Sustainable Reconstruction of the Guard Lock near Limmel

Rijkswaterstaat, The Netherlands

- Remarkable savings equivalent to the average annual CO2 emissions of about 750 European households
- The procurement approach taken fostered the uptake of innovative materials and working methods

Standard tender
- 12,662 t CO2e emission
- 3,609 toe energy consumption

GPP 2020 tender
- New procurement methodology and design optimization
- 8,082 t CO2e emission
- 2,303 toe energy consumption

Results
- 4,580 t CO2e savings
- 1,305 toe energy savings

www.gpp2020.eu
Contract tendered

The contract is a design, build, maintain and finance (DBFM) contract tendered by Rijkswaterstaat. The contract includes the reconstruction of a guard lock in the river Meuse in the municipality of Limmel. The contractor was asked to:

○ Design, finance and construct:
  ▪ temporary building pits
  ▪ a new guard lock, including mechanical components and electrical installations to operate it
  ▪ hydraulic reinforcements of the water bottom of the adjacent Juliana Channel,
  ▪ a spillway, waiting pontoons, staging areas
  ▪ a culvert for an adjacent watercourse
  ▪ Maintenance of the existing object’s floodgate function during construction of the new lock
  ▪ the road infrastructure, including fixed traffic bridges, cycle paths and road on the lock property and public lighting,
  ▪ the design life time of the guard lock and adjacent infrastructure is 100 years.

○ Demolition of the existing lock complex after the new means of flood control is constructed. This includes demolition of the upper and lower ends of the lock chamber, mooring poles, the existing Kanjel culvert and the fixed traffic bridge

○ Manage and maintain the new lock, dyke structures, culvert and fixed bridge for a period of 30 years.

This contract was tendered sustainably according to the Dutch Governmental policy and contributes directly to the Dutch policy “20% Less CO₂ emission in 2020 compared to 2009”.
Procurement approach

The tendering followed the Competitive Dialogue procedure:

- The dialogue phase started after the selection of five candidates.

- The dialogue consisted of two phases, both with several rounds of conversations.

- The second phase included specialist meetings of which sustainability was one of the topics to be discussed. After the first dialogue phase three candidates remained. After the second dialogue phase these three candidates were allowed to make bid for this DBFM-contract.

- In this tender the most economical advantageous tender (MEAT) procedure was used to select a bid based on the bidding price and 3 quality criterions:
  - Hindrance: reduction of hindrance to the shipping traffic
  - Risk: Risk management plan
  - Sustainability: a low CO₂ emission due to working processes and a low environmental impact due to materials use

Sustainability

This informative paper is about the last criterion ‘Sustainability’. By applying this criterion Rijkswaterstaat shows that it wants to select a provider with a) energy efficient Working Processes who also offers b) a product with a high Product Quality (resulting in a low environmental impact). Both aspects – process and product – contribute to reduced CO₂ emissions.

- **Working processes**: Rijkswaterstaat favours companies that organize their working processes efficiently and thus reduce CO₂ emission. This is done by deducting a fictional amount of money from the bidding price. The higher the efforts to reduce CO₂ emissions, the higher the deduction. The tool utilized for the monetizing of the benefit is called the CO₂ Performance Ladder, see [www.skao.nl](http://www.skao.nl).

- **Product Quality**: Rijkswaterstaat favours the bidder that offers a product with a low environmental impact due to materials and working methods. CO₂e emissions are a part of the environmental impact. In order to monetize the product quality, Rijkswaterstaat developed the software instrument DuboCalc. DuboCalc is based on the life cycle assessment (LCA) of all materials that are used in the construction. The result of this monetization is presented as the “environmental costs indicator value” (ECI Value, see [http://www.youtube.com/watch?v=cAaL4FfBOQc](http://www.youtube.com/watch?v=cAaL4FfBOQc)).

Most Economic Advantageous Tender (MEAT)

The MEAT approach implies a pricing of both above mentioned quality aspects. The ECI Value and CO₂ Performance Ladder are used in the MEAT procedure as follows:
the contracting authority provides organisations that expressed their interest in making a bid with all the functional requirements and technical framework conditions;

- these organisations make a design and calculate the price and the ECI Value;
- they also state how much effort they will put in the reduction of CO₂ emissions caused by their internal operational processes, more effort will result in a higher rung on the CO₂ Performance Ladder;
- these three criteria (bidding price, CO₂ Performance Ladder rung and ECI Value) are presented in the bid to the contracting authority.
- the contracting authority calculates the benefits and deducts these from the bidding price;
- the bidder with the lowest combined - fictional – bidding price wins the tender.

Criteria development

- In order to add an extra incentive for tenderers to design energy efficient installations the energy bill of the 30 years of maintenance is included in the bidding price (a fixed kWh price is prescribed in order to compensate for price fluctuations).

- The CO₂ 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 includes:
  - all materials that will be used for the rough structure of the project and for the temporary structures.
  - the object related energy consumption during the use phase

The following items were excluded from the calculation:
  - demolition of the old guard lock and disposal of the these demolished parts
  - the mechanical components and electrical installations,
  - the grouted anchors and area furniture like waste bins, fences and light poles

It resulted in an ECI Value of 1,410,000 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 as low as 900,000.

- The project team decided that a maximum deduction of the bidding price of 5,500,000 euro would be applied for green procurement purposes. This meant that the bidder that could make the work with an ECI Value of as low as 900,000 would be awarded with a – fictional - deduction of the bidding price of 5,500,000 Euros. A design that scored 1,140,000 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:
  - CO₂e emissions are one of the 11 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 44.9% of the ECI Value is caused by the emission of
CO₂e.

- The amount of CO₂ emission that is reduced was calculated by subtracting the
  ECI Value of the offered design from the reference design.

## Results

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<thead>
<tr>
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<th>CO₂e emissions</th>
<th>Energy consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Carbon Solution</td>
<td>107.8 t CO₂e/year</td>
<td>30.7 toe/year</td>
</tr>
<tr>
<td>Last Tender/or „worst case“</td>
<td>168.8 t CO₂e/year</td>
<td>48.1 toe/year</td>
</tr>
<tr>
<td>Annual savings</td>
<td>61.1 t CO₂e/year</td>
<td>17.4 toe/year</td>
</tr>
<tr>
<td>Total savings (over 75 years)</td>
<td>4,580 CO₂e</td>
<td>1,305 toe</td>
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- The winner offered a bidding price of € 26,443,718.
- The winner offered to perform the work under the regime of the fifth rung of the CO₂ Performance Ladder, so he earned a fictional deduction of 5% * € 26,443,718 = € 1,322,186.
- The winner offered an ECI Value of 900,000. This equals the minimum that was possible. It assured him of the maximum fictional deduction of € 5,500,000.
- The bidding price corrected for the fictional deductions was: € 26,443,718 – € 1,322,186 – € 5,500,000 = € 19,621,532. This was the lowest corrected, fictional bidding price.
- Emissions Reduction of CO₂ in this project
  - Beforehand, the contracting authority made a reference design and used this to calculate an ECI Value. CO₂e emissions are one of the (in total 11) parameters of the DuboCalc calculation that contributes to the ECI Value. This CO₂e emissions are the amount that is emitted as a result of the processing of all building materials involved (production, transport, demolishing, re-use, et cetera) and the realization processes.
  - The amount of CO₂e emissions that is reduced was calculated by subtracting the ECI Value of the offered design from the reference design.
  - The emissions of CO₂e is an integral, proportional part of the ECI Value. It follows from the DuboCalc calculation that in this project 44.9% of the ECI Value is caused by the emissions of CO₂e. The amount of CO₂e emissions can now be calculated since 1 t CO₂e emissions equals an ECI Value of 50.
  - The calculated ECI Value for the reference design is 1,410,000 for a design life time of 75 years. This yields CO₂e emissions of 12,662 t in 75 years and 3,609 toe in 75 years.
  - The winner offered in the tender an ECI Value of 900,000, which is equal to 8,082 t of CO₂e emissions and 2,303 toe in 75 years.
So the new procurement method yielded 4,580 t less emissions of CO₂e over a period of 75 years and 1,305 toe in 75 years.

The reduction in CO₂e emissions in construction is mainly achieved through:

- an efficient transport of materials, and
- the application of less (top) soil.

**Lessons learned**

- The new procurement method was applied successfully and Rijkswaterstaat will continue using it in future 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 and minimum 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.

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Tender information: [http://tinyurl.com/put44rh](http://tinyurl.com/put44rh)  
ECI Value, see: [http://www.youtube.com/watch?v=cAaL4fBQNC](http://www.youtube.com/watch?v=cAaL4fBQNC)
GPP 2020 tender model on a sustainable reconstruction of a guard lock, The Netherlands

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

Co-funded by the Intelligent Energy Europe Programme of the European Union

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