Dorset Council

WATER

Detailed Technical Paper

15 July 2021

WATER

1. CONTEXT

National Context

The water industry contributes 0.8% of annual UK greenhouse gas emissions[1], emitting 2,266 $ktCO_2^e$/year[2]. These emissions are created through the use of energy to treat water, pump it to and from homes, and then treat it again before returning it to our rivers, as well as emissions from the wastes generated from treatment processes[3].

A large proportion of emissions from water come from use in the home and are associated with the use of energy to heat water. These are covered in the Buildings section.

Water resources management is about balancing the abstraction of water for people to use against the requirements of the natural environment. Water abstraction in this country is currently running at unsustainable levels, with 20% of rivers and 26% of groundwater bodies being damaged by over abstraction[4]. Our water resources are coming under increasing pressure from population growth and development and, by 2031, there are likely to be ten million more people living in England and Wales, all requiring water for drinking, business, industry, leisure, and sanitation. Currently, population growth and development are the greatest pressures on our water supply[5].

In 2019, a single member household used an average of 54 cubic metres of water annually in the United Kingdom. In terms of daily use, average consumption across the country is 141 litres per person per day, which compares unfavourably to similar countries such as Germany (121 litres)[6]. Baths and showers are the biggest water use in homes (25%), followed by toilets (22%)[7].

Around 22% of water currently put into supply is lost through leakage, which equates to approximately 3 billion litres of water per day[8].

Climate change will seriously affect the water supply-demand balance, including resource availability, security of supply, and the water required to keep our rivers, lakes, and ecosystems healthy.

Climate change may see river flows decrease by as much as 80% in summer and rise by 15% in winter. However, wetter winters and drier summers, combined with increased temperatures, could see a total

[1] Greenhouse gas emissions of water supply and demand management options, Science Report, SC070010, Environment Agency, July 2008.
[2] Water UK; England and Wales, Apr 2018 - Mar 2019

[3] Evidence: A Low Carbon Water Industry in 2050, Environment Agency Report: SC070010/R3, 2009
[4] Environment Agency, 2021 River Basin Management Plan
[5] Adapting to Climate Change; Water Resources, Environment Agency
[6] Water Consumption, PR19 Challenge Report #5, WWF, 2019
[7] At home with water, DEFRA, Energy Saving Trust, 2013
[8] Water conservation report, DEFRA, December 2018

annual reduction in river flows by 15%. By 2025, it is likely that overall recharge to aquifers will decrease, river flows fed by groundwater will decrease, and that there will be a general lowering of groundwater levels[9].

Table 1: Climate Change and Risks

Climate change	Examples of key impacts
Increased summer temperatures	Increased water demand from households, businesses and agriculture. Increased risks to freshwater habitats and species as water temperatures rise with air temperatures.
Decreased annual and summer rainfall	Reduced rainfall with larger seasonal variations in river flow and groundwater levels will affect available resources and the abstraction (water withdrawal) regime.
Increased winter rainfall	Implications for the design and management of existing and newly planned reservoirs, with winter rainfall being condensed into fewer, higher intensity events.
Sea level rise	Water supply infrastructure near to the coast could be at risk from increased flooding.
More frequent extreme events (such as flooding, drought, heatwaves)	Yields from existing reservoirs, groundwater sources and rivers may decrease. Potential pollution of available water resources during flash flooding events, with greater surface water runoff/overland flows. Some critical infrastructure (such as water treatment plants) may be more vulnerable to flooding due to more intense rainfall.

In addition to increasing the vulnerability to flood risk for residents and commercial premises, sudden and heavy rainfall events will also increase amounts of surface water runoff into sewers, which may incidence of faecal and other pollutants in bathing and shellfish waters[10].

Water availability is often a key controlling factor in biodiversity. Aquatic organisms may be directly affected by water depletion, while groundwater-dependent terrestrial ecosystems also suffer from reduced water availability. In addition, excessive nutrient pollution from agriculture and chemical pollution deposited from the air can all degrade or destroy habitats, especially for fish.

The EEA report State of Europe's[11] seas found that Europe's marine biodiversity is deteriorating. Of those marine species and habitats that were assessed from 2007 to 2012, only 9% of habitats and 7% of species showed a 'favourable conservation status'.

As well as direct water use within the UK, our consumption of produce from other countries means that each of us effectively soaks up a staggering 4,645 litres of the world's water every day. Most of this is in the form of 'virtual water'. For example, water that has been used to grow the crops that make the food we eat, the beverages we drink, and the clothes we wear. It is thought approximately 62% of total UK water consumption is accounted for by water in other countries[12].

[9] Adapting to Climate Change; Water Resources, Environment Agency
[10] Under the weather: Improving health, wellbeing and resilience in a changing climate, Environment Agency, January 2014
[11] State of Europe's Seas, EEA Report No. 2/2015, EEA 2017
[12] UK Water Footprint: the impact of the UK's food and fibre consumption on global water resources, WWF, 2008

Dorset Context

From beautiful coastal waters, which are important for tourism and conservation (and fronting up the 'Jurassic Coast' World Heritage Site), to its chalk aquifers that hold so much pure drinking water underground and give rise to important chalk streams, water is a defining characteristic for Dorset. The lush meadows of the Blackmore Vale, for example, support important agricultural enterprise and are dependent upon rainfall and rivers.

As part of the human water cycle, highly treated wastewater is returned to the rivers of Dorset, before flowing into the coastal zone and important estuaries including the Fleet and Poole Harbour. Here, and all along the coast, water quality is vital to maintain clean bathing beaches and shellfisheries.

Wessex Water supplies and treats the water in the majority of Dorset, with Southern Water operating in the eastern border of the county.

In the Wessex water region, around 75% of the water abstracted for public water supply comes from groundwater sources. Important aquifers are located under Salisbury Plain to the North East, Cranborne Chase to the East and West Dorset. The remainder of their water supplies (~25%) come from impounding reservoirs located in the west of their supply region. In the Dorset area of Southern Water's territory, 100% of the supply comes from groundwater[13].

Wessex Water customers currently use an average of 131 litres of water every day, while Southern Water customers use an average of just 129 litres each day compared to the national average of 141[14], which recent data suggests is one of the lowest averages by water company area in the country[15].

With a succession of severe storms bringing persistent heavy rainfall, February 2020 was the sixth wettest on record - 147mm (223% long term average). All borehole sites in the Wessex region (Dorset & South Wilts) either had 'exceptionally high' or 'notably high' groundwater levels for this time of year.

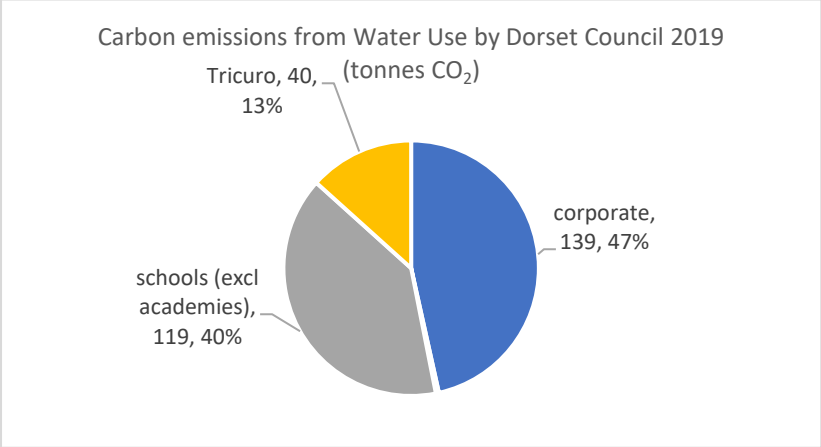
Dorset Council Context

Water is used in Dorset Council in the main for drinking, flushing toilets, hand washing, and vehicle washing. In 2019, total water use in Dorset Council, Tricuro sites, and schools (excluding academies) was 284,109 m3, resulting in the emission of 299 tonnes CO_2^e . This equates to about 3 % of Dorset Councils Carbon Footprint.

[13] Where our water comes from, Southern Water https://www.southernwater.co.uk/water-for-life/education/where-our-water-comes-from

[14] Target 100, Act today, save tomorrow, Southern Water, https://www.southernwater.co.uk/media/2227/t100_acttoday.pdf

[15] Water Resources Management Plan, Wessex Water 2019



Dorset Council's Building Regulation team are responsible for ensuring the water consumption and foul and surface water drainage systems meet the national standard.

May 2020 was an exceptionally dry month, being the second driest May on record after 1896, with only 9% LTA rainfall across the Wessex area.

Climate change in the form of rainfall (circa 40% increase) has a significant effect on local flood risk. Dorset Council has a management overview of flooding from these 'local sources', which includes surface water, groundwater, and ordinary watercourses. These are managed by the flood risk management team who undertake the role of Lead Local Flood Authority (ref. Flood and Water Management Act 2010).

A Local Flood Risk Management Strategy has been developed which sets direction for our work. A number of flooding investigations and flood alleviation interventions have been developed since 2011, with the most notable being a £750k scheme installing property level resilience measures to ninety-four residential properties. We are also a statutory planning consultee for the management of surface water from major development sites. As part of this work, we promote sustainable development by managing flooding as close as possible to the source. This is undertaken by application of the Sustainable Drainage Systems (SuDS) hierarchy. This type of approach helps to reduce the amount of flow entering Sewage Treatment Works with associated running cost savings.

Climate change in the form of increases in tidal still water levels (circa 1.3m increase) and increased storminess also has a significant effect on flood risk along the coast. Dorset Council is a Coastal Management Authority, responsible for the management of erosion along the coast. This includes the development of Shoreline Management Plans which set policy for various interventions, including scheme development.

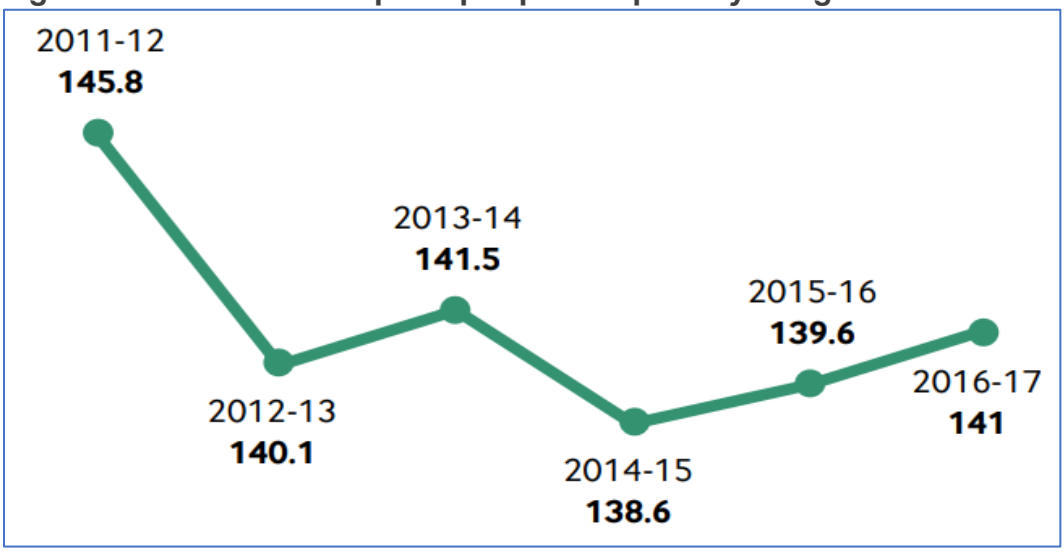
2. PROGRESS / CURRENT SITUATION

National

The UK water industry is the first industrial sector in the UK, and one of the first major sectors in the world, to commit to a carbon zero future by 2030[16].

Overall water consumption reduced from 145.8 litres per person per day in 2011/12 to its lowest level in 2014/15, then increased slightly to current levels of 141 litres per person per day.

Figure 1: Water Consumption per person per day - England & Wales - last 5 years[17]

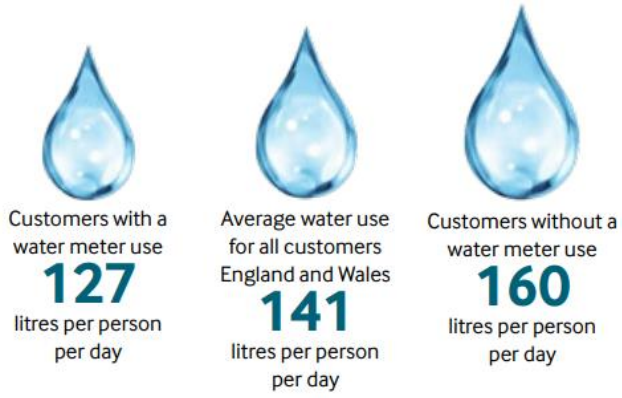


Over recent years, the Government has increased pressure and guidance for the water sector, aiming to ensure plans and investment are in place to secure long-term resilience to drought and other factors. Reducing demand is seen as a key solution. Water companies are therefore encouraged to promote water efficiency and leakage control and, where appropriate, increase customer metering, continuing the trend of reducing overall demand for water[18] [19] [20].

Water meters are proven to result in significant water savings in the home. In 2019, around 50% of homes in England are currently metered. This is expected to reach around 80% by 2050, saving around 400 Million litres per day[21].

Figure 2: Water Use: Metered and Unmetered

[16] https://www.water.org.uk/news-item/water-industry-takes-significant-first-step-in-drive-to-be-carbon-zero/
[17] Water Consumption, WWT; PR19 Challenge report #5
[18] Section 22 of the Water Act 2014 introduced a primary duty on the Environment Agency to secure resilience by amending section 2 of the Water Industry Act 1991.
[19] https://www.water.org.uk/water-resources-long-term-planning-framework
[20] Water Conservation Report, DEFRA, December 2018
[21] Water Consumption, PR19 Challenge report #5, WWF, 2019



In addition, higher Building Regulation standards for domestic water usage have been introduced to set a minimum standard of 125 litres per person per day. However, where there is a clear local need, local planning authorities can set tighter standards of 110 litres per person per day[22].

The environmental quality of the rivers and beaches in England and Wales has also improved consistently, supporting the recovery of wildlife species such as otters that were previously absent or in decline. However, water companies are still striving to reduce the levels of nitrates, phosphates, and pesticides such as metaldehyde in the water that are often the result of run-off from farmland . There is also increasing awareness and concern about micro-pollutants such as pharmaceuticals, micro-plastics, endocrine disruptors, and metals [23].

Water companies are moving away from end of pipe solutions (cleaning up contaminated flows of water at the point where that effluent enters the environment) towards more integrated catchment management approaches[24].

In the Government's 'Green Future: Our 25 Year Plan to Improve the Environment' (December 2017) report, the reduction in the amount of water people use and reducing leakage are an important part of the goal to achieve the clean and plentiful water included in the plan. Key actions include:

- Working with the water industry to determine appropriate targets for personal water consumption and the measures needed to achieve them
- Working with the industry and the Waterwise group to improve water efficiency and customer involvement to explore the impact of introducing new water efficiency measures
- Supporting Ofwat's ambitions to minimise the amount of water lost through leakage year on year, with water companies expected to reduce leakage by at least an average of 15% by 2025.

[22] Water Conservation Report, DEFRA, December 2018
[23] Towards Water 2020 – meeting the challenges for, water and wastewater services in England and Wales, Environment Agency
[24] Towards Water 2020 – meeting the challenges for, water and wastewater services in England and Wales, Environment Agency

Dorset

Water supplies in Dorset are provided in the main by Wessex Water, with Southern Water supplying the far east of the county.

The Wessex Water region[25] has faced above average population growth and deteriorating water quality. To ensure river flows keep within the limits of secure supply, Wessex Water have worked closely with the EA to reduce abstraction licences with the largest impact on local watercourses, groundwater levels, and wildlife. Much work has also taken place to reduce leakage down by 62% from the 1995 level by 2025.

Both Wessex Water and Southern Water have been working with customers to reduce their use, with Southern Water reducing average daily consumption by more than 15% from 155 litres in 2000-01 to 129 litres in 2017-18 by metering, supported by water efficiency campaigns[26].

In 2019, over 75% of households in the Wessex Water[27] area had a water meter, whilst Southern Water's Universal Metering Programme means that almost 90% of their customers pay for the amount of water they use[28], compared to an average of 55% in the rest of the industry.

Wessex Water aim to reduce consumers daily water use by 4 litres by 2025 (to 127 litres per day) and by a further 3 litres (to just over 124 litres) by 2045[29]. They have also been supporting their customers with a 'home check service' to fit water saving devices, such as eco-showerheads, repair easy to fix plumbing leaks, and offer personalised behavioural advice. Each visit leads to savings of over 40 litres per household per day. By 2020, they will have delivered the service to 20,000 homes across their region, and from 2020 to 2025 they intend to expand the service and deliver it to a further 40,000 customers[30].

Southern Water is committed to advising, supporting, and incentivising customers to reduce their water use to 100 litres per person, per day by 2040. At the same time, they aim to reduce their leakage by at least 15% by 2025 and 50% by 2050.

The water quality of less than half of the rivers of Dorset is considered 'good' under current European standards. The Environment Agency continues to work with water companies and industry to reduce pollution from wastewater treatment works, farms, and industrial site runoff through surface water drains. However, for diffuse pollution, whose sources and causes are less easy to trace and are not controlled by permits, the control is not so straightforward[31].

[25] Wessex Water region includes most of Dorset, Bristol, Somerset, Wiltshire, and parts of Gloucester and Hampshire
[26] Target 100, Act today, save tomorrow, Southern Water, https://www.southernwater.co.uk/media/2227/t100_acttoday.pdf
[27] Water Resources Management Plan, Wessex Water 2019
[28] Target 100, Act today, save tomorrow, Southern Water, https://www.southernwater.co.uk/media/2227/t100_acttoday.pdf
[29] Water Resources Management Plan, Wessex Water 2019
[30] Water Resources Management Plan, Wessex Water 2019
[31] Water Management in Dorset, A Dorset Local Nature Partnership Position Paper, Sept 2017

Wessex Water were one of the first companies to pioneer the catchment management approach to protect our sources of water. They have been working with farmers and land managers to reduce the application of nitrate / phosphate fertilisers and pesticides, which has been successful in some areas[32].

In 2013, DEFRA published a policy framework to encourage the wider adoption of the integrated Catchment Based Approach, and although there is widespread agreement that this approach can be very successful, the reality in Dorset is that it has not been widely adopted. However, there are some notable successes, such as the Poole Harbour Catchment Initiative and the developing Stour Catchment Initiative[33].

The Dorset Wild Rivers project (2015 -2020), funded by Wessex Water, aims to achieve restoration of over 5km of river habitat and seven new wetland enhancement schemes by engaging with farmers and land owners to share knowledge, and bring about lasting benefits to the ecology of the river habitat. Benefits of the project include:

- Improved catchment resilience to climate change in terms of biodiversity, water quality, and water quantity
- Flood alleviation through the reconnection of floodplains and improved river morphology
- Increased public understanding and awareness of water issues to help build support for future projects.

Dorset Council

It is not possible to analyse historic progress for Dorset Council as the organisation has only existed since 2019, and there is not a full set of data for even that year. However, each of the constituent local authorities had a good history of water conservation in their buildings.

The former County Council had an ongoing programme, which included benchmarking water use to identify high users, and implement targeted reduction campaigns and leak investigations to identify repairs needed. This is as well as water logging at half hourly intervals at County Hall to identify wastage, which resulted in cost savings of approximately £16k. Other key actions have included installing water efficiency measures, such as waterless urinals, water saving taps, and rainwater harvesting in some buildings.

Dorset Council is currently undertaking a full asset review, which will lead to the reduction in the estate and further reductions in water consumption.

We use water in a wide range of ways to perform our operations. For example, in highways, we use water for vehicle wash downs and consume water to assist in sawing masonry and using vibrating rollers (but not huge quantities). Our gully emptiers and high pressure jetters use portable stand pipes to fill up as required. This is as well as hydro blasting, which is the use of extremely high pressure water to etch the existing road surface and provide texture (to increase skid resistance and prolong the life of the surface).

[32] Water Resources Management Plan, Wessex Water 2019
[33] Water Management in Dorset, A Dorset Local Nature Partnership Position Paper, Sept 2017

Our vehicle washes re-use water to cut down on consumption and Cistermisers are fitted to urinal flushes in toilets.

To reduce the impact of flooding and intense rainfall, we have changed practices to help prevent future problems. Where resurfacing work is required, we use CCTV in advance of each scheme to survey drains along each proposed section that is to be surfaced to identify breakages / blockages. We then high pressure jet them out and, if necessary, carry out drain repairs and replacements whilst the road is closed for resurfacing. This is a subtle but very important change in terms of good asset management, as standing water and flooding can cause serious and rapid deterioration in the condition of our road surfaces. It also minimises disruption to road users.

We also carry out grip clearance, which involves digging out culverts at road sides, to ensure there is sufficient capacity to cope with the heavy demand caused by very intense rainfall.

3. THE FUTURE FOR WATER

Water plays a small part in terms of carbon emissions (0.8% UK total) but this will still need to be reduced to zero by 2050, largely through the deployment of renewable energy to provide the power for distribution and treatment. Reducing water usage and wastage, demand for high levels of treated water, and distribution will all have key roles to play in reducing this energy demand.

In addition, climate change will affect the availability of water resources and increase risk to water quality. By 2050, further steps will need to be taken, led by the water industry, to significantly reduce demand for water, reduce wastage, and manage water resources in ways that protect them for the future.

In 2017, Waterwise developed and published its water efficiency strategy for the UK. The strategy sets out a blueprint to deliver a vision where all people, homes, and businesses in the UK are water efficient, and where water is used wisely, every day, everywhere. Being water-efficient is using the appropriate amount of water required to carry out the specific task. By improving water efficiency, less water is wasted, and its economic, social, and environmental value is maximised. Water efficiency has an important role to play in the green economy, an inclusive society, and a thriving environment. Water reuse and rainwater harvesting also have a strong role to play in efficient urban water management[34].

It is possible to achieve an average household consumption of between 50 and 70l per head, per day in 50 years, without a reduction in the level of utility or quality of water use. However, this will require greater awareness of water scarcity issues in the UK and stronger leadership at all levels[35]. We will need to change the way that we use water and use the latest technology to reduce demand in our homes and businesses. Industry will also need to continue to implement steps to develop more water saving appliances. Smart metering is one of the strongest tools available to reduce consumption and can help to reduce consumption by 17% on average.

[34] Water Efficiency Strategy for the UK, Waterwise, June 2017
[35] The long term potential for deep reductions in household water demand, Artesia Consulting for OFWAT, 26th April 2018

By 2050, we could see more community level water systems, which will consist of low quality (non-potable water) supplied, either via mains or sourced locally, and treated by end of tap or community level packaged treatment. Bulk supply of potable water may also be the most sustainable option. Local sources of water will be used for low quality applications, as will rainwater, grey-water, surface water, and water contained in SuDS. Local processing will be powered by micro-generation of electricity[36].

The industry will need to improve leakage detection and repair, including platelet technology (self-healing pipes) and structural linings. The demand of water distribution will be reduced through approaches such as pump optimisation, low friction linings, and pressure reduction systems.

In terms of wastewater, it is envisioned that there will be a reduced load in sewers as a result of incentives to recycle carbon sources such as food waste, the banning of macerators, and adoption of SuDS on development sites. Water and sewerage companies will place more emphasis on waste minimisation and working with industry to remove non-biodegradable materials from sewers[37].

Vast amounts of water are used to produce consumer goods. For example, 1kg of beef uses 15,415 litres and 1kg of chocolate requires 17,196 litres, while a cotton t-shirt takes 3,241 litres and a mobile phone 1,091 litres to manufacture. Our total water footprint is therefore much greater than the water we use at home and work, and to reduce our 'virtual water footprint' we will need to carefully consider our purchasing options. These impacts are felt at a global scale, with much of the impact being felt in those countries hardest hit by water shortage[38].

4. ISSUES

- Regulation is insufficient. Developer education and reduction in scheme spend are potential game changers
- Housing growth pressures versus sustainable drainage solutions. Encourage early dialogue with the Planning system to get best out of sites
- Adequate staffing levels in the flood risk management arena to deal with increase in rainfall, housing growth, and promotion of adequate sustainable drainage solutions
- Benefit to cost ratios of to 8:1 or higher can be achieved in the provision of flood alleviation schemes
- Managing impacts of coastal erosion from the sea to vulnerable coastal communities
- While Building Control can regulate the performance of new developments, there are numerous older buildings that might not minimise water consumption or have drainage systems that will accommodate the increased rainfall predicted with climate change

[36] Evidence: A Low Carbon Water Industry in 2050, Report SC070010/R3, Environment Agency, 2009
[37] Evidence: A Low Carbon Water Industry in

2050, Report SC070010/R3, Environment Agency, 2009
[38] 2050 – the year by which many areas of England could run out of water, Sustainable Dorset; https://www.sustainabledorset.org/fresh-water/

- Building Control can ensure water calculations meet the expected standard, but have no power to prevent water conservation measures being replaced by more water intensive fittings and equipment
- Planning conditions may set higher standards than Building Regulations require, but these would not be checked by the Building Control team
- The partial privatisation of the Building Control sector has resulted in competition for business, with customers choosing the lowest cost option, achievable by stripping back the level of supervision and resulting in a "race to the bottom" (Dame Judith Hackett)
- Water reduction is heavily reliant on behaviour change by both residents and businesses
- Step up in the deployment of water saving measures in the home and work is required
- Most of the action is required at an industry level
- Less than half of the rivers of Dorset are considered 'good' water quality under current European standards
- Despite greatly improved waste water treatment, diffuse nutrient pollution from agriculture remains a major problem in the coastal and marine environment. It causes algal blooms and can lead to widespread oxygen depletion[39]. The adoption of Natural Flood Management techniques in the upper parts of drainage catchments can help offset surface water run-off (quantity and quality) from rural land
- Anything that is produced by industry – and that includes the food and farming industries – uses huge amounts of water.

  One almond takes 4.5 litres to grow

  One avocado uses 273 litres of water to grow

  One cell phone takes 1,091 litres to manufacture

  One cotton t-shirt takes 3,241 litres to produce1

  1 kg of beef uses 15,415 litres

  1 kg of chocolate consumes 17,196 litres1.

[39] Europe's seas and coasts, EEA; https://www.eea.europa.eu/themes/water/europes-seas-and-coasts/europes-seas-and-coasts/#interesting-facts

5. OBJECTIVES

- Reduce water demand
- Reduce use of mains water
- Reduce wasted water
- Protect water supplies
- Increase resilience to climate change
- Reduce flood risk to properties (existing and new)
- Increase uptake of SuDS solutions for new development.

6. OPPORTUNITIES

- Lead by example by reducing water usage on the Dorset Council estate as an integral part of 'zero carbon buildings' retro fit programme (see Buildings), as a proactive approach to identifying any key water intensive operations. This is as well as ensuring that any new builds on our own land employ the highest water efficiency standards and management techniques.

- Encourage developers working in Dorset to employ the latest water conservation technologies to reduce demand through the planning / building control process.

- Work with business organisations including Wessex and South West water companies and the Environment Agency to encourage and support businesses to reduce water use and wastage.

- Develop and promote case studies of best practice in terms of water resource management, protection, and water ecology.

The opportunities of decarbonising water in Dorset have a number of additional benefits, including:

- Reduced water bills for the Council
- Reduced water bills for residents and businesses
- Prevention of water shortages during dry periods
- Ensuring clean potable water for Dorset residents.

Case Study: Dorset Wild Rivers

The Dorset Wild Rivers Project is a major river and wetland restoration project that takes a collaborative catchment based approach. It is led by Dorset Wildlife Trust and focuses on the Frome and Piddle Valleys and the chalk stream tributaries of the Dorset Stour Valley. The Dorset Wild Rivers project can help farmers and landowners address riparian land management issues and identify opportunities for habitat restoration or creation, as well as delivering in-river habitat enhancements and water quality improvements. This can benefit both aquatic plants and animals and will deliver Water Framework Directive targets.

A number of priority species will also receive particular attention, including White Clawed Crayfish, Water Vole, Otter, Salmon and Brown Trout. This represents a collaborative approach to reducing the decline of wetland biodiversity.