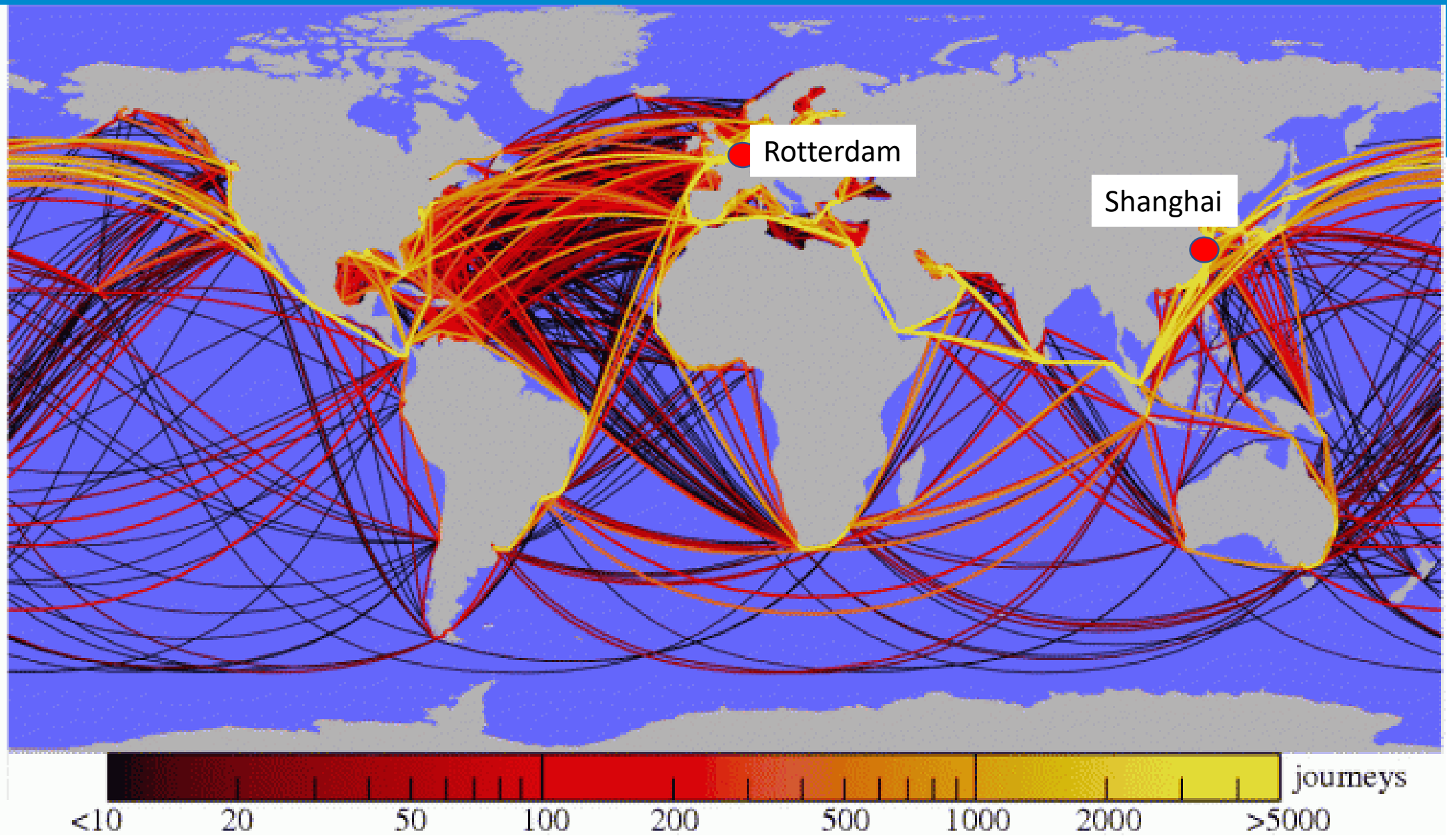


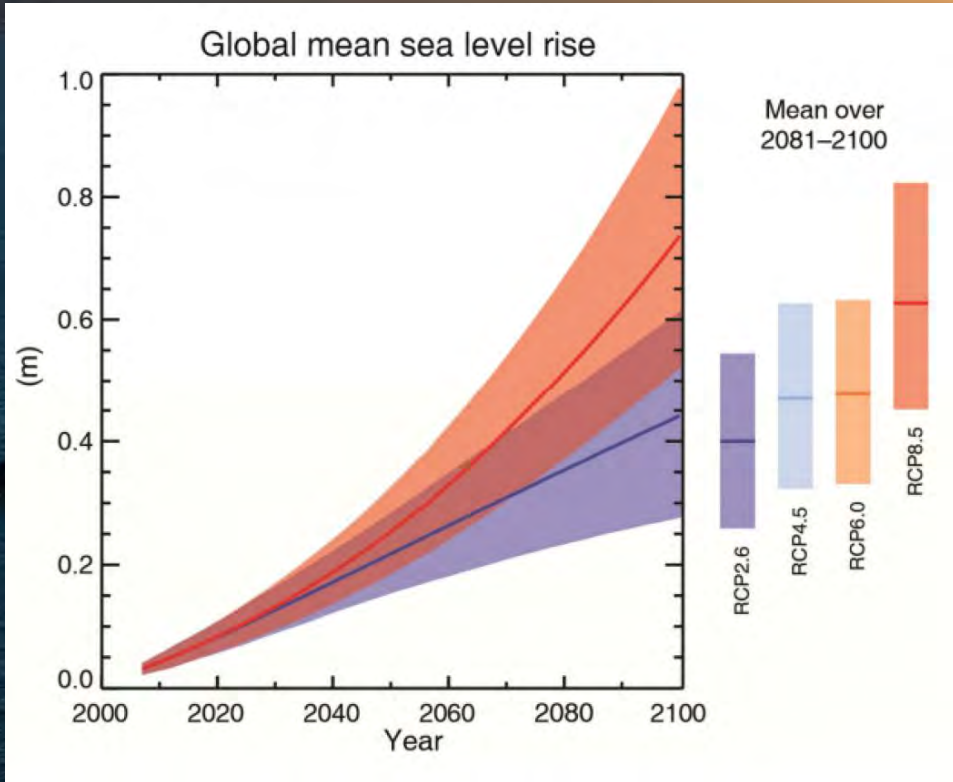


# Cities of Shanghai and Rotterdam: Strategies for Investment and Resiliency

Dr. Jeroen Aerts, VU University Amsterdam  
April 13<sup>th</sup> 2021

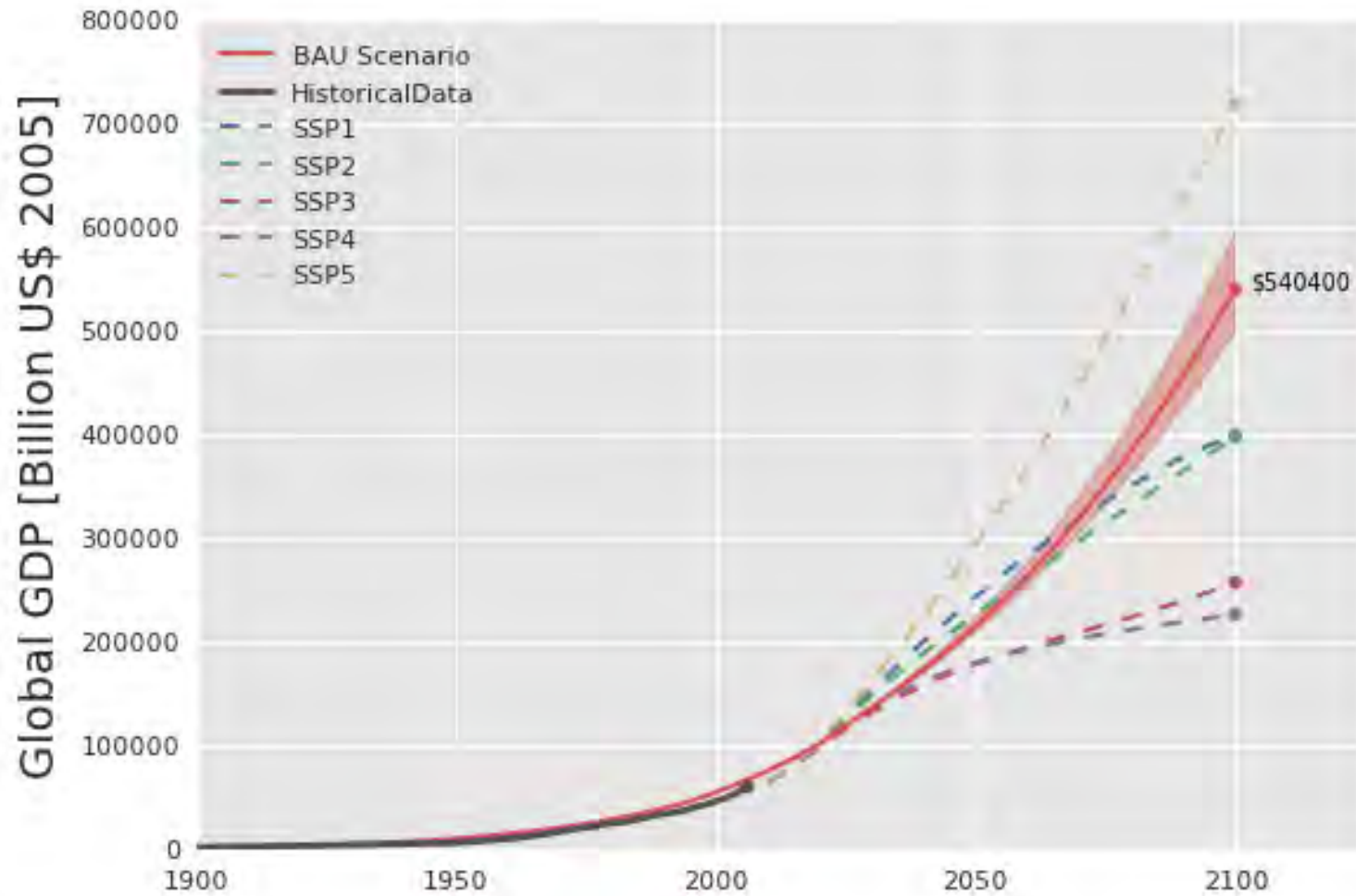


# Sea level rise

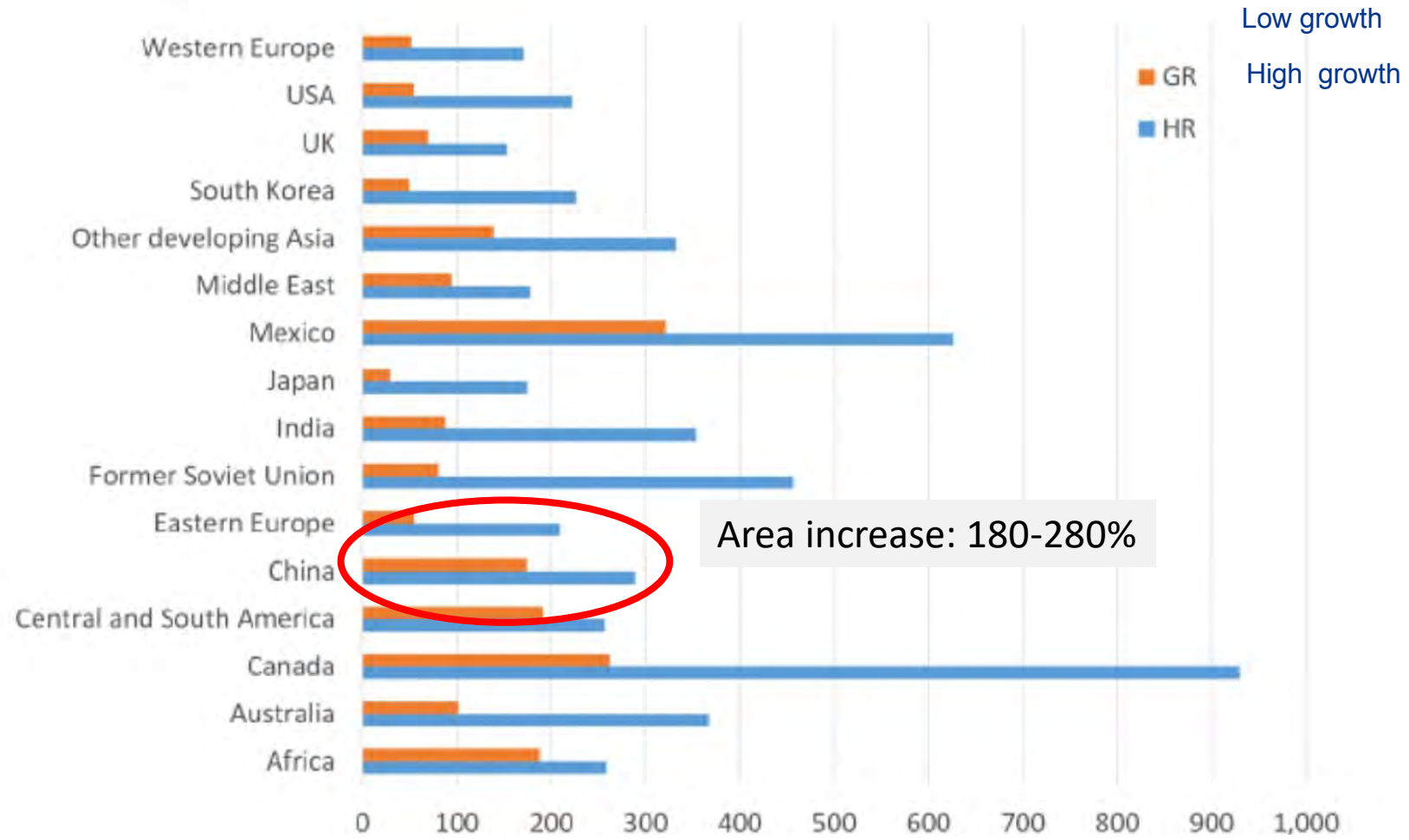


IPCC, 2014

# Socio economic trends



# Response ports to growth: increase area



Total investment cost 2050 for all global ports: \$223-768bn

Most of these costs are for new areas

6% of the cost are needed for climate/SLR adaptation

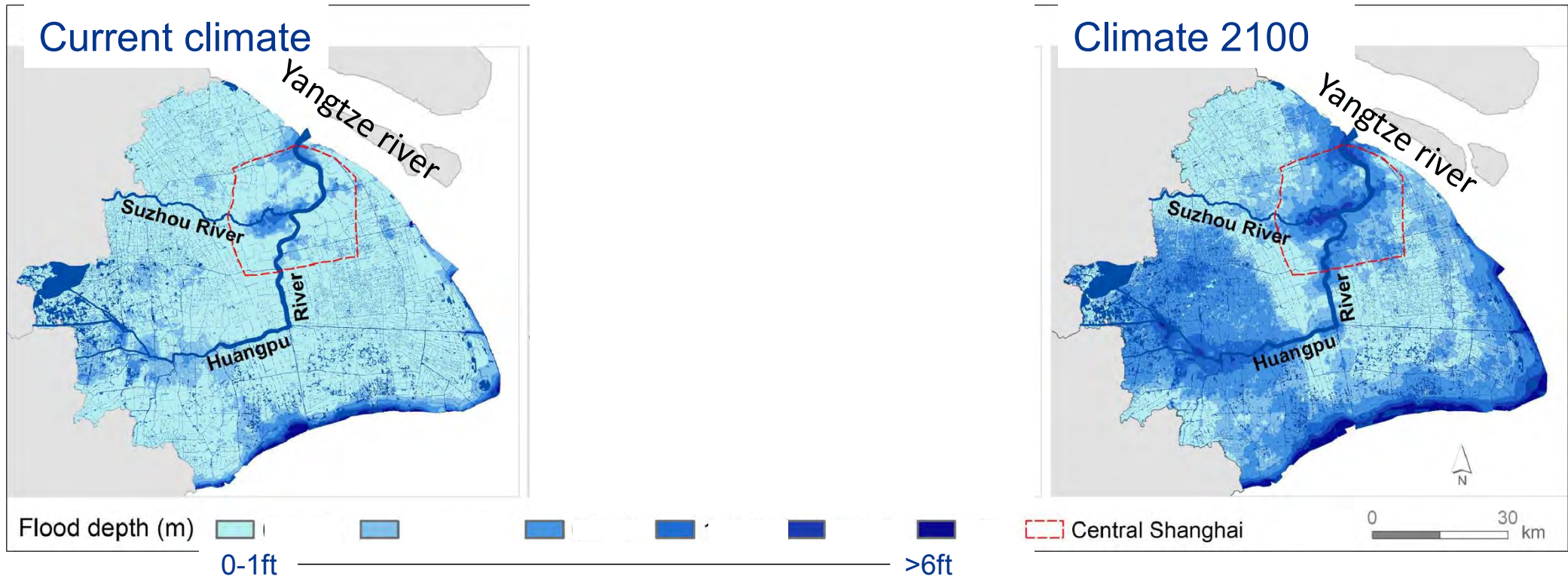
Shanghai: 22 mln inhabitants  
Mean elevation: +9ft asl (3-4m)





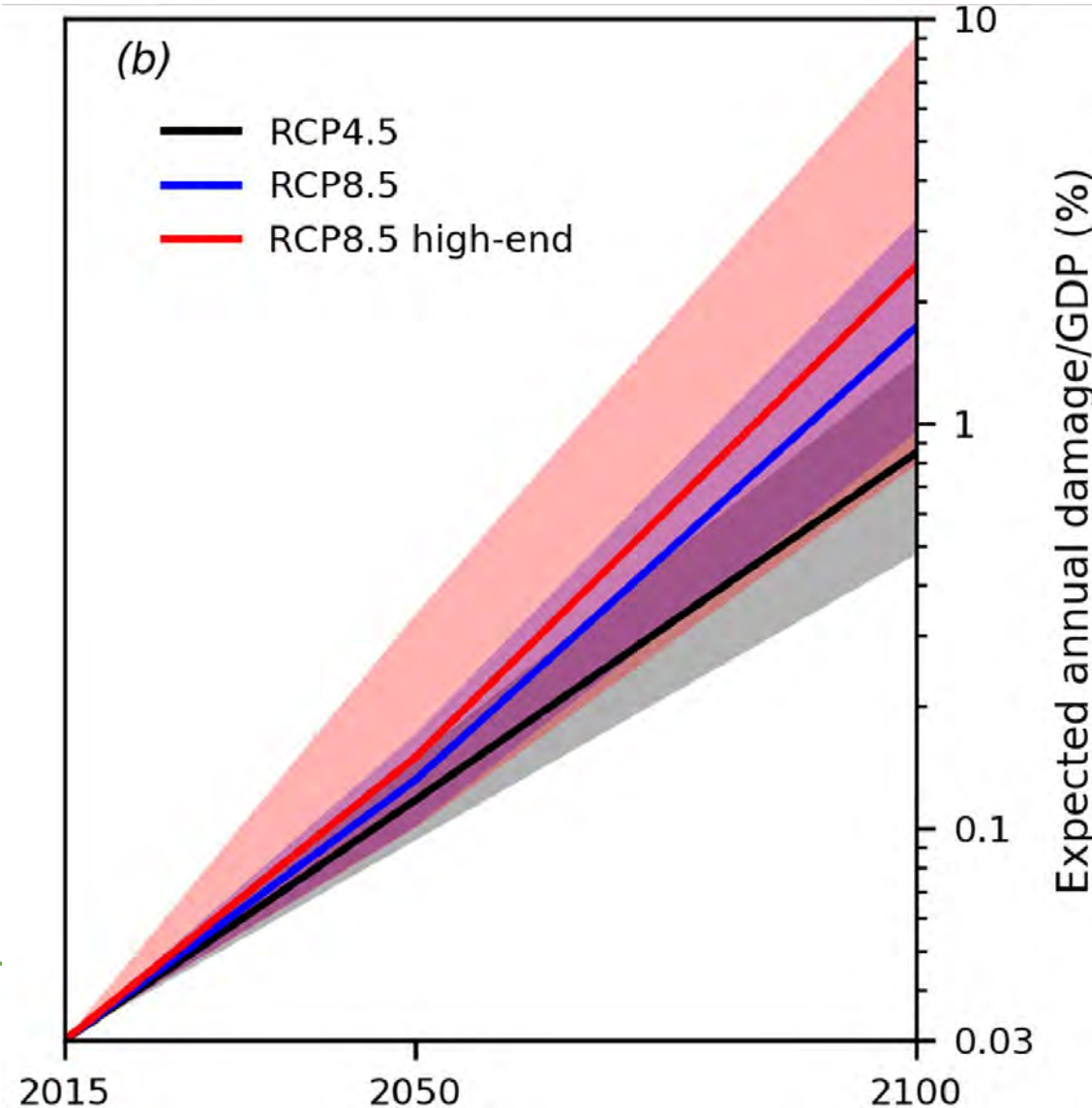


# Risk assessment



Du et al., 2019

# Projected flood losses 2050-2100



GDP Shanghai = US\$ 588bn

Du et al., 2019

# Flood Proofing Buildings

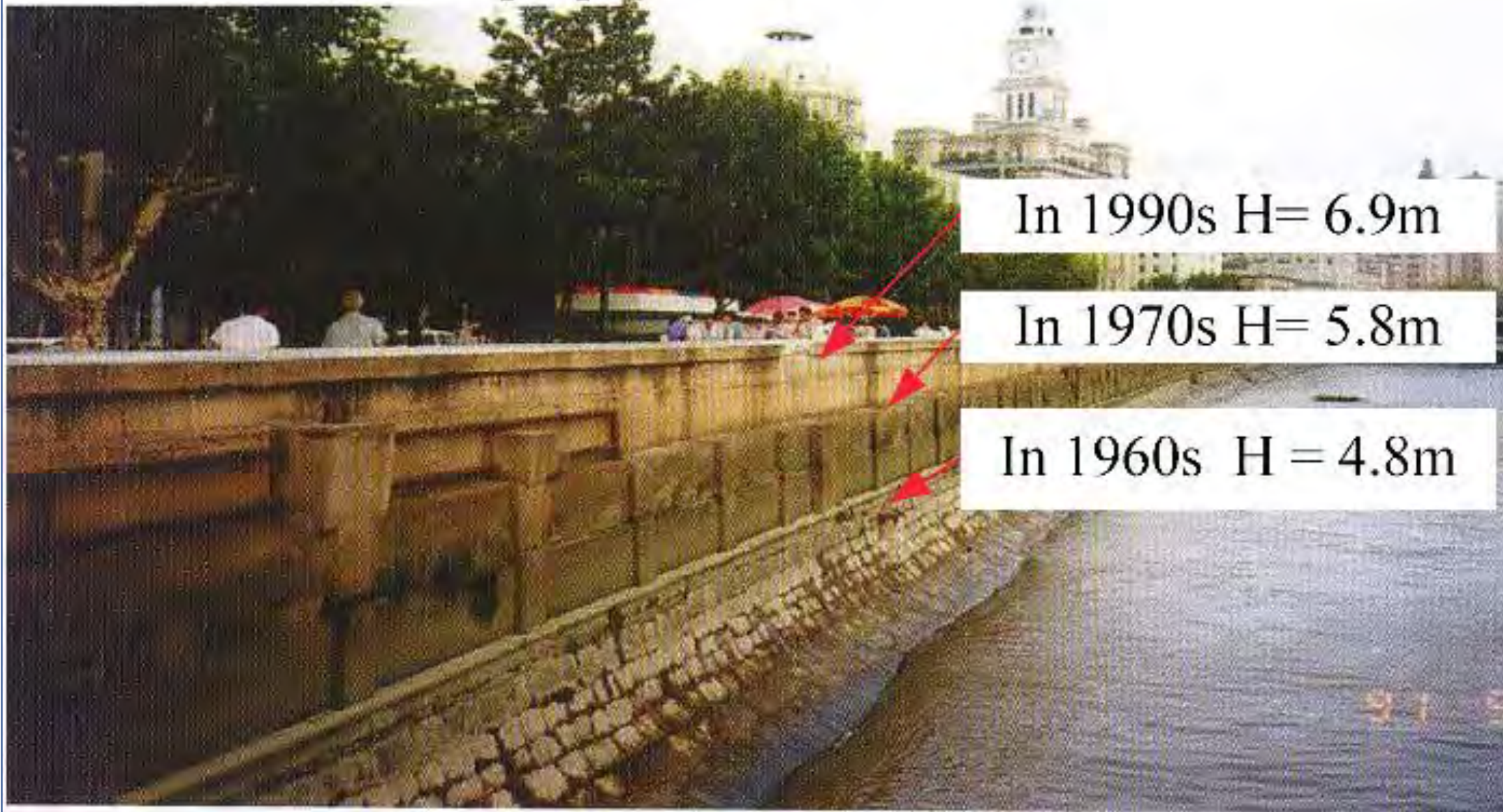


# Elevated subway entrance, Hangzhou, China





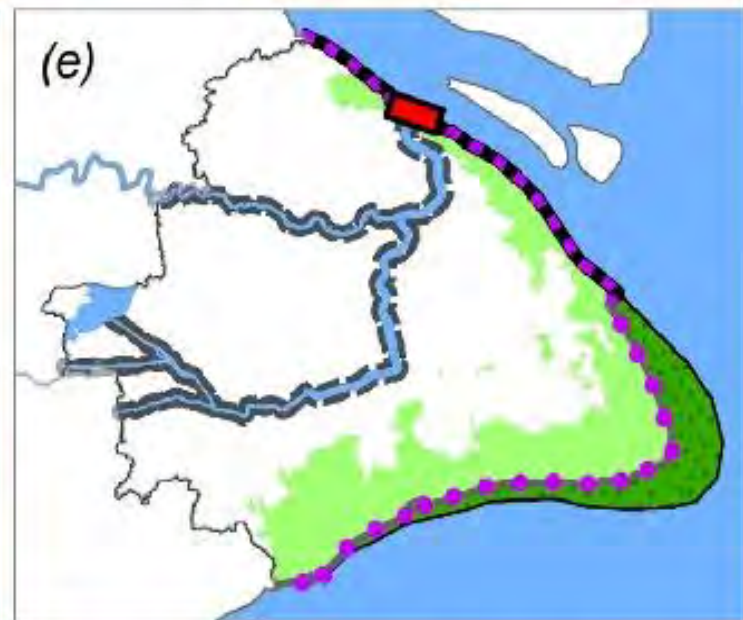
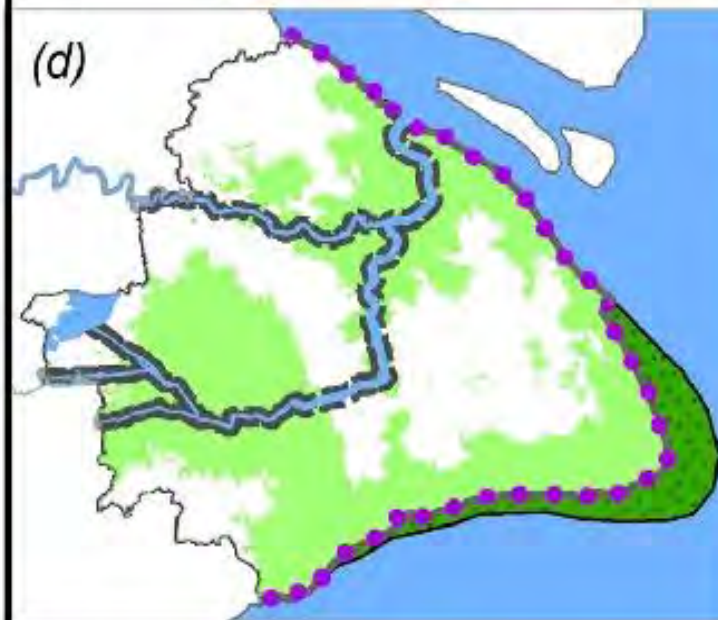
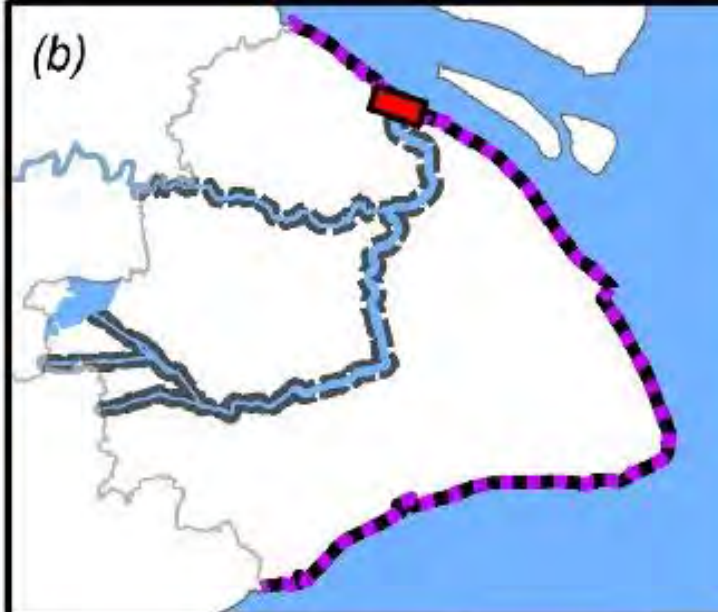
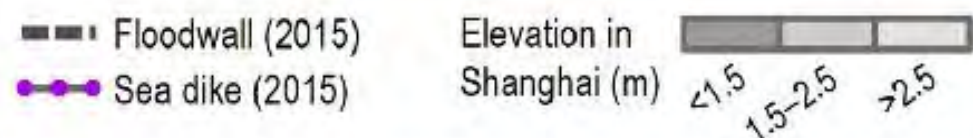
Based on reference [57]



In 1990s  $H= 6.9\text{m}$

In 1970s  $H= 5.8\text{m}$

In 1960s  $H = 4.8\text{m}$



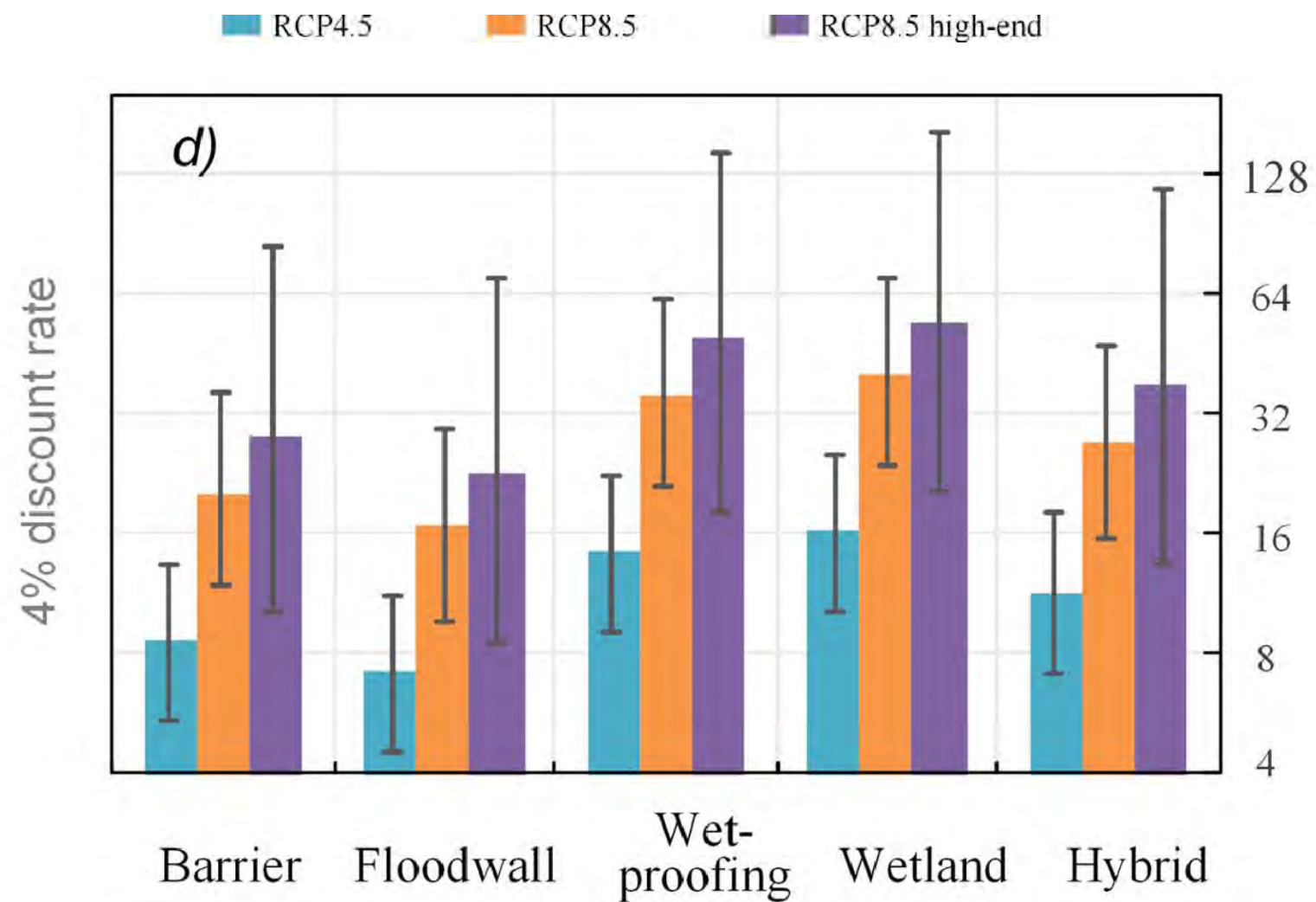


Wetland park: Hong kong





## Benefit to cost ratio Shanghai





Yangtze river



amsterdam



20 mile Donghai Bridge







The Netherlands: Building scale flood proofing (from 1000 AD)





City of Rotterdam:  
Storm surge barrier “Maeslantkering”





Port of Rotterdam ~1940-50





# Flood adaptation take-aways

- Protection of coastal cities is inevitable
- Spreads investments over time
- Cooperation water managers, spatial planners, investors/developers



Thanks for your attention!  
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