



Renovating Amsterdam's historic quay walls using innovation procurement

Tim van de Laar is a project manager for the Engineering Department of the City of Amsterdam. He has been responsible for the innovation partnership for quay walls from its beginning in 2017. For the innovation partnership he is leading a project team of young engineers with the ambition to stimulate innovation in the construction industry, by giving more space for market solutions and setting up long term public/private collaborations.

What is the challenge the City of Amsterdam is encountering in terms of quay walls?

The City of Amsterdam is inextricably linked to the water. We have many bridges and quay walls between our main bodies of water (the canals, the Amstel River and the IJ River), connecting the neighbourhoods and giving the City its character. However, hundreds of bridges and tens of kilometres of quay wall are at the end of their life and in poor condition. Urgent action is needed to keep the city safe, accessible and liveable.

The municipality of Amsterdam is currently renovating an average of 500 meters of quay wall and one bridge per year. The ambition is to renew two kilometres of quay wall and six to eight bridges per year from 2024 onwards. Most of the old quays are located in the increasingly busy inner city, where traffic, residents and tourists compete for space. The replacement of quays always has a major impact on the environment, due to traffic closures, construction traffic, noise and vibration nuisance,

displacement of houseboats and (the risk of) damage to the environment.

We are therefore working on flexible planning to tackle the renovation as smartly and efficiently as possible. We want to ensure that we renew the bridges and quay walls at a much faster pace and according to a strict plan, while at the same time keeping the city safe and as accessible and liveable as possible.

What is special about your renovation programme?

Knowing that we have a lot of renovation and maintenance ahead of us, we wanted to make sure that this project is in line with Amsterdam's overall circular economy strategy. The City of Amsterdam has set a goal to reduce primary resource consumption by 50% in 2030 and to be fully circular by 2050.

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Why did you opt for an innovation partnership?

With the scale of quay wall renovations we have ahead of us, we

knew we needed innovative solutions that would allow us to renovate as much of the quays and bridges as possible, in the shortest amount of time, while minimising negative impact on the neighbourhoods, such as noise, traffic jams, etc. All while aiming for high circularity impact and maintaining the future value of the materials. We wanted to give bidders the freedom to come up with innovative solutions and try out what works. Our situation in Amsterdam is quite unique, so we need unique solutions, and an innovation partnership allows us to develop these solutions together with our contractors.

How did you set up the innovation partnership procedure?

To set up the innovation partnership, we worked with a small internal team and a larger external consulting group including specialists on different subjects such as construction, law, and innovation.

Our innovation partnership had a set price for a reference case so that bidders would compete solely on the quality of the offer and the innovation. The fixed price was € 4,900,000.00 for a reference case with a size of a total of 268 meters of quay wall to be renovated. Bidders' business cases were evaluated based on a realistic construction cost level, reflecting the actual costs of the project on which the reference case is based, based on a traditional construction method. The business cases should include design and engineering costs, administrative costs, insurance costs and coordination costs.

The innovation partnership is organised in three stages. For stage one, the competitive phase, we published a call for tender in 2018. Out of the submitted bids, we selected six entries to be eligible to submit bids for the next stage, research and development (R&D). From those six, three are selected to enter an innovation partnership

with the City of Amsterdam. During the R&D stage, all three bidders complete an innovation process that takes their submitted idea from concept stage to prototyping, validating and testing stage. All parties that successfully complete the R&D phase, pass on to the commercial phase, where they enter a framework contract with the City of Amsterdam.

To select our partners for the innovation partnership, we awarded the three most economically advantageous offers, based on a pre-determined price and a set of award criteria. For the award criteria we chose to evaluate scalability, environmental impact, future value, and the proposed collaborative R&D process.

The "future value" is particularly interesting for us when it comes to achieving our circular economy goals. We want to ensure our solutions are future-proof and multifunctional. For this, we evaluated in how far the solutions enable simple changes



in functions and use, and offer or facilitate new other functions for future developments.

It is not possible to predict with certainty how the functions and use of the quay will develop in the future. There are, however, various developments underway that can influence the (future) quay and its design. Examples are climate adaptation, the energy transition, a green living environment and ecological quality, and the multifunctional use of space. We asked bidders to show how their solutions are adaptable to these changing circumstances to ensure their future value.

We also asked bidders to indicate how circular their innovative solution is. For us circularity includes how bidders propose to deal with residual material and promote high-quality reuse when the quay wall replacement is executed. It also includes high-quality reuse of materials from local sources and other projects within Amsterdam upon completion of the quay wall replacement. We evaluated positively the use of organic or compostable materials, where environmentally sensible, as well as modular solutions that contribute to easier management and maintenance, replacement, and reuse of materials after replacement. A long lifetime and low environmental impact was also evaluated positively

What are the results of the innovation partnership so far? Which impacts have your criteria for future value had on the submitted bids?

We were overwhelmed by the high quality of the solutions the market parties proposed. Some examples to illustrate this: Our innovation partners are electrifying a big part of their fleet: all transport will be

electric, and most construction material on the construction site. The result is less nuisance and lower CO₂ emissions. In a traditional quay wall renewal, all trees have to be cut down. All three market parties came up with solutions that protect the trees, resulting in a better climate and a healthier quality of life in the city. All parties are transporting their materials and machinery over water. This prevents large numbers of trucks navigating through the inner city and also diminishes nuisance.

From a circular perspective, the market parties have proposed the following ideas, which are currently being tested:

- The reuse of the old quay wall bricks, preserving the look and feel of the UNESCO world heritage canals
- Prefabricated constructions that are modular and reusable, for example the replacement and reuse of the poles and concrete shields
- Use of fiber reinforced concrete, which is stronger and easier to dismantle than traditional armed concrete

Our innovation partners are also testing overall smaller constructions, which leave space for other purposes on the quay wall, such as smart grids, rain water storage or energy storage batteries.

Which stage are you at currently? How is the innovation process developing?

We are currently in the R&D-phase. This means that by next year, the concepts will have evolved from first ideas (Technological Readiness Level (TRL) 3) to proven solutions, ready for the commercial use (TRL

8). This includes the verification of our list of demands, performing fabric tests and building a prototype. When we are satisfied, the contractors will start the next stage: applying the innovative concept on a pilot project.

You have also published a call for tender for a PCP for Quay wall monitoring, what are your goals with this procurement?

Research and monitoring are crucial to find out which bridges and quay walls actually need to be strengthened and/or renewed, and within which period of time. We are currently monitoring 10% of our acreage, wherever it is most needed. We do this using traditional methods, like tachymetry and levelling. In an ideal world, we want to be able to monitor the entire canal area. In order to gain a complete insight into the technical condition of our bridges and quay walls more quickly and to detect possible failure of structures at an early stage, we are looking for new measurement techniques so that we can intervene in time. A Pre-Commercial Procurement process is the ideal model, because the solutions we are looking for do not yet exist on the market and need to be quite tailored to Amsterdam's situation.