Climate change strategy delivery

Mark Williams
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Scottish Water

252 Water Treatment Works
1800 Waste Water Treatment Works
100,000 Km water and sewer network 1000s of pumping stations

…and what will it cost me?

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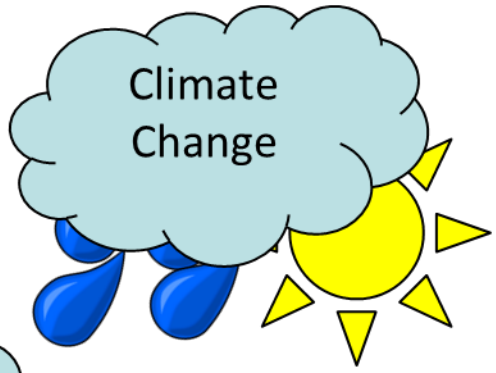
CO_2

N_2O CH_4

SF_6



Electricity
Fuel
Process Emissions
Capital Investment

Water and Wastewater Services

Water Quality
Water Quantity
Customer Demand
Service Resilience

Statutory Duties: Climate Change (Scotland) Act

Contribute to Scottish Government's 80% Carbon target
Support Scotland's Climate Change Adaptation Strategies
Act to support principles of Sustainable Development
Report Carbon Mitigation and Climate Adaptation activities (new in 2015)

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Strategy (2010)

ADAPT *to climate change: understand the impacts and service risks, and secure long term service and compliance from our assets*

MITIGATE *the causes of climate change: contribute appropriately to a reduction in our carbon emissions in line with Scotland's greenhouse gas targets."*

Business Plan Commitments

- 25GWh hydro and renewables programme
- Energy Efficiency programme
- Climate change studies and risk assessment

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Now What?

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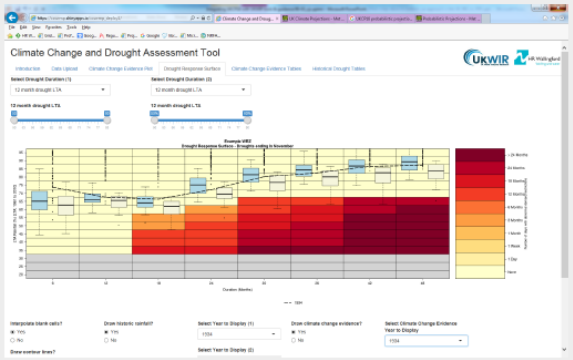
Climate change
Impacts
Source water quality
Water supply
Sewer flooding
Asset / service flood risk

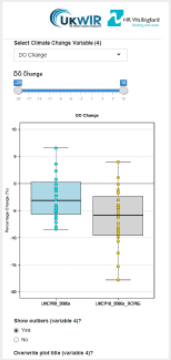
Establishing Evidence, Methods and Tools in *Partnership*

UKWIR

Climate Change and WRMP (18/CL/04/16)

- Compare UKCP09 and UKCP18 in the context of drought resilience
- Identify diverse / representative scenarios based on system vulnerabilities



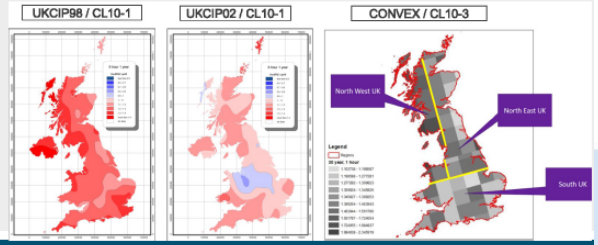


Tool link: https://eawrmp.shinyapps.io/eawrmp_deploy1/

Rainfall for urban systems Climate change models

Water company methods for climate change

- Design storm uplifts
  - Various approaches to increase in intensity
  - Various approaches to use of climate model data and tools
  - Uncertainty rarely considered
  - Scenario usually single (High) but sometimes multiple scenarios
- Future time series rainfall
  - UU and YW only?

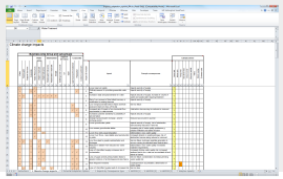


Adaptation Planning Framework (12/CL/01/18)

Understanding
What are your risks?
Why are you vulnerable to these?
Who are your stakeholders?
How can you analyse these risks?
When will the risks occur?

Planning
What are your options?
Why are these options suitable?
Who needs to be involved in planning these options?
How will the actions be carried out?
When will the actions be completed?

Managing
What needs to be monitored?
Why does this need to be monitored?
Who needs to be involved?
How can you evaluate and learn from this monitoring?
When are you going to monitor and evaluate?



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Delivering Adaptation - Partnership is Vital

East Lothian Council
Renfrewshire Council
North Lanarkshire Council
Stirling Council
South Lanarkshire Council
Edinburgh
West Lothian Council
Falkirk Council
Midlothian
The Scottish Government
Riaghaltas na h-Alba
SEPA
Scottish Environment Protection Agency
Angus Council
South Ayrshire Council
Perth & Kinross Council
East Ayrshire Council
Fife Council
Dundee City Council
Aberdeenshire Council
North Ayrshire Council
The Highland Council
Comhairle na Gàidhealtachd
Aberdeen City Council
Inverclyde Council

None can be controlled by Scottish Water alone (or anyone else!)

Scottish Water Carbon Plan 2010

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Renewables in the 2010-2015 Capital Programme

Key objective: to deliver an additional 25GWh of renewable generation from hydro schemes within the 2010-2015 Capital Programme (SR10)

Scottish Water currently generates up to 5% of our energy demand from small scale hydro generation units located within pipes, dams and treatment works. The new treatment works at Glencorse will generate up to 35% of its energy needs in on-site generation, with further potential in the catchment to offset an additional 30%.

We have identified a potential to deliver 25GWh of energy generation from renewables to be delivered within our investment plan for 2010-2015 (SR10). This would represent a potential carbon win of circa 12,000 tonnes CO_2e per annum. These opportunities are largely concerned with the installation of small scale hydro generation turbines within existing water assets.

Key Activities	Status
Work with consultant to deliver business cases for SR10 2nd DBP	Complete
Assess the costs of developing renewables in SR10	Complete
Quantify the carbon and financial savings of implementing renewables in SR10	Complete
Work with other parts of the business to promote appropriate schemes going forward within SR10	Ongoing

Outputs

- Fully costed solutions for Hydro are included in SR10
- Carbon and cost 'gain' are clearly understood and quantified
- Schemes to reduce emissions are delivered
- 25GWh produced / 12,000 tonnes CO_2e saved

Carbon in the supply chain

Key objective: Develop a supply chain that is fully engaged with Scottish Water on carbon measurement, partners with SW on achieving carbon and efficiency goals and is continually improving its carbon credentials and performance.

We invest heavily in the maintenance and replacement of asset stock, along with the development of new assets, through regulatory investment. To guide this, we have in place a regime that specifies the quality, performance and technical requirements for materials and equipment to be approved for use. This framework is used to ensure that capital maintenance and investment planners select kit of sufficient quality to do the job.

This section of the plan seeks to ensure that the supply chain supports us in evolving a more sustainable asset base. Pumps comprise a large proportion of operational emissions and have therefore been singled out for specific attention as they offer a great potential efficiency reward.

Key Activities	Status
SW to develop carbon guidance for suppliers	Complete
SW to engage suppliers in the process	Ongoing
SW to drive carbon reporting	Ongoing
SW to recommend clear accounting guidance – a model for how the supply chain should report	Complete
Initial focus on energy/fuel in carbon footprint	Ongoing
Move to include carbon in management of key suppliers	Ongoing
Liaison with stakeholders on pump requirements	Complete
Work with suppliers to report carbon and energy performance of pumps	Complete
Update supplier frameworks	Ongoing
Prioritise supplier initiatives that reduce carbon	Ongoing
Encourage new supplier initiatives	Ongoing
Carry out trials of supplier initiatives	Ongoing
Identify source of funding for improvement	Complete

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Sustainability report 2018

Doing the right thing for Scotland

Scottish Water and renewable power

Scottish Water has been installing renewable energy generation at a number of our operational sites in order to reduce the amount of grid electricity we use. We have also entered into a number of contracts with energy generators to lease some of our land to host wind turbines, helping the Scottish Government to meet its renewables targets.

Through a combination of Scottish Water's own investment in renewable energy installations and hosting private investment on our estate, we now generate and host around 923 Gigawatt hour (GWh) per annum of renewable energy. This saw a major energy milestone achieved in May 2018, after it was confirmed that the amount of renewable energy we generate and host is now more than double our own electricity consumption.

More than 70 of Scottish Water's water and waste water treatment works are now either fully or partly self-sufficient in their power requirements, leading to lower operating costs, smaller carbon footprint, and a more sustainable business.

Our solar energy (photovoltaic – PV) programme is focused on offsetting grid consumption at assets. Each site is different, but in all cases the vast majority of the power produced is used on site, with very little export to the electricity grid.

A new installation by Scottish Water Horizons at Invercannie Water Treatment Works, Aberdeenshire (shown in the photo below) is an excellent example of how we are making the most of our assets to help tackle climate change, as well as contribute to the Scottish Government's renewables targets. In 2017 we installed 710kW capacity of PV panels at Invercannie. 90% of the electricity they generate is used on site, providing over 15% of the site's electricity consumption.

Photovoltaic solar panels at Invercannie Water Treatment Works

Securing service during dry periods

Scottish Water manages the long-term resilience of water supplies through our 25 year Water Resource Plan and by investing in the resilience of our asset base. Climate change projections are taken into account within these. Weather, however, is much shorter-term and can present us with more immediate challenges.

This summer, Scotland faced its driest six month period since 1984, during which time some areas of Scotland saw a 30% increase in water use. As a result, an additional 140 million litres of drinking water was produced per day to meet customer usage. Maintaining supplies under exceptional demand, while experiencing extremely dry conditions, posed a significant challenge.

Scottish Water worked hard to avoid water supply interruptions or restrictions for customers. This was achieved largely through extensive rezoning of supplies, supply augmentation and leakage reduction activity. We also worked with the Scottish Environment Protection Agency (SEPA) to increase abstraction from, and reduce compensation flows to, the environment where appropriate. To help balance the need between the environment and customers, and to manage our water resources sustainably, Scottish Water issued guidance nationwide to help customers use water wisely, with more targeted communications in more severely affected areas.

Our year-round water efficiency campaign supported the effort to reduce demand by giving customers the tools to use water wisely through the Water Saving Pack project. Since the beginning of June 2018, over 5,250 households have received various water saving devices through this project. Scottish Water employees and our partners at Home Energy Scotland attended over 150 events over the summer, engaging with customers on water efficiency and providing bespoke advice and devices to help customers avoid wasting water.

In line with our Water Resource Plan, it is important that we act responsibly in controlling the amount of water we abstract from the environment, as well as enabling our customers to play their part – together protecting the future sustainability of water resources and the freshwater environment, while minimising the impact of dry weather on customers.

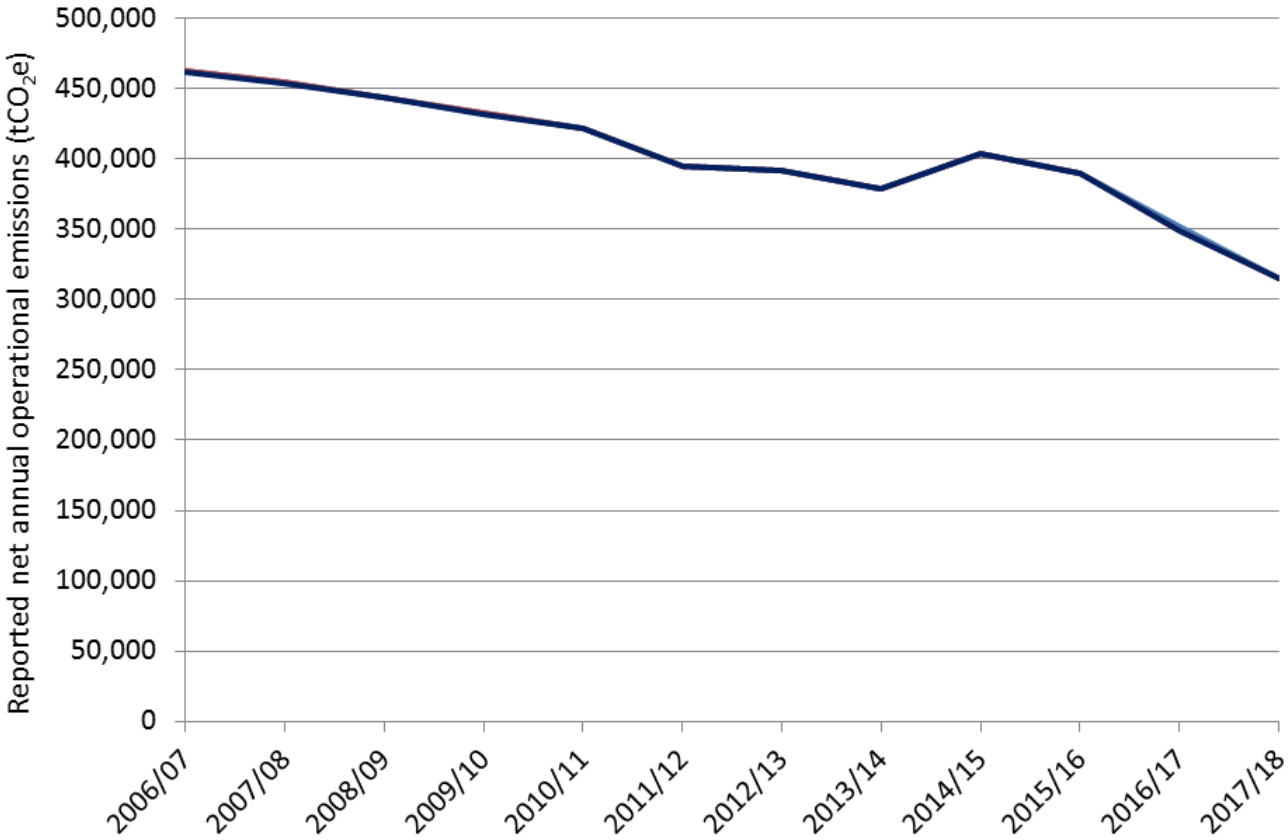
Meeting customers with Home Energy Scotland

Carbon – 2015-21Business Strategy

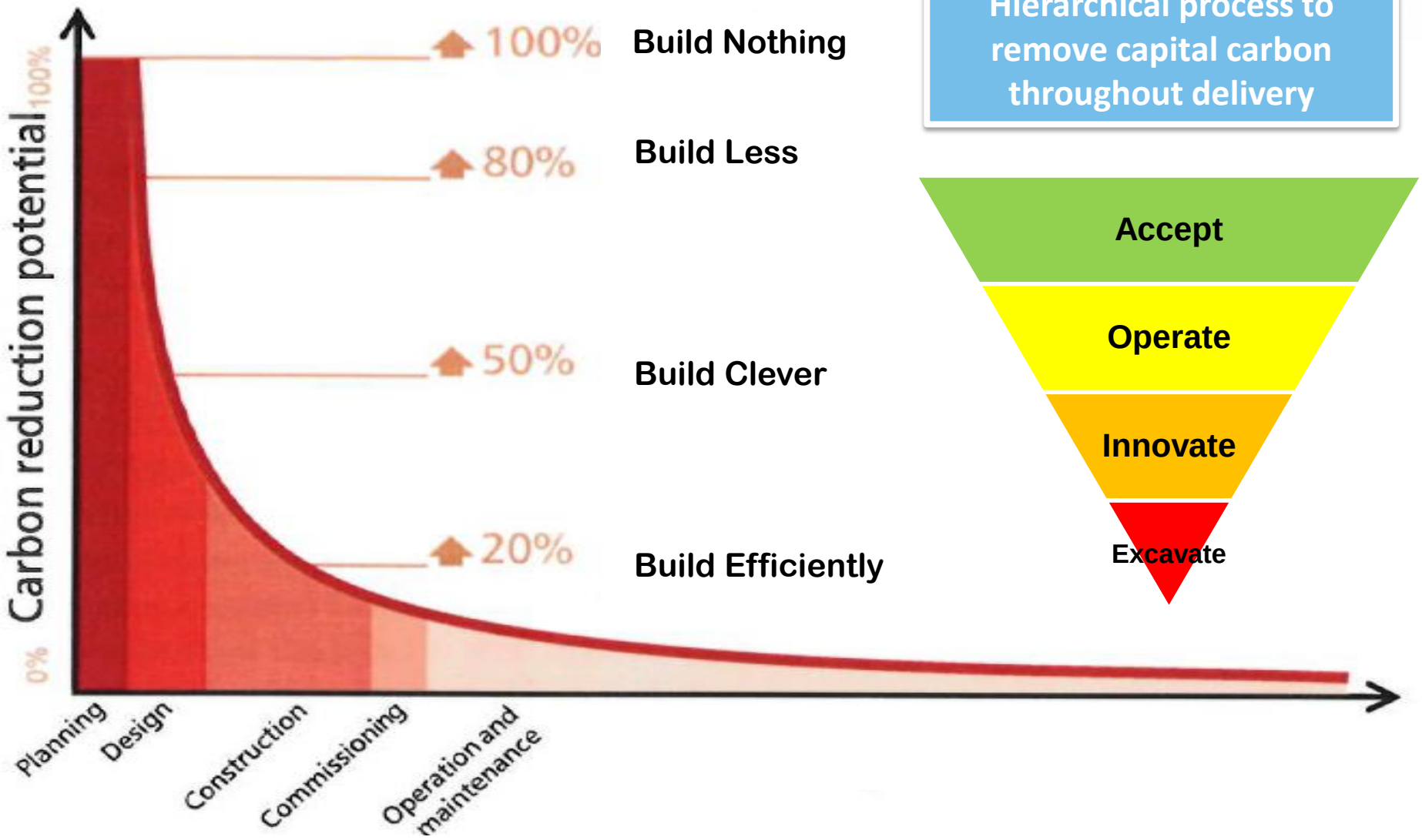
Reduce carbon across all areas of our business

Strategic Area 1 Reduce Carbon Demand	Optimise assets and licences to provide sustainable environmental protection Innovate by exploring approaches such as variable treatment Promote sustainable, passive options where we need to invest Drive a source control agenda for environment and drinking water protection Continue to promote resource efficiency through leakage reduction
Strategic Area 2 Invest in cost effective energy efficiency	Improve the energy efficiency of existing operational assets by investing £6.7m to deliver 11GWh per annum energy reduction by 2021
Strategic Area 3 Invest in cost effective renewable generation	Increase our generation of renewable power from within our asset base, where efficient to do so; Invest 11.2m to deliver 6.5GWh per annum renewable generation by 2021 Deliver renewable generation in partnership with third parties
Strategic Area 4 Strive to reduce carbon in capital delivery by 30%	Use carbon assessment within the SR15 programme appraisals at a project and programme level Challenge delivery vehicles to innovate and reduce carbon during delivery by 30% from SR15 projections whilst also delivering financial savings

Our Carbon Journey



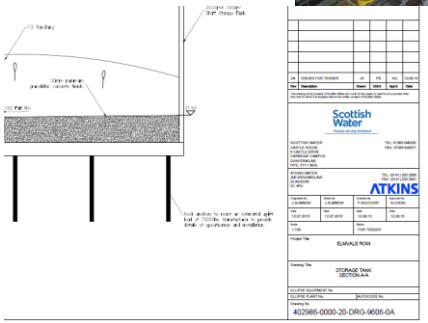
Capital Carbon Reduction Curve



Best Practice:

Hierarchical process to remove capital carbon throughout delivery

Scottish Water Examples



Build Nothing – Lomond Hills Water Quality
conventional whole life Mn filter = 3,413 tCO_2e
catchment management + Resmix = 286 tCO_2e
(92% saving)

Build Less – Cowdenbeath
wetland vs. transfer sewer
4,800 tCO_2e whole life carbon saved
(49% saving)

Build Clever – Elmvale Row Flooding Scheme
Conventional design = 5,011 tCO_2e
Vacuflush design = 3,246 tCO_2e
(35% saving)

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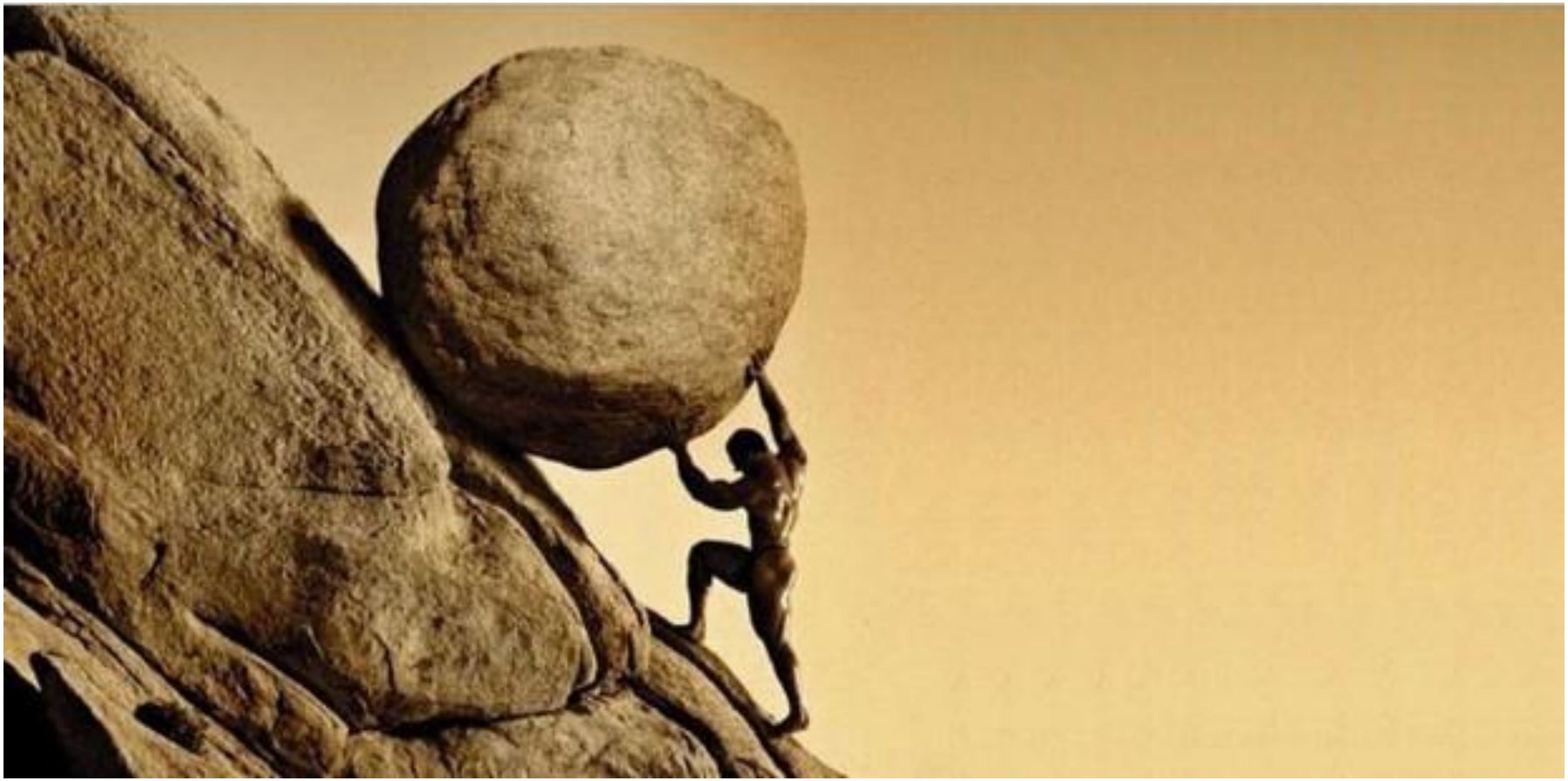

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Civils:

What are the embodied carbon emissions from excavating the Shieldhall Tunnel?

(4.65 metre diameter, 3.1 miles long. Excavation only; does not include tunnel lining etc)

Ground	Emissions factor (kg CO_2e/m^3)	Volume (m^3)	Emissions (tonnes CO_2e)
'Generally soft material'	53.645	84,706	**4,544**
Rock	148.28	84,706	**12,560**

Volume = $\pi * (4.65/2)^2 * 3.1 * 1,609 = 84,706\ m^3$

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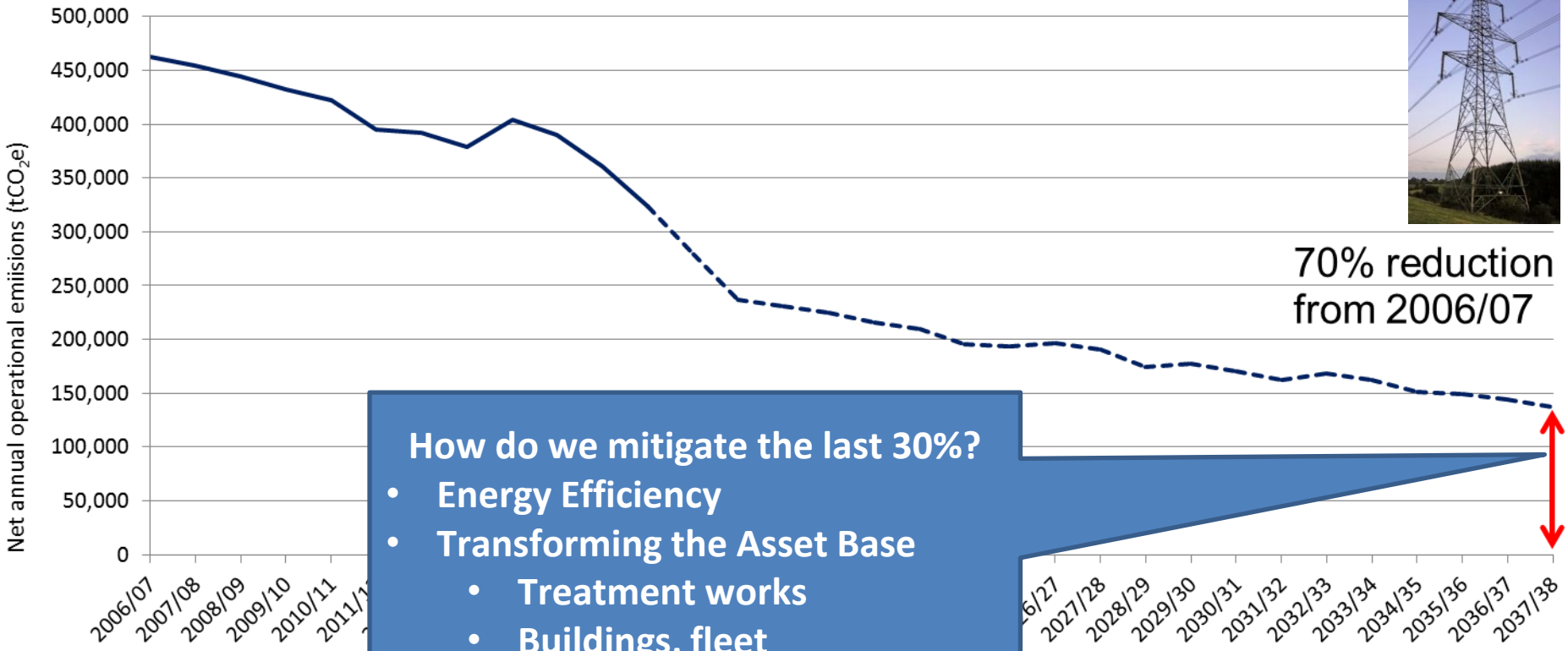
Ongoing support and training – online learning module for SW staff and contractors

Our Carbon Future – Developing Strategies in Partnership



How do we mitigate the last 30%?

- Energy Efficiency
- Transforming the Asset Base
  - Treatment works
  - Buildings, fleet
- Renewable Generation
- Carbon storage?

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Sustainable Growth Agreement – Making One Planet Choices

"Waste into Wealth"

"Sustainable Catchment Management"

"Resilient and Sustainable Cities"

Partnership to support new thinking

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