

Chapter 4: Considerations at systems level



ct5308 Breakwaters and Closure Dams

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Functions of breakwaters

- protection against waves
 - protection of port and shipping under normal conditions
 - protection of ports under extreme conditions
 - shore protection
- guiding of currents
- protection against shoaling
- provision of dock and quay facilities

Allowable wave heights

Type of vessel	Maximum H_s in m at the berth
Pleasure craft	0.15 – 0.25
Fishing vessel	0.40
Dredges and dredge barges	0.80 – 1.00
General cargo (<30.000 dwt)	1.00 – 1.25
Dry bulk cargo (30.000 dwt)	1.00 – 1.25
Dry bulk cargo (<100.000 dwt)	1.50
Oil tankers (<30.000 dwt)	1.00 – 1.25
Oil tankers (<200.000 dwt)	1.50 – 2.50
Oil tankers (<300.000 dwt)	2.50 – 3.00
Passenger vessels	0.70

data from Thoresen, 1988

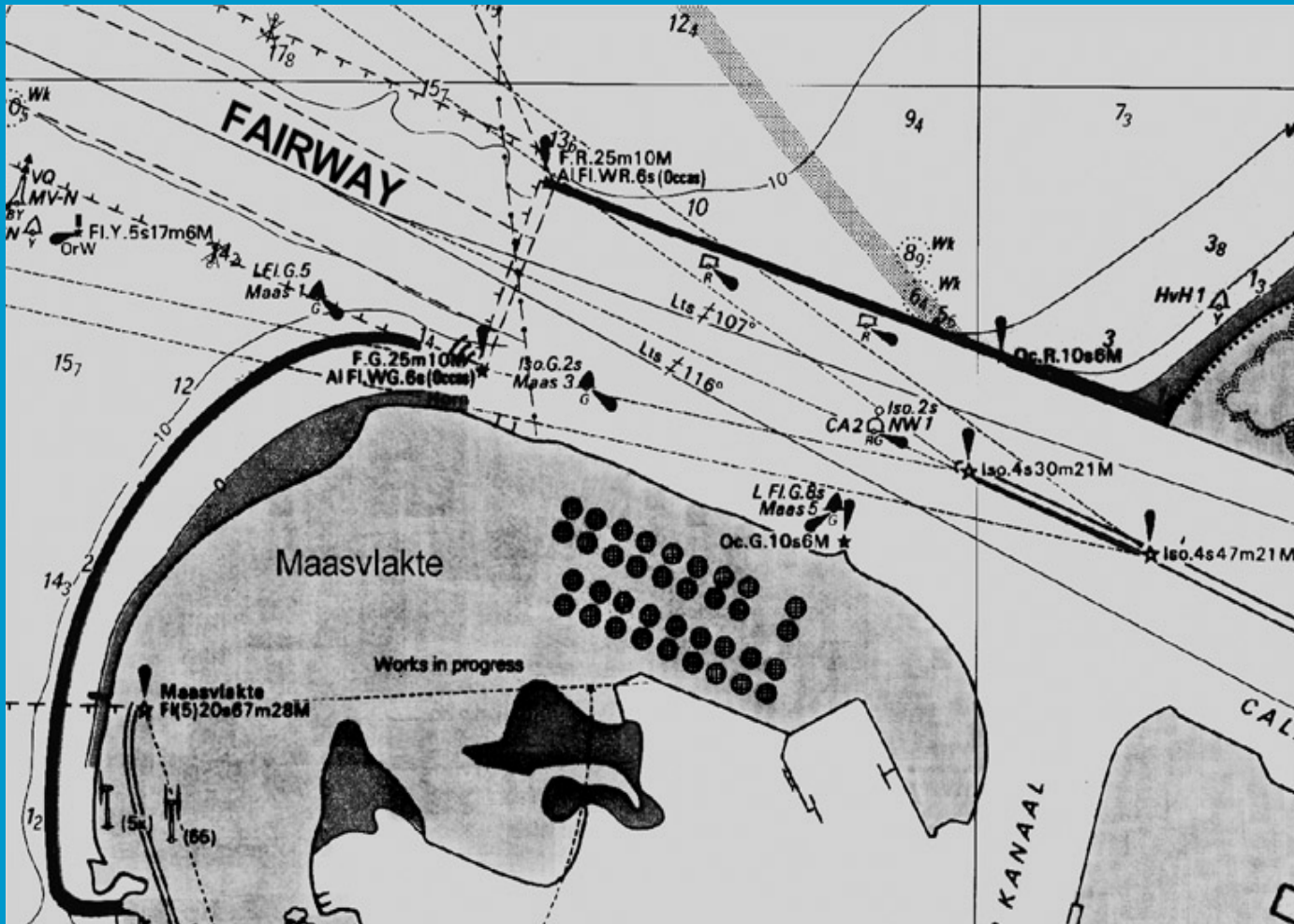
harbour of Marseilles



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Breakwater at the Europort entrance



A system of detached breakwaters at Fiumicino, Italy



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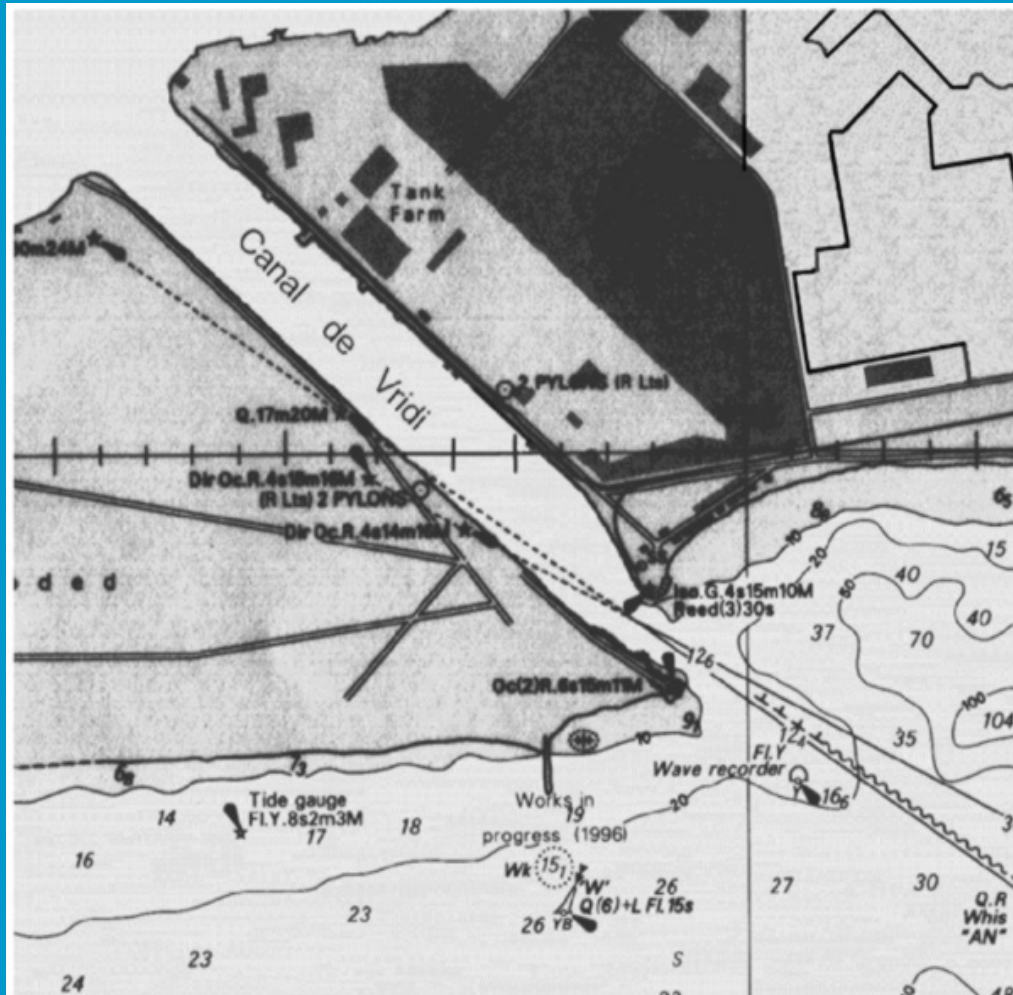
Flow pattern at the Europort entrance



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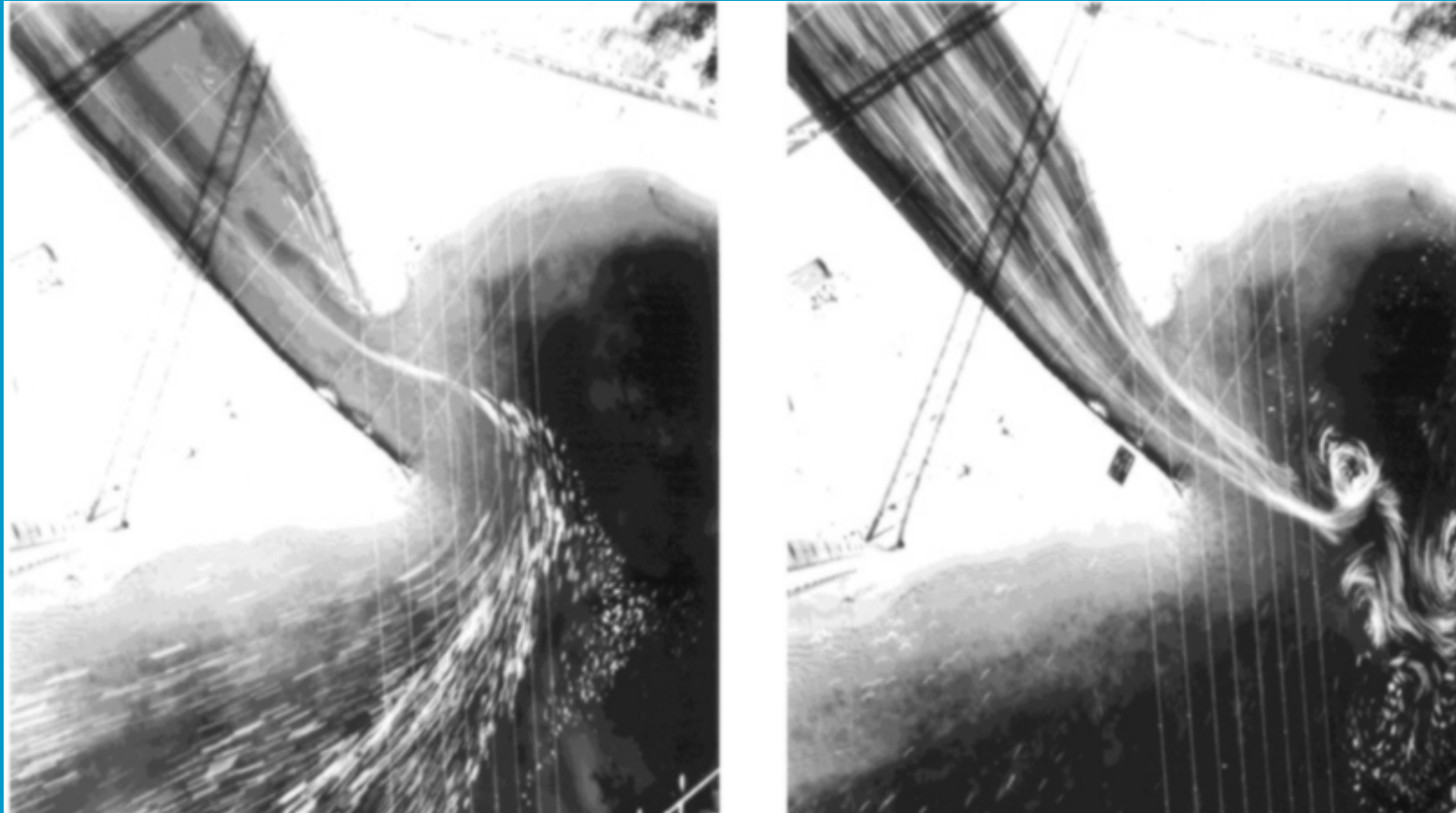
Entrance to the port of Abidjan



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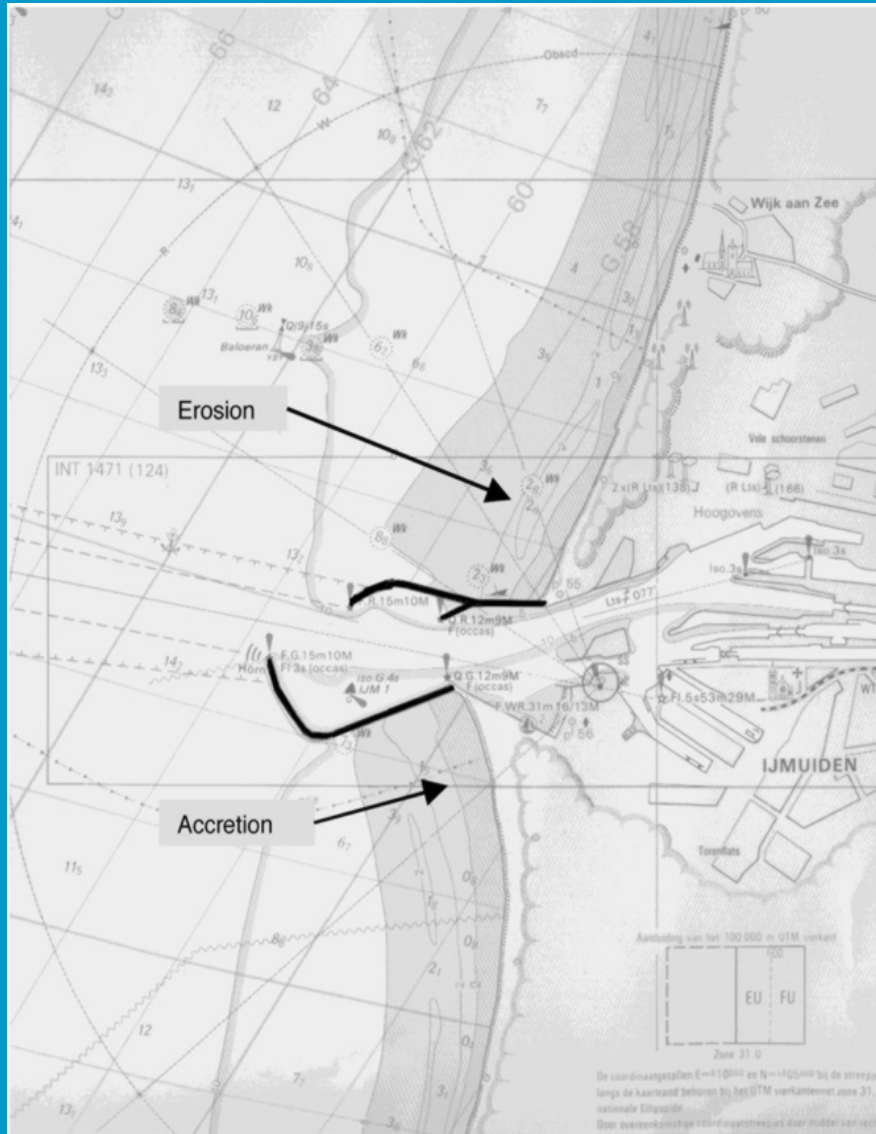
Flow pattern at the port of Abidjan



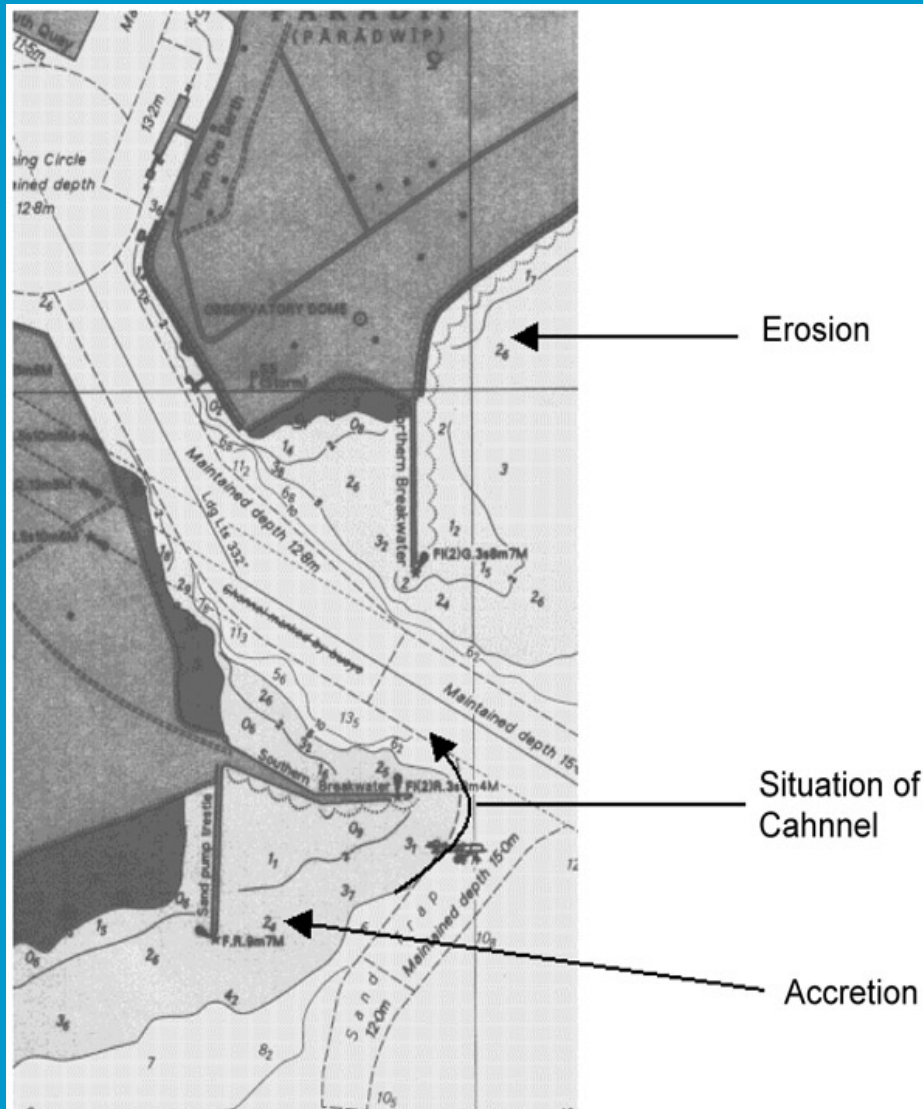
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Port and breakwaters of IJmuiden



Siltation at the entrance to the port of Paradip, India



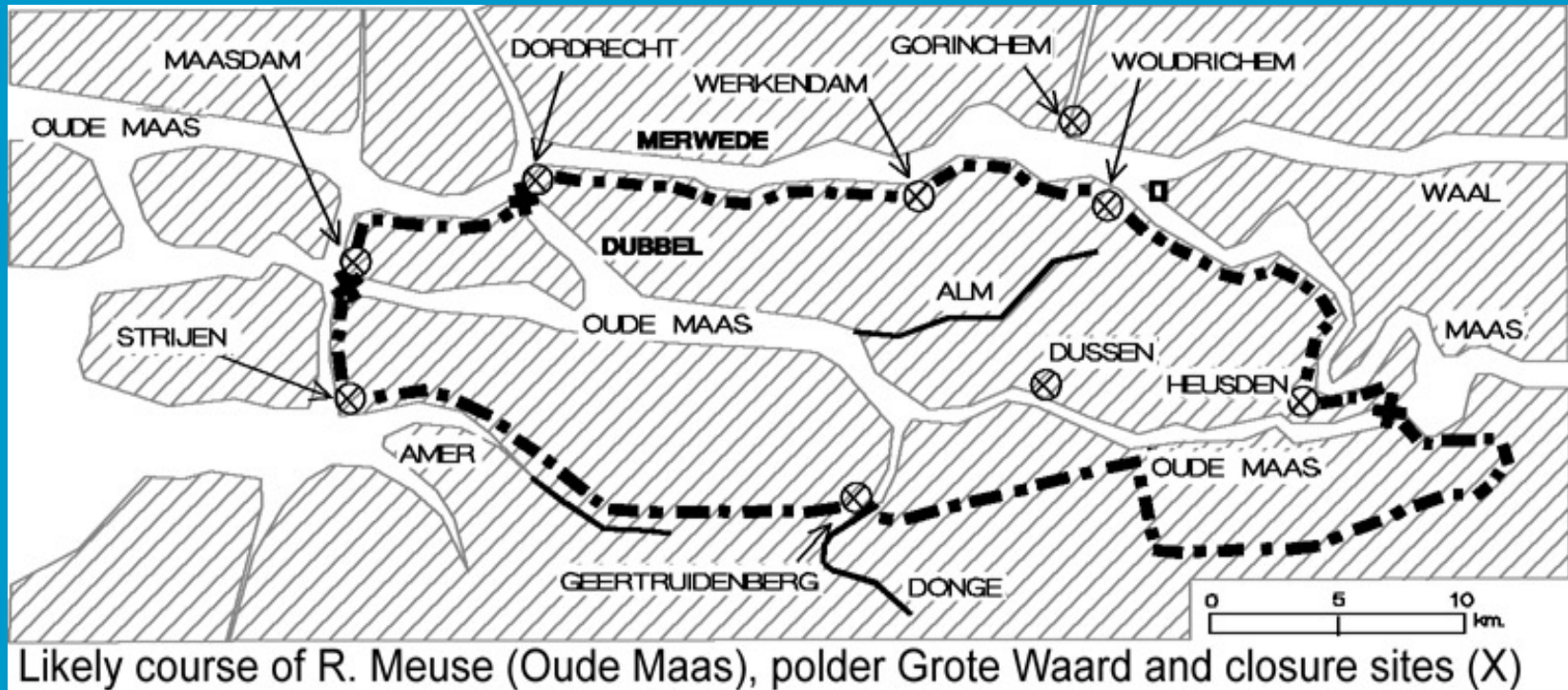
Functions of closure dams

- land reclamation
- shortening of the length of sea defence
- creating fresh water reservoir
- creation of tidal energy basin
- creation of a fixed level harbour basin
- creation of a construction dock
- providing road or railroad
- repair a dike breach
- control of upland flow
- creating fish ponds
- cutting of river bends

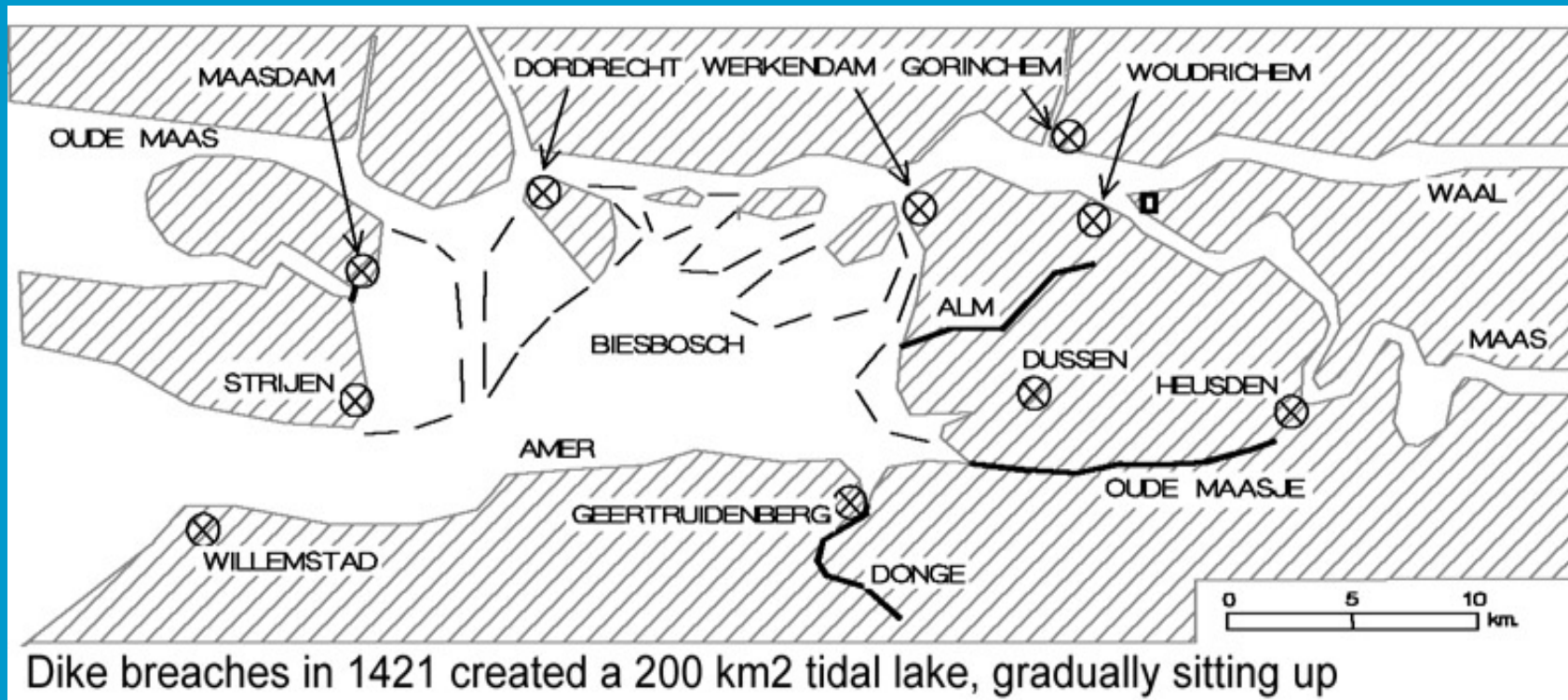
The Rhine Meuse delta before the year 1000



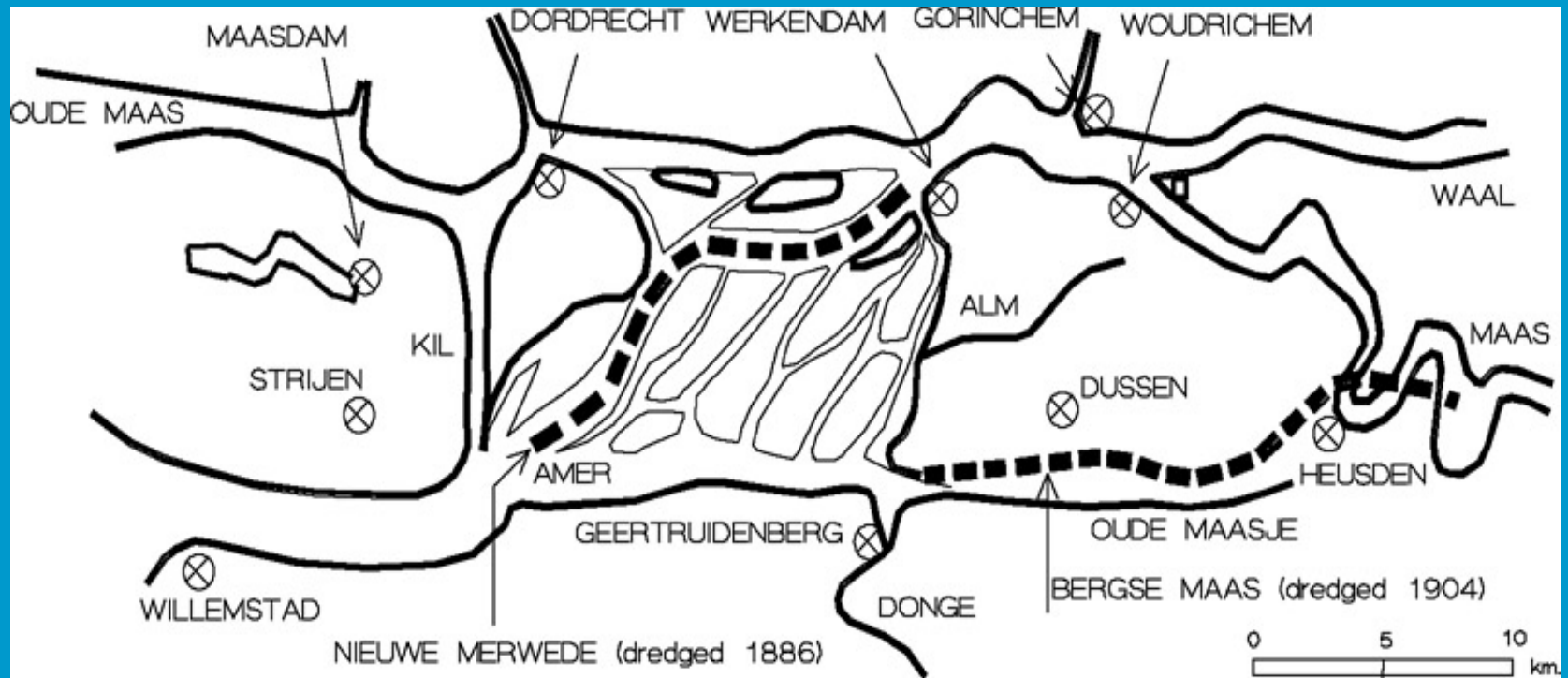
Situation after damming the river Meuse



Situation after the St. Elisabeth's Flood



The Biesbosch area



500 years sedimentation refilled the basin and drainage-"rivers" were dredged

The Afsluitdijk and the tidal range

