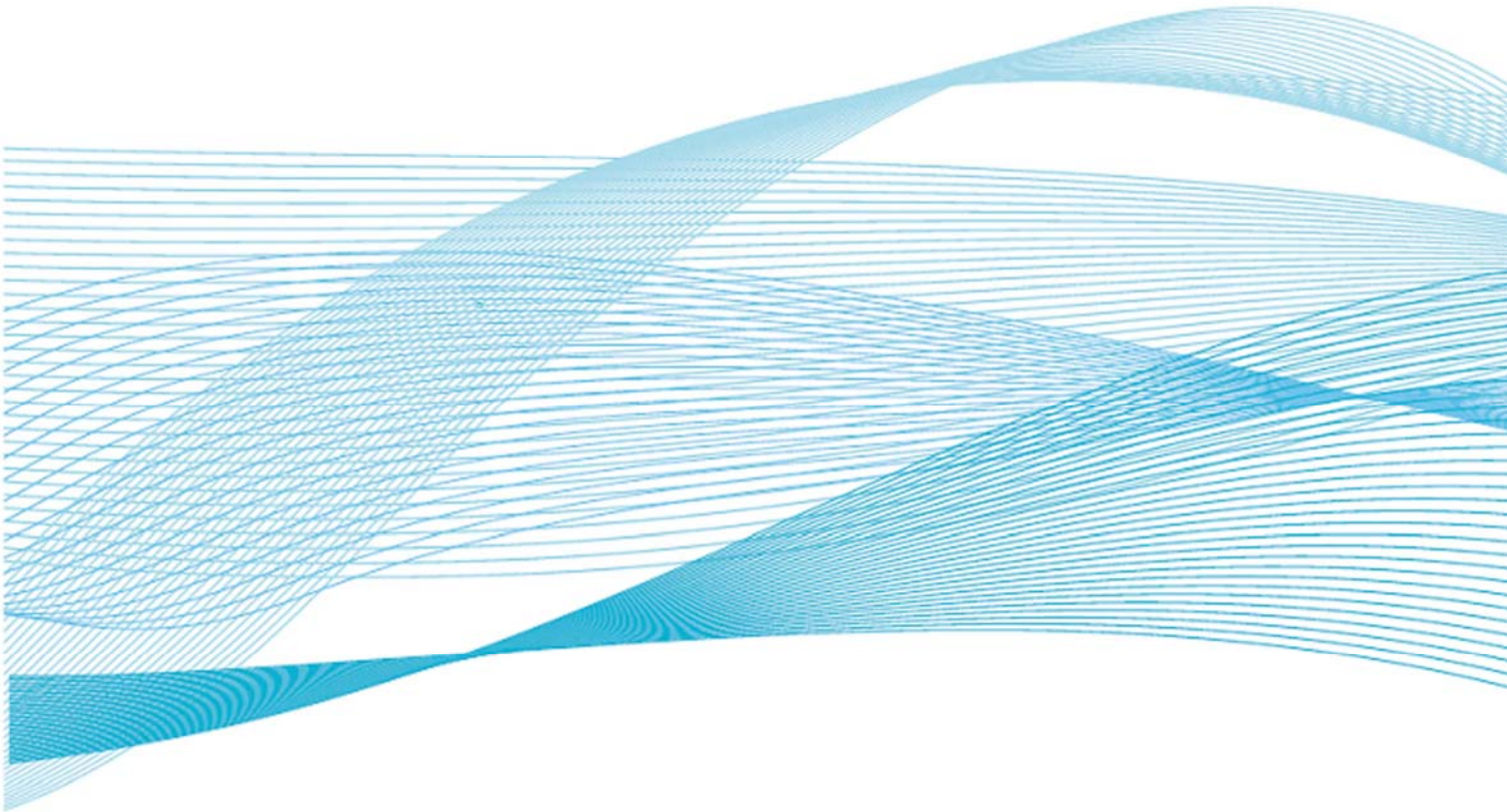
Environment Agency

Water for people and the environment

Water Resources Strategy
Regional Action Plan for Midlands Region

Appendix 1: Current state and future pressures on water resources



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1 Introduction

Water is essential for the environment, wildlife and for human health. This resource is necessary for our economy as a requirement for industry, agriculture and power generation. We need it to support our growing population and to maintain and improve our environment.

There are significant pressures on water resources that impact both the water environment and our water supplies. In some areas there is little or no water available for abstraction during dry periods. These pressures will only increase due to the rising demand associated with population growth, development and climate change.

This report summarises the current state and future pressures on water resources in Midlands Region. This includes work completed for our Catchment Abstraction Management Strategies (CAMS), River Basin Management Plans (RBMP), Restoring Sustainable Abstraction (RSA) programme, Water Resources Management Plans (WRMP) produced by water companies, plus work to assess the possible impacts of climate change.

This report presents information on the state of water resources and puts the current and future pressures into context. It does not explore the actions that we believe need to be taken to sustainably manage water resources to ensure that there is enough water for people and the environment. These actions are covered in the Water Resources Regional Action Plan for Midlands Region.

In April 2010, we intend to change the existing river catchment based operating boundaries of Environment Agency Wales, North West Region and Midlands Region. The new boundaries will align with the political administrative boundary between England and Wales. The analysis and maps presented in this Appendix include parts of the upper Severn catchment in Wales. This is because water resources will still need to be managed on a whole river catchment basis.

2 Available water

2.1 Freshwater Resources

Midlands Region includes many major cities (Figure 1) and has a rich diversity of urban and rural landscapes ranging from the mountains and uplands of the Peak District to the agricultural plains of Shropshire and the Vale of Evesham.

Midlands Region includes part of the Severn and Humber river basins and their sub-catchments. We manage the rivers in the region, which include the first and third longest rivers in the UK, and we work across national boundaries to regulate the River Severn. The Midlands also have a unique combination of surface water and groundwater held predominantly in sandstone aquifers.

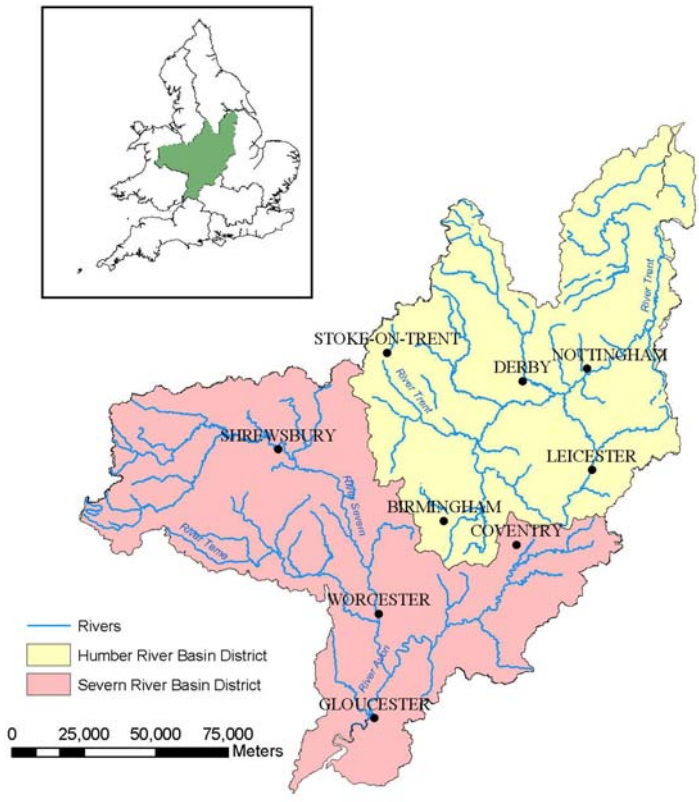


Figure 1: Midlands Region

The amount of water available varies greatly between seasons, years and across the region due to rainfall and abstraction. We monitor our water resources using our hydrometric network. This network consists of a number of sites that measure rainfall, river levels and flows, and groundwater levels.

We use two types of gauges, which are distributed relatively evenly across the region, to measure rainfall (Figure 2). Both the rainfall storage and intensity gauges measure the total volume of rain, but rainfall intensity gauges also measure how quickly the rain is falling which is particularly useful for flood forecasting.

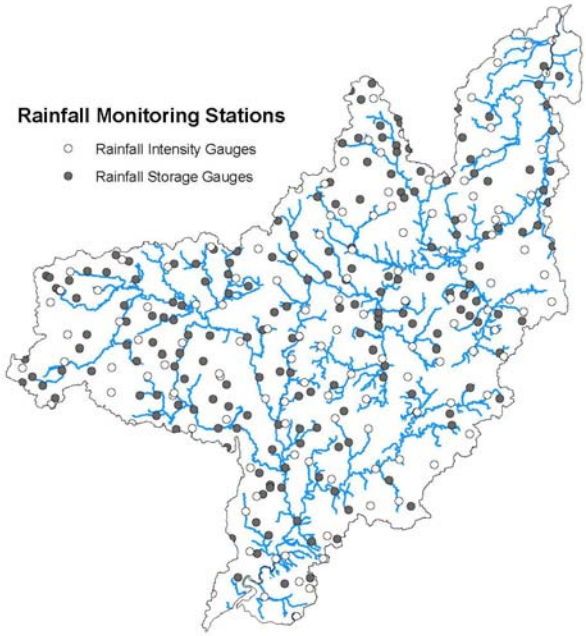


Figure 2: Rainfall monitoring stations in Midlands Region

Our river level measurements are also useful for flood forecasting. The river level and flow measurement stations measure the river level which allows us to forecast when a river might breach its banks. We also monitor the discharge of the river at our flow measurement stations. The locations of these stations are shown in Figure 3.

Not only do we monitor the level of our rivers, but we also monitor the level of our groundwater resources using observation boreholes. These boreholes are clustered around areas where there are aquifers (Figure 4).

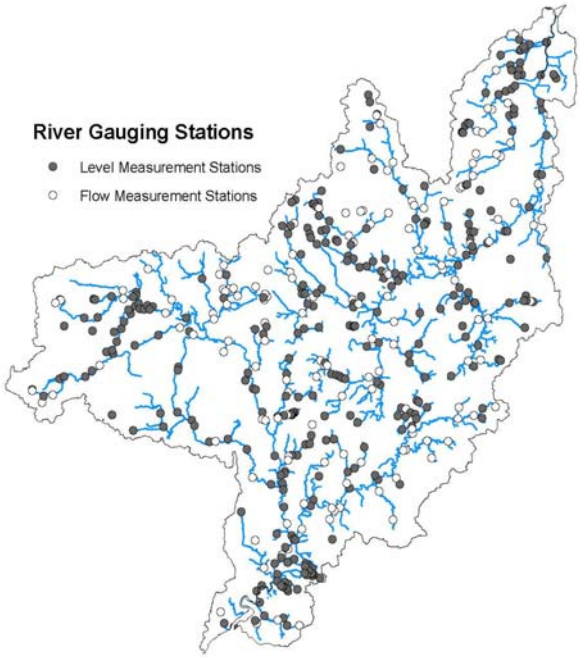


Figure 3: River gauging stations in Midlands Region

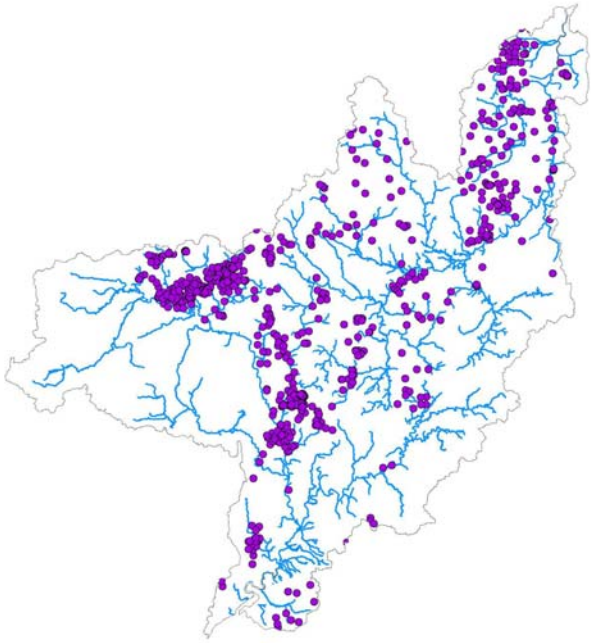


Figure 4: Groundwater observation boreholes in Midlands Region

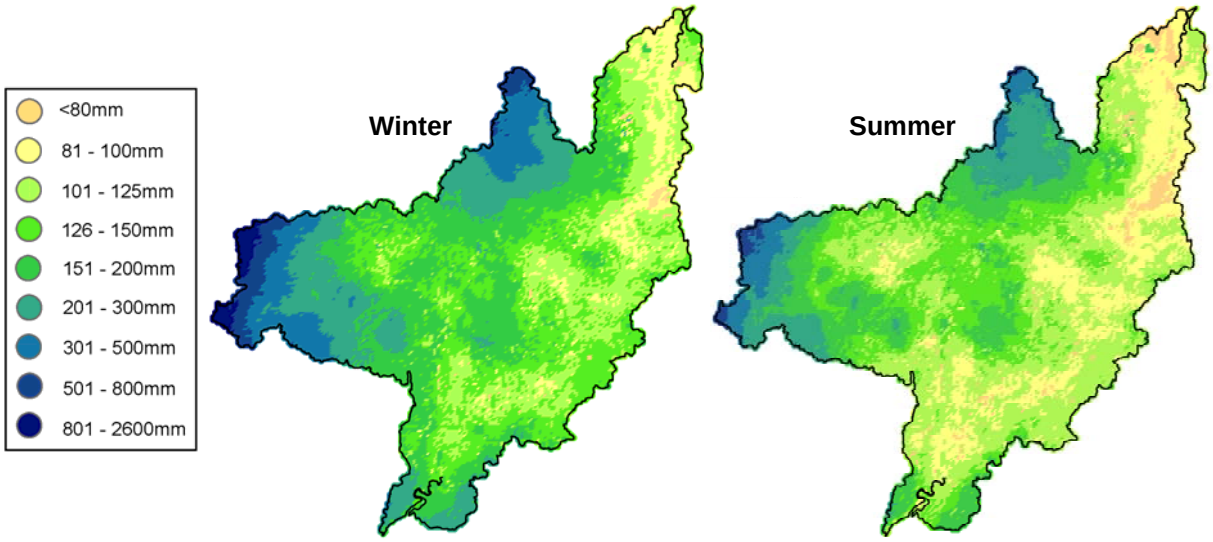


Figure 5: Seasonal effective rainfall in Midlands Region.

While the Midlands are often considered to be wet, parts of the region are among the driest in the country. The annual average rainfall is 754 mm, but a portion of that is lost through evaporation. The rainfall that is available to percolate into the soil or runoff into rivers and streams is called effective rainfall. In the Midlands, effective rainfall ranges from less than 50 mm to more than 700 mm (Figure 5). The driest parts of the region are in the east and northeast while the wettest are in the Welsh Uplands in the far west and the Peak District in the north. During the summer, effective rainfall decreases across the region.

There is usually sufficient water to meet the needs of people and wildlife in the Midlands apart from during prolonged periods of dry weather. It is essential to manage water resources during these periods. We use our drought plans and Water Company Drought Plans to ensure there is enough water for people and the environment during a drought and that appropriate action is taken when water resources become limited.

3 Using water in the Midlands

3.1 Using freshwater resources

We use about 10 per cent of our freshwater resources for abstraction in England and Wales (excluding abstraction of cooling water to support power production, which is often returned to the environment). This measure is known as the Water Exploitation Index[1] and water resources are considered to be 'under stress' if this index is greater than 20 per cent. The Midlands are not yet 'under stress', unlike the south east and eastern England (Figure 6).

In 2007 we classified the water company areas in England according to their relative levels of water stress[2]. The areas with high scores for both water demand and resource availability are classified as 'serious'. Areas where either the demand for water or resource

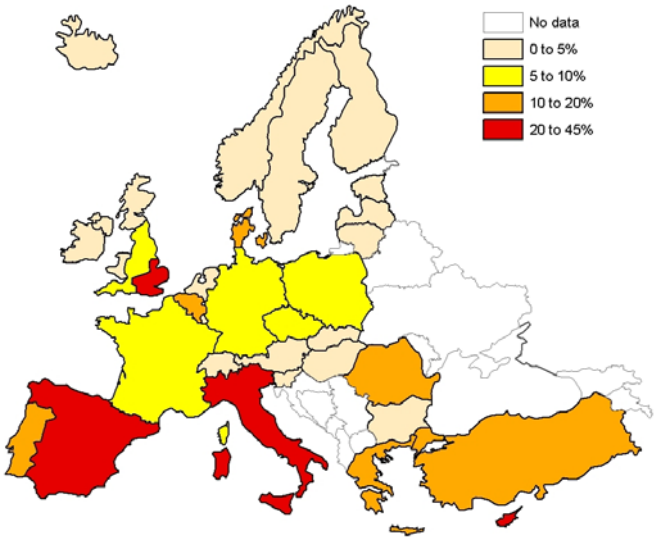


Figure 6: Water exploitation index (actual abstraction as a proportion of effective rainfall)

availability have high scores are in the ‘moderate’ class. Finally, those areas that do not have high scores for either water demand or resource availability are classified as ‘low’. Severn Trent Water and South Staffordshire Water are both considered to be moderately stressed.

3.2 Available water resources

We determine how much water is available for the environment and for abstraction using our Catchment Abstraction Management Strategies (CAMS). CAMS consider the amount of freshwater available, the amount the environment needs, and the amount of water already licensed for abstraction. Through these strategies we classify catchments as having water available, no water available, over-licensed, or over-abstracted at low flows.

Our CAMS show that water availability varies across the region (Figure 7). Most of the region has issues with water availability with either no water available or over licensed resources and some catchments are already over abstracted at low flows.

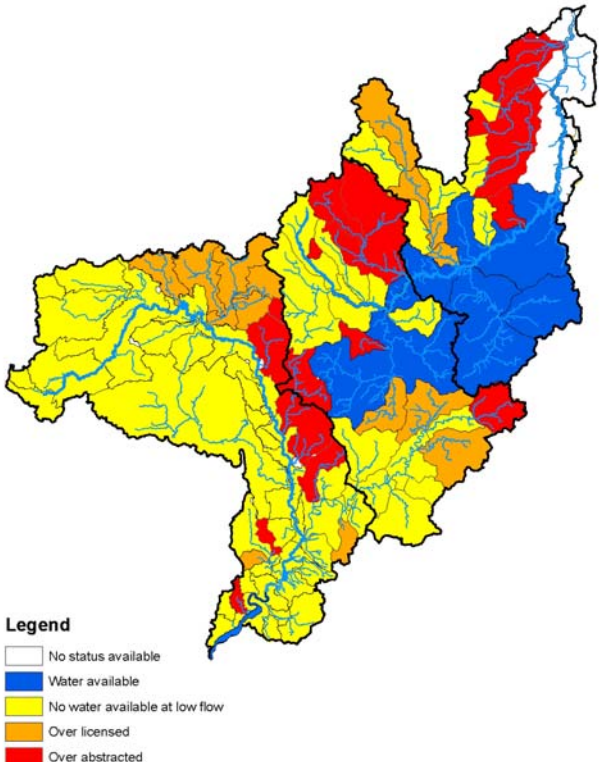


Figure 7: Water available for abstraction at low flows (surface water and groundwater combined)

Compared to the national average, Midlands Region has fewer catchments with water available and more catchments classified as over-abstracted and no water available (Figure 8). This highlights that the region’s water resources are already under pressure

When too much water is abstracted from a specific location there is the potential for environmental damage. Our Restoring Sustainable Abstraction (RSA) programme aims to return abstraction to sustainable levels where sites are at risk from abstraction.

We use this programme to investigate and resolve concerns at specific sites across the region including sites designated under the Habitats Directive, Public Service Agreement 3 (Sites of Special Scientific Interest), Biodiversity Action Plans and undesignated sites of local importance. When a site is being negatively impacted by abstraction we work with abstractors and other organisations to find a solution (i.e., a change to or revocation of a licence). We have targeted most of our RSA schemes in areas that are over abstracted as these are the areas with the most significant water resource issues (see Section 5.3 for more details).

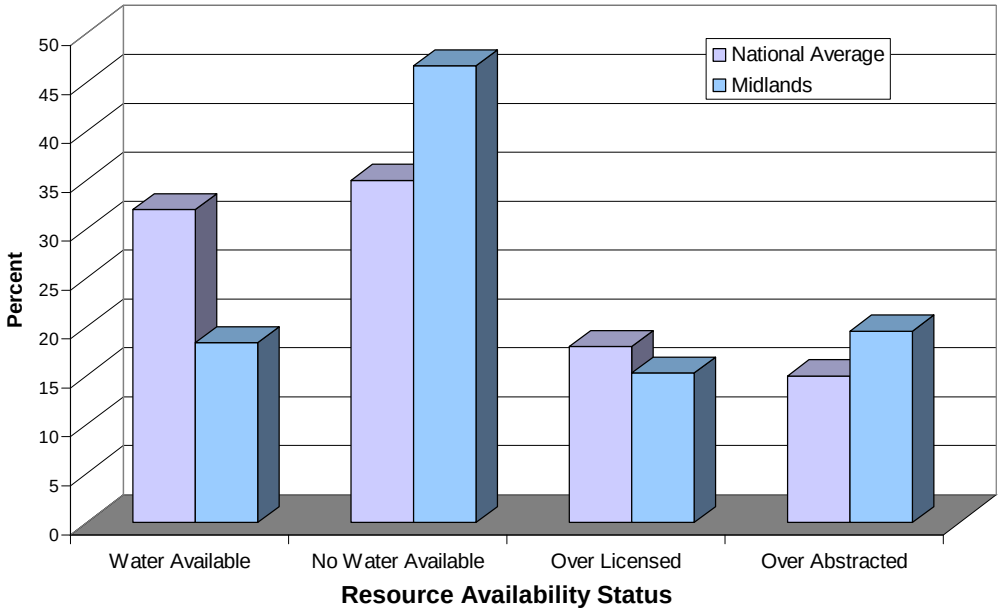


Figure 8: National average vs. Midlands Region available water resources (surface and groundwater combined)

3.3 Abstraction

Water can be abstracted from both surface water (e.g. rivers and lakes) and groundwater (e.g. underground aquifers) sources. However, the amount of water licensed for abstraction in the Midlands far exceeds what is actually taken. In 2006 more than 18600 mega litres per day (one mega litre is roughly half of an Olympic sized swimming pool, Ml/d) was licensed for abstraction, but only about 6800 Ml/d was actually abstracted (Figure 9). The difference between actual abstraction and licensed abstraction is particularly large for power generation and public water supply licences, which are our two main abstraction sectors.

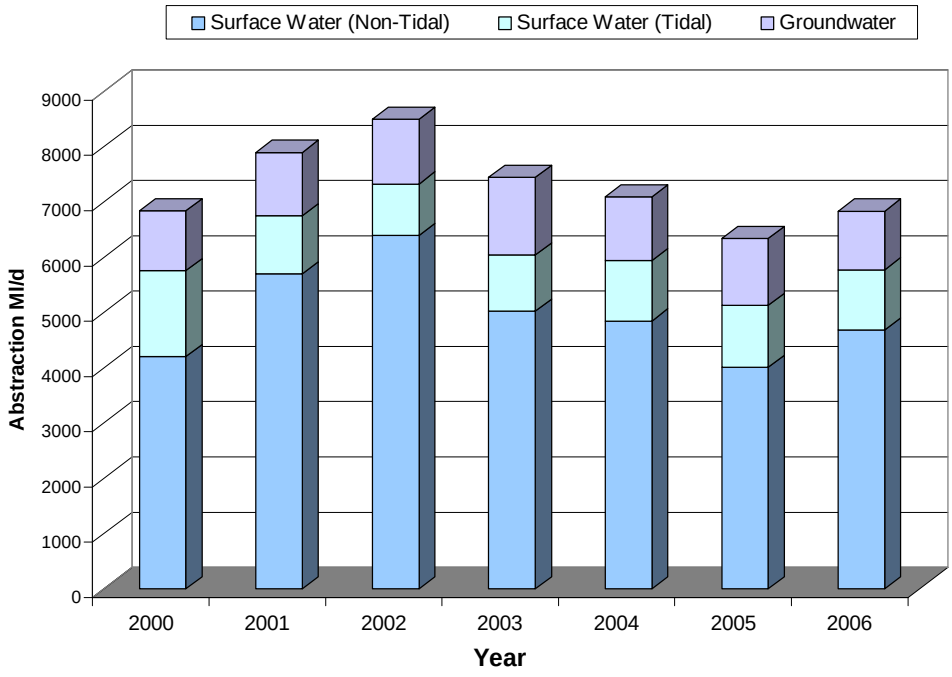


Figure 9: Actual abstraction in Midlands Region by source.

The proportion of time-limited licences has increased by 12 per cent in the Midlands between 2000 and 2007, but only a small volume of licensed abstraction is time limited. Time limiting

abstraction licences may help to create a more sustainable abstraction regime. If evidence indicates that the abstraction is unsustainable then we can change the licence conditions during the renewal process. This allows us to be more flexible in how we manage abstractions to protect the environment in response to increasing pressures.

Water is abstracted for a variety of uses in the Midlands. Cooling water abstracted for power generation and public water supply account for 89 per cent of total abstraction in the region (48 and 41 per cent respectively) while industrial abstraction makes up about six per cent of the total water abstracted (Figure 10). Targeting these sectors with water efficiency measures is therefore likely to have the greatest impact on our water resources. Industry has shown a 19 per cent reduction in its abstraction since 2000. A portion of this reduction is due to increased efficiency, but some of this may be a result of the changing nature of the manufacturing heavy industry in the Midlands.

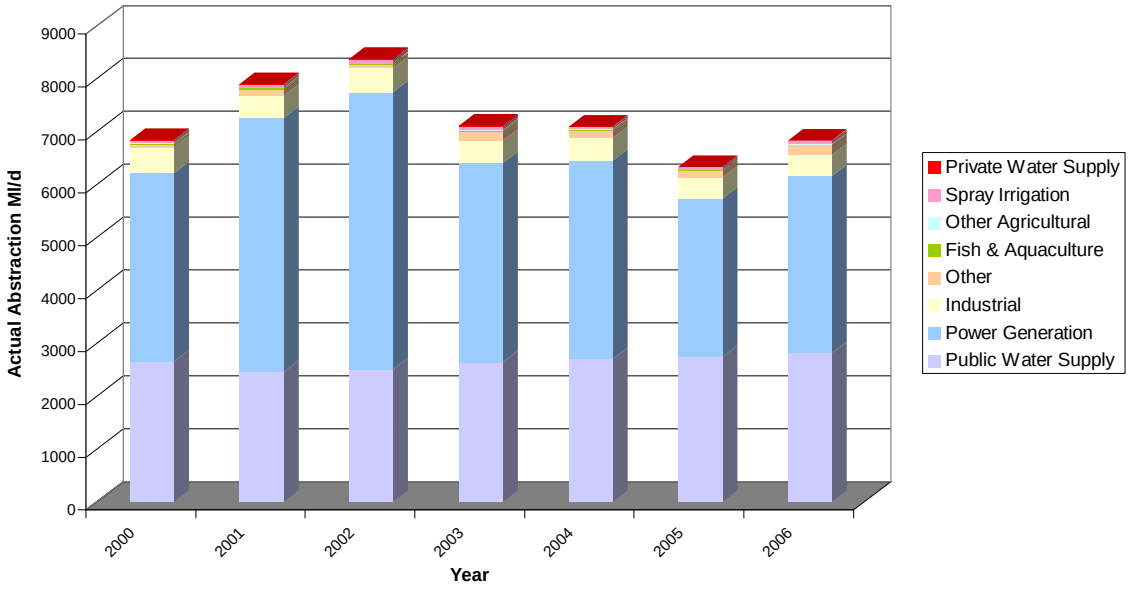


Figure 10: Actual abstraction in Midlands Region by use.

Approximately half of the water used in agriculture is needed for irrigation while the other half is used for livestock and glasshouse/nursery stocks[3] and some of this water isn't directly abstracted but it is taken from public water supplies. Farmers use less than one per cent of the total water abstracted in the Midlands for spray irrigation, but they need that water when resources are most limited. Nearly all the water used for spray irrigation is used by crops or lost by evaporation and can therefore have a much greater impact on the environment compared to other abstraction where water is returned after it has been used. The volume of water abstracted for spray irrigation has varied between 40-63 Ml/d between 2000 and 2006.

4 Supplying people with water

4.1 Current pressures

Where people live in Midlands Region is not necessarily where water supplies are available. In section 3 we have shown that freshwater resources are already stretched at low flows and, in some areas, abstraction is occurring at unsustainable levels. When we take population density into account (Figure 11) we actually have less water available per person than many hotter drier countries.

We have a dual responsibility in managing resources to ensure that people have adequate supplies of water, while minimising the impacts of abstracting water on the environment. Reconciling the needs of the environment with the demands of society is becoming an increasingly difficult challenge.

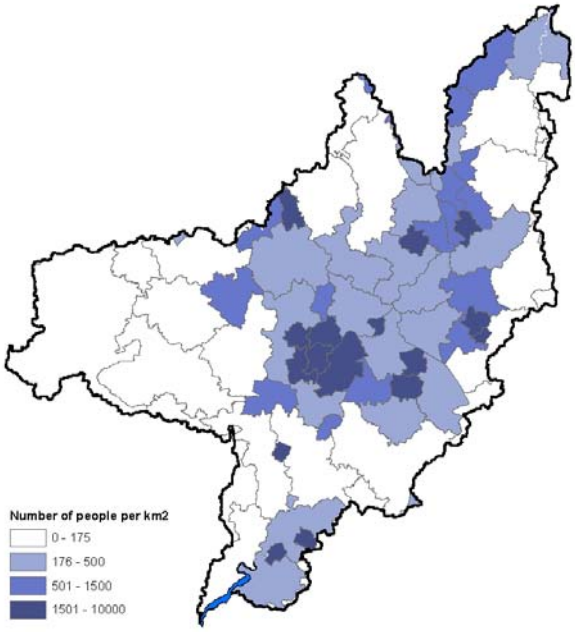


Figure 11: Population density 2006 mid year estimates (Source: ONS)

4.2 Household water use

The amount of water each person uses is called per capita consumption (pcc). On average the Midlands has relatively low pcc compared to the rest of the UK. In 2006/2007, the average pcc was 142 litres per person per day and, as expected, pcc varies quite markedly depending on whether the supply is metered or not (Figure 12). Generally in the Midlands unmeasured households use about 20 litres more water a day than measured households[4].

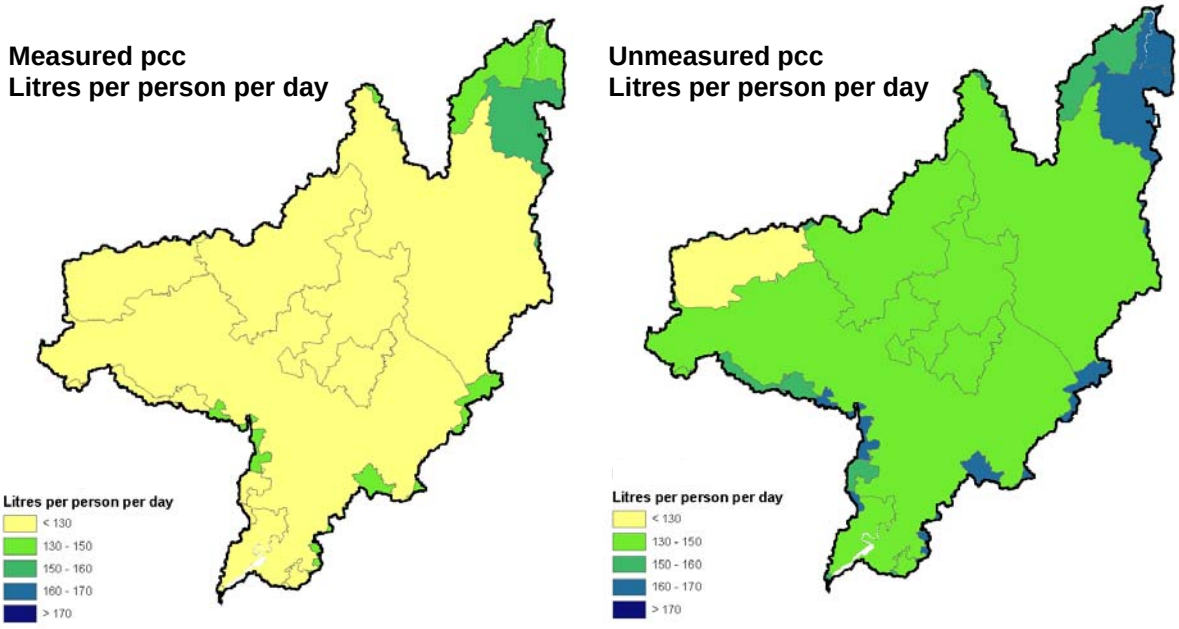


Figure 12: Current per capita consumption (Source: Ofwat June Return 2008)

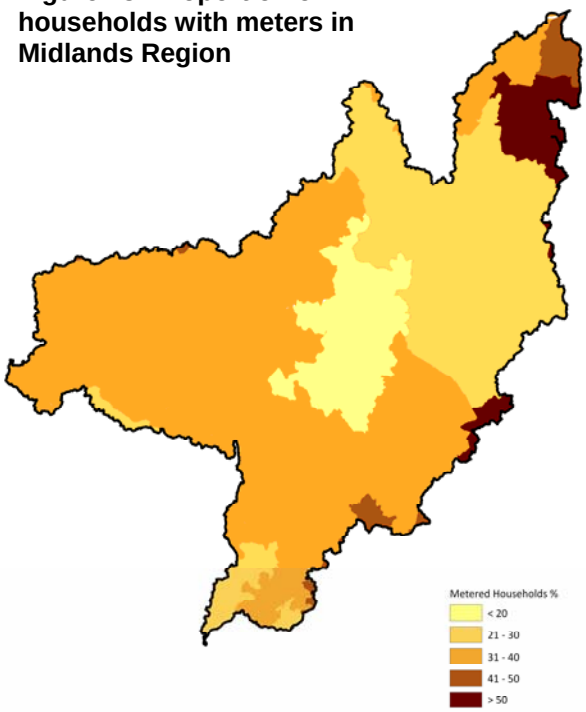
The two main water companies that supply the Midlands are working to reduce household water consumption. South Staffordshire Water predicts that it will reach a normal year average pcc of 129 litres per person per day by 2035 while Severn Trent Water aims to a reach normal year average pcc of 133 litres per person per day by 2035. Defra wants to reduce water consumption to 130 litres per person per day by 2030 and hopes that with new technology and future innovation this could go down to 120 litres per person per day by 2030[5]. We will continue to work with the water companies to increase water efficiency and reduce household consumption.

4.3 Household metering

Increased water metering is one way to reduce demand for water. In 2008 there was a higher proportion of households with a water meter in the drier east and northeast of the region where water is supplied by Anglian Water (Figure 13). The lowest rates of metering are in Birmingham and the area covered by South Staffordshire Water.

The number of households with meters has increased steadily since 2000/2001 (Figure 14). Currently 30 per cent of Severn Trent Water's households are metered and 20 per cent of South Staffordshire Water's households are metered. This is lower than the average for England and Wales (33 per cent) and considerably below the 39 per cent of households with water meters in areas already experiencing serious water stress.

Figure 13: Proportion of households with meters in Midlands Region



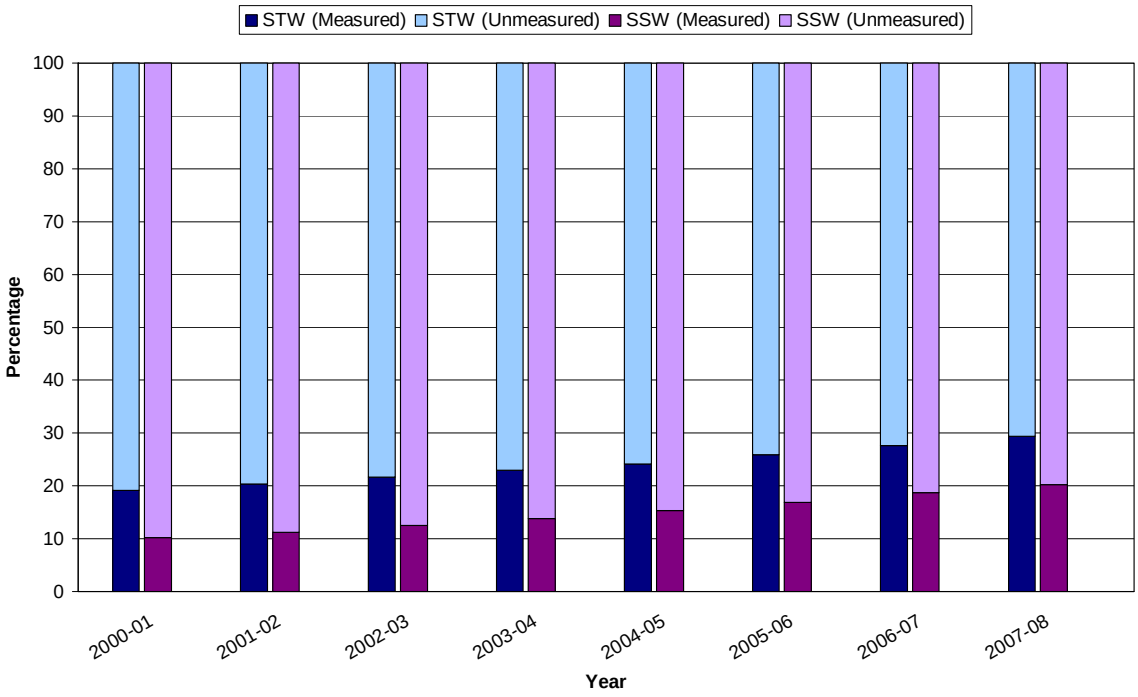


Figure 14: Percentage of Severn Trent Water (STW) and South Staffordshire Water (SSW) households with water meters

4.4 Leakage

Following the 1995 drought, Severn Trent Water reduced its leakage by 27 per cent and South Staffordshire Water by 25 per cent (Figure 15). Both water companies are now meeting their Economic Level of Leakage, but leakage could be reduced further. The apparent increase in leakage from 2002/2003 is due to improved leakage assessment techniques.

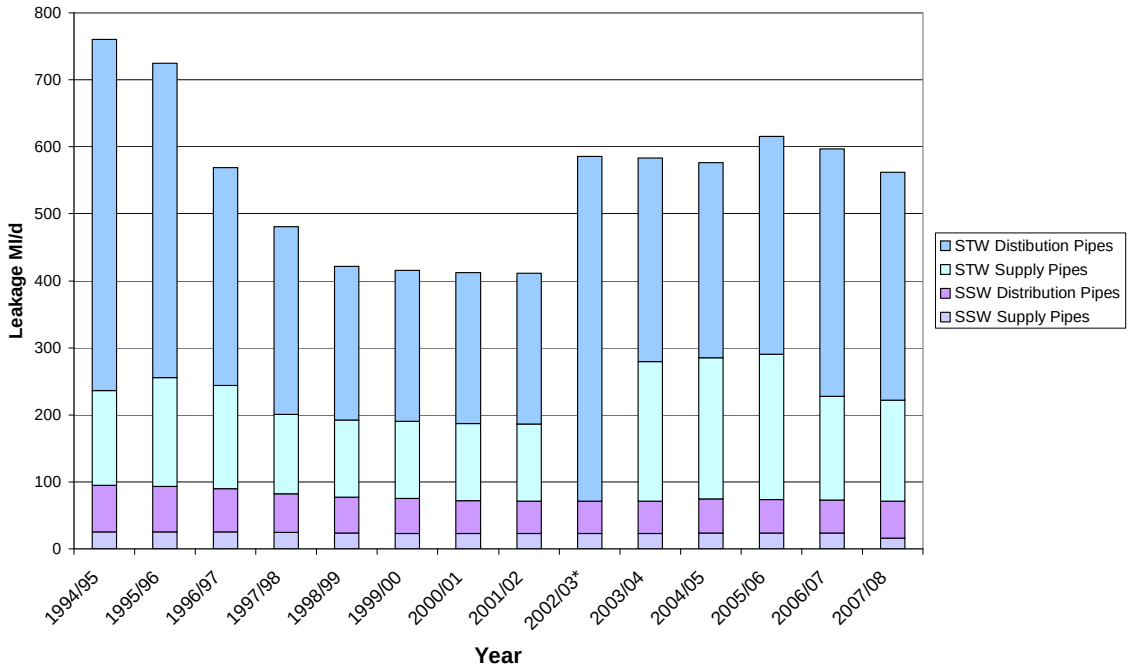


Figure 15: Water supply leakage by pipe type for Severn Trent Water (STW) and South Staffordshire Water (SSW). *The 2002/03 split data not available for Severn Trent Water therefore leakage assigned to distribution losses.

In 2007/2008 total leakage across the region stood at 575 Ml/d. This is equivalent to 230 full Olympic sized swimming pools each day. Losses through leakage not only reduce the water into supply, but also waste energy as water leaked from supply has been treated to public water supply standards and may have been pumped through pipes to reach demand centres.

We believe that in the long term more should be done as leakage reduction is an important mitigation to the effects of climate change. Water companies should take account of the importance of reducing leakage in improving customer's willingness to reduce demand. A reduction in leakage will benefit water supply and help water companies reduce the carbon footprint of water treatment processes.

4.5 Supply demand balance

Water Resources Management Plans (WRMPs) set out how a water company will manage supply and demand for water over the next 25 years. The difference between available supply and demand is known as 'headroom'. Each company calculates its target headroom to ensure it can reliably meet demand during a dry year.

Larger water companies, like Severn Trent Water, look at their supply demand balance on a water resources zones scale (Figure 16). Customers within a water resources zone share the same risk of supply failure (e.g., from a long period of below average rainfall). The draft Water Resources Management Plans and statements of response published by Severn Trent Water and South Staffordshire Water state that there is enough water to supply existing and likely future demands based on population growth.

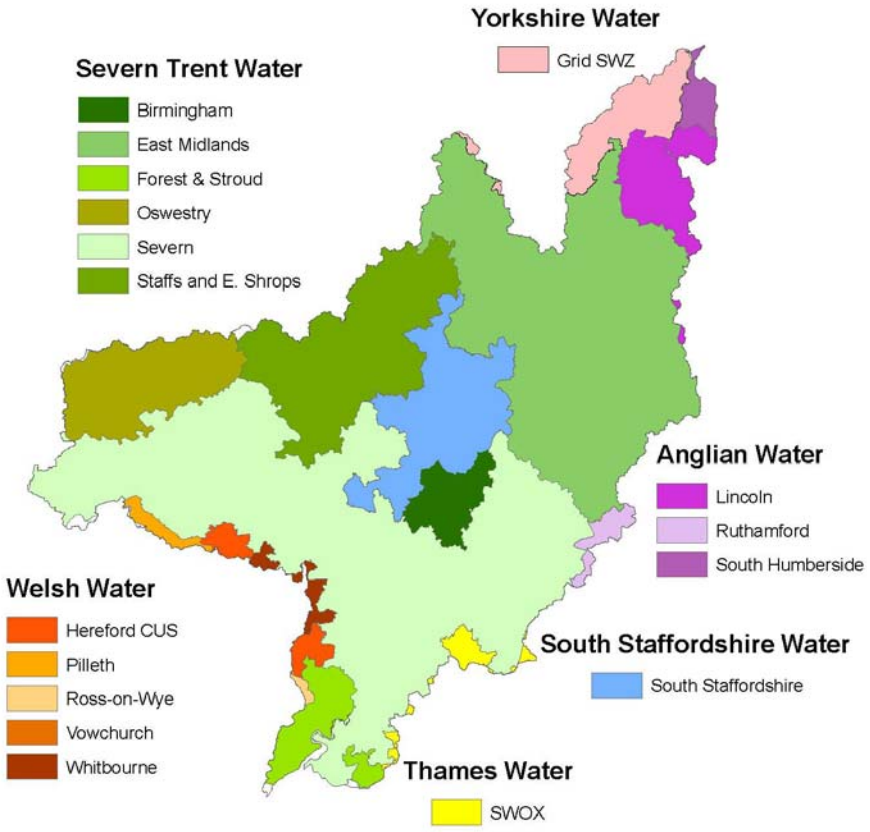


Figure 16: Water resource zones for water companies in Midlands Region

5 Future pressures and trends

5.1 Water Framework Directive

Under the European Water Framework Directive (WFD) member states must aim to achieve at least good status for all water bodies by 2015. Where this is not possible, and subject to the criteria set out in the WFD, member states must aim to achieve good status by 2021 or 2027. For surface water 'good status' is a statement of 'overall status' and has an ecological and chemical component. For groundwater good status has a quantitative and chemical component.

Information from CAMS has been used in the development of the River Basin Management Plans for the Severn and the Humber river basins, and helped us identify water bodies that are currently at risk due to abstraction (Figure 17).

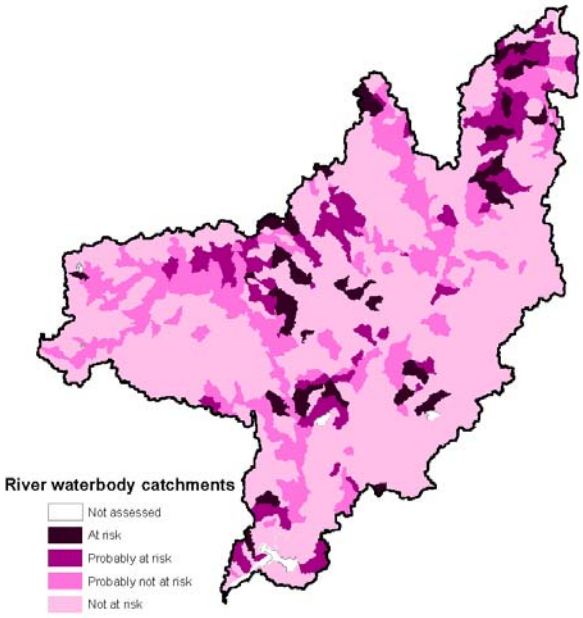


Figure 17: Surface water bodies at risk from abstraction

In many cases water bodies at highest risk occur where groundwater and surface water are connected and groundwater resources have been heavily over abstracted. This is particularly evident through Nottinghamshire and up to Doncaster. Action may be required to reduce abstraction to achieve the targets set by the WFD.

5.2 Pollution pressures

Not only are our water resources at risk from abstraction but they are also at risk from pollution. Discharges from sewage works and industrial processes can present a pollution risk to the water environment. The risks are greater from pollution washed by rainfall from the land into groundwater.

Most of the region's major aquifers are probably at risk from nitrate pollution (Figure 18). This poses a significant problem for our water resources. Contamination of groundwater could potentially limit its use if blending with other sources of water cannot achieve the required drinking water standards (e.g. 50 milligram per litre limit for nitrate).

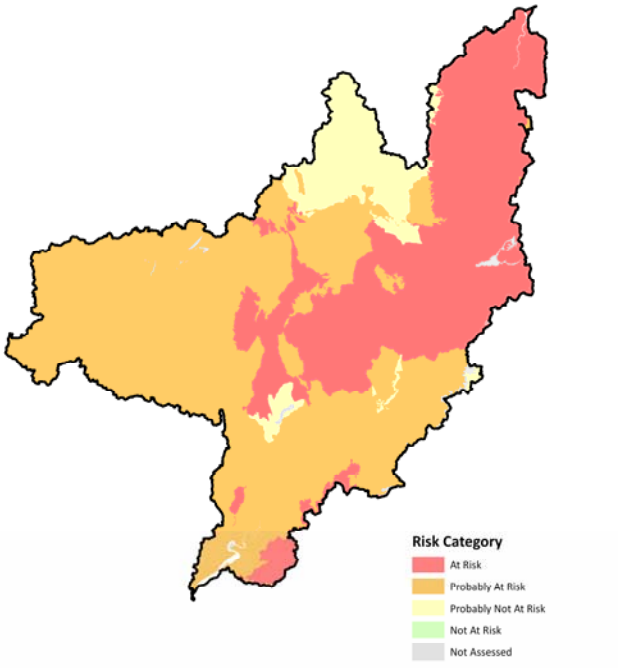


Figure 18: Groundwater bodies at risk from nitrate pollution

5.3 Water for wildlife

We have identified many important wildlife sites that may be at risk from abstraction (Figure 19). We plan to investigate and reduce abstraction where there is environmental damage through our Restoring Sustainable Abstraction (RSA) programme. Most of our RSA schemes are located in areas with availability problems (Figure 7).

The aim of these schemes is to manage surface and groundwater resources more effectively so there is sufficient water for the environment and wildlife. The RSA schemes that fall outside the areas with resource availability problems are largely related to Site of Special Scientific Interest and Habitat Directive sites. These schemes deal with site-specific issues, such as habitat provision, that may not be solely water related.

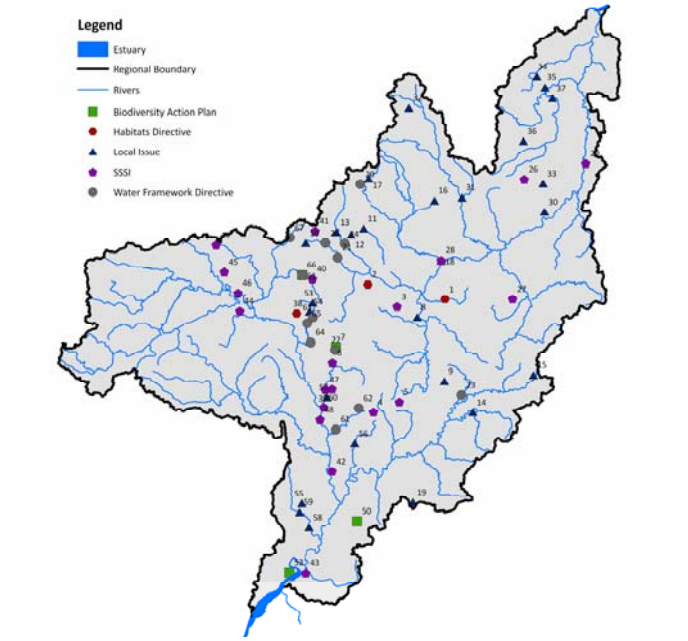


Figure 19: RSA sites in Midlands Region

5.4 Water for wetlands

On a national level, we have worked with Natural England, English Heritage, the Wildlife Trusts, and the Royal Society for the Protection of Birds to launch a 50-year vision for England's freshwater wetlands in July 2008. This work identified areas with the potential to create new wetlands and restore current wetlands, when sufficient water is available.

There are currently 438km² of wetlands in the region and there is potential for this to increase to 2100km² over the next 50 years (Figure 20). Restoring wetlands will provide water in our countryside and help people and wildlife adapt to climate change by moderating extremes of flooding and drought. A large proportion of potential future wetland sites are in parts of North Warwickshire, Leicestershire and Nottinghamshire where there is currently water available.

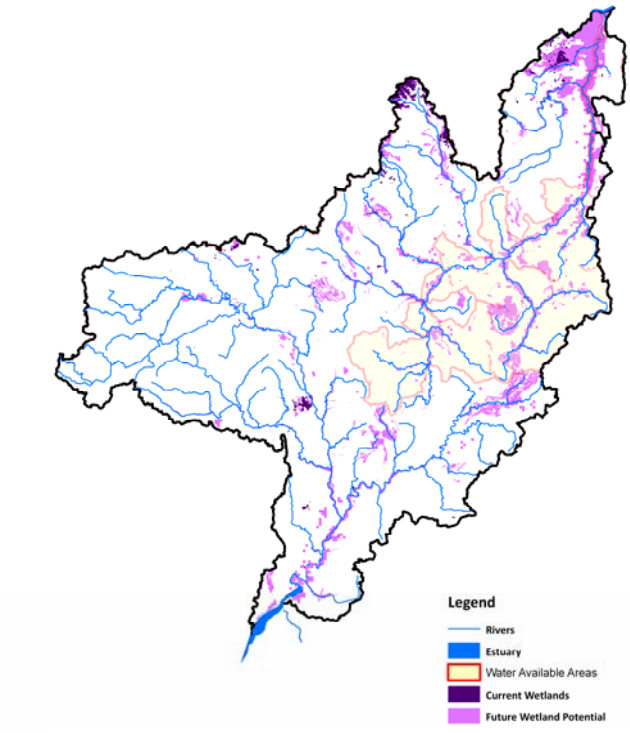


Figure 20: Midlands Region freshwater wetlands 50-year vision

5.5 Population growth

Population growth from 2006 to 2030 will be one of the biggest pressures on our water resources (Figure 21). Forecasts vary from place to place with the population in some parts of the region expected to increase by over 40 per cent.

The largest forecasted increases in population are in the major towns and cities in the drier eastern part of the region. For example, water is now available in the Leicestershire area, but population increases by 2030 and the associated increases in demand could reverse this situation. Pressures on water resources will increase in the future.

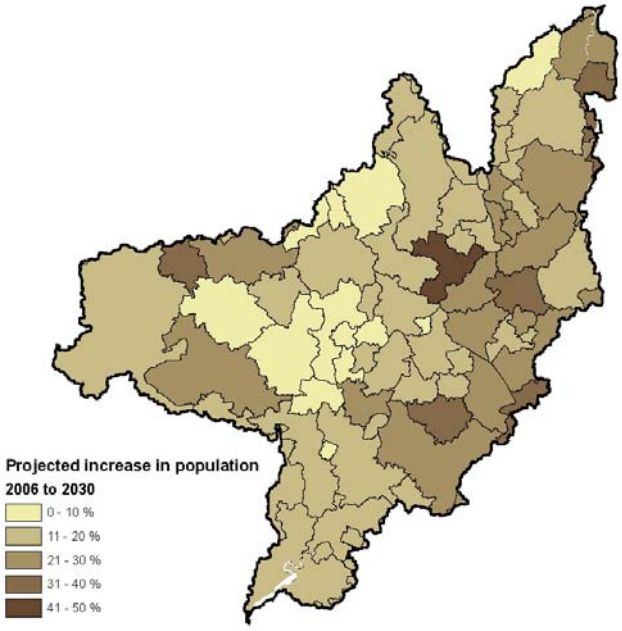


Figure 21: Projected population growth: 2006 to 2030 (Source: ONS)

5.6 Trends in household metering and water use

We can respond to the pressure on supplies from a rising population by increasing the number of households that pay for water with a meter. In section 3.1 we mentioned that water company areas have been classified by their relative level of water stress (serious, moderate, and low) and Defra recognises the need for compulsory water metering in serious water stress areas (WSA)[6]. In addition all new households in England and Wales are required to be metered.

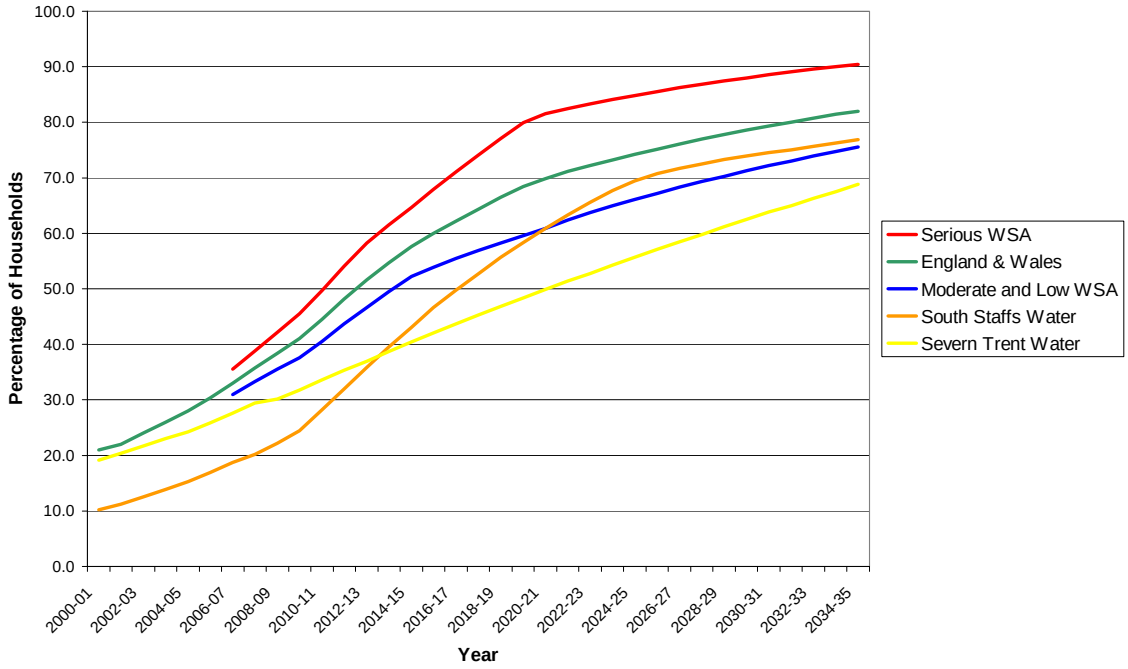


Figure 22: Actual and forecasted households with water meters

The two main water companies in Midlands Region, Severn Trent Water and South Staffordshire Water, have lower metering than the average for England and Wales and considerably lower than the average for water companies in serious WSA (Figure 22). However, these water companies plan to increase metering over the next 25 years. South Staffordshire Water proposes to install some change of occupier meters and allow households to opt for a meter. This metering policy will lead to the metering of 77 per cent of households in its customer base by 2035 and will also reduce demand by 4 Ml/d[7]. Severn Trent Water plans to have 72 per cent of its billed households metered by 2035 by trialling a change of occupier metering programme and encouraging households to opt for a meter[8].

5.7 Climate Change

Climate change is recognised as one of the most pressing environmental challenges that we face. We know that it is likely to alter the environment. It will affect the amount and distribution of rainfall, impacting on flows and water levels, and also water temperature.

In 2008, the Environment Agency assessed how potential changes in rainfall due to climate change could affect average annual river flows across England and Wales by 2050 using the UKCIP02 forecasts (Figure 23). The trend is for wetter milder winters, with an increased likelihood of flooding, and drier summers.

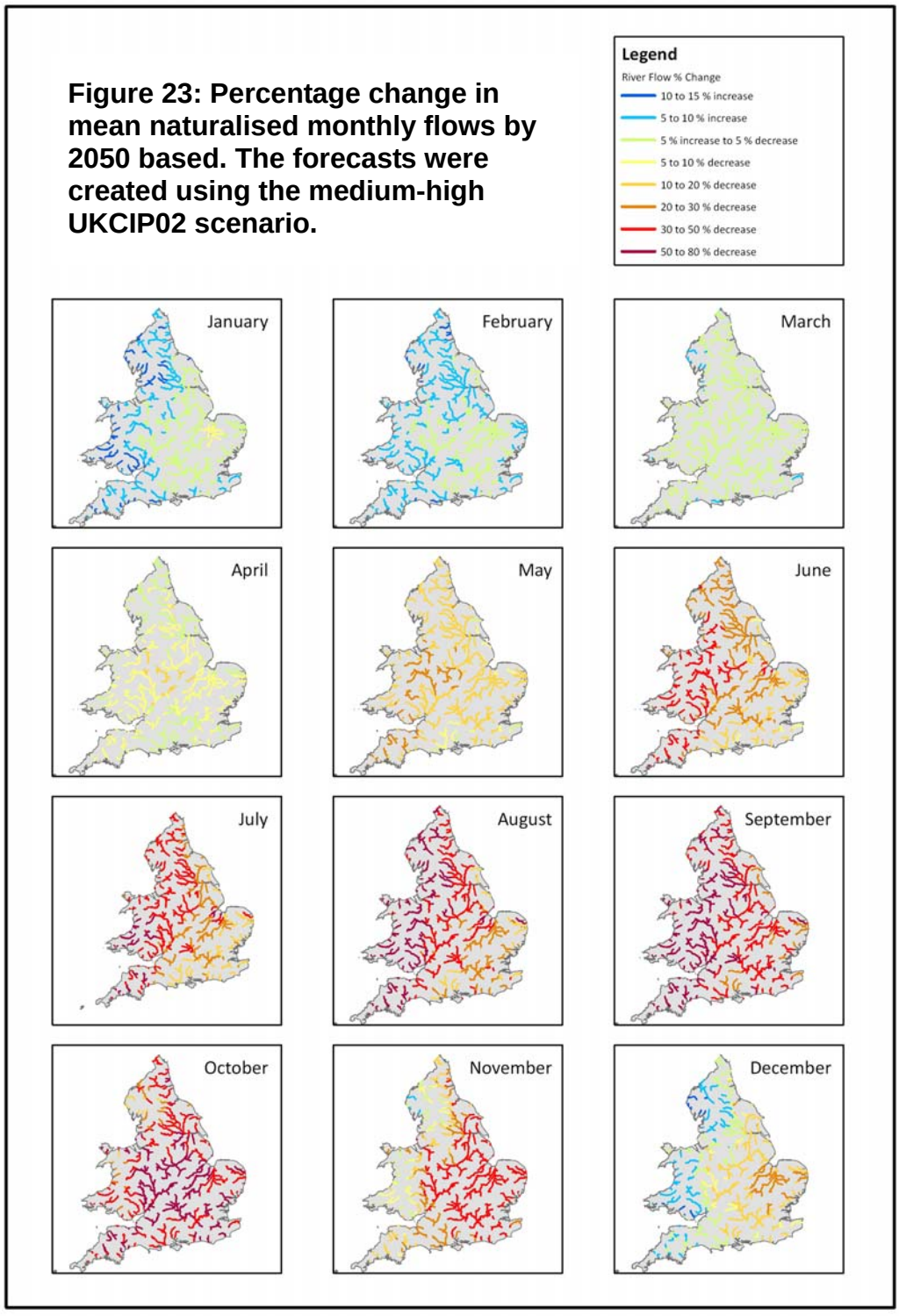


Figure 23: Percentage change in mean naturalised monthly flows by 2050 based. The forecasts were created using the medium-high UKCIP02 scenario.

In the Midlands mean monthly winter flows may increase by five to 10 per cent and mean monthly summer flows may decrease by 50 to 80 per cent by 2050. This work clearly shows that the potential scale of impact is serious. It is also important to note that while we believe that this is important evidence that helps us understand the potential scale of the future pressures, we recognise the uncertainty around these predictions and that we need to carry out further research to improve our understanding.

The potential decrease in river flows would pose serious problems for water supply as most of the region's supply comes from non-tidal surface water (Figure 9). In 2006, approximately 69 per cent of our public water supplies came from surface water sources while the other 31 per cent came from groundwater sources. While the volume of water abstracted has varied over the past seven years, the proportion of total abstraction from tidal and non-tidal surface water and groundwater has remained relatively constant since 2000. If this trend continues and river flows are reduced our water resources will be under significant pressure.

The UK Climate Impacts Programme updated its UKCIP02 climate change projections in July 2009. The new projections (UKCP09) look at UK temperature, rainfall, sea level rise and other variables to the end of this century. The projections are based on low, medium and high emissions scenarios and give us information on the likelihood of different levels of climate change. For this reason the projections are being called 'probabilistic scenarios'. It will be important for us to update our river flow forecasts using this new data.

The UKCP09 scenarios for the East and West Midlands indicate that, under medium emissions, annual mean precipitation won't change significantly by 2050. But, winter mean precipitation is likely to increase by approximately 13 -14 per cent and summer mean precipitation is likely to decrease by 15 -16 per cent by 2050. The East Midlands is one of the driest regions in terms of rainfall and a decrease in summer precipitation could cause problems for the agricultural industry.

Not only do we have to take into account the impact that climate change might have on our water resources, but we also have to acknowledge the impact we are having on our climate. The UK water industry emits about one per cent of the UK's total greenhouse gas emissions[9]. These emissions should not be overlooked and become significantly larger when the impact of water used in the home is considered. 89 per cent of the greenhouse gas emissions associated with water abstraction, treatment, transport, use and disposal are due to water use in the home[10]. We need to reduce our greenhouse gas emissions in order to reduce the impacts of climate change.

5.8 Future demand scenarios

It is difficult to understand how the demand for water may change in the future. The Water Resources Strategy for England and Wales used a tailored approach to model possible demand in the 2020s, 2030s and the 2050s. For the 2020s, a 'business as usual' demand scenario was developed for England and Wales while, for the 2030s and the 2050s, a different approach was needed due to the higher degree of uncertainty. Four scenarios, centred on consumption and governance, were used to explore the possible changes in the pressures on the UK environment. These demand scenarios were examined on the river basin boundaries (Figure 24) and we have used the Severn (England) and Humber (south) areas to represent Midlands Region.

Figure 24: Demand scenario areas for the water resources strategy.

Those living in the first scenario, **sustainable behaviour**, recognised the need for action against climate change and their governments responded to these concerns. In the **innovation** scenario governments recognised the need for action against climate change,

but relied on manufacturers and service providers to become increasingly resourceful in their engineering to meet a consumption lead society. The **local resilience** scenario assumed that governments were led by growth resulting in over-stretched natural resources triggering recession and inflation. Those living in this scenario had to become more resource focused to reduce their energy, water and food costs. In the final scenario, **uncontrolled demand**, there is a broad awareness of environmental issues, but these concerns are not heavily pressing for the public or the growth-led government.

It is important to note that this future scenario work was carried out before the current economic downturn. Unless the downturn is very protracted, it should not alter overall trends and pressures to the 2050's and beyond. For more information on how the forecasts were developed see the Water Resources Strategy for England and Wales[11].

Demand for water is likely to rise steadily over the next 10 years under the 'business as usual' approach (Figure 25). By 2050, under the worst case scenario, a further 1,025 mega litres per day may potentially be necessary to meet the additional needs of the public, industry and agriculture in Midlands Region. While under the best case scenario we would require 943 mega litres per day less than we currently demand. We would like to aim for future demand in Midlands Region to be on the lower end of this scale.

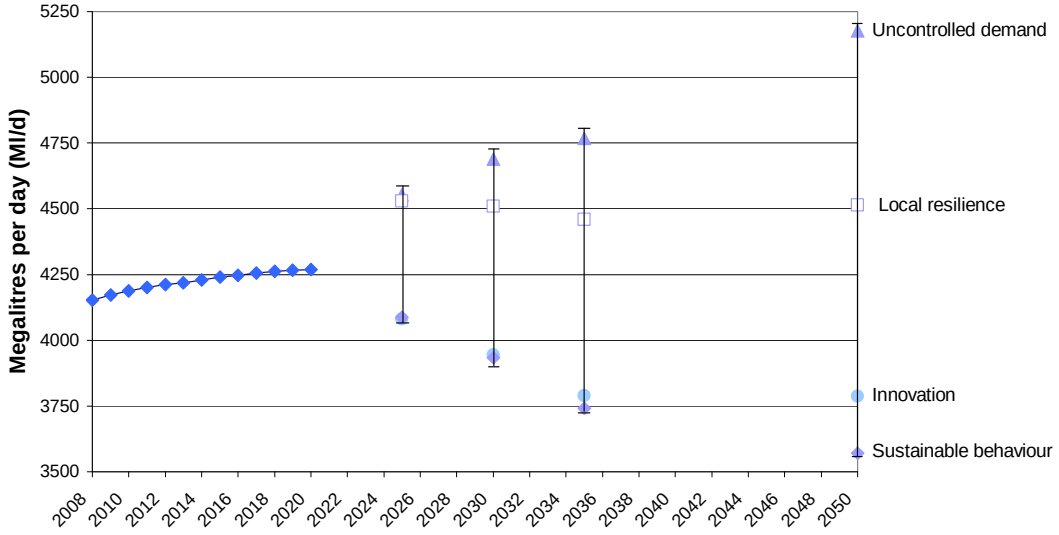


Figure 25: Total water demand for Severn (England) and Humber (south) River Basins (Source: data from the Environment Agency's future scenarios work)

These figures illustrate how important it is that society begins to value water more. Without this change in societal values the challenges facing our water resources and the water environment in the Midlands will be much harder to meet.

6 Conclusions

While Midlands Region still has water available in some areas, our water resources are stretched and we are moderately water stressed. Increasing pressure from population growth, development and climate change will only stretch our water resources further. We need to act on what the future might bring and plan for what the future could bring. Careful planning is essential to ensure there will be enough water for people and the environment in the future.

References

[1] Based on European Environment Agency data and our own data

[2] 'Areas of water stress: final classification', Environment Agency, December 2007

[3] 'Opportunities for reducing water use in agriculture', Defra, 2007

[4] Based on Water Company draft Water Resources Management Plan data, 2008

[5] 'Future Water: The Government's water strategy for England and Wales', Defra, February 2008

[6] 'Future Water: The Government's water strategy for England and Wales', Defra, February 2008

[7] Based on information in South Staffordshire Water's response to representations on the draft Water Resources Management Plans, 2008

[8] Based on data from Severn Trent Water's draft Water Resources Management Plans, 2008

[9] Water UK Sustainability Indicators, 2006-2007, December 2007

[10] Quantifying the energy and carbon effects of water saving, Environment Agency and Energy Saving Trust, April 2009

[11] Water Resources Strategy for England and Wales – water for people and the environment, Environment Agency, March 2009

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