

# Le Havre - Port 2000 : A new Containerport with a simultaneous move towards environmental rehabilitation of the Seine Estuary (1996–2016)

by

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## 1. Presentation of the project

. The “Port 2000” container facility was studied at the end of the 1990’s, built starting 2001, and had its first commercial operations in April 2006 (Figure 1).

It was born from the will of the French State to position Le Havre as a main gateway for the flows of containerised goods. Today, it has 3500 m of heavy duty container quays for vessels of 16+ meters of draught.



**Figure 1. Port of Le Havre after Port 2000 expansion**

Total costs of Port 2000 port works have been approximately 900 Million € (or MM €) public money plus 600 MM € private money for all terminal facilities

Today, the port accommodates every days of the year, in any tidal condition, ships of more than 10 000TEU's and often up to 20 000 TEU's

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The expansion also provided the opportunity to contribute to the environmental restoration of the Seine Estuary (Figure 2) with a budget of approximately 50 MM €.

To develop new intertidal wetland (mudflat) the following elements were constructed: a groin plus modifications of low-crested breakwaters plus the dredging of a purely environmental channel (> 1,5 MM m<sup>3</sup>) (21 MM €).

Two bird resting areas also were constructed, one on land using existing hunting ponds (3 MM €) and one in the south of Seine Estuary with the creation of an artificial island made of sand and gravel from the port works (9 MM €).



**Figure 2. Habitat improvements in the Seine Estuary showing the dredged environmental channel .**

Beyond these efforts, an important survey program was performed to increase the existing knowledge of the environment of the Estuary and the Port Authority contribution to the management of “Nature Reserve of the Seine Estuary” increased.

## **2. Port 2000: Applying the Working with Nature Philosophy**

### **Step 1: Establish project needs and objectives**

Port of Le Havre is at the mouth of the Seine River, at the entrance of English Channel and is a natural gateway to Normandy, Paris and North-West Europe. The Port 2000 vision was to leverage this nautical position to reinforce Le Havre as one of the major entrances to Europe for all sizes of containerships arriving from Asia or the Americas. The objectives of the port project included guaranty of quality and safety for the ships and goods entering Europe, competitiveness of port operations, increased employment for the region and increased capacity to accommodate long term growth of container traffic and size of ships.

The discussions with stakeholders pointed out that the weakest part of river Seine outer estuary were wetlands. Therefore the environmental objectives of the project focused on wetland restoration and creation. Wetlands (including mudflats) are much valued in the Seine Estuary due to historical losses, making the wetland component of the project integral to its success.

### **Step 2: Understand the environment**

In the 1990's, during the project's initial development, global environmental studies of the Seine Estuary, were performed to include the measurement of currents wave patterns and sedimentological processes. These studies built on previous studies performed in preparation of the Bridge of Normandy construction. Studies included measurements in the field, and physical and mathematical modeling to support an understanding of hydrodynamics and sediment transport in the river.

Biological studies also were performed and included studies of fishes and fish nurseries; a comprehensive survey on bird habitat; a study of the use of the estuary by birds, permanent and migratory; and a survey of amphibians and plants. The studies were performed in the port area, and to understand the larger estuary conditions outside and upstream of the port.

These studies were analyzed and summarized in a report prepared by a "Committee of Independent Experts on the river Seine Estuary" (1999). This Committee also presented recommendations for the development of the environmental and habitat components of Port 2000 project.

### **Step 3: Make meaningful use of stakeholder engagement to identify possible win-win opportunities**

The Port Authority decided to engage stakeholders and their consultations at an early stage to facilitate dialogue, mutual understanding and public acceptance of the project. This approach helped avoid unnecessary "stops and gos" in the project associated with public concerns.

There were many informal discussions with multiple stakeholders as early as 1996, well before the four months of official Public Hearings (Débat Public) were held in 1997 and 1998. This consultation of stakeholders continued through all phases of work, through construction, and up to the start of operation in 2006.

Thanks to all those discussions with stakeholders, the importance of wetlands and mudflats in the Seine outer estuary was put forward and it was decided to concentrate many of the environmental measures on these wetlands. It is also after dialogue with stakeholders that the building and also the design of a bird island in the south of the estuary was decided.

Specific attention was given to fishermen interests as in early years, fishermen associations opposed the project due to concerns of impact to fish nurseries in the Seine River and Estuary, and also due to concerns regarding reduced fishing opportunities due to port operations and the increased turbidity.

Results of all studies were shared, thus building relationships among stakeholders year after year. Port engineers worked with fishermen associations to address their concerns, build trust, and protect the environment. During construction, before any new phase of construction, in particular before dredging, meetings were held with fishermen and contractors to help protect fisheries and the environment to the maximum extent practicable.

#### **Step 4: Prepare initial project proposal/design to benefit navigation and nature**

The design of the groin and environmental channel for mudflat creation used the physical and mathematical models developed for the port design, to identify and realize opportunities to minimize sediment transport, optimize habitat creation, and maximize habitat stability. These measures led to win-win-win approaches that benefited Port 2000 economics, public perception and the environment.

The extensive hydrologic and sediment transport studies conducted at the beginning of the project showed that one of the risks associated with the Port 2000 expansion was the threat of upstream (eastward) sediment transport due to the acceleration of currents from Seine Bay during flood tides. These sediments could have moved towards existing mudflats with adverse effects including burial and smothering of existing habitat. To address this risk, the project included morphological dredging of approximately 3.5 MM m<sup>3</sup>, south of the breakwater, to remove sediment with the greatest potential for upstream transport from the estuarine system.

Regarding the main breakwater of 5 kilometres an innovative design was decided with first building of a +3m (marine-level) sub-base made with dredged gravel (Figure 3). This substantial re-use of dredged material was cost effective and provided environmental benefits by minimizing dredged sediment disposal.



**Figure 3. Breakwater sub-base made of gravel**

The necessity of a bird island in the southern part of the estuary emerged from stakeholders during the Public Hearings. This island (Figure 4) was designed with a fruitful dialogue with ornithologists and constructed south of the estuary, also using dredged material from the port construction.



**Figure 4. Bird Island constructed using dredged sediment.**

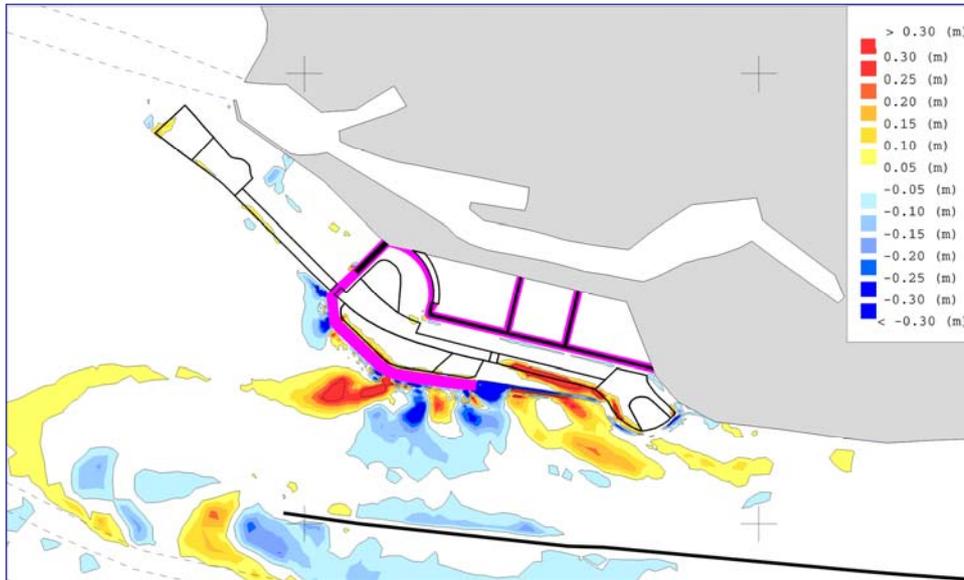


Globally the project reused 26 MM m<sup>3</sup> sediment, of the total 45 MM m<sup>3</sup> dredged for the new channel and basin.

Also it is good to point out the plant survey demonstrated the presence of a very rare and protected orchid named "*Liparis loeselii*". As a consequence the port modified the project to exclude the area favorable for *L. loeselii*, thus minimizing unintended habitat impacts.

### Stage 5: Build and implement

Construction of the project also considered environmental impacts and established measures to minimize environmental harm. Contractors were required to use mathematical models (Figure 5) to phase aquatic construction (e.g., dredging, building the breakwater) to identify progressive solutions that recognized current velocities and sediment transport potential.



**Figure 5. Mathematical modelling of Breakwater**

Physical and mathematical models also were used to evaluate the stability of the gravel sub-base of breakwaters in the presence of natural currents, with the goal of working with and not against natural water flows, thus achieving substantial economic improvements.

Building of the groin and the environmental channel was performed adaptively, to allow adaptations to the design during construction, in accordance with actual sediment transport processes.

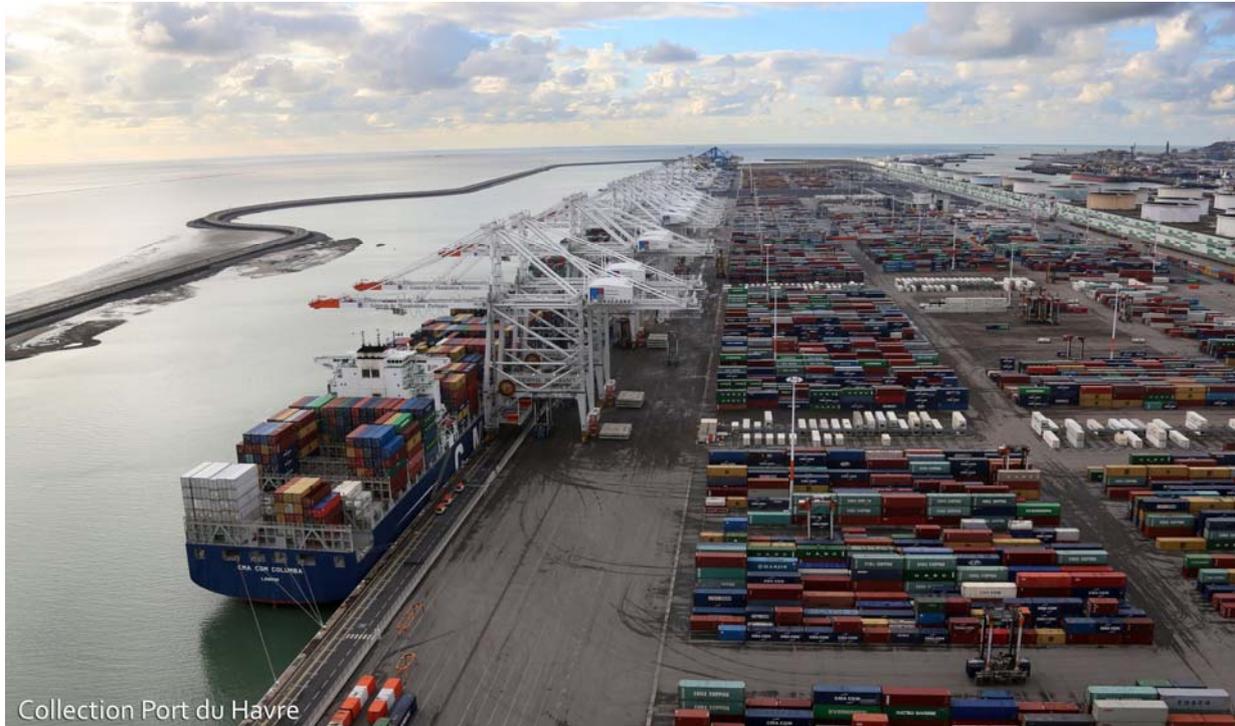
### Stage 6: Monitor, evaluate and adapt

The Port Authority established a 10+ year monitoring program that extends from the Bridge of Tancarville to the sea. The monitoring program aim and objectives were defined by an independent scientific committee active in Seine estuary, before it was officially approved by local state government (Préfet de Région) Regular presentations of monitoring results have been made to this scientific committee that has been an active participant in the monitoring, sometime asking for additional surveys.

The monitoring program includes specific attention to fish, birds and amphibians. Monitoring also extends to sediments, water quality, and all type of species living in the estuary. For fishes, monitoring also includes a socio-economic evaluation of the fishing industry to give assurance to fishermen that the new port does not adversely impact fishing.

The Port Authority shares its experiences with the public and with other port authorities to transfer knowledge and expand their experiences universally. Beyond meetings with stakeholders, which are still ongoing, the Port of Le Havre organized and led an International Symposium in May 2015, focused on Port 2000 environmental measures, in combination with the “Estuarine Coastal Sciences Association.”

**For any additional information** contact Paul Scherrer the project manager of Port 2000 from 1994 to 2014 ([pscherrer76@gmail.com](mailto:pscherrer76@gmail.com)) or Pascal Galichon, the deputy project manager of Port 2000 and current Manager of Sustainable Development at Port of Le Havre Authority ([pascal.galichon@havre-port.fr](mailto:pascal.galichon@havre-port.fr))



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