

Green Bond Impact Report 2019

Anglian Water Services Limited



Green Bond summary 2019

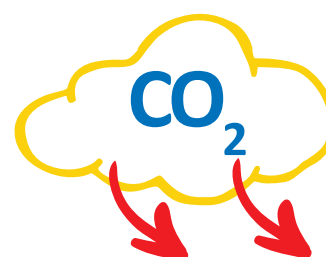
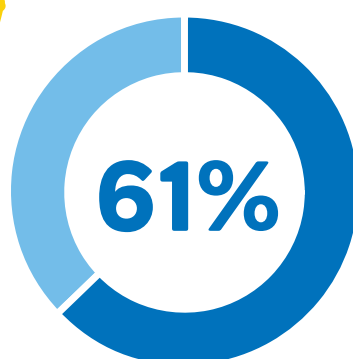
£811m
total funding for
Green Bond projects

c. 850 
green projects
funded by Green Bonds

Reduction in CO₂
160,736(eT)



61% CO₂ reduction
from 2010 capital
carbon baseline



Actual CO₂
102,212 (eT)



Five environmental objectives:

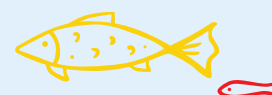
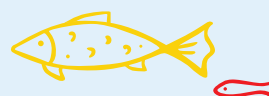
Climate change
mitigation

Climate change
adaptation

Biodiversity
conservation

Pollution prevention
and control

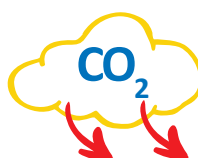
Natural resource
conservation



Impact of £1m investment:



£ efficiency
£326k



Capital carbon reduction
(CO₂)

95.78 (eT)

*As at 28 June 2019

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Our purpose is to bring environmental and social prosperity to the region we serve through our commitment to Love Every Drop



Securing long-term access to clean water supplies is one of the most pressing global challenges today, and one that we are tackling head on at Anglian Water, where we operate in one of the driest, yet fastest growing and most economically important regions of the UK.

We have a huge responsibility to clean water to the highest standards, deliver it to millions of homes and businesses

and recycle it safely, while caring for our communities, protecting and enhancing our environment and strengthening our region's resilience to climate change.

That sense of responsibility is central to the way we do business. Anglian Water is a sustainability leader and an innovator in areas including reducing carbon, reducing leakage, encouraging water efficiency, long-term water resource planning and environmental stewardship.

We made history in 2017 when we became the first ever public utility to launch a Sterling Green Bond, and we are very proud that all our capital activity meets the strict environmental criteria set for Green Bond investment.

With five Green Bonds now in operation and a sixth due to draw down in 2020, we are leading the way in green financing.

Our investors recognise that running our business sustainably, with long-term resilience in mind, isn't just the right thing to do, but makes good business sense too.

This year we have taken very significant steps to formalise our way of operating and enshrine our purpose into our company's constitution.

With the support of our shareholders, we have changed the Articles of Association of Anglian Water to lock consideration for the environment and our communities into the decisions our business will make for generations to come, alongside the need to deliver fair returns on investment.

“We are the first water company - and, we believe, the first utility company - to take such a significant and symbolic step to demonstrate our commitment to working in the public interest.”



Peter Simpson, CEO
Anglian Water



Steve Buck, CFO
Anglian Water

We are the first water company - and, we believe, the first utility company - to take such a significant and symbolic step to demonstrate our commitment to working in the public interest. And it doesn't stop there: we will shortly launch our social and environmental contract, developed with our customers, to set out how we will deliver on that purpose.

We are proud to work with investors who share our values and our commitment to building a sustainable future for our region and our communities, both now and in the generations to come.

“We made history in 2017 when we became the first ever public utility to launch a Sterling Green Bond, and we are very proud that all our capital activity meets the strict environmental criteria set for Green Bond investment.”



Net zero carbon

Anglian Water is committed to reaching net zero carbon by 2030 - an ambitious goal set collectively with our colleagues across the water industry as part of the Public Interest Commitment made in April 2019.

Yet our own journey to net zero carbon began many years ago, in recognition of the part we can play in addressing the effects of climate change and the need to make the most of finite resources to provide for a growing population. In 2006 we launched our ground-breaking Energy Initiative which continues to deliver savings of about 5,000 tonnes of CO₂e savings year-on-year. At that time we also started to measure, manage and reduce carbon in everything we do.

We and our supply chain partners are wholly committed to reducing the energy and materials we use to maintain our infrastructure; generating more of our own renewable energy; increasing the efficiency of our equipment; driving out waste and finding uses for the by-products of our treatment processes in pursuit of a truly circular economy.

Our greenhouse gas emission data is measured and reported in line with the environmental reporting guidelines from the Department for Environment, Food and Rural Affairs (Defra), and we follow the principles set out by HM Treasury's Infrastructure Carbon Review to release the value of low carbon solutions in how we build and operate.

Over the past financial year, our annual gross operational carbon emissions (audited in June 2019) decreased by 29 per cent in 2018/19 in comparison to the 2014/15 baseline, reducing from 455,335 CO₂ (eT) to 322,201 CO₂ (eT). In total, our design engineers and capital delivery teams have delivered a 58 per cent reduction in capital carbon against our



The Ingoldisthorpe wetland uses a low carbon approach to water treatment

2010 baseline to 2018/19, through a focus on design, materials used and installation and commissioning techniques in construction.

We were the first organisation in the world to be verified against the PAS 2080 standard in Carbon Management in Infrastructure in 2016, retaining our certification for a third consecutive year in 2019, demonstrating that we have the right leadership and governance in place for effective carbon management.

Our leading approach to measuring, managing and reducing both operational and capital carbon continues to deliver considerable financial savings and innovation through our company and supply chain.

Towards a circular economy

We are working towards a circular economy in which we find alternative uses for the materials produced as a by-product of our operations. Properly managed, almost everything can have a use and a value.

We continue to strive for zero waste to landfill; our Flag Fen Water Recycling Centre has a new waste hub station enabling the site to achieve this (barring sewage screenings and grit) and will be used as a model across our network.

Perhaps the best example of circular economy thinking in action at Anglian Water is the renewable energy generated by our biogas Combined Heat and Power (CHP) engines from sewage sludge at our water recycling centres.

This year has been one of breaking new ground in CHP performance, with our CHP outputs going above 100GWh for the first time, and on track to reach 120GWh by year end 2020 - enough to power 50,000 homes for 100 days.

Our CHP output is also key to the success of an ambitious new partnership project with Oasthouse Ventures and Green Capital to build two of the UK's largest greenhouses, one in Suffolk, the other in Norfolk.

When built, they are expected to deliver 12% of the UK's tomato supply -

all grown using renewable waste heat from Anglian Water treatment facilities, dramatically reducing the output's carbon footprint. An added benefit of the scheme is that the water that is then returned to our region's rivers and streams is cooled, removing excess heat from river systems.



CHP Plant, Great Billing.

Climate-related financial disclosures

Anglian Water is one of the biggest energy users in the East of England and operates in a region that is particularly vulnerable to climate change. This has informed the development of our integrated business and sustainability strategy, Love Every Drop.

We fully support the Task Force on Climate-related Financial Disclosures (TCFD) and are committed to ensuring our climate change disclosures align with TCFD recommendations. The Task Force defines organisations as either ‘financial’ or ‘non-financial’ and provides guidance as to the minimum recommended disclosures for each group. Anglian Water is similar to organisations described in the non-financial sector. As such, in reporting we have followed both the general guidance and the supplementary guidance for non-financial groups.



2018/19 highlights

- Implemented a new process for assessing the climate resilience of our investments.
- Consultations on our Water Resources Management Plan demonstrated that the majority (71 per cent) of our customers support investment to ensure resilience to climate change and to futureproof our water supplies against future needs.
- Accepted the Government’s invitation to prepare an Adaptation Report under the third round of the climate change adaptation reporting power.
- On track to exceed a 7 per cent reduction in real terms in gross operational carbon by 2020 from a 2015 baseline.
- Invited by the Committee on Climate Change to participate in the preparation of their next Evidence Report to support the UK’s third Climate Change Risk Assessment.
- Reduced capital carbon in the new assets we built by 58 per cent as compared to a 2010 baseline.
- Held a workshop with over 25 senior leaders from across our business to reassess climate risk and agree on further action.
- Continued to provide national leadership on climate change through groups including The Prince of Wales’s Corporate Leaders Group, the Prince’s Accounting for Sustainability Project and the Green Construction Board.

Our full TCFD disclosure is available at www.anglianwater.co.uk/climatechange and has been summarised below:

Governance



Our Board has effective oversight of climate-related risks and opportunities. Climate-related risks are included within Anglian Water's top-tier risk register. This is reviewed regularly in detail by the Board.

Short-, medium- and long-term targets have been agreed by the Board, and members of the Board chair the groups responsible for reducing carbon emissions and adapting to climate change.



Strategy

In 2016 we committed to become a carbon neutral business by 2050. In 2019 we committed, together with all water companies in England, to be a net zero carbon business by 2030, as part of the industry-wide Public Interest Commitment. Our energy and carbon strategy is reducing transition risk and unlocking financial efficiencies.

We have submitted two Adaptation Reports to the Government and are in the process of drafting our third. Our most significant physical risks are droughts and flooding. These are being effectively mitigated through collaboration and our long-term plans, which consider more than one climate change scenario.

Risk management



Climate-related risks are identified and assessed during the preparation of our Adaptation Reports.

Risks are also identified and managed through the preparation of long-term plans and the delivery of individual investments. The assessment and management of climate-related risks is consistent with the approach used to manage risk throughout the business.

Metrics and targets



Our Greenhouse Gas Report is published on our website. In it we report Scope 1, 2 and 3 greenhouse gas emissions and have short-, medium- and long-term emission reduction targets. Since 2011 our emissions have been measured, managed and reduced in accordance with ISO 14064. We also have targets to reduce climate-related risks such as drought and flooding.

Driving out leakage



Hydrophone installation in Lincoln by Senior Leakage Technician Daniel Hewitt

The battle to reduce leakage from the UK's vast – and in many cases ageing – water infrastructure has been one of the industry's biggest challenges since it was privatised in 1989. Given the need to ensure a sustainable supply of clean water in the face of climate change and population growth, the impetus to stamp out avoidable loss of water from our networks has never been greater, and leakage remains our customers' top concern.

Anglian Water is an industry leader in leakage reduction. Since privatisation, we've reduced leakage by a third across our 38,000km network, and it is now at record low levels - around half the national average based on the amount of water lost per kilometre of water main.

We are on target to exceed the leakage performance targets set by our regulator for a ninth year running and have set ourselves a new challenge for the next five years to 2025: to reduce leakage by a further 22%, which will take us to world-leading levels.

Our work on leakage is driven by constant innovation, with recent developments including our award-winning Integrated Leakage and Pressure Management System. It brings together more than 30 detailed data sources to process more than a billion data points, enabling us to monitor our water network via a simple graphical platform in near real time. We are creating a smart water network which blends the latest diagnostic technology with constant monitoring, with the goal of delivering a 'calm' network, as well as the ability to predict and fix potential leaks before they happen.

As an exemplar of best practice, we have also been chosen to lead our industry's collective efforts on leakage, together with Portsmouth Water and Affinity Water, as co-sponsors of the industry-wide Public Interest Commitment on leakage, which has set the ambitious goal of tripling the rate of sector-wide leakage reduction by 2030.

Six capitals

At Anglian Water we have always recognised our responsibility to the communities we serve and our environment. For several years our approach to sustainability has been informed by the six capitals approach.

Since 2015 we have recognised this in our Annual Integrated Report and accounts and illustrated how the capitals - Natural, Social, People, Manufactured, Financial and Intellectual - are at work in delivering our Business Plan.

We are recognised nationally for our work on natural and social capital in particular (most notably through the award of Business in the Community Responsible Business of the Year in 2017), and we continue to shape the debate on the role of a responsible business today. We are currently driving the development of Natural Capital East, a regional multi-sector approach to assessing natural capital in strategic planning and decision making.

This year, we have taken very significant steps to crystallise our purpose as an organisation, enshrining social and environmental considerations at the heart of our company constitution (see page 4).

Our Board has committed to use six capitals as the framework through which we will embed this approach into all investment decisions made.

For each of the capitals, a set of metrics has been defined to help us understand, track and report externally at a corporate level how we materially affect six capitals. We have also identified key metrics to embed in decision making across the business for investments, purchasing, strategic and operational decisions.

Using the six capitals lens will support our commitment to working in the public interest, helping decision makers to keep our obligations to communities and the environment at the front of their minds alongside considerations of delivering fair returns to our shareholders.



Aligning our goals with the United Nations Sustainable Development Goals

We want to demonstrate how we are contributing to wider societal goals by aligning our activities and the outcomes we deliver to the UN Sustainable Development Goals (SDGs).

We are working in the spirit of all 17 goals, but we have mapped our work to the 10 where we have the most material impact at the level of the targets.


These are currently being reviewed in line with our next five-year Business Plan for 2020-2025.

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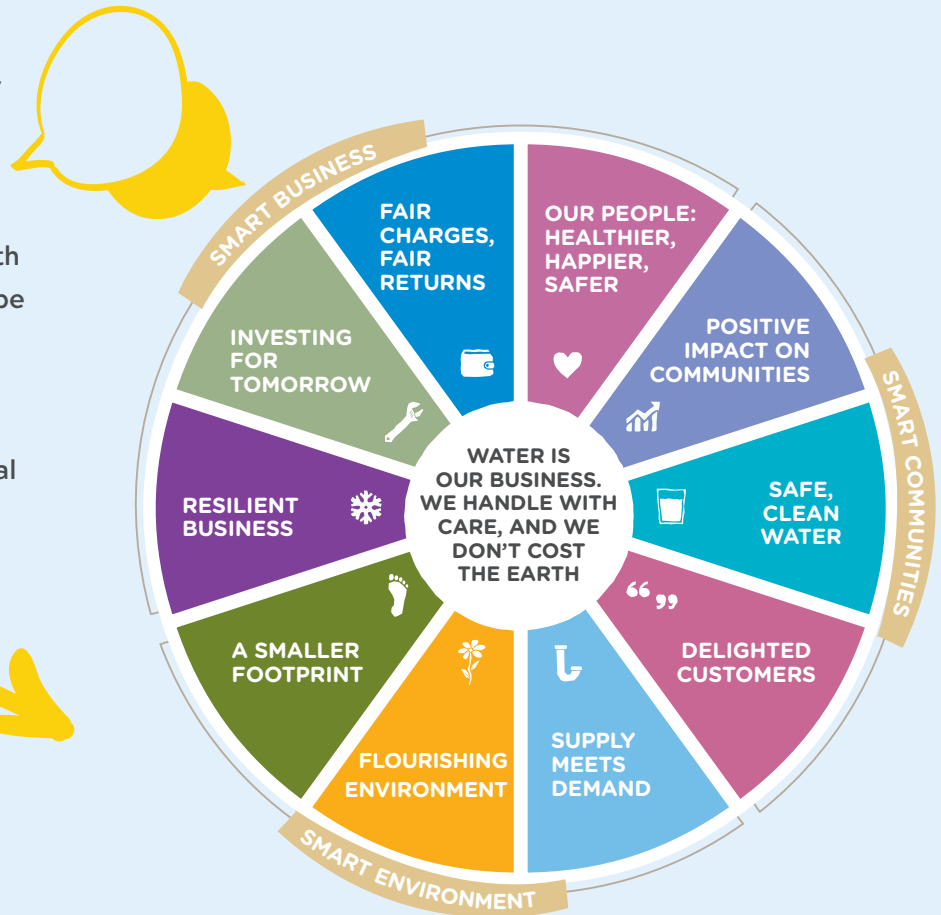
“The SDGs are a fantastic way of showing how our Business Plan for supporting sustainable growth in the East of England can directly contribute to a global movement - it helps us to consider all aspects of sustainability in our decision making.”

Peter Simpson, CEO
Anglian Water

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	 3 GOOD HEALTH AND WELL-BEING	 4 QUALITY EDUCATION	 6 CLEAN WATER AND SANITATION	 8 DECENT WORK AND ECONOMIC GROWTH
Relevance of SDG to our business (proportion of targets that we can directly contribute to)				
Example target of material interest (we have mapped our engagement against the 169 targets under the 17 SDGs)	3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination	4.4 By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship	6.5 By 2030, implement integrated water resources management at all levels	8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation
How the SDG target aligns to our outcomes	Safe, clean water	Positive impact on communities	Supply meets demand	A smaller footprint

Our Love Every Drop strategy is guided by the things our customers have told us are important to them. Our 10 outcomes were developed with customers in 2013 and describe the future we are working towards. We refreshed them in 2017 to stretch ourselves further and reflect how central our people are to delivering everything we do.



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE	11 SUSTAINABLE CITIES AND COMMUNITIES	12 RESPONSIBLE CONSUMPTION AND PRODUCTION	13 CLIMATE ACTION	14 LIFE BELOW WATER	15 LIFE ON LAND
9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all	11.7 By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities	12.8 By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature	13.2 Integrate climate change measures into national policies, strategies and planning	14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution	15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species
Investing for tomorrow	Positive impact on communities	Positive impact on communities	Investing for tomorrow	Flourishing environment	Flourishing environment

Use of Green Bond funds

All capital expenditure follows Anglian Water's AMP6 (2015-2020) Governance Framework and is subject to BSI (British Standards Institute) PAS2080 verification. This is a standard launched by the Green Construction Board to encourage a consistent approach to the management of carbon by all involved in infrastructure. It sets out principles and components to manage whole life carbon emissions and deliver reduced carbon over the whole value chain.

Accordingly, all capital expenditure which Anglian Water undertakes is capable of being an eligible green project for inclusion in an eligible green project category, outlined in the Green Bond Principles, being related to: "sustainable water and wastewater management including sustainable infrastructure for clean and/or drinking water, wastewater treatment, sustainable urban drainage systems and river training and other forms of flooding mitigation".

The Anglian Water Green Bond Framework has been reviewed by DNV GL which has issued a Second Party Opinion. We also engaged DNV GL to perform limited assurance in accordance with ISAE 3000 (revised) standard on 'Reduction in CO₂ (eT)' key performance indicator disclosed on pages 15, 16 and 17 of this Green Bond Impact Report. DNV GL's full assurance report, including their conclusions and summary of work, can be found on our website:

anglianwater.co.uk/investor-information

In 2017 we became the first European utility company to issue a sterling Green Bond. The £250 million, eight-year bond will mature in August 2025 with a return to investors of 1.625 per cent. Since the successful launch of that debt transaction, we have raised a further £563 million of Green Bonds from investors in the UK and United States in accordance with the Green Bond Principles 2018.

The investments financed through this debt are expected to save or avoid 160,736 tonnes of carbon. Funds will be transferred out of the Capex bank account as expenditure is

undertaken. Anglian Water will maintain a buffer of additional Green Bond projects over the Green Bond proceeds with additional collateralisation of circa 30 per cent.

Eligible Green Bond projects

Sustainable water management projects with a reduced climate footprint:

- Capital maintenance
- Enhanced service level
- Growth (supply demand)
- Quality

Sustainable water recycling projects with a reduced climate footprint:

- Capital maintenance
- Enhanced service level
- Growth (supply demand)
- Quality



Our Green Bond portfolio

Cumulative eligible green projects in the eligible green portfolio as at 28/06/2019 are summarised in the following table:

Eligible green projects	Sustainable water management	Sustainable water recycling	Total £m
Quality	51.478	194.056	245.535
Capital maintenance	168.616	224.730	393.346
Growth (supply demand)	78.723	158.497	237.220
Enhanced service level	49.938	21.899	71.837
Grand total	348.76	599.183	947.939
Spend financed to date			718.399
Net proceeds			811.216
2010 Baseline CO ₂ (eT)	Actual CO ₂ (eT)	Reduction in CO ₂ (eT)	Reduction in CO ₂ (%)
262,887.33	102,212.03	160,735.50	61% from 2010 capital carbon baseline

£250m 1.625% Green Bond maturing 10 August 2025 ISIN: XS1659112616

c.200 green projects funded by the Green Bond

Eligible green projects	Sustainable water management	Sustainable water recycling	Total £m
Quality	21.308	82.452	103.759
Capital maintenance	47.461	60.178	107.638
Growth (supply demand)	42.598	40.063	82.660
Enhanced service level	21.762	7.684	29.446
Grand total	133.128	190.376	323.504
Spend financed to date			248.6423
Net proceeds			248.643
2010 Baseline CO ₂ (eT)	Actual CO ₂ (eT)	Reduction in CO ₂ (eT)	Reduction in CO ₂ (%)
131,506	52,653.33	78,899.56	60% from 2010 capital carbon baseline

Impact of £1m investment:



£ efficiency

£514k



Capital carbon reduction

317.32(eT)

£300m Green Bond issue maturing 26 October 2029 ISIN: XS1895640404

c.300 green projects funded by the Green Bond

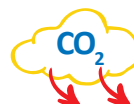
Eligible green projects	Sustainable water management	Sustainable water recycling	Total £m
Quality	10.105	50.589	60.695
Capital maintenance	88.650	85.082	173.732
Growth (supply demand)	23.549	83.305	106.854
Enhanced service level	8.347	7.971	16.317
Grand total	130.651	226.947	357.598
Spend financed to date			272.700
Net proceeds			296.649
2010 Baseline CO ₂ (eT)	Actual CO ₂ (eT)	Reduction in CO ₂ (eT)	Reduction in CO ₂ (%)
64,074.48	24,680.22	39,408.48	62% from 2010 capital carbon baseline

Impact of £1m investment:



£ efficiency

£43k



Capital carbon reduction

132.85(eT)

£150m USPP Green Bond issue maturing 6 February 2029 £85m USPP ISIN: GB00BH-0PB92 £25m USPP ISIN: GB00BH0PBK08 \$53m USPP ISIN: GB00BH0PBL15

c.100 green projects funded by the Green Bond

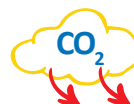
Eligible green projects	Sustainable water management	Sustainable water recycling	Total £m
Quality	7.482	30.774	38.256
Capital maintenance	8.900	21.394	30.294
Growth (supply demand)	2.329	20.615	22.945
Enhanced service level	17.013	1.180	18.192
Grand total	35.724	73.963	109.687
Spend financed to date			81.200
Net proceeds			150.067
2010 Baseline CO ₂ (eT)	Actual CO ₂ (eT)	Reduction in CO ₂ (eT)	Reduction in CO ₂ (%)
37,938.30	13,998.61	23,940.69	63% from 2010 capital carbon baseline

Impact of £1m investment:



£ efficiency

£304k



Capital carbon reduction

159.53(eT)

£65m USPP Green Bond issue maturing 16 April 2029 ISIN: N/A

c.100 Green projects funded by the Green Bond

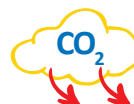
Eligible green projects	Sustainable water management	Sustainable water recycling	Total £m
Quality	1.782	28.601	30.383
Capital maintenance	12.410	28.103	40.513
Growth (supply demand)	1.333	11.208	12.541
Enhanced service level	1.948	4.837	6.785
Grand total	17.473	72.749	90.221
Spend financed to date			65.000
Net proceeds			65.000
2010 Baseline CO ₂ (eT)	Actual CO ₂ (eT)	Reduction in CO ₂ (eT)	Reduction in CO ₂ (%)
20,894.83	7,278.00	13,616.83	65% from 2010 capital carbon baseline

Impact of £1m investment:



£ efficiency

£445k



Capital carbon reduction

209.49(eT)

¥7bn Green Bond issue maturing 20 June 2039 ISIN: XS2010166572

C.100 green projects funded by the Green Bond

Eligible green projects	Sustainable water management	Sustainable water recycling	Total £m
Quality	10.801	1.641	12.442
Capital maintenance	11.195	29.974	41.169
Growth (supply demand)	8.915	3.306	12.221
Enhanced service level	0.869	0.228	1.097
Grand total	31.780	35.149	66.929
Spend financed to date			50.857
Net proceeds			50.857
2010 Baseline CO ₂ (eT)	Actual CO ₂ (eT)	Reduction in CO ₂ (eT)	Reduction in CO ₂ (%)
8,473.80	3,602.86	4,870.94	57% from 2010 capital carbon baseline

Impact of £1m investment:



£ efficiency

£326k



Capital carbon reduction

95.78(eT)

Featured projects

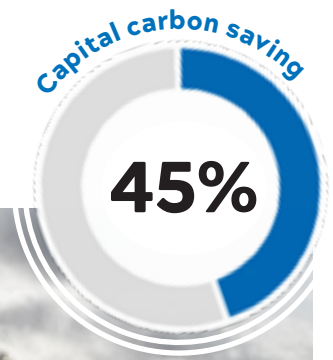
The project categories contribute to five environmental objectives:

1. Climate change mitigation
2. Climate change adaptation
3. Natural resource conservation
4. Biodiversity conservation
5. Pollution prevention and control

We are mapping our contribution to the United Nations Sustainable Development Goals (SDGs) – see pages 12 and 13 for further details.

		Capital Maintenance	Enhanced Service Level	Growth	Quality	Environmental Objectives	SDGs
Water Recycling	Broadholme				○	2 3 5	6 9 12 15
	Corby				○	4 5	6 7 9 15
	Cotton Valley	○				1 2 5	7 9 12
	Great Dunmow			○	○	1 2 3	7 9 11 12
	Orchard Close		○			1 3	9 11 13
Water	Cottingham	○				1 2	6 9 12
	Gt Wratting WTW				○	1 5	6 9 11
	Hartlepool Wynyard			○		1 2	6 9 12
	Semer WTW				○	1 3 5	6 7 9

Broadholme



Preparing for population growth

Broadholme Water Recycling Centre, near the Northamptonshire town of Wellingborough, currently serves around 230,000 people. With forecast population growth of around seven per cent over the next 10 years, a significant increase in capacity was needed to accommodate higher volumes of water which will pass through the centre.

The quality of the water discharged from Broadholme is crucial to the sustainability of the neighbouring Upper Nene Valley Gravel Pits Site of Special Scientific Interest, a nationally important site which is home to more than 40 species of birds, including the largest nesting colony of grey heron in Northamptonshire. A key element of the scheme is to better equip the centre to remove ammonia, supporting water quality.

The solution agreed for the site was a combination of new equipment – including new, larger washpactors, which screen raw sewage, and new centrifuges – and repurposing of existing assets, including new cabling, new pumps and new control panels.

Sustainability and carbon reduction were key to the delivery of the scheme: existing assets were maximised and repurposed wherever possible to minimise construction and reduce emissions, allowing the site to gain capacity without the need for extra buildings. Notably, this is also the first project of its type to send zero construction waste to landfill.



Capital carbon saving: **755.59 CO₂ (eT) (45%)**

Total project spend: **£7.5m**

Efficiency saving: **£7.3m (49%)**

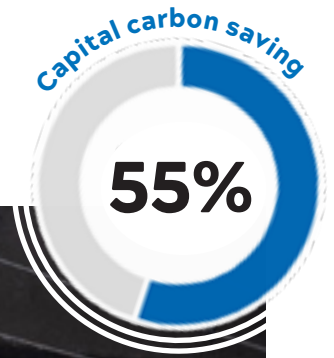
Population growth capacity: **17,000**

Volume of additional wastewater processed: **2,869m³/day**

All site waste to be composted or recycled

Vitally important to maintaining biodiversity in SSSI

Operational water consumption saving: **63,922.68 H₂Oe m³/year (93%)**



Driving efficiencies through low carbon solutions

Our treatment centre at Corby in Northamptonshire treats up to 505 litres of water per second, using what is known as the Kaldness treatment process – a biological process which uses bacteria growing on small pieces of plastic housed in a series of towers to break down sewage. One of the natural by-products of sewage is ammonia, which needs to be removed from the water before it can be returned to supply. This project came about because of a need to reduce ammonia levels at the site from 3mg/l to below 1mg/l.

The original plan for the site was to introduce a membrane bioreactor, a piece of equipment which combines microfiltration with a biological wastewater treatment process known as the activated sludge process. This would be effective but expensive, at a cost of £20 million, and would have meant introducing significant carbon-heavy infrastructure. Instead, the decision taken for Corby was to increase the lifespan of existing assets, refurbishing equipment to run more efficiently – including energy-efficient motors and blowers – and to build an additional Kaldness tower.

The scheme will also safeguard long-term resilience and sustainability by using digital enhancement to deliver an intelligent

optimised operating regime, as well as enabling a number of processes to be automated, reducing ongoing operational costs. The resulting programme of work has cost significantly less than half of the original planned expenditure and reduced capital carbon by 55 per cent. Biodiversity has also been safeguarded, for example by preserving a grass area which is a habitat for bee orchids.

Thanks to the success of the project at Corby, learnings from the new processes and solutions implemented there will be implemented in future projects, enabling further efficiencies across the investment portfolio.



Capital carbon saving: **655.00 CO₂ (eT) (55%)**

Total project spend: **£6.9m**

Efficiency saving: **£13m (65%)**

Treats up to 505 litres of water per second

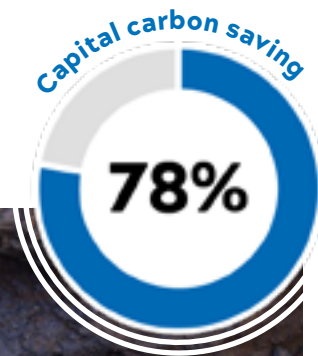
Ammonia levels reduced

Bee orchids found and protected on site

Embodied water consumption saving: **12,390.81 H₂Oe M3 (99%) reduction (from 12,478.55 to 87.739)**

Operational water consumption saving: **22,171.32 H₂Oe m3/year (99%)**

Cottingham



No-dig approach reduces carbon footprint

The cast iron water mains in Cottingham, near Corby in Northamptonshire, has burst 14 times over the last six years, which has led to low pressures and supply interruptions to more than 70 properties.

A range of factors has led to the bursts, including ground movement, the type of ground and the ageing cast iron material, combined with high pressure in the system. Pressure management is not possible in this area due to its topography.

While this a relatively small project when considered in isolation, the 'no dig' approach used at Cottingham demonstrates our innovative approach to carbon reduction and leakage.

In 2005 the average main replacement used a 95 per cent 'open cut' approach, which involves excavating around the main, laying the replacement pipes and backfilling the resulting hole. This is a carbon-heavy process, producing carbon emissions related to excavation, transportation and backfill, which is typically carried out with new material rather than simply replacing what was excavated.

Two of the methods used were sliplining and pipe bursting.

Sliplining (shown above) is the installation of a smaller, 'carrier pipe' into a larger 'host pipe'. The space between the two pipes is then grouted and the ends are sealed.

Pipe bursting is a limited/no dig pipe replacement method which is both quicker and cheaper than traditional open cut methods. Equipment is introduced into the ground through an insertion pit and then an expander head is pulled through by a machine at a receiving pit at the other end, breaking the old pipe into many small pieces and pushing the pieces into the surrounding soil. The new pipe is pulled in behind the expander, replacing the line in one single action.

In addition to the financial benefits of the no dig approach used, all trenchless techniques cause far less traffic disruption and significantly reduce carbon footprint by minimising site plant and traffic as well as also greatly reducing the use of backfill material.



Capital carbon saving: 189.00 CO₂ (eT) (78%)

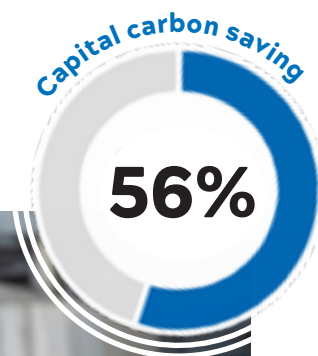
Total project spend: £707,000

Efficiency saving: £50k (13%)

70% no dig

Embodied water consumption saving: 635.03H₂Oe m³ (90%)

Cotton Valley



Generating power from waste

Anglian Water's Cotton Valley Sludge Treatment Centre in Milton Keynes serves more than 300,000 customers, and produces valuable renewable energy from the sewage processed at the site. With the area's population growing, greater sludge treatment capacity was needed, and an opportunity was identified to significantly increase the site's energy output. The solution chosen for Cotton Valley is to construct an additional digester - a large tank which uses the process of fermentation to break down sewage to produce biogas - along with an additional cooling tower and heat exchanger.

The increase in capacity at Cotton Valley will enable the site to process 25,000 tonnes of dry solids per year; increasing the levels of organic destruction and therefore significantly increasing the amount of biogas produced. This additional gas will be used in the onsite Combined Heat and Power units to increase the amount of renewable energy generated. Once the project is complete, the plant will be able to deliver 0.9MWh renewable energy per tonne of dry solids - reducing carbon emissions and turning waste into power.

The vast majority of the renewable power generated at Cotton Valley is used to run the adjacent water recycling centre. The site is also eligible for renewable incentives which, when combined with the power savings and income from the exported power, is worth over £2 million. Self-generation of renewable energy is also one of the most significant ways in which Anglian Water is reducing its carbon emissions. The increase at this and other sites will contribute towards the company's goal to achieve net zero carbon by 2030.



Capital carbon saving: **40.93 CO₂ (eT)** (56%)

Total project spend: **£5.6m**

Efficiency saving: **£668k (12%)**

Renewable energy generation: **0.9MWh per tonne dry solids**

Digestion capacity increased to **25,000 tonnes of dry solids per year**

Embodied water consumption saving: **223.86 H₂Oe m³ (64%)**

Great Dunmow



Space-saving solution powers growth in capacity

The market town of Great Dunmow, near Braintree in Essex, has seen growth of 26% since 2001, a rate of growth which is already placing a strain on current infrastructure. With a further 9,000 new homes planned as part of the Easton Park development, it was clear that greater capacity was needed at Anglian Water's water recycling centre in the town. The centre also needed to adapt to meet challenging new standards for ammonia, reducing the levels in water discharged from the centre from 5mg/l to 3mg/l, and phosphorus (from 6mg/l to 2mg/l).

The Great Dunmow site already contained an operational works and a previous water recycling works which was replaced in the early 1990s. The key challenges facing the design team were how to reuse the site as efficiently as possible and how to deliver the upgrade swiftly. Space constraints meant that the use of a conventional activated sludge process was not feasible, so a new solution was needed.

Using detailed 3D modelling, a combination of offsite construction and the use of a new biological water recycling treatment technology known as the Nereda process – made it possible to reuse the existing site

while minimising its footprint. The Nereda process, originally developed at the University of Delft in the Netherlands, and trialled at Anglian Water's Innovation Shop Window in Newmarket, is both sustainable and cost-effective. It requires only a quarter of the area of conventional activated sludge installations and the process itself can reduce energy costs by up to 50 per cent, creating high purity output and operating largely without the use of chemicals. This is only the second water recycling centre in the UK to feature a Nereda installation, and a great example of Anglian Water and its supply chain working together to solve challenges at speed while making choices which benefit the environment. The project was awarded Best Use of Technology for Carbon Reduction by New Civil Engineer.



Capital carbon saving: **68.00 CO₂ (eT)** (34%)

Total project spend: **£14.5m**

Efficiency saving: **£3.6m (31%)**

Embodied water consumption saving: **704.50H₂Oe M3 (82%) reduction (from 859.73 to 155.226)**

Operational water consumption saving: **11,307.74H₂Oe m3/year (71%)**

Great Wratting



Creating resilience

The 30,000 customers living in the town of Haverhill in Suffolk are currently only supplied from the existing water treatment works at Great Wratting. To provide resilience to the supply, and also enable further treatment and blending of water from the source boreholes at Wixoe and Kedington to ensure a high-quality water supply, Anglian Water is adding UV treatment to the Great Wratting works, building a new water treatment works next to the borehole at Kedington and laying new connecting pipelines to the storage reservoirs.

The combined infrastructure and non-infrastructure elements of the project are due for completion in March 2020 and will deliver a combined carbon reduction of 3,568eT - a reduction of 70% compared to the 2010 baseline. The new water treatment works at Kedington will have a capacity of 8.5 mega litres per day and is designed to work alongside the existing works. Innovative techniques were used in the design and are being used in the construction, largely involving digital technology. The entire works has been 3D modelled, which means all aspects can be reviewed using virtual reality, not only by the engineers and suppliers but also by the teams who will be responsible for maintaining the

works once completed. The 3D modelling of the design has also enabled changes to be made before construction.

Extensive offsite build techniques have also been used, minimising time on site for specialist teams. For example, the entire filter system and control modules could be dry tested offsite by the manufacturer before being delivered to site in ready-to-assemble sections. This meant not only minimising carbon and costs of transport and crane hire but also ensured construction in the safe, controlled environment of the manufacturing supplier.



Capital carbon saving: 3,568.00 CO₂ (eT) (70%)

Total project spend: £17.3m

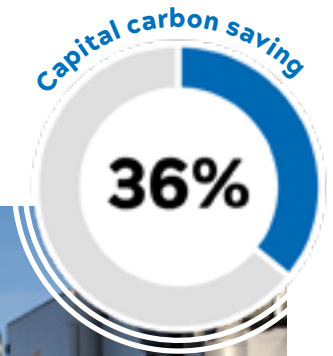
Efficiency saving: £3.9m (22%)

Customers supplied: c. 30,000

Average water throughput: c. 10.5 Ml/d

Embodied water consumption saving:
190,444.03 H₂Oe m³ (42%)

Hartlepool



Securing water supplies for a growing population

This scheme formed part of an £11.3 million water infrastructure project carried out by Anglian Water in and around the town of Hartlepool in County Durham to ensure a secure water supply for generations to come. The project was needed to support housing and economic growth in the area, with hundreds of new homes planned at the new Wynyard development outside the town, resulting in more than 100 jobs being created.

The new facility includes a state-of-the-art filtration system and the first manganese removal plant in the Anglian Water region, to remove trace elements from nearby boreholes and aquifers which supply drinking water to the town and its surrounding villages. Around 32 million litres of water a day - equivalent to 400,000 baths - will be processed daily at the works.

As part of the expansion scheme, two existing mains pipes between Amerston Hall and Wynyard were refurbished and reused using existing infrastructure to save on construction costs and reduce carbon.

Construction methods used at the site were chosen to minimise ecological impact, while a new so-called 'package' pumping station has been installed on site - a complete unit which is specifically designed to be easy to install and maintain.

The overall solution for the site will see a 36% reduction in capital carbon, amounting to a saving of more than 400 tonnes.



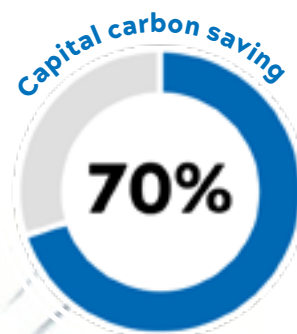
Capital carbon saving: **434.00 CO₂(eT)**
(36%)

Total project spend: **£11.3m**

Efficiency saving: **£1.1m (10%)**

Operational water consumption: **1,743.46 H₂Oe m3/year**

Orchard Close



Sustainable flood alleviation

This project was designed to tackle recurring flooding issues to a small number of properties in the densely populated residential area around Orchard Close in Norwich city centre. Increasingly intense rainfall as a result of climate change has led to the capacity of the sewerage network in the area around Heartsease Lane Pumping Station being exceeded on a number of occasions, with gardens and houses flooding as flows back up along the system.

To tackle the issue, a geo-cellular sustainable drainage system retention tank was installed to remove storm water quickly and effectively, protect it from contaminants and store it until it is safe to release it. The rate of release from the system is carefully controlled to make sure the surrounding land and water can cope with the additional flow.

The scheme also included boosting of the pumping station, while parts of the existing network were used to accept the diverted flows, eliminating the need for new pipes to be installed.

Sustainable drainage systems such as the one installed at Orchard Close make a vital contribution to our work to increase resilience to climate change and prevent flooding and pollution. By replacing hard, impermeable surfaces such as tarmac and paving with green and permeable landscapes, such as rain gardens and tree bowls, water can be soaked up much more slowly, reducing the risk of sewers overflowing and protecting the environment.

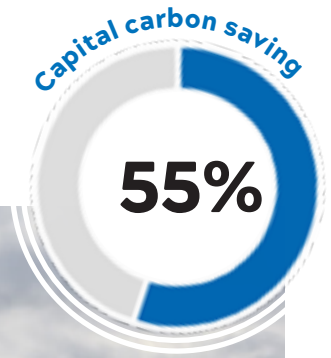


Capital carbon saving: **609.1 CO₂ (eT)**
(70%)

Total project spend: **£1,632,159**

Efficiency saving: **£551,041 (25%)**

Embodied water consumption saving:
24,516.06 H₂Oe m³ (99%)



Low carbon, reducing infrastructure

The small water treatment works at Semer near Stowmarket in Suffolk plays a vital role in the area's water infrastructure - as was made clear when water network management tool Miser was used to simulate the effect of switching off each water treatment works across the Anglian Water network. Semer was one of a small proportion of water treatment works which would create a water deficit if they were taken out of service, with the potential to interrupt supply to just over 2,000 properties.

The project was needed to replace a temporary pumping station at the site, which neighbours a caravan park, as well as removing a noisy diesel generator and its associated carbon emissions.

As part of the solution a new energy-efficient pumping station was installed, along with new power supply and connection to existing water tower telemetry, eliminating the need for back up diesel generators. Instead, a temporary generator can be brought in on the rare occasions it is needed, reducing carbon-heavy permanent infrastructure and enabling a 55% reduction in capital carbon.

Thanks to the solution installed, delivery of the design on site was swift and straightforward - albeit delayed by two weeks to allow the eggs of a nesting robin found at the site to hatch! - and minimal ongoing site supervision is required, further reducing the site's carbon footprint.

The new pumping station will ensure a resilient supply to the residents of Semer for generations to come.



Capital carbon saving: **31.6 CO₂ (eT) (55%)**

Total project spend: **£402,315**

Efficiency saving: **£-13,098 (3%)**

Embodied water consumption: **7,469.701 H₂O e m³**

Ensuring resilience for **2,031 properties**



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