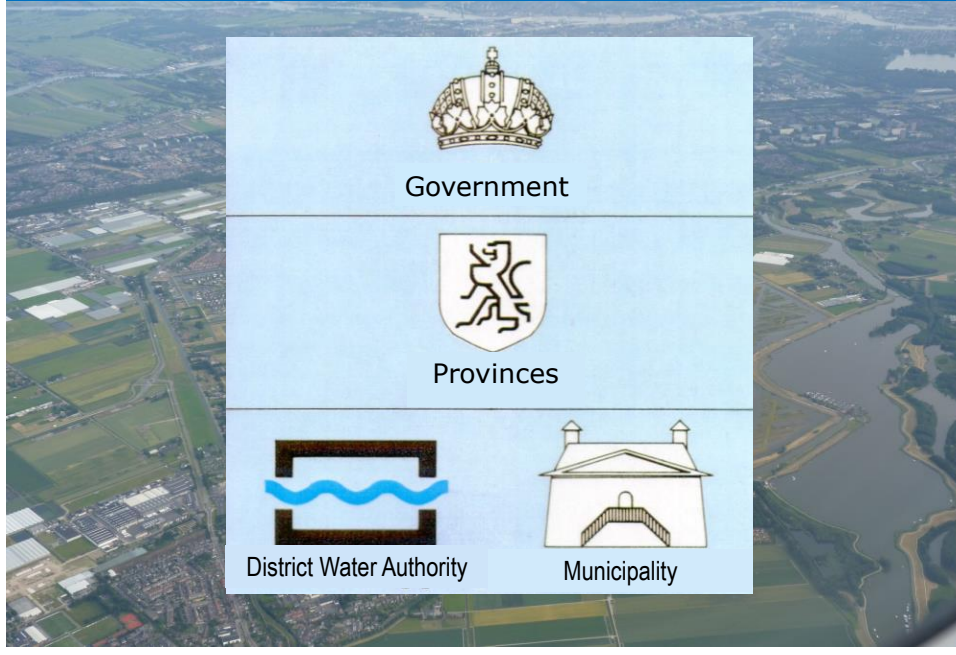
Multifunctional water storage EENDRAGTSPOLDER

Deltas in Practice Theme 3: Urban design and infrastructure

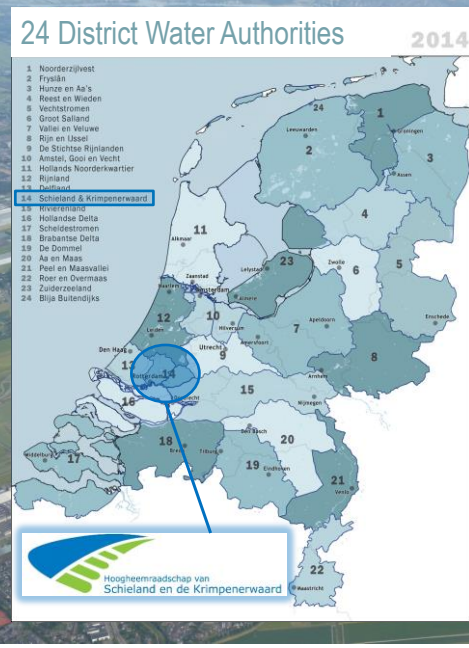
J. (Johan) Helmer
District Water Authority: Schieland en de Krimpenerwaard

Droge voeten en schoon water

District Water Authority



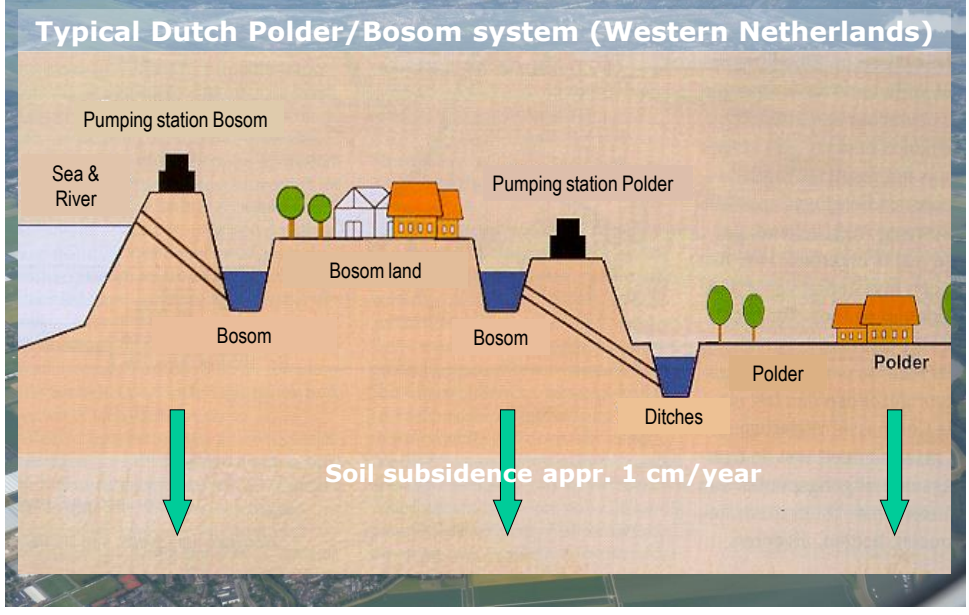
District Water Athority



Regional Management:

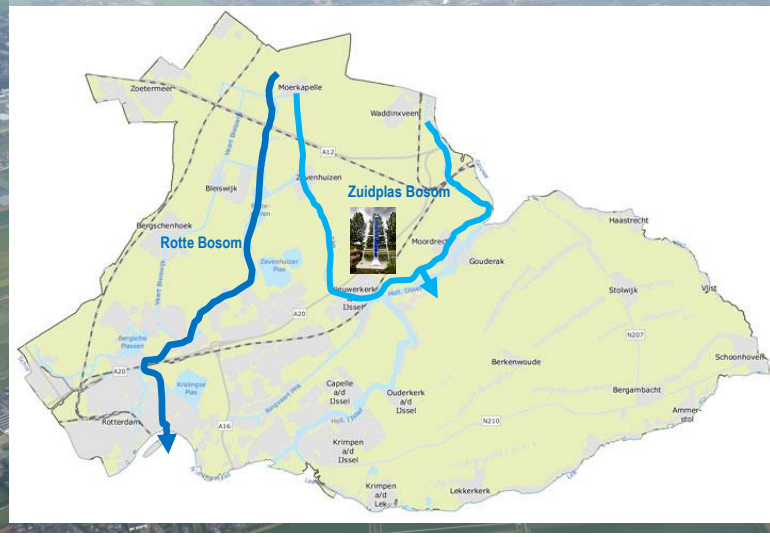
- Flood defences
- Water level
- Water quality
- (Roads)

Water system



Territory of Schieland and the Krimpenerwaard

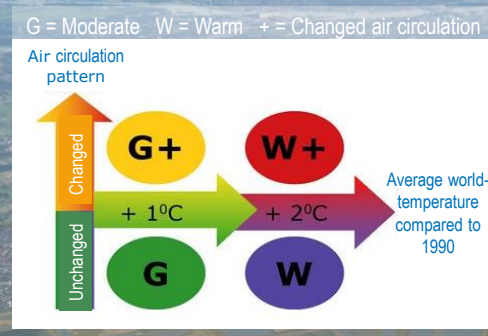
Nowadays



Climate Change

Climate Change

G = Moderate W = Warm + = Changed air circulation



Temperature

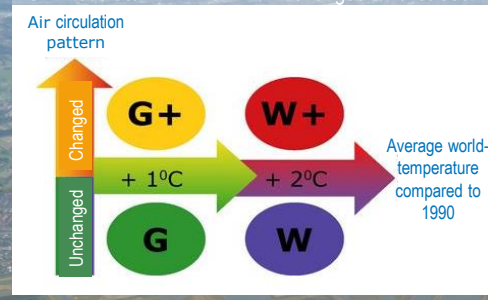
Hottest summer day	2050	2100
KNMI-06 Moderate	+ 1 °C	+ 2,1 °C
KNMI-06 Moderate +	+ 1,9 °C	+ 3,8 °C
KNMI-06 Warm	+ 1,7 °C	+ 4,2 °C
KNMI-06 Warm +	+ 3,8 °C	+ 7,6 °C

Sea level rising

Rise of sea level	2050	2100
KNMI-06 Moderate	15-25 cm	35–60 cm
KNMI-06 Moderate +		
KNMI-06 Warm	20–35 cm	40–85 cm
KNMI-06 Warm +		

Climate Change

G = Moderate W = Warm + = Changed air circulation



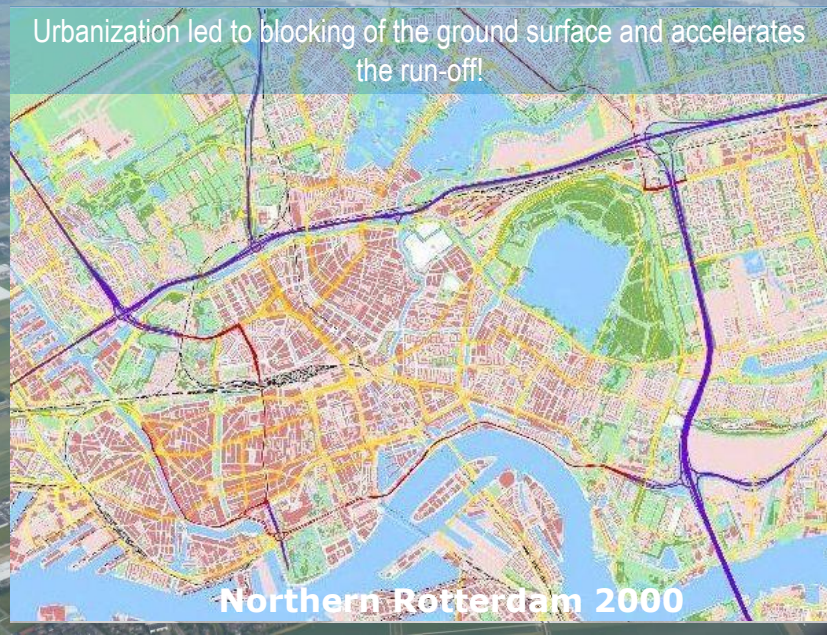
Atmospheric precipitation

Storm water peak in summer	2050	2100
KNMI-06 Moderate	+13%	+27%
KNMI-06 Moderate +	+5%	+10%
KNMI-06 Warm	+27%	+54%
KNMI-06 Warm +	+10%	+20%

Dutch Standards on flood risk related to land use	Area	Frequency 1/yr
Meadows	95 %	1/10
Agriculture	99 %	1/25
High-grade agri- and horticulture	99 %	1/50
Glass gardening	99 %	1/50
Urban area	100 %	1/100

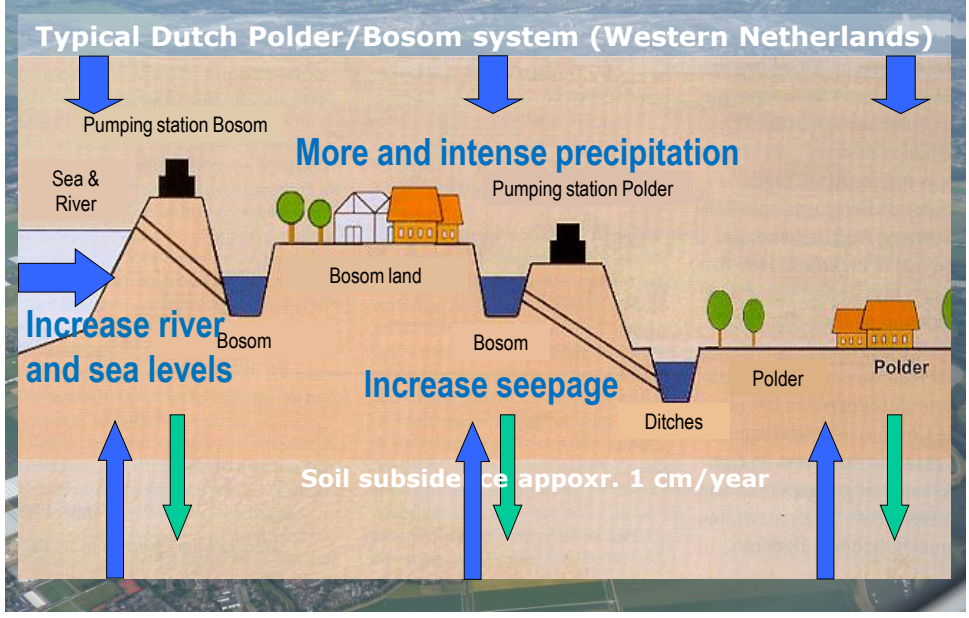
Urbanization of Rotterdam

Urbanization led to blocking of the ground surface and accelerates the run-off!



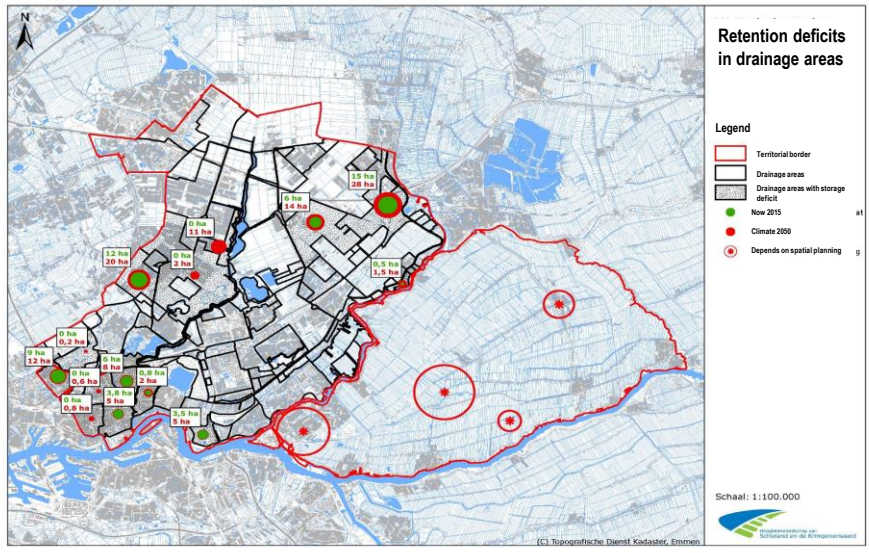
Northern Rotterdam 2000

Climate Change



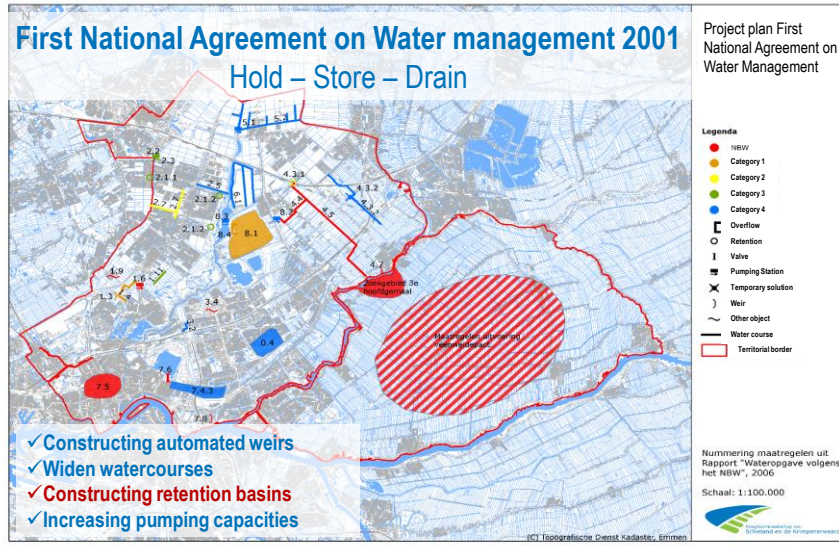
Effects of Climate Change HHSK

Survey on retention deficit at actual pumping capacity



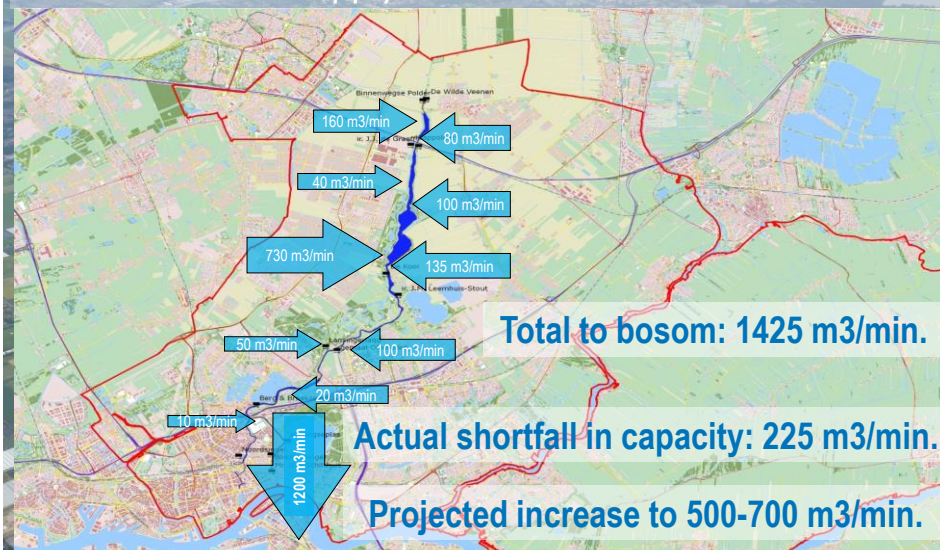
Projects to adapt to Climate Change

Project plan to adapt on Climate Change



Effect of Project plan

Imbalance in supply and drain of the Rotte bosom



Total to bosom: 1425 m3/min.

Actual shortfall in capacity: 225 m3/min.

Projected increase to 500-700 m3/min.

Figures on Water management

Total surface of the drainage area is 10.000 ha. (1 mm = 100.000 m^3)

Effective retention capacity of the drainage canal (bosom) is maximized to approx. 500.000 m^3. (5 mm.)

The excisting shape of the drainage canal (bosom) limits the Pumping capacity at max. 1200 m^3/min. (18 mm/d.)

Maximum retention capacity in polders of drainage area approx. 45 mm

Modelled cumulative retention deficit 3.000.000 m^3 (30 mm.)

Actual shortfall drainage capacity 225 m^3/min. (3 mm/d.)

Future shortfall drainage capacity 700 m^3/min. (10 mm/d.)

Climate proof solution

Possible solutions:

- Booster pumping Station in Rotte bosom
- Second drainage canal
- Additional water Retention of 3.000.000 m^3

Additional requirement:

As a result of the tidal movement of the North Sea an operational stop of the pumping station draining the Rotte bosom of maximal 48 hours is not inconceivable (Emergency retention of 4.000.000 m^3)!

The oportunity

The city of Zevenhuizen-Moerkapelle (nowadays Zuidplas) was planning a 400 ha recreational territory in the Eendragtspolder.

A survey in 2003 pointed out that integration of a 4.000.000 m^3 water storage with a recreational territory was feasable and adaptable!

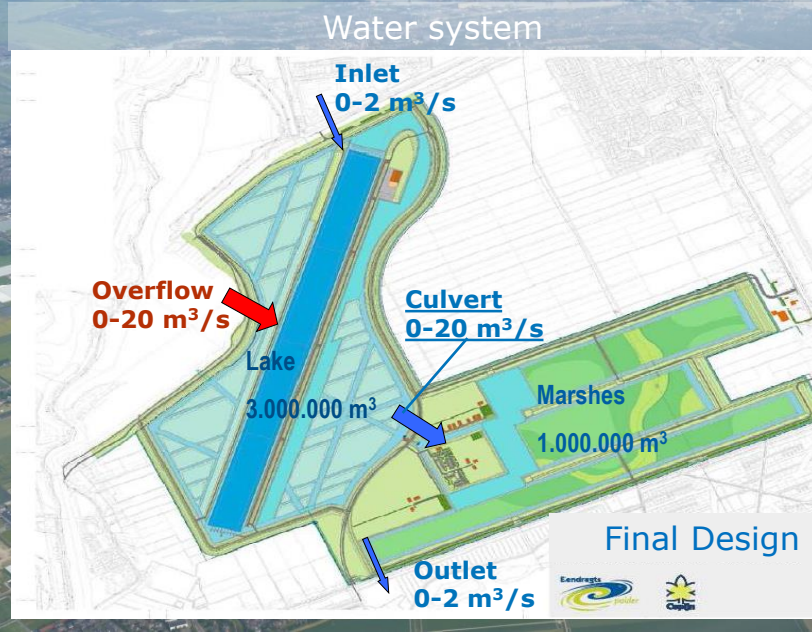
From that moment on the collaboration in the spatial development of the Eendragtspolder started!

In 2005 the City of Rotterdam joined this collaboration in order to devellop a international rowing course in the territory.

Afterwards the collaboration between the parties involved, province of South-Holland, Cities of Zuidplas and Rotterdam, Recreational Authority Rottemeren and the district Water Authority was ratified in agreements of collaboration and realization

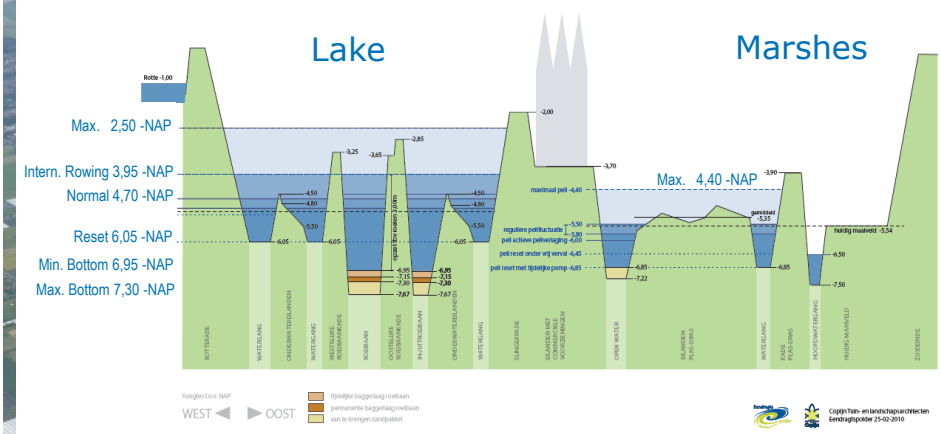
Landscape architecture

Landscape architecture



Landscape architecture

Cross section



Figures developped area

- Total surface Lake and marshes 300 ha.

- Maximum water storage 4 M. m^3
  - ✓ lake 3 M. m^3
  - ✓ marshes 1 M. m^3
- Length rowing course (Olympic) 2,2 km

Investments:

- land acquisition € 30 M.
- Development and project management € 40 M.
- Total investment € 70 M.

Water Quality

Facts on water quality

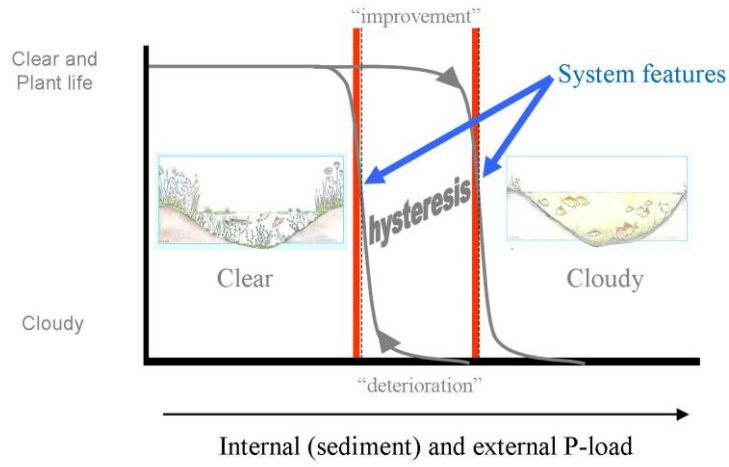
- ✓ European Water framework Directive is effective (area > 50 ha.);
- ✓ Surplus water to be stored is eutrophic;
- ✓ Area was previously used for agriculture;
- ✓ Vegetation filters the water but proliferates is clear water;
- ✓ Clear water limits the damage to the storage basins;
- ✓ Invasive vegetation threatens the rowing facility;
- ✓ Water quality of the Ringvaart bosom is better than the Rotte bosom;
- ✓ Storage of fresh water offers opportunities for dry seasons;

Issues on Water Quality

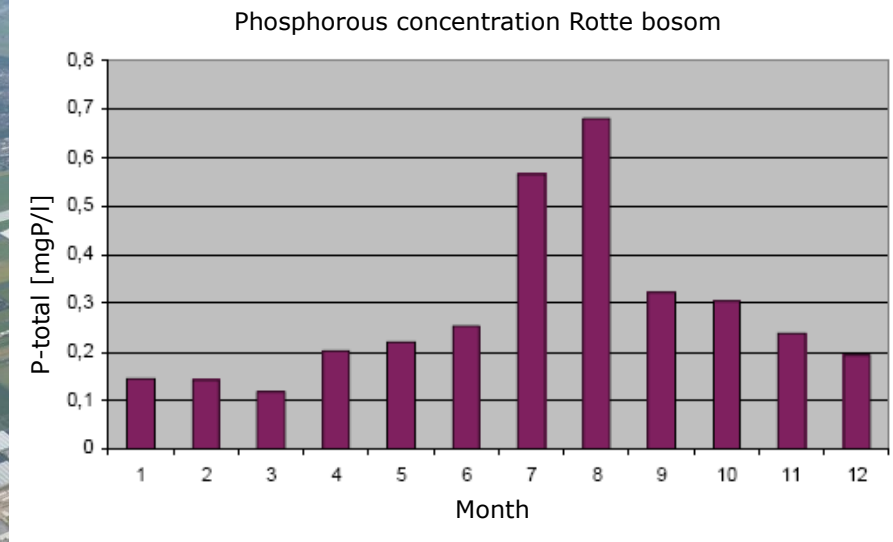
Beijing Algae experience frightened the Dutch Rowing Federation

Issues on Water Quality

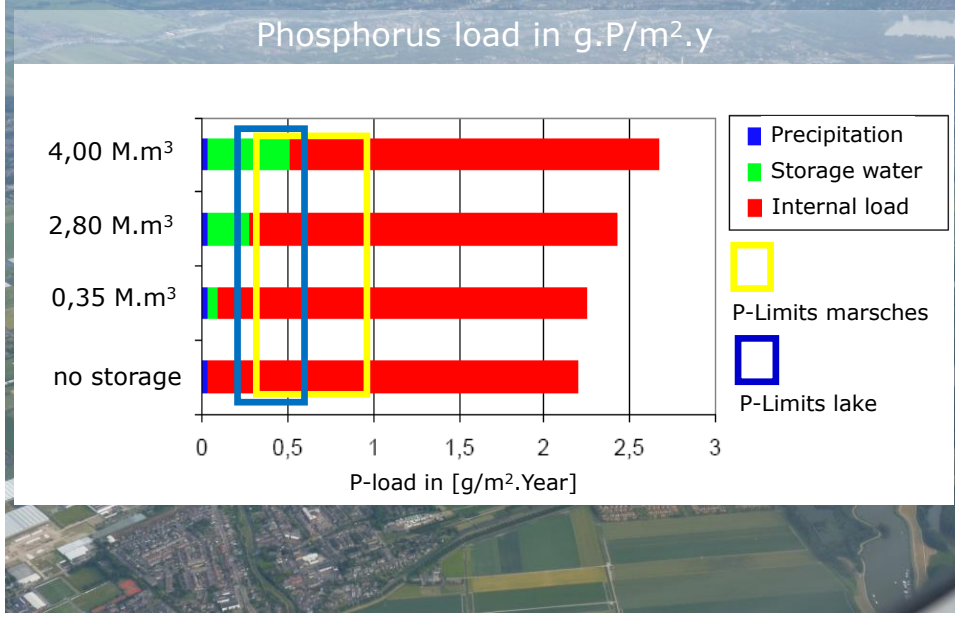
Phosphorus load restrictive to eutrophication



Phosphorus in Rotte bosom



Phosphorus load



Issues on Water Quality

Measurements

- Reduction of *external* Phosphorus load by:
  - Phosphorus removal from the water storage (FeCl3)
  - Limitations on fish and birds feeding
  - Limitations on bird (geese) population
- Reduction of *internal* Phosphorus load by:
  - Removal of top layers to be processed in the embankments or deep ploughing
  - Isolation of the submerged clay soil with a layer of sand (40 cm)
  - Limitations on bird (geese) population
  - Harvesting and removal of vegetation

Clear water in stable state

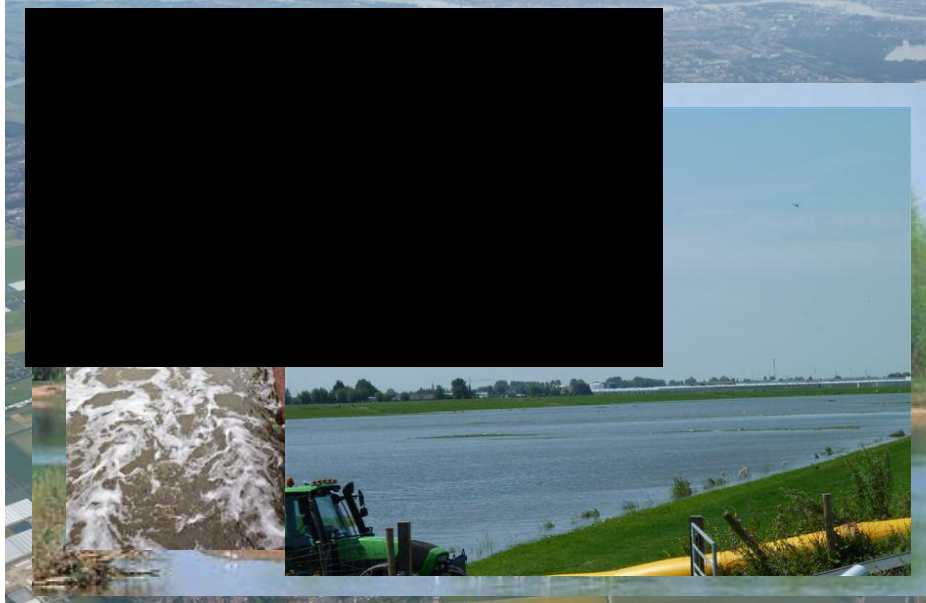
Under construction

36 Atlas cranes, highway for trucks, closed soil balance

Construction main overflow

From dream to reality

From dream to reality



Questions to answer

Hoogheemraadschap van Schieland en de Krimpenerwaard

provincie ZUID HOLLAND

Gemeente Rotterdam

WILLEM ALEXANDER BAAN

gemeente Zuidplas

recreatieschap Rottemeren