The Baltic Gate Terminal: Building a new mega hub using contaminated soils

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Dredging and coast protection
Carl Bro has completed the environmental impact assessments and initiated preliminary design studies for the Baltic Gate Terminal, the new Danish terminal hub. The terminal hub is primarily intended for transhipment of intercontinental container traffic dealing with ports in the Baltic Sea region.

The terminal
Located at the entry to the Baltic Sea in the Danish Great Belt, the new container terminal hub is planned for construction using 6.4 m$^3$ of contaminated soils as construction fill. Additional to these amounts, 1.2 m$^3$ of sand will be dredged in a nearby marine deposit for use in the construction.

The 100 ha terminal, with a projected capacity of 2.2 m TEU a year, will be situated in a shallow wetland area adjacent to a deepwater channel with an access depth of 20+ m. To operate effectively, the deepwater port will include quay length of more than 1,100 m and storage areas of 80 ha. It will allow two Post-Panamax container vessels and two feeder vessels at berth at the same time. Upon completion, 12 Post-Panamax quay cranes will handle loading and unloading of containers at the terminal.

A phased construction period of 10 years, with continuous infill and gradual construction of terminal facilities, is projected. A separate local industry bulk harbour is to be constructed as an integral part of the overall project. The local bulk harbour will be situated on the southern side of the terminal in the shallow area, and is expected to be operational six months after initiation of construction works. It is intended to handle the major part of the incoming contaminated soil during the construction period.

On the premises of the local harbour, treatment of different types of incoming contaminated soils is projected. Since treatment facilities are designed also to serve the purposes of the adjacent treatment and recycling company RGS90, they will be operational both during the construction period, and after completion.

Construction process
The use of gradual infill has required the design of a construction sequence allowing for optimal usage of already filled land. The first part of the terminal will hence be operational after two years, while full functionality is reached after 10 years. During this 10-year period, terminal operations and construction works will take place in separated segments of the area.

Figure 1. Site of the new Baltic Gate Terminal.

DREDGING AND COAST PROTECTION
The first parts of the terminal will be outer and inner bounds, which delimit the circumference of the terminal, and divide the construction into segments. Of these, the first segment will be ready for infill after three months, while the outer bounds will be completed after two years. At this time, the first part of the terminal operation area will also be complete. After completion of the outer bounds, the water level inside the construction will be lowered by 4 m, to reduce the release of contaminants from infill material. At this point, 4 m³ of water will be held inside the outer bounds – water that gradually will be pumped into the marine surroundings.

The use of innovative cleaning technologies for treatment of this surplus water, which will be contaminated with both organic and heavy metal components, has hence become part of the project. Since the concentration of contaminants in the initial stage of the construction period will be very low, the cleaning of the surplus water will begin when a defined threshold level of contaminants is exceeded.

In combination with rigorous demands for imperviousness of the construction, it is therefore guaranteed that only a minimal release of contaminants to the environment will take place. The release will be strictly regulated and will only take place during the construction period due to the surplus water. After completion of the construction, a reduced water level will be maintained inside the construction, thereby ensuring an inward water level gradient.

Environmental concerns

Though located adjacent to local heavy industry, the magnitude and marine location of the Baltic Gate Terminal has raised significant public concerns. Natura 2000 sites and RAMSAR zones closely border the new terminal, with only a narrow passage for shipping traffic. The environmental impact assessment has consequently been subject to considerable public attention, and all parts of the environmental assessments have been scrutinised repeatedly.

Carl Bro has undertaken investigations of impacts ranging from noise, gasses, dust, odour emissions, visual appearance, and potential leakage of contaminants to the surrounding environment, to impacts on coastal morphodynamics and marine archaeology, during both construction and operation of the terminal.

The assessment includes:

• Leaching experiments;
• Numerical modelling of hydrographical and environmental dynamics; and
• Modelling of noise emissions.

based on which impacts on populated areas, birds, wildlife and habitats have been projected.

The amount of public attention has demanded a high level of detail in the biological assessments, at a time where EU legislation is not fully implemented into Danish legislation and the new concepts of ‘good environmental quality’ is still unresolved.

To ensure minimal impact to the surrounding environment, monitoring programmes for bird life, the marine environment and terrestrial habitats will be established during the construction process.

Final comment

In summary, the construction of the Baltic Gate Terminal will demonstrate that the cost-effective solution of using contaminated material for construction material, can at the same time provide optimal protection from potential environmental problems.