

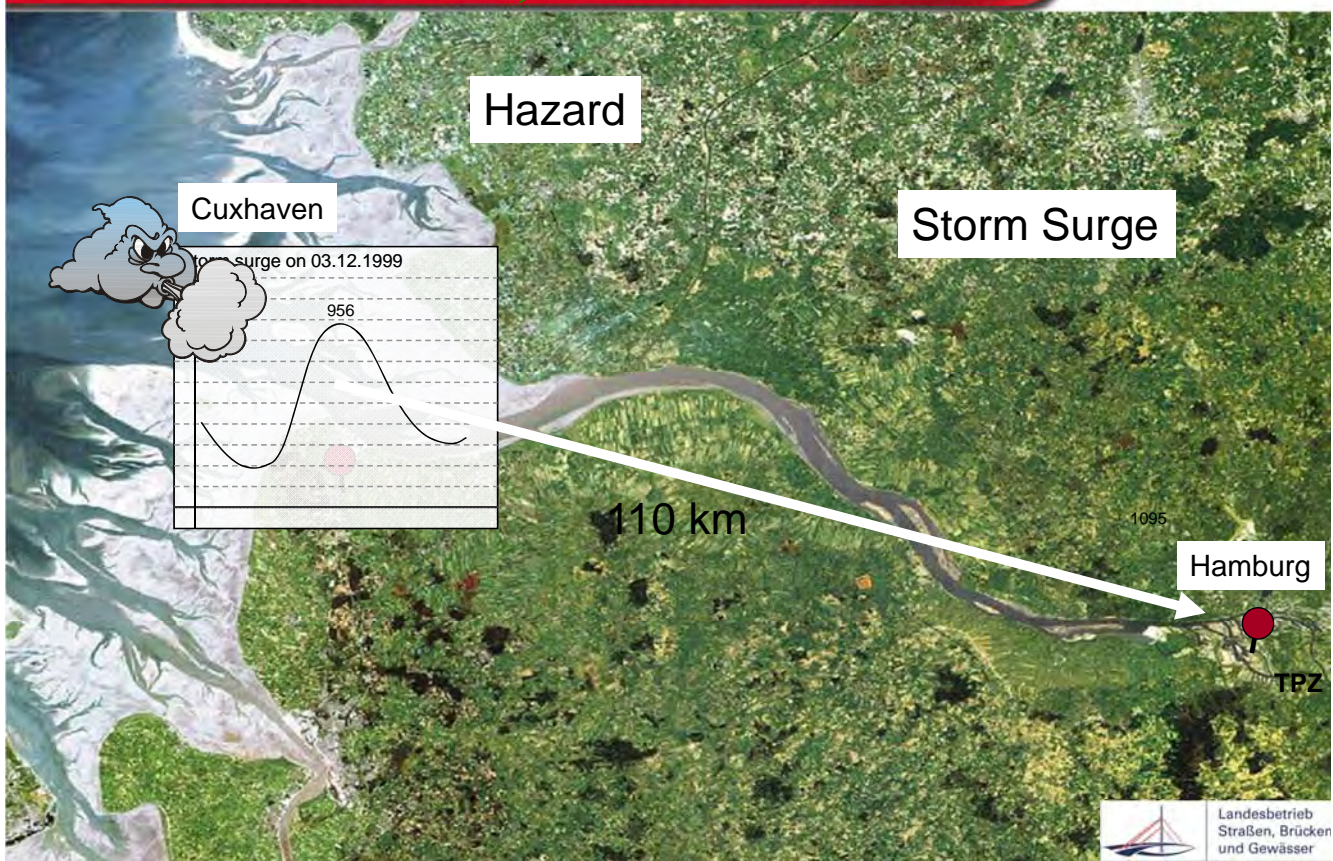


Coastal Protection in Hamburg

PD Dr. habil. Gabriele Gönnert



Hamburg at the Elbe River



Natural Hazards

2 Problems:

Storm Surges



& Rainfall



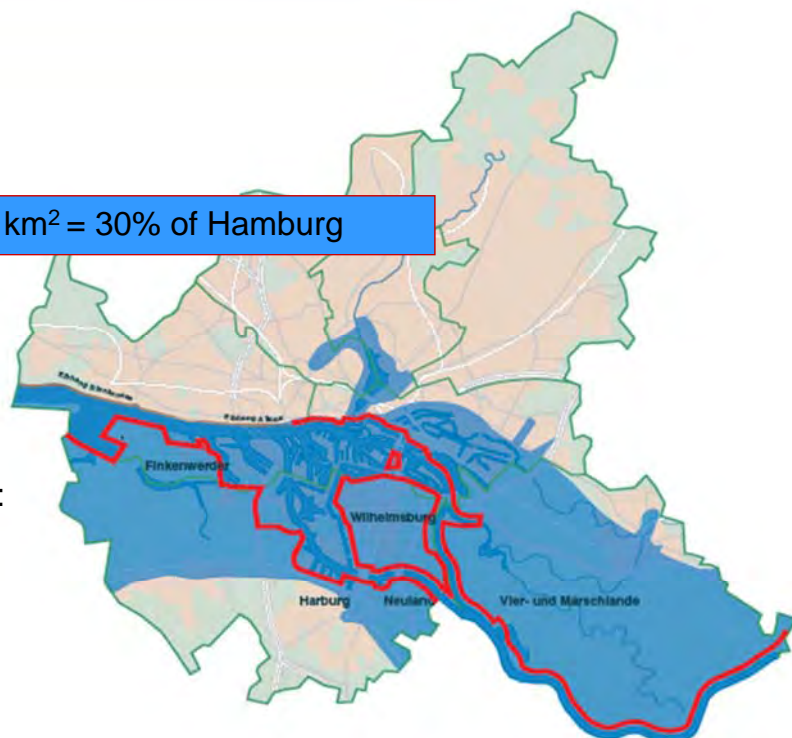
Why? Hamburg: Flood Prone Area



Flood Prone Area: 270 km² = 30% of Hamburg

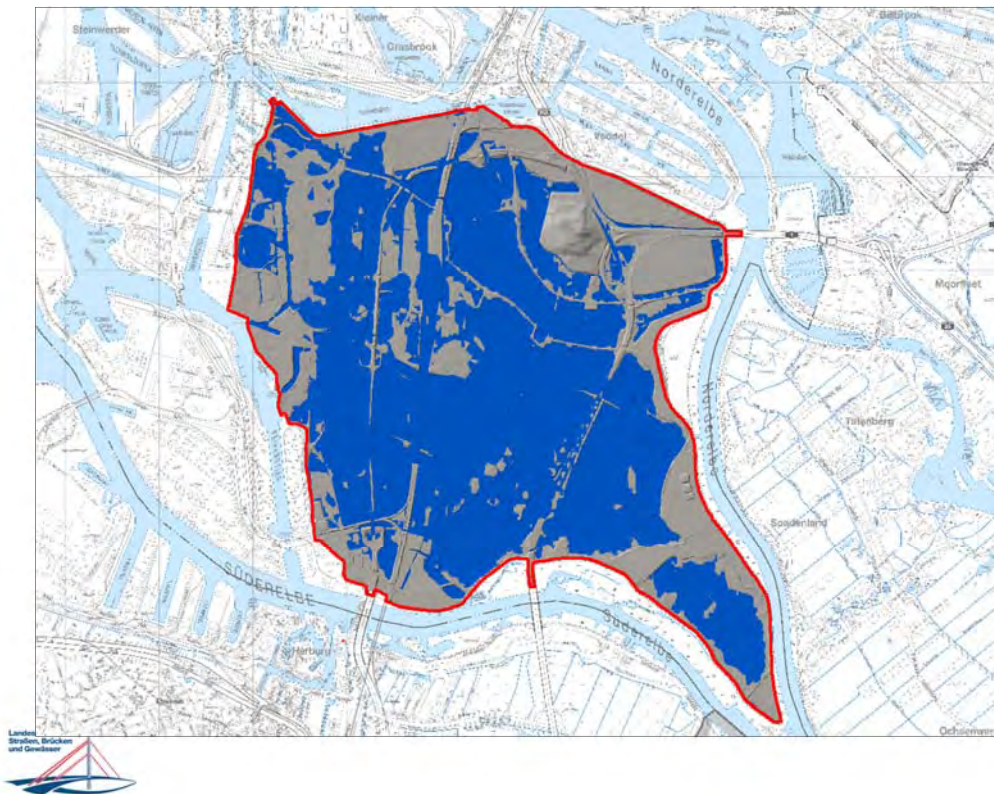
Within protected area:

160.000 Residents
140.000 Jobs
10 Billion € Goods



Hamburg

Wilhelmsburg



Wilhelmsburg
without dikes
during mean
high tide



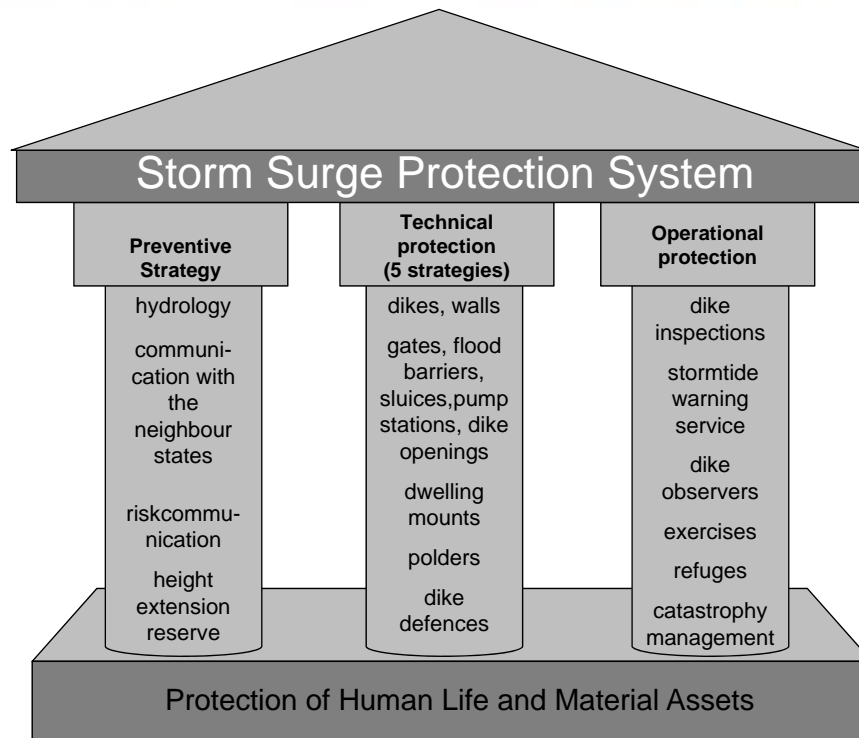
Storm Surge



Sturmflut 11.9.2007 Nachmittag und nächster Morgen



Coastal Protection Strategy



Technical Protection



Eindeichung/Polder



Objektschutz



Warft



Technical Protection



What is the correct level?

Speicherstadt Sturmflut, Januar 1995



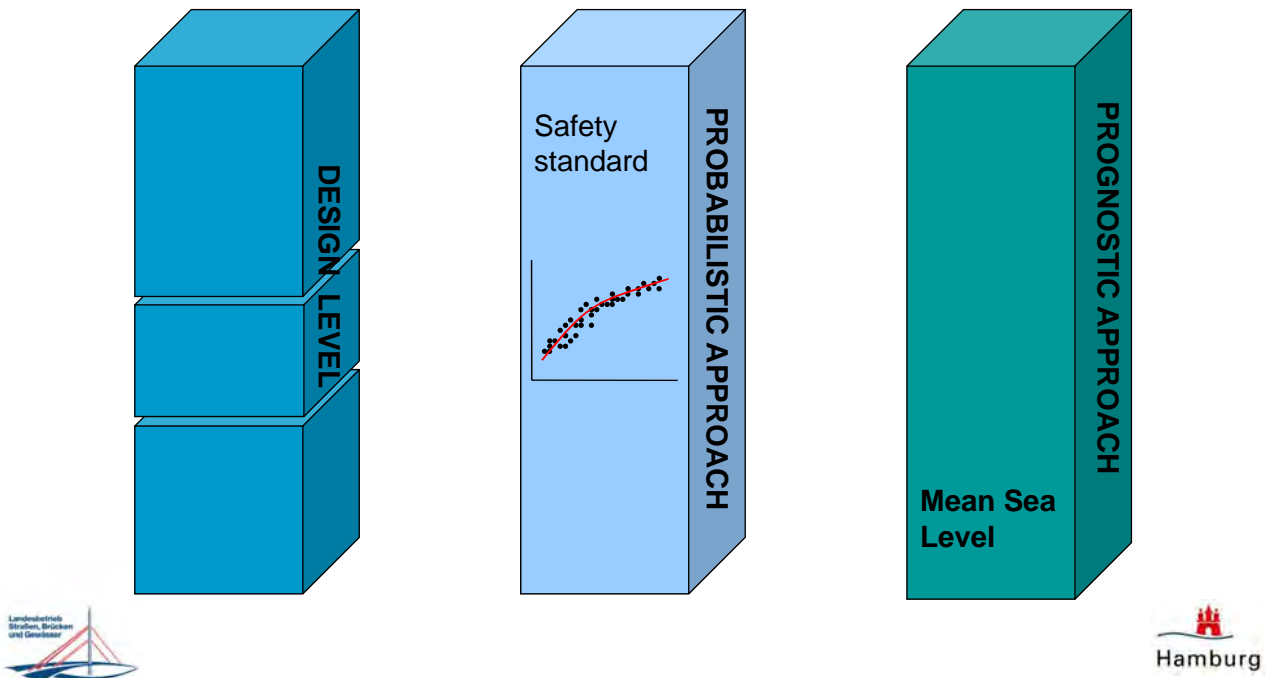
Storm Surge Protection: Main Questions

Design Level under today's
Water Level?
climate conditions

WRisk analysis

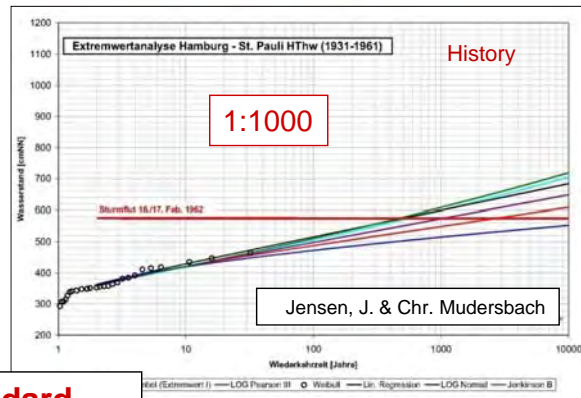
Climate Change Value

How can we react on climate change?

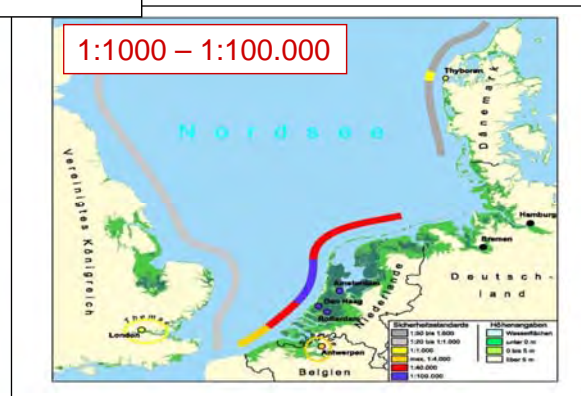
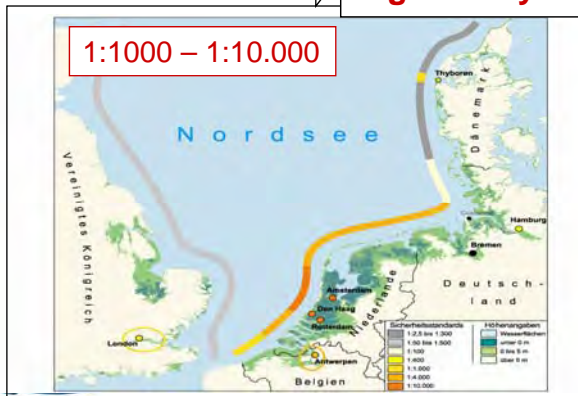


Safety Standard

- 180.000 Inhabitants
- 165.000 Employees
 - └ **High**
- Werte in Höhe von 10.000.000.000 €
 - └ **High Vulnerability**



High Safety Standard

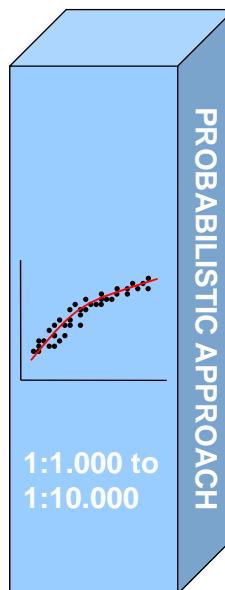
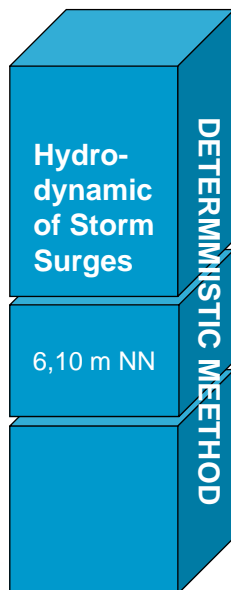


Result

Design Level under current
climate conditions

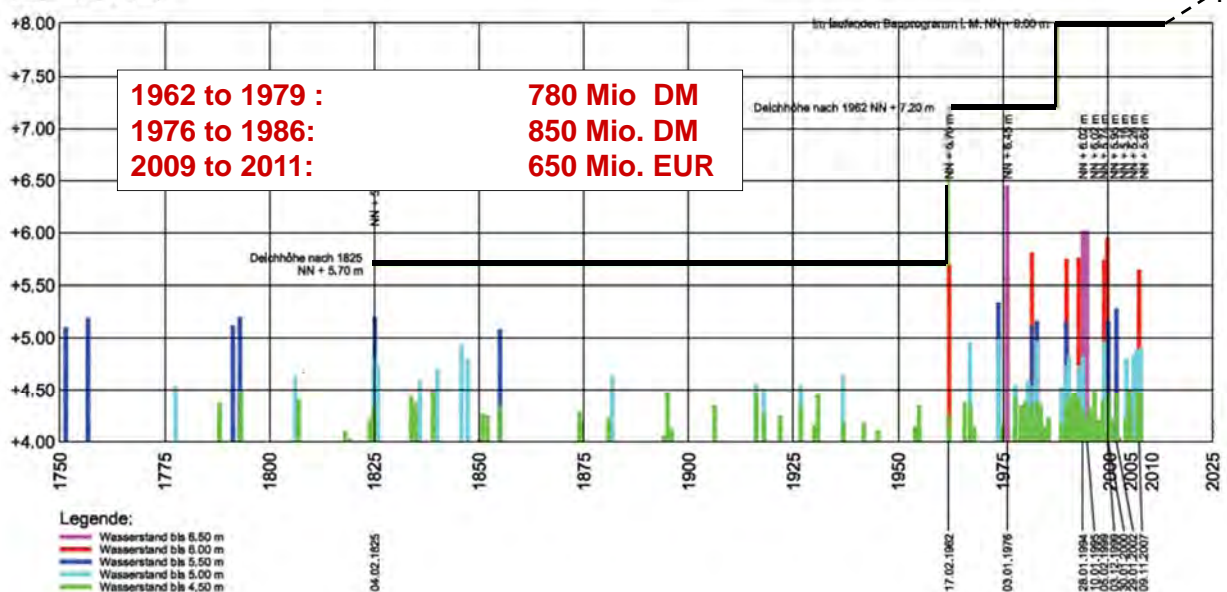
Safety Standard

Climate Change Value



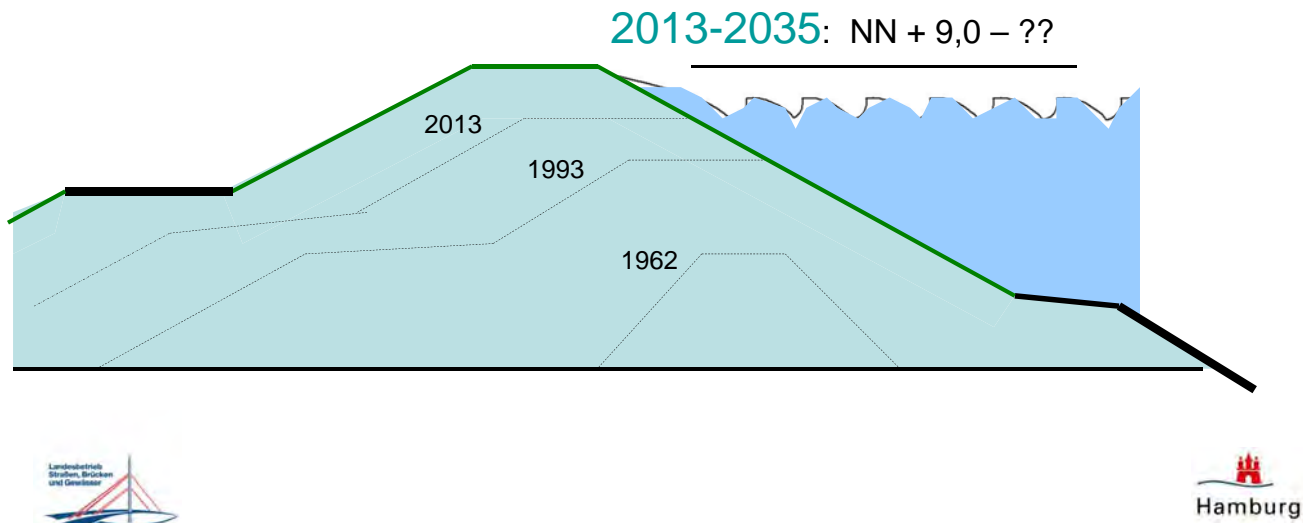
Consequences

Wasserstand in m ü. NN
(bezogen auf Pegel St. Pauli)

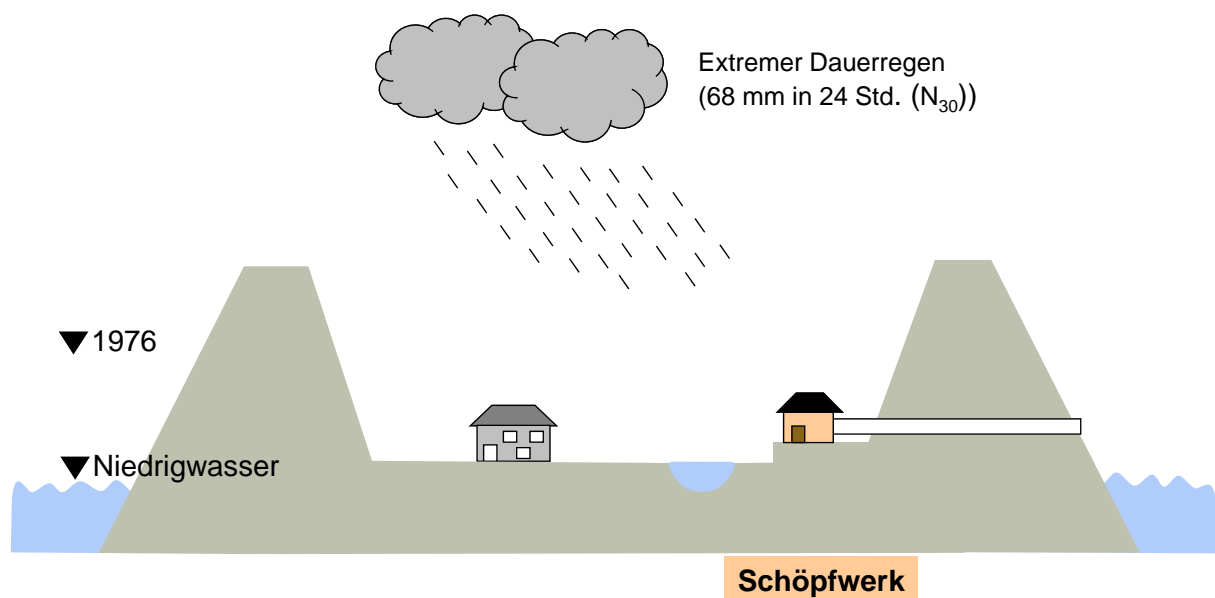


Past – Today – Future?

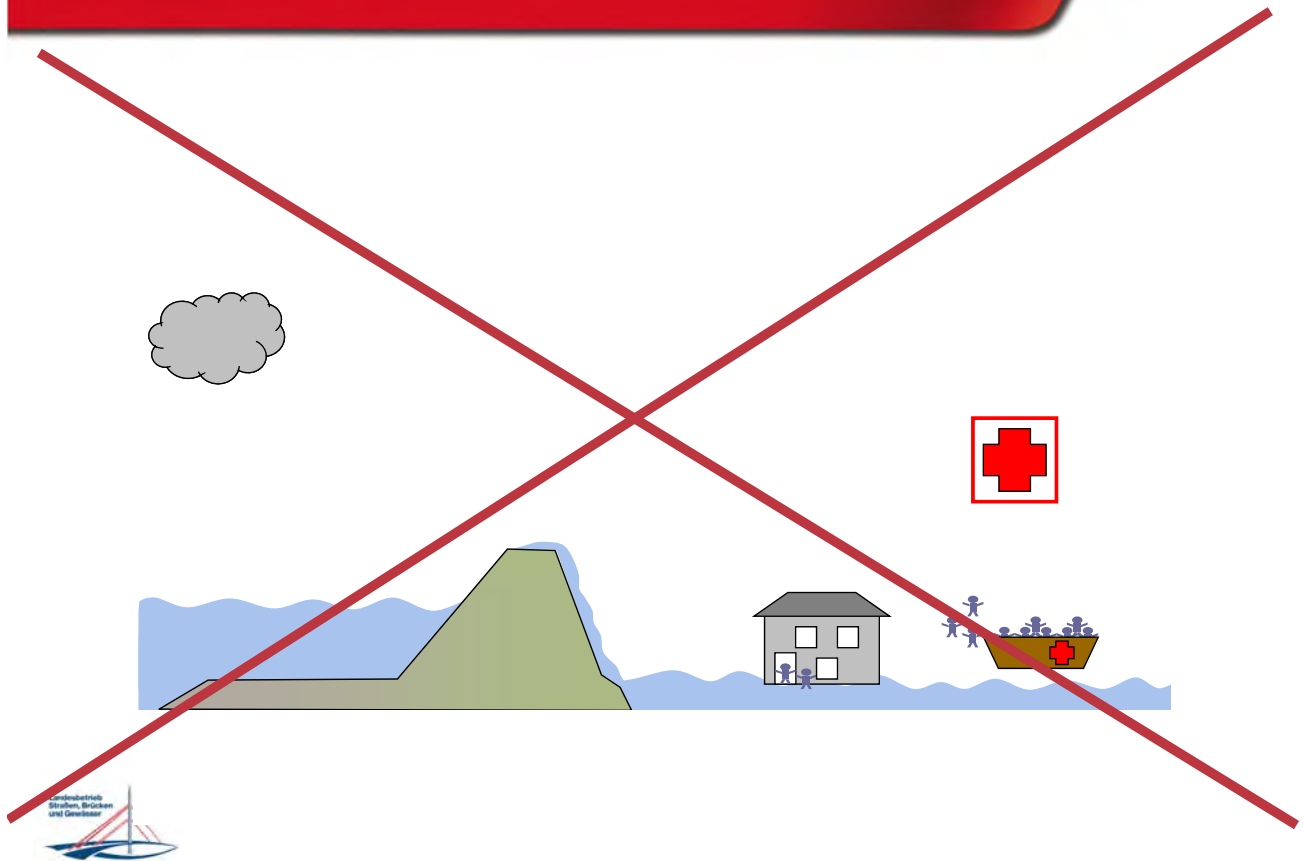
Adaptionsstrategy since 1962: Strengthening of the coastal protection facilities



Strategy against rainfall and storm surges (together)



Summary



Thank you for your Attention

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Agency of Roads, Bridges, and Waters
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Regional / Local Mean Sea Level Rise

-0,09 ± 15 mm/a (1807 -1890)
1,3 ± 0,15 mm/a (1890 -1980)
3,0 ± 0,5 mm/a (1980 - 2004)

North Sea / Gauge
Wöppelmann et al.

0,7 mm/a (1900 – 1997 in Aberdeen)
1,7 mm/a (1915 – 1997 in Newlyn)
1,3 mm/a (1990 – 1991 in Brest)

(2001)

The Region of the North Sea offers
an increase rate of ca. 1,4 mm/a
Woodworth et al. (2009)

1,25 mm/a

North Sea /gauge in Newlyn
Holgate (2007)

Results

Projections

- 5 up to + 115 cm

30 – 80 cm

North-East-Atlantic
Katsman et al. (2008)

-5 – 115 cm

Temperature increase 6°C
Dutch Coast
Deltacommissie (2008)

58 cm

Temperature increase 3°C
German North Sea Coast
Max-Palanck-Institut / MPI-M(2008)

70 – 80 cm

Temperature increase 6°C
English Coast
UK Climate Impacts Programme / UKCIP (2007)

14 – 20 cm

Temperature increase 3°C
English Coast
UK Climate Impacts Programme / UKCIP (2007)

