

Lagoon of Venice



**The interventions to
safeguard the lagoon of Venice**

**A project dealing
with uncertainties**

... in the past

... in the present

... in the future

Lagoon of Venice



The lagoon is.....

Venice





Island of San Lazzaro degli Armeni



Island of Torcello



Laguna sud. Valle Zappa



Salt marshes, channels and “tidal creeks”



Jesolo beach



Marghera. Dragaggio canali industriali



Marghera



Lagoon of Venice



An environment to be protected for the next generations.....

.....

taking in to account the existing problems

Isola delle Tresse. Dispersione inquinanti



Porto Marghera. Industrial canals

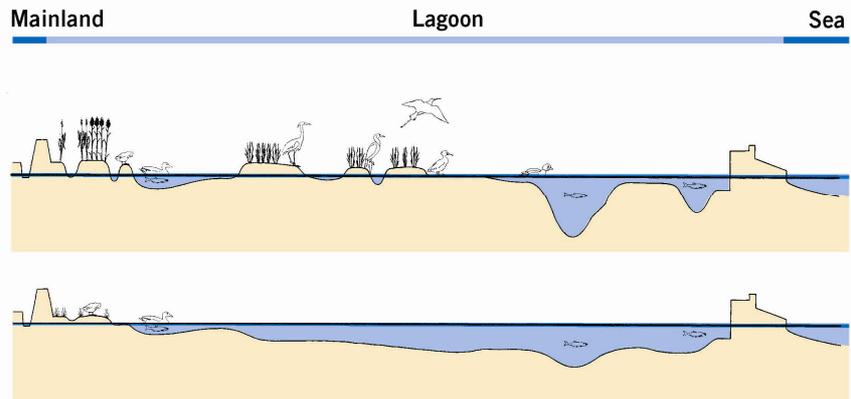


Eroding salt marsh



The lagoon becomes a bay

Alteration of the morphological structures



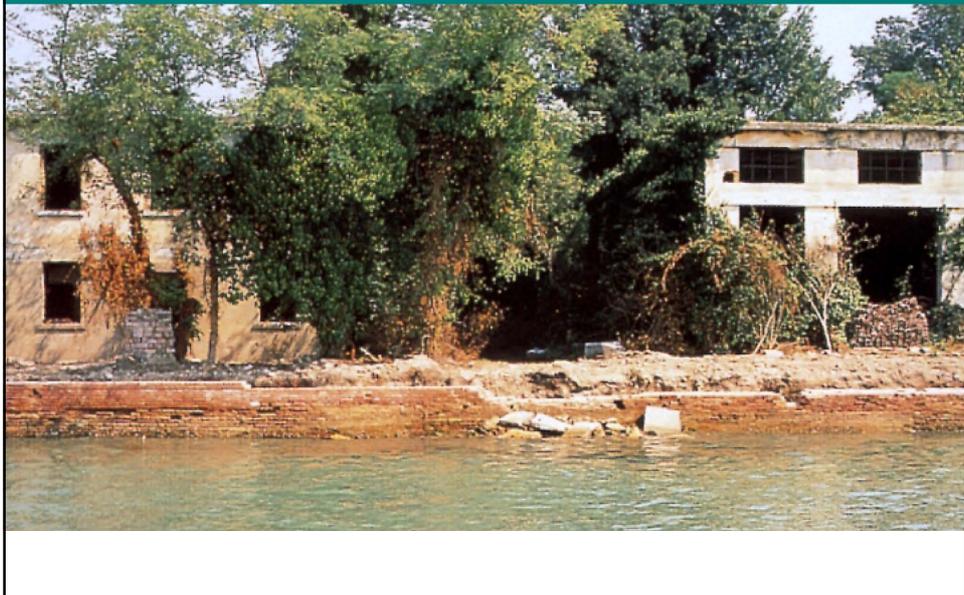
Pellestrina littoral after the flood of November 4th, 1966



Pellestrina. The littoral before interventions



Island of Certosa. The bank before interventions



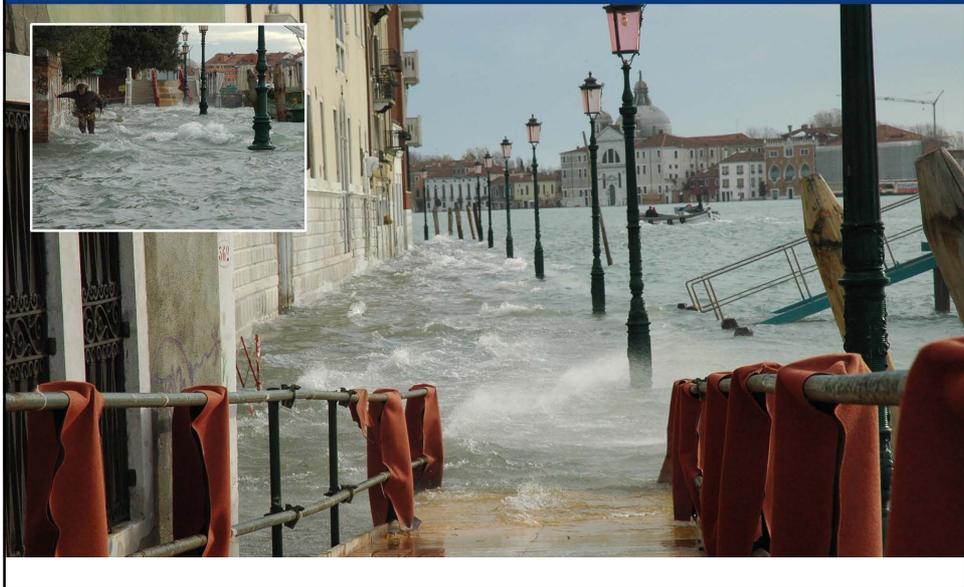
Chioggia. Acqua alta



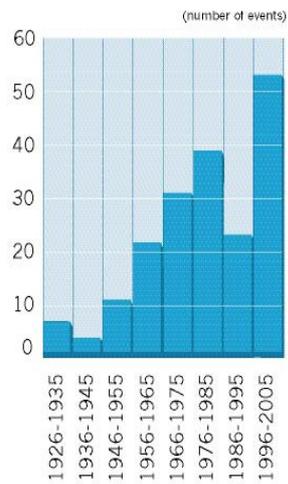
Acqua alta del 24 ottobre 2006 (+112 cm)



Venice. December 1, 2008



Frequency of high tides ≥ 110 cm



(tidal levels in cm)

November 4, 1966	194
December 22, 1979	166
February 1, 1986	159
December 1, 2008	156
November 12, 1951	151
November 16, 2002	147
October 15, 1960	145
November 6, 2000	144
November 3, 1968	144
December 8, 1992	142

Lagoon of Venice



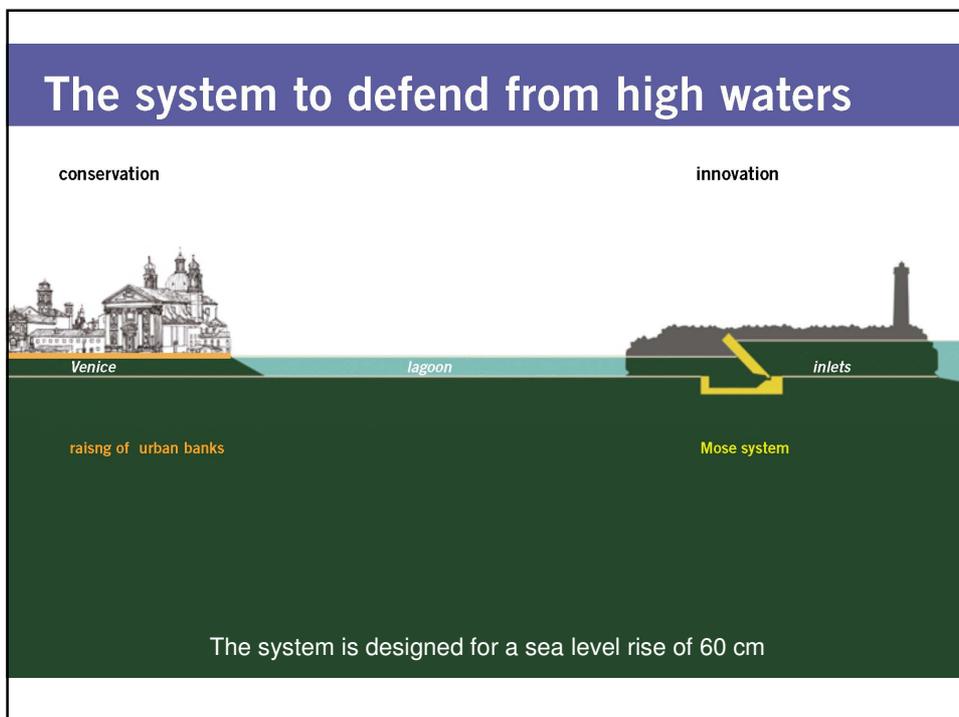
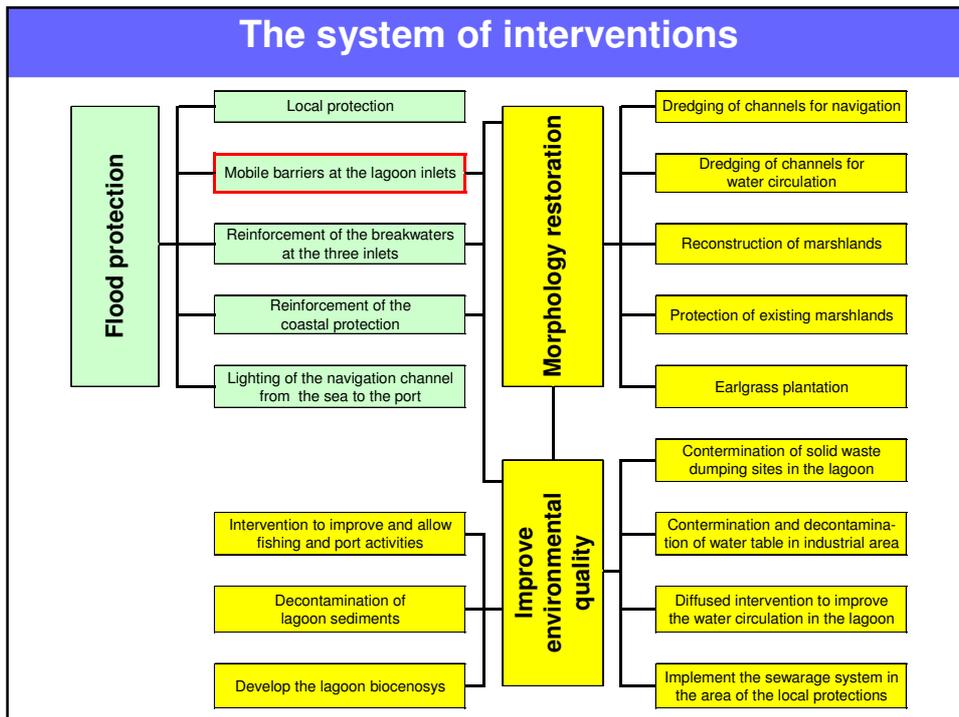
All lands are very flat and interested by a dense net of channels

Buildings are adjacent to the channels or at a short distance

Floods are frequent and even minor

Floods impact on:

- ✓all the economic activities
- ✓social habits
- ✓mobility
- ✓environment
- ✓stability of the existing structures



Local defences

●
Intervention areas

Works completed

Works extension
100 km

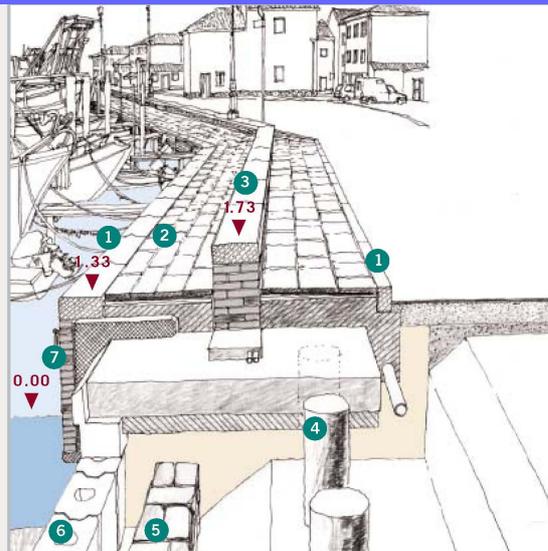
Total surface
areas protected
1,300 hectares



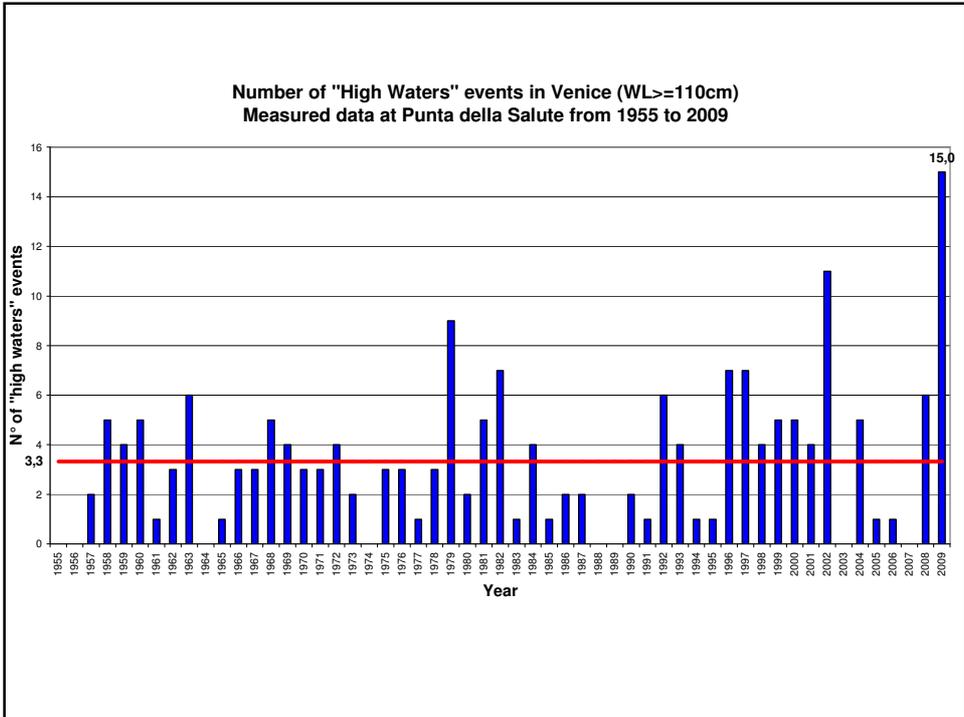
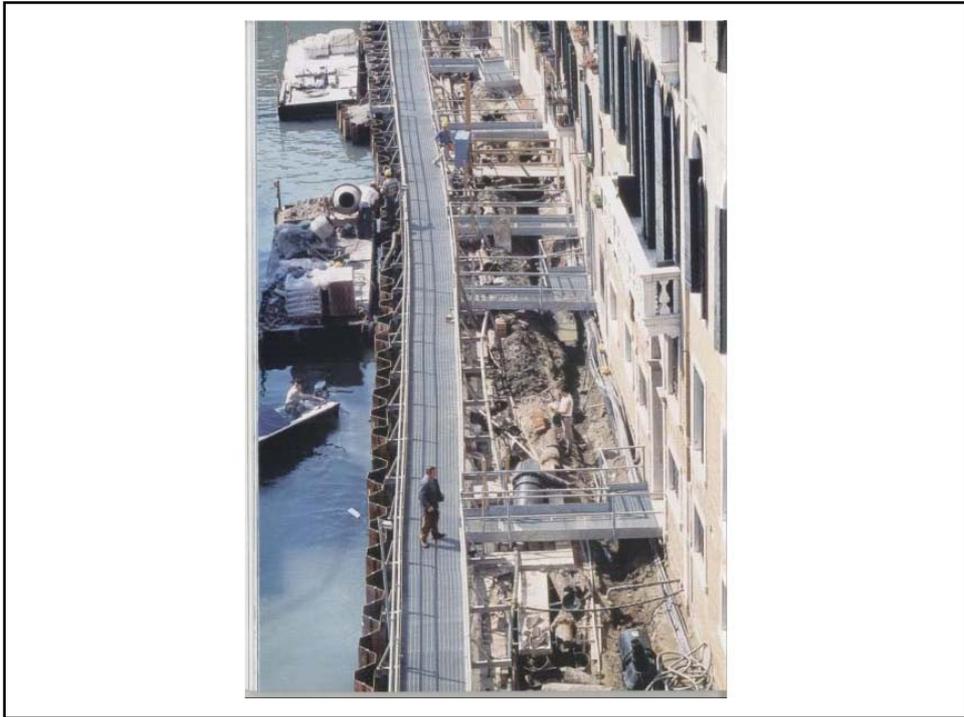
Pellestrina - Section of the new bank

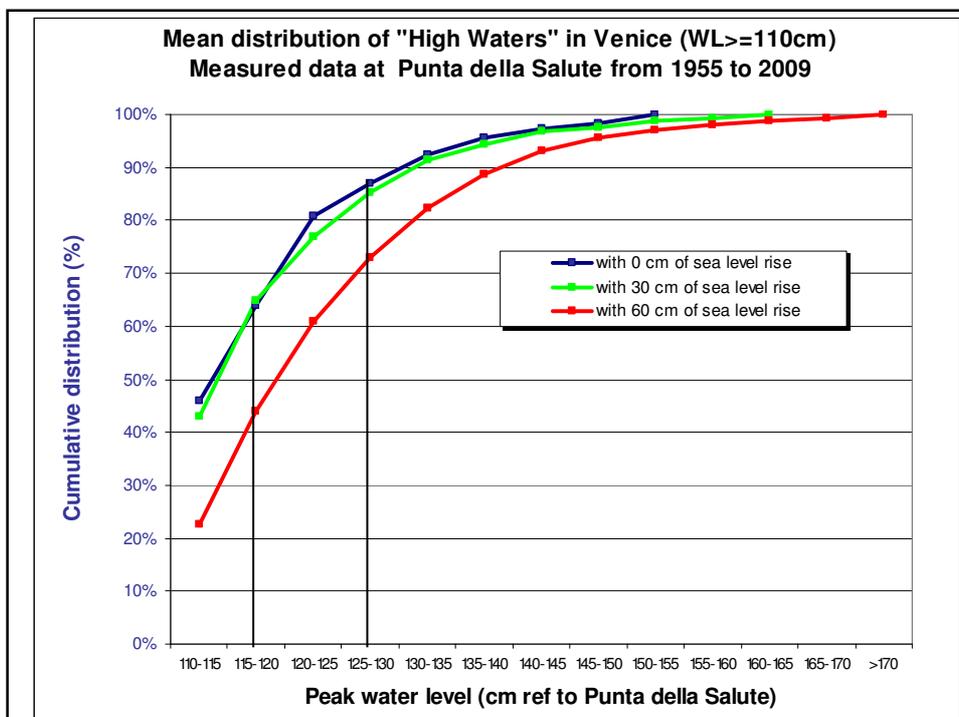
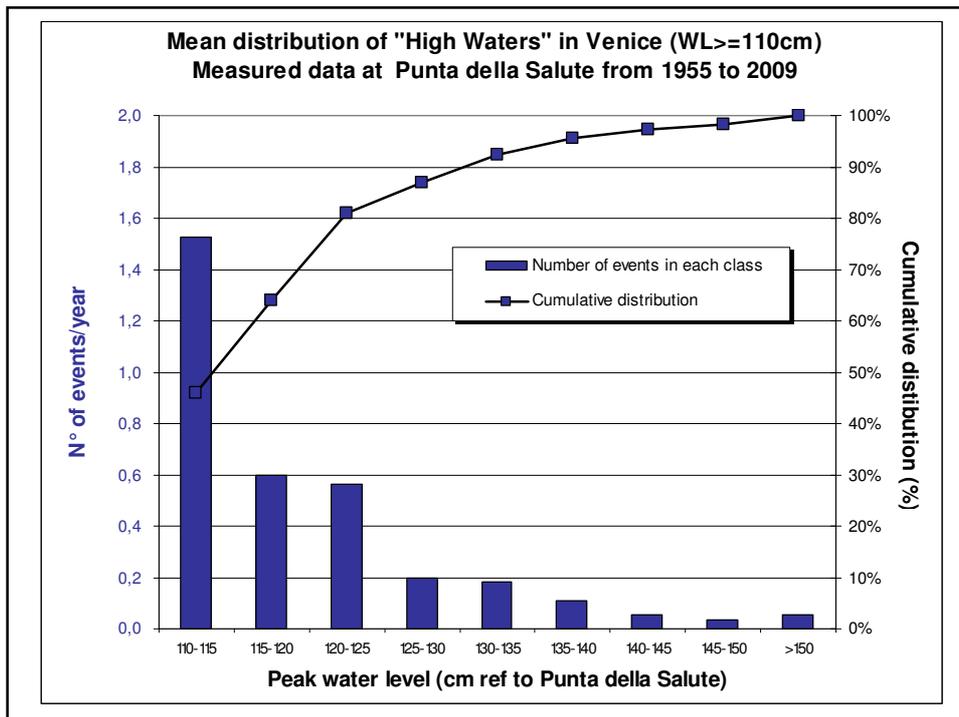
Sezione tipo correnti

- 1 cordolo di pietra tipo Istria
- 2 pavimentazione di trachite
- 3 coronamento di pietra tipo Istria
- 4 palo trivellato in c.a.
- 5 muro preesistente
- 6 palancole in c.a.c.
- 7 rivestimento di mattoni tipo a mano









Variation of the design conditions with the sea level rise

**Increase of the
floods frequency**

X 30

**with 60 cm of
eustatic rise**

**Increase of the design
differential levels**

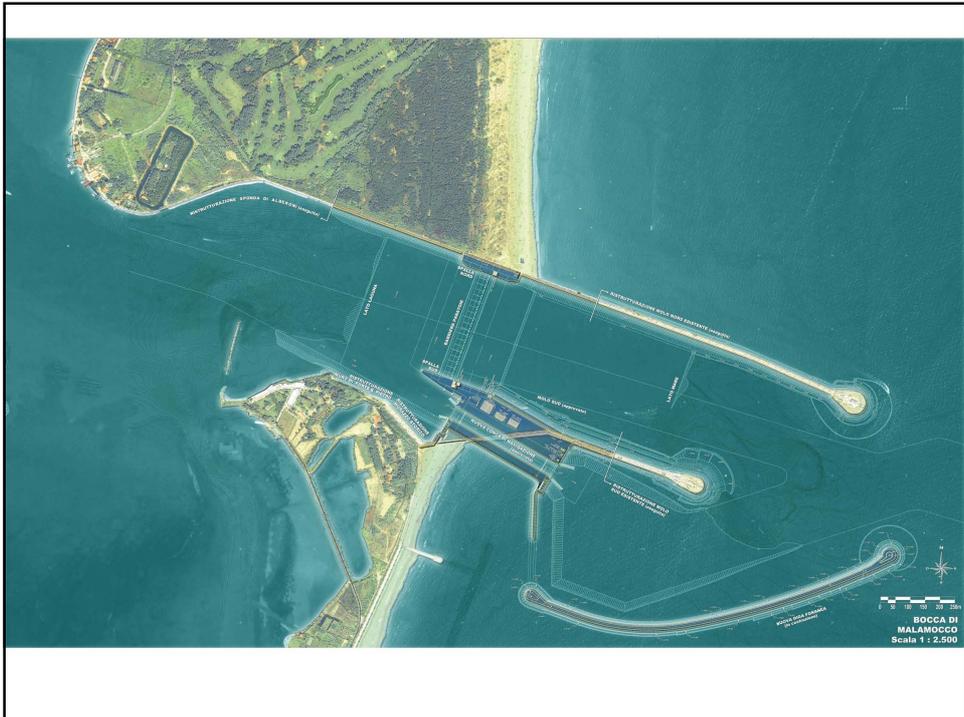
X 1,3

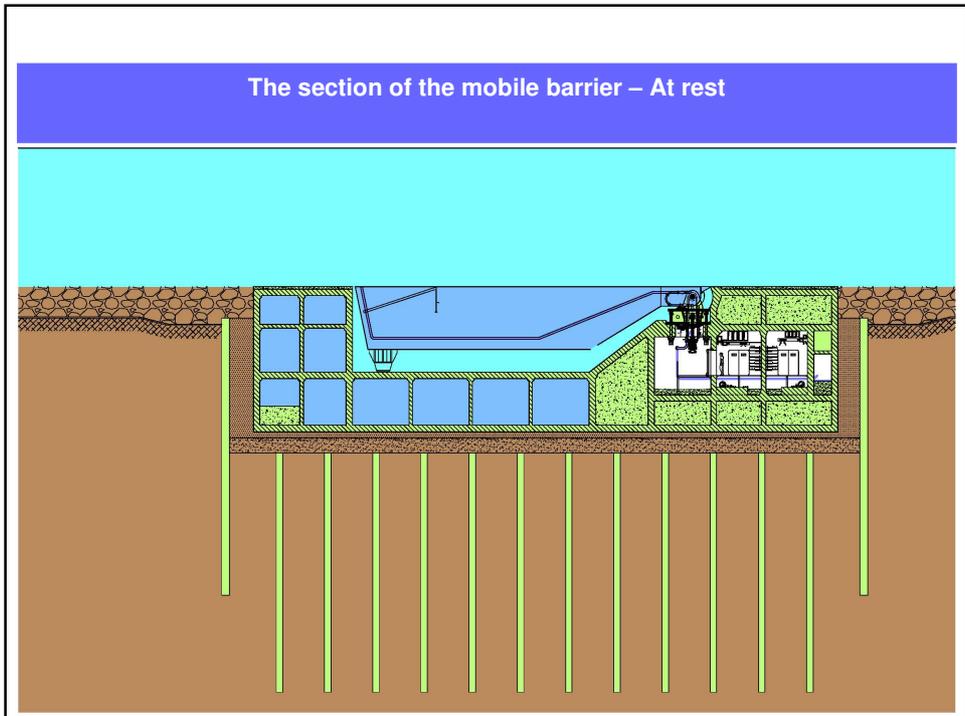
**with 60 cm of
eustatic rise**

Basic criteria for the barrier design in view of the sea level rise

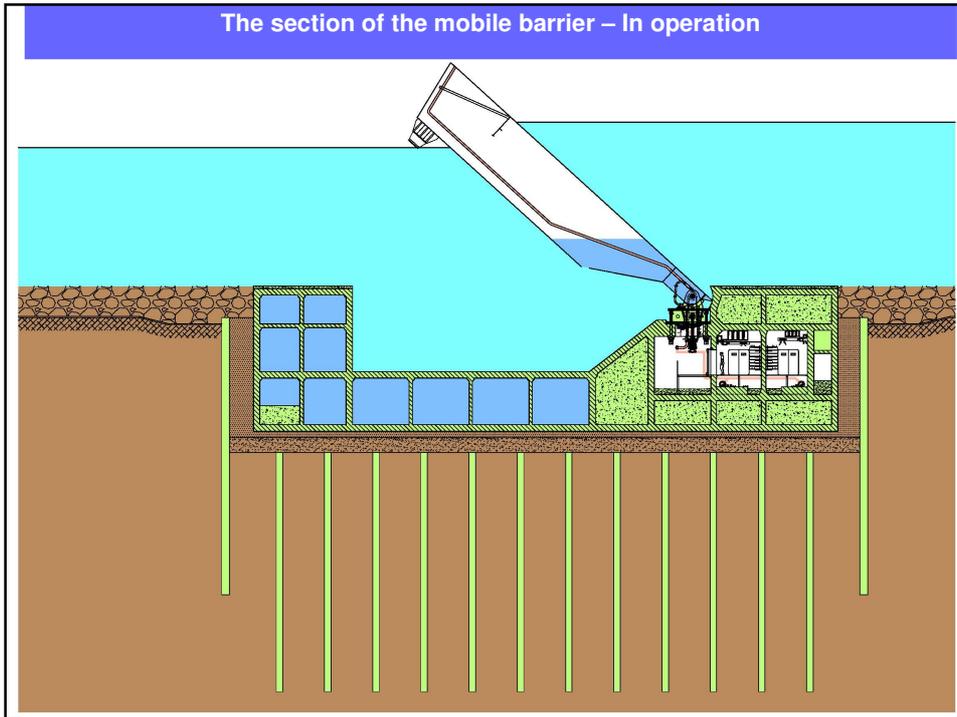
- ✓ **Each barrier should be split in smaller elements in order to offer a high level of flexibility**
- ✓ **Gate maintenance shall maintain in any moment the full efficiency of the barrier.**
- ✓ **The gate operations shall be supported by a fully automatic DSS for frequent decisions minimizing the closure number and duration**
- ✓ **An adaptative management procedure must be a key component of the design criteria**

Bocca di Lido

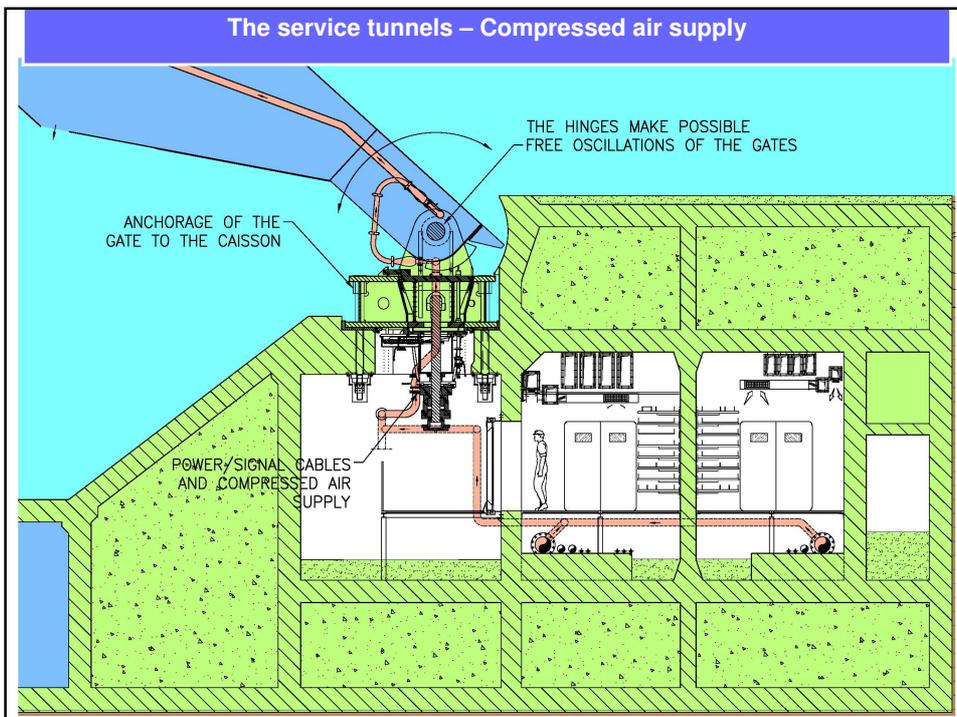




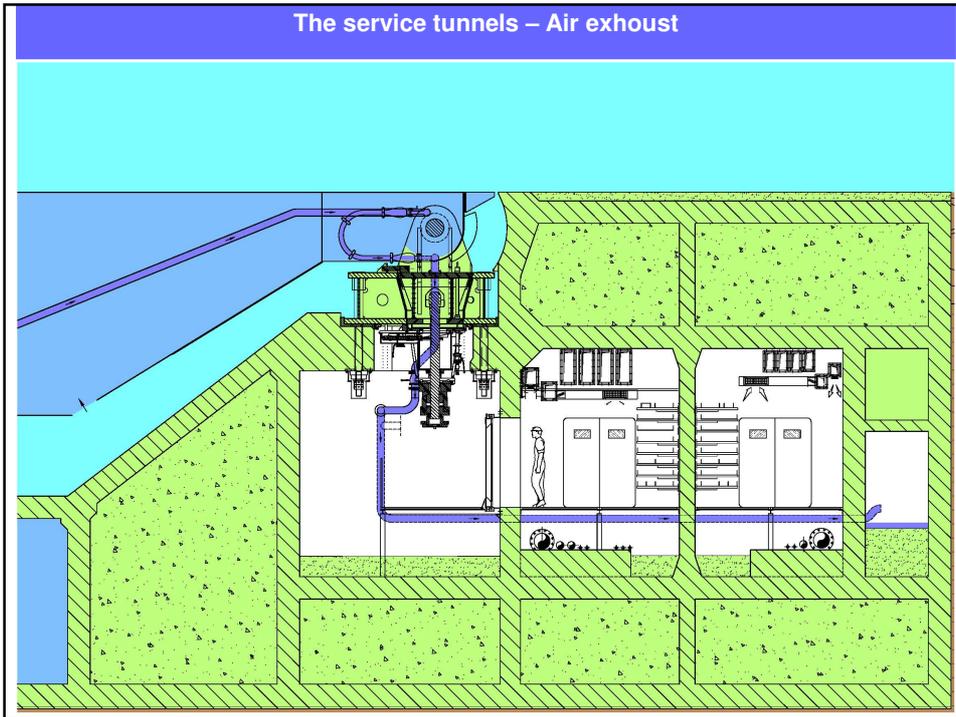
The section of the mobile barrier – In operation



The service tunnels – Compressed air supply



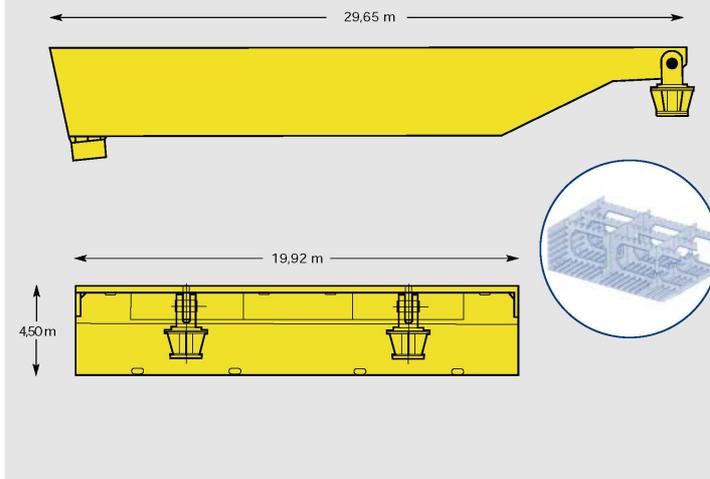
The service tunnels – Air exhaust

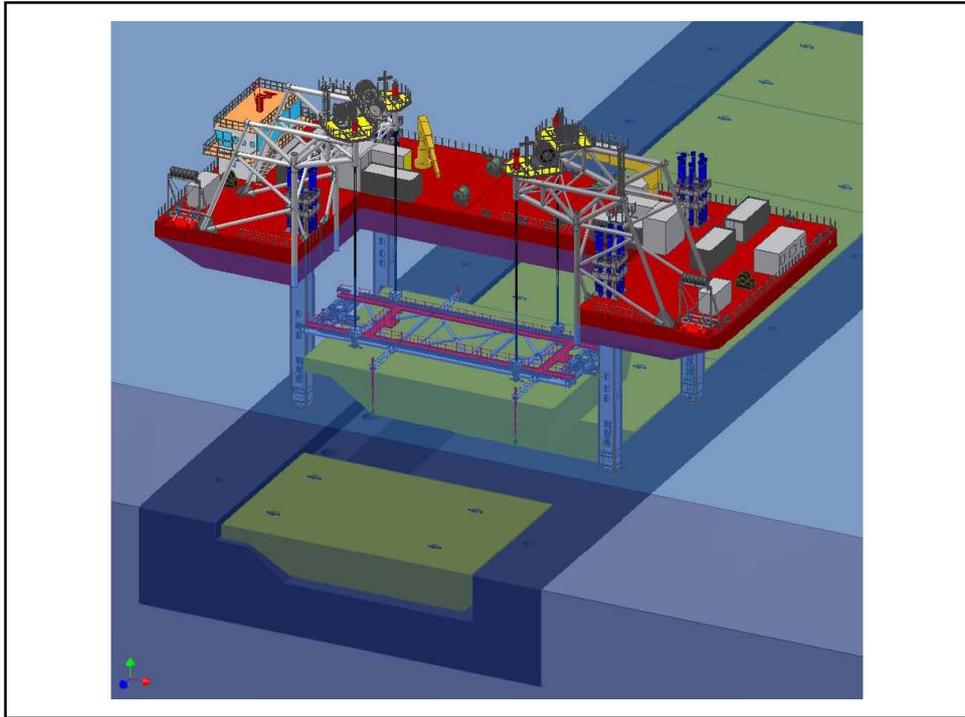


Malamocco

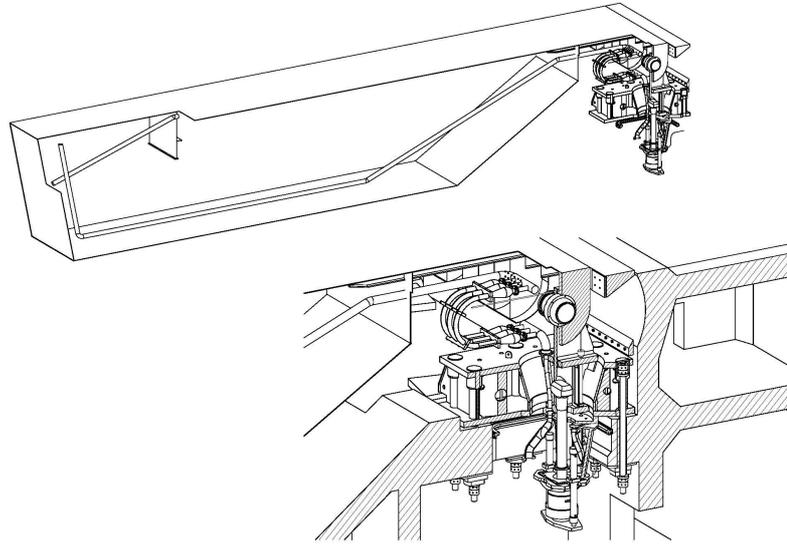
Building details
of the gates

*side view
back view
and structural
arrangement*

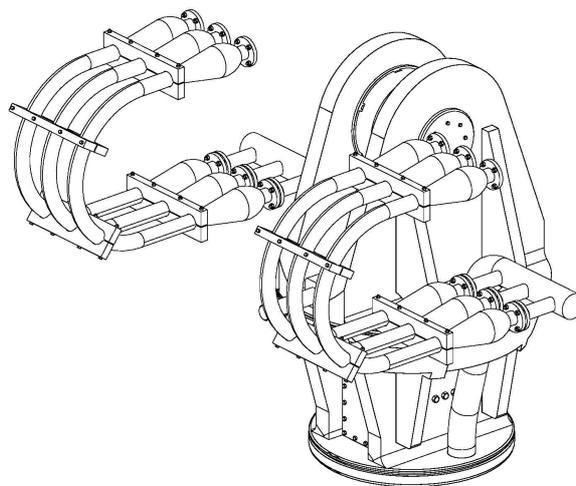




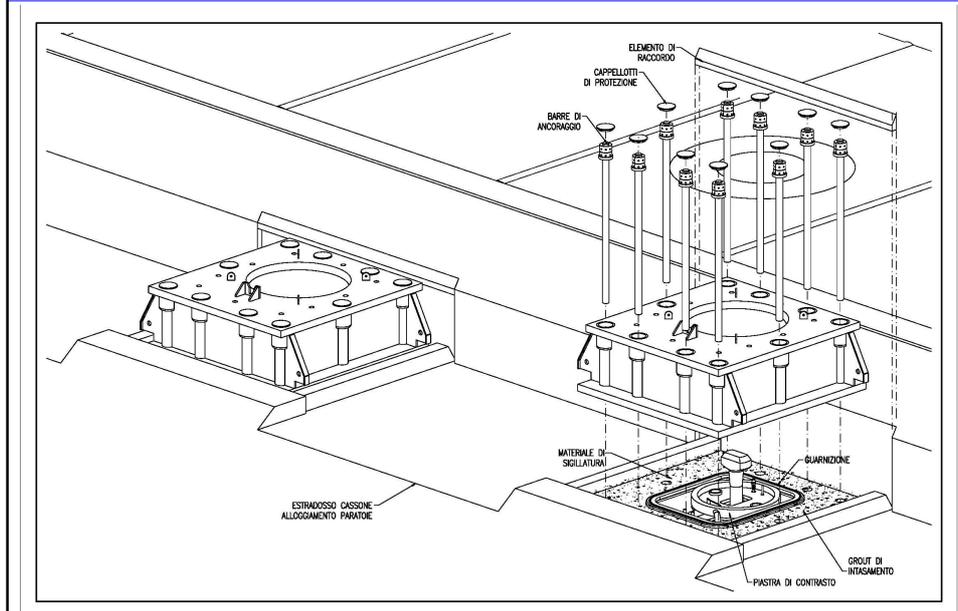
The flap gate connected to the foundation caisson



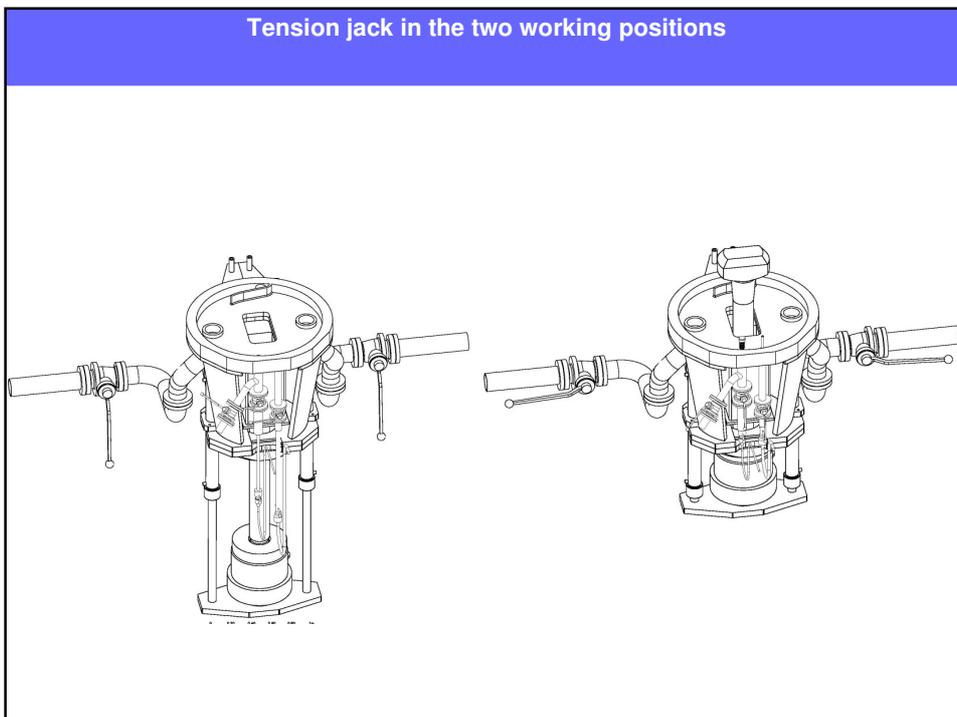
The male and the hinge



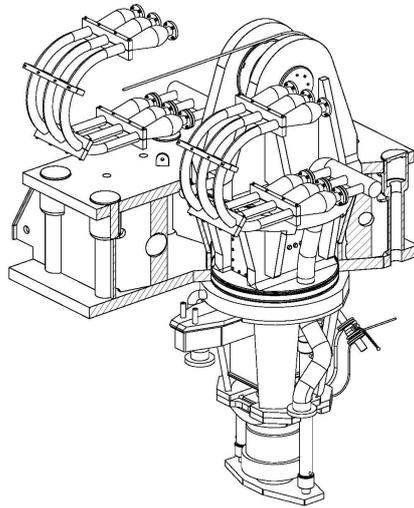
The female



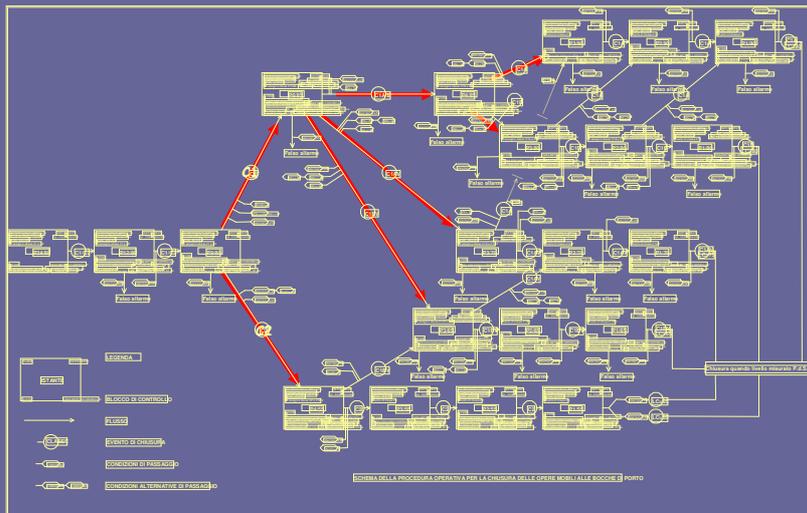
Tension jack in the two working positions



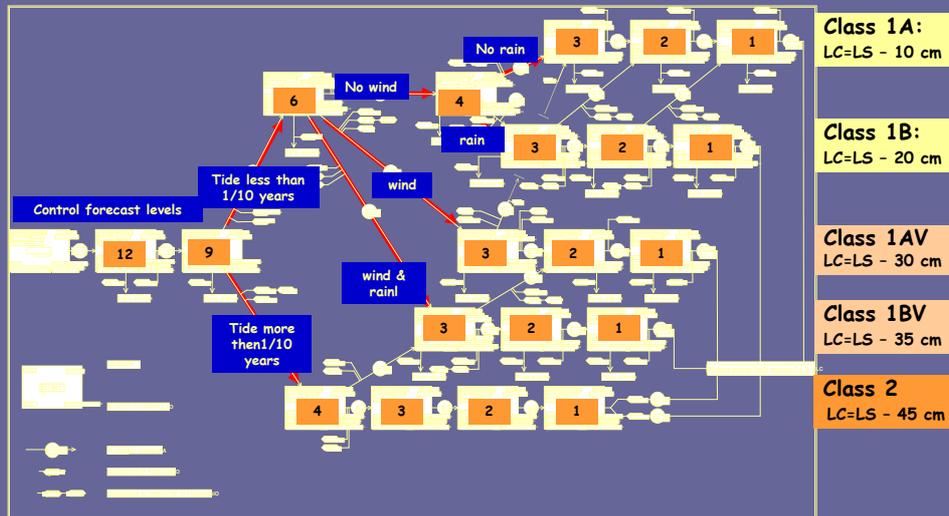
The hinge – connector complete unit



Complete Decisional Scheme

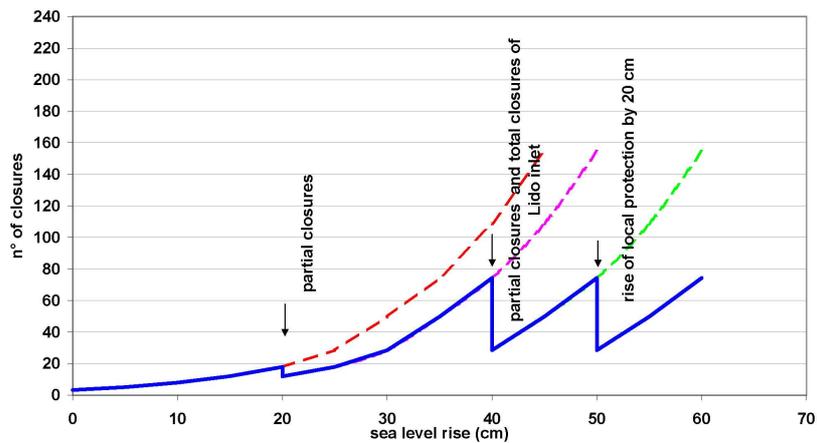


Complete Decisional Scheme



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Adaptative management for the flood protection of Venice with different scenarios of sea level rise



Adaptative management for the flood protection of Venice with different scenarios of sea level rise

