Hull & East Riding
Internal Carbon Pricing & Insetting

Phase 1 Report – v3, Final

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Executive Summary

The North East & Yorkshire (NEY) Net Zero Hub want to support better net zero decision making and find ways to embed the achievement of net zero into: day to day operations, the design of wider projects and programmes, and also find ways to support development of additional net zero projects.

Carbon Pricing is hailed as a key tool in addressing the climate crisis. Internal Carbon Pricing (ICP) is a tool that organisations can deploy in managing their carbon costs and risks, allowing proactive use of a cost of carbon in decision making. ICP is increasingly used in the private sector to assess the risks and costs associated with decarbonisation and bring consideration of those risks into processes throughout the organisation. The NEY Net Zero Hub have commissioned this study to examine how ICP could work in a Local Authority setting, with Hull and East Yorkshire (HEY) providing the examples and support for the deep dive into the realities of public sector operations. This report reviews the background and critical factors related to use of ICP in a Local Authority setting and proposes a suitable model for implementation in HEY in a trial phase, along with more general guidance on the process of determining elements of an ICP model.

There are two main ICP models[1] used by organisations to drive carbon reduction: Shadow Price and Carbon Tax:

Shadow Price – the pound per tonne of carbon dioxide equivalent (£/tCO_2e) carbon price is used for information in business decisions e.g. to alter the calculated NPV or payback of a considered option. Money does not move around the organisation, but shadow pricing typically allows justification of greater investment or spend towards lower carbon options. Shadow prices tend to be higher and based on more realistic costs of carbon.

Carbon Tax – the £/tCO_2e carbon price is levied against a part of the organisation so that money is collected based on carbon impact. This creates a fund (of money from elsewhere in the organisation) that can be used as required. Often, examples of carbon tax systems are based on very low costs of carbon more as a proxy than representing genuine costs of carbon reduction. These proxy figures can still have a beneficial impact on awareness raising but are limited in ability to achieve decarbonisation targets.

The **Implicit Price** £/tCO_2e is an important metric which defines what it will cost the specific organisation to achieve decarbonisation targets:

$$\frac{cost\ of\ carbon\ reduction\ measure(s)}{tonnes\ CO2e\ reduced}$$

The implicit price is best thought of as a price rather than a model. The implicit price can be used as a price within either a Shadow Price or Carbon Tax model. *In terms of determining a carbon price, it is helpful to realise that there isn't one price of carbon.* The relevant carbon price can be determined in various ways.

[1] By models we mean a description of *how* a carbon price is used in the organisation.

We can look at calculating the relevant price of carbon (in £/tCO_2e) from two main standpoints, either:

Looking forward from now assuming targets will be met (*the cost to avoid climate change*). Considering the current aim and imperative to achieve net zero targets, understanding what that will cost, and making decisions about the best use of money to achieve that aim based on what the specific organisation has to do to decarbonise. Implicit prices are based on this method which is sometimes called a Mitigation Cost Approach (MCA).

Looking back from the future assuming targets are not met (*the cost from climate change damage*). Considering the costs of the negative impacts of climate change if allowed to happen. Costing the impacts to health, infrastructure, prosperity and livelihoods if climate change isn't avoided. A Social Cost of Carbon (SCC) approach is the basis of prices calculated from this viewpoint.

A carbon price based on an Implicit Price/MCA or SCC approach can be used in either a Shadow Price or Carbon Tax model.

Key principles to consider in choosing a price:

The price should be set high enough to make a relevant impact in business case decisions. This can be checked through analysis of break-even price and through gathering feedback of stakeholders involved in the decision-making process(es).

The price must be defensible. Alignment with relevant external benchmarks is useful in this instance. These may be based on global analysis such as the World Bank corridors, country specific analysis (i.e. UK Green Book), or relevant taxes or trading schemes (e.g. EU ETS). However, the more high-level and global – the less specific to the organisation's sector, geography, and particular investments that will be needed.

The price needs to be effective. It needs to incentivise helpful behaviours without causing unwanted impacts. For example, in a case of use with contractors – is it high enough to successfully account for risk and to make it attractive for contractors to take on new materials and ways of working without leading to contract values that are unbalanced and unsupportable? Monitoring the impact of carbon prices through pilot projects and structured feedback is helpful.

The use of external benchmarks aids communication and governance in that updates to projections can be monitored.

Most external analysis points to the increase in carbon prices over time. A price structure that includes staged increases: current price, 2030 price, 2050 price etc. is recommended. For decision making processes where the legacy of that decision will have a specific lifetime, then the analysis structure should include the increasing prices.

External analysis is a useful guide to benchmarking an ICP system, even if an external benchmark isn't chosen to set the ICP price. Externally the carbon landscape is undergoing rapid change and evolution driven by increased engagement and response to the climate crisis, national target setting, increased demand, and changing regulation. Yearly review of key benchmark sources is recommended.

When setting up the decision-making structure, it is possible to include a range of prices, particularly for shadow pricing where the result is advisory (no funds are recovered). For example, a net present value (NPV) analysis could include a central ICP price e.g. £100 / tonCO_2e but also show the impact with a high-end estimate of future carbon price e.g. £200 /

tonCO$_2$e. This may require guidelines for decision makers to aid interpretation, but due to inherent uncertainty in external carbon prices, showing this range can be helpful.

Carbon Insetting

The topic of insetting was also included in the scoping project as an area of interest to the NEY Net Zero Hub and HEY. Insetting refers to investment in climate action within a defined boundary; the boundary can be organisational (e.g. a value chain) or geographic (e.g. within a local authority area). Funding for insetting activities can come from council budgets, or income generated through policies such as social value in procurement, or planning policy. Insetting and ICP can work together with the insetting price being a subset of the implicit price, insetting projects can also be funded via the creation of a carbon tax model.

An option that involved insetting and supplier contracts was considered. A form of insetting such as the proposed model described in this report can be implemented at any point, including alongside an ICP policy. A future insetting policy could use evidence generated around the implicit price used within ICP to inform the policy design. The project working group agreed that insetting will be more appropriate for a future development once the practice of working with carbon pricing is established.

Applying ICP

The process recommended for identifying how and where to apply ICP is as follows:

1. Determine drivers and boundary for the project.
2. Identify largest areas of Greenhouse Gas (GHG) footprint and areas of footprint that are hard to decarbonise, consider data quality.
3. Identify the decision-making processes within the organisation that have the greatest impact on the carbon emissions of those areas of the footprint.
4. Engage with stakeholders to understand how those processes currently influence sustainability and decarbonisation decisions. Ensure potential users of ICP are included, along with process owners, Finance, Sustainability, and comms teams. Discuss drivers for decarbonisation, culture, and priorities.
5. Factoring outcomes of points 1-4, decide on a decision process where ICP could be applied and an ICP model (shadow price or carbon tax).
6. Spend additional time investigating the chosen process to understand the people, systems, existing tools, and data.
7. To establish a price, first consider where it will be used and what are the relevant carbon costs and risks associate with the scope.
8. Calculate the relevant implicit price for decarbonisation of the scope area that is being targeted with ICP, using data on cost of decarbonisation for previous projects and external benchmarks. Generating a Marginal Abatement Cost Curve can be helpful in this process.
9. Consider external carbon prices, comparing the use of MCA based price: calculated implicit price or UK Green Book non-traded price, vs SCC.
10. Test the price on example cases to review what impact the use of a carbon price may have had on the decision.
11. Before implementation, consider the supporting materials (guidance documents, training materials, and tools) and talk to communications teams regarding best ways to get staff on board.

The above steps should be followed by the NEY NZ Hub partners who wish to consider using ICP in the future. The findings from the Pilot Phase 2 should also be considered in terms of lessons learnt. In this instance for Hull and East Riding, the use of ICP in the capital approval process was highlighted as a good starting point due to it's potential to impact the GHG footprint related to buildings and fleet. The boundary of the initial project relates to achievement of the authorities' own Net Zero target. This determines the boundary for what should be included in the ICP carbon and financial quantification in the Capital Approval process as those elements of projects that impact the authority's own footprint (scope 1,2, & elements of scope 3 that are included in the target).

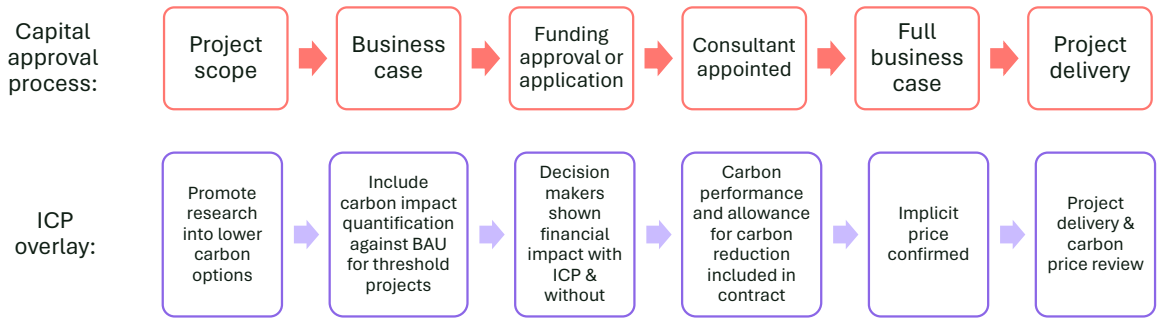
For use in Capital Approval, a shadow price is most appropriate. The shadow price is used in the consideration of options, so added into the calculation of Net Present Value based on the relative carbon impact of options. This usage then promotes investment in greener but initially more costly options. The implementation of an Internal Carbon Price system is likely to result in increased expenditure in the area where it is implemented. It is hoped that the ICP system will provide the justification for approving greener projects where the resultant increase in spend is equal to or less than the cost of reducing carbon emissions by other measures (the implicit price). This is an important point to emphasize: *the value of the additional spending results in decarbonisation that would otherwise ultimately be more costly to undertake later.*

The shadow price is ideally based on the implicit price and therefore represents the implied costs of carbon reductions needed should the funded project increase the carbon emissions of the council. The process aims to minimise the carbon emissions associated with funded projects and therefore minimise costs from needing to meet carbon targets.

The project specific implicit prices of various projects that could contribute to carbon reduction should be captured to build up an understanding of the overall cost £/tCO_2e reductions that is relevant for the organisation. This is then used to calculate an overall implicit price. Data to allow the calculation of an implicit price was scarce in this first phase.

It is proposed that the pilot starts by using an external proxy, and that data be captured from projects that go through the capital approval process to build up the implicit price over time. The proposed external proxy are the UK Green Book non-traded carbon values. These are the values that are already used in larger schemes and while they are high values, they sit between the range of individual implicit prices that were available. The UK Green Book prices are calculated based on an MCA approach and therefore align with an approach that requires an implicit price. Until a locally specific implicit price can be calculated, the UK Green Book is the best MCA based set of external prices that is available.

An overview of the capital approval process is shown in Figure 1 below along with the relevant data requirements and outputs at each stage. The bottom row of the diagram captures the actions required to prepare for implementation or a pilot are highlighted.



Data	(Technology) feasibility studies. Best practice prompters	Activity data on project & BAU. Emission factors – DEFRA £/tCO2e carbon price	Marginal tCO_2e Marginal cost £ with and without ICP carbon cost (based on £/tCO_2e)	Predicted tCO_2e over lifetime. Contract costings and budget. Relevant carbon price.	Updated marginal tCO_2e finalised. Updated marginal cost £ finalised.	Updated marginal tCO_2e delivered. Updated marginal cost £ delivered.
Output	BAU, proposed project + X other comparators	tCO_2e impact of project vs tCO_2e impact of BAU. Financial impact of carbon calculated.	NPV or IRR calculation with & without ICP. Draft economic model.	Impact on contract value from ICP. Contract agreement that incentivises carbon reduction.	Implicit price for project finalised. Full economic model incl. carbon. Centralised MACC updated	Implicit price for project delivered. Centralised MACC updated
Implications / actions required	Guidance and support. Pointers to best practice.	Support in carbon quantification, factors & guidance. £/tCO_2e carbon price calculated and communicated.	Decision maker guidance. IRR threshold adjustment if technology pays back in lifetime	Guidance on contracting with ICP. Consideration of incentives for good carbon performance.	Method for feeding back implicit price into governance of ICP system	Monitoring process for carbon impact. Method for feeding back implicit price into governance of ICP system.

Figure 1 Updates to the capital approval programme and implications

The key details of a proposed Internal Carbon Pricing scheme for an initial pilot at Hull are outlined in Table 1 below.

Table 1 Key elements of proposed ICP methodology

Consideration	Response	Comments
Type of ICP	Shadow	
Area of application	Capital Approval Process	
Boundary	Scope 1, 2, & 3 as relevant to Net Zero target set.	As a key driver is achievement of targets, the boundary of what is included in the carbon quantification (and therefor having a price applied to it) should relate to the decarbonisation target set. In this case, the project is focussed on the authorities' own emissions as shown in Figure 3. This boundary should be tested during the pilot.

Purpose	Incentivize consideration of lower carbon options in capital approval	
Carbon Price to be used	Low £130/tCO_2e Med £260/tCO_2e High £390/tCO_2e	The Green Book traded carbon prices are lower and perhaps perceived as an acceptable starting point, but the non-traded prices better align to the social cost of carbon. A higher initial starting point will enable greater comparison between capital project options when under trial in the pilot.
Carbon Price basis	Green book Non-Traded initially, changing to Implicit price as data improves	Insufficient information has been available to calculate an implicit price, but this can be built into the process and reviewed in the pilot. A starting price is required which can be based on published Green Book Non-Traded values.
Governance & ownership of methodology	Owned by Finance, and carbon quantification and support resources managed by a dedicated team	As in the Social Value model. Finance are inherently critical to the approval process and have several relevant transferable skills.
Tool & documentation requirements	Carbon quantification	ADEPT CCAS tool or Sustainability Impact tool / appraisal, or other suitable tool. A simplified version of the UK Green Book process for GHG calculation and valuation is suggested.
Communication & education requirements	Central carbon literacy with ICP ICP process guidance document	ICP can be a bolt-on to existing carbon literacy training. ICP process could be a PMO style mini guide.

Contents

Table of Acronyms

Acronym	In full
ABI	Authority Based Insetting
ADEPT	Association of Directors of Environment, Economy, Planning & Transport
BAU	Business as Usual
BEIS	Department for Business, Energy & Industry Strategy
CC	County Council
CCAS	Carbon Calculating & Accounting Standard
CDP	Carbon Disclosure Project
CIHT	Chartered Institution of Highways & Transportation
DfT	Department for Transport
ERYC	East Riding of Yorkshire Council
ETS	Emissions Trading Scheme
EU	European Union
FHRG	Future Highways Research Group
GBP	Great British Pound
GHG	Greenhouse Gas
GHNF	Green Heat Network Funding
GLA	Greater London Authority
HCC	Hull City Council
HEY LEP	Hull and East Yorkshire Local Enterprise Partnership
ICP	Internal Carbon Pricing / Internal Carbon Price
IPCC	International Panel for Climate Change
IRR	Internal Rate of Return
LA	Local Authority
MACC	Marginal Abatement Cost Curve
NEY	North-East Yorkshire
NGFS	Network for Greening the Financial System
NPV	Net Present Value
NZ	Net-zero
PMO	Project Management Office
SRRI	Social Rate of Return in Private Investments
STPR	Social Time Preference Rate
tCO_2e	Tonnes of carbon dioxide equivalent
UKAs	UK Emissions Trading Scheme Allowances

List of Figures

List of Tables

1 Background and Introduction

Background

The North East and Yorkshire Net Zero Hub (The Hub) supports local combined authorities and local enterprise partnerships to accelerate the region's efforts to drive a low carbon future. The Hub, through the Strategic Projects Pipeline, has provided £30,000 to help the region realise its net-zero ambitions. The Hub, with delegation to Hull and East Yorkshire, wish to gain greater understanding of internal carbon pricing and carbon insetting. This Hub funded project will explore a worked example of internal carbon pricing and carbon insetting in Hull and East Riding, enabling knowledge sharing more widely across the region as a result.

Hull City Council (Hull) has a carbon neutrality target of 2030 and aim to be a leading carbon neutral city within the UK. East Riding of Yorkshire Council (East Riding) has a net-zero target of 2050. The Councils want to improve how carbon impact is assessed as part of the decision-making process and service delivery, through a carbon budget or pricing mechanism. As a further build, Hull would also like to explore the potential for carbon insetting. Hull are interested in whether an internal carbon price (ICP) could help support the wider aim for carbon neutrality.

The full project objectives are to:

- Understand how internal carbon pricing can be used to support the Council's carbon neutral and net-zero targets;
- Understand the role of carbon insetting options within the context of ICP;
- Establish a set of recommendations for a pilot phase with Hull;
- Deliver and assess the pilot; and
- Detail the requirements for full implementation of ICP at Hull.

Hull requested support in a two-stage project format: a scoping phase for both Councils and a pilot phase for Hull, separated by a break to allow for preparation. This report covers Phase 1.

Introduction

This report provides details on the scoping study process undertaken with regards to Internal Carbon Pricing and Insetting at Hull and East Riding, describing the work undertaken, research, and conclusions reached.

The process has been a collaborative effort between Anthesis and a Working Group set up to represent Hull, East Riding, and the Hull and East Yorkshire (HEY) Business, Growth and Skills Hub (formerly HEY LEP). The working group consists of four key members:

- Harry Baross, Net Zero Coordinator, HEY Business, Growth and Skills Hub (formerly HEY LEP), and Regional Project Manager, North East and Yorkshire Net Zero Hub;
- Martin Budd, Climate Change Manager, Hull City Council;
- Helen Jenkins-Knight, Climate Change Manager, East Riding of Yorkshire Council;
- Phil Glover, Business Development Manager HEY Business, Growth and Skills Hub (formerly HEY LEP).

Internal Carbon Pricing is a simple idea at its heart: monetise carbon impacts and savings to put climate change on the balance sheet of every organisation and front and centre of decision making.

Recognising that decisions made in organisations are often based on financial language and quantitative financial measures, carbon pricing places a financial value on greenhouse gas emissions. By virtue of being about money, the price of carbon can tie into almost all parts of an organisation. It can be used selectively, but where used, it brings carbon deep into day-to-day decisions, in particular decision processes that have financial assessment running through their core. Systems, processes, data, reports; eventually come back to a financial metric. By making a conversion from tonnes of carbon to a monetary value, we bring carbon into the common language.

More information regarding Internal Carbon Pricing is provided in the links in Appendix 1. But in brief, there are two key models of internal carbon pricing programme that organisations can implement, sometimes a third is also listed:

Shadow Price – the £/tCO_2e carbon price is used for information in business decisions e.g. to alter the calculated NPV or payback of a considered option. Money does not move around the organisation, but shadow pricing typically allows justification of greater investment or spend towards lower carbon options. Shadow prices tend to be higher and based on more realistic costs of carbon.

Carbon Tax – the £/tCO_2e carbon price is levied against a part of the organisation so that money is collected based on carbon impact. This creates a fund (of money from elsewhere in the organisation) that can be used as required. Often, examples of carbon tax systems are based on very low costs of carbon more as a proxy than representing genuine costs of carbon reduction. These proxy figures can still have a beneficial impact on awareness raising, but are limited in ability to achieve decarbonisation targets.

Implicit price – the £/tCO_2e is the cost of carbon reduction measures divided by the tonnes of CO2e reduced.

The Implicit Price is best thought of as a useful metric that supports most types of ICP program. The implicit price is the cost of carbon reduction measures divided by the tonnes of CO_2e reduced (and is discussed further in section 5 on price setting). It can be used on its own for communication and reporting, or as part of either a tax or shadow model. If it is being actively used, then it tends to be in either a shadow or carbon tax model.

Within a carbon tax model of ICP, money moves between budgets within the organisation. With Internal Carbon Pricing the money will stay within the organisation (not to an external body). Typically, an internal fund is created, and money flows from one budget to another based on associated emissions. This might make it seem like shadow pricing is less powerful, but because the money isn't moving out of department budgets, this allows shadow pricing prices to be much higher (and therefore realistic and meaningful) so if they are worked carefully into a decision-making process then a shadow price can drive important change. It is also important to remember that an ICP Carbon Tax based system doesn't necessarily create additional money, it just typically moves it between budgets. The value of the additional spending results in decarbonisation that would otherwise ultimately be more costly to undertake later.

The implicit price can be used as a price within either a Shadow Price or Carbon Tax system. In terms of determining a carbon price, it is helpful to realise that there isn't one price of carbon.

We can look at determining the relevant price of carbon (in £/tCO_2e) from two standpoints, either:

Looking forward from now assuming targets will be met (the cost to avoid climate change). Considering the current aim and imperative to achieve net zero targets, understanding what that will cost, and making decisions about the best use of money to achieve that aim based on what the specific organisation has to do to decarbonise. Implicit prices are based on this method which is sometimes called a Mitigation Cost Approach (MCA).

Looking back from the future assuming targets are not met (the cost from climate change damage). Considering the costs of the negative impacts of climate change if allowed to happen. Costing the impacts to health, infrastructure, prosperity and livelihoods if climate change isn't avoided. A Social Cost of Carbon (SCC) approach is the basis of prices calculated from this viewpoint.

A carbon price based on an Implicit Price/MCA or SCC approach can be used in either a Shadow Price or Carbon Tax model. These approaches are discussed further in section 5 on determining the price.

It is important to ensure that that an ICP system is designed to fit the needs and drivers of the organisation, is based on a logical carbon price that has tangible meaning and can be communicated, and that the human factors of the implementation are considered (consideration of users, training, tools, support, etc).

Insetting builds upon the concept of traditional offsetting whereby organisations can compensate for their emissions by funding emissions reduction or removal elsewhere. In a local authority context, insetting augments the principles of offsetting by defining a geographical area in which the emissions reduction or removal activity must take place. In contrast, within a corporate context, organisations tend to use their own value chain when defining the boundary of insetting activities. Within this report, insetting will refer to investment in emissions reduction or removal projects within the Hull City and East Riding boundaries.

Within a local insetting scheme, either the council themselves or local businesses can fund carbon reduction or removal projects. Indeed, there are examples of each of these forms of insetting within the UK. Where the council is funding insetting projects, they often use mechanisms such as planning policy to generate a fund to invest in local emissions reduction or removal projects.

2 Scoping

Greenhouse Gas Footprint

Internal Carbon Pricing can be used to link carbon reduction targets to decision making within organisation day to day. In this respect, it is useful to focus the initial use of ICP in areas that impact scopes of the organisational footprint that are largest and/or hardest to decarbonize.

This initial consideration of ICP focusses on the target (and GHG footprint) related to the council's own emissions rather than the area wide emissions. It will still be possible to look at uses of ICP within the wider area emissions (Figure 2), and indeed one of the case studies included (see section 3) is for an initiative that used a carbon trading scheme and carbon price with volunteer residents to decrease the carbon intensity of their journeys.

For use in wider area emissions, many of the principles discussed in this study will remain the same. It is more likely that the usage will be at an internal/external boundary, by that it is meant that the Internal Carbon Price will be used with stakeholders outside the organisational boundary. This adds additional complexity and there are certainly potential pitfalls, particularly regarding whether it is seen as a punitive measure and the culture and nature of the relationship, but it is possible and beneficial to implement.

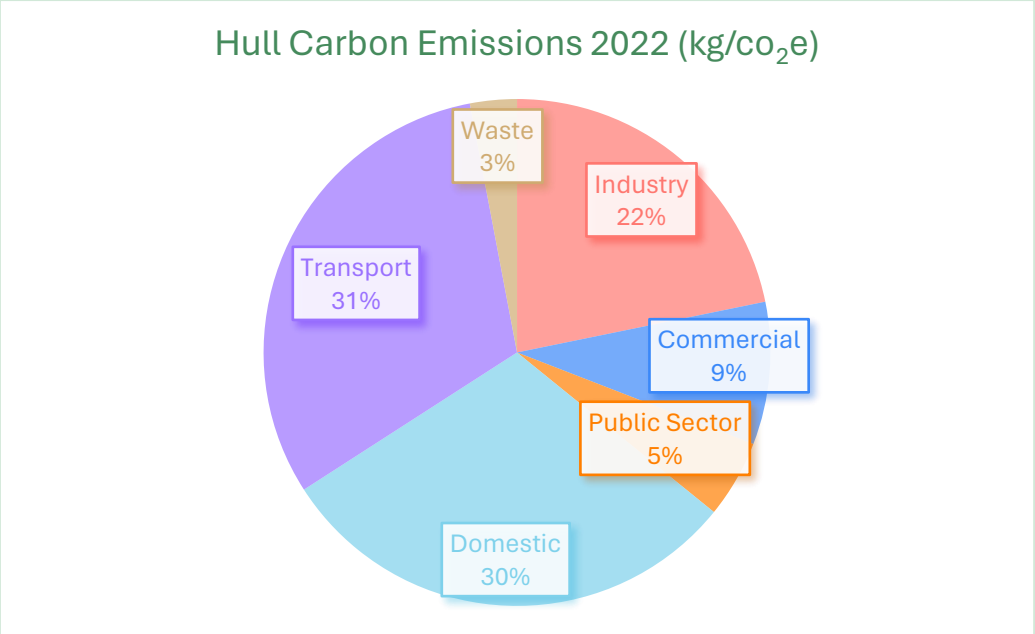


Figure 2 Area Wide Emissions for Hull City Council (2022)

The estimated carbon footprint of the East Riding of Yorkshire was 3,217.9 kilotonnes of carbon dioxide equivalent (kt CO_2e) in 2020 [2]. For reference, the Yorkshire and Humber region collectively produced 36,938.7 kt CO_2e, in the same year, and the carbon footprint of England was 291,134.6 kt CO_2e.

[2] https://downloads.eastriding.org.uk/corporate/pages/climate-change-what-we-do/Climate%20Change%20Strategy%202022-2030.pdf

For this study, we are focusing on the council's own emissions, and in particular the emissions profile of Hull City Council, who will host the potential pilot phase. These are shown in Figure 3 and Figure 4. The total emissions for Hull City Council for 2021/22 were 18,762 tCO_2e[3].

The estimated carbon footprint of East Riding of Yorkshire Council was 29,875 tonnes of carbon dioxide equivalent ($tCO2_e$) in 2020 - 21[4].

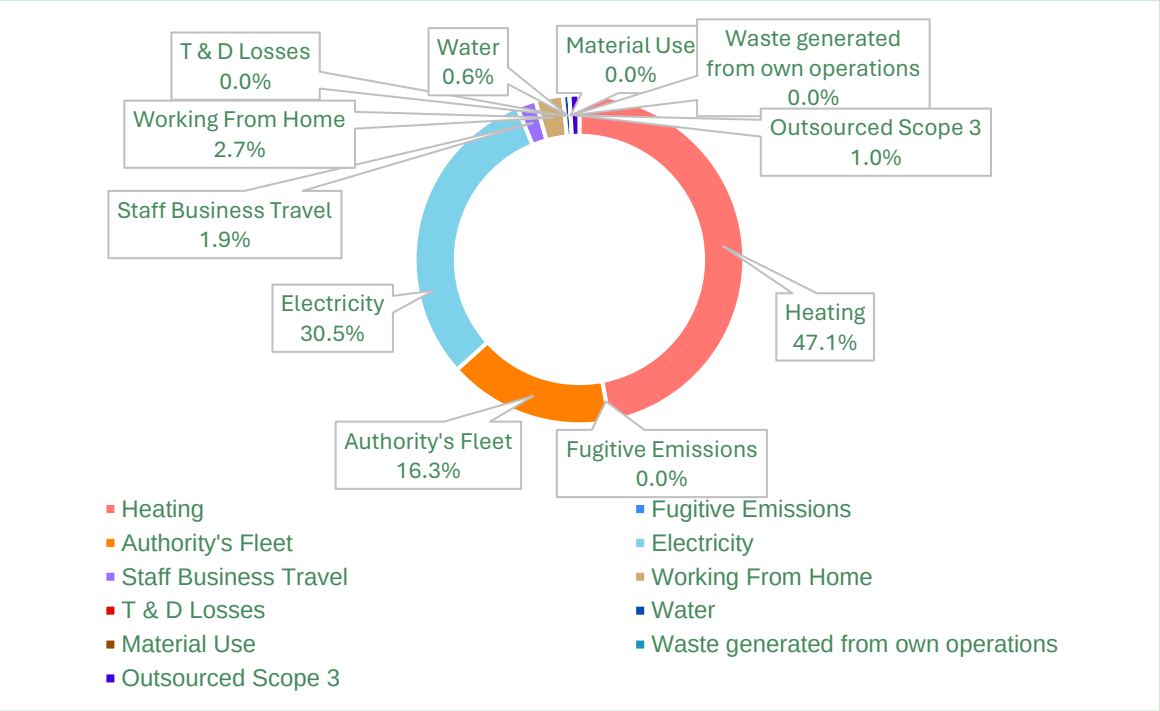


Figure 3 CO_2e emissions for Hull City Council (2021/22)

It can be seen that heating and electricity consumption (of buildings) are most significant. Followed by fleet emissions. Some areas of the baseline may not be fully developed, for example Purchased Goods & Services (PG&S) (Outsourced Scope 3 in Figure 3) have the potential to be material but are not currently fully accounted for. It is the right thing to use ICP to reduce emissions from PG&S, but if those emissions aren't currently measured within the baseline, it can cause difficulties in quantification of the carbon emissions as it suggests Hull don't have access to the necessary data or emissions factor. It also adds a difficulty in terms of understanding the Business as Usual (BaU), this is sometimes called the counterfactual. In measuring a decrease of anything (including carbon emissions and target achievement), that decrease must be in relation to something, the something is the BaU or counterfactual and will typically come from the baseline emissions calculations. More detail on BaU is provided in appendix 3.

It can be seen from Figure 3 that areas like staff travel and working from home are minor, these then don't make ideal areas to focus ICP.

[3] https://www.hull.gov.uk/downloads/file/2748/Carbon_emissions_report_2022_to_2023.pdf

[4] https://downloads.eastriding.org.uk/corporate/pages/climate-change-what-we-do/Climate%20Change%20Strategy%202022-2030.pdf

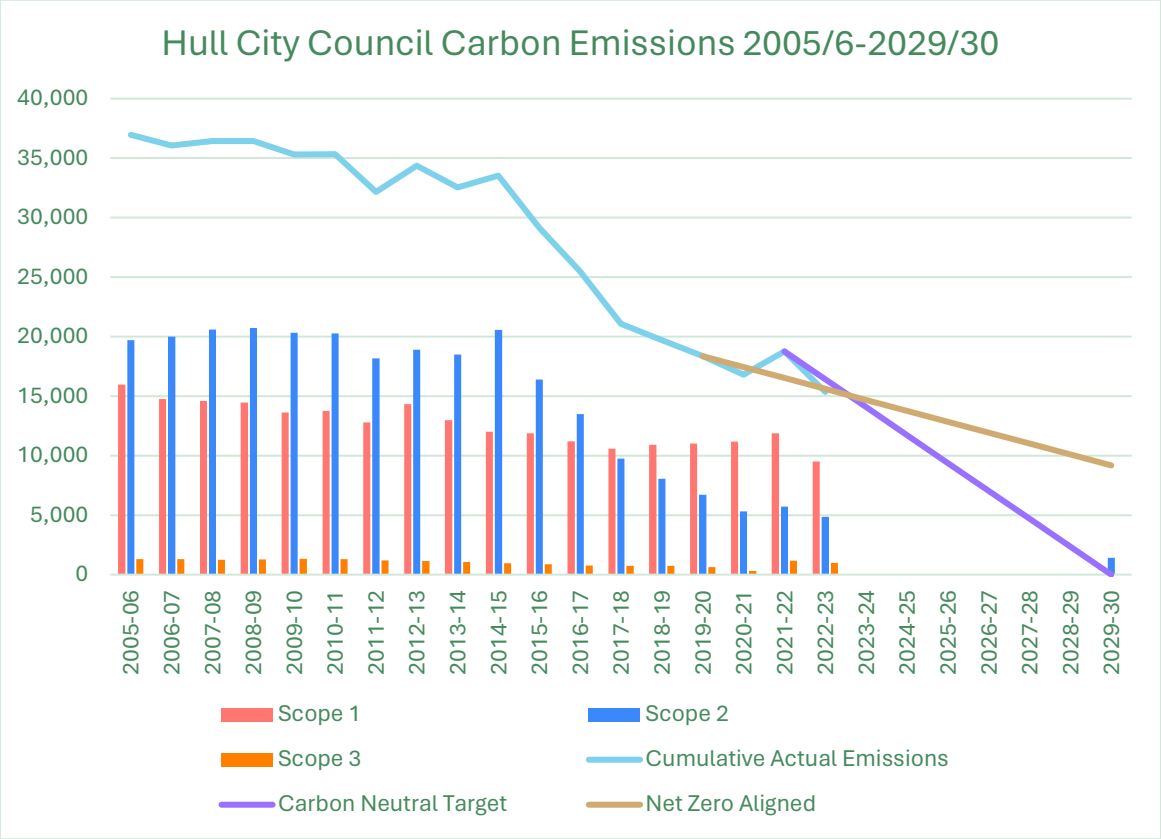


Figure 4 Net zero targets at Hull City Council and Emissions profile.

Having identified the most significant areas of GHG footprint (building energy consumption and fleet), the next step is to identify the processes within the authority that have the potential to influence these scope areas. This was discussed in a working group meeting. The following decision processes were highlighted by the working group:

- Procurement,
- Capital Programme,
- Service redesign or development,
- Partnership relations,
- Induction programme & education, and
- Operational decisions.

Some of these processes are more impactful on wider area emissions, an initial assessment of the impact of these decision processes is shown in Table 2.

Table 2 Prioritised Decision Processes re ICP

Decision process	Impact on council buildings/fleet & own target	Primarily wider area (WA) /Council Own (CO)
Procurement	Vehicles, fittings & energy use	CO
Capital Program	Building design, Vehicle purchase	CO
Service redesign or development	Fleet impact, increased or decreased building requirement	WA
Partnership relations	Potentially minor, certainly variable.	WA
Induction programme& education	Users of fleet & buildings	CO / WA
Operational decisions e.g. how often to collect bins	Fleet impact, increased or decreased building requirement	WA / CO

The decision processes shown in Table 2 were included for discussion in the stakeholder workshop discussed further in this section.

Stakeholders

Stakeholder mapping

A key stage in developing an Internal Carbon Pricing programme is to engage with stakeholders. This is to ensure that the programme developed is designed in such a way that meets the actual needs of stakeholders, and takes into account the culture, priorities and needs of the users.

With the working group, stakeholders across the decision processes were identified and mapped. This activity was undertaken on a Mural whiteboard. Stakeholders were brainstormed from both East Riding (ERYC) and Hull CC (HCC) and grouped depending on whether their key interest was:

- HCC Governance and processes;
- ERYC Governance and processes;
- HCC own targets, property & assets;
- EYRC assets/own targets;
- Area targets, domestic and transport, or industry;
- Insetting.

The stakeholders were then further mapped using a stakeholder mapping 2x2 matrix ranking interest/availability vs influence. In the 2x2 matrix, this groups stakeholders into four groups:

Figure 5 Stakeholder management can be tailored to each category

Some of the stakeholders in the Actively Engage category have been consulted during the 1:1 interviews (see section 4) and others have been engaged by the working group during the process.

Stakeholder workshop summary

Two stakeholder workshops were held in December 2023. Two dates were chosen to facilitate as many stakeholders joining as possible. Each workshop had a mix of Hull City Council (Hull) and East Riding of Yorkshire Council (East Riding) attendees.

The workshop was held on Mural with sections containing questions on ICP and insetting topics in order to draw out concerns and priorities and also to help focus in on the right decision process for implementation of ICP. “Sticky notes” were used to allow all participants to provide input to the questions.

The first section of questions related to the pre-identified decision processes (see Table 2). Each had been mapped out as simple flow diagrams with different colour sticky notes assigned to each relevant question. Questions were split out with separate areas for the Hull processes and the East Riding processes. The questions covered were:

- Is this process relevant to you? Yes (own or use it) or No (do not use or interact with it);
- Do you have any environmental/sustainability requirements included in the procurement process already today? Do you follow up supplier's products environmental impacts?
- Where is financial consideration (e.g. NPV or payback calculation relevant?)
- Where should carbon be considered?
- (for procurement only) Do you have different requirements depending on the size of the procurement?

The purpose of this section was to understand how the identified processes engaged with carbon reduction, and where ICP could or might need to be woven into existing practices.

A second section of questions related to decisions made in Hull CC and East Riding. The questions posed were:

- How do you consider environmental sustainability related issues in your decision making? (Examples of decisions made in your role, think daily, quarterly, yearly)
- Where/what are decisions made that may contradict/conflict with environmental sustainability aims and targets?
- Are those conflicting decisions financial? (i.e. if the financial consideration is over-riding the environmental sustainability consideration)

The purpose of this section was to get further into some of the details around decision making and identifying specific conflicts between making decisions on a financial basis versus a carbon or sustainability basis.

The third group of questions related to drivers, opportunities, risks and challenges for both ICP and Insetting across the two LAs. The specific questions were:

- What opportunities does reducing carbon emissions bring you?
- What are your challenges related to reducing carbon emissions?
- What are your carbon related risks? How will this impact you?

The stakeholders were also asked to identify the drivers for Internal Carbon Pricing and then rank them. This same exercise was repeated for insetting.

The purpose of these questions is to understand the motivation and perceived challenges in implementing ICP and Insetting. The drivers are particularly important in terms of identifying messages in communications, but also in the design of ICP and insetting schemes, for example, target achievement as a driver lends itself to particular structure of ICP that is different to that best suited for awareness raising.

Stakeholder workshop outputs (summary of overall themes)

Review of processes for application of ICP

- Capital programme a good starting point
- Procurement also important but hesitance to spearhead ICP
- Training & education an important theme from later responses
- Link with nature and other metrics

Day to Day decisions

- Consideration across many roles but can be ad-hoc and lack structure
- Interaction of carbon and nature priorities

Opportunities from reducing carbon emissions

- Funding
- Reputation
- Co-benefits

Challenges related to reducing carbon emissions

- Education & awareness
- Moving past “tick-box” approach
- Data
- Costs, Resourcing and pressures of day to day

Drivers for ICP

- Targets (suggesting implicit price)
- Funding
- Reputation

Drivers for Insetting

- Helping to achieve climate targets
- Funding – increased investment in decarbonisation projects
- Nature agenda

How could insetting funding support your area of work and priorities in Net Zero?

- Funding for increased climate action
- Local upskilling
- Partnerships
- Co-benefits
- Nature agenda

The full and detailed outputs of the workshop are collated in Appendix 2.

Specific Insetting Questions

Beyond the key themes, there were some specific questions relating to Insetting, that would provide some useful context to how an insetting scheme could be designed at Hull and East Riding. These questions were:

- How could insetting funding support your area of work and priorities in net zero?
- How is Biodiversity Net Gain, Local Nature recovery strategy and bio-recovery strategy being considered by the council (on the councils', or private, land)?
- Are there any examples or discussions of innovative use of finance mechanisms e.g. Community Municipal bonds, Crowdfunding, ESCos, Joint ventures, Green Loans?
- To what extent have local stakeholders e.g. businesses, community groups, third sector orgs been engaged on offsetting?

Other questions

How is Biodiversity Net Gain, Local Nature recovery strategy and bio-recovery strategy being considered by the council (on the councils', or private, land)?

This is an area where East Riding has more experience primarily with the Humber Forest. A Hull & East Yorkshire Local Nature Recovery Strategy is being developed including coastal and marine areas. A biodiversity Duty preparedness review is underway at East Riding. Hull is utilising a Biodiversity Net Gain grant to implement policy.

Are there any examples or discussions of innovative use of finance mechanisms e.g. Community Municipal bonds, Crowdfunding, ESCos, Joint ventures, Green Loans?

There is experience at both Local Authorities with innovative finance mechanisms including Live Labs II on decarbonisation of highways, and Biodiversity Net Gain initiatives.

To what extent have local stakeholders e.g. businesses, community groups, third sector orgs been engaged on offsetting?

East Riding has experience in offsetting via the Humber Forest. This isn’t an area that Hull has experience with.

3 Research

Research on Local Authority use of ICP

Case studies from Local Authorities using carbon budgets and pricing

Use of ICP across Local Authorities is limited, particularly to the extent of full implementation. However, there are examples of how the principles of ICP have been applied to different aspects of council operation. By assessing the individual successes and challenges it is possible to gain insight into the lessons learned and appropriateness for re-use.

1. Manchester City Council

Where was carbon assessment implemented?

Tender evaluation

How was it implemented?

- Inclusion of a 10% weighting in the evaluation of tenders specifically related to climate and environment, increasing total social value weighting to 30%, the highest in the UK.
- Bidders asked how they measure and reduce their carbon emissions, with evidence of reductions achieved to date.
- Bidders asked contract specific carbon emission questions most relevant to the contract nature.
- Higher contract values invite more detailed carbon responses regarding contract, company and staff carbon literacy.

Example tender questions

For small value contracts	For larger value contracts
What are your carbon emissions?	How do you measure your carbon emissions?
What is your organisation doing to reduce these emissions?	How are you raising the carbon literary of your staff?
What do you estimate the carbon emissions of this project to be?	What evidence can you share of achieved carbon reductions against your baseline?
	What decarbonisation targets are in place?

Learnings from experience

- These qualitative assessments require staff knowledge of what a 'good' response looks like, enhanced with carbon literacy training for all staff.
- Data on bidder carbon emissions and reductions may be better collected in non-written formats for ease of collating over several contracts.
- Developing specific guidance for smaller organisations.

Anthesis assessment: *Manchester City Council have taken a qualitative approach which aligns only partially with ICP principles. In particular, there is good reference to considering how contract negotiation and carbon emissions are managed together.*

2 . Yale University

Where was carbon assessment implemented?

Energy use from Yale University buildings

How was it implemented?

- Inclusion of a 10% weighting in the evaluation of tenders specifically related to climate and environment, increasing Internal carbon pricing (ICP) – carbon tax;
- Pilot with 20 university buildings, given monthly energy use and CO_2e;
- 20 buildings split across 4 approaches:
    - no carbon price;
    - carbon pricing with 20% of revenue for energy-efficient actions;
    - pricing with revenue distributed to buildings reducing their emissions by >1%;
    - pricing with revenue distributed to buildings whose % reduction exceeding average the average (revenue-neutral).
- Buildings outside the pilot acted as a control group.
- Building managers were responsible for any changes to operations;
- In 2016, the pilot ICP was $\$20/tCO_2e$;
- The current ICP is $\$40/tCO_2e$ due to Biden administration, increasing to $50 in FY25.

Example building operational changes

Building managers were responsible for any operational changes in response to the carbon charge.

Examples of actions
Cheaper options i.e. turning temperature of hearing down by 1°C
Behavioural changes i.e. turning off lights or unused electrical equipment
Investment in occupancy sensors, thermal window shades or swapping lightbulbs for LEDs

Learnings from experience

- Buildings with higher charges saw greatest reductions in energy use
- The revenue-neutral scheme was implemented campus-wide due to financial stability.

Anthesis assessment: *Yale took a quantitative approach to calculating building emissions, data which may also be available for Hull or East Riding. Yale's approach is ICP aligned; funding was developed from internal charges. A representative pilot across Council buildings may be viable and this would delegate responsibility to building managers, but there is a dependence on building leases as to a range of feasible operational changes.*

3 . Environment Agency

Where was carbon assessment implemented?

Construction projects

How was it implemented?

- Carbon budgets for construction projects
- Understand the cost of a project;
- Use the lowest carbon materials that meet performance criteria;
- Understand the carbon of a project;
- Understand carbon impact of capital programme;
- Everyone with financial budget responsibility given a carbon budget;
- Appraise for lowest financial and environmental impact at business case;
- Net zero goals linked with individual and organisational performance reviews.

Insetting with Nature for Climate

Steps to developing nature insetting projects
Development of a science-based framework to offset emissions using land already owned.
Seek projects that deliver maximum, measurable change whilst offering value for money.
Work with local landowners, suppliers and public bodies that present large-scale offsetting opportunities and habitat creation schemes.
Investing in nature for climate – developing habitats that can act as carbon sinks and build resilience to climate risk i.e. wetlands to mitigate flood risk.

Learnings from experience

- Using low carbon materials may require re-design but can greatly reduce material used, with knock-on carbon savings i.e. lorry deliveries
- Investing in air source heat pumps resulted in 25% less electricity usage
- The merit of upskilling all staff on climate change and carbon reduction

Anthesis assessment: *The Environment Agency took a quantitative approach aligned with ICP principles and developed a tool for carbon quantification. Insetting and ICP have been linked together in this case study; insetting costs could be used to set a carbon price used in insetting project contract negotiation. The Environment Agency in-house financial expertise helped shape the processes.*

4 . West Sussex County Council

Where was carbon assessment implemented?

The whole organisation involving all aspects of council operation, looking across social and broad environmental metrics.

How was it implemented?

- West Sussex used a Carbon Model to quantify the impacts of travel, waste, energy use etc. The aim to embed sustainability practices conflicted with funding the Council received from the government, impacting the Council's budget. This led to:
- The development of a 'business case' for sustainability, focusing on financially beneficial activities that didn't fundamentally challenge regular organisational practices. A 'Triple Bottom Line' approach was used for carbon pricing.
- The Sustainability Group managed to create innovative combinations of accounting and sustainability, despite limited resources and working outside mainstream accounting function.
- These hybrids significantly improved the eco-efficiency of the council's operations.

Feedback from the council

'...it seemed to us that the whole project and the whole reporting framework were going to provide the impetus for a coherent and holistic approach to what our footprint was environmentally across a whole range of issues ... the way forward for us to make a single commitment that would have a multiple impact, if you like. So rather than on each occasion when we looked at a new building or on each occasion at a new policy or whatever, trying to start the whole argumentation again, we made a single corporate commitment to achieving greater sustainability.'' (CEO)

''A lot of people go on about sustainability; they take the three core areas now: social, environmental and economic impacts. But what we're trying to do is take those three areas and then that is surrounded by finance.'' (Sustainability Group Manager)

Learnings from experience

- Carbon calculation was not as big an obstacle as was anticipated.
- The impact of the scheme was diluted by other initiatives & programmatics: new public management, public welfare, value for money, deregulation and competition, economic growth, and austerity. Finance limitations prevented greater action beyond the initiative's 3 year length and it was difficult to fully embed into existing structures.
- Success came from adapting the framework to the local systems & needs, creating their own hybrid.
- Increased awareness of the importance of social and environmental impacts across whole organisation.

Anthesis assessment: *This approach is more complex in comparison to an implementation of an ICP which tends to be more pragmatic and focused. West Sussex included Natural Capital Valuation; they included elements of nature and the co-benefits in a cited stakeholder workshop. West Sussex like other local authorities developed a tool to support carbon quantification.*

5 . Oxfordshire County Council

Where was carbon assessment implemented?

Within the highways team for decision making in new transport projects.

How was it implemented?

- Oxfordshire County Council have a policy, no. 55 that states it, "will adopt a whole life cost approach to maintaining the local road network, that as far as practicable within available budgets, reflects both the structural need of the assets, the strategic importance of the route and local priorities."
- The council agreed that any offsets needed to achieve net-zero must be certified, be additional and deliver local benefits.

Process for assessing the potential transport scheme

Assessment criteria
Consider contribution of scheme to carbon budget and targets (Inc. embodied emissions)
Beyond carbon, consider social issues (a just transition and inequality)
Scheme approved requires science based % of embodied tCO_2e reduction from baseline (not achieved through offsets)
Use PAS 2080 to assess, manage and minimise carbon emissions in transport infrastructure projects throughout the project lifecycle, including maintenance
Consider cost uplift
Use offsetting last resort

Learnings from experience

- To adopt a whole life approach, the council must work with the all contractors to reduce materials, source local and recycled materials, use less carbon-intensive transport options and building methods, and generate less waste.

Anthesis assessment: *Oxfordshire's consideration of the cost uplift of delivering lower carbon options is an element of ICP. We understand that considering the cost of carbon is a further build on what was approved in 2022. Available details on this scheme are limited.*

6 . City of Lahti – Finland

Where was carbon assessment implemented?

Transport emissions.

How was it implemented?

- Carbon trading scheme among inhabitants (cap & trade):
- Volunteers were given a carbon allowance, which decreased proportionally with carbon emitted from their journeys, calculated by data entry into a mobile app.
- The target was to reduce personal travel emissions by 25%.
- The carbon saving was converted to virtual carbon price.
- 350 volunteers regularly entered data May-Dec 2020; rewarded when their allowance was not exceeded with vouchers for local businesses and transport (using virtual euros saved).
- The voucher spend informed where to invest future effort.
- Those exceeding their allowance bought carbon with virtual euros i.e. households with children.
- Lahti is too small for heavy infrastructure investment so was an ideal testing ground to understand how to change residents' behaviours.

More detailed findings

Study insights
Average weekly carbon consumption: 21kg
Car users decreased their emissions by 30%
Fluctuations in the virtual carbon price had no effect on user mobility
36% of users claimed their mobility was more sustainable and 57% citing no difference
Volunteers were: slightly more educated, younger, higher earners, less likely to own a car
75% of Lahti's population live within 5km of the centre; Lahti can be navigated by bike/foot
Carbon price: € 0.10 / kgCO_2e, increased to € 0.50 then to € 0.75 / kg CO_2e during certain weeks
2,400 euros delivered as rewards

Learnings from experience

- Building an app was effort intensive and error-ridden, resulting in low trust for personal information and volunteer drop-outs. The lesson learned is to use existing products and apps, reduce the timescale of pilot projects and use low-tech options.

Anthesis assessment: *This public transport approach can be considered equivalent to an internal ICP related to staff travel. It is a budget-based system i.e. cap and trade, and can also work in terms of departmental carbon budgets.*

Research on Local Authority use of Insetting

Insetting within the context of this report is defined as funding projects within a defined geographic boundary, as opposed to insetting in a corporate context which uses a company's own value chain as the boundary for project activity. The geographic boundary considered here is the area that the local authority is responsible for.

Local authorities are considering the use of insetting in a variety of different contexts. Broadly, the use cases can be split into:

- Developing offset funds (through mechanisms such as s106 or social value).
- Establishing local offset schemes (where the council may not necessarily invest its own funding).

Local Authorities funding local insetting projects

The most common example of LAs funding local projects is through the establishment of 'Offset Funds' which channel funding into carbon saving or removal projects within the area. The primary distinction between the different approaches relates to the mechanism that the council uses to raise funding for the funds, whilst they also have different approaches to allocating the funding to projects within the respective areas.

Income from property development (using planning requirements). Possible mechanisms:

- Section 106: funding attached to planning permission as a condition of approval.
- Community Interest Levy: a local charge that can be applied to new local developments to fund infrastructure to support the development of the area.

Procurement policy, social value. A voluntary or mandatory financial contribution into a local 'social value' fund to be spent on carbon projects. The requirement or size of the contribution could be linked to the suppliers' decarbonisation performance.

Examples using income from property development (most common)

1. GLA Carbon Offset Fund

Description - All boroughs under the 2021 London Plan must establish and administer a Carbon Offset Fund to implement reduction projects. This is a part of London's target to become a net zero city by 2050.

How is funding raised – the funding uses a requirement within planning legislation that new domestic and non-domestic buildings have reduced energy use. The funding is raised through the use of s106 agreements, whilst it is paid by building developers.

2. Southampton – Carbon Offset Fund

Description - The Carbon Offset Fund was established in Southampton in 2013 and is used in conjunction with Energy Company Obligation funds and council funds to subsidize or fully fund insulation for fuel poor residents.

3 . Milton Keynes

Description - Milton Keynes set up a Carbon Offset Fund in 2008 to help developers achieve carbon neutrality, a requirement for new developments in their Local Plan. The fund has been used to provide free home insulation and install solar PV on public buildings. The fund has been successful, however many of the cheap and easy carbon savings have been made, causing local offsetting to increase in price. Requirements of the fund, such as a required cost per CO_2e tonne saved, has caused stagnation, with no spend in two years prior to 2019. However, a review of these requirements is hoped to address some of these challenges.

How is funding raised – property developers contribute to the carbon offset fund which is collected by the council using Section 106 planning contributions.

Examples using procurement and social value.

4 . Solihull Metropolitan Borough Council (SMBC)

SMBC stipulate in their contractual terms that for goods and services over £50,000, suppliers have to contribute part of their contract value to social value activities.

Details - All contracting authorities should consider the following national priority outcomes alongside any additional local priorities in their procurement activities in line with the National Procurement Policy Statement:

- Creating new businesses, new jobs and new skills;
- Tackling climate change and reducing waste, and
- Improving supplier diversity, innovation and resilience.

Local social value priorities will be driven by the Council Plan which outlines the Council's vision, purpose and ambition for Solihull. Delivery of this policy will support delivery of the council priorities through wise use of our procurement power which ensures maximum benefit for our local communities when letting contracts.

5 . Hammersmith and Fulham[5]

Description - The Strategy introduces a mandatory requirement for all contracts above £100,000 to achieve a minimum of 10% in Social Value. Over the next 12 months, the council target is to fully implement the approach to all procured contracts over £100,000, direct awards and contract variations. The council's ambition is to increase the Social Value weighting to 20% by 2023.

They have recently appointed a Social Value officer to maximize the opportunities throughout the council and have also set up a Social Value Delivery Group (SVDG)

Impact - There have been around 40 tenders undertaken since May 2020 but only 8 with a value of over £100,000. The Social Value committed and delivered since then includes;

- 52 weeks of apprenticeship placements;
- 50 tCO_2e of carbon reductions;
- 778 hours of career support sessions;

[5] https://www.local.gov.uk/our-support/financial-resilience-and-economic-growth/procurement/hammersmith-fulham-council-social

- 190 hours of educational sessions;
- 2 jobs for local residents;
- Over £200,000 spent in the local economy;
- 260 weeks of training opportunities;
- 64 hours of volunteering in the community.

6 . West Sussex[6]

Description - Commissioning, procurement, sourcing and contract management are all critical to ensuring the achievement of social value through our supply base. In order to achieve this West Sussex set out to ensure that;

- Tenders over £500,000 will be subject to measurement against the targets of the Reset Plan
- Tenders over £100,000 will be assessed for the potential to include Social Value and decisions will be documented.
- Where Social Value is considered appropriate a minimum weighting of 10% will be allocated to Social Value.

Establishing local offset schemes

There are different ways councils have considered the establishment of local offsetting schemes. A group of councils are exploring the use of Anthesis' Area Based Insetting (ABI) as a mechanism to encourage greater local action, whilst there are examples of councils who have taken on more of a role as 'project developers' to deliver projects which reduce or remove carbon and act as offsets.

Devon County Council purchased 28 acres of land to implement a tree planting project on their own land as a local inset. The land lies adjacent to a Forestry Commission wood, which is possibly a Plantation on Ancient Woodland Site (PAWS) - increasing the benefit of planting by expanding existing habitat and providing space for natural colonisation (non-carbon benefits). The land cost £7,500 per acre (which is relatively cheap) and the first carbon units will be available in 2032-33 at the earliest. It will be verified under the woodland carbon code.

Area Based Insetting (ABI) – there are a host of local authorities involved with ABI and a smaller subset who are actively implementing it - these are Surrey County Council, Oxford City Council and Colchester City Council. In each of these areas, the councils are interested in establishing mechanisms that the council can use to offset their own emissions and mechanisms for local businesses and corporates to offset/ inset locally.

Summary and reflections on research

Research on ICP and Insetting across local authorities gives an early indication of the maturity of existing practices and the barriers to successful implementation. It allows for a decision point that assesses if either or both of ICP and Insetting will be appropriate for the pilot phase at Hull.

[6] https://www.westsussex.gov.uk/media/17191/social_value_framework.pdf

Research summary and conclusions - ICP

There are limited UK based examples of Local Authority use of Internal Carbon Pricing to date. In the main it seems that the preference has been for qualitative approaches to estimation of sustainability and carbon benefit. Qualitative approaches used with council processes can be widely found with varying degrees of formalisation. Manchester City Council's inclusion in tender evaluation is an example of a more formalized approach. Ultimately, all qualitative approaches suffer from a need to know and educate staff on what "good" looks like in terms of carbon reduction and to have common frameworks for making that assessment.

Qualitative approaches have been preferred over quantitative due to the difficulty (both perceived and in reality) associated with quantification of carbon emissions. Problems stem from:

- Access to data;
- Access to emission factors;
- Knowledge, training, and support on the quantification process;
- Time pressures and resourcing.

There are examples of public sector organisations overcoming these issues to quantify carbon emissions in various processes. The Environment Agency has a detailed calculation tool (which is also shared publicly[7], see also Table 11), that helps quantify carbon emissions from construction projects and whole life carbon from constructed assets. West Sussex developed a Carbon Model that quantified carbon from travel, waste, and energy use. The West Sussex initiative is no longer live; however, the carbon calculation element was one of the most successful outcomes from the trial and it was the complexity of the scheme (looking across the whole organisation at social and broad environmental metrics) that led to it not continuing in the face of many other competing initiatives.

Across many Local Authorities, there was familiarity with carbon pricing and carbon quantification via larger funded projects and interactions with the UK Government's Green Book[8] methodology. An example of a large-scale project which was encountered in several Local Authorities was heat network development funded by the Green Heat Network Fund (GHNF). The GHNF process requires quantification of carbon emissions and impacts via their own spreadsheet format. The spreadsheet also calculates a carbon price of sorts: *carbon savings per £1m of grant funding* and also a *£grant/tCO$_2$e abated* figure. In most cases, external consultants were supporting the quantification in addition to the scheme design.

The Greater London Authority has supported use of a carbon price in various London boroughs, most notably through the use of offsetting (which is discussed further in section 5 on price setting). In 2019, all London boroughs had a planning policy requiring 35 % (compared to Part L building regulations) carbon reduction in new buildings, with a requirement to offset remaining carbon emissions at a carbon price of £60-£95/tCO$_2$e. As discussed in section 5, this use of a carbon price has led to awareness of the value of carbon reduction and has promoted additional

[7] https://assets.publishing.service.gov.uk/media/5a7f5da4e5274a2e8ab4bbe1/LIT_7067.pdf

[8] https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government/the-green-book-2020

measures to be considered in the planning process, but the experience has been that the current price used is too low.

Research summary and conclusions - Insetting

The establishment of carbon offset funds is the most widespread form of local government insetting/ offsetting in the UK. There are numerous carbon offset funds in the UK, with the GLA carbon offset fund being the most widely known example. Where carbon offset funds have been established, they have generally been successful in raising additional funding to be spent on local carbon saving projects.

One of the main challenges associated with carbon offset funds, and main distinguishing features between them, relates to the price per tonne of carbon used to collect the offset fund payment. Among the examples cited in this report, the price ranges from £95/tCO_2e (GLA) to £210/tCO_2e (Milton Keynes). A recent report published on behalf of a series of London boroughs proposed a carbon price of up to £880/tCO_2e. An additional challenge related to carbon offset funds relates to having a solid pipeline of projects that can be invested in once the funding has been raised. In some cases, councils are limited to invest in only certain projects by the s106 agreement that is used to collect the funding.

There are limited examples of local authorities using social value through procurement policy to raise funding to be spent on local insetting/ offsetting projects. As seen from the examples set out in the preceding pages, the predominant means of using social value in procurement is to weight potential suppliers' responses to questions regarding how they would create social value within the local authority area, were they to be awarded the contract.

There are limited cases of local authorities going beyond this to stipulate that a percentage of the contract's value is required to be spent on social value projects – this approach is described within our proposed option 2 below.

Overview of proposed models

In reviewing the information available to decide what model of Internal Carbon Pricing might be appropriate, there are several areas to consider regarding suitability of ICP in general, where it is to be applied, and whether a shadow or tax model is most appropriate. More specific considerations are outlined below and in section 6.

Is ICP suitable?

- Are there targets or identified transition risks?
- General willingness and interest in ICP;
- Data availability;
- Are assets and scopes within organisational control?
- Do any competing drivers rule it out?

Where?

- Which are the largest scope areas of the footprint?
- Which are the decision processes related to material footprint scopes?
- Are there decision processes where there are potential conflicts between financial and sustainability priorities?
- Access to data for specific scopes and decision processes;

- Alignment of the decision process with drivers (i.e. are the drivers related to targets, tax, reputation etc.?)
- Identifying willing users of the proposed system.

Shadow or Tax?

- What are the drivers for decarbonisation?
- Decision process or scope (e.g. waste or travel tend to tax, others to shadow);
- Is there a link to insetting? (e.g. tax may be more suited).

Following on from the initial period of stakeholder consultation and research, and consideration of the above factors, two potential models for Internal Carbon Pricing were proposed:

- Option 1: Application to capital approval process, as a shadow price based on understanding implicit price.
- Option 2: Fund-based mechanism that links to insetting. Insetting based on a Procurement Policy "Offset Fund" model.

These are outlined in more detail below.

Option 1: Application to capital approval process, as a shadow price based on understanding implicit price.

Model overview

Implicit price P £/tCO_2e is applied to different options A vs B considered in capital approval process. Doing so allows the carbon impact of each option to be monetised and included within the decision-making process.

There are two options for implementing a capital project, options A and B.

- Option A produces greater tCO_2e emissions than Option B, however.
- Option B is higher cost relative to Option A.

To include the price of carbon in the decision-making process, the carbon impact of each option will be monetised and added to the capital cost of each. Decision makers will be able to understand the trade-off more accurately between cost and carbon impact of the two options. The diagram below represents the two options and ICP process.

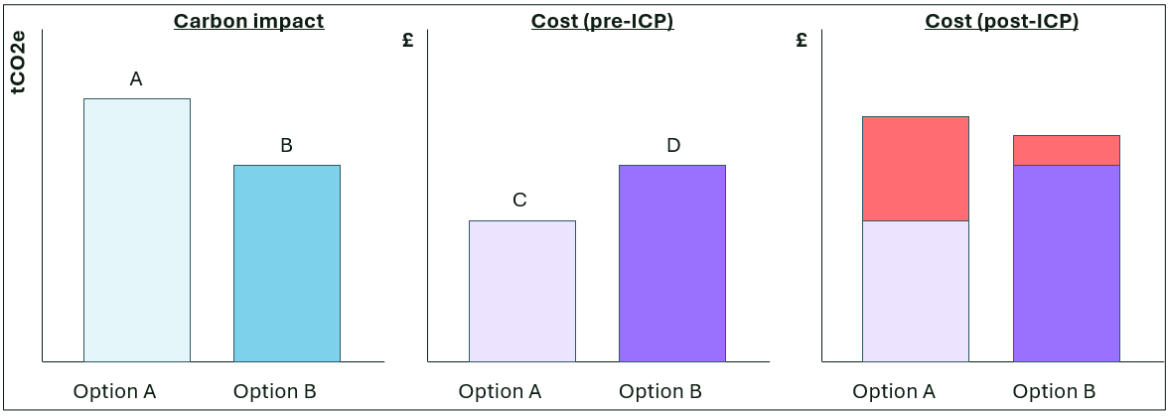


Figure 6 Chart representing the application of ICP onto a capital approval process

On the far right-hand side chart, the pink additional cost is created by multiplying the carbon impact (tCO_2e) of each option by the implicit carbon price P £/tCO_2e. This is represented below.

*Cost (post ICP) = cost (pre ICP) + (carbon impact * carbon price)*

For the two options, this is calculated as:

- £ Option A = C + A*P
- £ Option B = D + B*P

Decision makers will use the comparison of the cost of options reflecting the ICP price, in addition to looking solely at the capital cost of each option when determining which option to implement.

Illustrative example

Hull City Council want to replace the heating system in their main office building. The options are to install a like-for-like replacement of their gas boiler, or to install a heat pump.

- Gas boiler is lower cost but higher carbon.
- Heat pump is higher cost but low carbon.

The cost of carbon emissions is formally included within the capital decision making process by the council using the internal carbon price. This is done by monetising the carbon impact of each option and comparing the financial and carbon costs of each.

When the high carbon impact of the gas boiler is multiplied by the price P (£/tCO_2e), this adds a significant extra cost to the gas boiler project. This extra cost represents the cost to counteract or later reduce the additional emissions that result from choosing a gas boiler. The value of the higher cost heat pump can be seen in how it avoids adding extra emissions (that would later have to be reduced in order to meet net zero targets).

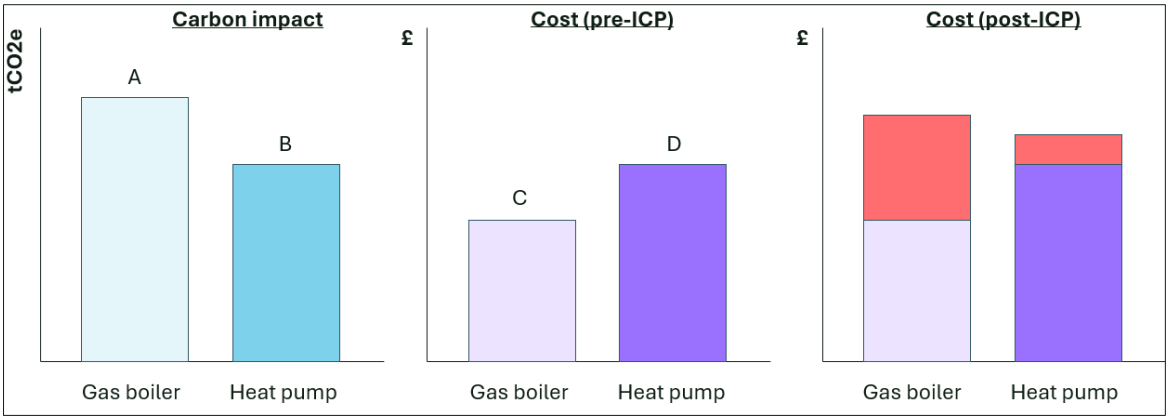


Figure 7 Representation of the application of ICP onto a decision regarding the replacement of heating system in a council building

Within the capital approval process, the cost of each heating system and their monetised carbon impact will be assessed in tandem.

Reasoning

- Significant scope area covered by inclusion of ICP in Capital Approval.
- Potential to resolve conflicts between financial consideration and sustainability consideration.

- Positive comments in support of improvements in this decision process. With Procurement more reluctant to engage in initial pilot.
- Most obvious of the processes selected and no obvious alternative reason to start elsewhere.
- ICP in capital approval is a well understood model used frequently in private sector.
- Aligned drivers: management of future carbon risk, achievement of net zero, ensuring decisions take into account impact on environment, reputational, investment in decarbonisation.
- Data availability relatively good particularly for larger projects. Improving data quality feels proportionate to the size of the effort put into each capital application.
- Does not create a fund, but an ICP that does not interact with external boundaries will not create any new money; an internal carbon tax system only moves and ringfences existing money.

Considerations

- Interesting points came up in stakeholder workshop of use of ICP in education, but quantification is likely to be more difficult.
- Nature element / Natural Capital Valuation (NCV) / Connected reporting framework slant is currently missing from this option, but can be integrated to future development of Internal Carbon Pricing. NCV approach is aligned with ICP.
- Challenges of scepticism, resources, competing drivers, and data

Option 2: Fund-based and carbon budget mechanism that links to insetting.

Insetting based on a Procurement Policy “Offset Fund” model.

Model overview

Within option 2, the council is encouraging its suppliers and operational teams to reduce their own emissions by charging them a cost per tonne of carbon emissions above a set level for the good or service that they are procuring or delivering.

To implement the model, the council would monitor previous years spend (£X) on a category of goods or service with carbon impact of ZtCO_2e. In subsequent years, the council would identify that the spend may remain at £X but that the carbon emissions of the good or service should reduce to YtCO_2e (where Y<Z and aligns with targets).

If a provider/operator of services or goods is not in line with desired emissions decrease, (i.e. they provide the service or good with impact of TtCO_2e (where T>Y), they are expected to pay a ‘cost’ per tonne of carbon above the desired level – represented by the area ‘S’ on the chart below. (The cost payment could also be phrased in terms of a discount on services provided).

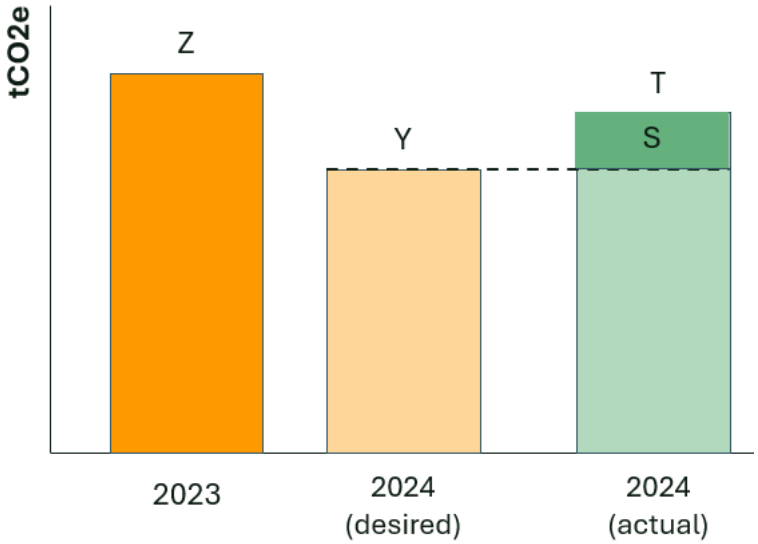


Figure 3 Procurement and operational policy 'offset fund' model, diagrammatic representation

The cost that is paid into the insetting fund depends on two things. Firstly, the quantity of emissions above the threshold level, and secondly the cost per tonne of emissions used by the council. There are two options for the cost per tonne:

- Implicit Price of P £/tCO_2e, or
- Insetting Price of Q £/tCO_2e

The insetting price is typically a subset of the implicit price hence both having relevance.

The additional cost S represents the cost of needing to decarbonise the service or goods as proposed by the supplier (T) to get it in line with the target Y. There are different ways that that cost S can be shared:

- 50/50 based on P. So that (T-Y)tCO_2e * P £/tCO_2e * 50% in £ is charged to provider to contribute to a fund for insetting, or
- 100% based on Q. So that (T-Y)tCO2e * Q £/tCO2e in £ is charged to provider to contribute to a fund for insetting, or
- Some other proportion (judgement on proportion best held until P & Q are known).

Illustrative example

Last year East Riding Council procured its waste services from a provider with emissions of ZtCO_2e. This year, the council wants to reduce the emissions associated with its waste services to Y levels.

The council goes to an open tender to procure waste services and wants to appoint Biffa to deliver the service. However, the emissions of Biffa's waste services for East Riding would be TtCO_2e, which are slightly higher than the council's desired emissions level for waste services of YtCO_2e.

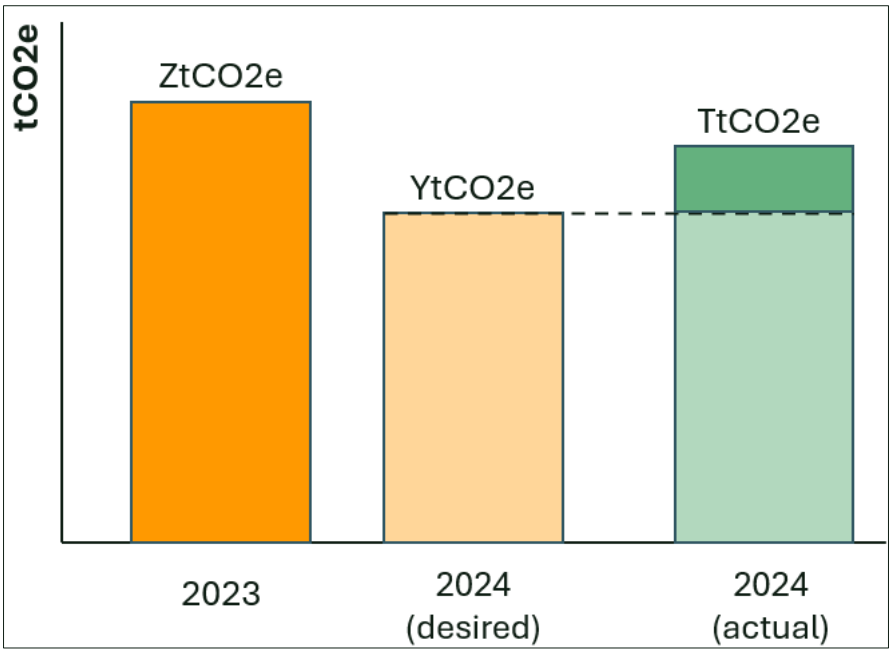


Figure 6 Procurement policy offset fund linked to Waste

Ahead of appointing Biffa as their contractor, the council requests Biffa to pay into an insetting fund to cover the increase in emissions relative to the desired amount for the target year. The amount is (T-Y)tCO_2e and the insetting price of Q (£/tCO_2e) is used.

Biffa pays (T-Y)tCO_2e * Q£/tCO_2e into the council's insetting fund.

These examples and model are based on use of ICP with external partners, but it is equally possible to use a tax with internal departments.

Reasoning

- This model takes the use in Capital Approval but expands it to the wider area footprint, procurement, and the boundary with external stakeholders (suppliers or contractors).
- The model in option 2 relates to material areas of footprint for wider area emissions.
- It can be based on experience and knowledge share from Greater London Authority use of carbon pricing.
- The model links to identified drivers: management of future carbon risk, achievement of net zero, ensuring decisions take into account impact on environment, investment in decarbonisation.
- Brings in opportunity for insetting.

Considerations

- Where is the money coming from? Is it possible to provide sufficient justification or explanation to the party who is paying the carbon tax?
- What are the reputational risks or issues?
- Financial and legal complexity of accepting funding, and allocating it to projects.
- Requires a pipeline of investable projects to allocate the funding to.
- The potential for supplier disruption needs to be managed carefully. The model needs careful consideration to take account of the culture of supplier relations and availability of suppliers and contractors.
- It may be tricky to obtain council approval (due to risk aversion of council finance teams)

- The model requires a mechanism to determine how funding raised is spent.
- May require additional council staff to manage.

Chosen model for further development

Both options were presented to and discussed with the working group. Option 1 – ICP shadow price, was chosen as the preferred immediate-term approach, as it can integrate carbon into financial decisions. Using a shadow price, stakeholders involved in the pilot study will be able to understand the carbon impact of financial decisions, without any carbon tax should the higher carbon, lower cost be chosen. The working group also concluded that there are elements of option 2, that links with carbon insetting, that could be beneficial. However, it was agreed that insetting would be an area to expand on later down the line, as the use of ICP develops.

In alignment with earlier workshops, the capital approval process was again identified as the easiest place to start. The capital approval process was therefore decided on as the focus of the subsequent pilot stage. Looking ahead to the pilot, relevant stakeholders were identified who could support further investigation into the capital approval process. These stakeholders will help explore and facilitate the potential application of ICP as described in option 1. The refinement of the proposed model is described in the following section.

4 Refinement

Interviews with stakeholders

A series of eight interviews were held across both councils to explore the capital approval process through the lens of carbon. Hull and East Riding represent different geographies, constituents and approaches to climate action. Given the close working relationship between them, stakeholders in similar functions were engaged to compare and contrast on carbon and its consideration in the capital program.

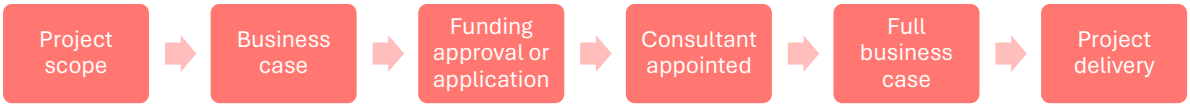


Figure 8: Capital programme approval process

Anthesis explored each stakeholder's role in the capital approval process to understand where and how carbon is calculated and assessed.

Table 3: Interviews targeted both councils across multiple functions

Council	Function
Hull	Governance
	Finance
	Capital Projects
	Carbon Reduction Projects
	Project Management Office (PMO)
East Riding	Democratic Services
	Carbon Reduction Projects

Common themes of interviews

Speaking to both councils, the commonalities across them fell largely into three categories; people, process and value chain. The people themed points centred around the annually evolving nature of councils through elections; each year there may be new elected members representing the views of the communities served, and a new scrutiny team make-up. Combined, this annual turnover of roles and responsibilities impacts how knowledge, particularly with respect to carbon, is managed, maintained and built on.

The process themed items highlighted that carbon impact is mostly estimated. Where carbon is quantified in some way, that information is not held centrally, nor is it requested or assessed as part of the capital approval process. Capital approval decisions are financially driven, with a threshold value for internal rate of return (IRR). For larger programs, full business cases are Green Book aligned, but it was widely recognized that such an approach is deemed too complex for smaller scale projects.

The interviews looked beyond internal operations, to the value chain. The interviews showed that whilst carbon literacy exists in pockets in each council and there is an appetite to incorporate it

into decisions, at present there are limited suppliers available that can offer low carbon materials or solutions.

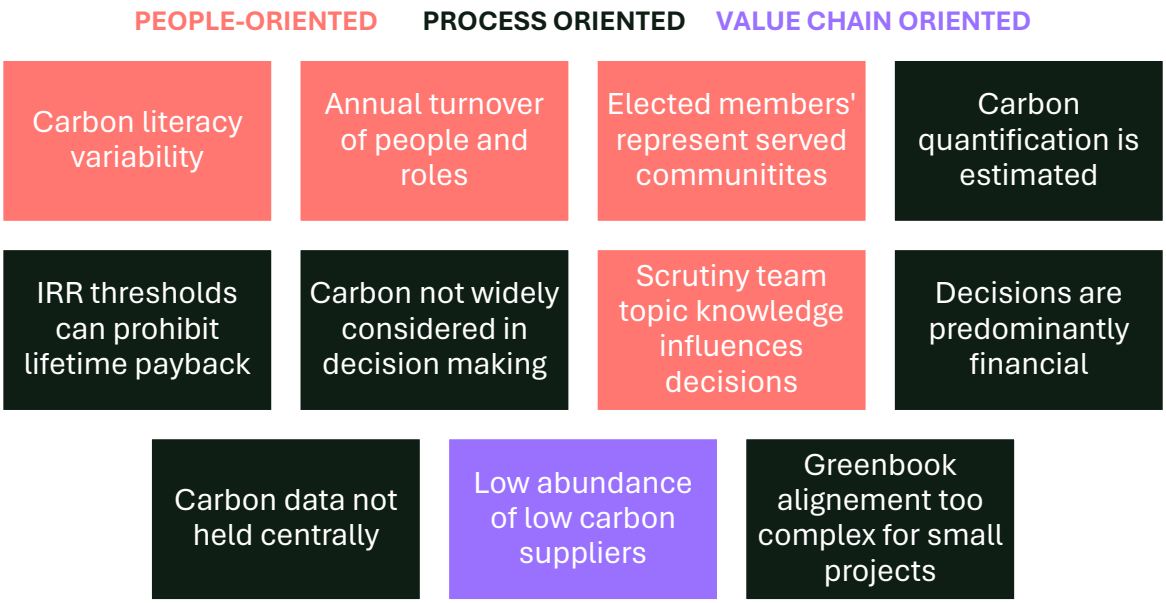


Figure 9: Stakeholder interviews helped identify where to focus development ahead of an ICP pilot.

Hull specific observations

Hull is a large urban city that declared a climate emergency in 2019, leading a north-east net-zero working group. Hull has the ambition to lead on decarbonisation and in doing so, show how other local authorities can follow suit. Resultantly, carbon reduction projects are viewed favourably, particularly when they mitigate energy price volatility. Specifically, Hull capital business cases ask for alignment to community plan ambitions, including one focused on responding to the climate and nature emergency.

However, whilst carbon reduction projects are viewed favourably, finance remains the most important project comparator, particularly through the public perception of overspending. At present, an internal rate of return (IRR) threshold typically prevents some carbon projects seeing approval, unless there is a strong case that the project will pay for itself within its lifetime. This is a good example of where thresholds are showing flexibility.

Project funding remains key; if ICP can develop funds for the authority, it would overcome the current position of increased Capex resulting in reduced Opex budgets. It is not likely that this creation of funds can be achieved in an initial phase of ICP implementation. At a more regional and national level, larger grants for carbon reduction projects, such as Green Heat Network Funding, are Green Book aligned. These grants enable councils with limited budgets to still deliver on decarbonisation targets. The challenge for these grants is producing suitably detailed carbon and financial models. Invariably Hull seeks Consultancy support for these larger projects. It is not clear to Hull how the Green Book guidance could be scaled down for smaller local projects. (Potential scaling of Green Book guidance is discussed further in section 6). Simplicity of process as a key theme is further emphasised by variable carbon literacy in Hull City Council members, specifically in the capital approval decision makers. Elected members also rotate over time and represent the views of their constituents; there is a need for any new process or subject matter to be communicated in layperson language.

Looking at project delivery, Hull's current supply chain is already finite, due to Hull's geography, with low-carbon ready suppliers in even shorter supply. Looking longer-term, Hull learned from the Equalities Initiative that any carbon reduction mechanism needs lifecycle impact monitoring, enabling continuous process improvement.

East Riding specific observations

East Riding differs from Hull in that it is a more rural area, looking to follow and learn from Hull's ICP pilot. East Riding also declared a climate emergency in 2021. As an example of sustainability progression, business cases were recently evolved to include social value. The Scrutiny team owned this initiative, and it is perceived widely to have been beneficial. The Learning & Development team support education of the Scrutiny team; this study's recommendations will explore if carbon education could be included.

Like Hull, East Riding receives government funding that requires carbon savings, often aligned to the Green Book. For smaller scale projects, carbon assessments vary from qualitative to estimated quantitative, sometimes supported by the Energy team, who host a set of historical calculation records. However, at a local level, carbon is not part of the formal project assessment process, nor is a comparison of carbon between a proposed solution and a business as usual position. Like Hull, decisions are predominantly financial with an 8% IRR required, with case by case approval for lifetime payback.

East Riding shared that some staff roles and functions are stretched already, combined with rotating elected members. ICP, as well as core carbon literacy, needs to be simple to understand, with a straight-forward self-led knowledge management approach to ensure longevity.

Early recommendations as a result of interviews

Reflecting on the stakeholder interviews, early recommendations for the pilot fall into two key themes: people & process. People recommendations focus on carbon/ICP education, stakeholder engagement and knowledge management. Process recommendations focus on adaptability, impact monitoring, and iterative improvement.

People

- Carbon and ICP education to take account of regularly changing roles and also to account for informality in Project Scope phase.
- Involvement of Learning & Development team in pilot, and the importance of Scrutiny; engage early as possible and involve in pilot.
- Potential central function for carbon quantification with education on the importance of BAU and counterfactual needed in the quantification process.
- Education to make the carbon saving value relevant by articulating the value of money spent on carbon saving in accessible language.
- Application to Capital Approval is also intrinsically linked to Budget process. Engage stakeholders within pilot.

Process

- ICP pilot to focus on capital budget but consider impact on revenue budget. Reflect on learnings from the use and integration of Social Value.
- Strong references to Green Book in process design and carbon quantification, but mindful of complexity as there is a need to be able to adapt requirements for different funding schemes.

- Create KPIs that link to community plan ambitions and enable through-life impact monitoring.

Interviews with other Local Authorities

Over 300 local authorities have declared a climate emergency and two thirds of councils in England have an ambition to be net-zero by 2030[9]. However, the use of ICP as a means to support decarbonisation is fairly sparse, demonstrated in the case studies. Local authorities have the ability to lead on local decarbonisation, share learning across authorities and deliver collective national progress towards targets. Through this lens, it was an important activity of this project to explore what other councils may have that can be learned from. Specifically, Anthesis spoke to Oxfordshire County Council about the development of a carbon calculator tool. Anthesis engaged the North East and Yorkshire Net Zero hub, in a similar way to the stakeholder interviews, to understand the viability of implementing an ICP in their areas. We also explored our own local authority contacts via existing Anthesis projects for informal discussions about their appetite for ICP.

Oxfordshire County Council

Oxfordshire County Council's involvement in developing carbon accounting guidance and a carbon calculator led to discussion about its potential applicability to Hull or East Riding.

Carbon Calculator & Accounting Standard (CCAS)

The Future Highways Research Group (FHRG) and Association of Directors of Environment, Economy, Planning & Transport (ADEPT) members developed carbon reporting guidance for local highways authorities, in the form of a Carbon Calculator and Accounting Standard (CCAS)[10]. Oxfordshire County Council supported the guidance development, as one of six county councils:

- Oxfordshire County Council;
- Lincolnshire County Council;
- Surrey County Council;
- Derbyshire County Council;
- Warwickshire County Council.
- The FHRG was contributed by several others, including Devon County Council as the seventh county council involved.

The purpose of the guidance is to assist local highways authorities and their supply chain partners in understanding their greenhouse gas emissions for measuring and reporting. The guidance was developed in recognition that existing carbon calculators varied in accuracy, but also aimed to create a common and accessible approach to carbon quantification.

The outcome is a tool and supporting guidance, intended to be accessible to local authorities freely, without commercial barriers. The tool itself is flexible; it can be scaled up or down and

[9] https://www.local.gov.uk/delivering-local-net-zero

[10] https://www.adeptnet.org.uk/sites/default/files/media/2023-10/Carbon%20Calculation%20and%20Reporting%20%28CCAS%29%20Guidance%20for%20Local%20Roads.pdf

can be transferred and used for other carbon quantification exercises. The tool is popular for carbon baselining but could easily adapted to other sectors and projects. The tool outputs a data set that can be interrogated to identify hotspots. The hotspots enable users to recognize where investment in lower carbon solutions will have the greatest impact.

The Chartered Institute of Highways & Transport (CIHT) has produced an educational package to support CCAS, from carbon literacy through to tool specific user-training. The Department for Transport (DfT) are also in discussion about how the CCAS can contribute to a highways sector standard. Since development and trial, a further 30 local authorities have expressed interest in CCAS.

This model is perhaps the most promising of the carbon calculators available to local authorities. It is not currently available or supported in the long term, but following a conversation with Oxfordshire CC, there is some hope that this tool will be available and can provide an adaptable and flexible tool useful for carbon quantification across a range of footprinting and project requirements. Table 11 in section 6 details various carbon calculator tool options.

Applicability of CCAS to Hull & East Riding

A fundamental part of implementing ICP is carbon quantification. For Hull and East Riding, carbon quantification is undertaken ad hoc and currently estimated with some variance across project teams. A key step towards implementing ICP is to make carbon quantification more accessible and consistent. The CCAS tool is already developed with an accompanying educational program; Hull and East Riding would not need to invest or develop a bespoke tool.

Regardless of tool selection, there will remain a need for carbon literacy to some degree. This is both at a council level but also with suppliers. Interviews with Hull stakeholders identified that there is an already limited pool of suppliers and contractors in some sectors, with even fewer able to offer lower-carbon solutions. There would likely be need for any regular council suppliers to be upskilled in the sort of data and information required by carbon calculations.

North East & Yorkshire Net Zero Hub

The North East and Yorkshire Net Zero Hub (NZ Hub/The Hub) is a “collaboration of six combined authorities and local enterprise partnerships accelerating the transition to net zero”[11]. The Hub is made up of:

- Hull and East Yorkshire (HEY) Business, Growth and Skills Hub (formerly HEY LEP),
- West Yorkshire Combined Authority,
- Tees Valley Combined Authority,
- York & North Yorkshire Combined Authority,
- North East Combined Authority,
- South Yorkshire Mayoral Combined Authority.

Hull and East Riding are represented in the Hub through the HEY Business, Growth and Skills Hub. The Hub are the funders and ultimate owners of this work. The Hub has delegated the role of understanding ICP in a greater way, through a worked example of implementation, to HEY. By

[11] https://www.neynetzerohub.com/

HEY working through ICP implementation in their area, the Hub can the share and encourage other local authorities to take it up too. There may be economies of scale available, by adopting common practices such as process, tools, education programs or supplier engagement activities.

During this project, there was a one-off workshop with the Hub. The workshop was with the Hub team, i.e. representatives of the Hub's partners, and not a full-scale combined authority engagement. The workshop's purpose was to understand the current position of each of the combined authorities in the Hub, by gaining as much insight as the Hub team could offer for their members. As with all other interviews and engagements, the workshop focused on the capital approval process, then asked more open questions about general knowledge and perceived barriers.

Capital Approval Process – How carbon is considered

The workshop presented the capital approval process at a high level, seeking inputs on each stage across a set of prompts. The workshop set out to clarify how carbon is, or is not considered at present, as a baseline to develop recommendations from.

Where is carbon currently considered and is it qualitative?

Across the Hub region, carbon is not widely considered during project scoping, unless there is a stand-out environmental benefit that bolsters the economic case. Carbon is first considered at the business case stage as part of a climate assessment, or in response to a specific KPI. Carbon quantification is mostly estimated or a qualitative range. Beyond initial funding approval, carbon data is not regularly tracked through life, due to the additional resources both internally and from the supply chain.

How does the capital approval process need changing?

The Hub team acknowledges that best practice would be for carbon to be considered in a consistent manner and in alignment with the Green Book. However, for smaller projects, the Green Book is not always pragmatic, nor accessible without supplementary education. Carbon literacy is needed at both project level and amongst decision makers, both at project scoping and through-life. Separately, developing viable economic models for investment is already a present challenge with projects struggling to meet government requirements. The Hub team all agreed the role ICP can play in creating economic viability.

What are the challenges of carbon quantification? Is the cost of carbon reduction understood?

Carbon quantification requires a specific skillset that is currently sparse and not part of formal role responsibilities. The cost of carbon reduction is subsequently not widely understood. It was suggested that carbon budgets and trading across departments and even outside of individual local authority boundaries may work alongside ICP, as an accessible route where further funding cannot be generated.

How engaged are people in carbon, what is the level of training or knowledge?

Due to the climate crisis declarations, carbon and decarbonisation are on peoples' minds, with varying levels of carbon literacy. In terms of training, discussions centred primarily around the Green Book; the Hub team represented the experience of their members stating that they believed there was low familiarity with the methodology, nor the technical carbon quantification skills underpinning it. Often, it is difficult to identify where specialist support from external consultants would be beneficial, versus simplifying the process and upskilling staff in-house. Any simplification of the Green Book needs widespread agreement, with appropriate accompanying training and guidance.

What documentation or tools are needed?

The Hub team emphasized that any documentation or tools need to feel accessible, clear and straight forward, for their members to be able to use. In an ideal setting, the user of any tool would have to hand an accompanying guidance document that is aligned to the chosen methodology. Where the methodology calls for additional (external) technical support, the Hub would welcome guidance on bounding additional scope and/or what standards are recognized as best practice in the sustainability industry.

Issues and barriers with ICP

At present, none of the Hub team or their members have experience with ICP or Insetting. However, insights were shared as to potential issues and barriers. There is limited national guidance on a consistent approach for carbon quantification, resulting in more qualitative and less effective carbon impact assessment. For time-poor resources, the method of carbon quantification, and then calculation of implicit carbon price, needs to be accessible, consistent between departments and with supporting education.

Benefits of ICP being applied to the NEY NZ Hub member authorities

The Hub team recognized that wider adoption of ICP would result in better clarity of progress towards net-zero goals and increase general understanding of the carbon impact of new projects. It was acknowledged that ICP enables decision makers to course-correct towards net-zero targets, by strengthening the case for investment beyond the limits of current criteria.

Appetite of ICP in the NEY NZ Hub member authorities

North Yorkshire Council have actively explored ICP and would like formal support exploring it further. North Yorkshire suggested involvement in a linked pilot project and recognized that their involvement could contribute to better data and wider understanding of the impact of ICP.

South Yorkshire also believed ICP could already be relevant to their combined authority, as they are already in a position to set carbon-related conditions on funding for local authorities.

Hub-wide there was real interest to see ICP in practice and trialled in a Hub member area. However, there was an open acknowledgement that any new process would take time to embed, and need whole organisation buy-in.

Anthesis Local Authority Project Experience

Through historical and existing local authority projects, informal discussions were undertaken regarding the interest in and appetite for ICP and Insetting. Like Hull, one of the local authorities consulted is demonstrating good practice by aligning to the Green Book for heat network projects. This is in direct response to a grant from the Green Heat Network Funding, requiring a full business case to showcase the economic and commercial models alongside carbon. The Green Book asks for the net present social value, which is inclusive of pollution emissions, as well as monetisable carbon savings. Discussions found that the result of providing this information was a triple bottom line, that presented the business case with due consideration for profit, people and planet. The triple bottom line approach doesn't particularly value people and planet over profit, though often there is a financial benefit associated with doing so.

Potential economies of scale that be achieved at a combined authority or regional scale

The Hub has funded this project so that any of its partners, constituent local authorities or other public sector bodies can benefit from the learnings and consider their own applications. This

focus project will explore ICP through a capital program-oriented pilot project with Hull, where future implementation could expand to East Riding.

Methodology

Hull City Council will explore how the Capital Approval process is modified to incorporate ICP. The methodology will likely be iterated and trialled at different scales depending on project size and data available. The outcome is a methodology that is beginning to mature for Hull and as such, could be a starting point for other comparable local or combined authorities.

At this stage, the project team have not had sight of the ADEPT carbon quantification tool. However, from conversations with Oxfordshire County council, who contributed to its development, the tool is perceived to be very adaptable and scalable. The tool is accessible by other authorities; progressive and consistent use by local and regional authorities has significant potential to influence how carbon is currently evaluated for regional funding. It was highlighted that the Department for Transport has an interest in the ADEPT tool, supported by CIHT. Sponsorship at this level could potentially begin to influence carbon evaluation at national level.

A larger body of knowledge will be built around the core methodology as a result of involving several different authority functions in the pilot. Training and guidance documents will be developed, refined and could again be shared.

Suppliers

Stakeholder interviews cited that at present, the supply chain is already finite in the north-east, with only a few suppliers able to offer lower carbon solutions. A regional approach to ICP could offer an opportunity to pool supplier engagement, with benefits such as upskilling suppliers on the information typically needed for carbon evaluation, or increasing demand for lower carbon materials.

Barriers to successful adoption of carbon trading within local government

Local Authorities have a good history of collaboration, co-ordination, and knowledge sharing. The Local Government Association is an example of a structure in place to aid Local Authority Cooperation, whilst the regional Net Zero Hubs also play an important role in doing so.

A non-exhaustive list of barriers follows in Table 4.

Table 4 Potential barriers to adoption of carbon trading within local government

Barrier	Detail	Requirements
Ownership and management	A service would need to be responsible for scheme design, set-up, and governance as a minimum.	Resource Skills Identification of suitable body
Financial procedures	Regulation around carbon credits has been light to date, but scrutiny has been increasing. It is likely in general that carbon markets will become increasingly regulated.	Alignment with existing financial procedures and requirements Expert input regarding set-up and integration
Resource availability	Local Authorities are funding and resource constrained. Recruitment of additional staff is not easily funded.	External funding Adjustment of existing budgets and priorities.
Organisational Culture	The collaborative nature of Local Authorities puts them in good stead for region wide initiatives.	Communication and engagement

	Competitiveness would still be a part of culture which could be beneficial.	
Capability	Capability of existing council teams to monitor the effectiveness of the ICP policy and to review whether the implicit price should be updated.	Resource Upskilling (carbon literacy)

Were a Local Authority to implement Option 2, consideration would also need to be given to further barriers such as procurement, financial/ legal considerations and the capability necessary to implement the option.

What are the emerging skills and resource gaps

Across Hull, East Riding and wider authority stakeholders, there are patterns of resource and skills that would be needed to support ICP. This shows that in many instances, local and combined authority staff roles are multi-functional, with carbon a far more recent subject.

Process ownership

At a high level, any new process requires ownership and sponsorship. The most appropriate functional ownership is likely to vary but could be within Finance or a central PMO, though not restricted to either. The process owner would typically hold write-access to any related documentation, templates, or guidance. Best practice would extend beyond information hosting and dedicate resources as well to monitor how the methodology is being applied and where there are challenges. It then has the benefit of centralizing lessons learned and iterative improvement.

Carbon literacy

Specifically for an ICP process, carbon quantification skills are additional to the core process ownership resource requirements. Currently, there is a gap in the carbon quantification skills and similarly, carbon literacy is varied across the Councils. As carbon is important across an authority, any carbon literacy education could be centralized outside the process owner. There is a range of suitable responses to filling the carbon quantification gap, it does not need to be a single individual or tool and could be a series of individuals across each function.

5 Price setting

General principals

There are no externally set standards or processes to follow in creating an Internal Carbon Pricing scheme. There are some useful sources of information and guidance, primarily CDP[12]. The overarching principle is to identify what influences the price of carbon for your organisation. Carbon emissions will result in risks and costs, carbon reductions will result in additional costs, but also opportunities and financial benefits. These are currently externalities, but in identifying a carbon price, the aim is to make tangible the things that will likely affect your organisation over the coming years.

The types of impacts will vary by sector and will include both external and internal drivers.

External factors:

- Risk of legislation;
- Carbon taxes, trading schemes, and benchmarks in relevant geographies;
- Value of carbon reductions to stakeholders;
- Market factors: costs of credits, removal certificates, purchasing renewable energy etc;
- Insetting price.

Internal factors:

- Your implicit cost of carbon historically;
- Your implicit cost of carbon for future reductions;
- Costs required to create behaviour change;
- Scope of application.

We can look at determining the relevant price of carbon primarily from two standpoints, either:

- Looking forward from now – Mitigation Cost Approach (MCA)
- Looking back from the future – Social Cost of Carbon (SCC)

Looking forward from now assuming targets will be met (*the cost to avoid climate change*). In this viewpoint we are considering the current aim and imperative to achieve net zero targets, understanding what that will cost, and making decisions about the best use of money to achieve that aim based on what the specific organisation has to do to decarbonise. Implicit prices are based on this method which is sometimes called Mitigation Cost Approach (MCA). The implicit price is further explained in the following section.

A Mitigation Cost Approach models the costs of achieving a certain emissions reduction target. There are varying levels of complexity applied to this modelling depending on who the target is applied to. In general, cost estimates for the different actions and activities that are needed to achieve the target are calculated (e.g. project specific implicit prices) and ranked in terms of their £/tCO_2e price. The use of this analysis promotes the use of the lowest £/tCO_2e price that is

[12] https://www.cdp.net/en/climate/carbon-pricing

appropriate for achievement of that target. It is possible to adapt this approach for specific organisations and gives a pragmatic price that should still be high enough to incentivise practical options.

Looking back from the future assuming targets are not met (*the cost from climate change damage*). Considering the costs of the negative impacts of climate change if allowed to happen. Costing the impacts to health, infrastructure, prosperity and livelihoods if climate change isn't avoided. A Social Cost of Carbon (SCC) approach is the basis of prices calculated from this viewpoint.

The Social Cost of Carbon is an approach to valuing carbon emissions which is particularly popular in some geographies (including the US). Calculation of SCC is typically more centralised and academic as the emphasis is on finding a single number that represents the damage that results from emitting a tonne of CO_2e. The SCC is not specific to an organisation. However, that does not mean that it is straightforward to find agreement on a universal cost of carbon using the SCC method. Calculation of SCC is based on complex climate and socio-economic models with numerous assumptions including for example a value put on a human life. The UK Government has considered and moved away from the use of SCC as a method for calculating Green Book prices and instead utilises the Mitigation Cost Approach. The detailed rationale for this was explained in in a literature review published in 2021[13] and concluded that when reviewed in terms of Robustness, Timeliness, Policy alignment, and Credibility, that SCC did not score well in comparison with a Mitigation Cost Approach.

Implicit cost of carbon:

The implicit cost of carbon calculation is based on an MCA approach as we are looking at what investments are needed to meet a target. The implicit cost of carbon is a measure of the specific cost to reduce carbon emissions (towards a target) within the relevant area.

(for a simple 1-year measure)

$$\frac{cost\ of\ carbon\ reduction\ measure(s)}{tonnes\ CO2e\ reduced}$$

(for a capital investment with a multi-year lifetime)

$$\frac{discounted\ lifetime\ cost\ of\ carbon\ reduction\ measure(s)}{discounted\ lifetime\ tonnes\ CO2e\ reduced\ *}$$

*** Carbon may not be discounted but would still be assessed over the same lifetime as the investment.**

The choice of discount rate to apply to future carbon is a widely debated topic. Two approaches are the Social Rate of Return on private investments (SRRI), and the Social Time Preference Rate (STPR). STPR is stipulated in the UK Green Book approach, it represents the value that society attaches to the present as opposed to future impacts. The Green Book discount rate is set at 3.5% primarily for financial discounting, but this rate is also relevant to discounting carbon. So, for a public sector assessment, both Carbon and Finance can be discounted at 3.5%.

[13] https://assets.publishing.service.gov.uk/media/613f61ae8fa8f503c4b208e8/carbon-values-lit-review.pdf

Key principles to consider in choosing a price:

The price should be set high enough to make a relevant impact in business case decisions, this can be checked through analysis of break-even price and through gathering feedback of stakeholders involved in the decision-making process(es)

The price must be defensible. Alignment with relevant external benchmarks is useful in this instance. These may be based on global analysis such as the World Bank corridors, country specific analysis (i.e. UK Green Book), or relevant taxes or trading schemes (e.g. EU ETS). However, the more high-level and global – the less specific to the organisations sector, geography, and particular investments that will be needed.

The price needs to be effective. It needs to incentivise helpful behaviours without causing unwanted impacts. For example, in a case of use with contractors – is it high enough to successfully account for risk and to make it attractive for contractors to take on new materials and ways of working without leading to contract values that are unbalanced and unsupportable? Monitoring the impact of carbon prices through pilot projects and structured feedback is helpful.

The use of external benchmarks aids communication and governance in that updates to projections can be monitored.

Most external analysis points to the increase in carbon prices over time. A price structure that includes staged increases: current price, 2030 price, 2050 price etc. is recommended. For decision making processes where the legacy of that decision will have a specific lifetime then the analysis structure should include the increasing prices.

External analysis is a useful guide to benchmarking an ICP system, even if an external benchmark isn't chosen to set the ICP price. Externally the carbon landscape is undergoing rapid change and evolution driven by increased engagement and response to the climate crisis, national target setting, increased demand, and changing regulation. Yearly review of key benchmark sources is recommended.

When setting up the decision-making structure, it is possible to include a range of prices particularly for shadow pricing where the result is advisory (no funds are recovered). For example, a net present value (NPV) analysis could include the central ICP price e.g. £100 / tonCO_2e but also show the impact with a high-end estimate of future carbon price e.g. £200 / tonCO_2e. This may require guidelines for decision makers to aid interpretation, but due to inherent uncertainty in external carbon prices, showing this range can be helpful.

External Options for basis of Internal Carbon Price

UK Green Book analysis

The UK Government's Green Book guidance is a relevant source of forward-looking price projections[14]. The 'Green Book' describes how major public sector investment projects in the UK are assessed, part of that assessment includes sustainability and quantifying and valuing carbon emissions and reductions. Within the available data tables, projections of carbon price (£/tCO_2e) out to 2050 are included and shown in Table 5 and Figure 10. Within the Green Book

[14] https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government/the-green-book-2020

terminology, these prices are referred to as "Carbon Values" rather than prices. Within this section discussing the UK Green Book we use that same terminology, but for our purposes the terms carbon price and carbon value are interchangeable. The source for the original modelling is BEIS (UK Department for Business, Energy & Industrial Strategy), based on IPCC data with recent updates modelled by Enerdata using a top-down sectoral model of the world energy system.

Two sets of carbon values are provided under the Green Book heading: Traded and Non-Traded. The Traded values represent a market-based value of carbon: how much is the market willing to pay to reduce carbon emissions (£/tCO_2e). These Traded carbon values are shown in Table 5.

Table 5 Carbon Values and Sensitivities 2020-2050 for appraisal, 2020 £/tCO_2e [15]

Year	Market Carbon Values	Low Sensitivity - High Fossil Fuel Prices and Low Economic Growth	Net Zero Strategy Aligned	High Sensitivity – Low Fossil Fuel Prices and High Economic Growth
	(2023 GBP)	(2023 GBP)	(2023 GBP)	(2023 GBP)
2023	70	51	59	64
2024	72	63	76	84
2025	79	71	88	100
2026	91	77	98	114
2027	97	73	97	116
2028	98	69	98	124
2029	89	58	89	118
2030	87	56	87	118
2031	94	60	94	128
2032	101	67	101	131
2033	108	70	108	136
2034	111	72	111	139
2035	121	80	121	149
2036	128	85	128	156
2037	135	94	135	162
2038	145	104	145	170
2039	145	106	145	171
2040	142	103	142	169
2041	139	100	139	166
2042	135	97	135	165
2043	133	95	133	162
2044	133	94	133	164
2045	134	94	134	165
2046	133	93	133	167

[15] https://www.gov.uk/government/publications/traded-carbon-values-used-for-modelling-purposes-2023/traded-carbon-values-used-for-modelling-purposes-2023

2047	133	92	133	166
2048	135	93	135	168
2049	134	93	134	169
2050	138	95	138	172

To calculate the central figures a 'target consistent' Mitigation Cost Approach (MCA) has been used, to find the marginal abatement cost of meeting net zero target in the UK. A "target consistent price path" approach looks at the types of activities and projects that will be needed to achieve net zero and assesses the combined costs and carbon savings from the compiled options. This approach is aligned with the implicit price calculation approach discussed earlier in this section.

The high sensitivity / high trajectory is based on a scenario where fossil fuel prices are lower and therefore compete more keenly with renewable energy. Higher emissions than the central scenario result and therefore higher carbon prices are required in order to meet targets. The alternative scenario of high fossil fuel prices and lower requirement on carbon prices is shown in the low sensitivity trajectory.

The market trajectory focuses on market factors such as transaction costs, liquidity, market inertia etc. All trajectories use a combination of:

- Business As Usual emission projections for the UK;
- Marginal Abatement Cost Curves (MACCs)/MCA for target achievement (UK government target);
- Market prices of UK ETS Allowances (UKAs) futures contracts (trading of UK Allowances to or from the UK Emissions Trading Registry).

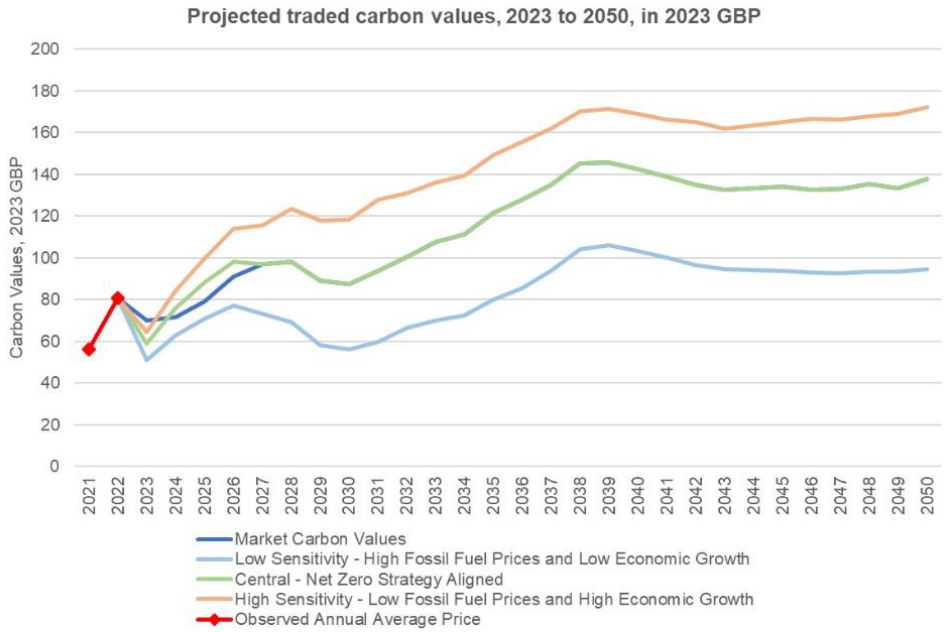


Figure 10 Traded carbon values for modelling purposes, £/tCO2e (real 2023) from UK Green Book[16]

The UK Green Book pricing analysis for traded carbon values was revised in November 2023. It accounts for updates in international and UK domestic targets, Brexit, and updated understanding of technology costs and availability; it forms a robust and readily available source of information. The carbon values shown in Table 5 supersede previous UK Green Book carbon prices. Previously calculated Green Book prices have been higher, but all analysis underlying the Green Book carbon values is based on similar methodology and models. The green book traded values are anchored in values of UKAs, so modified by market-based factors and therefore lower, the projected price of UKAs becomes part of the calculation of implicit price. The prices are still based on the UK Net Zero Strategy and associated MACCs to bring implicit pricing into the calculation, but a second data set used in the calculation, based on market prices of UKA futures contracts acts to modify and reduce the resultant prices. By being anchored in the market value of the price of carbon, the traded values provide a useful benchmark for consideration of capital investment as they are more linked to the costs of decarbonisation of energy use, transport/travel, and material substitution. These traded carbon values are particularly relevant for corporate users, but are also relevant in a local authority setting to represent the practical costs of decarbonisation for local authority own operations. They also offer a more conservative starting point that may align better with stakeholder expectations on what the carbon price should be.

The UK Government also calculate the non-traded values. Non-traded values represent a monetary value that society places on the reduction of carbon emissions (£/tCO_2e). The non-traded values from the UK Green Book are shown in Table 6. These values are typically higher than the traded values. These non-traded values are used in policy appraisal across government. The calculation of these non-traded values follows a similar principle to the traded values in that

[16] https://www.gov.uk/government/publications/traded-carbon-values-used-for-modelling-purposes-2023/traded-carbon-values-used-for-modelling-purposes-2023

it uses a "target consistent" MCA approach, which means that it is based on scenarios of what the UK Government needs to do to ensure that decarbonisation targets are met. In this way, the UK Green Book prices are based on the same principles and method as calculating a locally specific implicit price and so can provide a good proxy to locally specific implicit prices.

While the non-traded cost of carbon represents the value of carbon reduction to society it is not based on a "Social Cost of Carbon" (SCC) approach[17]. The values are revised periodically, and latest revisions include the impacts of target changes, Brexit, and changes in technology and costs of decarbonisation options (such as decreasing costs of renewable energy). When looking to use a carbon price for wider area local emissions, the non-traded values are the most appropriate as these decisions will be more policy based and further from decarbonisation of traded sectors. Local authority users may be more familiar with the non-traded values and they certainly provide a higher level of ambition likely to incentivise greater investment in decarbonisation.

As there is no mandated need to use either set of Green Book carbon values in the capital approval process, it is down the user to decide which set is more appropriate. In this instance we would recommend the use of the non-traded values.

Table 6 Carbon values in £2020 prices per tonne of CO2

Year	Low series	Central Series	High Series
2020	120	241	361
2021	122	245	367
2022	124	248	373
2023	126	252	378
2024	128	256	384
2025	130	260	390
2026	132	264	396
2027	134	268	402
2028	136	272	408
2029	138	276	414
2030	140	280	420
2031	142	285	427
2032	144	289	433
2033	147	293	440
2034	149	298	447
2035	151	302	453
2036	153	307	460
2037	156	312	467
2038	158	316	474
2039	161	321	482

[17] For more information on Social Cost of Carbon and the different approaches that can be taken to valuing carbon see https://www.gov.uk/government/publications/carbon-valuation-in-uk-policy-appraisal-a-revised-approach

2040	163	326	489
2041	165	331	496
2042	168	336	504
2043	170	341	511
2044	173	346	519
2045	176	351	527
2046	178	356	535
2047	181	362	543
2048	184	367	551
2049	186	373	559
2050	189	378	568

World Bank Carbon Pricing Corridors

The World Bank's 2017 High-Level Commission report[18] recommended carbon prices that will be needed to meet the Paris Agreement. These prices are $40-80 per tonne by 2020, $50-100 per tonne by 2030 and $100 to $200 by 2050. The ranges included here are applicable globally and are based on sound analysis, albeit now a few years old. This is a most widely quoted and respected source of carbon price information and so provides a good backstop. The use of corridors (range of price) and staggered price increasing over time is beneficial.

Network for Greening the Financial System

The Network for Greening the Financial System (NGFS) provides modelled carbon prices by geography across different political and transition scenarios. NGFS is a scenario analysis tool to explore the inherent uncertainty of government policies and socioeconomic impacts, so it's best practice to look across all the scenarios in order to see the range of exposure that organisations could be subject to. These prices are intended in the first instance for financial sector institutions, but all sectors can use the scenarios to assess potential risks. The most relevant scenarios for a UK public sector body such as Hull or East Riding are shown in Figure 11.

[18] Carbon Pricing Leadership Coalition (2017) Report of the High-Level Commission on Carbon Prices. Available from: https://www. carbonpricingleadership.org/report-of-the-highlevel-commission-on-carbon-prices

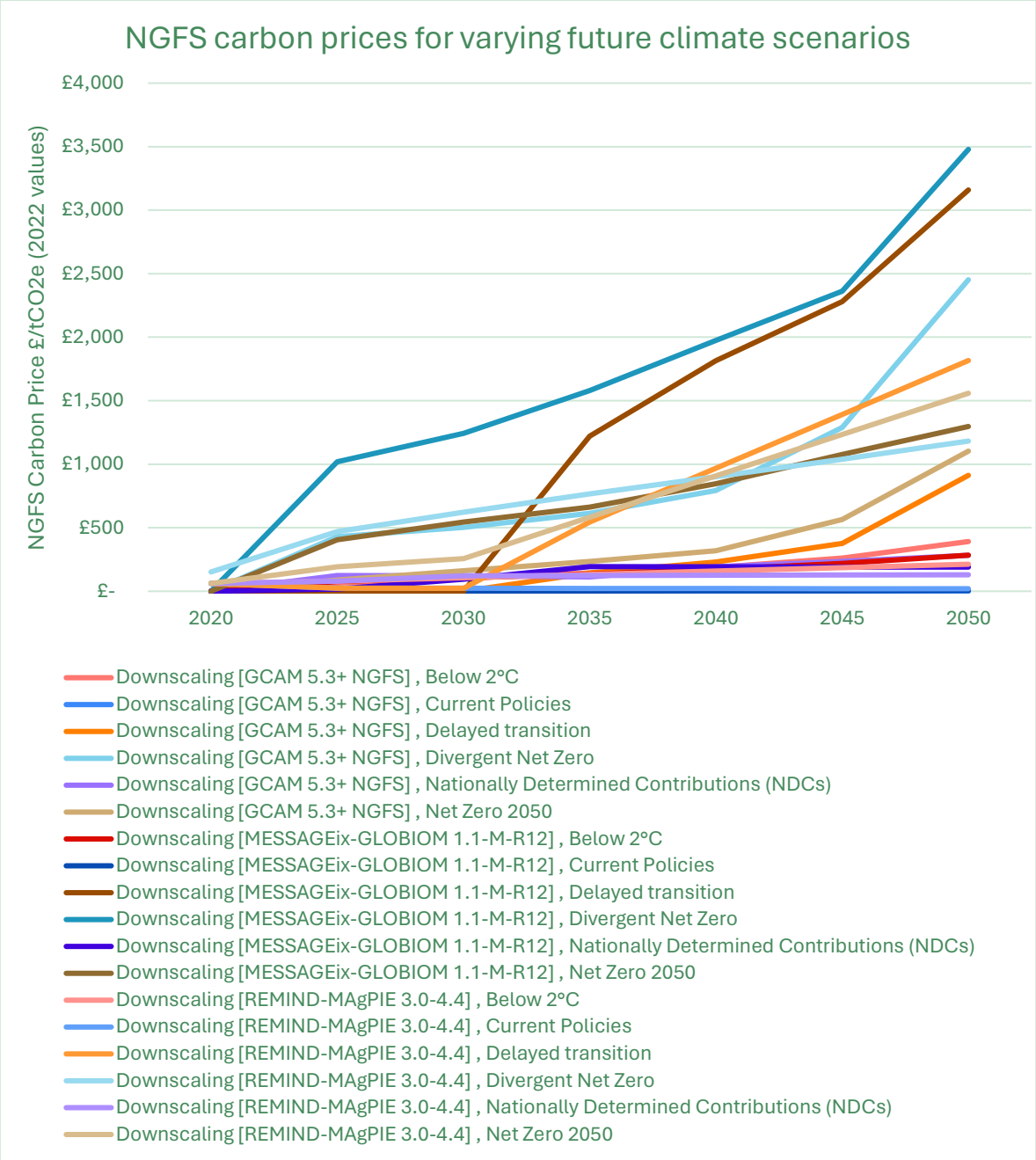


Figure 11 NGFS Carbon Price Scenarios, United Kingdom

These figures represent a wide range of scenarios with outputs produced using different models:

1. Downscaling [GCAM 5.3+ NGFS]
2. Downscaling [MESSAGEix-GLOBIOM 1.1-M-R12]
3. Downscaling [REMIND-MAgPIE 3.0-4.4]

The numbers for each model relate to the numbering used in Table 7 which contains the data from Figure 11. The different models include different socio-economic assumptions overlaid

over the climate scenarios (which are based primarily on accepted academic climate models). Taking the average from across the three models is recommended.

The data was updated in 2022 with the latest economic and climate data, model versions and policy commitments. The updates did not include impacts from the war in Ukraine. NGFS is currently exploring how regularly they should update the information. It is our experience that the data has been updated on approximately (though not precisely) a yearly basis.

It can be seen that there are a wide range of prices shown in the models, but for achievement of net zero ("Net Zero 2050" scenarios), there are prices ranging from £162-£545 (average £321) in 2030 through to £1,103 - £1,559 (average £1,320) in 2050.

Table 7 NGFS Scenario data for United Kingdom carbon prices under differing scenarios

Scenario	2020	2025	2030	2035	2040	2045	2050
1. Below 2°C	£0	£64	£101	£144	£189	£262	£391
1. Current Policies	£0	£0	£0	£0	£0	£0	£0
1. Delayed transition	£0	£0	£0	£144	£231	£377	£913
1. Divergent Net Zero	£0	£430	£504	£615	£794	£1,290	£2,452
1. Nationally Determined Contributions (NDCs)	£0	£123	£122	£113	£193	£235	£283
1. Net Zero 2050	**£0**	**£88**	**£162**	**£235**	**£319**	**£565**	**£1,103**
2. Below 2°C	£0	£78	£107	£135	£173	£220	£284
2. Current Policies	£0	£1	£0	£2	£4	£5	£7
2. Delayed transition	£0	£1	£0	£1,221	£1,814	£2,281	£3,159
2. Divergent Net Zero	£0	£1,020	£1,243	£1,579	£1,975	£2,362	£3,478
2. Nationally Determined Contributions (NDCs)	£0	£16	£94	£194	£193	£191	£190
2. Net Zero 2050	**£0**	**£406**	**£545**	**£662**	**£846**	**£1,077**	**£1,297**
3. Below 2°C	£62	£80	£106	£133	£160	£186	£213
3. Current Policies	£62	£25	£24	£23	£22	£21	£20
3. Delayed transition	£62	£25	£24	£544	£968	£1,392	£1,816
3. Divergent Net Zero	£152	£469	£623	£767	£901	£1,039	£1,182
3. Nationally Determined Contributions (NDCs)	£62	£80	£121	£123	£126	£128	£130
3. Net Zero 2050	**£62**	**£192**	**£257**	**£582**	**£908**	**£1,233**	**£1,559**

The scenarios can be seen in terms of risk: what is the cost of carbon reduction likely to be for the UK government in different scenarios? And would or how would this cost be felt by stakeholders? Certainly, in the short term, it would not be likely that the higher carbon prices represented in some of these scenarios would result in equivalent carbon taxes. But as Local Authorities are key stakeholders to the UK Government carbon reduction plans, these carbon prices may still be relevant in terms of what the UK government is prepared to pay for carbon reduction and so it is valid to use them as a proxy for investment related cost of carbon (rather than tax risk). It is fair to say that the UK Green Book Non-Traded prices should be a more direct proxy (than say the NGFS data) in this case being produced by the UK Government.

Offset or inset cost basis

Offsetting is an approach used in many sectors to deal with residual emissions. Offsetting is a term that has come to mean a credit or certification that is purchased from a 3rd party, to demonstrate that an action to reduce or avoid an amount of carbon dioxide emissions has taken place, for which the organisation buying the credit can account for or disclose and this same carbon reduction is not claimed elsewhere.

Where offsets are a sustainable and acceptable solution to achievement, then the cost of the offset sets a basis for a carbon price. Where a decarbonisation action can be undertaken more cheaply or at the same rate as offsetting, it makes sense to undertake the action. The problem with this approach has been the availability of cheap offsets that do not provide a sustainable solution to carbon reduction, but are marketed as supportive of decarbonisation target achievement. Fortunately, an increase in scrutiny and regulation regarding offsets has raised awareness and kick-started improvements in quality[19].

In a 2023 report for 18 London Boroughs that addresses the question of how net zero will be delivered[20], issues with offsetting and offset prices are raised. It is highlighted that it is "*virtually impossible to save 1 tonne of carbon at the current Greater London Authority (GLA) carbon price (£60-95)*". This is causing many Local Authorities to question and raise the carbon price related to offsetting and proposing that a carbon price should be based on the implicit price i.e. the cost of abating a tonne using alternate means rather than the non-traded cost of carbon (which the current GLA price is based on). The report proposes that offsetting should not be the cheapest option for carbon abatement and its price should be at least equivalent to the cost of installing PV panels on the building. The report also recommends an approach much more aligned to insetting, "*The carbon offset price should be set at a level which enables each London borough to save carbon elsewhere on a 1:1 basis, [and] administer the carbon offset fund*".

The report concludes that a carbon price should be at least £300/tCO_2e and possibly as high as £880/tCO_2e over 30 years. This is based on a calculation involving consideration of PV implementation costs within London and consideration of lifetime carbon emissions from avoided electricity use.

[19] https://ec.europa.eu/commission/presscorner/detail/en/ip_24_885

[20] https://www.levittbernstein.co.uk/now/delivering-net-zero-for-18-london-boroughs/#:~:text=The%20Delivering%20Net%20Zero%20study,deliver%20net%20zero%20carbon%20development. https://www.levittbernstein.co.uk/site/assets/files/4563/delivering_net_zero_-_main_report.pdf

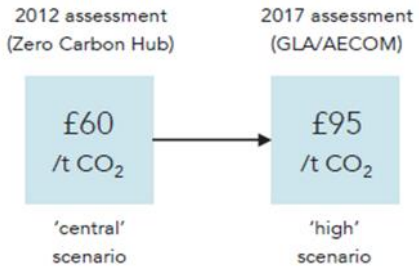


Figure 12 Carbon offset price using the the non-traded cost of carbon approach. The GLA recommended price dates back from 2017 and is considered insufficient to save carbon on a 1:1 basis [20]

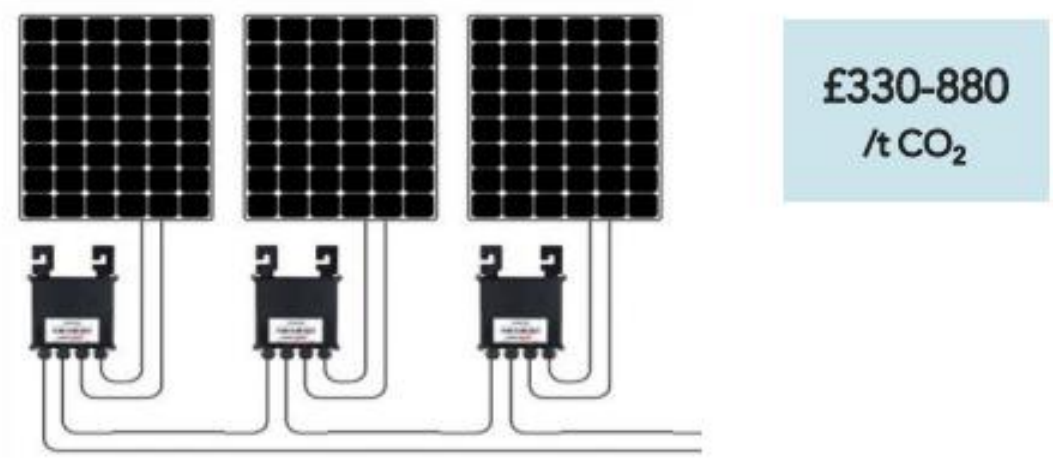


Figure 13 If the carbon offset price is to incentive more PVs on-site, it should be set at more than £330/tCO_2e assuming the same electricity carbon factor as SAP 10.2 of 136 gCO_2e/kWh (Part L 2021).

However, should a London borough wish to use an electricity carbon factor representative of the average electricity carbon content over the lifetime of the PV system (e.g. 50gCO_2e/kWh), this number would increase to £880/tCO_2e. Both carbon offset prices include a 10% administration and management fee. [20]

The Science Based Targets Initiative SBTi published their Above and Beyond[21] report on the design and implementation of Beyond Value Chain Mitigation (BVCM) report in February this year. The report outlines how organisations should/could set up a system of investing in BVCM that supplements science-based targets. BVCM being another term for Offsets. Within the report the SBTi come up with a term of "Science Based Carbon Price". A science-based price needs to be reflective of the real costs of decarbonisation, the SBTi suggest the use of either Social Cost of Carbon (SCC), or Mitigation Cost Approach (MCA) (e.g. based on implicit price analysis such as green book, NGFS etc), or based on fully costed removal. Fully costed removal is less well defined, but it is a positive step to have the emphasis on ensuring the costs of offsets is truly

[21] https://sciencebasedtargets.org/resources/files/Above-and-Beyond-Report-on-BVCM.pdf

representative of the cost of removal. For different organisations, different choices from within this (wide) range of prices will be appropriate.

Above we have talked about offsetting, but the principles apply to the use of an insetting price. If the use of insetting is a valid way to achieve a proportion of your target, then the insetting price can form part of the implicit price calculation based on the maximum decarbonisation potential for the scope area that it applies to. This means that the insetting price is usually a sub-set of how an implicit price is calculated.

For example, if insetting is a valid method for reducing and claiming achievement of reductions on scope 3 purchased goods & services, and if purchased goods and services forms 20% of the organisational footprint (e.g. 4,000 tCO_2e), the insetting price used is a valid element of the MACC curve with the X-axis cumulative carbon reduction potential maximum at 4,000tCO_2e. The calculation of implicit price is further explained in the following section.

If the insetting price is of a similar order of magnitude to the implicit price, then it may be appropriate to use the inset price as a representative carbon price.

As with any of these methods of price setting, it is recommended to use a price that relates to that specific scope area. By example, a price for a business travel ICP scheme should relate to costs and risks of business travel i.e. tax risks, costs of changing transport mode. It would not be relevant to use an ICP price for buying new building materials, as that does not represent the costs and risks of business travel.

Material substitution estimates

It is common to think of external benchmarks relating to carbon price in terms of tax levels and internal measures in relation to implicit prices of opportunities or investments. There is also information available externally on implicit prices for key opportunities that bodies such as the EU wish to incentivise.

A 2019 report from the Institute for Sustainable Development and International Relations (IDDRI)[22] looks at the breakeven costs of key technologies relating to material substitution (Figure 14). The breakeven price determines what the price of carbon (in this case from the EU ETS) would need to be in order to make the investment in technology break even. The current (Mar 2024) EU ETS price is €60/tCO_2e (£51.30/tCO_2e). Note that the EU ETS price referenced in the chart is for 2019 not the current EU ETS price.

The implicit price and break-even price aren't directly the same but are closely enough related as to provide a useful benchmark.

[22] https://www.iddri.org/sites/default/files/PDF/Publications/Catalogue%20Iddri/Etude/201910-ST0619-CCfDs_0.pdf

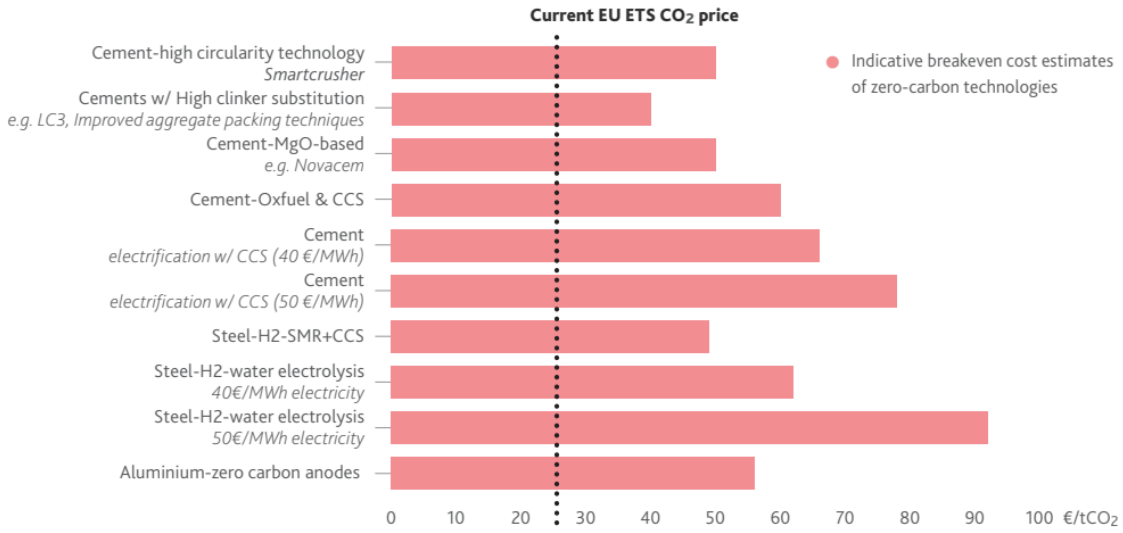


Figure 14 Breakeven cost estimates of very low-carbon cement, primary steel, and primary aluminium technologies.

Implicit price

A price for use in an ICP system can be set in a variety of ways. Even if not used as the basis of setting the price, it is important to understand your implicit price. The implicit price is particular to each organisation and is the price that the organisation has or will be paying for the carbon reductions needed to achieve the decarbonisation target:

$$\frac{Cost\ of\ carbon\ reduction\ measures}{tonnes\ CO2e\ saved}$$

If backward looking, it does not account for how the costs of technologies might increase or decrease and how options such as offsets will increase over time.

The implicit price is helpful, as it tells us the appetite the organisation has for paying for carbon reduction, what they have had to pay so far, and also about the future cost risk of increasing emissions. If a reduction target has been set such as an SBT or net zero target, then a decision to increase emissions will result in a need to invest in carbon reductions at some future point. This is illustrated in Figure 15.

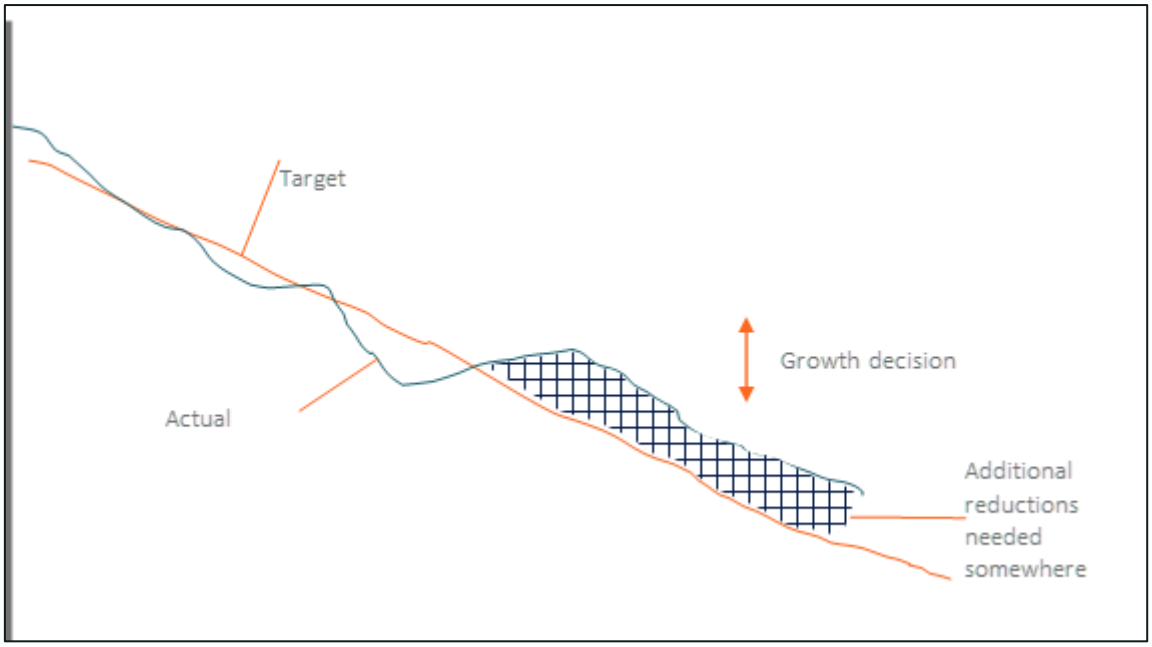


Figure 15 Impact of decision to increase carbon emissions.

The implicit price can also be understood by analysing the break-even price for a range of example projects. The break-even price is the ICP price at which a Net Present Value (NPV) calculation (including ICP impact) is zero. This is the point at which any additional costs (nominally attributed to the carbon saving) are equalled out by the calculated value of the carbon saving. If one of these projects is approved, then the break-even price becomes part of the implicit price. If the break-even cost is too high or there are other reasons why that project is not approved – this informs our understanding of the implicit price. In the following section we look at implicit price for Hull and East Riding.

Calculating the implicit price for Hull

Given the proposed use of Internal Carbon Pricing within the capital approval process, the most relevant and appropriate carbon price is the implicit price for decarbonisation of scope areas included in the capital approval process. By this we mean that if the capital approval process does not include decisions that impact the decarbonisation of a scope area e.g. business travel, then it is not required to include the implicit price data from this area.

The carbon price used in this decision-making process should represent the cost for the specific risks related with that decision process i.e.:

The risk that the footprint increases requiring investment to decarbonize and meet targets.

During the scoping phase, some data was collected on carbon reduction projects to date across Hull CC. The project team is aware that more data is available, but collating it has been a challenge, this in itself points to a need to centralise information regarding carbon reduction.

The data required to calculate the implicit price for a specific project is included in Table 8 below.

Table 8 Data requirements for calculating implicit price

Data	Units	Source	Comments
Capital Cost (Marginal[23])	£	Full Business Case	Key information in current capital process – Total Budget is a requested field, but not broken down as Capex/Opex
Operating Cost (Marginal)	£	Highlight Report	Forecasted spend requested for future years. No specific call out for Opex in Business Case.
Financial savings (Marginal)	£		Not collected as standard
Lifetime of project	years	Project Brief & Full Business Case	Key information in current capital process – milestones, start and end dates requested
Annual carbon savings (Marginal)	tCO_2e	Ad hoc	Not collected as standard

Furthermore, this data needs to be in relation to a Business As Usual or counterfactual case, so if LED streetlights replace existing standard streetlights, the capital cost must be the difference in capital cost (marginal). This is the additional capital cost that is paid to install more efficient versions, not the total capital cost of installing the LED streetlights.

The data shown in Table 8 has been collected for five projects across Hull and East Riding:

- Solar Carport @ East Riding Leisure, Driffield;
- Solar Farm @ South Cliff;
- Heat Network @ Goole;
- HUG phase 1;
- Heat Network for Hull City Centre.

For a further three projects, data was collected but key elements were missing and could not be extrapolated:

- EV charge points;
- Live labs 2 – LED street lights;
- SME carbon reduction grants.

[23] "Marginal" refers to a comparison against a Business As Usual or counterfactual

The resulting implicit prices are shown in

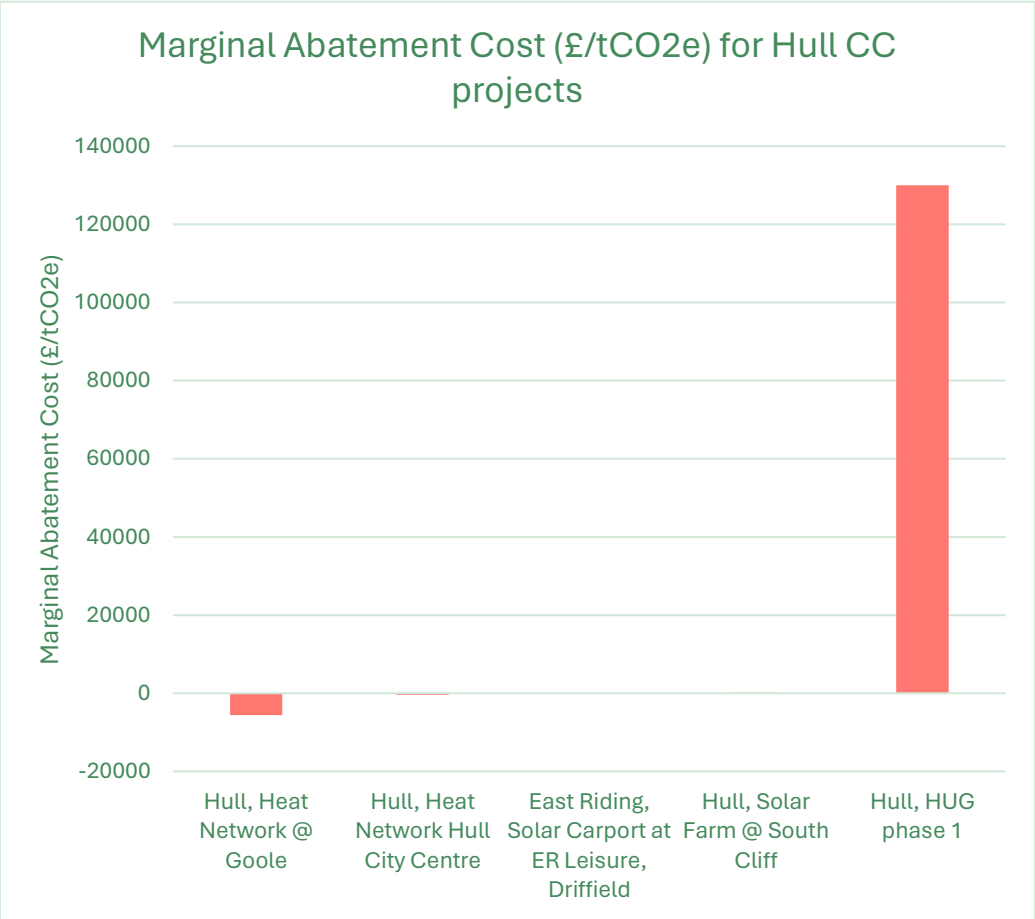


Figure 16. As can be seen, there is quite a wide range of prices, with many providing financial return alongside the decarbonisation benefit (a negative marginal abatement cost) and with an outlier having a carbon price of £130k/tCO_2e. It is likely that the data for the HUG phase 1 project is not the marginal data but absolute, as such this project has either an erroneous carbon price or is an outlier that would not be justified based on carbon price and shouldn't be included in any averaging.

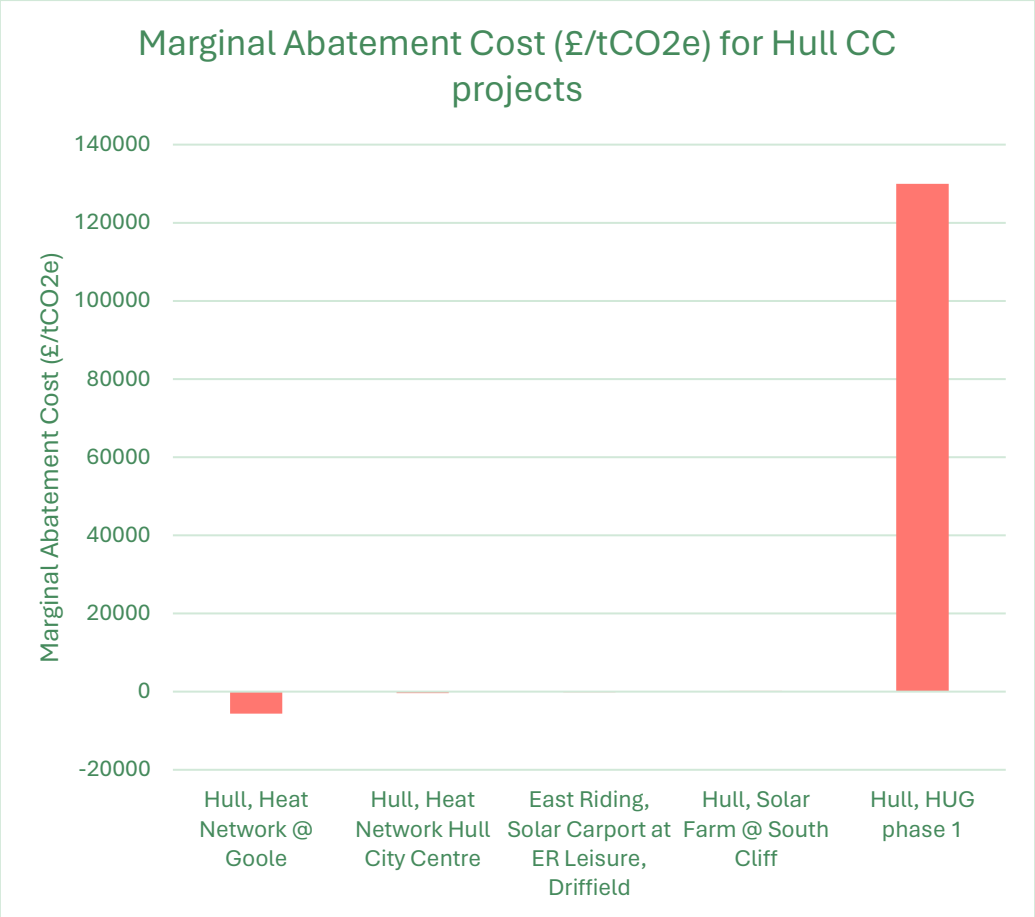


Figure 16 Hull and East Riding only projects and implicit prices

Given the lack of data for implicit price calculation, external benchmark sources have been included, with the intention of continuing to update the implicit price during the pilot stage.

Additional sources are:

- Greater London Authority metric for "Allowable solutions cost for carbon reduction" from London Plan;[24]
- Higher and Further Education study on costs to decarbonise a variety of scope areas[25];
- London School of Economics (LSE) study on carbon price required to decarbonise a variety of scope areas;[26]

In comparing the implicit prices from Figure 17 with Green Book Non-Traded and NGFS prices (Figure 18), we can see that for the lower range of implicit prices (£40 to £307/tCO_2e), that the UK Green Book Non-Traded mid scenario is in an approximate order of magnitude (prices from £241 to £378), but that the NGFS scenarios describe the greater range of carbon prices as seen in the implicit price range;

[24] https://www.london.gov.uk/sites/default/files/gla_carbon_offsetting_guidance_2022.pdf

[25] https://www.eauc.org.uk/file_uploads/20230524_hfe_v4_0_-_cost_of_net_zero_report_1.pdf

[26] https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2019/05/GRI_POLICY-REPORT_How-to-price-carbon-to-reach-net-zero-emissions-in-the-UK.pdf

- NGFS range (based on average): £20/tCO_2e to £1,320/tCO_2e;
- Green Book Traded range (based on net zero strategy alignment): £88/tCO_2e to £134/tCO_2e;
- Implicit price range: £40/tCO_2e to £6,435/tCO_2e.

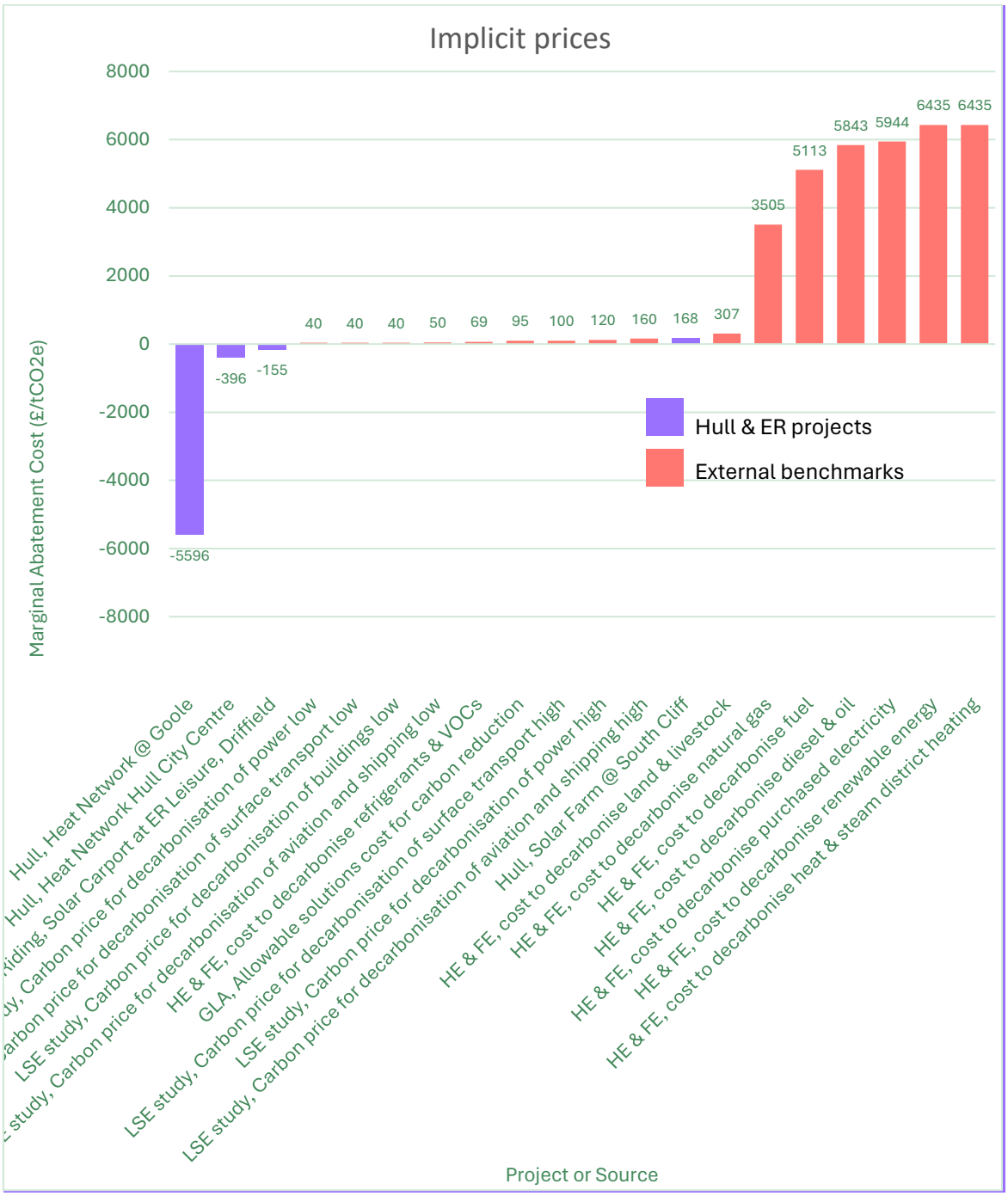


Figure 17 Implicit Prices for Hull & East Riding projects and external benchmarks excluding outlier and null data

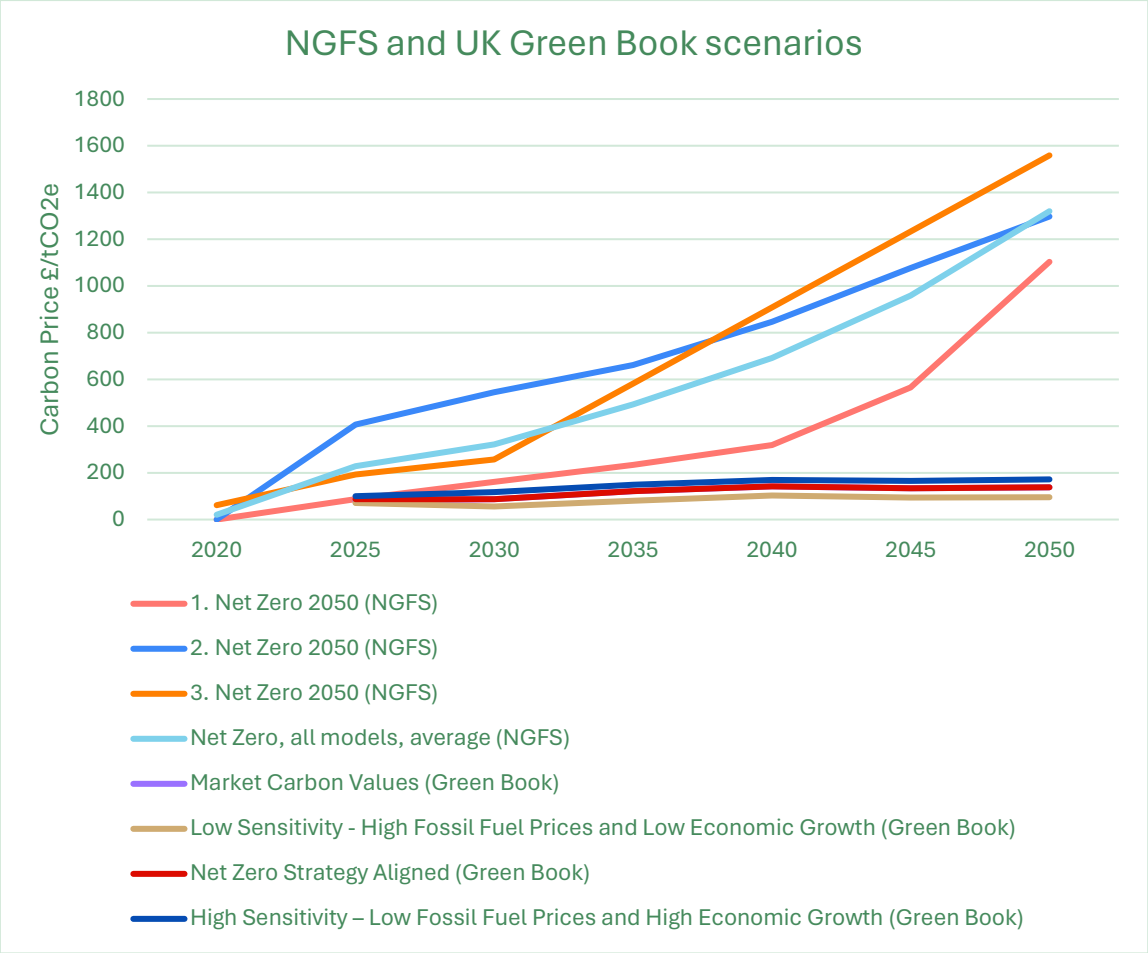


Figure 18 Combined NGFS and UK Green Book carbon price scenarios

How can costs be paid for, and benefits measured

The implementation of an Internal Carbon Price system is likely to result in increased expenditure in the area where it is implemented. It is hoped that the ICP system will provide the justification for approving greener projects where the resultant increase in spend is equal to or less than the cost of reducing carbon emissions by other measures (the implicit price).

This is an important point to emphasize: *the value of the additional spending results in decarbonisation that would otherwise ultimately be more costly to undertake later*.

The difficulty is the impact of risk and differing timescales vs present cost pressures. ICP is promoting better decisions now, to avoid the cost impact of issues that are currently externalities. Those externalities are:

- The cost to decarbonize and meet targets at a later date;
- The risk of penalties and taxes related to carbon regulation;
- The financial impact of climate change on lives and livelihoods in the region.

In parallel to Social Value, it will be important to articulate the value of carbon reductions *qualitatively* to support the carbon price as a *quantitative* representation of the value of carbon reductions.

As was discussed in the stakeholder interviews in Section 4, additional costs will primarily likely come through adjustments in budgets and adjustments of timescales. It must be noted that those increases in spending now, are avoiding the risk of greater spending later.

Recommendations for pricing model

In the absence of more complete data on implicit pricing, it can be useful to begin with a set of external benchmark carbon price data that is in rough alignment with the usage and potential implicit prices. The ICP system should be set up in a way such that data gathered in the ICP process feeds back into the governance of the system and the updating of the price.

For example, an initial price can be based on the UK Green Book Non-Traded carbon price, e.g. £260/tCO_2e for 2025 (higher prices for longer term projects can be used in line with projections). The low, medium and high prices can be incorporated into the process to give a range of risk considerations.

For 2025 the UK Green Book Non-Traded prices are:

- £130/tCO_2e - low
- £260/tCO_2e - medium
- £390/tCO_2e - high

A project brought forward into the Capital Approval process includes a comparison with a Business As Usual (BAU) option and has quantified an additional cost and a resultant carbon saving [CARBON] (e.g. a higher specification build on proposal for new build offices) and a resultant additional cost [COST]. See appendix 3 for more information on BAU.

The process should capture data on:

- Marginal cost for the proposed project [COST];
- Marginal carbon savings for the proposed project [CARBON];
- Whether the proposed project was approved;

The COST & CARBON data can be used to calculate the implicit price:

$$\frac{COST}{CARBON} = \text{implicit carbon price for the project}$$

And combined with information on the decision, this price can be built into a Marginal Abatement Cost Curve (MACC) which tells Hull how they have been funding decarbonisation decisions within the capital approval process to date.

Ultimately, the MACC can be the basis for a bespoke carbon price for Hull by taking the maximum price from the MACC required to meet targets. This should also be a means of measuring the benefit of the ICP system so that data can be tracked on what has been approved.

6 Final recommendations & plan for implementation/pilot

Overview of updates to capital approval process

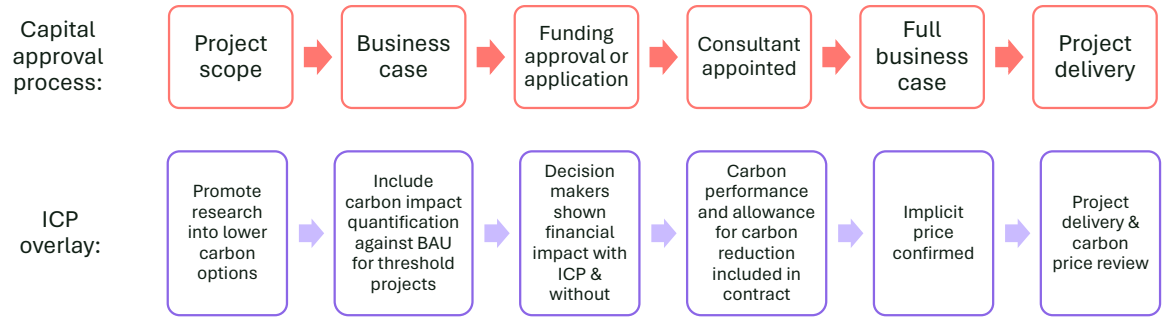
The key details of a proposed Internal Carbon Pricing scheme for an initial pilot at Hull are outlined in Table 9 below. Further narrative detail is provided in this section, concluding with a proposed set of specific actions that would be required for the pilot and then for full implementation.

Table 9 Key elements of proposed ICP methodology

Consideration	Response	Comments
Type of ICP	Shadow	
Area of application	Capital Approval Process	
Boundary	Scope 1, 2, & 3 as relevant to Net Zero target set.	As a key driver is achievement of targets, the boundary of what is included in the carbon quantification (and therefor having a price applied to it) should relate to the decarbonisation target set. In this case, the project is focussed on the authorities' own emissions as shown in Figure 3. This boundary should be tested during the pilot.
Purpose	Incentivize consideration of lower carbon options in capital approval	
Carbon Price to be used	Low £130/tCO_2e Med £260/tCO_2e High £390/tCO_2e	Whilst the Green Book traded carbon prices are lower and perhaps perceived as an acceptable starting point, the non-traded prices better align to the social cost of carbon. A higher initial starting point will enable greater comparison between capital project options when under trial in the pilot.
Carbon Price basis	Green book Non-Traded initially, changing to Implicit price as data improves	Insufficient information has been available to calculate an implicit price, but this can be built into the process and reviewed in the pilot. A starting price is required which can be based on published Green Book Non-Traded values.
Governance & ownership of methodology	Owned by Finance, and carbon quantification and support resources managed by a dedicated team	As in the Social Value model. Finance are inherently critical to the approval process and have several relevant transferable skills.
Tool & documentation requirements	Carbon quantification	ADEPT CCAS tool or Sustainability Impact tool / appraisal, or other suitable tool. A simplified version of the UK Green Book process for GHG calculation and valuation is suggested.

Communication & education requirements	Central carbon literacy with ICP ICP process guidance document	ICP can be a bolt-on to existing carbon literacy training. ICP process could be a PMO style mini guide.

The capital approval process is shown in Figure 19 below. This is an approximation of the process as provided by Hull. In practice, the process is more enmeshed with other formal and informal processes. The proposed ICP process is overlain on the capital approval process, in terms of what additions or modifications will need to be included. Figure 19 continues by highlighting the required additional data for each stage, and the output that would be created via the additional ICP element. The final row summarizes the implications of these changes in terms of actions and changes required.



Data	(Technology) feasibility studies. Best practice prompters	Activity data on project & BAU. Emission factors – DEFRA £/tCO_2e carbon price	Marginal tCO_2e Marginal cost £ with and without ICP carbon cost (based on £/tCO_2e)	Predicted tCO_2e over lifetime. Contract costings and budget. Relevant carbon price.	Updated marginal tCO_2e finalised. Updated marginal cost £ finalised.	Updated marginal tCO_2e delivered. Updated marginal cost £ delivered.
Output	BAU, proposed project + X other comparators	tCO_2e impact of project vs tCO_2e impact of BAU. Financial impact of carbon calculated.	NPV or IRR calculation with & without ICP. Draft economic model.	Impact on contract value from ICP. Contract agreement that incentivises carbon reduction.	Implicit price for project finalised. Full economic model incl. carbon. Centralised MACC updated	Implicit price for project delivered. Centralised MACC updated
Implications / actions required	Guidance and support. Pointers to best practice.	Support in carbon quantification, factors & guidance. £/tCO_2e carbon price calculated and communicated.	Decision maker guidance. IRR threshold adjustment if technology pays back in lifetime	Guidance on contracting with ICP. Consideration of incentives for good carbon performance.	Method for feeding back implicit price into governance of ICP system	Monitoring process for carbon impact. Method for feeding back implicit price into governance of ICP system.

Figure 19 Updates to the capital approval programme and implications

Discussion of details of the proposed scheme

Boundary of calculation for carbon/carbon price, to include scope 1&2, plus currently calculated scope 3 areas.

As a key driver is achievement of targets, the boundary of what is included in the carbon quantification (and therefor having a price applied to it) should relate to the decarbonisation target set. In this case, the project is focussed on the authorities' own emissions currently calculated in the annual footprint as demonstrated in Figure 3. For Hull these include:

- Scope 1&2 direct fuel use and electricity
- Staff travel
- Staff working from home
- Waste
- Water
- Outsourced – (Capital goods)
- Material use – (Purchased Goods & Services)

The rationale for this, is that the intent is to use ICP to focus decisions on achievement of the Net Zero target, so where an element is quantified in terms of its carbon impact, but doesn't relate to the target it can result in confusion. For example, if the benefit of a project that is reducing domestic household emissions is quantified in terms of carbon reduction, care must be taken not to attribute that reduction to achievement of the authorities' target for its internal emissions (where domestic household emissions do not feature in the footprint).

As the project develops, the boundary can be expanded to include emissions associated with wider targets including Biodiversity Net Gain, and wider area emissions, but for the initial pilot and implementation the focus should be on quantifying impacts that directly related to the authority internal Net Zero target.

The final two items on the list (outsourced, and material use) are potentially not fully quantified currently in the footprint. In the pilot, the inclusion of these scope items will be reviewed to understand the potential to quantify and the impacts on target achievement.

Use of Green Book Non-Traded prices initially, changing to implicit price as data improves

As discussed in section 5, the recommended process is to begin by using UK Green Book Non-Traded prices until data can be gathered on implicit prices from specific projects being approved (and also not approved). During the pilot further information on implicit prices can be collected which may result in being able to start implementation with a specific implicit price-based carbon price.

Overall ownership of the ICP process by Finance

Internal Carbon Pricing is a bringing together of carbon considerations into a financial framework, as such it has a natural home either with the sustainability/carbon function or with Finance. Ownership by Finance is preferred in most cases as this has a beneficial impact on spreading awareness of carbon and decarbonisation requirements. It is also more likely to result in carbon considerations becoming embedded within day-to-day functioning of the organisation.

Previous similar initiatives in East Riding were instigated with and by Scrutiny and could be considered as an alternative owner of the ICP process. But it was felt that Scrutiny officers may

not have the capacity or knowledge to apply it and that in Hull, the influence on decisions is small due to timing of interventions. It was agreed that providing Scrutiny with the knowledge of an ICP model is important so that when they receive wider service updates, they can challenge the approaches taken by services.

Beyond ownership, it is important to consider wider stakeholder engagement to identify who else needs to be informed and consulted. For example, senior and corporate leadership will likely need to be informed of the pilot but not be involved regularly. Similarly, regular member briefings would gradually increase awareness ahead of fuller implementation.

Ownership of carbon quantification by a dedicated team in a similar model to the "social value engine" approach at East Riding

It is proposed that a small, dedicated team take ownership of carbon quantification primarily for the process used in the Capital Approval process, but the remit could be expanded as the ICP process expands. There are currently areas of the authorities that use and own different parts of the required data, and have expertise in quantification. For example, the energy team on quantification of energy reduction projects, or the sustainability team on GHG reporting and relevant emission factors. However, these teams do not have capacity to become a "help desk" for carbon quantification.

Within East Riding, the application of Social Value was greatly aided by the development of the "Social Value Engine", which was then owned by a team. When stakeholders required an estimation of Social Value, they could contact the team, who would then undertake the calculation, or support the user in making the estimation. Tools, guidance, and documentation can be owned and updated by this team and users know where to go to get help. A similar model makes sense for ICP quantification.

Within the proposed ICP system, the owner of a project that is going through capital approval must quantify the carbon impact of the project. This is a step change in process from what most users are used to and has the potential to seem overwhelming and outside of the user's area of understanding. Most carbon quantification can be based on the collection of user data that is likely to be more familiar to the users. For example, identification of a change in vehicle mileage rather than identification of the carbon impact of relocation of a depot. So, in this way, having a dedicated support team can scaffold the carbon quantification process, breaking it down into clarification of required input data, and explanation of outputs.

It was felt that this model may be more appropriate for East Riding (where the Social Value model originates from), but Hull are likely to struggle to identify the necessary funding and resources. It was also felt that having a central hub dealing with carbon quantification from wider uses of ICP might be more problematic as it may be different owners are required depending upon whether ICP is being used in procurement or in the project/ business development process.

Supporting education

Carbon quantification tool users will need a different set of skills than decision makers. However, all affected stakeholders will need a common understanding of carbon and why it is being incorporated. This can range between formal or informal education that is either centralized or in self-led informative documents. Communicating and educating on change builds a body of knowledge that can then be maintained over time. Regardless of process ownership, there is a specific need to educate members and tool users, that overcomes the

rotating and sometimes short-term nature of roles. It may be possible to repeat practices from introducing other initiatives and apply lessons learned.

There are two elements of the recommended education: central carbon literacy and specific carbon quantification. The central carbon training would be most relevant to the scrutiny team, finance team and elected member decision makers, with further benefits when delivered to the PMO and project leads. Understanding that carbon literacy training trials have been positively received, an add-on covering ICP would likely be a successful way to enhance the course. The Learning and Development team would be an option for hosting the training resources. Virtual self-led training minimizes effort in the creation and allows for wider participation. The ADEPT carbon tool is currently supported by training from the CIHT, though Anthesis has not seen the resources available. For the pilot, fewer people would need carbon quantification training for the ADEPT tool but over time, training can be rolled out by function or project.

Communicating the value of carbon

An important element of ICP is articulating the value of carbon reductions in a way that resonates with members and the public; they should understand what the price per tCO_2e is paying for. Although not as accurate, the public may find it easier to equate to funding raised for solar panels, or carbon savings to trees planted. Key to note, members and the public will look for monetary savings in one area as a way to fund reinvestment in others. The pilot is a good time to experiment with impactful and meaningful comparisons that will resonate with members and public.

A key point that was highlighted several times in the stakeholder interviews was the need to articulate the value of carbon reduction in simple terms. It can be thought of as a process of asking “Why?” until an answer is reached that resonates. An example is shown in Figure 20. The top explanations are unlikely to resonate or mean much to those outside of the sustainability sphere, but going the further down the hierarchy uncovers reasonings that have wider meaning. The pilot stage should engage with a communications team to develop suitable wording and language.

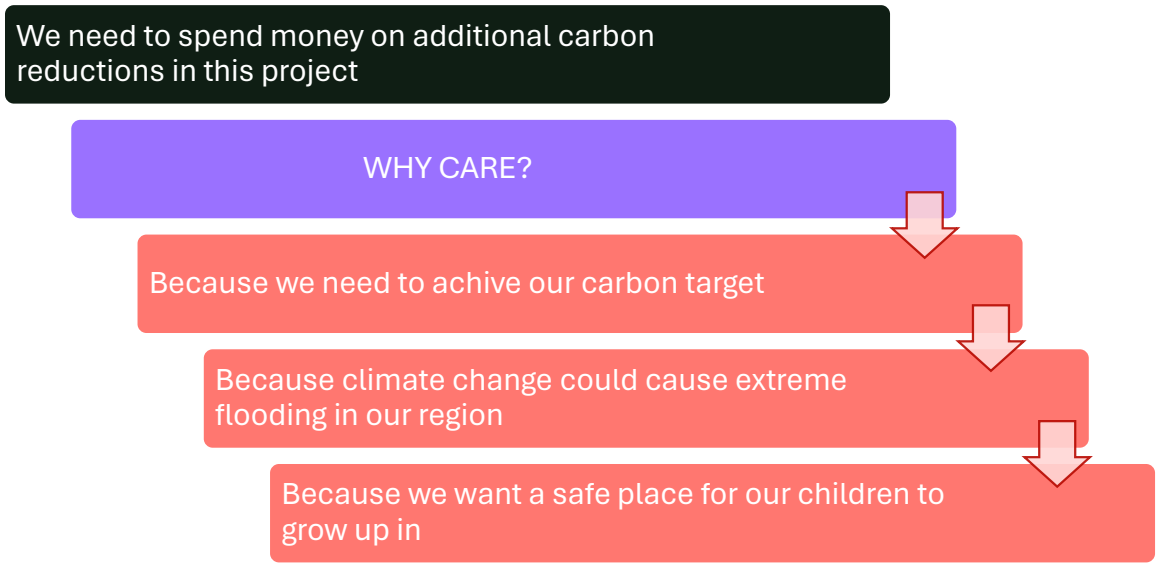


Figure 20 Example of hierarchy of reasoning for carbon reductions

Communication of changes

It is important to communicate any change in process and provide guidance on any new tools, to all affected stakeholders. However, the pilot will start with some project scoping. Communication at this informal and progressive phase is likely twofold, introducing the approach and why/how it should be used, with subsequent guidance on how to apply it. In an ideal scenario, the authority would combine the introduction of changes with an appraisal of the wider existing sustainability and climate impact tools.

Tool & documentation

In order for Internal Carbon Pricing to function within Hull CC, several key updates are required to tools & documentation:

- PMO: Update documentation to incorporate ICP and be a repository of ICP related data;
- Creation / adoption of a tool that can support the necessary carbon quantification.

PMO documents and documentation

The Project Management Office (PMO) at Hull CC is a more recent team who over the last ~18 months have been consolidating how all aspects of Hull CC projects run, aiming for improved consistency and efficiency. The PMO has documented several processes and templates, aligned to PRINCE2 practices; the PMO acting as the centre of excellence and source of consolidated project statues. Within the PMO document suite, PMO is currently the repository for key documents related to the capital approval process. Following a discussion with the PMO, it is clear that several existing documents can be updated to include reference and data capture related to ICP. A non-exhaustive list of these documents is below, proposing that a more detailed review of all relevant PMO documentation can be undertaken in the Pilot phase.

Table 10 PMO documentation and updates

Name	Format	What is it	Updates required
Highlight Report	Excel spreadsheet	An excel from the PMO to project owners / PMs. The spreadsheet captures key data which is then centralized into the "Master Summary".	Addition of columns: Marginal carbon saving/increase (tCO_2e) Marginal capital cost, for carbon saving (£) Marginal operating cost/benefit (£) Lifetime of project (years) Implicit price (£/tCO_2e) Outcome decision
Master Summary	Excel spreadsheet	Centralized capture of data from project highlight reports. Fully updated every quarter.	Addition of columns: Marginal carbon saving (tCO_2e) Marginal capital cost, for carbon saving (£) Marginal operating cost/benefit (£) Lifetime of project (years) Implicit price (£/tCO_2e) Outcome decision
Mini guides		General introduction into a topic.	Creation of an ICP mini-guide

Carbon quantification support / tool

Within the capital approval process, there will be a need to estimate the marginal carbon impact of investments. Typically, this requires a tool to support estimation. The tool should have

appropriate carbon emission factors and be able to quantify a variety of categories of carbon impact from activity data such as:

- Carbon Impact of changes in electricity and gas use from kWh estimates;
- Carbon impact of changes in transport from fuel use or milage and vehicle type data;
- Carbon impact of changes in waste from waste quantity data;
- Carbon impact of changes in purchased goods & services from spend data or specific item factors e.g. land use change.

As discussed in Section 4, the ADEPT CCAS tool provides one option for carbon quantification; it was presented as scalable to a variety of carbon quantification requirements. It is pre-existing and has supporting educational material. However, the tool should be explored more fully, then compared to existing tools that Hull and East Riding are already familiar with, such as the sustainability impact appraisal tool and review process. Other options may be available should the ADEPT tool not be suitable. Other potential options are shown in Table 11. The pilot can oversee a comparison between the tools and facilitate a discussion about the most suitable way forward.

Table 11 Potential Quantification Tool options

Name	Format / Link to Access	Published by	Scope	Comments
A**DEPT CCAS tool**	Intended to be Excel[27]	Future Highways Research Group	Scope 1, 2, & 3 related to construction and maintenance of highways including office functions.	We understand that the tool and supporting guidance, is intended to be accessible to local authorities freely, without commercial barriers. The tool itself is flexible; it can be scaled up or down and can be transferred and used for other carbon quantification exercises. The tool is popular for carbon baselining and could easily adapted to other sectors and projects. Currently in development, cost unconfirmed.
Environment Agency Carbon Calculator for Construction (ERIC)	Excel[28]	Environment Agency	Embodied Carbon (scope 3) for construction	The tool can be used to assess and compare the sustainability performance of different design and management choices. Particularly at the options appraisal stage. It helps highlight where you can make big carbon savings on specific construction projects. It can also be used to help calculate your organisation's

				overall carbon footprint from construction and identify ways of reducing it. Access by contacting Carbonplanningtool@environment-agency.gov.uk. Free
The Highways Agency Carbon Calculator for Construction	Excel[29]	National Highways	Maintenance, construction and operational activities (office and travel) associated with Highways Agency	This tool helps National Highways collect and calculate the emissions from their business and supply chain. The methodology for carbon measurement behind this tool is available and so if not used "as is", authorities might find the Highways' approach useful for developing their own tool and methodology. Free.
BRE IMPACT Compliant Tools: **eTool** & One Click LCA	Website [30] Website [31]	The Building Research Establishment (BRE)	Operational and embodied carbon emissions with whole-of-life environmental impact assessments	The Building Research Establishment (BRE) published an embodied carbon database called IMPACT. IMPACT is a database of emissions factors instead of an embodied carbon tool. eTool and One Click LCA are software packages that are IMPACT compliant. eTool is a web-based life cycle assessment (LCA) tool for buildings. It is one of the few BRE IMPACT compliant tools available. One Click is an online LCA tool for buildings or infrastructure projects. Require subscription but can be free or low cost.

Discussions highlighted a request for recognized standards and qualifications of sustainability professionals to help with finding the right additional support. There are no specific qualifications relating to carbon qualification, but a thorough knowledge of standards such as the GHG Protocol is recommended.

It is also suggested that a simplified version of the UK Green Book approach to GHG valuation is used. The Green Book guidance as a whole is complex and intimidating, but the guidance relating to quantification of carbon is relatively straightforward and can be simplified further without losing the essence of what is required by the Green Book guidance. Occasionally the council are engaged in larger scale projects that require following of the full Green Book guidance. There is no mandate to follow this in the capital approval process, however having an

aligned quantification process makes sense in terms of dealing with any larger projects that cross over into the capital approval process and also help with users' familiarity.

The full guidance on GHG Valuation can be found online[32] with other Green Book guidance. The diagram below gives a summary straight from the guidance document.

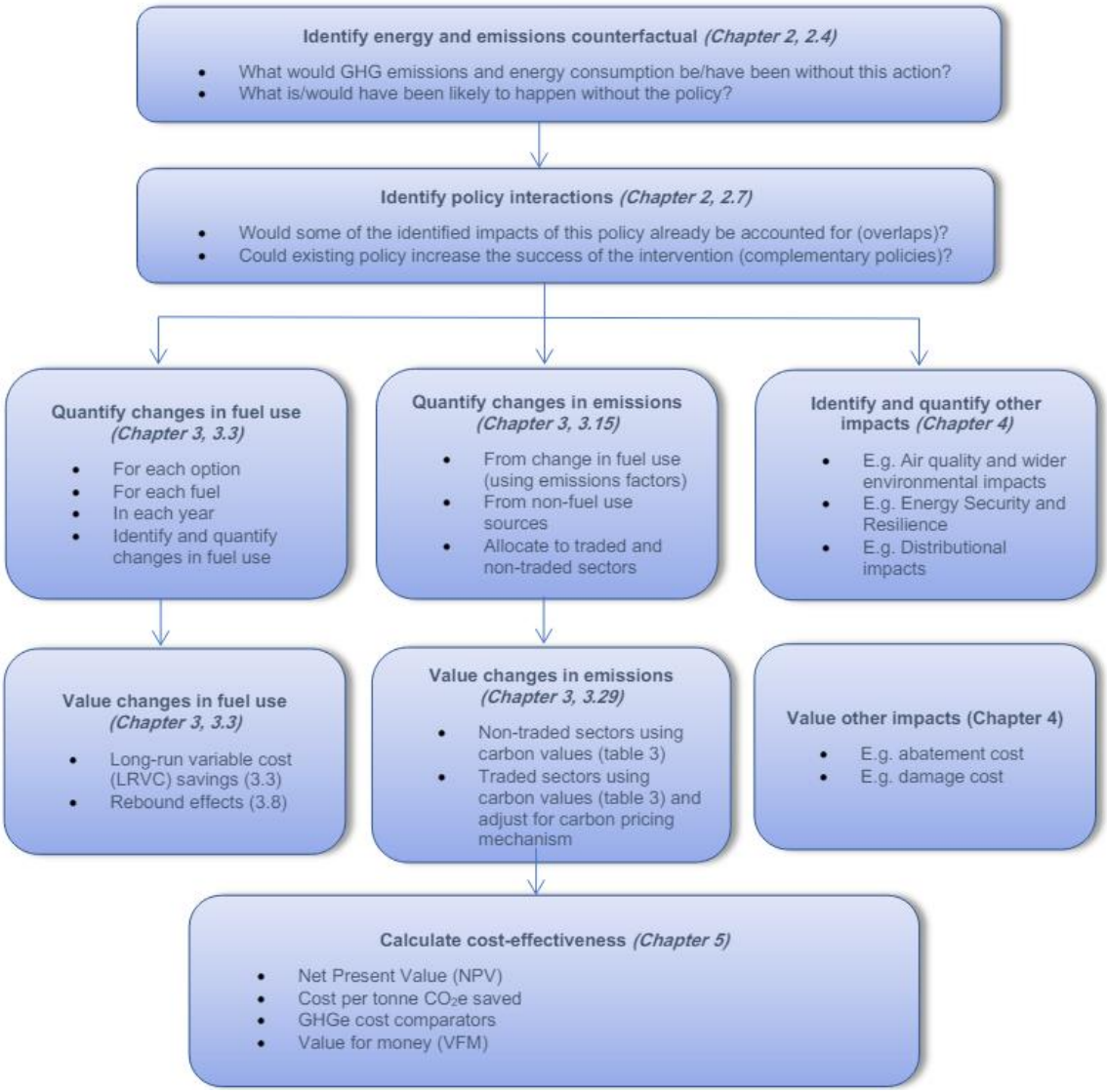


Figure 21 Diagram from UK Green Book guidance on GHG valuation outlining process. Source: "Valuation of energy use and greenhouse gas emissions for appraisal" UK Government Green Book Guidance.

The suggested simplified version is shown in Table 12.

[32] https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal

Table 12 Suggested carbon quantification and valuation process based on a simplified Green Book process.

Step		Relation to Green Book Guidance[27] and Figure 21
1	Identify counterfactual (BAU): what would GHG emissions and energy consumption be without this proposed project/action?	As per "Identify energy and emissions counterfactual (Chapter 2, 2.4)"
2	Are these GHG emissions or savings accounted for elsewhere?	Aligned with "Identify policy interactions (Chapter 2, 2.7)" but simplified to just focus on LA own accounting for GHG reductions rather than wider policy.
3	What are the changes in fuel use (scopes 1 & 2) for both BAU and proposed project.	As per "Quantify changes in fuel use (Chapter 3, 3.3)"
4	Quantify carbon emissions from the changes in fuel use identified above (in step 3), and also from scope 3 emissions. Quantify for both BAU and proposed project.	Aligned with "Quantify changes in emissions (Chapter 3, 3.15)" but just using the Non-traded carbon values, not separating out scope areas.
6	Quantify financial impact of changes in fuel use (from step 3).	As per "Value changes in fuel use (Chapter 3, 3.3)"
7	Use the carbon price to quantify the financial impact of the difference in carbon emissions (from 4) between the BAU and proposed project, so if the proposed project has lower carbon emissions, the difference in carbon emissions multiplied by the carbon price is the £ value saved going for the proposed project.	As per "Value changes in emissions (Chapter 3, 3.29)"
8	Incorporate the £ value calculated based on carbon emissions difference and carbon price into the financial valuation of the consideration of BAU vs he proposed project, e.g. NPV.	As per "Calculate cost effectiveness (Chapter 5)". Using whichever method is relevant e.g. NPV. Not using all methods.

This approach aligns with the UK Green Book guidance on valuing energy and GHG emissions. It doesn't require separating out impacts that are in the traded and non-traded sector and it doesn't include valuing other impacts, but otherwise this is the same process. The key element to retain between both the UK Green Book approach and a simplified version is the consideration of a counterfactual/BAU and the use of a carbon price to value the financial impact of the difference in carbon emissions between BAU and the proposed project.

How ICP for the capital budget could influence the revenue budget

ICP will be piloted with the capital budget first, but capital and revenue are intertwined. It is important to evaluate the influence and impact, so that the pilot focuses as broadly or as narrowly as is appropriate. As context, capital generally covers new projects, whereas revenue covers more of the repeating activities with fairly established practices. It must also be

considered that the revenue budget may cover a great proportion of scope 3 elements that are not currently accounted for in the council GHG footprint or target (as discussed in section 1 regarding Purchase Goods & Services). This provides a challenge in terms of carbon quantification; if Purchased Goods & Services hasn't been tackled for the purpose of the GHG baseline, it is more difficult to introduce carbon quantification into the related processes.

Generally, there is consensus that applying ICP to the revenue budget could cause more challenge initially and has some finer points to work through beforehand. For example, applying ICP to revenue may require a carbon budget per service or function, with a carbon price used for amounts above this threshold or to drive reduction where the service or function has the capability. With this example, the council could be responsible for setting a carbon budget for each area, but at present, there is not a set of supporting data for a carbon price. There would be uncertainty if the capital budget carbon price would also suit the revenue budget, which would need to be investigated and tested. As with the current proposal, it is possible to set a base price which is then tested against decisions made and to develop an implicit price going forward. From a change management and people-oriented perspective, ICP for revenue would need more sensitive communication and management to secure greater stakeholder support and promote the right practices. Revenue is an ideal candidate for a future extension of the pilot process, where learnings from the capital budget can be applied.

Recommended actions

Actions required for Pilot

Action	Timeframe	Responsible function
Engage finance function regarding potential ownership of pilot and ICP function longer term.	Prior to pilot	Working group
Engage learning & development team to participate in pilot.	Prior to pilot	Working group
Access ADEPT, Environment Agency, or other tool to be tested as the carbon quantification tool for pilot (to be used by pilot and Anthesis team, not by PMs leading capital projects through approval process).	Prior to pilot	Working group
Identify suitable projects to engage with during pilot. Projects should be going through the early stages of capital approval over the duration of the pilot, represent varied project types, and be willing to participate (provide activity data, be interviewed).	Start of pilot	Working group
Create draft guidance for quantification of projects (as part of Pilot). E.g. simplified version of Green Book	Start of pilot	Anthesis
Create guidance and training material for decision makers in capital approval process (as part of Pilot)	During pilot	Anthesis

Actions required for full implementation

Action	Timeframe	Responsible function
Investigate possibility of setting up a dedicated central function for ICP quantification (and documentation/tools).	During pilot	Potentially finance, supported by sustainability

Clarify definition of "Capital Project". **Review** and agree boundary of what is calculated in terms of relevant scopes and carbon impact. Clarify inclusion of Biodiversity Net Gain projects.	During pilot	Central ICP function team or ICP project owner.
Engage with ADEPT tool team, or other tool owner (including considering bespoke created) to onboard Hull CC with the use of the tool for carbon quantification within Hull CC.	For pilot	Central ICP function team or ICP project owner.
Update PMO narrative & explanatory documentation relating to capital approval process.	During pilot or following	PMO
Update specific documents Highlight report and master summary to allow implicit price data to be fed back into ICP process.	During pilot or following	PMO
Create data collection function and monitoring to review implicit price updates and impact of price on decisions for use in governance process and updates to the stated and used implicit price.	Specified during pilot	Central ICP function team or ICP project owner. TBC.
Create guidance and training material (explanation of process, thresholds, implications of decisions) for decision makers in capital approval process, based on pilot.	Following pilot	Learning & development + ICP project owner.
Engage with suppliers to educate and communicate importance of carbon reduction. Open dialogue on how suppliers can improve data required for quantification of carbon impacts, and provide quantified carbon impact data themselves.	Medium term post pilot	TBC

Recommended process for a Local Authority wanting to consider Internal Carbon Pricing.

Applying ICP

The process recommended for identifying how and where to apply ICP is as follows:

1. Determine drivers and boundary for the project;

For example, are the drivers related to achieving decarbonisation targets, creating of a fund, awareness raising, etc? Is the intention to tackle the Local Authority's own emissions or wider area emissions? Some drivers can link readily to particular uses of Internal Carbon Pricing or be more aligned with one or other of the 2 main carbon pricing models, as shown in Table 13. It is important to avoid making a final decision until further investigation is undertaken.

Table 13 Drivers and potential ICP models

Drivers	Shadow Price	Carbon Tax	Commentary
Management of future carbon risk	✓✓✓	✓	Higher (accurate) shadow price can reflect longer term risks
Management of specific tax risk/regulation	✓✓	✓✓✓	Taxes are generally lower than the level required to be impactful as a shadow price

Achievement of net zero	✓✓✓	✓✓	Shadow price more suited to strategic decision making, but both can be used
Awareness raising	✓✓	✓✓✓	The higher shadow price is a useful communication tool. If applied to departments and communicated well, carbon tax can be particularly effective
Collecting funds for decarbonisation		✓✓✓	Shadow price use does not generate a fund
Reputational risk	✓✓✓	✓	Typically, Carbon Fee systems use lower prices, lower than current cost of carbon e.g., UK ETS, also take care if carbon tax is based on cheap offsets – reputational risk.
Tackling problem areas of GHG footprint	✓✓✓	✓✓	Either can be tailored to specific requirements, but shadow is more flexible
Costing the impact of choices that result in growth of CO2e footprint	✓✓✓	✓	Using carbon tax may make absorbing cost of those choices into budgets prohibitive.

In determining the boundaries of the project, consider which targets might be key drivers. Targets are set based on a baseline with a specific boundary, so it is important to sense check that the boundary in the relevant target footprint relates to the boundary included in the project as it develops. **Try to avoid including quantification of projects and impacts that fall outside the boundary of the relevant target**. If there is a driver to include these projects and impacts, see it as a prompter to reconsider what the drivers and targets are.

2. In deciding if ICP is a suitable tool, we want to consider:
    - Are there decarbonisation targets in place or identified transition risks?;
    - General willingness and interest in ICP;
    - Data availability;
    - Are assets and scopes within organisational control?
    - Do any competing drivers rule it out?
3. Identify largest areas of Greenhouse Gas (GHG) footprint and areas of footprint that are hard to decarbonise, consider data quality;

This should come directly from a review of the calculated GHG footprint that relates to the chosen boundary. Where a scope area is currently not calculated (e.g. the scope 3 area of Purchased Goods & Services) application of Internal Carbon Pricing to that area may need to wait until progress has been made on data for that area due to the difficulty that would be involved in quantifying carbon impact. See section 2 for further commentary on this element.

It is also worth considering if a wider high-level use of ICP is appropriate. This might be the application of a carbon tax to department budgets based on their contribution to the carbon footprint. If a carbon tax system were to be applied, it would be based on a breakdown of

emissions data across relevant departments, so it is important to check whether the structure of the GHG footprint calculation supports this. Is it possible to break down the current footprint data in a way that apportions responsibility for GHG emissions to different parts of the organisation?

4. Identify the decision-making processes within the organisation that have the greatest impact on the carbon emissions of those areas of the footprint;

For the Hull CC pilot, the requirements are to use ICP to tackle target achievement for the council own emissions, with building energy use and fleet being the biggest areas that needed to be decarbonised. The key considerations in this decision are shown in Table 14 below. A similar process and table can be used to list decision making processes. More detailed decision mapping can also be undertaken.

Table 14 Example of table used to identify an appropriate decision process

Decision process	Impact on council buildings/fleet & own target	Primarily wider area (WA) /Council Own (CO)
Procurement	Vehicles, fittings & energy use	CO
Capital Program	Building design, Vehicle purchase	CO
Service redesign or development	Fleet impact, increased or decreased building requirement	WA
Partnership relations	Potentially minor, certainly variable.	WA
Induction programme& education	Users of fleet & buildings	CO / WA
Operational decisions e.g. how often to collect bins	Fleet impact, increased or decreased building requirement	WA / CO

See section 2 for more on this aspect.

5. Engage with stakeholders to understand how those processes currently influence sustainability and decarbonisation decisions. Ensure potential users of ICP are included, along with process owners, Finance, Sustainability, and comms teams. Discuss drivers for decarbonisation, culture, and priorities;

In the Hull example, the decision processes shown in step 3 were discussed with stakeholders, leading to the outcome that ICP's use in the Capital Programme would be preferable. Procurement was considered, but greater enthusiasm from representatives of the capital programme made it a more obvious choice. A similar method and table (Table 14) can be used along with judgement based on discussions with stakeholders.

Aspects of culture should be considered, how are departments likely to react to a punitive use of carbon pricing (i.e. a carbon tax)? Does this align with our drivers and the culture we want to maintain?

6. Factoring outcomes of points 1-4, decide on a decision process where ICP could be applied and an ICP model (shadow price or carbon tax);

The outcome of steps 1-4 points to the use of ICP in either a particular decision process or across the organisation at high-level. Key points to consider in selection of where to apply ICP include:

- Which are the largest scope areas of the footprint?
- Which are the decision processes related to material footprint scopes?

- Are there decision processes where there are potential conflicts between financial and sustainability priorities?
- Access to data for specific scopes and decision processes;
- Alignment of the decision process with drivers (i.e. are the drivers related to targets, tax, reputation etc.?)
- Identifying willing users of the proposed system.

Using a shadow price model means that the financial impact related to carbon is calculated and presented typically to influence a decision. That decision is likely to result in additional money being spent or invested than would have without ICP, but the shadow price in itself is just for information and does not result in movement of any money in budgets. Use of a carbon tax model means that the financial impact related to carbon is calculated and then the resultant £ are moved from one budget to another within the organisation. Both models can be considered in a wide range of uses, for example:

- A tax or shadow price can be used with a decision process,
- a shadow price can be used in a collaborative way with external stakeholders,
- a tax can be used in various internal transactions.
- Extra care should be taken if applying a tax to an external stakeholder (e.g. supplier or resident) to ensure that legal and cultural difficulties are not encountered.

When thinking about whether a shadow price model or carbon tax model is most appropriate, consider:

- What are the drivers for decarbonisation?
- Cultural aspects and impact of punitive or collaborative dynamics;
- Decision process or scope (e.g. waste or travel tend to tax, others to shadow);
- Is there a link to insetting? (e.g. tax may be more suited).
- Consider options and discuss with stakeholders. See section 3 for further detail.

7 . Spend additional time investigating the chosen process to understand the people, systems, existing tools, and data.

With a potential model outlined for how ICP might be applied to the organisation it is important to take time to talk in more detail to stakeholders. In particular talk to the people who are most likely to be affected by the use of ICP as proposed including process owners, data owners, and process users. It is helpful to draw out the steps in the process that is proposed to be updated with ICP. Consider:

- where do people interact with the processes and how they might be impacted, what support might they need?
- where decisions are made in the process and who makes those decisions, what new information will they need?
- current data inputs and outputs from the process, and how will those data flows will be changed by the use of ICP?
- what documents and tools support the current process, e.g. guidance documents, websites, excel tools or software, how will they need updating or adding to?

Try to speak to people who can tell you more about the aspects listed above to get a clear idea of the actions that would be needed to update the process to incorporate ICP, and also to

understand the issues that might arise, and how to get users and stakeholders on board. See section 4 for more information.

8. To establish a price (£/tCO_2e), first consider where it will be used and what are the relevant carbon costs and risks associated with this scope.

If ICP is applied in business travel for instance, then the price used should relate to the costs associated with decarbonising business travel, and a calculated price related to building energy reduction for example is not relevant. If a price is to be applied across the whole organisation, then an implicit price that represents an average of all costs of decarbonisation across all scope areas could be used. But if there are wide variations in costs of decarbonisation across scope areas (for example decarbonisation of procurement is much higher than business travel or fleet) then consider using a more specific price in particular decisions. An average price may not be helpful in influencing decisions making in high-cost areas of decarbonisation as the *average* price underrepresents the highest costs in this area. It is a question of balancing the ease of having a more universal and easily communicated price vs the accuracy it represents.

Where the requirement is driven by achievement of decarbonisation targets and in particular assessing the cost to decarbonise or meet a target, an MCA based price (implicit price or external benchmark) is most appropriate. Where there is no target, or no known opportunities for decarbonisation, then an SCC based price (from an external benchmark) may be considered.

In a pilot, consider testing how accurate a price needs to be, often just being in a similar order of magnitude is sufficient. So if the costs of decarbonisation across the organisation range from £75/tCO_2e to £190/tCO_2e it may be appropriate to have a single cost that is in the £150-£200/tCO_2e range and for that to be used across the organisation. Whereas a range of £20/tCO_2e to £4,000/tCO_2e can result in adverse effects if £4,000/tCO_2e is used universally or if an average is taken. See section 5 for more information.

9. Calculate the relevant implicit price for decarbonisation of the scope area that is being targeted with ICP using data on cost of decarbonisation for previous projects and external benchmarks. Generating a Marginal Abatement Cost Curve can be helpful in this process.

The implicit price is particular to each organisation and is the price that the organisation has or will be paying for carbon reductions. The calculation for implicit price is:

$$\frac{Cost\ of\ carbon\ reduction\ measures}{tonnes\ CO2e\ saved}$$

The overall implicit price is based on reviewing collected data on project specific implicit prices which can be assembled into a Marginal Abatement Cost Curve (MACC). See section 5 for more information.

10. Consider external carbon prices, comparing the use of MCA based price: calculated implicit price or UK Green Book non-traded price vs SCC.

For a Local Authority, the UK Green Book prices are the most appropriate external benchmark for carbon prices. The choice to use Green Book prices rather than the calculated implicit price might be based on consideration of the following factors:

- The quality of the data available for implicit price calculation;
- The ease of communicating where the price comes from and what it represents;
- The area where the price is being used and whether UK Green Book prices are more relevant to that area;

- Familiarity with UK Green book prices by users and stakeholders.

Where an implicit price can be calculated (i.e. via Mitigation Cost Approach (MCA)) this can be a much more relevant, specific, and robust price than a Social Cost of Carbon (SCC) based price. A SCC based price reflects wider societal costs of the impacts of carbon emissions. There will be uses where this is relevant, for example on some wider area emissions, or where there are no known or appropriate abatement opportunities or technologies, or no set targets. It may be that if the driver is awareness raising, that SCC is particularly meaningful for that audience and should be considered. In the UK, at a government level, the MCA approach is favoured over SCC and MCA forms the basis of the most widely available benchmark (UK Green Book prices). This reduces the likelihood that an SCC approach would be favoured given the need to identify a suitable source of SCC prices.

See section 5 for more information.

11. Test the price on example cases to review what impact the use of a carbon price may have had on the decision.

For this project, testing will be undertaken in the pilot which makes up phase 2. The pilot will take several example projects/decisions, in the case of the Hull pilot those will be business cases that are being considered in the capital approval process. The pilot will involve collection of relevant data, calculation of project specific implicit prices, and discussion with and feedback from the stakeholders associated with those projects to understand any issues, suggestions for improvement, and potential impact on decisions. It is recommended that a similar process be followed and also that the results from phase 2 be reviewed when available.

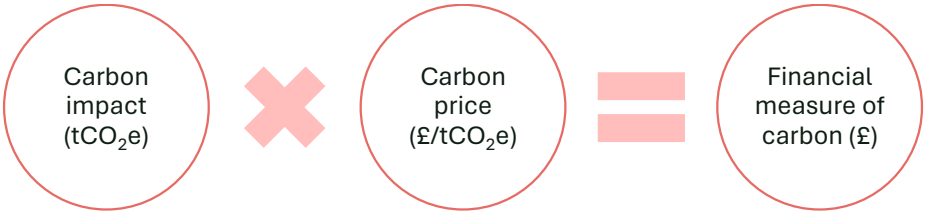
12. Before implementation, consider the supporting materials (guidance documents, training materials, and tools) and talk to communications teams regarding best ways to get staff on board.

A further part of the pilot phase 2 will be development of guidance material and the update of key tools and documentation. It is recommended to include key Local Authority stakeholders who can help in these tasks as early as possible in the process. For Hull, the Project Management Office were engaged who will be able to help with guidance and tool updates. The communications team will also be involved in the pilot. External tools may be available to help with carbon quantification, consider the use of external freely available tools before creating bespoke options. See section 6 for more details.

Appendix 1 – Further information on Internal Carbon Pricing and Insetting

Internal Carbon Pricing

Internal carbon pricing places a financial value on greenhouse gas emissions and recognizes that decisions made in organisations are largely based on financial language and quantitative financial measures.



There is not one universal carbon price. The power of ICP is in working out an organisation's specific cost of carbon. This may include:

- external carbon pricing schemes e.g. trading schemes and taxes;
- external industry and country benchmarks;
- the imperative to meet carbon targets;
- renewable energy prices and certificates;
- implementing carbon reduction initiatives relevant to the sector and geography;
- cost of credits;
- tipping points for behaviour change;
- reputation damage.

Carbon pricing is about understanding carbon risk. Carbon emissions represent impacts that are currently externalities but can and will impact organisations over the next decade and through to 2050. The extent to which will vary by geography and sector.

ICP is used to bring a fuller understanding of the potential financial risks and obligations organisations take on when making decisions and also to more accurately represent the benefits of lower carbon innovation and investments.

There are two main models that are talked about with Internal Carbon Pricing. Sometimes a third is mentioned (Implicit Price), but this is really a useful metric that can be applied as either a carbon tax or shadow price.

Implicit price

The cost of carbon reduction for that organisation

$$\frac{cost\ of\ carbon\ reduction\ measure(s)}{tonnes\ CO2e\ reduced}$$

Can be used on its own for communication and reporting, or as part of either a tax or shadow model.

	Carbon Tax	Shadow Pricing
Practical difference?	Money moves within the organisation	Price is used “for information”
Carbon price?	Price is typically set lower and with acceptability and impacts on behaviour change in mind.	Price typically represents some risk or cost to the organisation. More likely linked to external benchmarks.
Typical uses?	Good for earmarking funds (though no new money is typically generated). Awareness raising & behaviour change	Powerful for decision making Supporting innovation

Appendix 2 – Stakeholder workshop outputs

Review of processes for application of ICP

Hull

- Procurement, carbon needs to be considered: across whole process / carbon output of machinery used / in Need & budget phase / in service specifications and tender responses.
- Lack of control over our supply chain. We may specify environmental criteria in some contracts, but this is not universal. And even when we do specify it, who is there to police it; and how?
- Needs to be considered even before procurement. For example, in capital schemes, I understand an element of carbon cost has been factored into some schemes, but only as regards construction, not whole of life impacts. Risk of stranded assets! EG Lidos, etc?
- Capital programme, carbon needs to be considered: in project scope and business case / in links to wider decarbonisation / whether Project has potential to accelerate decarbonisation, i.e. can use renewable power / “I understand it is considered here, but not on a comprehensive or whole of life basis, so needs further development.”
- Capital is a good place to start. [I think this works on 2 levels. Firstly, this is where we have new construction, which has a visibility factor in terms of articulating environmental impact. Secondly if we’re building a capital asset that should provide 10-, 20-, or 30-years’ service, the plans already need to reflect our targets for the 2030s/40s/50s. Otherwise, we risk a legacy of stranded assets.]
- Service redesign or development, carbon needs to be considered: across all stages, but emphasis on front end and options appraisal / “Needs FULL consideration of air quality impacts, not just carbon” / “Carbon reduction likely to be a 'cross cutting theme’ and not considered in detail in individual service areas design?”
- Partnership relationships, carbon needs to be considered: most stages / Contract management - service reviews?
- Induction programme & education, carbon needs to be considered: subject identified / training programme developed / Mandatory training for net zero / In mandatory corporate procurement training / include all air quality aspects.
- Operational decisions, carbon needs to be considered: assess service standards / requirements.
- The question in mind is whether our resources are better placed on adaptation than reduction? The former needs consideration in the service planning process. Not sure whether we a need a wider process to link the two?

East Riding

- Procurement, carbon needs to be considered across whole process / Within the business case, along with financial considerations / Form part of the framework requirements / We often look at standards to be included within the spec, we often add other requirements, key to discuss at early stages / Stakeholders need t good advice and to build considerations in to their specification / Actual direction or targets required, with none existing currently, the financial case always takes precedent / Early work on service objectives and required specification/outputs/links to council objectives need to be included as early as possible
- Procurement are NOT the advisory group around Carbon or other key considerations within a specification. We are FACILITATORS.

- Procurement is an enabler and facilitator. We need to work closely with the relevant teams internally/externally to support good specification design and good procurement outcomes. We are NOT relevant for providing carbon advice. itself.
- Capital programme, carbon should be considered: across all 6 stages, particularly in the business cases.
- Service redesign or development, carbon should be considered: as part of scoping / in approval.
- Partnership relationships, carbon should be considered: joining & accepting terms of reference / in ongoing operation / depends on the scope & remit of the partnership / ongoing monitoring.
- Induction programme & education: carbon Maybe specific to service area, not relevant for all
- Carbon and climate change is mentioned through our current mandatory environmental training package.
- Operational decisions: Climate and Environment are a required reporting section within service plans.

Overall themes

- Capital programme a good starting point.
- Procurement also important but hesitance to spearhead ICP
- Training & education an important theme from later responses
- Link with nature and other metrics.

Day to Day decisions

Hull

- Overall strategic priorities and the wording / framing of them as recommendations for Executive / Council approval
- Day to day in relation to environmental impact regarding pesticide / herbicide usage in grounds maintenance and parks and open spaces.
- Also peat usage alternatives, plant species and where and how they are sourced Ad hoc, e.g. an implicit factor in my and the team's day to day decisions re whether to work from the office, at home, or at other office. But this is peripheral.
- As air quality officer it is a continuous part of my role.
- Consideration given to investors that will use or develop low carbon technologies
- daily- both through our statutory consultee role in planning and strategies/projects We have carbon as a strategic pillar and as part of our OKRs in Streetscene
  I don't consider environmental sustainability related issues as part of my decision making - but my costs are low mainly staff costs -
- Rarely to be honest. at service level. I do think about it a population level (Public Health) Tick box exercise for most tenders
  Agree - time / cost / resource constraints mean that this is deprioritised)
- I have to consider the environmental impact of agriculture daily.
- Often not considered in reactive decision making.
- F2F .
- Promoting self-serve and paperless processes.

East Riding

- Project and strategic development;
- Consideration of environmental impacts of products i.e. vaping products, Needle Exchange products - but not as standard;
- Included with policy Health Impact Assessment - but this focuses on health impacts. This is done as part of policy/strategy review and/or development (yearly);
- Decision to speed a project up or invest to save (this comment is linked to investment in LED lighting to reduce carbon and cost);
- It is a daily part of my decision making. I often have to balance preconceptions that carbon solutions = biodiversity positive solutions which is not the case so balancing carbon, biodiversity and also assumptions around carbon benefits which may lack robust evidence. e.g. assumptions that specific land/habitat management actions are carbon positive;
- Types of vehicle procured for the fleet users ;
- The nature of work requires sustainability to be embedded as a primary consideration;
- When working with stakeholders to facilitate their procurement requirements. In running my own team operations.
- Daily decisions on right tree, right place to avoid impacts upon various ecosystems and infrastructure.
- Daily decisions on how to make sustainable options (mainly nature-based) appealing to non-environmental audiences. Promoting natural capital thinking as an example.

Overall themes

- Consideration across many roles but can be ad-hoc and lack structure.
- Interaction of carbon and nature priorities.

Opportunities from reducing carbon emissions

Hull

- Aligning with blue green infrastructure ;
- Multi-benefit solutions should attract more funding;
- More attractive employer;
- Cleaner city -reputational.

East Riding

- Improved health outcomes;
- Potential for income;
- Leading by example within the LA area;
- Opportunities to deliver environmental co-benefits;
- Economic growth - job creation as well as higher paid / more productive employment;
- Opportunity to invest in nature-based solutions and support nature recovery.

Overall themes:

- Funding;
- Reputation;
- Co-benefits.

Challenges related to reducing carbon emissions

Hull

- Scepticism - "Will any of this really reduce Hull's risk (e.g. of flooding) in context of a global challenge?"
- Complete lack of internal understanding;
- Council's financial position is a bigger priority on management time and resources in the short term.
- Procurement is a tick box exercise atm. There are no implications if a contractor does not deliver.
- Lack of staff resource to embed any additional activity over and above current day to day.
- Affordability - current and short-term financial pressures across most Local Authorities;
- Uncertain on some aspects of work & any potential to off-set.

East Riding

- Costs;
- Complexity of service delivery;
- Large agriculture industry;
- The pace of decision making generally but env. decision making often slow due to lack of understanding and/or prioritisation against other agendas.
- Robust data to support decision making (around nature-based interventions).

Overall themes:

- Education & awareness;
- Moving past “tick-box” approach;
- Data;
- Resourcing and pressures of day to day.

Drivers for ICP

Hull

- Management of future carbon risk;
- Ensures decisions take into account impact on the environment;
- Achievement of net zero;
- Reputational harm if not seen to do our bit. CST identified this as a strategic risk;
- Legislative compliance;
- Our Geography and flood risk;
- Keeping up with the current trend;
- Investment in decarbonisation;
- Net zero statement;
- The scale of the issue and ability to create impact.

East Riding (ranked)

1. Legislation requirements;
2. Management of future carbon risk;

3. Achievement of net zero;
4. Council Priority.

Overall themes

- Targets (suggesting implicit price);
- Funding;
- Reputation.

Drivers for Insetting

Hull

- Management of future carbon risk;
- Create local benefits e.g. jobs, improve public health;
- Achievement of net zero;
- Alternative to offsetting internationally;
- Self-generation - panels/canopies district heating;
- Realising projects that are part funded;
- Investment in decarbonisation projects;
- Supplementing government funding;
- Partnering with local businesses.

East Riding (ranked)

1. Legislation requirements;
2. Achievement of net zero;
3. Management of future carbon risk;
4. Create local benefits e.g. jobs, improve public health;
5. Investment in decarbonisation;
6. Realising projects that are part funded.

- (low priority):
- Alternative to offsetting internationally;
- Partnering with local businesses.

How could insetting funding support your area of work and priorities in net zero?

Hull

- Build local capacity in decarbonisation activity;
- Additional funding would be welcomed;
- Can provide local benefits i.e. health/biodiversity;
- Aligns with our 25 year Blue Green Plan.

East Riding

- Support procurement and commissioning of services;
- Added value to projects;
- Create new enterprises to deliver insetting;
- Opens up a wider clientele ;
- Could unlock nature recovery in wide range of areas that Council engages with;

- Providing private investment for nature recovery and community support;
- Better working partnerships with other large public bodies, i.e. university, NHS estates etc.

Overall themes:

- Funding for increased climate action;
- Local upskilling;
- Partnerships;
- Co-benefits;
- Nature agenda.

How is Biodiversity Net Gain, Local Nature recovery strategy and bio-recovery strategy being considered by the council (on the councils', or private, land)?

Hull

- Working in partnership with East Riding on the Local Nature Recovery Strategy (LNRS) - key player representing Hull;
- piece of work completed on delivering Biodiversity Net Gain with SuDs;
- looking at opportunity mapping for all council open spaces;
- Use of government grant for BNG being utilised to implement policy;
- 'Right to grow motion' for growing food on council land.

East Riding

- Hull & East Yorkshire LNRS being developed now, will include coastal and marine area. Consultation expected spring/summer 24;
- Links to Open Spaces;
- Scope to explore use of ERYC land in Biodiversity Duty requirements;
- As Humber Forest it opens up planting opportunities on ERYC land in order to meet targets. If the land is suitable;
- Links to Flood alleviation schemes and nature-based solutions;
- Utilising Ecological data to underpin decision making.;
- LNRS currently under development, co-benefits are considered although not the priority of the process BNG processes largely developed;
- Biodiversity Duty preparedness review underway;
- Natural flood management is being considered and scoped more frequently.

Overall themes:

- Co-benefits;
- Nature agenda.

Are there any examples or discussions of innovative use of finance mechanisms e.g. Community Municipal bonds, Crowdfunding, ESCos, Joint ventures, Green Loans?

Hull

- Part of the BNG/SuDs work;
- Yes - includes work with the area teams promoting community participation.

East Riding

- DfT funding linked to Live Labs II - delivery of a project linked to decarbonising the highway.

Overall themes:

- Experience at both Las with innovative finance mechanisms.

To what extent have local stakeholders e.g. businesses, community groups, third sector orgs been engaged on offsetting?

Hull

- Not aware of any;
- Not aware for carbon to a limited extent regarding biodiversity units.

East Riding

- Often businesses get in touch with Humber Forest to plant tree in order to gain carbon credits and offset it against their businesses;
- Humber Forest engage with businesses/ landowners/ communities to facilitate woodland creation/ and carbon reduction.

Overall themes:

- East Riding has experience in offsetting via the Humber Forest. This isn't an area that Hull has experience with.

Appendix 3 – Carbon Quantification and Business As Usual

The purpose of the ICP process is to understand the carbon related cost impact of a decision e.g. within the capital approval process, and to factor that into the decision-making processes along with the financial metrics.

To generate the carbon cost impact figure (£) it is necessary to have a carbon price to apply (as discussed above) and also to have a process to be able to quantify the carbon emissions that are related to a project, see Figure 22 below. The quantification process is discussed further in the next section.

Figure 22 The variables needed to calculate the carbon cost impact of a decision.

To start with, it is important to understand what needs to be included in the calculation, this is sometimes called *setting the boundaries* for the assessment.

Defining the base case and proposed project

For any business case that is being considered there will be a scenario that represents what would happen if this business case doesn't get approved. This alternative scenario can be called several things: Base Case / Business as Usual / Counterfactual. Table 15 below shows some proposed projects and example Business as Usual (BAU) cases.

Table 15 Example Business as Usual scenarios

	Examples of business case being proposed	Business as Usual or Base case (what would happen if the business case isn't approved).
1	A proposal to install solar panels on the roof of a school	No solar panels are installed, the electricity that could have been generated has to continue to be purchased from the grid.
2	A proposal to change what furniture is used when replacing broken items	The existing furniture supplier would continue to be used
3	Streetlighting needs replacing at the end of life, an upgraded model is proposed with new features.	The equipment would be replaced with the same model as is in place currently
4	A new waste processing site is proposed which brings online new capacity.	The existing infrastructure must be used, waste processing may struggle to keep up with demand.

When considering the Business as Usual (BAU) as in the table above, it may sometimes seem that there is no alternative to the business case being proposed, but on closer inspection, there is almost always an alternative, otherwise there wouldn't be the need to make a decision on it in the Business Case process.

In scenario 3 in the table above, it is possible that the business case could be to request to replace the equipment (streetlighting) with the same model (rather than proposing an upgraded option). If it is really the case that the BAU case is the same as what is being proposed, then there is no need to undertake the carbon quantification process; the result of the Business Case decision would have zero carbon impact.

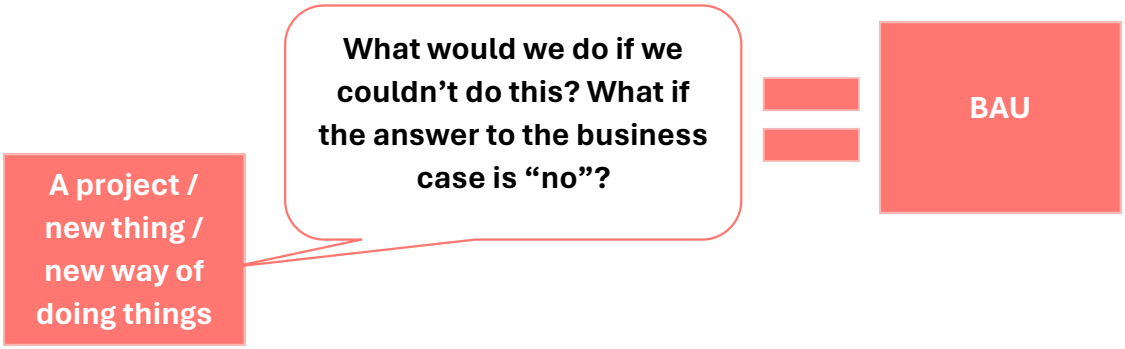


Figure 23 Identifying BAU.

To be able to compare the proposed project in terms of GHG emissions, it is vital to define the base case.

It can be helpful to use an understanding of the GHG emissions scopes to help think about what might change between the proposed project and the BAU case. A simplified set of scope areas is shown in Figure 24 below. The GHG emissions that need to be quantified are the difference between the emissions in the base case and in the proposed project for any of these areas where there is a change.

Fuel use (scope 1)	Electricity use (scope 2)	Purchased Goods & Services (scope 3)	Transport (scope 3)	Waste and End of Life (scope 3)	Business travel and commuting (scope 3)
Does fuel use change? (amount, fuel type)	Does electricity use change? (amount, fuel type, country)	Does what we buy change? (Goods, services, CAPEX or OPEX)	Is there a change in how things are transported? (Weight / distance / method)?	Is there a change in waste? (Amount, material or disposal)?	Is there a change in employee travel? (Commuting or business travel, mode or distance)?

Figure 24 Examples of areas where a change can occur when comparing BAU and a proposed project.

Each of the emission scopes should be considered in relation to the comparison between the proposed project and BAU. An example considering just two scope areas is shown in figure 25 below. Where there is likely to be very little material difference e.g., what is transported does not change materially in either weight, distance, or transport method – it is not necessary to calculate the carbon impact. If there is no change, there is no carbon impact of the decision.

In the example in figure 25 there is however a change in what is purchased, perhaps the removal of an item of energy using equipment from site means that a service needs to be purchased to provide the same function. Perhaps there will be a CAPEX investment in renewable generation on a site. In this situation (where there will be a change) the carbon impact needs to be quantified.

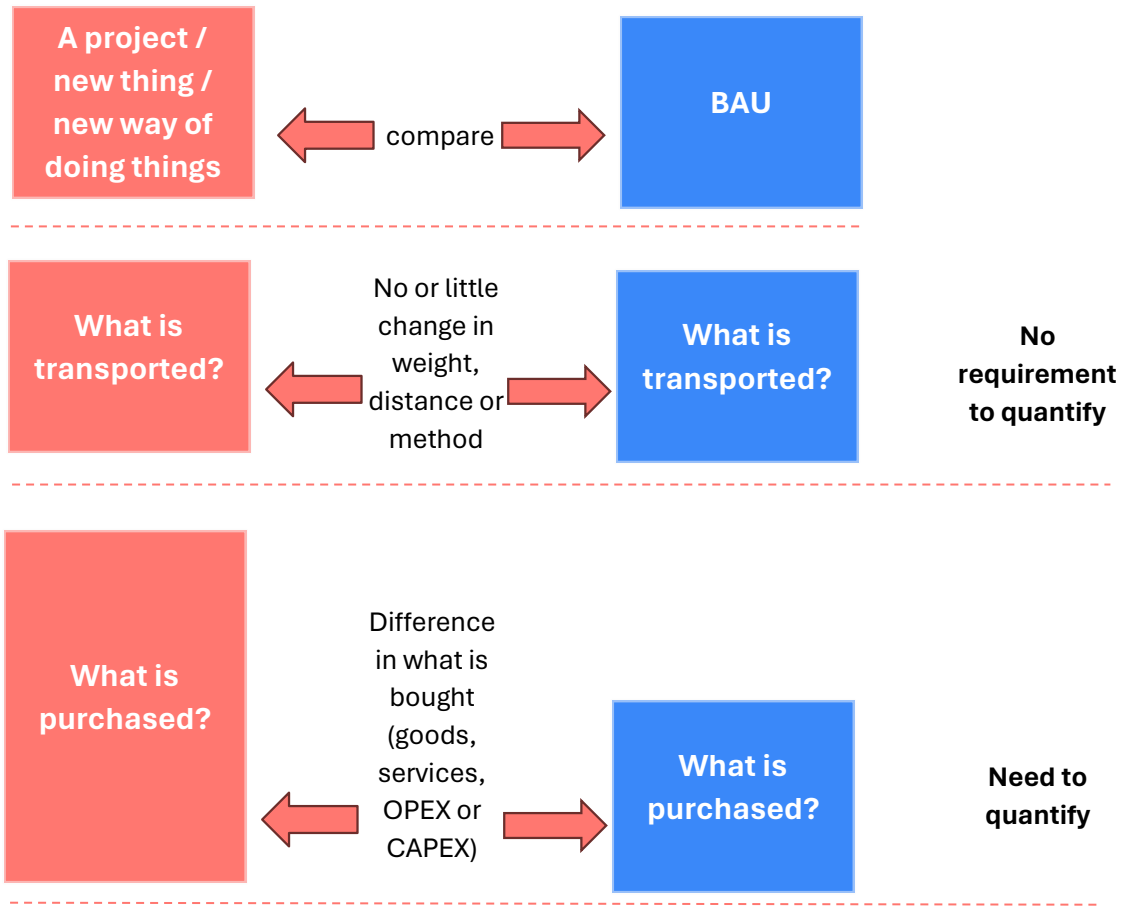


Figure 25: Identifying if there is a material change

Deciding whether there is a material change between the BAU-case and the proposed project isn't always easy and sometimes we can think that changes won't have a big impact, when in reality they do. If you are unsure and you want to be certain, then really the only way is to calculate and review what the impact is. However, for many decisions it may be clearer whether there is a difference that is worth calculating, Table 16 provides some examples of material and non-material changes for different scopes. In particular, note that if the change will impact the elements shown in the "Key factors" column in that the input data will change or the factor used will change, then there is likely to be a material difference.

Table 16 Examples of emissions sources and material and non-material changes

	Key factors	Material	Not Material
Fuel use	tCO_2e/Litre, tCO_2e/kWh	Fuel type switch (petrol to diesel)	Supplier changes
Electricity use	tCO_2e/kWh (country specific)	Country of production (where electricity is consumed) changes	Supplier changes within country
Purchased goods and services	tCO_2e/Tonne or tCO_2e/£ spend	The type of item purchased changes to something recognizably different. Volumes purchased change	Same type and volume of item is purchased from a different supplier
Transport	tCO_2e/Km, tCO_2e/tonne.km	Same type and volume of item is purchased from a different supplier in a different country. Transport mode changes for a distribution route.	The item shipped changes material (e.g. green steel instead of steel) but doesn't change in weight
Waste & End of Life	tCO_2e/Tonne	Changes in disposal method (landfill to recycling)	Small changes in volumes. Minor changes in product type i.e. changes in type of paper used.
Business travel & commuting	tCO_2e/Km, tCO2e/ passenger.km	Shifts in mode of transport (air to rail)	Small changes in behaviour as part of normal fluctuations

It is necessary to assess the change between the BAU and the proposed project. This is sometimes called the incremental difference or marginal difference. Where there is no change in a scope area there is no need to quantify the impact. This is illustrated in Figure 26 below.

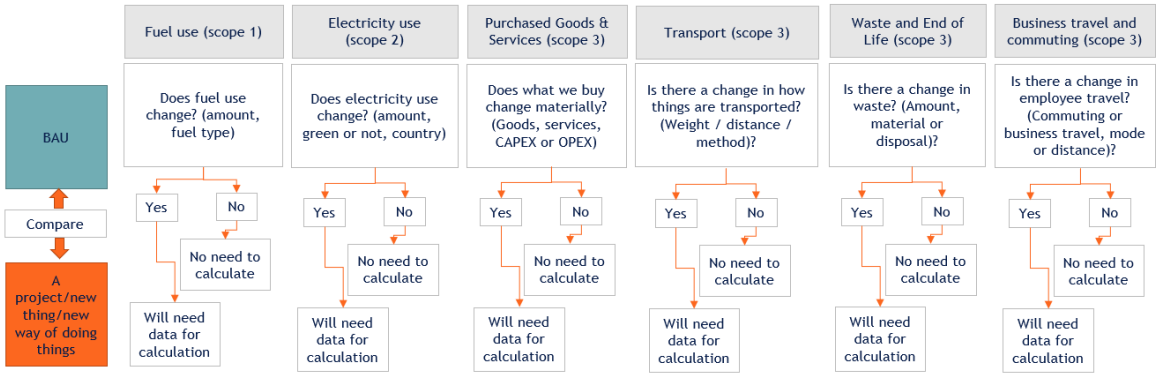


Figure 26 Flowchart illustrating differences between BAU and proposed project divided into scopes

It could be that for a project, the only material change is in whether the energy use has green certificates attached, in which case it is only necessary to quantify the existing electricity use and the electricity use that will have green certificates. The difference between the two will give the CO_2e impact of the decision. Similarly, it could be that the project proposed requires many aspects to change including energy use, transport, additional purchase of goods and services, in which case data needs to be collected for the BAU and the proposed project for each of those scope areas to calculate the difference in each. An example of what data might need to be collected is shown in Table 17 below where only the pink shaded items need to be quantified.

Table 17 Overview of proposed project examples and related questions regarding carbon change

	Does fuel use change? (amount, fuel type)	Does electricity use change? (amount, fuel type)	Does it change what we buy change materially?	Does it change transport / distribution? (weight / distance / method)	Is there a change in waste? (Amount, material or disposal)	Is there a change in employee travel? (commuting or business travel, mode or distance?
New photocopier vs buying old model	No	Yes	No	No	No	No
New offices closer to city centre, no gas boilers	Yes	Yes	No	No	No	Yes
Energy contract – green tariff vs existing tariff	No	Yes (fuel)	No	No	No	No
Additional waste production facility	Yes	Yes	Yes	Yes	Yes	Yes
Heat pumps vs gas boiler in existing building	Yes	Yes	Yes	No	No	No