

Eco-efficiency Assessment of Urban Water Supply Systems in Nordhavn

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This project presents an eco-efficiency assessment (EEA) of alternative water supplies in the new city district Nordhavn in Copenhagen. The development of Nordhavn is one of Scandinavia's largest development projects, with the overall vision of creating a sustainable and innovative city district.

The eco-efficiency assessment tool

The EEA combines an environmental lifecycle approach with an economic performance using value chain modeling. The aim is to assess the economic and environmental progress by introducing new technologies in the water supply system in Nordhavn. A concept or a technology that has both an increased environmental performance and economic performance is considered as an eco-innovation.

The proposed alternative urban water supplies for Nordhavn

The concepts used in the EEA were inspired by the existing water supply in Copenhagen and experiences for alternative water supplies. The water resources were distributed to two water use categories; potable purposes (drinking and cooking, bath, cleaning and dishwashing) and non-potable purposes (toilet flush and laundry), depending on the water quality demands.

- Concept 0: groundwater is used for all purposes
- Concept 1: rain- and stormwater for non-potable purposes and groundwater for potable purposes and as makeup water.
- Concept 2: recycled grey wastewater as non-potable water and groundwater for potable purposes and as makeup water.
- Concept 3: a combination of Concept 1 and Concept 2. Rain- and stormwater and water recycled grey wastewater covers the non-potable water demand and groundwater covers the potable water demands.

Results and conclusion

The eco-efficiency indicators considered in this project were climate change, eutrophication and water resource depletion. The results showed that alternative water supply Concept 3 has significantly larger eco-efficiency than the baseline (Concept 0) for all indicators. Both concept 2 and 3 are considered eco-innovations. The most crucial element in the eco-efficiency assessment was the difference in the climate change potential due to the benefits of using warmer recycled grey wastewater for non-potable purposes. The eco-efficiency for the climate change indicator for Concept 3 was 3.8 times higher than the baseline (Concept 0), mainly due to these benefits.

By applying the eco-efficiency assessment in Nordhavn and in similar city developing projects, a wide decision-making perspective is given. The water supply strategy will not be limited to one specific actor or goal, but considers several actors, environmental impacts and economic aspects.