

The Public Spending Code:

E. Technical References

Shadow Price of Carbon

E-05

Summary:

This document sets out the current parameter values for the shadow price of public carbon. This is based on work carried out by an Interdepartmental Working Group chaired by the Department of Public Expenditure and Reform and reporting to the relevant Senior Officials Group. The Group recommended that CBAs should monetise the value of emissions from the "basket of seven" Green House Gases which can be converted into carbon emissions. Market pricing should be used to monetise carbon emissions. In certain circumstances, CBAs should also monetise the value of emissions of other specified non-Green House Gas emissions.

Overview

In late 2012, the Senior Official's Group on Climate Change and the Green Economy approved the Terms of Reference for the establishment of a new Interdepartmental Working Group –chaired by the Department of Public Expenditure and Reform and reporting to the Group. This working group was tasked with updating the existing Guidance note on the inclusion of the Cost of Carbon emissions in capital appraisals, published by the Department of Finance in 2009.

The work of this inter-Departmental group was completed in early 2014 and informs the recommendations about reflecting the cost of carbon emissions in CBAs and economic appraisals. It is important to note that the values of the cost of the carbon parameters are significantly affected by policy developments at EU level. Analysts and practitioners should consult this section of the website on a regular basis as this parameter will be updated in line with new EU policy direction.

Description

The main recommendations in relation to appraising carbon emissions in economic appraisals are highlighted in the table overleaf. In addition, the Group recommended that CBAs incorporating carbon emissions should be consistent with the other parameters for economic appraisal set out in the Public Spending Code. Further queries about the work of the Group and/or the detailed calculations regarding emissions monetisation should be directed to the CEEU and the Climate Change Expenditure Evaluation Unit in the Department of Public Expenditure and Reform.

Table 1 Recommendations of Working Group regarding Carbon Emissions

- 1 CBAs should monetise the value of emissions from the “basket of seven” Green House Gases which can be converted into CO₂e (carbon dioxide equivalent) using GWP (Global Warming Potential) conversion rates – Carbon Dioxide (CO₂), Methane (CH₄), Nitrous Oxide (N₂O), Sulphur Hexafluoride (SF₆), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), and the new addition to the basket - Nitrogen Trifluoride (NF₃) - where emissions are considered relevant, significant and practicable for inclusion.
- 2 CBAs should also monetise the value of emissions of other specified non-GHG emissions (NO_x, SO₂, PM and noise) where such emissions are considered relevant, significant and practicable for inclusion.
- 3 Emissions should be converted into CO₂e using the latest available and Intergovernmental Panel on Climate Change adopted conversion factors for the GWP¹.
- 4 Market pricing should be used to monetise CO₂e emissions
- 5 For monetising the other specified non-GHG emissions (NO_x, SO₂, PM and noise) recommended for inclusion in CBAs – where such emissions are considered relevant, significant and practicable for inclusions – and pending the development of relevant values in an Irish context, the Group recommends that Departments/Agencies refer to the values outlined for NO_x, SO₂, PM and noise in the Department of Transport’s *“Guidelines on a Common Appraisal Framework for Transport Projects and Programmes”*².
- 6 The introduction of a carbon tax impacts on the appropriate price of CO₂e for inclusion in CBA. The shadow price is used to account for the external costs associated with CO₂e emissions. If this is partially or fully internalised in the product or input purchase price through the carbon tax then the price needs to be adjusted to reflect this and avoid double counting. This readjustment should only take place downwards to take account of the fact that the actual price of the input would include a CO₂e cost element.
- 7 A sensitivity analysis should be undertaken to highlight the sensitivity of the analysis to changes in assumptions about the value of CO₂e emissions;

Notes:

CO₂e emissions from inputs/materials purchased from organisations/facilities/installations with the EU ETS sector should not be included in the quantification of emissions for a project scenario as this would be double counting.

Direct CO₂e emissions from sources within the State’s jurisdiction, including those from direct construction and operation should be included in CBAs bearing in mind not to double count. In certain instances consideration may need to be given by project managers to indirect emissions.

¹ The Group recommends the 100-year Direct Global Warming Potential (GWP) values from IPCC AR4 as the best measure currently available to convert other gases into CO₂e. See Annex 1 of report for the latest Direct Global Warming Potentials from IPCC 4th Review (AR4). The latest available and IPCC-adopted conversion factors for the GWP should always be used. These were revised as part of the IPCC’s 5th Review (AR5).

² Department of Transport’s *“Guidelines on a Common Appraisal Framework for Transport Projects and Programmes”* is currently being updated and will be published when complete.

For reasons of clarity two definitions for defining direct CO₂e emissions were agreed. One for project/programmes in the transport sector and one for other projects/programmes such as those with fixed type structures.

Definition of direct CO₂e emissions for transport:

“Direct emissions from a transport project/programme include the marginal increase/decrease in emissions in the jurisdiction from fuel and other energy associated with the increased/decreased usage of vehicles and any increase/decrease caused by the provision of the new/improved transport infrastructure. It includes emissions from both stationary and mobile sources. It will also include CO₂e emissions generated from the materials used in the construction process bearing in mind not to double count emissions. In order to avoid double counting of emissions, CO₂ emissions from inputs/materials purchased from organisations/installations/facilities in the EU ETS should not be included in the quantification of emissions for a project scenario.”

Definition of direct CO₂e emissions for other projects such as those with fixed type structures:

“Direct CO₂e emissions from a project/programme encompass those generated on site via the generation of power and those produced from the work process. CO₂e emissions generated in the jurisdiction in the construction process should also be included where relevant and bearing in mind not to double count emissions. In addition, where relevant, the analysis should also include significant CO₂e emissions from the transport associated with the facility, including that of fuels, chemicals, waste and materials. Where appropriate, estimates for the CO₂e emissions from air conditioning/cooling losses should also be incorporated. In order to avoid double counting of emissions, CO₂ emissions from inputs/materials purchased from organisations/installations/facilities in the EU ETS should not be included in the quantification of emissions for a project scenario.”

Market Prices for CO₂e emissions

Focusing on the prices to be applied for CO₂e³ emissions, the Group has made the following findings and recommendations for the period 2014 to 2020:

- The price of CO₂e on the EU ETS system on the European Climate Exchange should be used as the cost of CO₂e, where possible.
- The European Climate Exchange⁴ offers futures pricing on the EU ETS until December 2017. Table 2 below demonstrates the average of the futures prices in the period 22nd January 2014 to 25th March 2014, along with the most recent auction clearing price available at the time of writing.
- The Group recommends the continued use of the December 2017 futures price as a shadow price for the 2018-2019 period i.e. €7.29/tCO₂

Table 2 summarises the Group's recommendations on CO₂e prices.

Table 2 Recommendations of Working Group regarding Carbon Emissions

	Price (€/tCO ₂)
Market Spot Price - 25 th March 2014	€5.80
Average Futures Price – December 2014	€6.32
Average Futures Price – December 2015	€6.58
Average Futures Price – December 2016	€6.92
Average Futures Price – December 2017	€7.29
Shadow price – 2018/2019	€7.29

³ Carbon Dioxide (CO₂), Methane (CH₄), Nitrous Oxide (N₂O), Sulphur Hexafluoride (SF₆), Perfluorocarbons (PFCs), Hydrofluorocarbons (HFCs) and Nitrogen trifluoride (NF₃) [See Table 4.1 in Chapter 4 for list]

⁴ as of March 2014

For the period post-2020⁵, the Group has made the following findings and recommendations:

- Future market prices for the post-2020 period are not available.
- The Impact Assessment which accompanied the recently proposed⁶ EU 2030 Framework for Climate and Energy Policy provides a price projection for the ETS in the event of no further policy developments, the so-called Reference Scenario.
- Bearing in mind the existence of a significant degree of uncertainty over what might be agreed in subsequent negotiations on the 2030 Framework and based on the best available information before the Group as of April 2014, the Group recommends that for the post-2020 period the EU 2030 Climate and Energy Reference Scenario values be used to represent the value of CO₂ in CBA.
- The price projection is reported in 5 year intervals until 2050 and is detailed below in table 3. All prices are denominated in €₂₀₁₀.

Table 3 Recommended tCO₂e values for application in CBAs for period post-2020

EU Reference Scenario – Projected price⁷	Price (€/tCO₂)
EU Reference Scenario (Projected price) - 2020	€10
EU Reference Scenario (Projected price) - 2025	€14
EU Reference Scenario (Projected price) - 2030	€35
EU Reference Scenario (Projected price) - 2035	€57
EU Reference Scenario (Projected price) - 2040	€78
EU Reference Scenario (Projected price) - 2045	€90
EU Reference Scenario (Projected price) - 2050	€100

⁵ For sensitivity purposes, Departments/Agencies could use (i) the values for carbon that are put forward in the Impact assessment (2014) of the EU Framework for Climate and Energy Policies, and (ii) the projected values for carbon that emerge from the domestic low-carbon road-mapping and modelling process that is ongoing.

⁶ January 2014

⁷ All prices are denominated in €₂₀₁₀.