PR24
Lower carbon concrete definition

Anglian Water

October 2023

Lower carbon concrete assets – clean version

Purpose: This performance commitment incentivises the company to reduce the carbon associated with concrete used in the delivery of the capital programme. This will be achieved through either avoiding emissions through adapting project scope or re-purposing existing assets whilst meeting customer or environmental need, or improving the design or switching components of our concrete assets to reduce the carbon emissions.

Benefits: Concrete emissions represent a significant proportion of all greenhouse gas emissions associated with capital programme delivery. This performance commitment helps on the journey to carbon neutrality by reducing greenhouse gas emissions associated with the use of concrete in the construction or the refurbishment of assets. This performance commitment will act as an industry pathfinder on how best to deliver less concrete-intensive infrastructure projects through extensive collaboration with our partners in the supply chain. It could contribute to the development of a common capital/embedded carbon performance commitment at PR29.

Performance commitment definition and parameters

1.1 Detailed definitions of performance measure

Percentage reduction in the greenhouse gas emissions associated with concrete and reinforcement used in the construction of capital assets against a 2022 baseline. The baseline is the methodology and approach used to deliver an outcome or output for customers and the environment.

For each scheme where a concrete-based solution is identified within the business plan, a carbon baseline has been created based on the need and the traditional approach to designing and construction techniques used for concrete assets in the UK water sector (as of 2022). This will then be compared to the solution delivered in AMP8. The company will only include changes in emissions that are driven from the company's activities, it's partners and contractors, use of materials or supply chain specific emissions factors.

Each year the company will report the baseline emissions associated for standalone capital projects delivered in the year. The company will calculate the actual modelled emissions, accounting where relevant for activities that impact emissions (noted below). The difference between these figures will be reported as a percentage change. A single percentage change figure will be reported each year for the investment programme.

The measure will cover, for example, the following areas of the company's carbon footprint:

1. Avoid emissions by delivering the customer or environmental need without building new assets:
    - Adapting project scope or introducing an alternative design solution between the initial promotion to the capital vehicle from Anglian Water to outline design.
    - Re-purposing existing assets to avoid concrete being required to build new assets.
2. Improving the design of our concrete assets:
    - Reducing the mass of concrete or reinforced steel within design between the baseline and build phases of a project.
    - Using lower carbon alternative materials (e.g. Glass coated steel tank)
3. Switching components of concrete to use lower carbon alternatives:
    - Changing supplier (i.e. switching to a supplier that uses lower carbon materials).

- Changing the product from our suppliers, such as products with a higher proportion of lower carbon alternative components (e.g. GGBS) compared to Ordinary Portland Cement (OPC).
- Using alternative materials to steel reinforcement
- Encouraging suppliers to stock non-standard, lower carbon products and purchasing them.

4. Sequestration of carbon within concrete
    - It may be possible that in coming years, concrete could act as a medium to sequester carbon. If this can be proven and adopted in relevant standards then this could contribute to our emissions reductions.

1.2 Additional detail on measurement units

This performance commitment measures the percentage reduction of GHG emissions from both concrete and rebar. Rebar refers to reinforced concrete where additional components (such as metal wires and bars) are added to provide strength to the system. This performance commitment only applies to standalone schemes, in alignment with our PR19 Capital Carbon commitment. Standalone schemes are large individual schemes that are typically in one physical location. Standalone schemes represent the majority of our capital delivery schemes by financial value.

For simplicity the following example focuses purely on the concrete & not the reinforcing elements. This example also ignores any restrictions that might be imposed by which may prohibit options as presented in this idealised imagined example with a fair tailwind, such as:

- Site safety configuration e.g. solutions being limited in height due local power lines
- Layout e.g. existing site services including underground and maintaining a build with a working WRC
- Local planning rules e.g. issues with the height & screening of assets
- Access Restriction e.g. limitations on the size or type of vehicles which may prohibit certain types of materials
- Land ownership/purchase e.g. space for temporary construction traffic or materials as well as for permeant locations of new assets.
- Materials availability e.g. local supply chain capabilities to supply specified materials
- People resources within organisation & supply chain e.g. to implement more complex design & construction processes
- Time e.g. some of the changes add duration to the design, construction of enabling programme which may not be possible on projects with tight obligation dates.

Step	**A worked example of the process in measuring and reducing the lower carbon concrete solution**
1	Business Need – A water recycling centre requires additional storm water capacity to meet WINEP obligations
2	Baseline solution would be a single concrete storage tank and associated pumping to meet the full additional volume stated by the EA as required. $Concrete\ Carbon\ Emissions\ =\ W$

3	A review of the site identified three partial solutions – which will be used together to meet the WINEP obligation		
	A) Measurement of the existing storm volume shows it is slightly larger or smaller than thought,	B) some unused old assets that could be repurposed (may be possible on some sites)	C) a space onsite for a new storage tank.
4	Either No further action taken – no build partial solution $Concrete\ Carbon\ Emissions = 0$ Or Additional volume is required, increasing the carbon of the scheme $Concrete\ Carbon\ Emissions = K$	A more detailed structural & suitability review identifies refurbishment requirements – these have a lower carbon footprint of the conventional solution. However the construction program is more complicated with a greater range of contractors and detailed inspections are necessary collaborating with a broad supply chain (at additional financial cost) $Concrete\ Carbon\ Emissions = T$	While the traditional solution to this new volume would be concrete tank (walls & floor), a possible innovate solution which may be suitable (subject to a range of site specific circumstances) is a concrete base with a glass coated steel tank (for example) – this alternative material lowers the Whole life carbon cost (even though it has a shorter lifetime) although requires a broader supplier base (and may require new suppliers) $Concrete\ Carbon\ Emissions = Y$
5			Traditionally the tank would sit on a square concrete foundation as this is easy to design and construct – a possible the innovative engineering design solution is a a more complex shaped concrete floor shape . This requires more time on site to construct the formwork increasing labour costs as well as more time to complete a more complex design. Consideration is required of long term maintenance requirements to avoid creating operational issues $Concrete\ Carbon\ Emissions = Y - B$
6			Normal industry standard practise is to use s 100% OPC mix due to fast setting time. Innovative, working in close partnership with the local supply chain a 30% GGBS (balance OPC) is identified. Due to the winter weather at the time of construction this will set slowly. Therefore the construction program is modified to allow a longer cure period (increases cost). Close collaboration with the supply chain is required both to supply materials and a suitably trained workforce to use these materials $Concrete\ Carbon\ Emissions = Y - B - C$

$$\textbf{\textit{Reduction on this example scheme}} = \boldsymbol{W} - \frac{K + 0 + T + (Y - B - C)]}{W}$$

1.3 Specific exclusions

Specific exclusions:

- Parcel schemes – parcel schemes are those which are not considered 'stand alone' as defined above.
- Major infrastructure projects which are delivered through DPC or SIPR rather than through our traditional delivery routes.
- Projects that transition between AMP periods

1.4 Reporting and assurance

The company will provide external third-party assurance detailing all data required to maintain the PAS 2080 'Carbon Management in Infrastructure' standard, including quantification, baselining, monitoring and reporting of emissions related to concrete assets.

Table 1 Definition parameters

Measurement unit and decimal places	Percentage reduction of tonnes CO2e reported to two decimal places compared to the 2022 baseline approach
Measurement timing	Reporting year
Incentive form	Revenue
Incentive type	Underperformance and outperformance payments (underperformance incentive rate set at half the outperformance incentive rate)
Timing of underperformance and outperformance payments	Annual (financial year)
Price control allocation	Water resources: 2.7% Water network plus: 36% Wastewater network plus: 54.5% Bioresources: 6.8%
Frequency of reporting	Annual, on a reporting year basis
Any other relevant information	
Links to relevant external documents	

Lower carbon concrete assets – black line version

~~Low~~Lower carbon concrete assets

Purpose: This performance commitment incentivises the company to reduce the carbon associated with ~~reinforced and unreinforced~~ concrete used in the delivery of the capital programme. This will be achieved through ~~innovative techniques to reduce the carbon emissions of concrete required to build the~~either avoiding emissions through adapting project scope or re-purposing existing assets ~~required to fulfil~~whilst meeting customer or environmental need~~.~~, or improving the design or switching components of our concrete assets to reduce the carbon emissions.

Benefits: Concrete emissions represent a significant proportion of all greenhouse gas emissions associated with capital programme delivery. This performance commitment helps on the journey to carbon neutrality by reducing greenhouse gas emissions associated with the use of concrete in the construction or the refurbishment of assets. This performance commitment will act as an industry pathfinder on how best to deliver less concrete-intensive infrastructure projects through extensive collaboration with our partners in the supply chain. It could contribute to the development of a common capital/embedded carbon performance commitment at PR29.

Performance commitment definition and parameters

1.1 Detailed definitions of performance measure

Percentage reduction in the greenhouse gas emissions associated with concrete and reinforcement used in the construction of capital assets against a 2022 baseline. ~~-~~The baseline is the methodology and approach used to deliver an outcome or output for customers and the environment.

~~The measure will cover, for example, the following areas of the company's carbon footprint:~~

- ~~Reduction in the volume of concrete through optioneering, altering the design and geometry of concrete assets ('designing out concrete') and substituting in lower carbon alternative materials (e.g. glass coated steel).~~
- ~~Reduction in the carbon intensity of concrete through substituting the chemical constituents for lower carbon or zero carbon concretes alternatives (e.g. substituting Ordinary Portland Cement for by-products from the steel and coal industries).~~
- ~~Reduction in the volume and/or emissions of structural steel including the use of alternative low carbon structural materials.~~

For each scheme where a concrete-based solution is identified within the business plan, a carbon baseline ~~will be~~has been created based on the need and the traditional approach to designing and construction techniques used for concrete assets in the UK water sector (as of 2022). This will then be compared to the solution ~~implemented~~delivered in AMP8. The company will only include changes in emissions that are driven from the company's activities, it's partners and contractors, use of materials or supply chain specific ~~rather than changes in existing~~ emissions factors.

Each year the company will report the baseline emissions associated for standalone capital projects delivered in the year. The company will calculate the actual modelled emissions, accounting where relevant for activities that impact emissions (noted below). The difference between these figures will be reported as a percentage change. A single percentage change figure will be reported each year for the investment programme.

The measure will cover, for example, the following areas of the company's carbon footprint:

5. Avoid emissions by delivering the customer or environmental need without building new assets:
    - Adapting project scope or introducing an alternative design solution between the initial promotion to the capital vehicle from Anglian Water to outline design.
    - Re-purposing existing assets to avoid concrete being required to build new assets.
6. Improving the design of our concrete assets:
    - Reducing the mass of concrete or reinforced steel within design between the baseline and build phases of a project.
    - Using lower carbon alternative materials (e.g. Glass coated steel tank)
7. Switching components of concrete to use lower carbon alternatives:
    - Changing supplier (i.e. switching to a supplier that uses lower carbon materials).
    - Changing the product from our suppliers, such as products with a higher proportion of lower carbon alternative components (e.g. GGBS) compared to Ordinary Portland Cement (OPC).
    - Using alternative materials to steel reinforcement
    - Encouraging suppliers to stock non-standard, lower carbon products and purchasing them.
8. Sequestration of carbon within concrete
    - It may be possible that in coming years, concrete could act as a medium to sequester carbon. If this can be proven and adopted in relevant standards then this could contribute to our emissions reductions.

1.2 Additional detail on measurement units

~~N/A~~

This performance commitment measures the percentage reduction of GHG emissions from both concrete and rebar. Rebar refers to reinforced concrete where additional components (such as metal wires and bars) are added to provide strength to the system. This performance commitment only applies to standalone schemes, in alignment with our PR19 Capital Carbon commitment. Standalone schemes are large individual schemes that are typically in one physical location. Standalone schemes represent the majority of our capital delivery schemes by financial value.

For simplicity the following example focuses purely on the concrete & not the reinforcing elements. This example also ignores any restrictions that might be imposed by which may prohibit options as presented in this idealised imagined example with a fair tailwind, such as:

- Site safety configuration e.g. solutions being limited in height due local power lines
- Layout e.g. existing site services including underground and maintaining a build with a working WRC
- Local planning rules e.g. issues with the height & screening of assets
- Access Restriction e.g. limitations on the size or type of vehicles which may prohibit certain types of materials
- Land ownership/purchase e.g. space for temporary construction traffic or materials as well as for permeant locations of new assets.
- Materials availability e.g. local supply chain capabilities to supply specified materials

- People resources within organisation & supply chain e.g. to implement more complex design & construction processes
- Time e.g. some of the changes add duration to the design, construction of enabling programme which may not be possible on projects with tight obligation dates.

Step	**A worked example of the process in measuring and reducing the lower carbon concrete solution**		
1	Business Need – A water recycling centre requires additional storm water capacity to meet WINEP obligations		
2	Baseline solution would be a single concrete storage tank and associated pumping to meet the full additional volume stated by the EA as required. $$Concrete\ Carbon\ Emissions\ =\ W$$		
3	A review of the site identified three partial solutions – which will be used together to meet the WINEP obligation		
	D) Measurement of the existing storm volume shows it is slightly larger or smaller than thought,	E) some unused old assets that could be repurposed (may be possible on some sites)	F) a space onsite for a new storage tank.
4	Either No further action taken – no build partial solution $Concrete\ Carbon\ Emissions = 0$ Or Additional volume is required, increasing the carbon of the scheme $Concrete\ Carbon\ Emissions = K$	A more detailed structural & suitability review identifies refurbishment requirements – these have a lower carbon footprint of the conventional solution. However the construction program is more complicated with a greater range of contractors and detailed inspections are necessary collaborating with a broad supply chain (at additional financial cost) $Concrete\ Carbon\ Emissions = T$	While the traditional solution to this new volume would be concrete tank (walls & floor), a possible innovate solution which may be suitable (subject to a range of site specific circumstances) is a concrete base with a glass coated steel tank (for example) – this alternative material lowers the Whole life carbon cost (even though it has a shorter lifetime) although requires a broader supplier base (and may require new suppliers) $Concrete\ Carbon\ Emissions\ =\ Y$
5			Traditionally the tank would sit on a square concrete foundation as this is easy to design and construct – a possible the innovative engineering design solution is a a more complex shaped concrete floor shape . This requires more time on site to construct the formwork increasing labour costs as well as more time to complete a more complex design. Consideration is required of long term maintenance requirements to avoid creating operational issues $Concrete\ Carbon\ Emissions = Y - B$
6			Normal industry standard practise is to use s 100% OPC mix due to fast setting time. Innovative, working in close partnership with the local supply chain a

			30% GGBS (balance OPC) is identified. Due to the winter weather at the time of construction this will set slowly. Therefore the construction program is modified to allow a longer cure period (increases cost). Close collaboration with the supply chain is required both to supply materials and a suitably trained workforce to use these materials $Concrete\ Carbon\ Emissions = Y - B - C$

$$\textbf{Reduction on this example scheme} = W - \frac{K + 0 + T + (Y - B - C)]}{W}$$

1.3 Specific exclusions

~~None~~
Specific exclusions:

- Parcel schemes – parcel schemes are those which are not considered 'stand alone' as defined above.
- Major infrastructure projects which are delivered through DPC or SIPR rather than through our traditional delivery routes.
- Projects that transition between AMP periods

1.4 Reporting and assurance

The company will provide external third-party assurance detailing all data required to maintain the PAS 2080 'Carbon Management in Infrastructure' standard, including quantification, baselining, monitoring and reporting of emissions related to concrete assets.

Table 1 Definition parameters

Measurement unit and decimal places	Percentage reduction of tonnes CO2e reported to two decimal places ~~since~~compared to the 2022 baseline approach
Measurement timing	Reporting year
Incentive form	Revenue
Incentive type	Underperformance and outperformance payments (underperformance incentive rate set at half the outperformance incentive rate)
Timing of underperformance and outperformance payments	~~End of period~~ Annual (financial year)
Price control allocation	~~50% water~~Water resources: 2.7% Water network plus~~, 50% wastewater~~: 36% Wastewater network plus~~-~~: 54.5% Bioresources: 6.8%

Frequency of reporting	Annual, on a reporting year basis
Any other relevant information	
Links to relevant external documents	