Sustainable Construction of the Sea Entrance IJmuiden

Rijkswaterstaat, The Netherlands

- The new tendering method that aims to reduce CO₂e emissions was applied in this tender of an infrastructural work
- Tendering parties were stimulated to offer a lean design and to apply innovative materials and working methods

<table>
<thead>
<tr>
<th>Standard tendering</th>
<th>GPP 2020 tender</th>
<th>Results</th>
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</thead>
<tbody>
<tr>
<td>221,598 t CO₂e emissions</td>
<td>132,959 t CO₂e emissions</td>
<td>88,639 t CO₂e emissions reduction over 75 years</td>
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<tr>
<td>63,155 toe energy consumption</td>
<td>37,893 toe energy consumption</td>
<td>25,262 toe energy savings over 75 years</td>
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www.gpp2020.eu
Contract tendered

A new lock at the sea side of the Noordzeekanaal (North Sea Channel) in the harbour of IJmuiden is required to give large ocean-going vessels access to the port of Amsterdam. The construction of this new lock in the harbour of IJmuiden is a joint action of Rijkswaterstaat, the Province of Noord-Holland, the City of Amsterdam and the Harbour Authority of Amsterdam.

The contract is a Design, Build, Maintain and Finance contract DBFM). The tender was prepared and executed under the leadership of Rijkswaterstaat and includes:

- The design and construction of a new sea lock (dimensions at least 500x65x18m) to replace the current Noordersluis (Norther Lock) (400x50x15m);
- A provision for road traffic, in accordance with requirements;
- The design and implementation of other adjustments in the project area (outer port and fairway) to enable a safe and smooth passage through the new lock;
- Freeing the project area of objects;
- Planning and realization of the maintenance of the new lock and the actual port for about twenty-six years;
- Financing the project;
- Maintaining the primary weir (primary flood defence) according to the Water Act.
- The design life time of the lock is 75 years.

- Time schedule of the tender procedure
  - First dialogue phase (all candidates): June 30th 2014 - December 8th 2014
  - Second dialogue phase (three candidates): December 9th 2014 - May 1st 2015
  - Publication registration: May 1st 2015
  - Enrolment phase: May 1st 2015 - June 30th 2015
  - Submission of the final offers: June 4th 2015
  - Intention to award selected bidder: July 9th 2015
  - Alcatel period: July 10th - July 29th 2015
  - Award decision: July 30th 2015
  - Contract Close: Augustus 2015
  - Financial Close: September 2015

Estimated total costs: €515,000,000,-
Procurement approach

The Dutch Government wants to reduce the emission of CO\textsubscript{2}e by 20% in 2020 compared to 1990. Sustainable procurement is one of the methods by which this can be achieved. Rijkswaterstaat (the Dept. of Public Works of the Ministry of Infrastructure and the Environment) developed a methodology for infrastructure projects whereby the functional specification of the tender together with the quality input from the client ensure an innovative and high-quality solution. This methodology will contribute to the reduction of CO\textsubscript{2}e emissions and other environmental impacts caused by materials used in infrastructure projects.

Tendering based on functional specifications
Rijkswaterstaat (RWS) strives to commission procurement projects as far as possible based on functional, performance-based specifications of the required infrastructure so that the market has the optimum freedom to arrive at effective, alternative and innovative solutions.

Most Economically Advantageous Tender (MEAT)
The ‘Most Economically Advantageous Tender (MEAT)’ procedure means that RWS selects tenders on the basis of a combination of price and quality. Quality includes for this project:

- Risk management
- Width of the lock
- Sustainability
  - CO\textsubscript{2}e performance ladder
  - DuboCalc

RWS assigns a price to specific quality aspects. This value is subtracted from the actual offer price to yield a corrected ‘total price’. The more effort the bidder makes to improve the quality of the bid, the higher the monetised value that will be deducted from his actual offer price. The tenderer with the lowest ‘total price’ wins the tender.

By applying these sustainability criteria Rijkswaterstaat shows that it want to select a provider with a) an energy efficient Working Processes who also offers b) a product with a high Product Quality (being a low environmental impact).

Sustainability as quality aspect
RWS has decided to focus on two criteria when assessing the sustainability attributes of offers, work processes and associated products: CO\textsubscript{2}e emissions and environmental impact. Two instruments have been developed for these two aspects: the CO\textsubscript{2}e performance ladder and ‘DuboCalc’ respectively.

The CO\textsubscript{2}e performance ladder is a certification system with which a tenderer can show the measures (to be) taken to limit CO\textsubscript{2}e emissions within the company and in projects, as well as elsewhere in the supply chain. See [www.skao.nl](http://www.skao.nl)

DuboCalc is an LCA-based tool which calculates the sustainability value of a specific design based on the materials to be used. Bidders use DuboCalc to compare different design options for their submissions. The DuboCalc score (ECI value) of the preferred design is submitted with the tender price. For more information see:

- [http://www.youtube.com/watch?v=cAaL4FBQNCc](http://www.youtube.com/watch?v=cAaL4FBQNCc)
- [http://www.youtube.com/watch?v=LIyQzxiW2w](http://www.youtube.com/watch?v=LIyQzxiW2w)
• https://www.milieudatabase.nl/imgcms/SBK_Assessment_method_version_2_0_TIC_versie.pdf

The ECI value indicates the environmental impact of a particular design for civil engineering works. A lower value indicates a lower environmental impact. Designs that differ significantly from each other in terms of material use also differ in terms of environmental quality. DuboCalc enables designers to calculate ECI values of alternative designs to arrive at an optimally sustainable design.

Sustainable procurement:
To ensure sustainable procurement, RWS carries out tendering procedures as follows:
• Energy consumption is included where possible as part of the submission price, in order to create a direct stimulus for energy efficiency.
• Specific technical solutions for energy saving and sustainability are obligatory. For instance, in tunnels LED lighting is always required. Another example is that only sustainable timber is allowed.

Criteria development
• The CO2e Performance Ladder was applied to this tender. According to the green procurement policy of Rijkswaterstaat every rung of the ladder yielded an extra one percent fictional deduction of the bidding price. The highest rung (rung 5) yields 5% extra fictional deduction from the bidding price.
• A reference design was made to estimate the quantities of materials applied in this project. These quantities were used to calculate the reference ECI Value.
• The scope of the DuboCalc calculation was the sluice, outer port and the dyke, including all the applied materials for structural work and carry out earthworks, in the period between the launch date and completion date.
• Also the supporting facilities, including electricity consumption during the operational phase was part of the DuboCalc calculation.
• This resulted in an (maximum) ECI Value of 22,770,000 for a design with a life time of 75 years. According to their professional knowledge the project team expected that the most optimal design could have an ECI Value of 40% less. This means a ECI value as low as 13,662,000.
• The project team decided that a maximum deduction of the bidding price of €17,500,000,- would be applied for green procurement purposes in this tender. This meant that the bidder that could make the work with an ECI Value of as low as 13,662,000 would be awarded with a – fictional - deduction of the bidding price of €17,500,000,-. A design that scored 22,770,000 would have no deduction from the bidding price. Other ECI Values would result in a deduction proportional to the ECI Value.
• Assessment of the offers:
  o CO2e emissions are one of the 13 parameters that contribute to the ECI Value. The CO2e emissions are a result of all processes involved; production, transport, construction, demolishing, re-use, et cetera of all the building materials.
○ In this project 48.66% of the ECI Value is caused by the emission of CO₂e. The amount of CO₂e emission that is reduced was calculated by subtracting the ECI Value of the offered design from the reference design.

○ New in this tender was the (explicit) possibility to deliver the Life Cycle Analysis (which is compulsory) of new materials to be used in the project, one year after contract close. This used to be a few months causing a deterrence effect at the bidders to use new materials.

Results

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<tr>
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<th>CO₂e emissions</th>
<th>Energy consumption</th>
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<tbody>
<tr>
<td>Low Carbon Solution</td>
<td>1,772.8 t CO₂e/year</td>
<td>505.2 toe/year</td>
</tr>
<tr>
<td>Last Tender/or „worst case“</td>
<td>2,954.6 t CO₂e/year</td>
<td>842.1 toe/year</td>
</tr>
<tr>
<td>Annual savings</td>
<td>1,181.9 t CO₂e/year</td>
<td>336.8 toe/year</td>
</tr>
<tr>
<td>Total savings</td>
<td>88,639 t CO₂e</td>
<td>25,262 toe</td>
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○ The new procurement method was successfully applied
○ The winner offered a bidding price below €515,000,000,-.
○ The winner offered to perform the work under the regime of the fifth rung of the CO₂e Performance Ladder
○ The winner offered an ECI Value of 13,662,000. This was the maximum. It assured him of the maximum fictional deduction of €17,500,000,-.

○ The gains in ECI Value were:
  ○ Mostly due to a sustainable concrete alternative, reducing the need of primary raw materials. Calculated with a quick-scan method to prove carbon reduction.
  ○ An innovative construction method resulting in a lower amount of needed concrete.
  ○ The bidder added many solar panels to the lock, which results in a lower energy consumption.
  ○ Final ECI has to be verified within the first year.

○ Emissions reduction
  ○ An ECI Value of 50 equals 1 tonne of CO₂e emission.
  ○ The amount of CO₂e emission that is reduced can easily be calculated by subtracting the ECI Value of the offered design from the reference design.
  ○ The calculated ECI Value for the reference design is 22,770,000 for a design life time of 75 years. This equals a CO₂e emission of 221,598 t, or 63,155 toe energy. Which is 2,954.6 t CO₂e emission each year, or 842.1 toe energy each year.
  ○ The winner offered in the tender an ECI Value of 13,662,000, which equals 132,959 t of CO₂e emission, or 37,893 toe energy. Which is 1,772.8 t CO₂e emission each year, or 505.2 toe energy each year.
  ○ This procurement method yielded 88,639 t less emission of CO₂e over a period of 75 years, or 25,262 toe energy. This is 1,181.9t less emission of CO₂e each year or 336.8 toe each year.
The emission reduction can be roughly assigned to:

- Materials for construction (61%): 54,070 t CO₂e emission
- Operating & Maintenance (13%): 11,523 t CO₂e emission
- End of life (demolishing) (26%): 23,046 t CO₂e emission

Lessons learned

- The new procurement method was applied successfully and Rijkswaterstaat will continue applying this method in the coming tenders.
- The bidders must have the freedom to make their own choices, so they should only be provided with functional requirements and technical framework conditions. The market appreciates this approach.
- The client must have a well-thought-out reference design and know where there is room for improvement in order to predict a maximum ECI Value.
- The gains of this tendering procedure should justify the costs; i.e. the reduction of carbon emission should outweigh the tendering costs. It is therefore necessary to perform a sensitivity analysis to assess this.
- Tenderers where challenged to design a lock with a 40% lower ECI than the reference model created by Rijkswaterstaat. 2 out of 3 tenderers made a bid with such a sustainable design.
- The low environmental impact is mainly due to a sustainable concrete alternative, reducing the need of primary raw materials.
- The low environmental impact is also due to an innovative construction method resulting in a lower amount of concrete needed.
- The low environmental impact is also due to the many solar panels added to the lock, which results in a lower energy consumption.

Contact

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Sites:
http://www.duurzaamgww.nl/
Tender accessible at: http://tinyurl.com/n3ge94
About GPP 2020

GPP 2020 aims to mainstream low-carbon procurement across Europe in support of the EU’s goals to achieve a 20% reduction in greenhouse gas emissions, a 20% increase in the share of renewable energy and a 20% increase in energy efficiency by 2020.

To this end, GPP 2020 will implement more than 100 low-carbon tenders, which will directly result in substantial CO₂ savings. Moreover, GPP 2020 is running a capacity building programme that includes trainings and exchange. – www.gpp2020.eu

About PRIMES

Across six countries in Europe; Denmark, Sweden, Latvia, Croatia, France and Italy, PRIMES project seeks to help municipalities overcome barriers in GPP processes, many of which lack capacity and knowledge.

PRIMES aims to develop basic skills and provide hands-on support for public purchasing organisations in order to overcome barriers and implement Green Public Purchasing. This will consequently result in energy savings and CO₂ reductions. – www.primes-eu.net

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