

# Nordiskt Vejforum

## – Klimakrav i kontrakter





# Methods for climate requirements in contracts

The following is a catalogue with inspiration regarding climate requirements in construction or maintenance contracts and the focus is on methods to reduce the sector's CO<sub>2</sub> footprint while ensuring optimum competition.

The Client can select the method or methods most appropriate for the ambitions, resources and economy in the project.

The methods can be used alone or combined, and all methods have advantages and disadvantages.

## The examples are based on an award model of the pricing model type

In the examples that require an evaluation where criterion for awarding the contract is the best price-quality ratio, the examples are based on an award model of the pricing model type, meaning that for each tender a total evaluation price is calculated which is the evaluation tender price adjusted by a fictitious addition or deduction for each of the qualitative sub-criteria. These additions/deductions are determined on the basis of the quality of the tender in such way that for an average quality no adjustment is made to the evaluation tender price, for above-average quality a deduction is made to the evaluation tender price, and for below-average quality an addition is made to the evaluation tender price.

Another award model can be used with modifications.



# Sustainability Coordinator

With time, sustainability goals and requirements should be an integrated part of the projects like the contract's other goals and requirements.

To ensure the implementation of sustainability goals and requirements in the earlier phases, a Sustainability Coordinator could be appointed.

- It can be done by appointing a Sustainability Coordinator who will be responsible for sustainability goals and requirements across the entire project or organisation.
- Another option is to have a Sustainability Coordinator who is to be responsible for sustainability goals and requirements within a subject area. This could be relevant if the project or organisation works with different specialised subject areas.

# Climate requirements and cost-effective carbon dioxide reductions

The eight methods which are introduced in the next slide all rely on one or both two concepts of willingness to pay for greenhouse gas reduction and shadow price of carbon. The two concepts will be introduced in the following.

## Shadow prices:

The **shadow price of carbon** can be used to evaluate if a climate initiative is considered to contribute with cost-effective carbon dioxide reductions or if the cost is too big compared to the amount of CO<sub>2</sub> which are reduced by the climate initiative.

The definition of shadow prices of carbon in this presentation rely on the definition used by the Danish Ministry of Finance:

*The shadow price of carbon reflects the social cost per ton carbon dioxide reduced by a specific initiative \**

This means that when calculating the shadow price of carbon social cost should be included in the calculation. Thereby the shadow price does not only reflect the direct cost of a climate initiative but has a societal perspective. Social costs in road projects could be noise, air pollution or traffic congestion \*\*.

Of the eight methods introduced in the next slides it is only in method number 1, where the client calculate climate initiatives shadow prices of carbon. In method number 2-8 the focus is on the projects final CO<sub>2</sub> emissions, and it is not possible to calculate shadow prices, instead climate initiatives are evaluated on their direct extra cost.

## Willingness to pay for greenhouse gas reduction:

To make sure that CO<sub>2</sub> is reduced where it makes the biggest difference and where the CO<sub>2</sub>-reductions can be considered as cost-effective, it is essential that the willingness to pay for green house gas reduction is the same across projects, contracts, climate initiatives and source of emissions.

Therefor the shadow price for at climate initiative should always be lower than the willingness to pay for reducing carbon by one ton.

*The willingness to pay for greenhouse gas reductions reflects the maximum amount that should be paid for reducing the carbon impact by one ton*

In Denmark one way to determine the willingness to pay could be to look at reports from The Danish Council on Climate Changes, who provides recommendation on climate initiatives\*\*\*.

The Danish Council on Climate Changes and the Danish Economic Councils have made analysis on how to meet the political ambition in the Danish law on climate. A homogenous CO<sub>2</sub>-tax across all sources of emissions is considered to be the most cost-effective way to reduce carbon and meet the political ambition\*\*\*\*. In their analyses the most expensive ton of reduced CO<sub>2</sub> should cost about 160-200 EUR in 2030.

In the end it is up to the client to determine the willingness to pay for greenhouse gas reductions. There can be arguments for paying more for some climate initiatives then for others, specially if it is a new technology and it can be expected that the shadow price will go down over time when the technology is widespread and no longer under development. In this case paying more for CO<sub>2</sub>-reductions in the first years are considered as an investment in cheaper CO<sub>2</sub>-reductions in the future.

\* Definition defined by the Danish Ministry of Finance "Vejledning i samfundsøkonomiske konsekvensvurderinger", 2017. In contrast to the Danish Ministry of Finance guidance it is recommended to include an initiatives global CO<sub>2</sub> emissions and not only the national CO<sub>2</sub> emissions in the shadow prices. If the focus is only on national CO<sub>2</sub> emissions in construction projects, there can be an incentive for the contractor to reduce CO<sub>2</sub> emissions in their solution by moving the CO<sub>2</sub> emissions to other countries.

\*\* Transportøkonomiske Enhedspriser, nyeste version via <https://www.cta.man.dtu.dk/modelbibliotek/teresa/transportoekonomiske-enhedspriser>

\*\*\* [Klimarådet \(klimaraadet.dk\)](https://www.klimaradet.dk)

\*\*\*\* [DØRS. Økonomi og Miljø 2020 – Dansk Klimapolitik frem mod 2030](#), 2021 and [Klimarådet. Kendte veje og nye spor til 70 procents reduktion, 2020](#)

## Climate requirements in contracts

- Eight ways of setting requirements for CO<sub>2</sub> reducing measures in contracts are presented below
  - These are methods that require determining willingness to pay for CO<sub>2</sub> reductions, and that it can be published in calls for tenders.
- The choice of method(s) is based on a balance of advantages and disadvantages, e.g.
  - Administration and cost for the procurement process – both for the Client and the Contractor
  - Incentive structure
  - Market maturity\*
  - Price
  - Uncertainty
- The methods can be used individually or combined in a variety of ways to adapt CO<sub>2</sub> reduction requirements to the ambitions, resources and economics of each contract.
- Before making the requirements and preparing the tender documents, it should be examined which solutions the market can offer, whether there is sufficient competition as well as the current prices in the market.
- The climate requirements must relate to the subject of the contract and not to the supplier's general sustainability initiatives.

## Climate requirements in contracts

1. Requirements for project design and execution
2. Costs determined via CO<sub>2</sub> questionnaire
3. Parallel tenders
4. Options containing CO<sub>2</sub> reducing measures
5. CO<sub>2</sub> pool in the construction phase
6. Alternative tenders
7. Requirements for CO<sub>2</sub> baseline in the construction phase
8. CO<sub>2</sub> baseline as award criterion

# Requirements for project design and execution

## Description:

- The contract sets out a number of requirements for project design and execution methods that the contractor must meet. Those requirements can include CO<sub>2</sub> reductions. Requirements that result in CO<sub>2</sub> reductions can, for example, be to:
  - Use specific product types (e.g. CO<sub>2</sub> reduced concrete or LED lighting)
  - Characteristics of individual products (e.g. CO<sub>2</sub> emission requirements for a noise barrier)
  - Implementation methods (e.g. electrically-powered equipment)
  - Construction site operations (e.g. energy supply)
- Before incorporating CO<sub>2</sub> reduction measures as requirements for project design and execution in a contract, they should be analysed, so that the project team knows the level of CO<sub>2</sub> reduction the requirement entails. Before the requirement is made, assess what the additional costs would be if it were introduced into the contract.
- Based on estimates of additional costs and the calculated CO<sub>2</sub> reduction, a shadow price can be calculated by applying the requirement.
- Application of these types of climate requirements does not require contractors to provide documentation via EPDs of the CO<sub>2</sub> reduction they entail.
- It is easy to obtain documentation to monitor contractor compliance, as there is no need for documentation in the form of EPDs.

## Shadow prices and willingness to pay

- A level is calculated for how much CO<sub>2</sub> emissions can be reduced by implementing the requirement.
- The shadow price is calculated on the basis of the CO<sub>2</sub> reductions, an assessment of the additional price and the socio-economic costs. The shadow price will be an average per tonne of CO<sub>2</sub> reduced.
- In principle, the requirement will only be made if the shadow price is lower than the willingness to pay.

## Sanctions

- If the requirements are not met, the Client can make use of the sanctions in the contract.

# Requirements for project design and execution

## Advantages

- + **Administration and cost:** For most requirements, it will be easy to obtain documentation to monitor contractor compliance, as there is no need for documentation in the form of EPDs.
- + **Market maturity:** The method does not require contractors to have LCA calculation skills or to be able to come up with initiatives to reduce CO<sub>2</sub> in the project.
- + It will be easy for contractors to tender for the contract when the measures are formulated as requirements.
- + **Uncertainty:** The Client has control over which CO<sub>2</sub> reduction measures are implemented and is not dependent on suppliers being able to produce EPDs for each requirement.

## Disadvantages

- ÷ **Administration and cost:** The Client will calculate CO<sub>2</sub> emissions and shadow prices for all (possible) product types, execution methods and design choices.
- ÷ **Incentive structure:** Even if the contractor is aware of CO<sub>2</sub> reducing measures with a shadow price lower than the Client's willingness to pay, the contractor has no incentive to tender and use CO<sub>2</sub> reducing measures not described as a requirement in the contract.
- ÷ There is a risk of limiting competition if only a few contractors can meet the requirements.
- ÷ **Price:** The actual additional cost of applying the requirement is not known, and if the costs are misjudged, the Client can risk applying a requirement setting a shadow price that is too high.
- ÷ The Client must select the requirements and does not necessarily know the cheapest CO<sub>2</sub> reducing measures. The requirements will often be very rigid, leaving little room for flexibility.

# Costs determined via CO<sub>2</sub> questionnaire

## Description

- A project can include CO<sub>2</sub> reductions as a competitive parameter for awarding the contract. To include CO<sub>2</sub> reductions in the award criteria, the criterion "costs" should be used.
- The award model describes how, based on the contractor's completion of a CO<sub>2</sub> questionnaire, a surcharge is added to the tender price per tonne CO<sub>2</sub> emitted by the solution tendered. The amount of surcharge will be determined on the basis of the Client's willingness to pay.
- The Client has defined and described all the areas in which CO<sub>2</sub> reductions are competed for in a questionnaire. This could be on different types of materials, transport distances or something else.
- The questionnaire contains the emission factors for the different options and the quantities of materials used.
- The contractor is not entitled to a deduction for CO<sub>2</sub> reducing measures not defined by the Client in the CO<sub>2</sub> questionnaire. The contractor thus has no opportunity to invent and tender new solutions.
- The contractor provides a completed CO<sub>2</sub> questionnaire with its tender. The contractor will list its material selection in the questionnaire and, based on this information and the emission factors in the questionnaire, the carbon footprint can be calculated for the selected parts of the contract. The calculation model should be available, so the contractor can calculate CO<sub>2</sub> emissions itself.
- An evaluation price is set by adding a surcharge per tonne of CO<sub>2</sub> emitted in the contractor's proposed solution.
- If necessary, the CO<sub>2</sub> questionnaire can be extended to include other socio-economic parameters (e.g. particulate pollution) with associated unit prices.

## Shadow prices and willingness to pay:

- A surcharge to the evaluation price corresponding to the Client's willingness to pay per tonne of CO<sub>2</sub> emitted is calculated in the CO<sub>2</sub> questionnaire.
- When the surcharge per tonne corresponds to the Client's willingness to pay, the contractor has no incentive to tender solutions for which the surcharge is higher than the willingness to pay.
- Socio-economic factors are not included, and shadow prices are not calculated.

## Sanctions

- To ensure that the tendered measures are implemented during construction, the contract provides for sanctions to ensure a CO<sub>2</sub> reduction as stated in the tender. This could be a fine per tonne of CO<sub>2</sub> exceeded.

## Tender documents

The evaluation model is described in the Procurement Specifications.



# Costs determined via CO<sub>2</sub> questionnaire

## Advantages

- + **Administration and cost:** When CO<sub>2</sub> reduction options are set out in the CO<sub>2</sub> questionnaire, they are easy for the Client to evaluate. Transparency is also provided for the contractor.
- + The methodology is similar to the way certain other elements sometimes are being evaluated, if they can turn out to be an additional cost for the project.
- + **Incentive structure:** When a surcharge is applied to the Client's willingness to pay per tonne of CO<sub>2</sub>, the contractor has no incentive to reduce CO<sub>2</sub> over the Client's willingness to pay.
- + **Market maturity:** It is easy for the contractor to calculate the carbon footprint of the solution, as only quantities and materials need to be reported in the questionnaire.
- + **Price:** There is low risk of speculation, as the Client defines the scope for contractors to compete on CO<sub>2</sub> reductions.
- + CO<sub>2</sub> reductions are subject to competition, to avoid the risk of the Client overpaying
- + **Uncertainty:** There is a low degree of uncertainty, as the Client defines the options for tendering CO<sub>2</sub> reducing measures via the questionnaire.

## Disadvantages

- ÷ **Administration and cost:** The Client has to define emission factors for all elements that can be competed for.
- ÷ **Incentive structure:** The contractor is not entitled to a deduction for CO<sub>2</sub> reducing measures not defined by the Client in the CO<sub>2</sub> questionnaire. It therefore does not give the contractor an incentive to apply its own innovative CO<sub>2</sub> reducing solutions.
- ÷ The contractor calculates the additional cost and CO<sub>2</sub> emissions of its solution, but has no incentive to include socio-economic factors. There will therefore be measures the contractor chooses not to tender, even if they have a shadow price within the Client's willingness to pay.

# Parallel tenders

## Description

- A parallel tender is one in which the Client, tender out several solutions for the tendered work with different project design or different execution methods.
- Parallel tenders can be used if the Client wants to implement a CO<sub>2</sub> reducing measure in a contract, but does not know or cannot obtain information about the level of additional cost by requiring the measure in the contract. By using parallel tenders, the Client can set requirements for climate-saving initiatives that will only be implemented in the contract if the additional price is below a fixed level.
- Parallel tenders can include solutions with one or more CO<sub>2</sub> reducing measures.
- The Client calculates the CO<sub>2</sub> emissions and any other external costs (e.g. noise, particulate pollution, etc.) it wants to include in the tender evaluation for each parallel tender.
- Based on the calculated CO<sub>2</sub> emissions, a maximum willingness to pay is calculated for parallel tenders containing CO<sub>2</sub> reducing measures. This willingness to pay is given as a total deduction on the parallel tender in question.
- The award criterion is set as cost and the evaluation price is calculated as the tender sum including a deduction for CO<sub>2</sub> reductions.

## Shadow prices and willingness to pay

- CO<sub>2</sub> reductions are priced based on willingness to pay (averaged), while other effects use current unit prices.

## Sanctions

- Deductions from the evaluation price for parallel tenders with CO<sub>2</sub> reducing measures are calculated on the basis of CO<sub>2</sub> emissions and any other socio-economic costs/benefits from the measure.
- CO<sub>2</sub> reductions are priced based on willingness to pay (averaged), while other effects use current unit prices .

## Tender documents

The evaluation method is described in the Procurement Specifications

# Parallel tenders

## Advantages

- + **Market maturity:** The method does not require contractors to have special skills to calculate LCA on different solutions and products.
- + If the CO<sub>2</sub> reducing measures are sufficiently described, it will be easy for contractors to submit tenders for the solutions defined by the Client.
- + **Price:** A deduction from the evaluation price should ensure that tenders with CO<sub>2</sub> reducing measures are only submitted if the shadow price is below the Client's defined willingness to pay.
- + **Uncertainty:** The Client has defined the framework for tenders, the contractors know the amount of the deduction and can make a tender, including CO<sub>2</sub> reductions or not, depending on their expected additional costs.

## Disadvantages

- ÷ **Administration and cost:** The Client shall prepare tender documents containing various options and calculate the socio-economic effects of the various options described in the tender documents.
- ÷ Tenderers will need to expend more resources calculating and/or tendering when there are several possible solutions.
- ÷ **Incentive structure:** Contractors have no incentive to tender additional CO<sub>2</sub> reducing measures, as only those solutions described in the tender documents are deducted.
- ÷ **Price:** If a parallel tender includes several CO<sub>2</sub> reducing measures, it can include elements that have a shadow price above the willingness to pay.
- ÷ There is a risk that the Client will not gather the most cost-effective CO<sub>2</sub> reducing measures in the solution options.

# Options containing CO<sub>2</sub> reducing measures

## Description

- An option is a prior agreement that the contract can be extended under specified conditions. Options can be used when the project team is not sure at the time of the tender whether a particular service or product will be available during the contract period, but would like to retain the option to purchase that service or product from the chosen supplier.
- If climate measures are tendered as options in a contract, it allows the project team to decide whether the measure is to be implemented when the price of the option/measure is available in the tender. The option can also be used in cases when it is not known in advance whether there will be the financial means to implement the change. If several CO<sub>2</sub>- reducing measures are listed as options, the project team can choose to implement the measure(s) with the lowest shadow price.
- Examples of options can be:
  - Additional requirements for recycling that reduce CO<sub>2</sub> emissions compared to 'standard methods'
  - Replacing one product with another that has lower CO<sub>2</sub> emissions. E.g. diesel with HVO diesel
  - A CO<sub>2</sub> pool in the construction phase is also considered an option

## Shadow prices and willingness to pay

- The project team has to analyse how much CO<sub>2</sub> can be reduced if each option is used before the call for tenders.
- When a price for the option is received in a tender, a shadow price can be calculated and assessed against the willingness to pay.

## Sanctions

- Sanctions are determined according to what is required.
- If a project change is agreed and the contractor does not implement it, it will be regarded as a defect.
- If a specific method of execution is agreed and the contractor does not use it, the related supplementary contract will not be paid or a penalty will be applied

## Tender documents

- Options and the Client's deadline for taking a position are described in general terms in the contract, supplemented where necessary by a detailed description in the underlying contract documents.
- In the case of EU procurement, it is compulsory to reproduce the options in the contract notice (II.2.11).



# Options containing CO<sub>2</sub> reducing measures

## Advantages

- + **Administration and cost:** the use of options in tenders are common and the method in itself, is not especially demanding, when the Client can describe the CO<sub>2</sub> reducing measures sufficiently.
- + It's easy for contractors to submit tenders, when the options are sufficiently described.
- + **Market maturity:** The method does not require contractors to have LCA calculation skills or to be able to come up with initiatives to reduce CO<sub>2</sub> in the project.
- + **Uncertainty:** The Client can choose to use the options in during the entire contract period. Options can be used, when the project team is not sure at the time of the tender whether a particular service or product will be available during the contract period.

## Disadvantages

- ÷ **Incentive structure:** It's only the CO<sub>2</sub> reducing measures described, that can be a part of the tender. Contractors have no incentive to find additional CO<sub>2</sub> reducing measures during the contract period.
- ÷ When CO<sub>2</sub> reducing measures are tendered out as options, it's not certain that they will be used during the contract period.
- ÷ **Price:** When the Client defines the areas, in which CO<sub>2</sub> reductions can be made, it's not necessarily the cheapest measures that ends up being implemented.

# CO<sub>2</sub> pool in the construction phase

## Description

- The project team includes a pool for reducing the carbon footprint of the contract.
- The pool can be activated by the contractor or the Client proposing project modifications or changes to execution methods that will reduce the carbon footprint of the contract.
- Proposals for changes must be submitted in writing and must include, in addition to a description of the proposal, a CO<sub>2</sub> estimate for the contract with and without the change, so that it is clear how much CO<sub>2</sub> the contractor expects to be able to reduce through the measure.
- In order to create an incentive for the contractor to spend time and resources on proposing project modifications that can reduce CO<sub>2</sub> emissions, it is recommended that the Client pays a fixed price corresponding to the maximum willingness to pay per tonne of CO<sub>2</sub> contributed by each project modification.
- If the contractor submits a proposal, proof must be provided of how much CO<sub>2</sub> the change will contribute. If the Client makes a proposal, the Client will calculate how much CO<sub>2</sub> will be reduced and the price the Client offers the contractor to implement the change.
  - An LCA tool can be used by Client and Contractor to calculate CO<sub>2</sub> estimates that can be included in the change proposal.
- Proposals for changes must be made in sufficient time to enable the Client to decide on them before the actual material is to be ordered or the actual work is to commence.

## Shadow prices

- A shadow price is not calculated for this method. The contractor calculates its additional price for the proposed change and assesses it in relation to the Client's willingness to pay.
- If the Contractor's additional cost is lower than the Client's willingness to pay, there is an incentive for the proposed change to be implemented.

## Sanctions

- Sanctions are determined according to what is required.
- If a project change is agreed and the contractor does not implement it, it will be regarded as a defect.
- If a special method of execution is agreed and the contractor does not use it, the associated supplementary contract will not be paid, or a penalty will be payable.

## Tender documents

- The pool will be described in the special conditions or contract, how it can be used and how much money is allocated for CO<sub>2</sub> reducing measures
- The pool for CO<sub>2</sub> reducing measures is included as an option in the contract

# CO<sub>2</sub> pool in the construction phase

## Advantages

- + **Administration and cost:** Considerable flexibility for dialogue between contractor and Client to agree individual actions.
- + **Incentive structure:** The contractor has an incentive to continuously propose project changes that can reduce CO<sub>2</sub>.
- + It is possible to make use of new technologies continuously in the project.
- + For longer-term projects, measures can be introduced along the way, when/if developed or become sufficiently cost-effective
- + **Market maturity:** In the tender phase, no specific requirements are set for the contractor's ability to calculate LCA.
- + **Uncertainty:** If the economics of the project turns out to be unviable, the client will not need to invest in measures.

## Disadvantages

- ÷ **Administration and cost:** The Client shall prepare tender documents containing various options and calculate the socio-economic effects of the various options described in the tender documents.
- ÷ Proposals for changes requires time and resources for the contractor.
- ÷ **Price:** The model implies that the maximum willingness to pay is always used, which means a higher cost for the Client to reduce CO<sub>2</sub> emissions
- ÷ The CO<sub>2</sub> reducing initiatives are not put out to competition and can therefore be more expensive
- ÷ Initiatives need to be very specific, so small 'easy' CO<sub>2</sub> reductions will not necessarily materialise
- ÷ **Incentive structure:** If the winning contractor does not examine and present possible CO<sub>2</sub> reducing measures, there is a risk that only a few measures will be implemented in the contract.

# Alternative tenders

## Description

- An alternative tender is one in which the Tenderer, at the request of the Client, proposes a solution other than that described in the tender documents.
- This approach is best suited to open up alternative solutions for the project design (as described in the tender documents) and not alternative solutions to the execution methods or choice of equipment, as there are normally no requirements for these described in the tender documents.
- Evaluation of alternative tenders containing CO<sub>2</sub> reducing measures can be handled by using Cost as an award criterion (or as sub-criterion if qualitative sub-criteria are also to be used. In which case, the award criterion will be "best price-quality ratio").
- The Client must be able to ensure the quality of the documentation in the contractor's tender.
- The tender documents must state:
  - What the minimum requirements are for alternative tenders.
  - The specific documentation requirements for the submission of alternative tenders. Among other things, the contractor will be required to document CO<sub>2</sub> reductions in the alternative tender via EPDs or calculations, and the Client shall be able to approve those calculations before the tender can be accepted.
  - The evaluation price (Cost) is determined by adding a deduction per tonne of CO<sub>2</sub> reduced in the contractor's alternative solution to the total tender sum. The amount of the deduction shall be determined on the basis of the Client's willingness to pay.

## Shadow prices and willingness to pay

- This method does not calculate a precise shadow price for CO<sub>2</sub> reducing measures in the alternative tender.
- Willingness to pay is used to determine the level of the deduction given for the CO<sub>2</sub> reducing measures in the alternative tender.

## Sanctions

- Sanctions will be determined according to what is required.
- Depending on the requirement, the penalty could be withheld from the contract value or fine until the defect is rectified. In cases when it is found that delivery will not be made in accordance with the contract, proportional discounts can be considered.

## Tender documents

- The evaluation method is described in the Procurement Specifications.



# Alternative tenders

## Advantages

- + **Incentive structure:** The Contractor knows the Client's willingness to pay for CO<sub>2</sub> reductions, as it is reflected by the deduction to the evaluation price per tonne of CO<sub>2</sub> reduced, and only has an incentive to implement CO<sub>2</sub> reducing solutions with a premium price lower than the deduction/the Client's willingness to pay.
- + This freedom of choice increases the possibility of being able to compete on CO<sub>2</sub> reducing measures.
- + **Market maturity:** It is optional for the contractor to submit an alternative tender or not.
- + **Price:** Contractors can make suggestions, increasing the likelihood of cheap CO<sub>2</sub> reductions

## Disadvantages

- ÷ **Administration and cost:** It is more resource-intensive for the contractor to bid for the job, as they have to calculate and submit two tenders for the same project.
- ÷ The contractor must have the skills to calculate and document the CO<sub>2</sub> reductions in the alternative tender (via EPDs and/or a LCA tool).
- ÷ The Client must be able to ensure the quality of the documentation in the contractor's tender.
- ÷ The contractor might not be able to obtain new EPDs for alternative solutions during the tender phase, and might therefore only be able to use EPDs as documentation if they already have the EPDs. Alternatively, documentation must be provided via calculations in an LCA tool.
- ÷ **Price:** The methodology does not, by default, allow for socio-economic considerations.
- ÷ **Uncertainty:** There is greater uncertainty about the cost and CO<sub>2</sub> reductions of new and unproven methods.

# Requirements for CO<sub>2</sub> baseline in the construction phase

## Description

- The contract contains an incentive model in the form of a penalty or bonus for deviating from the baseline set by the Client for the carbon footprint of the contract.
- The penalty and bonus are set so that the penalty for emitting one tonne of CO<sub>2</sub> more than the baseline is equal in amount to the bonus that can be earned by reducing one tonne of CO<sub>2</sub> extra. The model includes bonuses and penalties to ensure incentives to reduce CO<sub>2</sub> emissions where it is cost-effective to do so.
- The potential for CO<sub>2</sub> reduction can be limited to a number of selected elements of the project (e.g. materials, transport, energy, etc.).
- CO<sub>2</sub> emissions can be reduced both through volumes and improved emission factors.
- The solution tendered by the contractor will not be evaluated on the level of CO<sub>2</sub> emissions, but the bonus model gives the contractor an incentive to implement the expected cost-effective CO<sub>2</sub> reduction measures in its tender, and to include the expected bonus in the tender price to increase the chance of winning the contract.
- The Client establishes baseline using an LCA tool, which is based on the expected level of emissions, given the fixed penalty/bonus rate.
- The maximum bonus could set above the Client's expectations for the level of emissions (with penalty/bonus), but can be limited as a result of the contract budget.
- Maximum penalties could set between standard discharge (without penalty/bonus) and expected emissions (with penalty/bonus). Setting the maximum bonus close to or below the expected level of emissions would imply a need for higher maximum penalty payments to ensure incentives for emission reductions.

## Shadow prices and willingness to pay

- Penalty/bonus is determined on the basis of marginal willingness to pay, as described in the note on willingness to pay as well as in the earlier slides.
- One penalty/bonus rate is established and maintained throughout the construction period.
- A penalty rate lower than the willingness to pay can be applied. In that case, the maximum penalty limit should be adjusted upwards.

## Sanctions

- Penalty or bonus for deviating from the established baseline of CO<sub>2</sub> emissions.
- In order to reduce uncertainty for the contractor, maximum fines are defined, while maximum bonuses are incorporated to reduce uncertainty for the Client.
- Failure to provide documentation in the form of EPDs should be sanctioned more severely to ensure an incentive to provide EPDs even if it can result in a penalty/reduced bonus.

## Tender documents

- Penalty and bonus clauses are described in the contract.

# Requirements for CO<sub>2</sub> baseline in the construction phase

## Advantages

- + **Incentive structure:** The contractor has an incentive to optimise its CO<sub>2</sub> emissions during the contract.
- + The contractor will only implement CO<sub>2</sub> reducing measures when the additional cost is lower than the established willingness to pay penalty/bonus rate.
- + **Price:** The contractor can include several small CO<sub>2</sub> saving measures and has incentives for all cost-effective reductions.
- + The CO<sub>2</sub> savings are competitive, and the contractor has an incentive to include expected bonus profits in its tender to win the contract.

## Disadvantages

- ÷ **Administration and cost:** Baselines can be difficult to establish, especially on design-build contracts, and require in-depth knowledge of CO<sub>2</sub> saving methods, prices and EPDs. All changes in the project during the entire construction period must be accounted for in terms of CO<sub>2</sub>.
- ÷ The contractor must document its emissions in the form of EPDs for all products and processes that form the basis for the payment of penalties or bonuses.
- ÷ **Incentive structure:** The contractor only takes into account actual costs and CO<sub>2</sub> emissions included in the LCA tool, and not socio-economic elements such as noise.
- ÷ **Market maturity:** Before the contractor can include expected profit from the penalty/bonus model in the tender price, a thorough understanding of carbon-saving methods and their costs is required.
- ÷ **Uncertainty:** The contractor's emissions level will only be known at the end of the contract, and the amount of bonus will be unknown at the time of contracting.
- ÷ This can act as a deterrent to contractors, and places greater demands on the accuracy of their CO<sub>2</sub> emission calculations.

# CO<sub>2</sub> baseline as award criterion

## Description

- The contract contains an incentive model in the form of a penalty or bonus for deviating from the baseline for the carbon footprint of the contract.
- The contractor must determine the carbon footprint of the solution tendered in its tender, and this will serve as the baseline for the payment of penalties or bonuses (in Model 7, the Client sets this baseline).
- The rate of penalty and bonus is set symmetrically around the baseline, so that the same amount per tonne is given in penalty and bonus.
- When awarding the contract, the carbon footprint of the solution will be a sub-criterion, and a surcharge will be added to the evaluation price per tonne of CO<sub>2</sub> emitted in the contractor's tender. The supplement is based on the Client's willingness to pay.
- The potential for CO<sub>2</sub> reduction can be limited to a number of specific elements of the project (e.g. materials, transport, energy, etc.).
- CO<sub>2</sub> emissions can be reduced both through volumes and improved emission factors.
- The maximum penalty and bonus are determined by reference to the Client's baseline, not the baseline from the contractor's tender.
- The maximum bonus is initially set well above the Client's expectations for the level of emissions (with penalty/bonus), but can be limited as a result of the contract budget.
- The maximum penalty is set between the Client's estimate of emissions (without penalty/bonus) and the expected emissions (with penalty/bonus). Setting the maximum bonus close to or below the expected level of emissions would imply a need for higher maximum penalty payments to ensure incentives for emission reductions.

## Shadow prices and willingness to pay

- A single rate for penalty/bonus will be set during the construction phase. The rate is based on the marginal willingness to pay, as described in the note on willingness to pay as well as in the earlier slides.
- A penalty rate lower than the willingness to pay can be used. In this case, the threshold for the transition between the two levels should be determined by the Client, and not on the basis of the contractor's tender. In that case, the maximum penalty limit should be adjusted upwards.

## Sanctions

- Penalty or bonus for deviating from the contractor's established baseline of CO<sub>2</sub> emissions.
- In order to reduce uncertainty for the contractor, maximum fines are defined, while maximum bonuses are incorporated to reduce uncertainty for the Client.
- Failure to provide documentation in the form of EPDs could be sanctioned more severely to ensure an incentive to provide EPDs even if it can result in a penalty/reduced bonus.

## Tender documents

- The evaluation model is described in the Procurement Specifications.
- Penalty and bonus provisions are described in in the contract.



# CO<sub>2</sub> baseline as award criterion

## Advantages

- + **Incentive structure:** The contractor will only implement CO<sub>2</sub> reducing measures if the additional cost is lower than the fixed penalty/bonus rate.
- + The contractor has an explicit incentive to find CO<sub>2</sub> reductions and make a tender with a realistic emission level, as well as to pursue the target and possibly optimise further during the contract when new methods become possible.
- + **Price:** The method is expected to be the most effective in reducing the most CO<sub>2</sub> in a contract through the most cost-effective measures.

## Disadvantages

- ÷ **Administration and cost:** The Client must calculate the expected baseline and set the limits for penalties and bonuses, which determine the incentive model. All changes in the project during the entire construction period must be accounted for in terms of CO<sub>2</sub>.
- ÷ It is time-consuming for tenderers to provide an informed estimate of their final CO<sub>2</sub> emissions – especially in the start-up phase with the use of climate requirements.
- ÷ The contractor must document its emissions in the form of EPDs for all products and processes that form the basis for the payment of penalties or bonuses.
- ÷ **Incentive structure:** The contractor only takes into account actual costs and CO<sub>2</sub> emissions included in the LCA tool, and not socio-economic elements such as noise.
- ÷ **Market maturity:** Before the contractor can specify an expected level of emissions, a thorough understanding of CO<sub>2</sub> saving methods and their costs will be required.
- ÷ **Uncertainty:** This can act as a deterrent to contractors, and places greater demands on the accuracy of their CO<sub>2</sub> emission calculations.



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