, by 2020 the river flow will drop below these levels for half the year unless we take significant action.

At the same time more intense summer rainfall will mean more sediment and pollution being washed into the river and, as the river flow is lower, there will be less dilution.



In addition, increased water temperature may lead to reduced dissolved oxygen levels in the river. Degradation of the river habitat, in particular the Ranunculus plants that provide the structure on which much of the river ecosystem depends, is likely to make the river more vulnerable to winter floods.

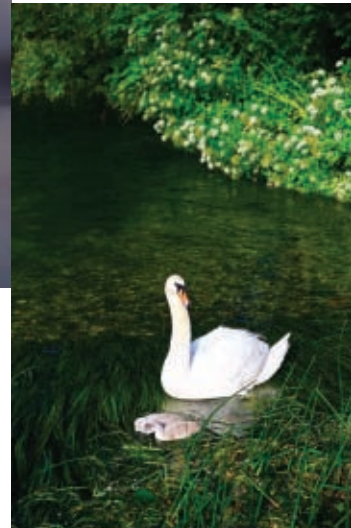
Taken separately the impacts are harmful. Taken together they could ultimately devastate the ecosystems of an internationally important river.



Ecosystems

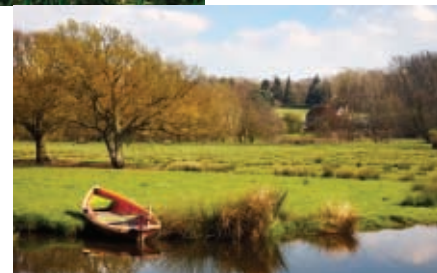


The River Thames is now home to some 120 fish species, including two rarities: the Twaite Shad (a migrating Herring) and the Sea Lamprey.



The Thames Basin has over 500 Sites of Special Scientific Interest, covering more than 45,000 hectares.

The combination of lower summer flows, higher temperatures and declining water quality will undoubtedly leave ecosystems more vulnerable to collapse. This, in turn, will lead to significant declines in populations of fish, insects, water-based mammals and birds.



Many of the freshwater ecosystems of the Thames have been very heavily affected by centuries of human modification. Despite this, important ecosystems remain in the Basin, including major fisheries. And, as many of us know, millions enjoy the various rivers of the Thames. The chalk tributaries, such as the Kennet, Colne and Lee, are of international significance due to the richness, uniqueness and beauty of their biodiversity.

Already, abstractions during the summer exceed available water resources for six weeks. Under projected climate change and increases in water demand, this period will extend to ten weeks by the 2020s. It goes without saying that this will place additional pressure on ecosystems.

Tributaries, such as the Kennet and the Lee, are more vulnerable to low rainfall and low summer flows than the principal River Thames itself. While much of the main channel of the Thames has been degraded, these tributaries are less damaged and among the most ecologically important ecosystems in the Basin.

Recent improvements in water quality in the Thames Basin are likely to be challenged by reduced flow volumes, higher water temperatures and extreme falls of rain.

Greater intensity of heavy rainfall in summer could increase the amount of pollutants including sewage washed into rivers. This would further compound the problems of low flows and high water temperatures. A foretaste of what we might expect to see occurred in the River Lee after a torrential rainfall in July 2007. Within the space of three hours the flow of storm water passing Lea Bridge experienced a massive reduction in oxygen levels, threatening the lives of all living creatures in the river at that point.

Threats combined

Domestic demand for water increases in hot weather, exactly when the pressures on ecosystems are at their highest.



In the past 30 years, the temperature of the Thames estuary has increased 2.7°C



This report has highlighted a number of the key individual vulnerabilities and threats to the River Thames.

However, the likelihood is that the most significant impact on our lives and on the health of the river will not come from individual threats but from a number working in combination, often in ways that we cannot easily predict.

For example, a slight increase in groundwater exploitation may not be that important when considered in isolation. However, combined with increased groundwater pollution, it becomes a significant threat to the public water supply. This may suddenly become most apparent in hot, dry summers when rivers are at their lowest and our needs for water greatest.

It is a combination of impacts that is also likely to lead to the most significant damage to rivers – low flows, high temperatures and increased pollution levels.

The response



Plans exist in theory to address many of these issues, but there are real questions as to whether they will be implemented in practice.

Reducing the amount of water each person uses, reducing leakage and pollution will become increasingly important as climate change intensifies.

There are – at least in principle – plans and strategies in place to tackle many of these issues individually. For example, the Government, its agencies and water companies have plans to mitigate against shortfalls in water supply that look at the issue from both the supply and the demand angle. Likewise, there are flooding and environmental strategies underpinned by European law.

However, it remains an open question as to whether these plans and strategies will be realised. Water also needs to play a much more central role in discussions on planning, economics, and climate change.

Climate change will exacerbate the problems that currently exist, placing enormous pressure on the water environment. We need to develop policies that can address droughts, floods, pollution and climate change simultaneously, rather than treating each in isolation. This approach may require some radically different solutions to those currently being proposed.

Fresh Water Thinking



In 1830 the average person in the UK used 18 litres of water a day. In 2008 the average person uses at least 160 litres.

As the Vulnerability Report reveals, the Thames Basin is a threatened and stressed resource. At WWF our response is: **act now**. It's worth the effort and the imagination.



Through our UK freshwater programme, WWF will work on solutions to help our precious freshwater systems adapt to the impacts of climate change.

Our starting point is the River Thames. Using the Thames Basin Vulnerability Report, we will start a debate on how the Thames Basin can be better managed to meet the predicted challenge.

We will be working with government, stakeholders and communities to raise awareness, engage and influence. We will focus on improving national policies that govern the use of water and rivers. We will push for better river basin planning, and work to enhance the resilience of rivers so that they can better resist the impacts of climate change and increased water demand.

With a global network covering more than 90 countries and nearly 50 years of conservation work behind us, WWF is one of the most experienced environmental organisations in the world, leading in areas such as climate change, species, forests and freshwater.

WWF is grateful for HSBC's support of this report and initiative through the global HSBC Climate Partnership. The HSBC Climate Partnership is a 5 year global partnership between HSBC, The Climate Group, Earthwatch Institute, The Smithsonian Tropical Research Institute and WWF to reduce the impacts of climate change for people, forests, water and cities.

This report is a preliminary assessment of the vulnerability of the Thames Basin to climate change. The study was carried out by the UCL Environment Institute, in partnership with WWF-UK. The main contributors to the report are Dr Sarah Bell, Dr Julien Harou, Dr Patrick Austin and Dr Philip Hopley from UCL, Dr Tom Le Quesne from WWF-UK, and Mr Jacob Tompkins from Waterwise. The study was reviewed by Dr Rob Wilby, independent climate science advisor, and Professor Paul Whitehead of the University of Reading. The authors gratefully acknowledge the reviewers' comments and suggestions and accept any responsibility for errors or omissions.

This vulnerability assessment is based on an extensive technical report, which is available along with an accompanying summary at: wwf.org.uk/freshwater

Climate change is likely to result in hotter, drier summers and warmer, wetter winters – both could threaten people and nature.

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(Image numbers left to right on each page)

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