

ConstructZERO

The Construction Industry's Zero carbon change programme

Environment Agency Case Study

The Environment Agency and its role

Environment Agency England manages the risk of flooding from main rivers, reservoirs, estuaries, and the sea and we take a strategic overview of others' work, to manage the risk of flooding from all sources. Part of the Environment Agency's role is to create better places for people and wildlife and to support sustainable development.

EA commitment to Net Zero

In October 2019, the organisation set itself the goal to become Net Zero Carbon (NZC) by 2030. (Further detail on the NZC target - Appendix A).



Net Zero is only one of the four challenges established as part of the Environment Agency corporate sustainability plan (eMission2030)¹. In the plan, the EA outlines its ambition for the future, using hard evidence to build sustainability into every decision. The plan focuses on other three key challenges for a more sustainable future of the organization: optimizing the use of resources, benefitting people and communities, and delivering Environmental Net Gain. Net Zero is incorporated into all of our plans and strategies, providing a clear line of sight from project to organisation ambitions.

Net Zero Carbon Programme for Infrastructure (NZCP4I)

The Net Zero Carbon programme for infrastructure supports our organization's ambitions and focuses on whole life asset management and projects. Through our analysis and reporting, we know that currently 54% of our carbon impact lies with the construction and operation of flood risk assets and protecting communities from flooding. NZCP4I includes investigative projects, trials, and pilots that will provide the intelligence needed to formulate the glidepath to NZC²

¹ 2 - We will set out our plans to meet net zero by 2045, including annual targets, recognising that the majority of cuts need to be made by 2030 [see note 1]. We will publish this, and our progress against it, annually

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Carbon Data

Currently, Environment Agency's Eric whole life carbon planning tool is used to baseline and report carbon on construction projects. Our tool is aligned to PAS 2080 and its utilisation is embedded in our business case processes and governance. Carbon data utilised is based upon publically available data sources, a clear whole life cradle to grave methodology, and is linked to both our frameworks and contracts. Data received from our supply chain is assured and utilised for forecasting carbon at a portfolio and programme level via carbon intensity metrics, formal corporate reporting, updating our Minimum Technical Requirements, and understanding the cost and carbon impact of our choices including tackling carbon hotspots. The Environment Agency is also making progress in integrating and aligning carbon and cost, as part of the wider modernisation of asset management. The delivery of the Cost and Carbon Tool (CCT), in summer 2021, will enable the Environment Agency to produce whole-life carbon and cost estimates, making easier the selection of more sustainable solutions. The estimates will be updated at the different project delivery stages. A benchmarked estimate of carbon and cost will be available at Strategic Outline Case (SOC) moving to a more granular estimate at OBC and FBC stages². (CCT explainer video <https://youtu.be/Rx4rnzrk1Y>)

Data assurance

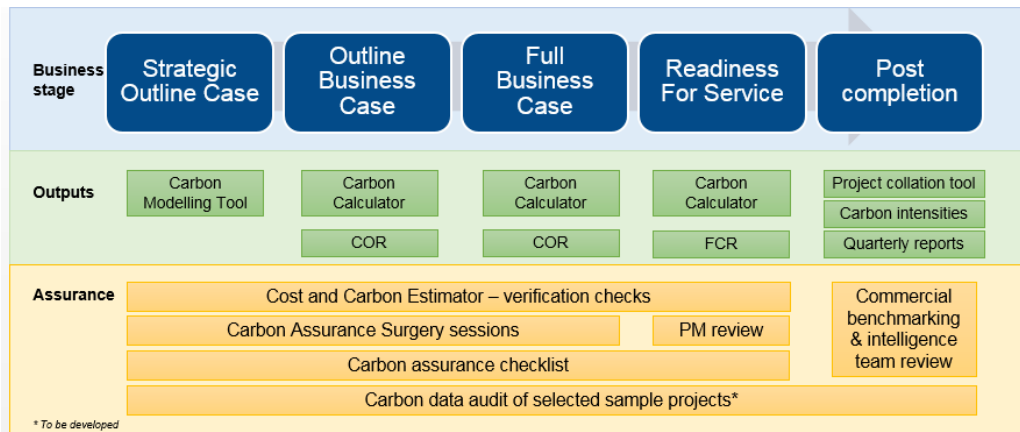
Our Carbon and Cost team as a service, assure our data returns, the PM has the overall responsibility to ensure the required steps are undertaken and that the project's carbon reduction target is achieved. The Carbon and Cost Estimators and carbon hub leads are involved throughout the programme stages and undertake the assessment and liaison work with contractors and suppliers to help reduce carbon.

To assure that carbon management is embedded in decision-making and carbon report data are accurate, the EA ensures resources are available throughout the process⁷.

² 6 - We commit to explore and adopt approaches that: a. improve our capability to evaluate, as well as reduce, embedded and operational carbon in the design and construction phase; b. measure and reduce carbon emissions during the life of existing assets and during decommissioning.

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The assurance process includes the following steps:

1. Cost and Carbon Estimators (CCEs) self-check
2. Quarterly workshop sessions with the CCEs and national carbon team: discussion group for sharing knowledge of carbon reduction opportunities on schemes, data requirements, reporting practices, etc.
3. Carbon assurance checklist tool: outlines a series of checks to be carried out when completing the ERIC tool
4. Selected audits of completed projects: a deeper look into the evidence of ERIC data.

The EA is now implementing the carbon data assurance process even further, setting monthly carbon data review to be carried out by ECC PMs. This process will follow the same approach used for approving costs³.

Data Usage

In line with the PAS 2080 Continual improvement requirements our carbon data from Eric reporting is used to share knowledge and successes once the project is completed and to provide continuous improvements in the following areas^{4,6}:

- Compare traditional and low carbon measures in terms of costs and performance;
- Evaluate technology swaps to see where savings could be made;
- Inform conversations with the supply chain about where savings need to be made and what solutions could be applied;
- Plan out the operational and maintenance activities for the scheme, comparing different solutions impact on the operational emissions.

³ 5 - We commit to having our carbon data externally verified as part of our reporting requirements e.g. via CEMARS in compliance with ISO 14064-1:2006

⁴ 7 - We will align our capital and operational investment plans with the national net zero carbon obligation, including retrofitting decarbonisation to our existing asset operations and their use. We will use early stage optioneering to prioritise no-build and low-build solutions, which optimise existing assets, systems and processes, before new build is considered

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Low carbon case studies and factsheet can be found at the links below:

- Case Studies - <https://adoddleak.asite.com/adoddlepublic/dpd/M8LL78InXBonGtEoB9>
- Fact Sheet - <https://adoddleak.asite.com/adoddlepublic/dpd/j9zzGyF79Be66Co4xr>

How data influences the way the Environment Agency works

The analysis and management of the carbon data via our dashboards help projects and EA identifying quick wins, gaps and suggest changes in the way we approach our asset management and project activities. This information informs NZCP4I on how we progress towards net-zero target ambition and established benefits and key areas of intervention.

Carbon data enabled the calculation of the Carbon Intensity factors. The intensity Factors are average factors calculated from a set of delivered projects, where Capital Carbon and Whole life Carbon emissions are normalised by construction spend. The Intensity Factors have been used for forecasting and assurance purposes and we reviewed them in 2021. The following values have been established for the Whole Life and Capital Intensity factors:

- Capital – 3.73 t CO₂e/ £10k of construction cost
- Whole Life – 6.94 t CO₂e/ £10k of construction cost

Our carbon data feeds to the Minimum Technical Requirements (MTRs) updates, in April 2021 we amended the following information:

- ultra-low carbon concrete
- optimisation of steel reinforcement in concrete structures
- optimising the design of steel piles
- renewable energy for site-set-up
- Using electric, hydrogen, or hybrid-powered plant and greener fuels to replace fossil fuels.

Our data interrogation enabled the identification of trends across projects and to inform, decision making, e.g. ERIC data identified that more than half of the construction emissions are due to concrete. Funding of the NZCP4I is now allocated to trial Low and Ultra low carbon concrete.

Contracts

All of our framework contracts (CDF, CSF, FOF, and (future) MEICA framework) include/ to include carbon reporting¹¹. This collaborative approach with our supply chain is a requirement of PAS 2080.

As per the Collaborative Delivery Framework (CDF), 'The Delivery Partner supports the Client in cutting carbon and other emissions. Committing cutting planned and actual whole life carbon emissions associated with the delivery of Projects'.

The Collaborative Support Framework (CSF), schedule 2, about Sustainability, requires the delivery partner to fulfill the following clause regarding climate action:

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- Minimise the contribution to climate change, accounting for the whole life greenhouse gas emissions (expressed as carbon dioxide equivalent, abbreviated to carbon in this document). This includes the embedded carbon of materials and the process of construction; whole life carbon associated with operations, maintenance, and end of life of assets; the effect on existing carbon sinks and sources; and the creation of habitat to provide additional capacity for carbon sequestration.

As mentioned in the paragraph above, it is also a contractual requirement for our consultants and contractors to provide carbon data at Gateways 1 and 4⁵.

The EA is also working on implementing the following changes to all our procurement documents, making even more explicit our NZC commitment:

- Supplier charter - it will develop a supplier charter setting out our values, by 2022 and ask all our suppliers to sign up for it. This will be mandated in new contracts and tracked as part of supplier performance.
- Contract terms and conditions - By April 2022 our supplier contract standard terms and conditions will set data reporting requirements for our suppliers, to ensure they provide us with carbon data and publically disclose their emissions.
- Contract carbon requirements - By April 2022 all-new significant contracts (>£0.5m) will be required to submit baseline carbon emissions and then reduce those across the life of the contract by 10% per annum. That will deliver between 40 and 50% reduction across a typical contract.
- Major supplier disclosure - By 2024 all gold & silver contract suppliers will be required to report their emissions to the Carbon Disclosure Project.
- Major supplier SBT - By 2024 all gold contract suppliers will be required to set a Science-Based Net Zero target and report on progress annually.

External Knowledge Sharing

The Environment Agency is working with several external organizations to share best practices on our methodologies for carbon measurement and management^{6,7}.

⁵ 3 - We will include carbon reduction targets and reporting commitments explicitly in all our procurement documents from 2021, as a deliverable of the procurement process, to move the 'cost-carbon' balance in favour of low carbon choices. This will include capital carbon (product, A1-A3 and construction processes, A4-A5, according to the quantification framework of PAS 2080). We will use PAS 2080 (or equivalent standard) as the reference document for this

⁶ 9 - As clients, we will work together (with our peers, umbrella industry bodies and our supply chains) to share best practice around our methodologies for carbon measurement and management. By also understanding where we have 'common asset types and activities' we will ensure we all measure and report on the carbon in these assets/activities consistently by 2022.

⁷ 10 - By 2025 we will have in place an Infrastructure Carbon Data Set, which will be used wholly by the sector. To achieve this, we commit to share our carbon data openly, through a national carbon integrator (where available) and through working with industry.

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Some of the key working groups include:

- Infrastructure Client Group (ICG) Carbon - The ICG works in partnership with the Green Construction Board Infrastructure Working Group. As part of the group, EA shares learning and progress on carbon targets and benchmarking in compliance with PAS 2080.
- Infrastructure and Projects Authority (IPA) – The EA supports IPA aligning carbon and cost in industry guidance, senior responsible officer guidance, and benchmarking guidance. As well as sharing the whole life carbon methodology approach.
- Infrastructure Industry Innovation Partnership (i3P) – The EA collaborates with other client and supply chain organisations to deliver innovation and sharing industry knowledge, driving transformation in the infrastructure and construction industry.

Offsetting

The Environment Agency considers offsetting only as a last resource, once all the emissions have been reduced as far as possible. This is reflected in the guidance and templates⁸.

The EA is committed to prioritizing offsetting removal techniques, focusing on nature-based solutions, such as growing trees or other types of habitat restoration. Offsetting is considered at a corporate level and a Corporate Strategy on offsetting will be produced by the end of 2021.

⁸ Using our common understanding of ecosystem services we will share knowledge and information on the benefits of nature-based solutions for carbon sequestration and increased resilience instead of 'hard engineering' interventions. This will allow carbon capture to be reported on consistently across the infrastructure sector.

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Appendix A – NZC Target

The Environment Agency's goal is to become Net Zero Carbon (NZC) by 2030. This means that by 2030 the Environment Agency will aim to balance the carbon emissions produced with those taken from the atmosphere so that it is no longer contributing to climate change⁹. To get to Net Zero, the emissions will have to be reduced at least by 45% compare to the 2019 baseline. By 2050 the Environment Agency aims to become an absolute carbon zero organisation. Hitting Net-Zero by 2030 is already ambitious, but the EA is keen to go even further. So, as it works towards net-zero, it will also explore how to become an 'absolute zero' organisation – one that does not produce any carbon emissions at all.

According to the FCRM strategy, this does not mean that the Environment Agency stops building flood defenses, pumping water out of people's homes if they flood, and or all the other things we need to do to create a better place. But it does mean that it will need to find ways to do these things which produce fewer carbon emissions.

⁹ 1 - We will aim to reduce our direct and indirect (Scope 1, 2 and where appropriate Scope 3)1 carbon emissions by at least 75% by 2025 (20% per year, compound, on average) in order to meet zero carbon emissions by 2045 (or the relevant government stipulated date, if earlier).

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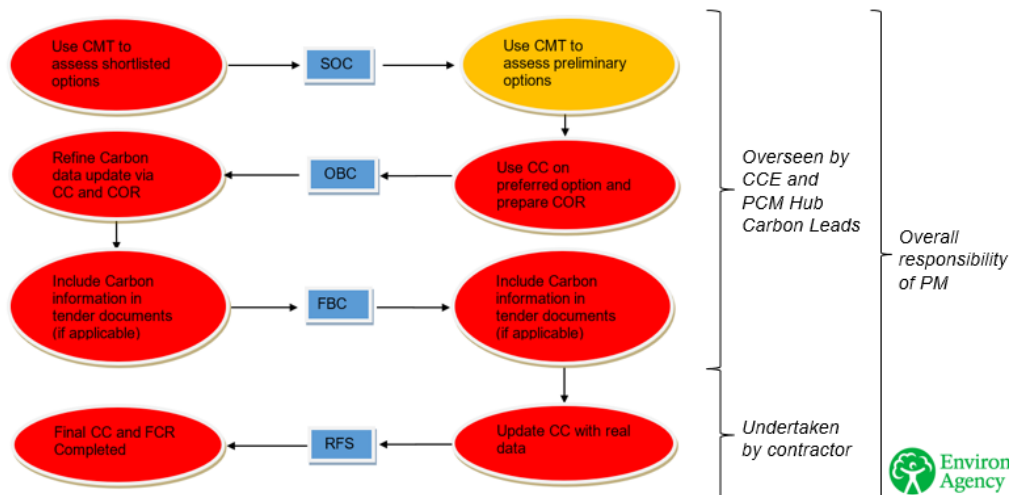
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Appendix B – ERIC

The ERIC Carbon Modelling Tool (CMT) is used to forecast and baseline the lifecycle carbon footprint for construction projects. The Carbon Calculator (CC) is used to measure the actual lifecycle carbon footprint.

PAS 2080 carbon management hierarchy and carbon principles are used throughout the lifecycle of the projects to identify and implement carbon reduction opportunities. The Environment Agency considers the carbon hierarchy from the very early stage of the projects, as it is shown how early engagement and action are key¹⁰.

The chart below illustrates how and when the carbon management tool should be considered along the 5-case business model process and who has responsibility:



1. At Strategic Outline Case (SOC) stage (Gateway 1), the Carbon Modelling Tool (CMT) is used to produce a footprint of the different viable scheme options and identify the low carbon solutions that may be taken forward establishing a carbon baseline¹¹. This step is based on a high-level top-down approach to quantifying emissions but helps to

¹¹ 4 - We commit to providing a carbon baseline for each of our projects and setting targets for carbon reduction against these, which will drive innovation. We will also include, where appropriate, progressive carbon reduction targets throughout the life of a project and appropriate financial incentives, having regard to the other commitments on the code. Carbon offsetting may be unavoidable but should be the last resort and used when all other carbon reduction efforts are exhausted. Carbon offsetting should follow the Oxford offsetting principles 3 or equivalent.

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- identify the preferred option to proceed with, based on estimated carbon emissions across the lifecycle.
2. Once the viable options are reviewed and a preferred option is chosen, a more detailed footprint is produced using the Carbon Calculator (CC), which uses a bottom-up approach to estimating emissions. The CC is used to develop the Carbon Optimisation Report (COR). These get included an Outline Business Case to agree on full investment approval, along with details on how the results influenced the selection of the preferred option;
 3. As the design develops and the model gets refined, the carbon calculator is updated and the results revised in the COR and included in the Full Business Case. The carbon information gets also included in tender documents.
 4. Once construction starts, another version of the CC is produced which uses actuals data collected by the contractor. The final CC and Final Carbon Report (FCR) are produced upon scheme completion (Gateway 4) by the contractor. This is a requirement under the construction contract¹¹. The FCR should include information on key carbon drivers, reduction measures implemented throughout the design development, and reduction measures implemented throughout construction.
 5. Following this process, handover to the EA occurs and the assets become operational.

Once Carbon data are submitted carbon reduction dashboards, including CMT and CC results, are shared internally and with the supply chain every quarter. A final annual report is also produced. The dashboard shows the overall emissions generated by construction projects and schemes in FCRM².

Using ERIC data for construction, the entire organization's emissions were re-baselined in summer 2020, from now on the corporate progress will be shared annually² internally and externally.

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Appendix C - Project Example

In line with the NZC commitments, the Environment Agency is already delivering projects with significant carbon reductions. In spring 2020 the EA started the Hythe Ranges¹² sea defence scheme. The works involved:

- refurbishment and raising of 30 timber groynes
- construction of a 200m rock revetment made from 37,000 tonnes of imported Norwegian granite
- recharging the shingle beach with over 300,000 cubic meters of material

This work to the beach and groynes will reduce the risk of flooding from the sea.

The Hythe Ranges sea defence scheme, delivered in partnership with the MoD, is a £25m investment. With the scheme's completion, 787 properties are now better protected from tidal flooding for the next 100 years, taking into account climate change and sea-level rise. The Hythe project achieved efficiencies of over £2.5 million and more than 1,660t CO₂e savings including:

- 490t CO₂e saved by realigning a sheet pile wall to reduce total steel by 75%
- 390t CO₂e saved by optimising the construction of the rock revetment toe and use of a geotextile to reduce the rock volume by 30%
- 570t CO₂e from reducing the number of timber groynes from 45 to 30, saving approximately 30% of the timber volume
- 215t CO₂e saved on concrete including the pioneering use of low carbon concrete.

This project helps the Environment Agency protect people from climate shocks and reduces the carbon footprint.

Environmental enhancements¹³

The project included environmental enhancements which encourage intertidal habitat to develop. These included:

- The novel use of a mechanical rock grinder attached to an excavator to create artificial rock pools that were then placed in the granite rock revetment. Over 70 rock

¹² <https://www.gov.uk/government/news/hythe-ranges-sea-defence-scheme-virtual-opening-ceremony>

¹³ 11 - Using our common understanding of ecosystem services we will share knowledge and information on the benefits of nature-based solutions for carbon sequestration and increased resilience instead of 'hard engineering' interventions. This will allow carbon capture to be reported on consistently across the infrastructure sector.

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pools were created and within 48 hours of installation, sand eels had been identified in the pools.

- The timber groynes were constructed from 100% Forest Stewardship Council (FSC) timber, including FSC certified recycled timber. Approximately 5-10% of the demolished timber from the old groynes was re-used in the new structures, with the remainder recycled or re-used by third parties. This included the construction of benches from recycled timbers which have been installed on the public promenade.

A rock revetment was constructed to protect the Dymchurch Redoubt, a 200-year old military fort requiring Scheduled Monument Consent and Listed Building Consent. MoD Funding.