Scottish Water

Trusted to serve Scotland

NET ZERO EMISSIONS ROUTEMAP

WELCOME TO THE

NET ZERO EMISSIONS ROUTEMAP

LET'S GET STARTED

CONTENTS

INTRODUCTION

We are responsible for providing water and waste water services that are essential to everyday life for households and businesses across Scotland; making a critical contribution to the country's health, wellbeing, economic prosperity and natural environment.

But the changing climate will increasingly threaten our ability to deliver these services. We must therefore adapt our approaches, deal with the climate challenges, and secure the future reliability and sustainability of the country's water and waste water services.

While we must adapt our services to deal with climate change, we must also eliminate the greenhouse gas emissions that are contributing to the climate emergency.

"While we must adapt our services to deal with climate change, we must also eliminate the greenhouse gas emissions that are contributing to the climate emergency."

PROGRESS

We have already made good progress in reducing emissions through energy efficiency and generating renewable power, but we must go much further to become net zero by 2040, and beyond that thereafter.

The scale of change ahead is nothing short of transformational. In our Strategic Plan, 'A Sustainable Future Together', I highlighted that Victorian pioneers created the water industry in order to transform the health of the people of Scotland.

Over the next 25 years, we will need to undergo another transformation in the face of a changing climate.

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This is a big challenge because we have a substantial emissions footprint. We consume large amounts of electricity and chemicals to deliver our services, and generate emissions from the wastewater we treat and through our large capital investment programme.

In the Programme for Government 2019, we committed to producing a routemap to take us to net zero emissions by 2040. Developed in conjunction with our Expert Advisory Panel and stakeholders, this routemap sets out how we will lead our industry to create a greater contribution to Scotland's emissions ambition than simply addressing our own footprint.

If we use current accepted carbon accounting practices, it would be relatively straightforward to achieve net zero emissions over the next 20 years. We would look only at operational emissions in our direct control and would overlook activities associated with our capital investment programme, whose emissions are attributed to the supply chain.

With this in mind, we could seek to achieve net zero emissions though reducing our operational emissions and working to provide our electricity through developing further renewable energy on our land.

However, this would completely miss the point. Climate change is an existential threat to the wellbeing of future generations. Pursuing net zero emissions is not primarily about meeting a target, but rather doing everything possible to minimise the emissions associated with our activities and maximising the positive contribution we can make, irrespective of which party accounts for the emissions.

This is why our routemap looks beyond those operational emissions immediately under our control to include all emissions associated with our activities, wherever they are generated.

COMMITMENT

> This is not primarily about meeting a target. Rather, pursuing net zero emissions is about doing everything possible to minimise the emissions associated with our activities and maximising the contribution we can make.

But the routemap does not stop there.

It highlights how we will work to positively generate renewable energy and store away unavoidable emissions, irrespective of where the emissions benefits are accrued; it outlines what we will do to decarbonise our activities as quickly as possible, while continuing to deliver an excellent service to our customers; and it shows how we will break the issue down into what we can control, what we can influence and what technologies we can hopefully adopt.

We will learn as we go, innovating, piloting, discovering what works well and can be scaled economically, and what works less well. To maximise our positive contribution to Scotland's emissions imperative, we do not have enough time to perfect each idea. Instead we will look to continually improve and refine as we progress, mindful of the consequences of our choices.

Each year we will review our progress and update the routemap.

We will work with stakeholders to demonstrate to our customers and communities that their money is being invested wisely as we progress towards net zero emissions. We believe this accountability and transparency is vital when there is no greater threat to our environment and the wellbeing of future generations.

RESULTS

Our greatest responsibility is to manage Scotland's public water and waste water systems, providing our customers with reliable and resilient services.

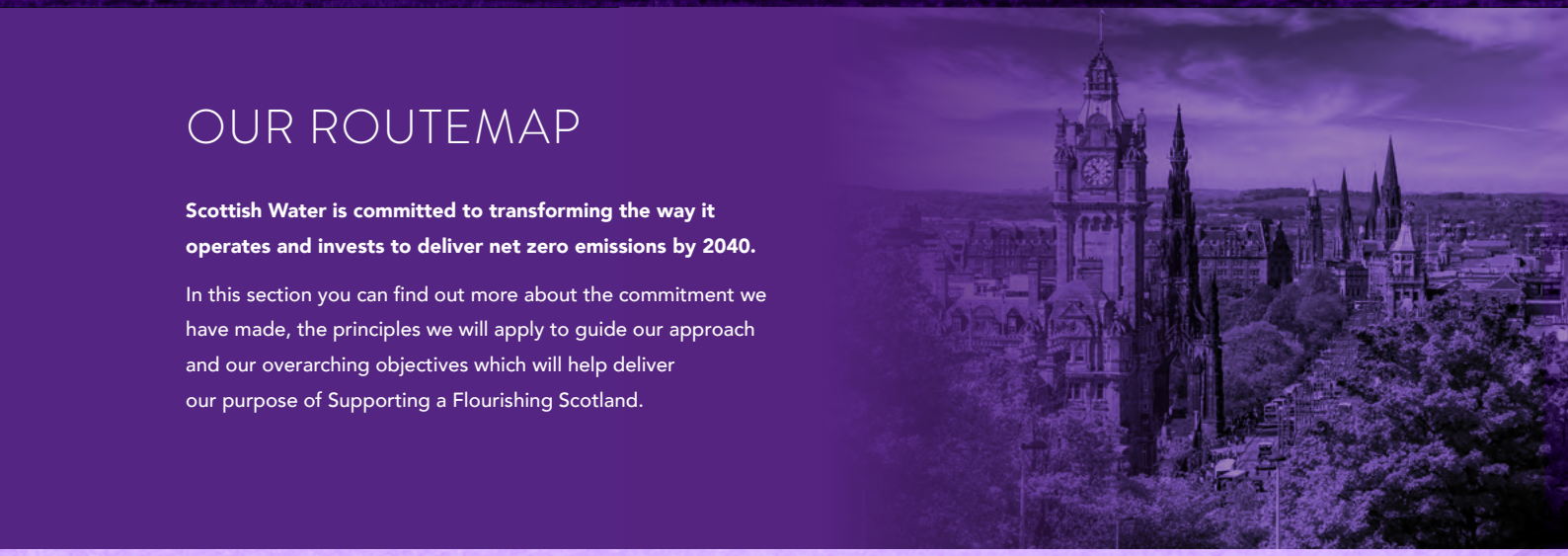
But we must do this in a way that is truly sustainable; and that is why we commit to this routemap as we play our part in supporting a flourishing Scotland.

DOUGLAS MILLICAN

CHIEF EXECUTIVE, SCOTTISH WATER

TRANSFORMATION

LET'S GET STARTED



OUR ROUTEMAP

Scottish Water is committed to transforming the way it operates and invests to deliver net zero emissions by 2040.

In this section you can find out more about the commitment we have made, the principles we will apply to guide our approach and our overarching objectives which will help deliver our purpose of Supporting a Flourishing Scotland.

PARIS AGREEMENT 2015

UNITED NATIONS PURSUES EFFORTS TO LIMIT GLOBAL TEMPERATURE RISE TO 1.5 DEGREES C BY

2050

SCOTLAND 2019

DECLARATION OF CLIMATE EMERGENCY, CLIMATE CHANGE ACT

2045

NET ZERO TARGET

CLIMATE CHANGE

Climate change is an existential threat to the wellbeing of future generations as it impacts the environment on which we all depend, and we must all play our part in limiting its adverse impacts. We rely on a good quality environment for the provision of our vital services.

At the heart of our response to the declaration of a climate emergency is the ambition we have set to achieve net zero emissions by 2040, 5 years ahead of the Scottish Government's target and then going beyond it.

To plan for the resilience of our services in the future, as set out in our strategic plan, we have developed a parallel set of activities that focus on climate change adaptation.

TO ACHIEVE OUR NET ZERO EMISSIONS AMBITION, WE WILL:

BECOME MORE ENERGY EFFICIENT

USE LOWER-CARBON ENERGY PRODUCTS

EMBRACE LOW CARBON CONSTRUCTION

STORE AWAY EMISSIONS THAT CANNOT BE AVOIDED

OUR EMISSIONS TODAY

We are an emission-intensive business, meaning our current emission footprint is large. We have two major contributors to our emissions: operational emissions from the delivery of our vital services and investment emissions driven by our investment programme that maintains and improves our services.

We have been working hard, year on year, to reduce our emissions by using more efficient equipment, reducing leaks from our water pipes, and through using solar, hydro and wind power. This has meant that, since 2007, we have nearly halved the emissions from our operations.

Currently, our operational emissions are over 254,000 tCO_2e* each year, the equivalent of up to 40,000 car journeys around the world.

Whilst the challenge ahead of us is big, we have the experience, ambition and commitment to overcome it.

*Tonnes carbon dioxide equivalent per annum

All figures shown are our 2019/20 operational emissions

In this section you'll find out more about our current emissions and the progress we have made so far towards net zero.

CARBON INTENSITY OF OUR SERVICES

WATER

0.1

gCO_2e/Litre

WASTEWATER

0.19

gCO_2e/Litre

Our water service has one of the lowest carbon intensities in the UK.*

*From industry benchmarking.

ACHIEVEMENTS SO FAR

45%

REDUCTION IN OPERATIONAL EMISSIONS SINCE 2007

53GWh

OF RENEWABLE ENERGY PRODUCED AND USED ANNUALLY ON OUR SITES

831GWh

THIRD PARTY RENEWABLE ENERGY HOSTED ON OUR LAND AND EXPORTED TO GRID

OUR EMISSIONS FOOTPRINT

Our operational emissions are calculated using the water sector carbon accounting workbook* and are independently verified. They cover what are termed Scope 1, 2 and 3 emissions:

Scope 1 – Direct emissions: onsite combustion of fossil fuels; process emissions; and emissions from vehicles owned or leased by Scottish Water.

Scope 2 – Indirect emissions: use of grid electricity.

Scope 3 – Indirect emissions: business travel by public transport and private vehicles; outsourced activities including sites run by PFI companies.

*UK Water Industry Research Ltd Carbon Accounting Workbook

As well as operational emissions, our investment activities also generate emissions.

From the extraction of raw materials from the ground all the way to the delivery of a project on site, there are emissions released at every step of the way. Regardless of where these come from in the world and who produces them, we will account for them and work hard to drive them down.

Emissions associated with raw material extraction

Emissions content of material production (concrete, steel, pipes, pumps etc)

Emissions associated with construction, transport, fuel onsite etc

However, this isn't easy. Investment emissions are challenging to accurately measure and record, meaning it can be difficult to manage them effectively.

Because of this we have developed our Capital Carbon Accounting Tool through which we can plan, measure and report the emissions driven by our supply chain activity. This means that when options for a project are developed, our teams can now calculate the emissions impact and use this to make better decisions, with a focus on lower emission options.

We are developing a new metric – the carbon intensity of investment – to bring focus to this area. Our current understanding is that this sits in the range of 200-300 tCO_2e/£m of investment. By knowing where these emissions are coming from in the supply chain, we can take steps to reduce them, helping us and our supply chain towards net zero emissions.

OUR ROUTEMAP TO NET ZERO EMISSIONS

Our routemap starts from where we are now, our knowledge and understanding of what can be done with what we know today, and sets out a journey to net zero emissions.

IN THE ROUTEMAP, WE HAVE ESTABLISHED THREE MILESTONES ON OUR JOURNEY TO NET ZERO

2025
SHORT TERM

We will reduce our operational emissions by at least 60%*. We will progress reducing our investment emissions, growing our understanding, and will set a reduction goal for 2030.

*from 2007 baseline (read more here)

2030
MEDIUM TERM

We will reduce our operational emissions by at least 75%* in line with Scottish Government targets.

2040
LONG TERM

We will achieve net zero emissions and will be supporting Scotland to achieve its goal of net zero emissions.

To get to net zero emissions will require the support of others.

There are many actions we can take to reduce the emissions which are directly under our control, for example, making our wastewater treatment works more energy efficient, reducing leakage or using our land to host renewable energy or to store away carbon.

Other emissions require us to influence customers, partners and supply chains, for example, the amount of water people use, the removal of surface water from our sewers or the emissions in the cement we buy.

And for some emissions we will take the opportunities that come from development of new technologies, such as low energy lighting or zero emission vans and tankers.

But we can also help others and can make a significant contribution to a Flourishing Scotland by supporting university research, helping develop the workforce of the future, the low carbon construction sector and looking at how our assets and resources can help reduce Scotland's emissions. For example, by growing Scotland's natural capital and supporting the hydrogen economy.

REDUCING EMISSIONS

THERE IS NOT ONE SINGLE ROUTE TO GET TO NET ZERO EMISSIONS.

In the pages below you can see the steps we plan to take to reduce our emissions across 5 areas:

ELECTRICITY

PROCESS EMISSIONS

GAS

TRANSPORT AND TRAVEL

INVESTMENT

We are committed to getting to net zero emissions whilst delivering excellent service and great value to our customers.

These commitments are based on what we know today and can, when added together, deliver our ambition of net zero emissions by 2040.

We will use the best scientific evidence to inform our actions. Where needed we will work with academic and research organisations to build understanding.

It is not just about getting to net zero emissions, it's also about getting there in the most efficient way possible. We will:

- understand, assess and prioritise options to reduce our emissions
- look to pilot and demonstrate the emissions impact
- implement at scale; and then
- sustain the activity where shown to deliver benefits.

BECOME MORE ENERGY EFFICIENT

Our aim is to reduce the amount of energy we consume to deliver our vital water and wastewater services.

In the last 5 years we have delivered 19 GWh of energy efficiency per annum and will look to deliver a further 20% improvement.

ENERGY EFFICIENT PROJECTS

Installation of a real time control system at our largest wastewater treatment works at Shieldhall has reduced energy consumption by 15% pa, reducing emissions as well as delivering savings.

USE LOWER CARBON ENERGY PRODUCTS

Our aim is to operate all of our assets using renewable power.

This may be through renewable generation on our sites and in our processes, or through others operated on our behalf.

STORNOWAY WASTE WATER TREATMENT WORKS WINDFARM AND GLENCORSE TURBINE

Stornoway is 36% self-sufficient in renewable energy from 13 wind turbines on site; Glencorse is 91% self-sufficient in renewable energy from turbines on the incoming raw water.

NIGG WASTE WATER TREATMENT WORKS ENERGY FROM SLUDGE

now 52% self-sufficient following investment on site.

Our gas consumption is dominated by the thermal drying and processing of wastewater sludge.

We aim to transform the technology we use, and use this resource as a source of renewable energy.

We have started to transform our 1600 strong fleet from fossil fuels to zero emission vehicles.

We plan to accelerate as vehicle technology develops.

POOL CAR ELECTRIC VEHICLE FLEET

We have recently changed all our pool car fleet to electric vehicles and have charge points located across our office locations.

EMBRACING LOW CARBON CONSTRUCTION

WATER TREATMENT UNITS

Through improving the design of these, our supply chain partners have reduced the amount of steel and cladding used by 30%, reducing emissions by 50 tonnes per unit.

Our aim is to reduce the carbon intensity of our investment.

We will do this by selecting low carbon options, designing and building net zero assets.

STORING AWAY EMISSIONS THAT CANNOT BE AVOIDED

We know that we will not be able to reduce all our emissions to zero and will need to store away those which we cannot reduce.

To do this we will improve peatlands in our water catchments, and increase tree planting on all of the land that we own.

PEATLAND RESTORATION

Restoring peatland helps lock up carbon but also delivers wider benefits for drinking water quality and biodiversity.

PROCESS EMISSIONS

Treating wastewater produces emissions that cannot be avoided with current technology. We will look to store carbon to offset these emissions.

ENABLERS

Throughout this routemap we will be highlighting specific activities in key areas that will enable us to make progress and external factors that will support us. On our journey to net zero there are some key enabling activities that we will be focusing on.

PEOPLE

The delivery of this routemap is underpinned by a strong foundation of our people and the people in our supply chain. All of our activities drive emissions and we all need to grow new capabilities and change our behaviours to deliver net zero emissions. We plan to work with schools, colleges and universities to develop the workforce of the future and with our supply chain partners to ensure their people have the skills needed to deliver net zero emissions.

CUSTOMERS AND COMMUNITIES

Customers and communities can help us to achieve net zero emissions through their use of our services. We want to work with them in three areas. We will be continuing our activities to reduce leakage and want to engage them on leakage within their property boundary, the amount of water they consume and the correct disposal of wet wipes, fats, oils and greases.

PROCUREMENT

Through our operational and investment activities, we purchase over six hundred million pounds of goods and services annually. We plan that all our contracts will be incentivised to reduce emissions and encourage the development of low/zero emissions goods and services.

GOVERNANCE

We are fundamentally changing how we appraise projects to include emissions and wider benefits to customers and communities.

POLICY AND REGULATION

We will work with the Scottish Government and stakeholders to ensure that the regulatory framework facilitates and supports emissions reduction and the progress of SEPA's sector plans. This will cover a broad range of activity from environmental regulation, to the co-digestion of wastes, building regulations that will deliver more water efficient homes and urban planning to support surface water removal.

INNOVATION

Research, development and adoption of new technologies are going to be key to us achieving net zero emissions. We are funding a Hydro Nation Chair to develop the research capability we need here in Scotland. To help us identify and source new technologies we will appoint a technology scouting partner and will use our unique Technology Development Centres to support the field trials of emerging technologies to allow us to rapidly assess and embrace them.

STRATEGIC INNOVATION FOCUS AREAS

LOW ENERGY WATER AND WASTEWATER TREATMENT, AMMONIA AND METHANE RECOVERY

The development and deployment of innovative treatment processes are key to reducing energy consumption and reducing process emissions.

DIGITAL AND ANALYTIC TOOLS

This is an area of technology that is rapidly changing that will enable emissions reduction across all our activities.

MATERIALS RESEARCH

The development of low/zero emission materials for use in investment and operations are key to reducing our emissions.

WATER FOR HYDROGEN PRODUCTION

Scotland's water resources will be different in a climate change future. We need to understand how we might recover wastewater final effluent and surface drainage water to support hydrogen production, ensuring the availability of fresh water for drinking and other uses.

HOW WE WILL MONITOR AND REVIEW OUR PROGRESS

To show progress towards net zero emissions we will review and measure our progress against our routemap. We are committed to open and transparent reporting of our performance and the lessons we have learnt on the way.

Annually, we will report on our operational and investment emissions and will track their progress to net zero. We will focus on showing our progress in our four key areas of:

BECOMING MORE ENERGY EFFICIENT

USING LOWER-CARBON ENERGY PRODUCTS

EMBRACING LOW CARBON CONSTRUCTION

STORING AWAY EMISSIONS THAT CANNOT BE AVOIDED

We will also report on our net zero and climate change adaptation measures in line with Scotland's Public Body Reporting Requirements.

As we have developed this routemap we have been supported by an expert advisory panel who have helped significantly to test and shape our thinking.

The panel will continue to support us and review our progress, challenge our assumptions and provide support as we update our plans.

We will also work with stakeholders to demonstrate to our customers and communities that their money is being invested efficiently in delivering net zero emissions.

ELECTRICITY

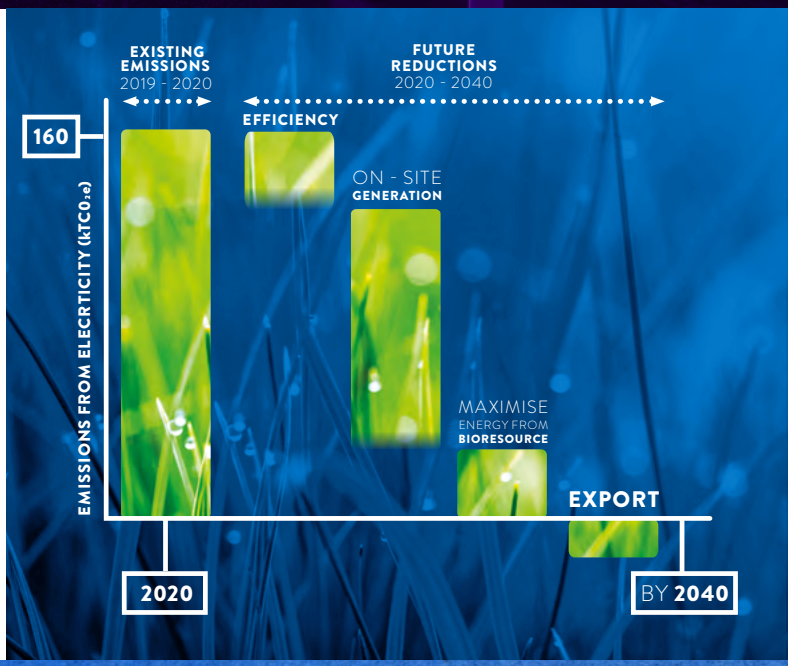
LET'S GET STARTED

WHERE ARE WE NOW?

Scottish Water delivers vital water and wastewater services in Scotland and uses 576GWh pa of electricity, leading to 160ktCO$_2$e pa.

We currently generate and consume 53GWh of renewable electricity on our assets, displacing the use of grid electricity.

We also host renewable generation of 831GWh per annum for others on our land. This is exported to the National Grid, supporting UK emissions.We aim to significantly increase this, playing our part in supporting a flourishing Scotland.



CURRENT POSITION

576GWh
PER ANNUM
GRID ELECTRICITY USAGE

53GWh
PER ANNUM
GENERATED AND CONSUMED ON SITE

831GWh
PER ANNUM
HOSTED RENEWABLE ENERGY EXPORTED TO GRID

TOP 5 CONTRIBUTORS TO ELECTRICITY CONSUMPTION

20% WASTEWATER AERATION

29% WASTEWATER PUMPING

21% WATER TREATMENT

14% WATER PUMPING

14% WASTEWATER SLUDGE TREATMENT

OUR APPROACH

We will reduce our consumption of electricity

We will maximise the energy we generate from bioresource

We will generate or host all the energy we consume

REDUCE CONSUMPTION ON SITE

MAXIMISE ENERGY RECOVERED FROM BIORESOURCE

GENERATE OR HOST ON SITE

These tables illustrate the key activities we are exploring to reduce our electricity emissions.

We will keep these under review with our expert advisory panel.

1 REDUCING OUR CONSUMPTION OF ELECTRICITY

GOAL
20% REDUCTION

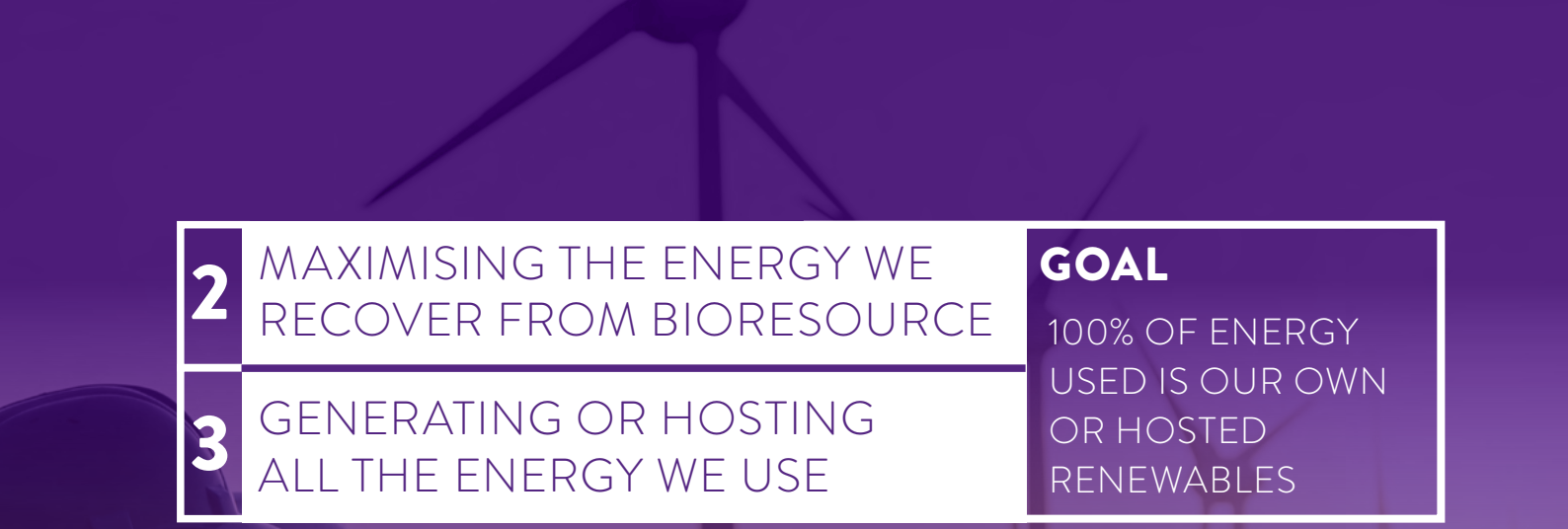
UP TO 2025	UP TO 2030	UP TO 2040
• Identify, assess and implement energy efficiency opportunities (e.g. real time control).	• Implement energy efficiency opportunities, adapting emerging technologies.	• Implement further energy efficiency opportunities.
• All new equipment we replace to be more energy efficient.	• All new equipment we replace to be more energy efficient.	• All new equipment we replace to be more energy efficient.
• Identify, assess and implement new more energy efficient treatment technologies.	• Implement new more energy efficient treatment technologies.	• Further development of new more energy efficient treatment technologies.
• Demonstrate potential for use of analytics in pump control and water production planning.	• Implement at scale new digital demonstrators.	• Implement at scale further new digital demonstrators.
• Identify, assess and implement leakage and per capita consumption reduction opportunities.	• Implement leakage and per capita consumption reduction opportunities.	• Implement further leakage and per capita consumption reduction opportunities.
• Demonstrate the energy efficiency impact of stormwater removal from the wastewater network.	• Implement stormwater removal from the wastewater network.	• Implement further stormwater removal from the wastewater network.

INNOVATION CHALLENGES

DEVELOP ZERO EMISSIONS LEAKAGE FIND AND FIX OPTIONS.

DEVELOP NEW ANALYTICS/DIGITAL TOOLS TO REDUCE ENERGY CONSUMPTION.

DEVELOP AND DEMONSTRATE WASTEWATER ANAEROBIC TREATMENT, REMOVING THE NEED FOR AERATION.



2 MAXIMISING THE ENERGY WE RECOVER FROM BIORESOURCE

3 GENERATING OR HOSTING ALL THE ENERGY WE USE

GOAL

100% OF ENERGY USED IS OUR OWN OR HOSTED RENEWABLES

UP TO 2025

- Study all Scottish Water assets and landbank for potential retrofit and hosting of renewable generation.
- Engage with market to understand opportunities to deliver and host renewables.
- Identify and implement partnerships to deliver renewables.
- Identify, assess and deliver phase 1 of renewable generation projects.
- Identify, assess and deliver options to maximise energy recovery from bioresources at Kinneil Kerse and Daldowie.
- Demonstrate viability of co-digestion of sewage sludge and other waste streams.
- Technology scouting for innovative renewable energy technologies.

UP TO 2030

- Complete delivery of phase 2 of renewables SW assets and land.
- Delivery of new solution at Daldowie to maximise energy recovery from bioresource.
- Identify, assess and implement activities to maximise energy recovery from bioresource at ex PFI assets.
- Implement co-digestion of sewage sludge and other waste streams.
- Assess and demonstrate innovative renewable energy technologies.

UP TO 2040

- Maximise renewable generation from bioresource.
- Implement at scale innovative renewable energy technologies.

INNOVATION CHALLENGE

DEVELOP WAYS OF MAXIMISING ENERGY RECOVERY FROM BIORESOURCE

KEY ENABLERS TO SUPPORT REDUCING ELECTRICITY EMISSIONS

DECISION MAKING
Building emissions into our decision making processes

PEOPLE CAPABILITY
Growing our people's analytic and digital capability

REVISING BUILDING STANDARDS
To deliver water efficient houses

ENGAGE APPLIANCE MANUFACTURERS
To deliver water efficient appliances

ENGAGE CUSTOMERS
To reduce customer side leakage

SUPPLY CHAIN
Developing energy efficient equipment

EXTERNAL FACTORS THAT SUPPORT REDUCING ELECTRICITY EMISSIONS

FURTHER GREENING OF THE GRID

REGULATORY FRAMEWORK
How we account for our emissions in future

PROCESS EMISSIONS

LET'S GET STARTED

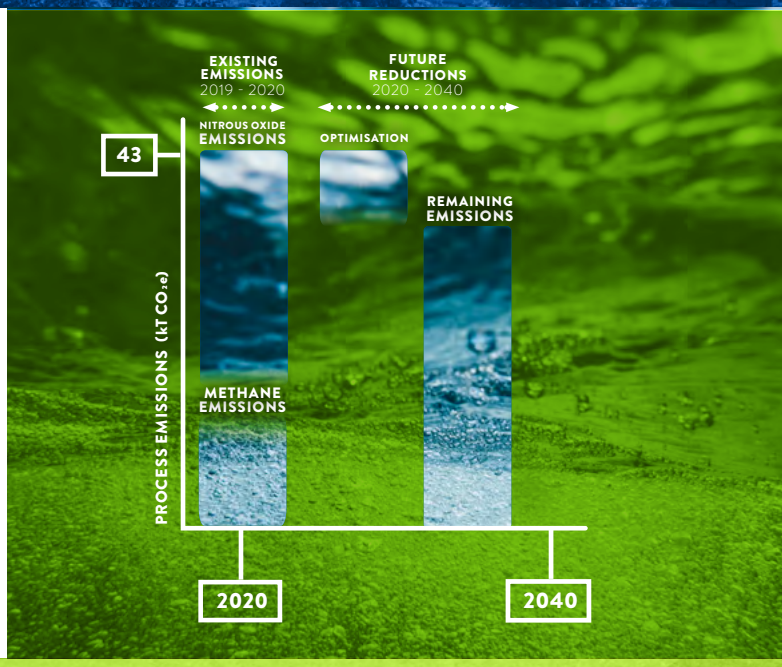
WHERE ARE WE NOW?

Scottish Waters treats 983ML* of wastewater per day.

Our biological treatment processes generate nitrous oxide (N_2O) and methane (CH_4). Both are greenhouse gases.

This is the equivalent of 43kt CO_2e pa.

*1 ML (megalitre) = 1 million litres



CURRENT POSITION

983ML
PER DAY
WASTEWATER TREATED

43kt CO_2e
PER ANNUM
NITROUS OXIDE AND METHANE PRODUCED

TOP 3 CONTRIBUTORS FOR PROCESS EMISSIONS

NITROUS OXIDE
34%
WASTEWATER AERATION

NITROUS OXIDE
22%
WASTEWATER SLUDGE TREATMENT

METHANE
20%
WASTEWATER SLUDGE STORAGE

OUR APPROACH

We will reduce our production of process emissions

We will maximise the energy we recover from bioresource

REDUCE EMISSION PRODUCTION

MAXIMISE ENERGY RECOVERED FROM BIORESOURCE

These tables illustrate the key activities we are exploring to reduce our process emissions.

We will keep these under review with our expert advisory panel.

1 REDUCING OUR PRODUCTION OF PROCESS EMISSIONS

GOAL
20% REDUCTION

UP TO 2025

- Identify and implement more accurate measurement and accounting for process emissions.
- Demonstrate optimisation of WWTWs and Sludge Treatment Centres to decrease production of N_2O.
- Identify, assess and demonstrate sludge storage and transport optimisation to decrease methane emissions.
- Technology scouting for innovative technology to reduce process emissions.

UP TO 2030

- Implement optimisation of WWTWs and Sludge Treatment Centres to decrease production of N_2O.
- Implement sludge storage and transport optimisation to decrease methane emissions.

UP TO 2040

- Complete optimisation of WWTWs and Sludge Treatment Centres to decrease production of N_2O.
- Complete sludge storage and transport optimisation to decrease methane emissions.

INNOVATION CHALLENGES

DEVELOP RECOVERY OF AMMONIA FROM WASTEWATER AVOIDING PROCESS EMISSIONS.

DEVELOP METHANE CAPTURE TECHNOLOGY, AVOIDING PROCESS EMISSIONS.

IDENTIFY CIRCULAR ECONOMY OPPORTUNITIES FOR USE OF RECOVERED AMMONIA.

KEY ENABLERS TO SUPPORT REDUCING PROCESS EMISSIONS

PEOPLE CAPABILITY
Expand our process science skills

TECHNOLOGY
Developing improved process monitoring equipment

MARKETS
Develop a quality product for the circular economy

EXTERNAL FACTORS THAT SUPPORT REDUCING PROCESS EMISSIONS

INCENTIVES
to stimulate technology development for energy recovery

INTERNATIONAL REVIEWS OF GREENHOUSE GAS EMISSIONS FACTORS
for methane and nitrous oxide

REGULATORY FRAMEWORK
developed for how we measure process emissions

GAS AND FUEL OIL

LET'S GET STARTED

WHERE ARE WE NOW?

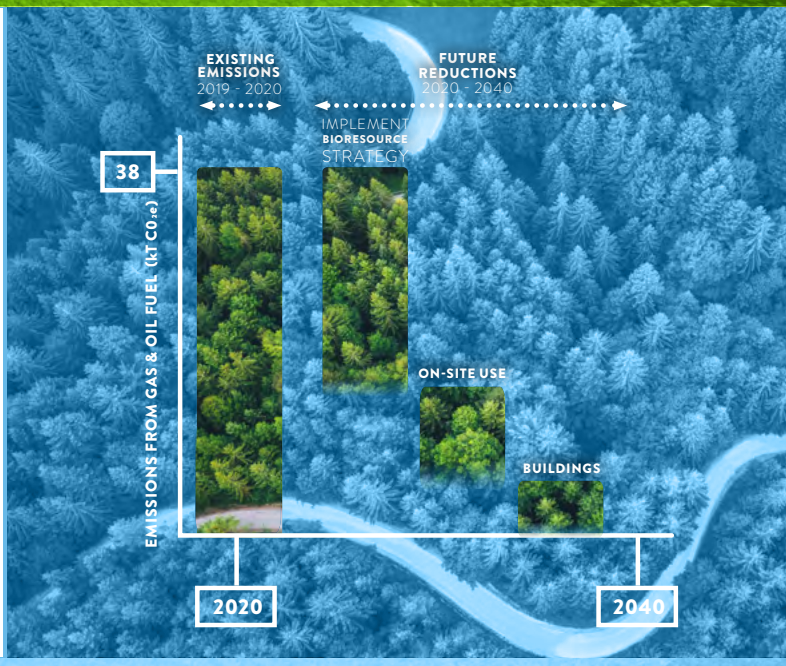
Scottish Water and its PFI partners use 199GWh of gas and fuel oil per year.

The majority of the gas is used in the thermal drying and processing of wastewater sludge.

Fuel oil is used for standby generation of power at our assets in the event of power supply problems.

The remaining gas is used for heating in our buildings.

This leads to 38ktCO_2e per annum.



CURRENT POSITION

199GWh
PER YEAR
GAS AND FUEL OIL USED

TOP 4 CONTRIBUTORS TO GAS AND FUEL CONSUMPTION

61%
WASTEWATER SLUDGE DRYING AT DALDOWIE

5%
SLUDGE PROCESSING AT SEAFIELD

11%
STANDBY GENERATION

3%
HEATING BUILDINGS

OUR APPROACH

We will maximise the energy we recover from bioresource

We will reduce the consumption of fuel oil for standby generation

We will reduce the use of gas for heating buildings

MAXIMISE ENERGY RECOVERED FROM BIORESOURCE

REDUCE CONSUMPTION OF FUEL OIL

REDUCE USE OF GAS

These tables illustrate the key activities we are exploring to reduce our fuel and gas oil emissions.

We will keep these under review with our expert advisory panel.

1 MAXIMISING THE ENERGY WE RECOVER FROM BIORESOURCE

2 ELIMINATING CONSUMPTION OF GAS AND FUEL OIL

GOAL
100% REDUCTION IN GAS AND FUEL OIL CONSUMPTION

UP TO 2025	UP TO 2030	UP TO 2040
• Consider rationalisation of buildings post COVID-19.		
• Identify, assess and implement activities to replace sludge drying technology and alternatives to gas for sludge processing.	• Delivery of new solution at Daldowie to maximise value of bioresource. • Identify, assess and implement activities to maximise value of bioresource at returning PFI assets.	• Maximise renewable generation from bioresource.
• Identify, assess and implement alternative technologies to replace standby generation on our assets (e.g. battery power).	• Complete implementation of alternative technologies to replace standby generation on our assets.	
• Identify, assess and implement renewable heat sources for our buildings.	• Complete implementation of renewable heat sources for our buildings.	
• Deliver Juniper House refurbishment as a net zero emissions building.		

INNOVATION CHALLENGES

DEVELOP ALTERNATIVE FUEL FOR SLUDGE PROCESSING.

DEVELOP ALTERNATIVE TECHNOLOGIES TO STANDBY GENERATION.

DEVELOP ZERO EMISSIONS BUILDINGS.

KEY ENABLERS TO SUPPORT REDUCING GAS AND FUEL OIL EMISSIONS

DECISION MAKING
Building emissions into our decision making processes

EXTERNAL FACTOR THAT SUPPORTS REDUCING GAS AND FUEL OIL EMISSIONS

UK GAS NETWORK TRANSITION
from natural gas to biomethane and hydrogen for heating

TRANSPORT AND TRAVEL

LET'S GET STARTED

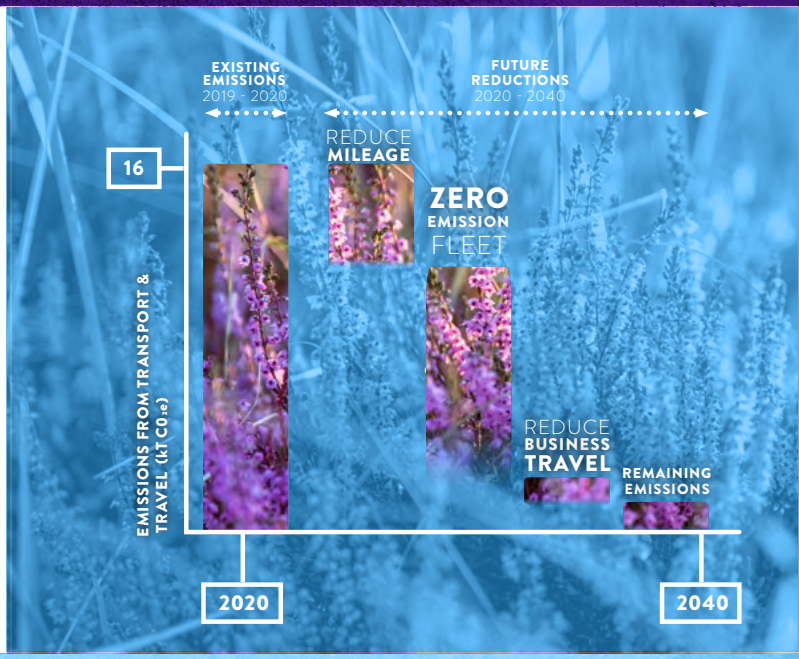
WHERE ARE WE NOW?

Scottish Water's fleet travels 19 million miles per annum.

Business travel - car, train and plane – make up the remainder of these emissions.

We currently have 21 electric and hydrogen vehicles.

Transport and travel led to 16ktCO$_2$e of emissions.



CURRENT POSITION

19 million
MILES TRAVELLED BY FLEET YEARLY

21
EV AND HYDROGEN VEHICLES

16ktCO$_2$e
TRANSPORT AND TRAVEL EMISSIONS

TOP 5 CONTRIBUTORS TO TRANSPORT EMISSIONS

31% SLUDGE TANKERING

21% WATER OPERATIONS

17% WASTEWATER OPERATIONS

12% BUSINESS TRAVEL

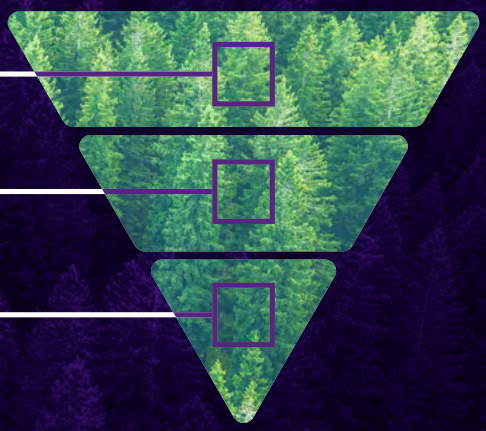
6% SAMPLING

OUR APPROACH

We will reduce the miles travelled by our fleet

We will reduce our business travel

We will replace our fleet with zero emission vehicles



REDUCE MILES TRAVELLED

REDUCE BUSINESS TRAVEL

REPLACE FLEET WITH ZERO EMISSION VEHICLES

These tables illustrate the key activities we are exploring to reduce our transport and travel emissions.

We will keep these under review with our expert advisory panel.

1 REDUCING FLEET MILEAGE AND BUSINESS TRAVEL

GOAL
50% REDUCTION IN THE DISTANCE WE TRAVEL

UP TO 2025	UP TO 2030	UP TO 2040
• Review learning from COVID-19 agile working to embed new practices and digital working to reduce fleet and business travel.		
• Identify, assess and implement streamlined end to end processes that reduce fleet mileage. (e.g. increased remote monitoring of sites to reduce visits).	• Continue to transform our end to end processes to reduce fleet mileage.	• Continue to transform our end to end processes to reduce fleet mileage.
• Maximise benefits of digital working to reduce business travel.	• Continue to maximise benefits of digital working to reduce business travel.	• All remaining business travel to be zero emissions.

2 TRANSITIONING OUR FLEET TO ZERO EMISSIONS VEHICLES

GOAL
100% ZERO EMISSIONS FLEET

UP TO
2025

- Identify, assess and implement new vehicle technology as it becomes available on market (e.g. electric and hydrogen vehicles).
- Zero emission options to be tested for all new fleet vehicles.
- Seek grant funding for electric vehicle charging infrastructure to accelerate fleet conversion.
- Work with other public sector bodies on development of refuelling infrastructure to accelerate deployment of zero emission vehicles.

UP TO
2030

- Complete transition to zero emission fleet.
- Implement refuelling infrastructure to enable deployment of new vehicle technology.

UP TO
2040

- Test and deploy new zero emission vehicle technology as it becomes available on market.

INNOVATION CHALLENGE

DEVELOPMENT OF HYDROGEN VEHICLES.

KEY ENABLERS TO SUPPORT REDUCING TRANSPORT AND TRAVEL EMISSIONS

PROCUREMENT
Enabling low emission fleet transition

PEOPLE CAPABILITY
Develop agile working behaviours and digital abilities

EXTERNAL FACTORS THAT SUPPORT REDUCING TRANSPORT AND TRAVEL EMISSIONS

TECHNOLOGY AVAILABILITY
Growing availability of zero emissions fuel and sustainable transport technology

HYDROGEN NETWORK
Growing availability of hydrogen refuelling infrastructure

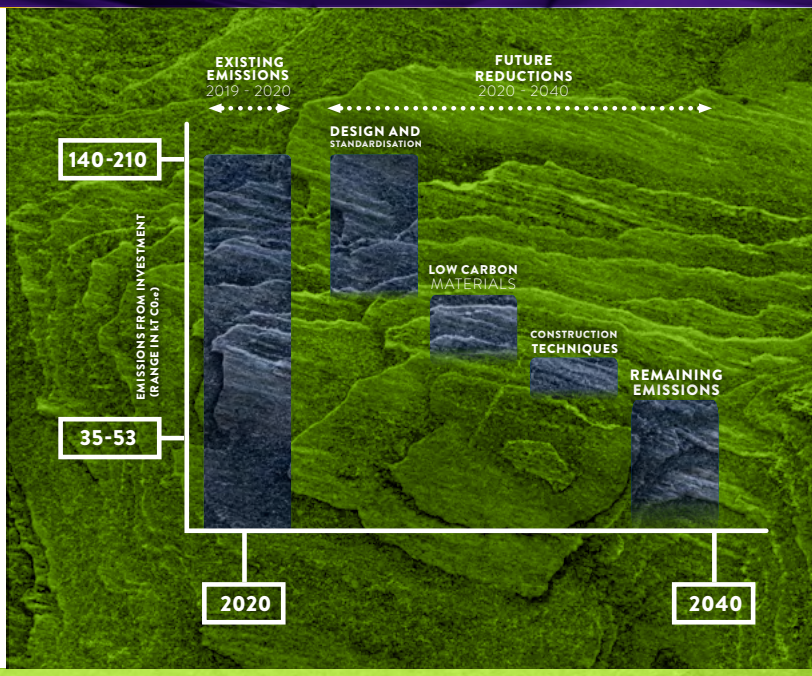
INVESTMENT

LET'S GET STARTED

WHERE ARE WE NOW?

Scottish Water invests £700m pa to maintain and improve our services.

We are growing our understanding of investment emissions and have developed a new measure - the carbon intensity of investment that we will work to reduce. Our current view of this is 200-300 $tCO_2e/£m$.



CURRENT POSITION

£700m
INVESTED PER YEAR

200-300tCO_2e
PER MILLION POUND CARBON INTENSITY OF INVESTMENT

TOP 5 CONTRIBUTORS TO INVESTMENT EMISSIONS

60% CIVIL ENGINEERING

20% INFRASTRUCTURE

15% MECHANICAL AND ELECTRICAL

<5% SITE TEMPORARY WORKS

<5% DEMOLITION

OUR APPROACH

We will select low emissions options and design for net zero

We will procure low or zero emission construction materials

We will build using low or zero carbon construction techniques

REDUCE CARBON INTENSITY OF INVESTMENT

ZERO EMISSION DESIGNS

LOW CARBON MATERIALS

LOW CARBON CONSTRUCTION

These tables illustrate the key activities we are exploring to reduce our investment emissions.

We will keep these under review with our expert advisory panel.

1 WE ENABLE ZERO EMISSION CONSTRUCTION

GOAL
75% REDUCTION IN CARBON INTENSITY OF INVESTMENT

UP TO 2025

- Establish Construction Expert Panel to bring external knowledge and innovation support.
- Applying circular economy principles, our decision support tools promote low emission options.
- All projects assess and report the emissions impact of their construction and operation.
- We improve availability of emissions data of products and services to support low emission investment decisons.
- We develop engineering specifications, with learning from other sectors, to deliver net zero emissions assets.
- We will develop a design library with proven and standard low emission designs.
- Delivery and supply chain partners are engaged and contractually incentivised to deliver emissions reduction.

UP TO 2030

- Low carbon construction expertise is embedded throughout Scottish Water delivery teams.
- All programmes and projects are aiming to reduce emisisons.
- Common data reporting of emissions across all products and services supports low emission choices
- Engineering specifications continually adopt innovation and learning from other sectors to deliver net zero assets.
- We continually update our design library with proven and standard low emission designs.
- Delivery and supply chain partners embrace low carbon innovation and lead in developing and adopting best practice.

UP TO 2040

- All projects routinely demonstrate they have minimised emissions as far as possible.
- All programmes and projects are able to demonstrate net zero emissions over the life of the asset.

2 DELIVERING ZERO EMISSION INVESTMENT WITH SUPPLY CHAIN

GOAL
75% REDUCTION IN CARBON INTENSITY

UP TO
2025

- With our supply chain we will identify and assess the top 10 emission intensive construction materials and promote low/zero emission alternatives.
- Supply chain engaged in assessing emissions in its own supply chain; seeking low emission products
- Our supply chain develops decision support tools to enable low emission designs and construction.
- Promote offsite fabrication and no dig designs to reduce time, emissions and waste on sites applying circular economy principles.

UP TO
2030

- Progress development of low and zero emission construction materials.
- Supply chain procures low and zero emissions materials as standard.
- Our supply chain applies decision support tools to enable low emission designs and construction.
- Offsite fabrication and no dig designs adopted as standard to reduce time, emssions and waste on site.

UP TO
2040

- Adopt emerging new low and zero emission construction materials.

INNOVATION CHALLENGES

DEVELOPMENT OF EMISSION FREE MATERIALS.

DEVELOPMENT OF EMISSION FREE CONSTRUCTION TECHNIQUES.

DEVELOPMENT OF EMISSION FREE PLANT AND EQUIPMENT.

KEY ENABLERS TO SUPPORT REDUCING INVESTMENT EMISSIONS

DATA AND INFORMATION
on emissions in products and services

CONSTRUCTION PARTNERS
work with us to deliver reduction of carbon intensity of investment

DECISION MAKING
building emissions into our decision making processes

PROCUREMENT
enabling procurement of low and zero emission materials

PEOPLE CAPABILITY
develop low and zero emissions design and construction skills

EXTERNAL FACTORS THAT SUPPORT REDUCING INVESTMENT EMISSIONS

REGULATORY GOVERNANCE
and decision making fully represents the emissions impacts and benefits from all investment choices

MATERIAL AVAILABILITY
Availability of zero emissions materials and plant for supply chain

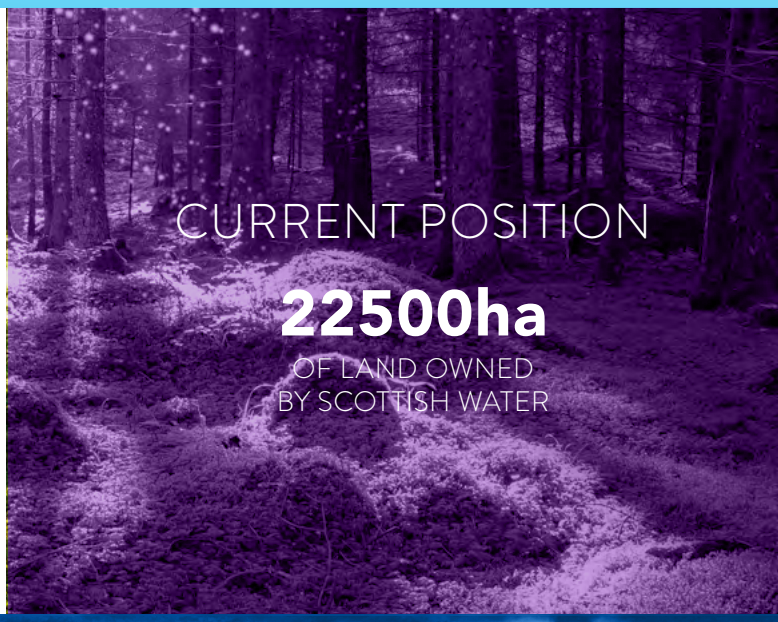
SUPPORTING A FLOURISHING SCOTLAND

LET'S GET STARTED

GROWING SCOTLAND'S NATURAL CAPITAL

Scottish Water owns more than 22,500 hectares of land, the equivalent of around 15,000 football pitches.

At the moment we do not know how much carbon dioxide is stored by our land, but will work with the world renowned James Hutton Institute to understand how we best use our valuable natural resources.

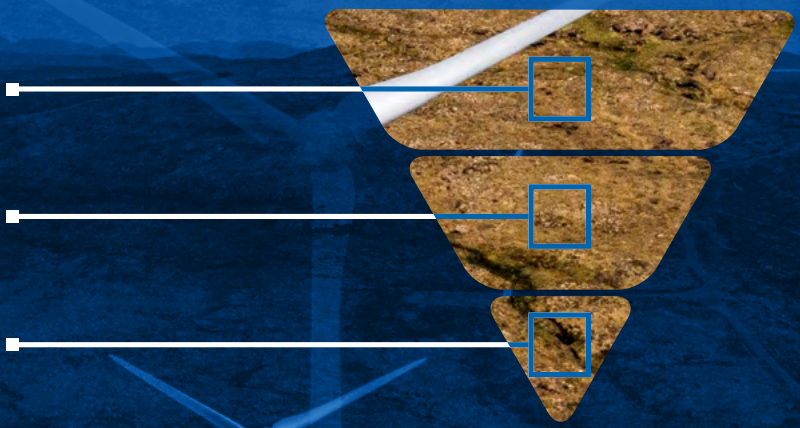


OUR APPROACH

We will store more carbon dioxide than we produce.

We will do this by increasing the carbon dioxide stored on the land that we own.

We will increase the biodiversity on the land that we own.



STORE MORE EMISSIONS THAN WE PRODUCE

INCREASING CARBON DIOXIDE STORAGE ON THE LAND WE OWN

INCREASE BIODIVERSITY ON THE LAND WE OWN

These tables illustrate the key activities we are exploring to support a flourishing Scotland.

We will keep these under review with our expert advisory panel.

1 WE WILL CAPTURE AND STORE MORE CARBON DIOXIDE THAN WE PRODUCE

OUTCOME
IMPROVE CARBON DIOXIDE STORAGE ON OUR LAND TO SUPPORT NET ZERO EMISSIONS

UP TO 2025

- Establish how much carbon dioxide our land stores each year and the biodiversity status of our land.
- Develop an accredited scheme for annual reporting of nature based carbon dioxide capture.
- We work with James Hutton Institute to confirm carbon storage needs and opportunities to deliver and go beyond net zero.
- Assess and implement peatland restoration on our land and water catchments in partnership with SNH.
- Identify, assess and implement woodland creation on our land and at operational sites in partnership with Forest & Land Scotland and NGOs.
- Work with partners on grant applications for tree planting and peatland restoration.
- Investment options adopt natural solutions to increase carbon dioxide capture and biodiversity (eg water catchment management for water quality).
- Demonstrate and implement carbon dioxide capture and biodiversity benefits of urban blue green solutions.

UP TO 2030

- We show net gain in biodiversity and carbon storage.
- Reporting of carbon dioxide capture shows our progress to net zero.
- Complete peatland restoration on our land and water catchments.
- Woodland creation programmes on our land and at operational sites.
- Implement natural solutions to increase carbon dioxide capture and biodiversity.
- Implement sequestration and biodiversity benefits of urban blue green solutions.

UP TO 2040

- Net carbon storage balances or exceeds our ongoing emissions.
- Sustainable peatland management to lock up carbon dioxide.
- Sustainable woodland management on our land and at operational sites.
- Natural solutions widely adopted to increase carbon dioxide capture and biodiversity.
- Transformed blue green urban landscapes.

INNOVATION CHALLENGE

DEVELOP NATURE BASED SOLUTIONS FOR ENGINEERING PROBLEMS

KEY ENABLERS TO SUPPORT NET ZERO EMISSIONS

PARTNERSHIPS
with NGOs, public sector partners and private landowners to increase carbon dioxide storage

PEOPLE CAPABILITY
expanding land management and biodiversity skills

UNDERSTANDING
of multiple benefits of nature based solutions

GRANT FUNDING
Seeking grant funding to accelerate projects

EXTERNAL FACTORS SUPPORTING NET ZERO EMISSIONS

SCIENTIFIC UNDERSTANDING
of cabon dioxide capture

REGULATORY FRAMEWORK
how we account for carbon dioxide storage

SUPPORTING EMERGING GREEN TECHNOLOGY

Decarbonising heating and transport are two big challenges for Scotland to deliver net zero.

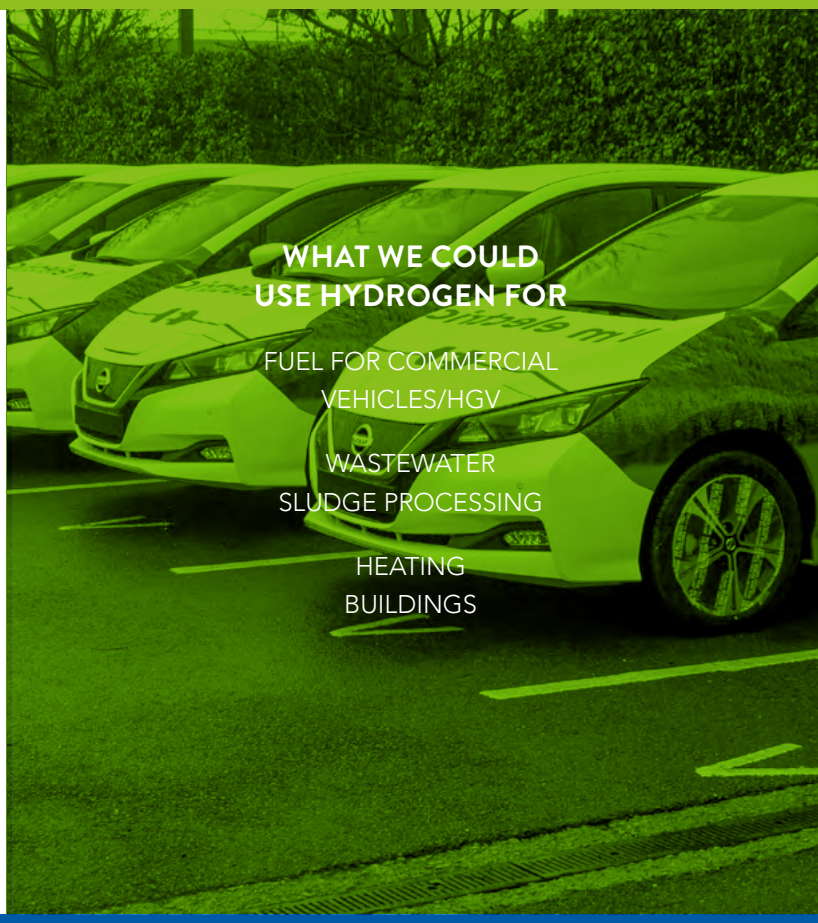
Scottish Water is working to support these challenges through two activities- the availability of renewable heat from sewers using heat pumps and in supporting the hydrogen economy, which is forecast to have a role in decarbonising both heat and transport. These will be crtitical in our support of the green recovery.

SUPPORTING THE HYDROGEN ECONOMY

Hydrogen, when produced with renewable energy, is a zero emission fuel.

The production of hydrogen needs a lot of water and we want to work with partners to understand the implications on Scotland's water resources.

We will play our part in developing integrated water and energy systems to enable the hydrogen and renewable economy.



EXPANDING HEAT FROM SEWERS

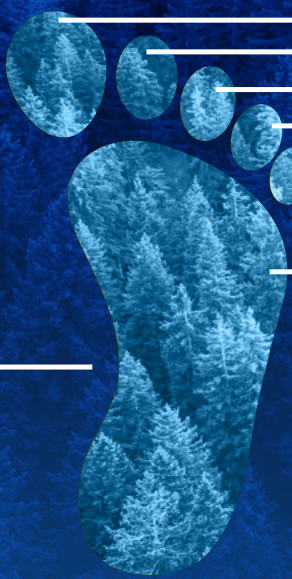
Scottish Water pioneered recovering heat from sewers in the UK.

We have delivered 2 schemes which are saving over 300 tCO2e pa, and are commissioning a further scheme with even greater potential. We are undertaking feasibility studies at other sites to increase use of this renewable heat source.

E OPERATIONAL EMISSIONS

OUR OPERATIONAL EMISSIONS FOOTPRINT

We have been measuring and publishing our operational emissions footprint since 2007



17% Process Emissions
14% Gas
6% Transport & travel
2% Others

63% Grid Electricity
- 14% Water Network
- 21% Water Treatment
- 19% Wastewater network
- 31% Wastewater treatment
- 14% Sludge
- 1% Admin

-2% Self Generated renewable electricity

Electricity
63% of total emissions

Scottish Water and its PFI partners consume 576GWh per annum to deliver vital water and waste services. Electricity is by far the largest contributor to our operational footprint at 160ktCO_2e tonnes.

Process emissions
17% of total emissions

These are the emissions which naturally come from wastewater and the treatment of it which include N_2O and CH_4. Annually, this equates to 43ktCO_2e.

Gas
14% of total emissions

The use of fossil fuels comes predominantly from the gas used for the thermal drying and processing of sludge at PFI Wastewater Treatment Works and in heating our offices. Annually, we produce 38ktCO_2e from gas.

Transport & Travel 6%

This is mainly driven by the 19 million miles travelled by our fleet, along with business travel. Annually, we produce 16ktCO_2e from transport and travel.

Other 2%

This covers the use of on site fuel for standby generation, emissions from waste disposal and from refrigerant and electrical insulation gases.

Self-generated
renewable electricity -2%

We currently produce and use 53GWh of electricity per annum helping to reduce our carbon footprint by 2%.

All figures shown are our operational 2019/20 emissions

EXPERT PANEL

OUR EXPERT ADVISORY PANEL

With the scope and scale of the challenge ahead, it is vital that we face outward as an organisation and constantly look for new ways of cutting our emissions.

To help us to look beyond the water industry, we have established an Expert Advisory Panel made up of individuals from very different organisational backgrounds. The panel have challenged us on this routemap's contents and ambition.

The panel will meet annually to review our progress against the routemap and what adjustments we may need to make to deliver net zero emissions.

As we have developed our net zero routemap we have recognised the scale of our investment emissions and have developed a second panel of construction sector experts to support us on reducing emissions in this key area.

THE FOLLOWING HAVE AGREED TO PARTICIPATE ON THE PANEL:

Chris Stark
Committee for Climate Change

Ross Martin
Advisor, Regional Economies

Professor Ana Soares
Cranfield University

Professor David Reay
Edinburgh University

Professor James Yu
Scottish Power

Angus McIntosh
Scotia Gas Networks

Professor Colin Campbell
James Hutton Institute

Kathryn Dapré
NHS Scotland

SCALE OF OUR CURRENT EMISSIONS AND PROJECTION OF 2040 EMISSIONS