

Jun 22nd, 2:00 PM - 2:15 PM

## Session E2: Benefits of New Management of the Haringvliet Sluices and the Effects on Fish Migration

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Breukelaar, André, "Session E2: Benefits of New Management of the Haringvliet Sluices and the Effects on Fish Migration" (2015).  
*International Conference on Engineering and Ecohydrology for Fish Passage*. 45.  
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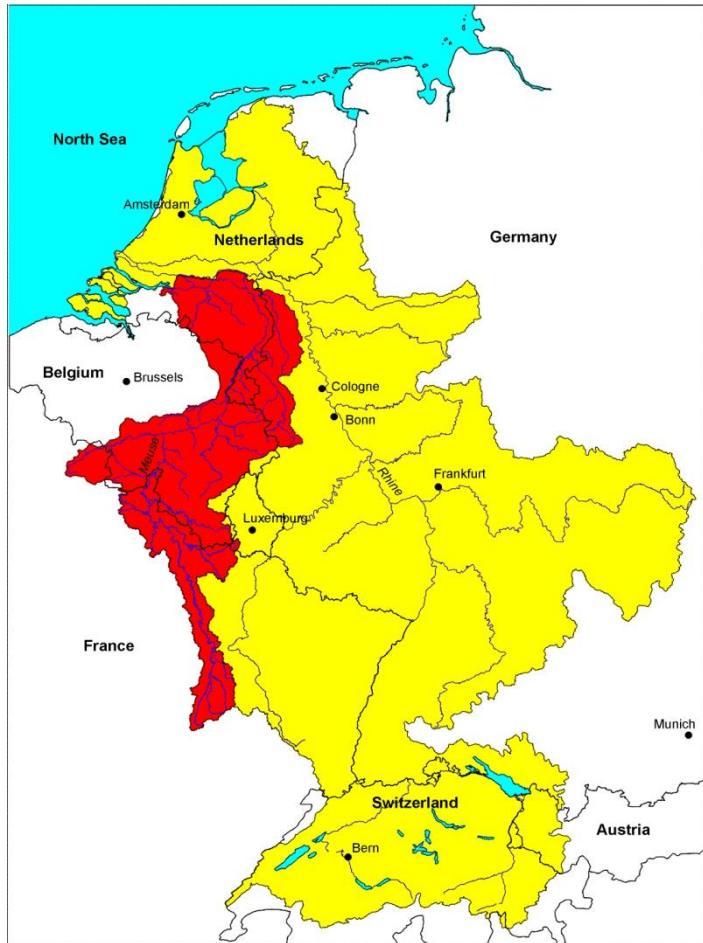
Rijkswaterstaat  
*Ministry of Infrastructure and the  
Environment*

# Benefits of new management of the Haringvliet sluices and the effects on fish migration

André Breukelaar (RWS WNZ)

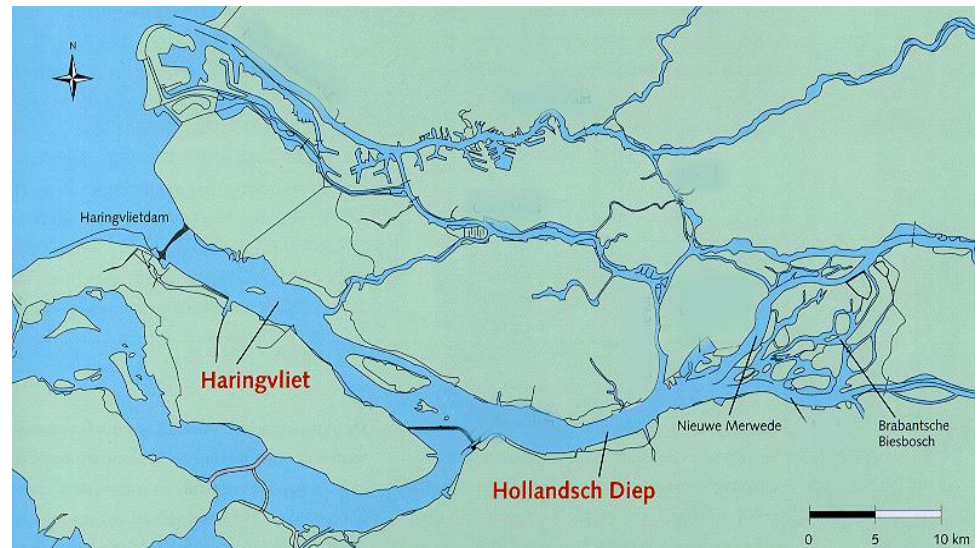


# Rhine-Meuse estuary



**Basin 120.000 km<sup>2</sup>**  
**Average discharge**  
**Rhine 2200 m<sup>3</sup>/s**  
**Meuse 230 m<sup>3</sup>/s**  
**Delta 40.000 km<sup>2</sup>**  
**50% below sea level**

**3 water bodies:**  
**Haringvliet (80 km<sup>2</sup>)**  
**Hollandsch diep (38 km<sup>2</sup>)**  
**Biesbosch (10 km<sup>2</sup>)**  
**Total length 64 km**  
**Max. depth 5 - 12 m.**



# Why building sluices and barriers ?

- 1953 floods  
(> 1800 people killed)
- Delta project (1958)
  - dike strengthening
  - closure of coastal inlets of which Haringvlietsluices are one (1970)



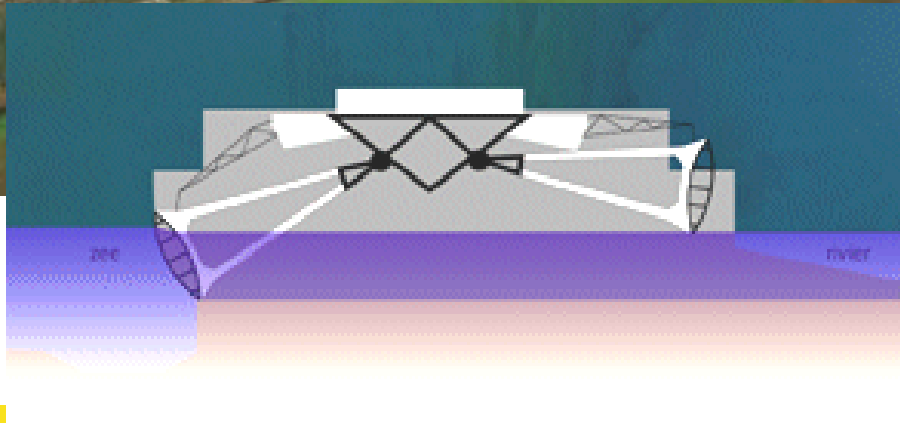


# Delta project





# Haringvliet sluices (1970)





# Consequences of the construction for the Haringvliet estuary

## **Before**

- tidal range 1.8 – 2.3 m
- salt/brackish/fresh
- free fish migration
- mudflats and creeks
- reed beds rushes and willows

## **After**

- tidal range 0.3 m.
- fresh water body
- fish migration disabled
- fresh water fish washed out/ flushed to sea with surplus fresh water in HV
- bank erosion
- willows and nettles
- water for agriculture & drinking-water



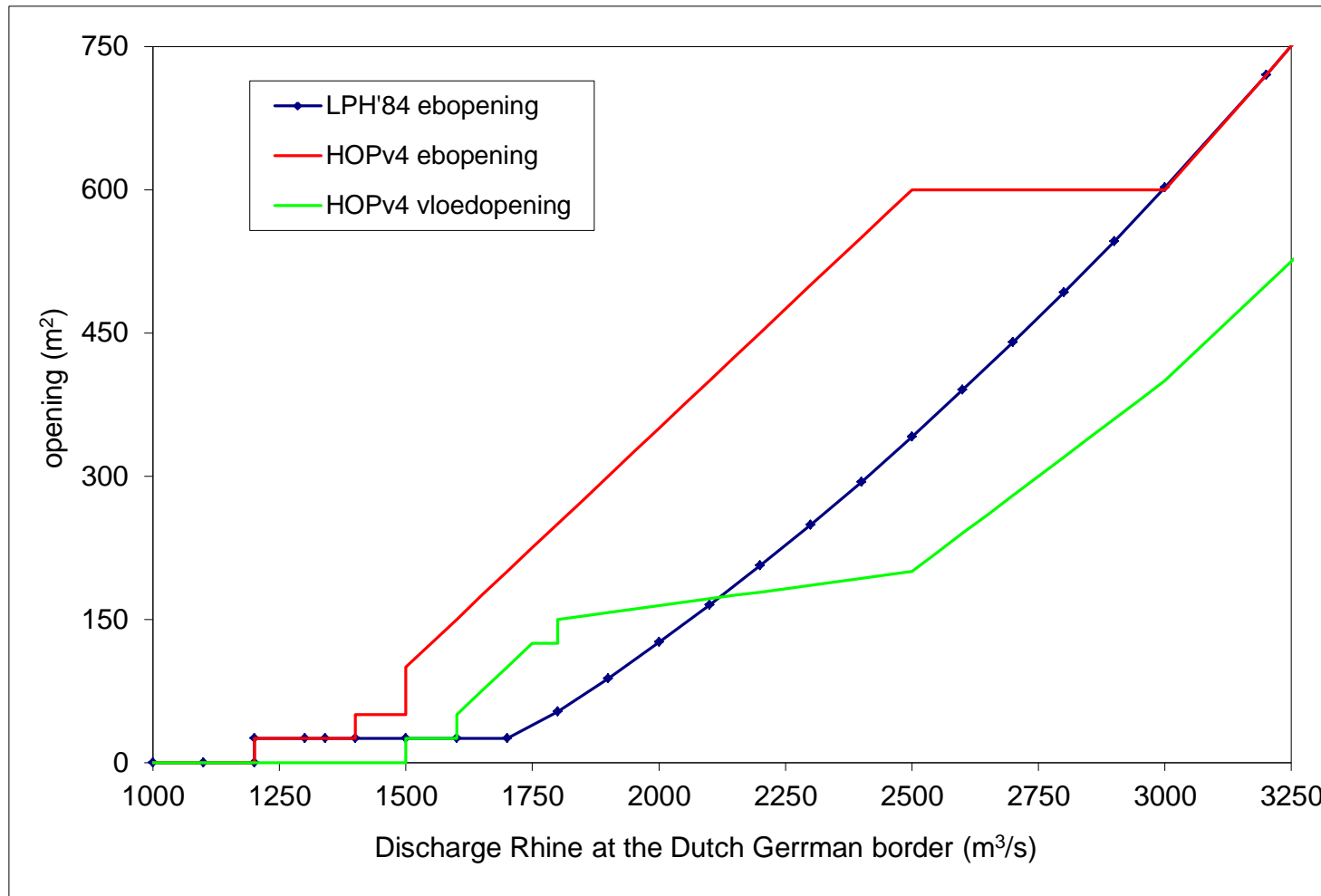
## Fish species

<b>Number of species per ecological guild</b>	<b>Historical</b>	<b>Present</b>
Diadromous	12	9
Estuarine resident	20	1
Freshwater	27	38
Marine (juvenile)	16	0
Marine (seasonal)	20	1
<b>TOTAL</b>	<b>95</b>	<b>49</b>





# Comparing LPH'84 HOPv4





## Sluices Ajar' a balancing act

Optimizing effect on ecology with maximum opening during flood and ebb periods

&

Controlling salt intrusion and preventing significant effect on freshwater supply

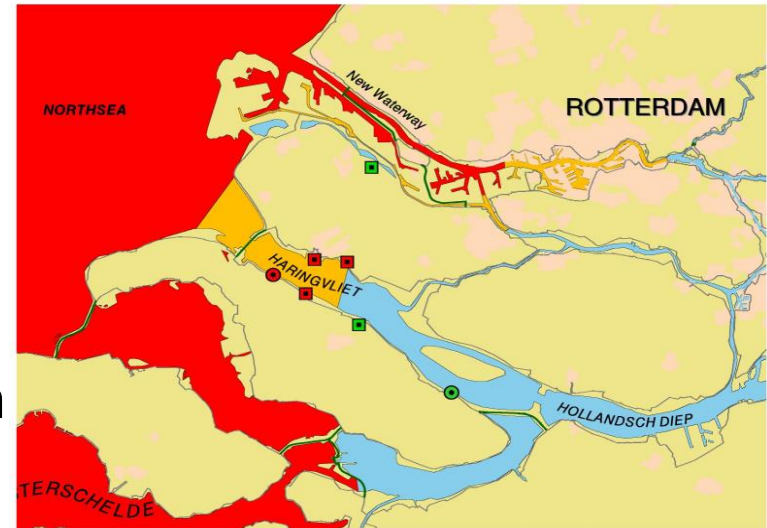




## 'Sluices Ajar' in 2018

Controlling factors:

- marginal lowering of water levels
- restricted salt intrusion & network to monitor salt
- set up network to monitor changes in ecosystem
- draw up protocols with water boards and water supply companies



Compensation:

- relocating intakes for drinking and agricultural water



## Conclusions

- Closing off the Haringvliet has had a major impact on estuarine ecology
- Partial restoration is possible with alternative sluice management
- In 2018 Haringvliet sluices will open also during flood period, diadromous fish will benefit the most



Thanks for your attention!

