

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

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### **1. Presentation of the project**

The Port 2000 container port was studied at the end of the 90's, built starting 2001 and had its first commercial operations in April 2006.

It was born from the will of the French State to position Le Havre as a main gateway for the flows of containerised goods. It has nowadays 3 500 m of heavy duty container quays for vessels of 16+ meters of draught.



This huge port operation also provided the opportunity to initiate a real move towards the environmental restoration of the Seine Estuary with a budget of approximately 50 Million €. To develop intertidal wetland (mudflat) there was in particular dredging of a purely environmental channel (More than 1,5 Million m3)



There was also the building of two bird resting areas, one on land using past hunting ponds and one in the south of Seine estuary with the creation of an artificial island.

Beyond these works, an important survey program is done to increase the knowledge of the environment of the Estuary and the port contributes to the management of "Nature Reserve of the Seine Estuary".

## **2. Port 2000, Working with Nature philosophy even before the position paper.**

Port 2000 as a whole is quite a good example of the Working with Nature Philosophy applied to a huge project, even before the position paper was finalized.

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

Port of Le Havre is very close to the entrance of the main navigation route to British Channel and North Sea. The idea of Port 2000 was therefore to use the opportunity of this nautical advantage to confirm Le Havre as one of the major entrance to Europe for all size containerships coming from Asia or America.

At the same time, even if the project did not have many adverse effects on the intertidal wetlands the environmental objectives of the project focused on wetland restoration as this ecosystem was recognized as Seine estuary weakest part.

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

Completely at beginning of project in the years 1990's, there were global environmental studies of the Seine estuary, also using the results of the studies conducted some years before for the Bridge of Normandy.

These studies were on currents, wave patterns and all sedimentological issues in the estuary. This was performed via on site surveys, physical and mathematical modeling.

There were also specific studies on fishes and fish nurseries and a complete survey on bird habitat and use of the estuary by birds, permanent or migratory. There was also complete survey on amphibians and plants in the global area of the possible future works.

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

Port Authority decided to go through very early stakeholders consultations to facilitate dialogue, understanding and acceptance of the project, avoiding therefore any stops and go.

There were many informal discussions with all stakeholders concerned starting 1996 well before the official "Débat Public" (Public Hearing) of four months performed in 1997-1998. This consultation of stakeholders continued during all study phase and later work period up to the start of operation in 2006.

Specific attention was given to fishermen interest as the fishermen associations were at the beginning declared opponents to the project as they feared big impact on fish nurseries in the river Seine and also reduction of fishing possibilities due to the works and the increased turbidity. All the continuing studies were conducted with sharing of results, thus building year after year good technical relations, proving the real capacities of port engineers to work with fishing data and even more important building trust between the individuals. During works, before any new phase, in particular for dredging, there were also meetings with fishermen and contractors to facilitate start of works.

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

There was a risk of natural transport of sediments south of the project due to acceleration of currents. These sediments could have moved towards existing mudflats with adverse effects. It was therefore decided to have morphological dredging of some 3,5 million m<sup>3</sup> south of the breakwater to take them outside of the estuarine system.

Regarding the main breakwater of 5 km length an innovative design with a sub-base up to +3m marine level made with dredged pebbles permitted substantial re-use of dredged material and also financial economies.

The bird island south of the estuary was also designed to use a maximum of dredged material from the port.



Globally for all the different works, the design allowed use inside the project of some 26 Million m<sup>3</sup> out of the total 45 Million m<sup>3</sup> to be dredged for new channel and basin.

The fauna-flora survey demonstrated the presence of a very rare and protected orchid named “Liparis Loeseli”. The port modified some part of project to exclude all the area favorable for that orchid.

#### **Stage 5: Build and implement**

The use of mathematical modeling for the phasing of building the breakwater that was performed by all contractors during tendering permitted to choose an alternative solution much more progressive regarding current velocity increase and therefore movement of sediments in the estuary.

Also physical and mathematical modeling of the stability of the gravel sub-base of breakwaters permitted to work really with the natural currents and not against them thus achieving substantial economies and gain of time.

#### **Stage 6: Monitor, evaluate and adapt**

A more than 10 year monitoring program on a wide area from Bridge of Tancarville up to outer sea is still under way.

Specific attention is given to fish, birds and amphibians surveys but of course monitoring extends to sediments, water quality, benthos species and all type of species living in the estuary.

The Port Authority considers also of utmost importance to share the experience issued from all these works, in particular by organizing in 2015 an International Symposium focused on Port 2000 environmental measures in combination with the “Estuarine Coastal Sciences Association”.