



Port of  
Rotterdam

# The Diverse Dike in Rotterdam

April 7, 2011

Sander Cornelissen

Port of Rotterdam Authority

# Diverse Dike - contents

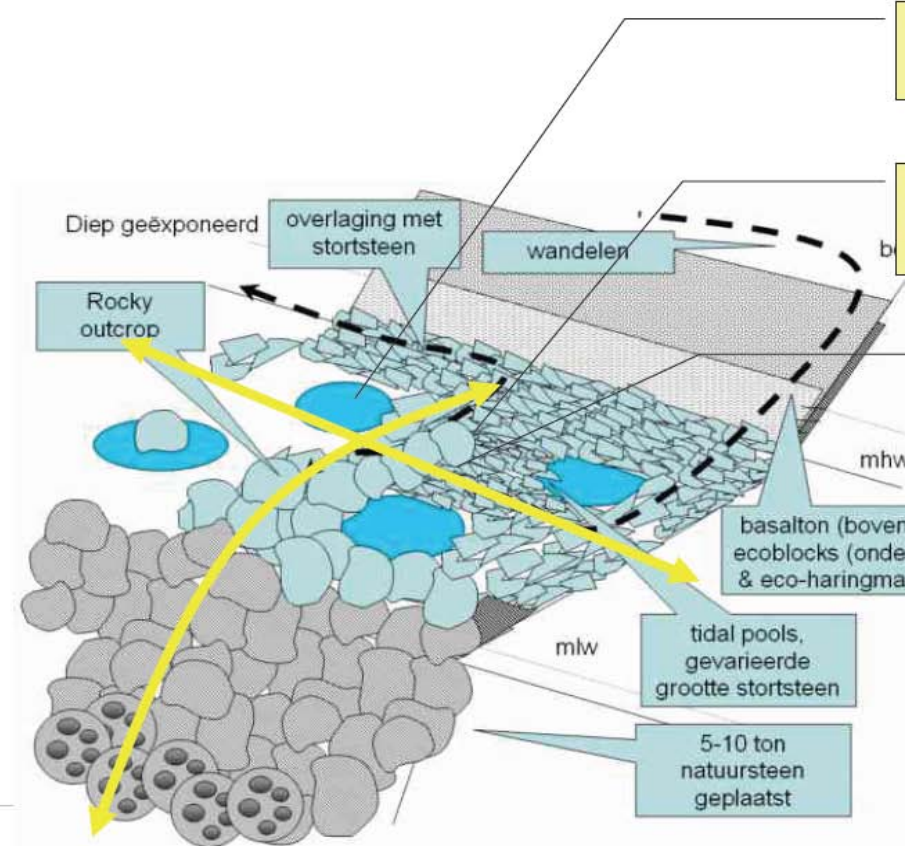
- Introduction
- Concept
- Pilot project 2009 - 2010
- Results
- Discussion

# Introduction

- Dutch Ministry of Infrastructure is responsible for water quality in the Port of Rotterdam waters
- This includes the ecological goals set through the European Water Framework Directive for 2015, 2027 (Good Ecological Status)
- The Port Authority wants to contribute where possible
- Preferably not hampering port activity in any way

# Nature friendly dikes

- Traditional concept of nature friendly dikes deals with sloping infrastructure
- Deltares promoted the idea of ecologically enhancing the slopes underwater, as well as between high and low tide levels and above water
- The concept has been used on occasion by the Port of Rotterdam Authority



# Nature friendly dikes

- Apart from slopes, in a port area there are many vertical structures present as well.
- E.g. Jetties, Mooring Poles, Quaywalls
- These are all smooth surfaces of steel, concrete, wood, with little ecological value



# Concept

- Deltares proposed to enhance the vertical surfaces in the Port in order to stimulate the production of biomass and to stimulate biodiversity
- Creating hiding space and feeding grounds for fish
- Contributing to ecological goals for the waterbody:

“Hanging Eco-structures” as part of the Diverse Dike

# Concept

- 3 basic elements of the Hanging Eco-structures by Deltares
- “Hula skirts” (Hawaii skirts): Ropes attached to Mooringpoles in the form of a skirt
- Pontoons: Ropes hanging from pontoons, attached to jetties
- “Eco-concrete”: Roughed up concrete plates, attached to poles or jetties

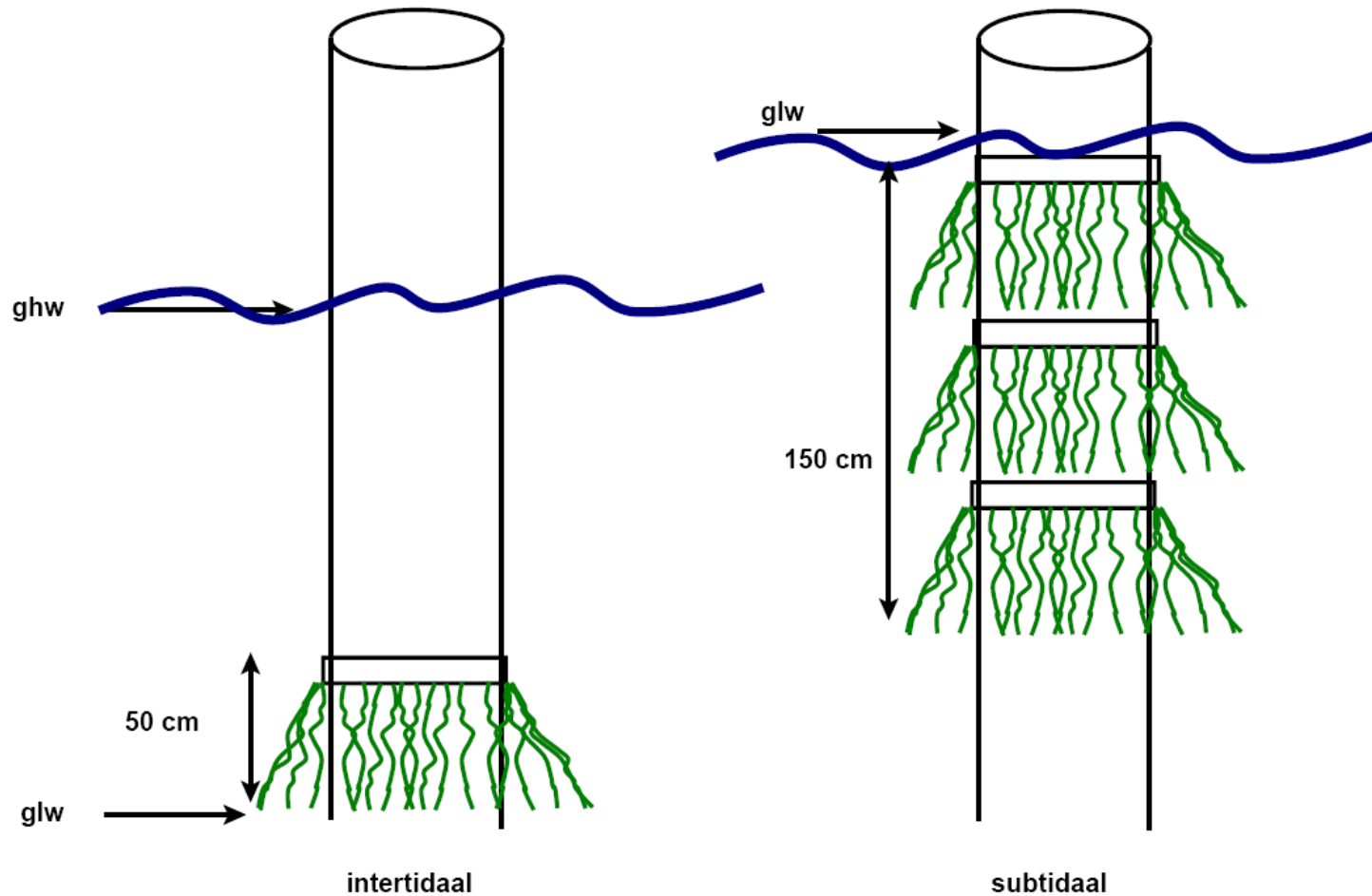
# Hula skirts





# Hula skirts on Mooringpoles

## paalhula's



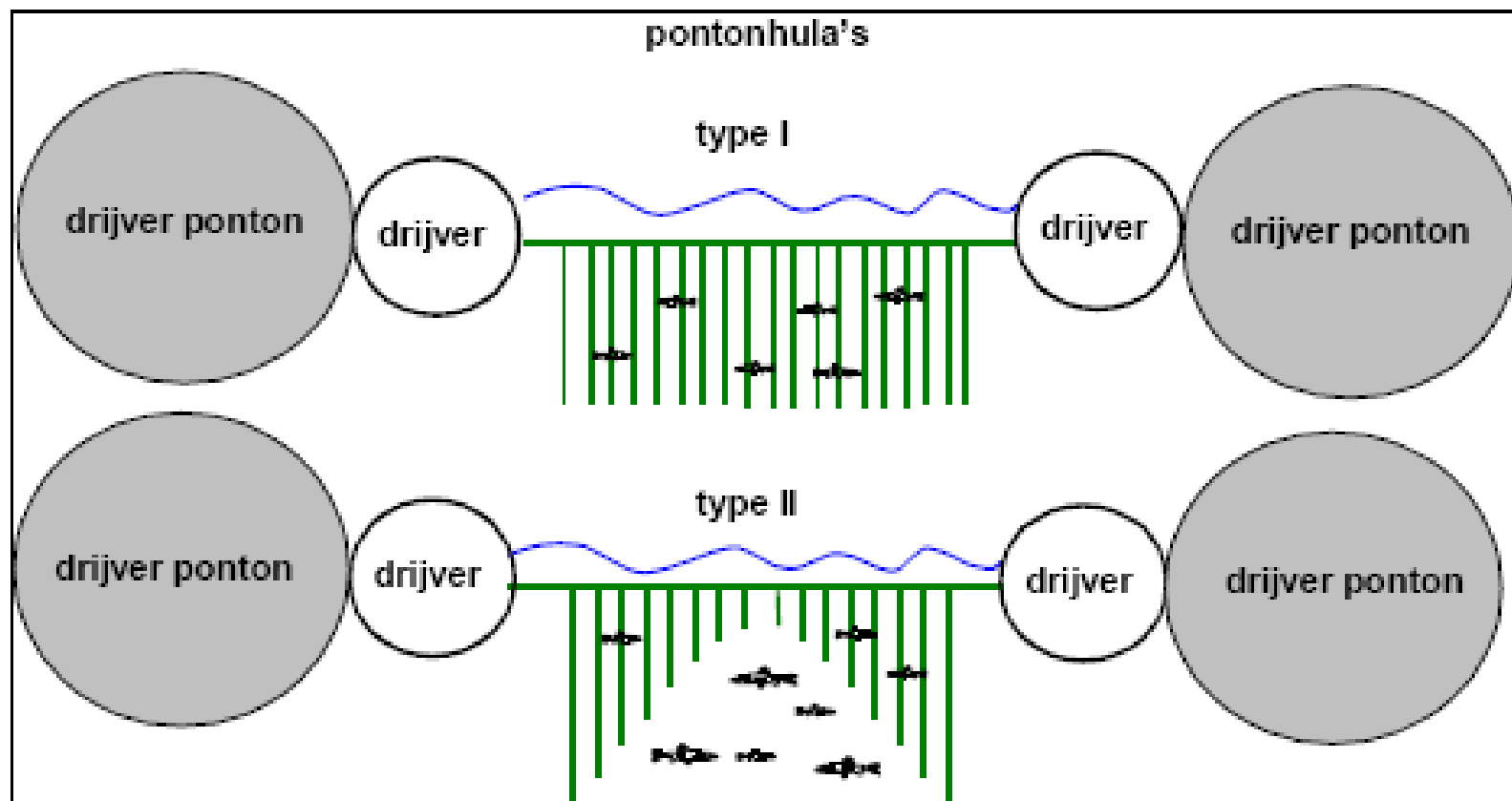
# Hula skirts on Mooringpoles

- Nylon fabric ropes
- Appr. 50 cm in length
- Attached either subtidal (below low tide level) or intertidal (between high and low tide level)

# Hula skirts on Mooringpoles



# Pontoon with hanging ropes



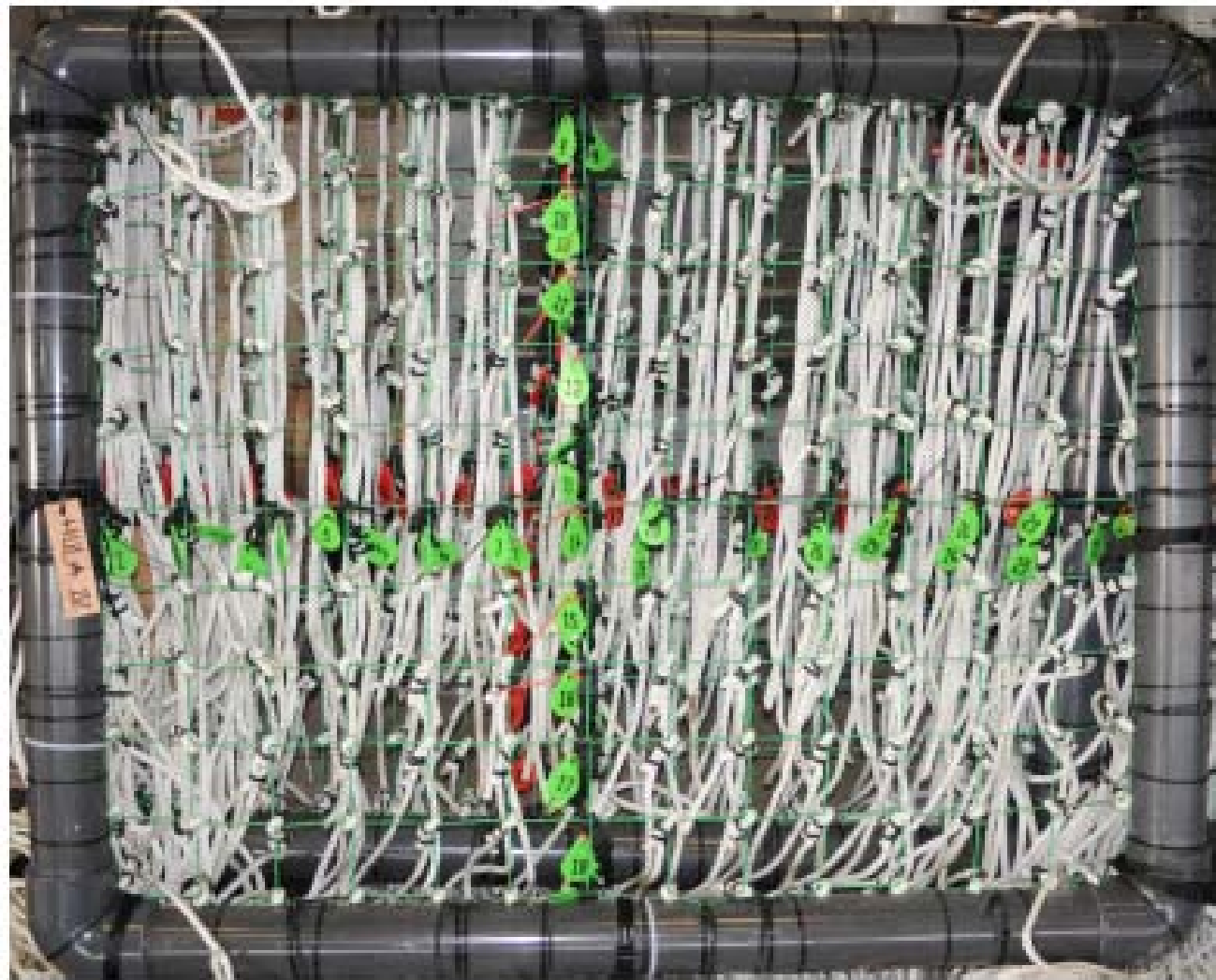
# Pontoon with hanging ropes

- Nylon fabric ropes, appr 150 cm in length
- Plastic floaters
- Attached to large pontoons or jetties

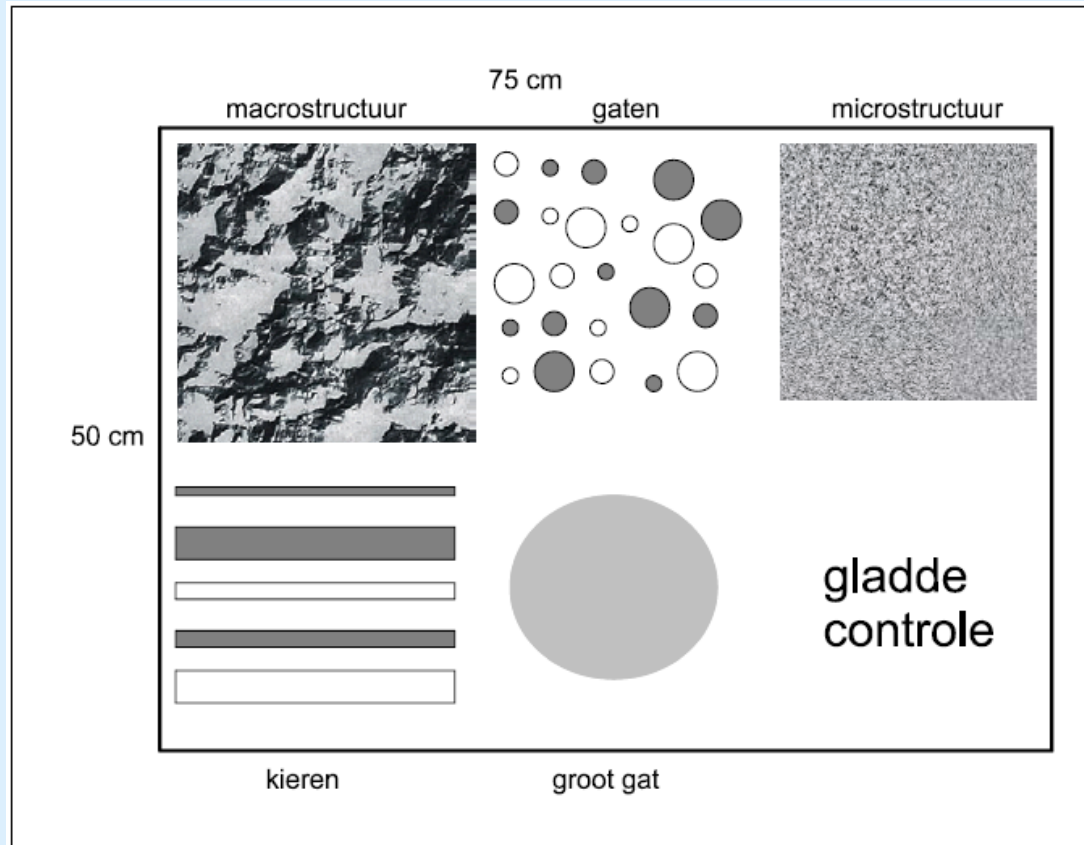
# Pontoon with hanging ropes



# Pontoon with hanging ropes



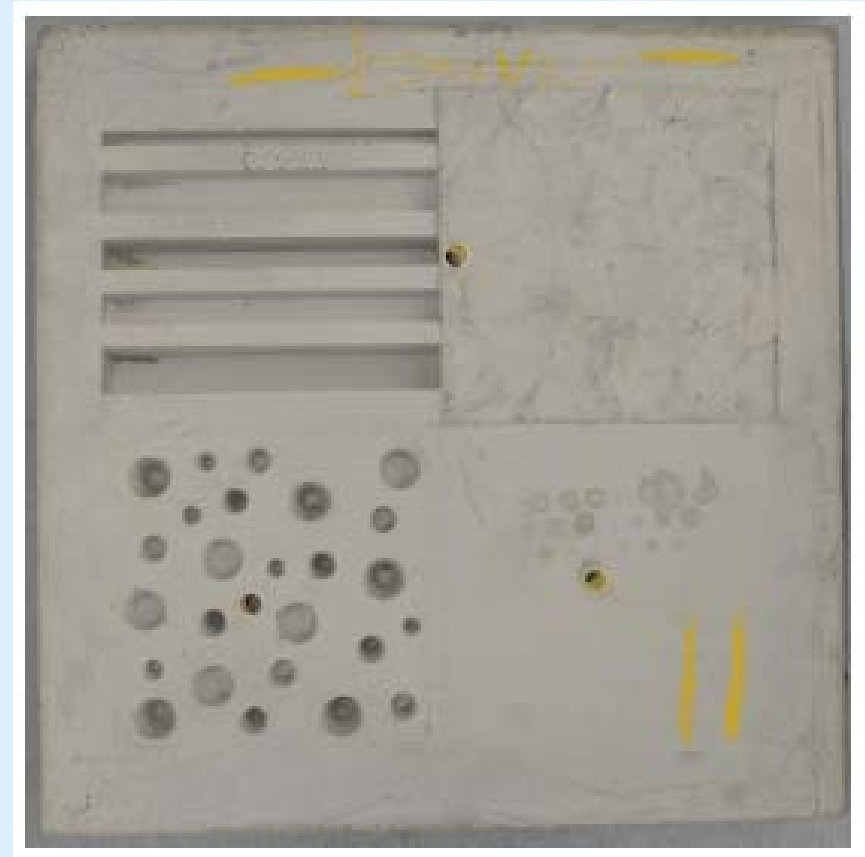
# Eco-concrete





# Eco-concrete

- Concrete plate with roughed up surfaces of different design
- Attached on jetties of poles on intertidal level
- Designed to hold tidal water in the roughed up surface



# Pilot project

- The Port Authority engaged in a pilot project in 2009
- Condition that port activity would not be hampered in any way
- Therefore evaluating the effect of the pilot on:
  - Shipping movement
  - Maintenance work
  - Cleaning work
  - Issues concerning environmental regulations

# Pilot project

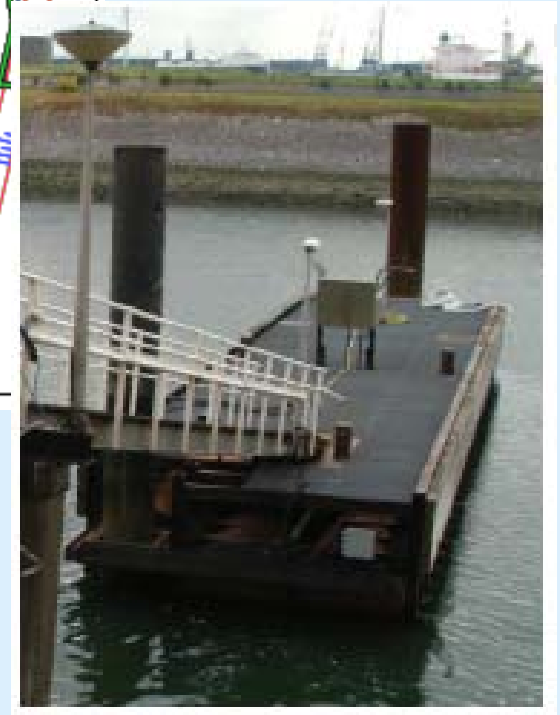
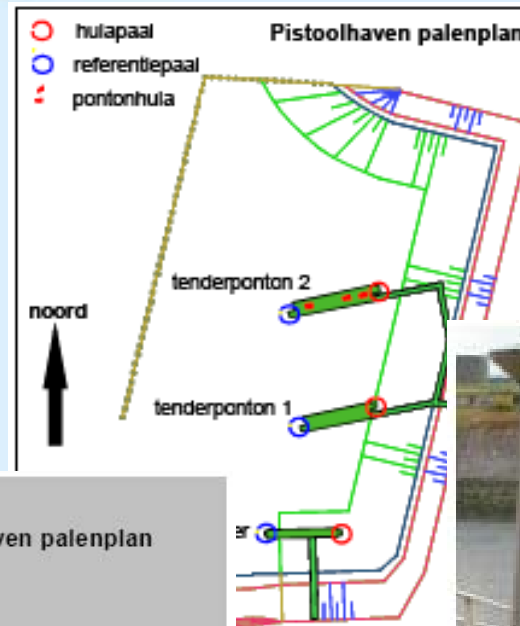
- Start March 2009
- Duration 1 year, prolonged by 6 months
- Port Authority and Deltares put in place:
- 10 Hula skirts
- 6 pontoons
- 10 Eco-concrete plates
- Deltares commenced monitoring and managing

# March 2009

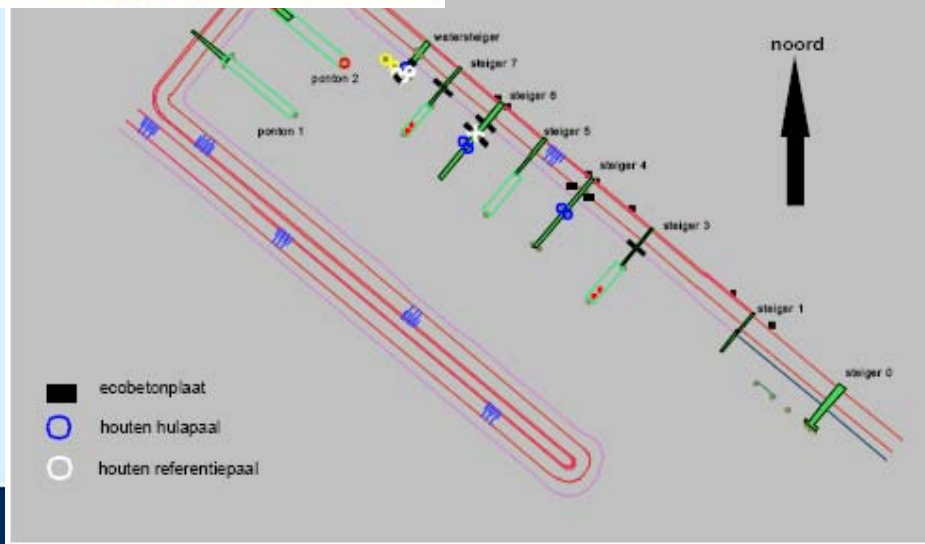
## Haven Rotterdam ponton- en paalhula's



# Pilot project



**Scheurhaven palenplan**



# Results

# Results - 1 Week



# 2 Months

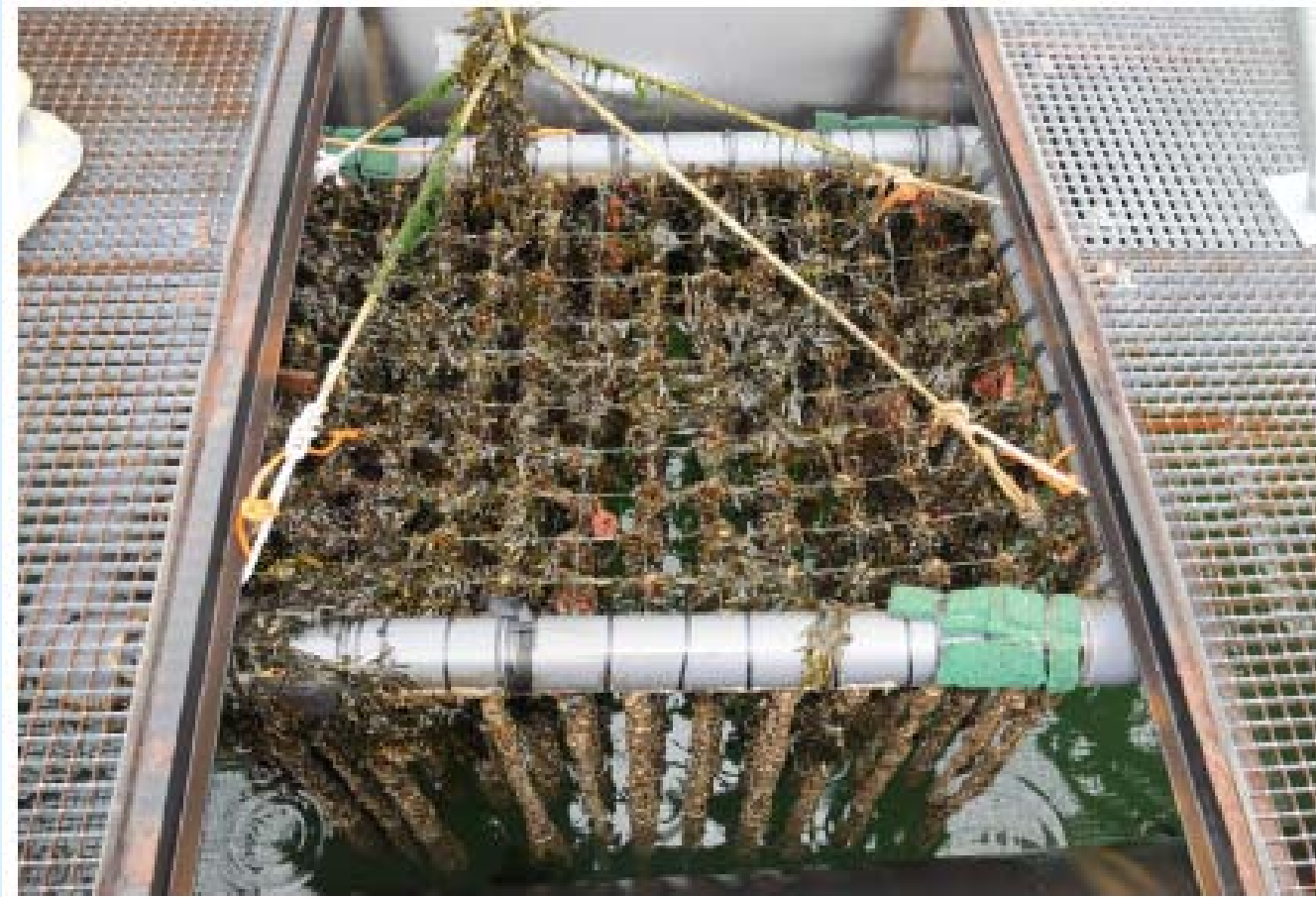




# 1 Year - Pontoon

# Hula skirt

# Results



# Results Eco-concrete

10-9-2009



18-12-2009



# Results - Ecological

- Biomass
  - Hulaskirts: Sharp increase in biomass
  - Pontoons: Sharp increase in biomass
  - Eco-concrete: Little increase in biomass
- Biodiversity: Increase in biodiversity, but local.
  - e.g. Sea grass, Filter Feeders (Mussels, polyps,...)
- Filter Feeders and plants filtering the water, contributing to better water quality

# Results – Port activity

- No apparent hampering of shipping movement or maintenance work
- 1 Pontoon broke loose and was picked up in a nearby canal

# Discussion

- Does the Port Authority, through implementing these eco-enhanced designs and thus actively create additional biomass and biodiversity, let the Trojan Horse in?
- Port of Rotterdam Authority has had to deal with some Habitats Directive protected species on land

# Fen Orchid, Natterjack Toad



# Discussion

- European Water Framework Directive and Birds and Habitats Directives are partly overlapping
- The Port Authority proposes to work with the instruments of the WFD, i.e. setting goals for and monitoring the whole watersystem, instead of – as on land – focussing on a possible single protected species

# The Diverse Dike in the Port of Rotterdam



- Thank you for your attention