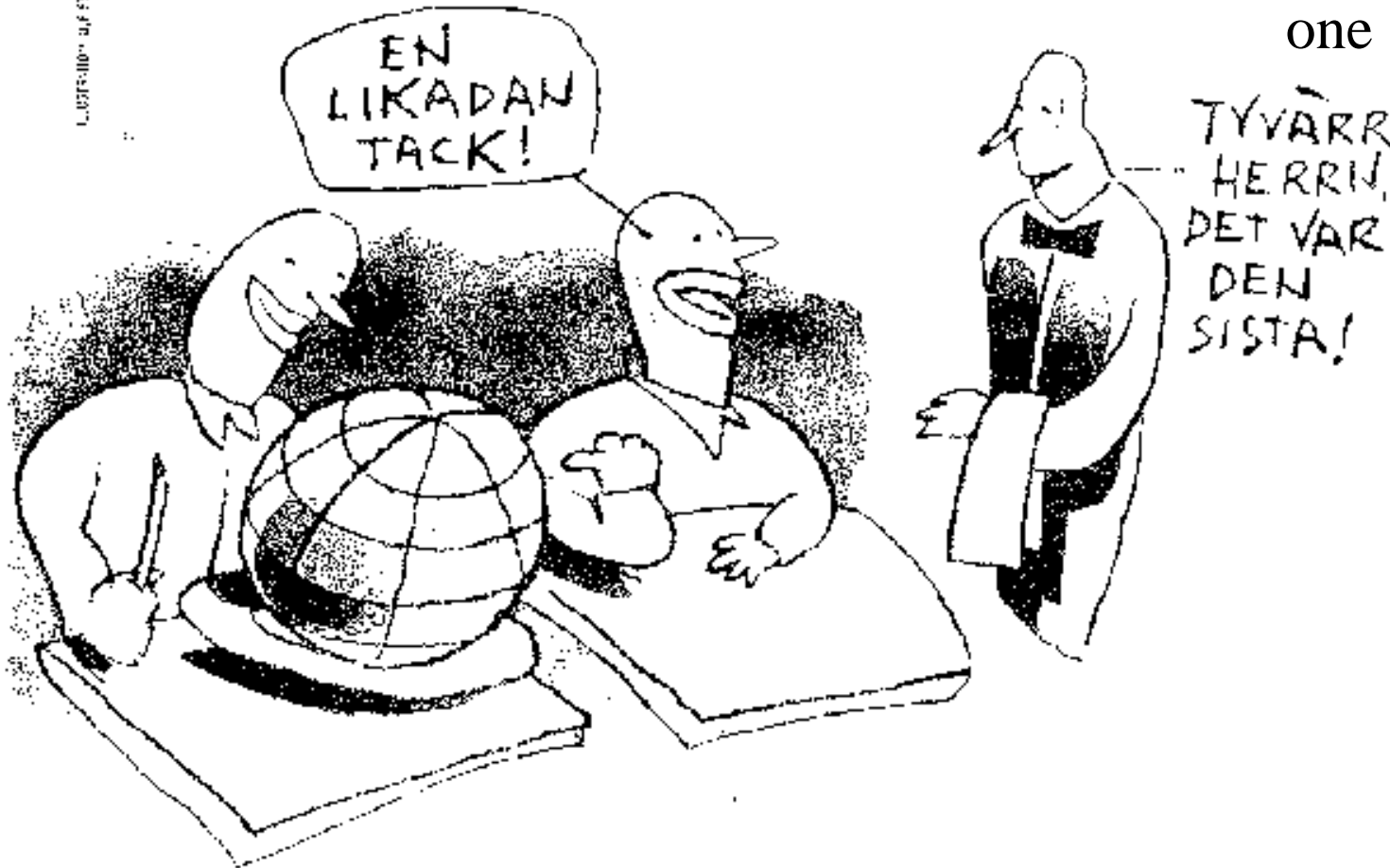
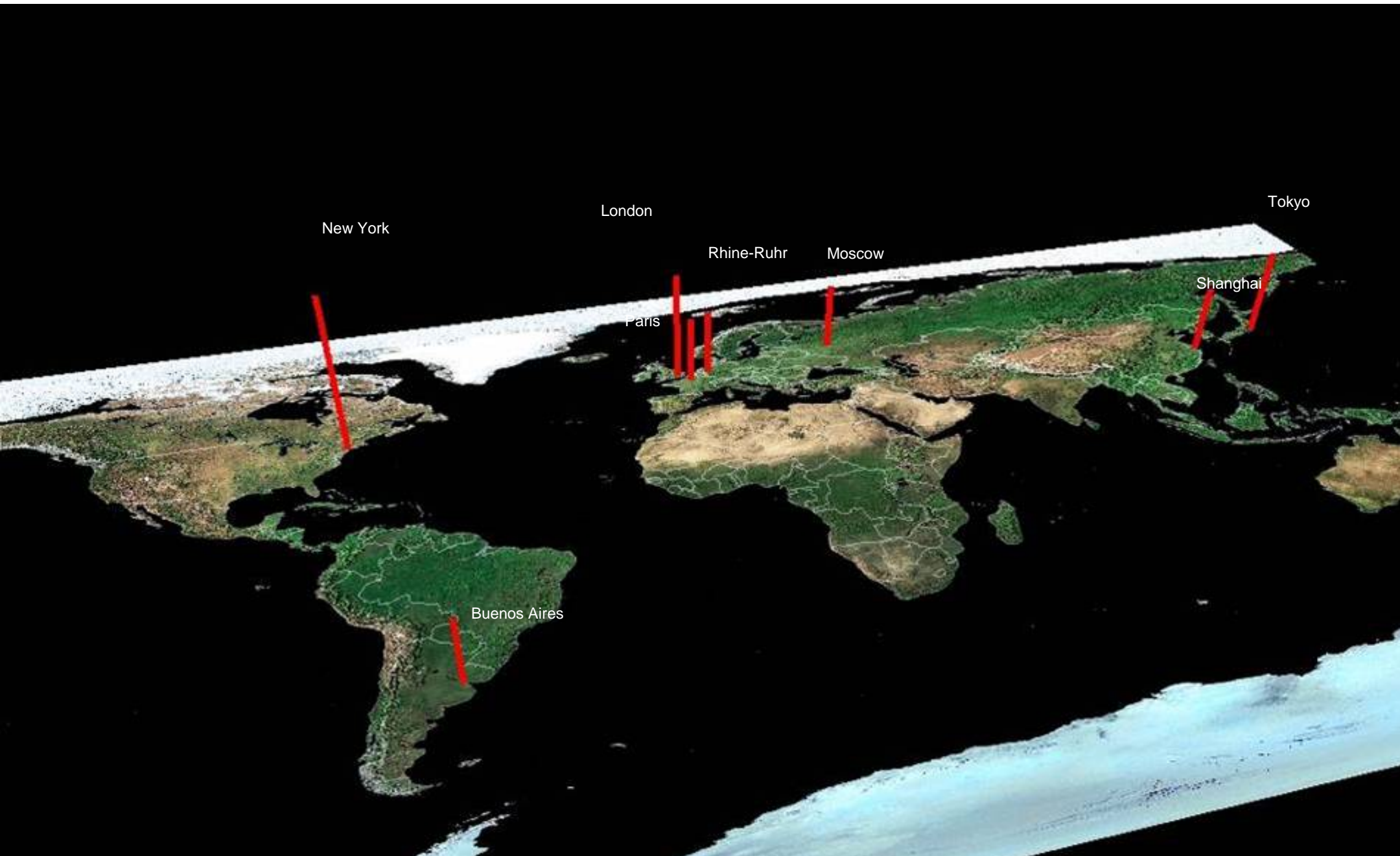


Can I have a
similar please

Sorry Mister
that's the last
one



Mega cities 1950



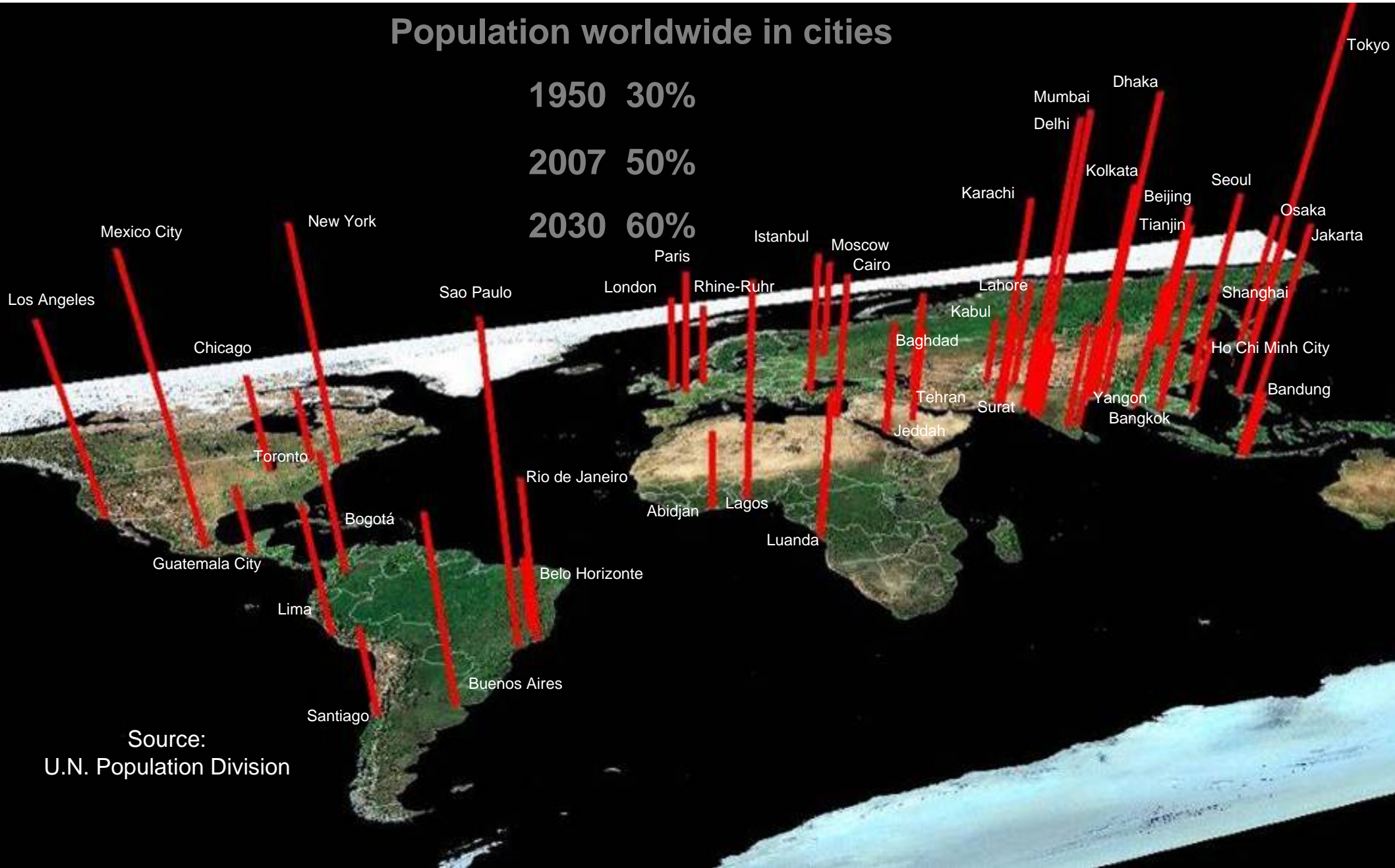
Mega cities 2015

Population worldwide in cities

1950 30%

2007 50%

2030 60%



Source:
U.N. Population Division

Extreme weather conditions today and tomorrow in Göteborg



The municipal executive board commission

- How prepared is Göteborg for extreme weather and climate change
- What kind of knowledge do we need?



Water – so clear

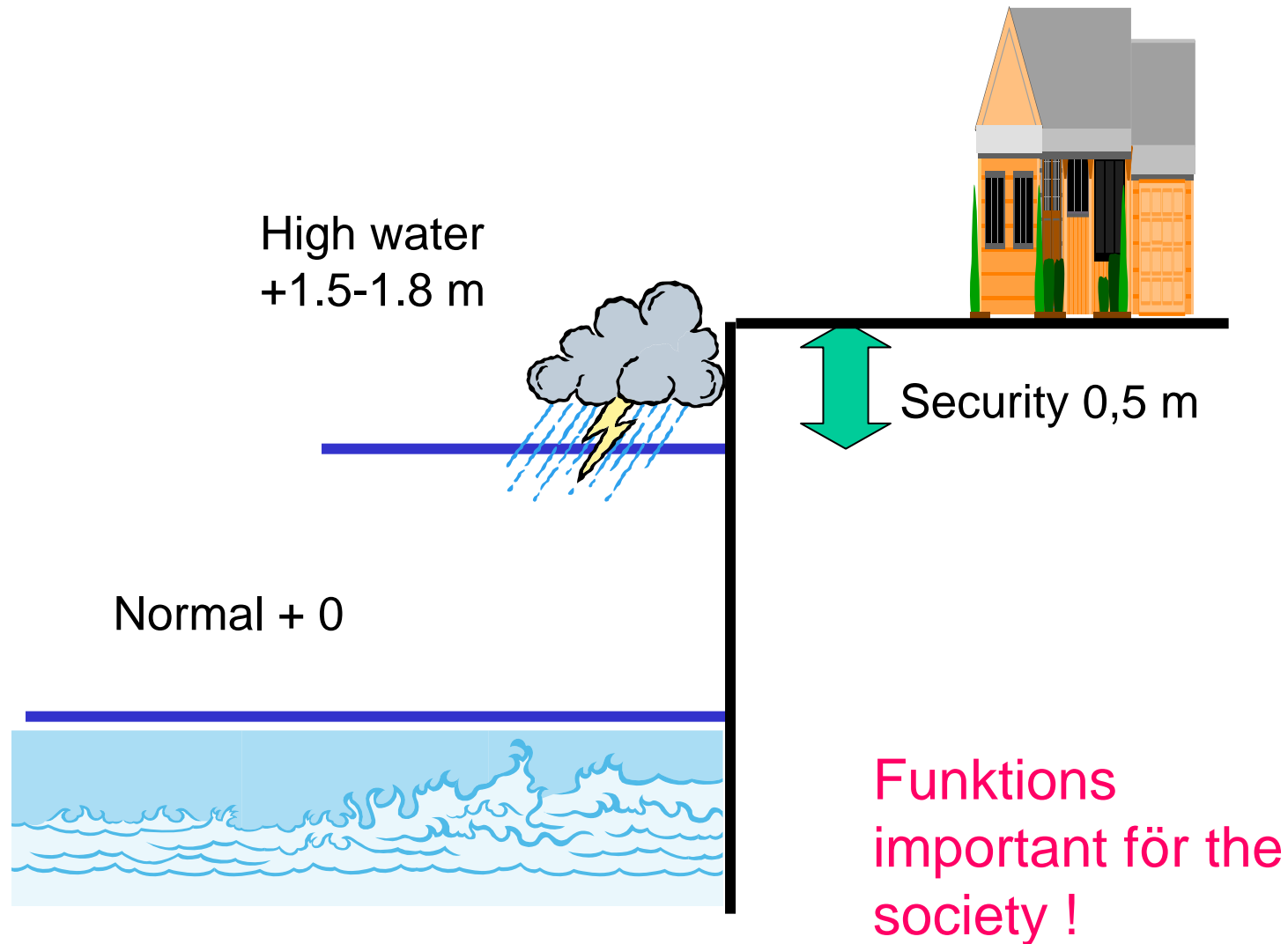
Adopted by city council KF september 2003



- Deepened comprehensive plan from City planning office
- Cooperation with
 - Real estate office
 - Park-and Natur
 - Environmental office
 - Water and sewage office
- EU-project

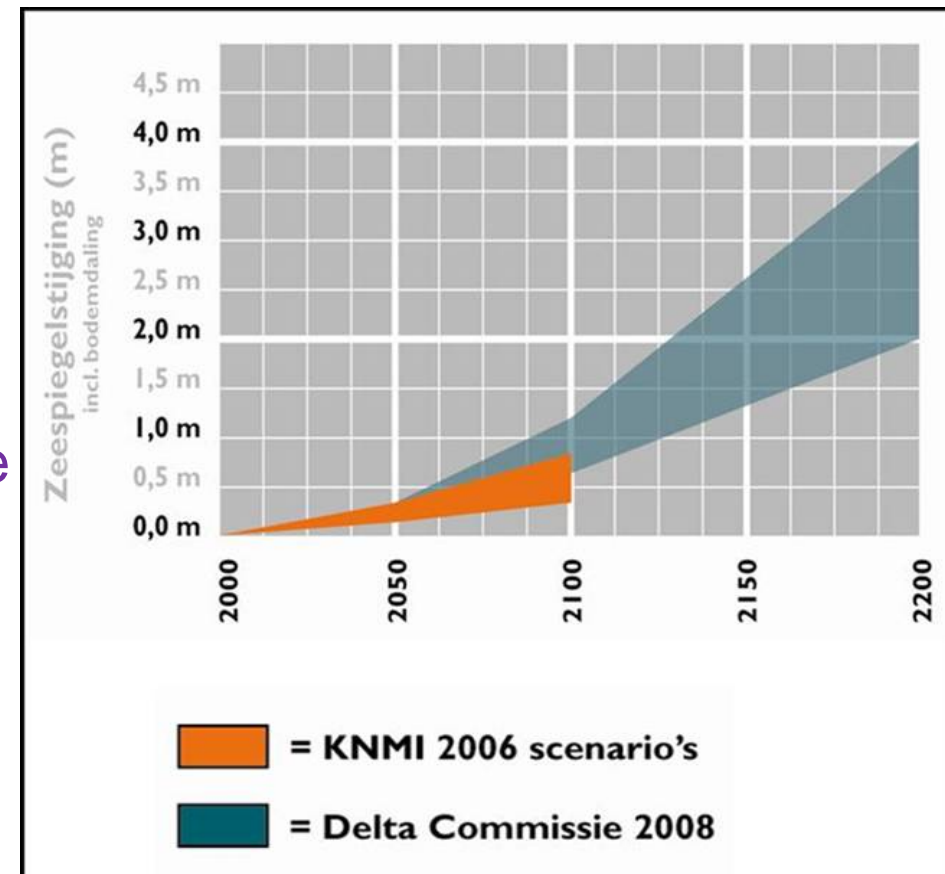


If the sea rise with 0,5 m

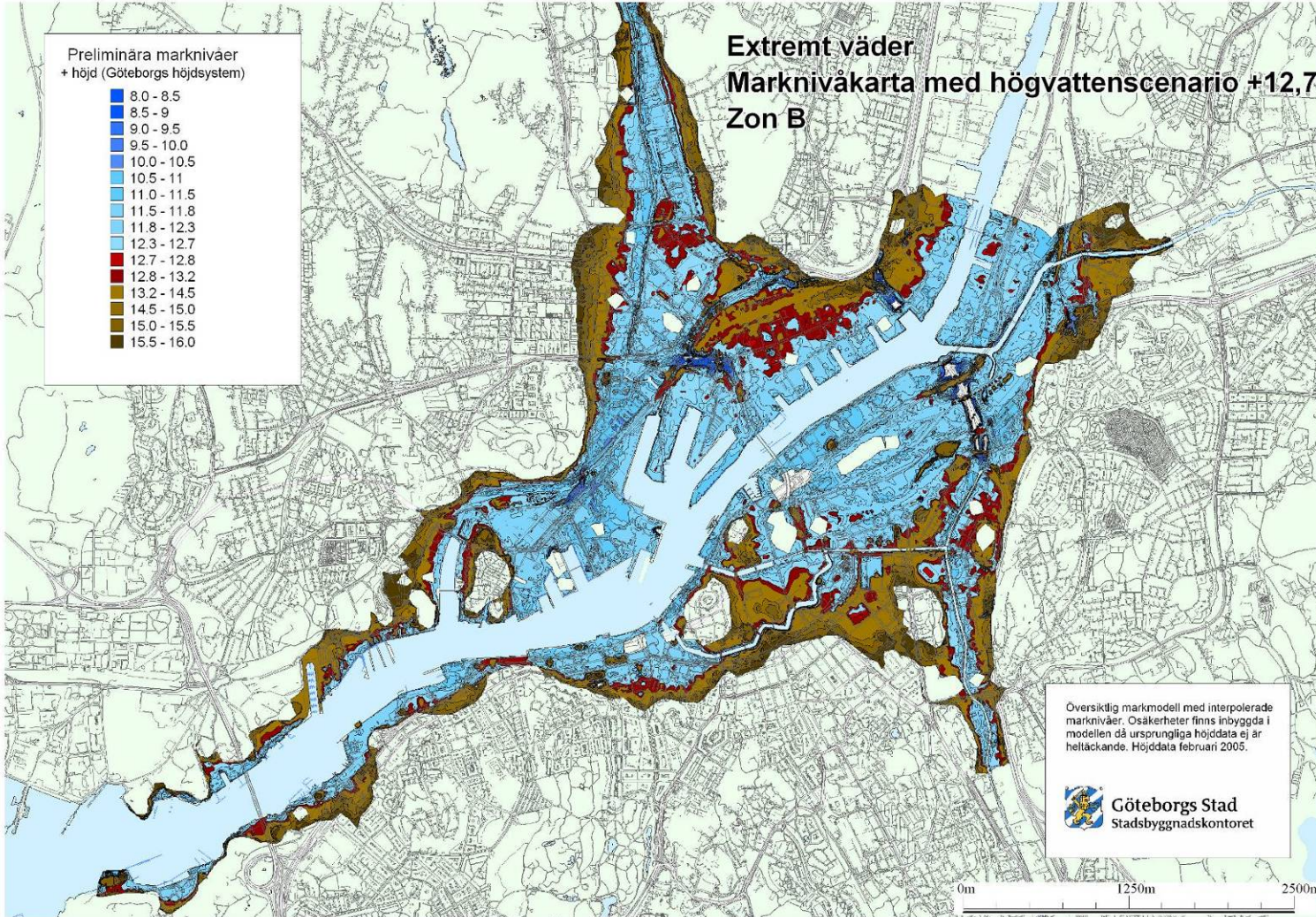


Updated scenario for sea level rise

- Latest IPCC (UN Intergovernmental panel on climate change) prediction on sea level rise is 0,9-1,6 meter by 2100. Earlier predictions (2007) were 0,2-0,6 meter.
- “The observed changes in sea ice on the Arctic Ocean and in the mass of the Greenland Ice Sheet and Arctic ice caps and glaciers over the past ten years are dramatic and represent an obvious departure from the long-term patterns.”

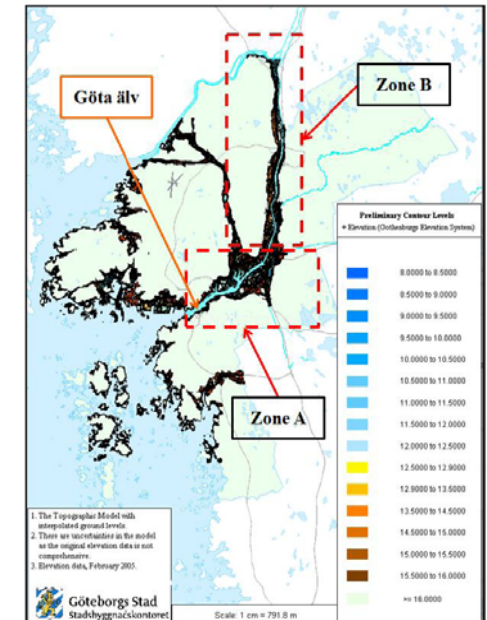


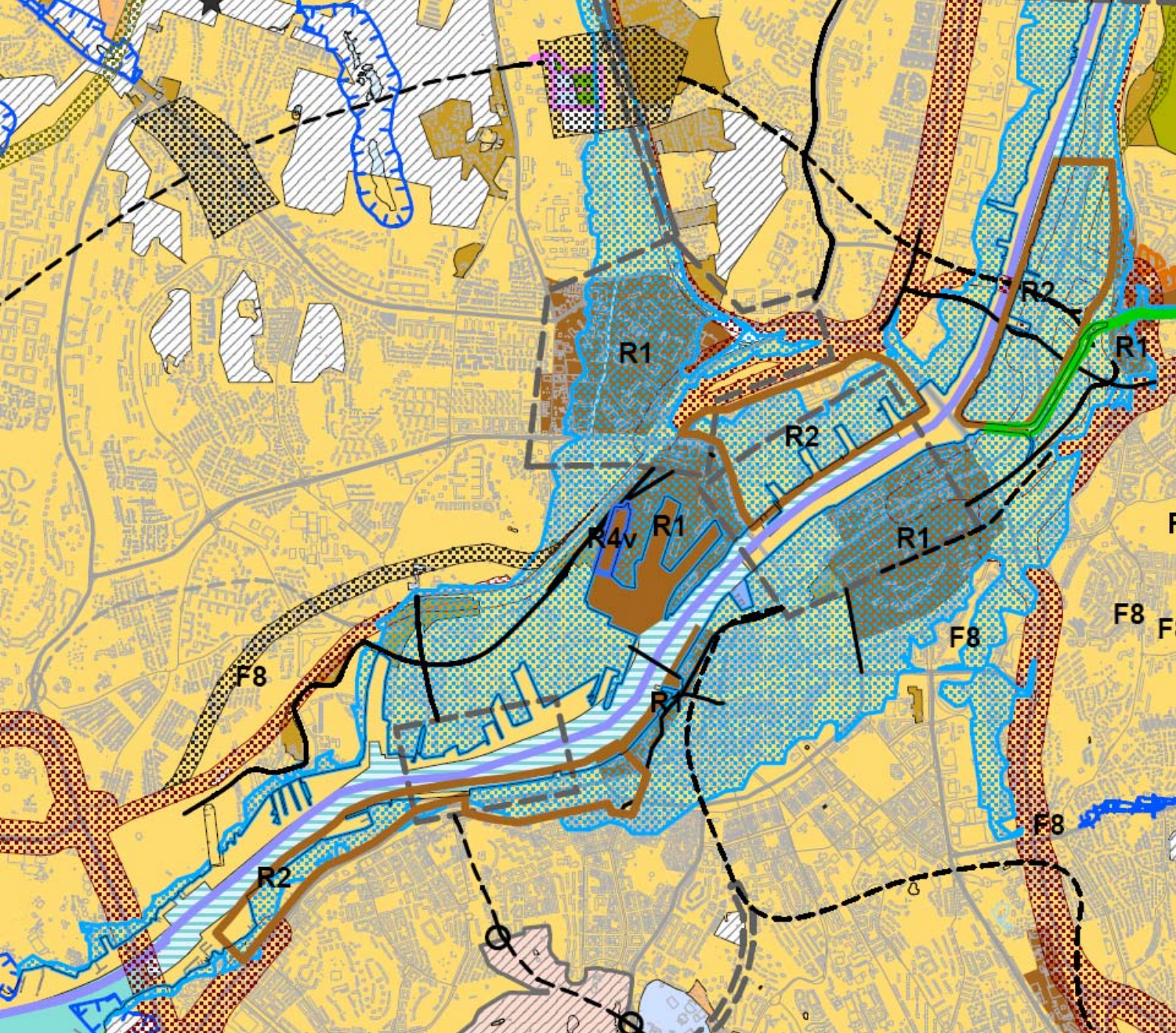
Topographic Map model



Value 100
billions

Protection 10
billions





COMPREHENSIVE PLAN

Recommendation

Risc for high water levels

2,8 m over normal water level

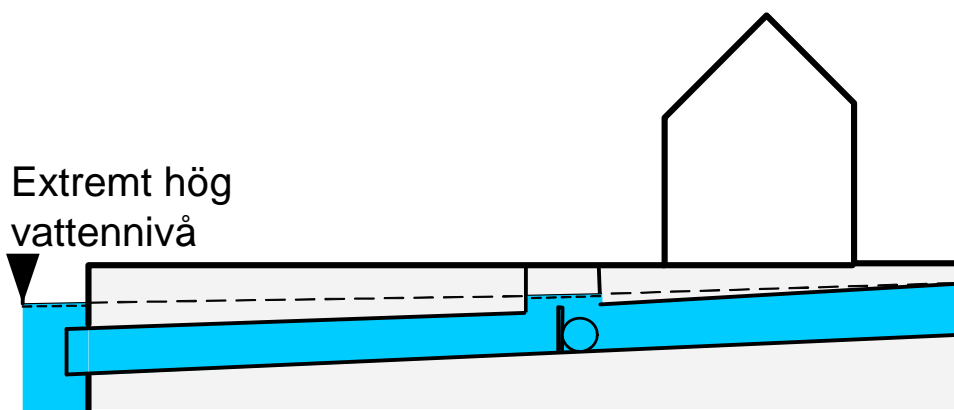
If not special protection measures shall be investigated

Central Älvstaden, The central river city

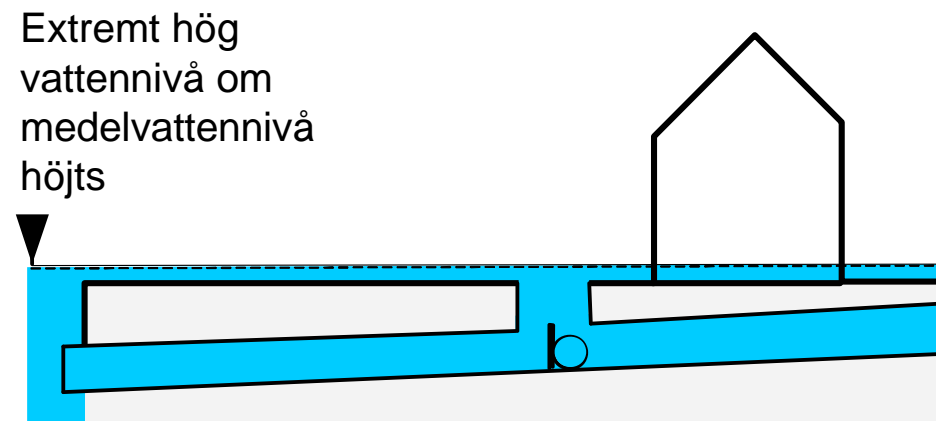


Land slides





Bräddavlopp. Vatten från recipient rinner bakvägen in i avloppssystem



Bräddavlopp. Avloppssystemet fullt av vatten. Marköversvämning. Byggnader drabbas.

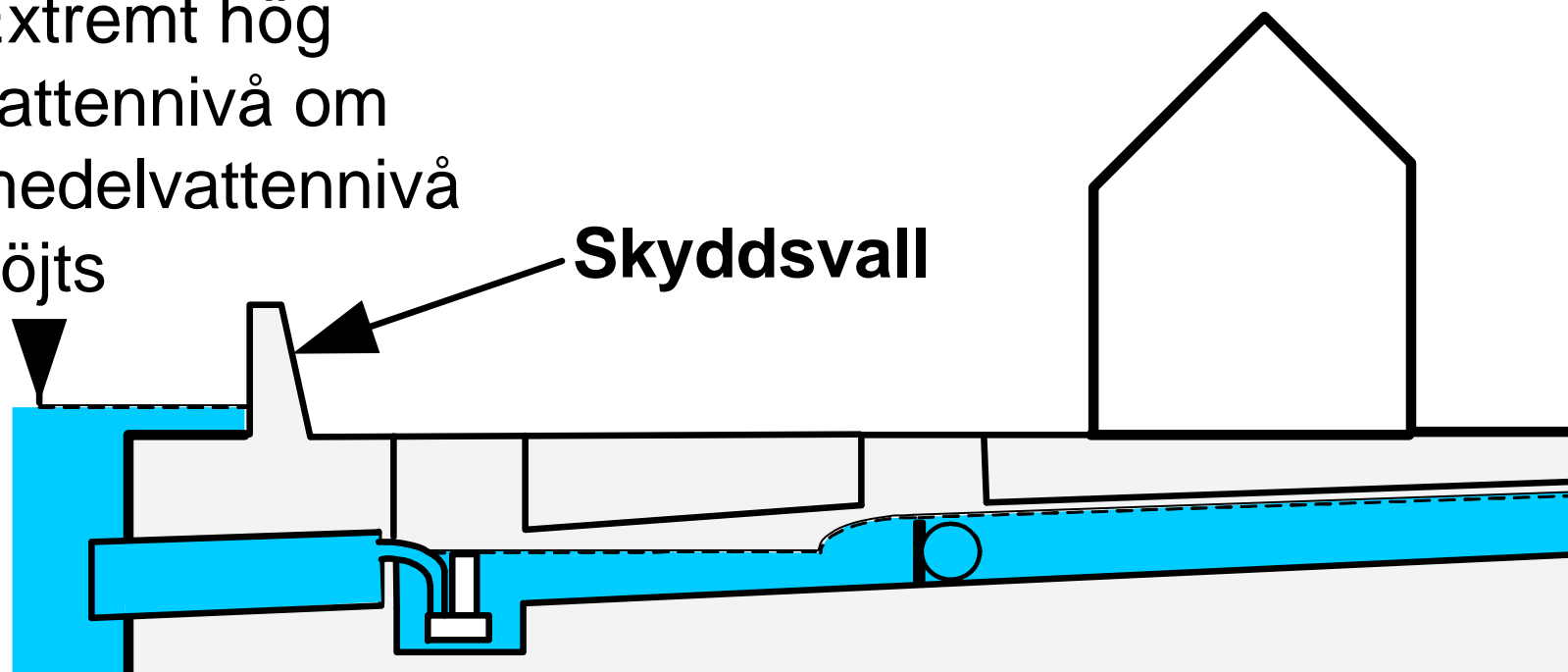








Extremt hög
vattennivå om
medelvattennivå
höjts



Bräddavlopp med pump.
Avloppssystemet har en trycknivå som
är acceptabel vid dimensionerande
regn.



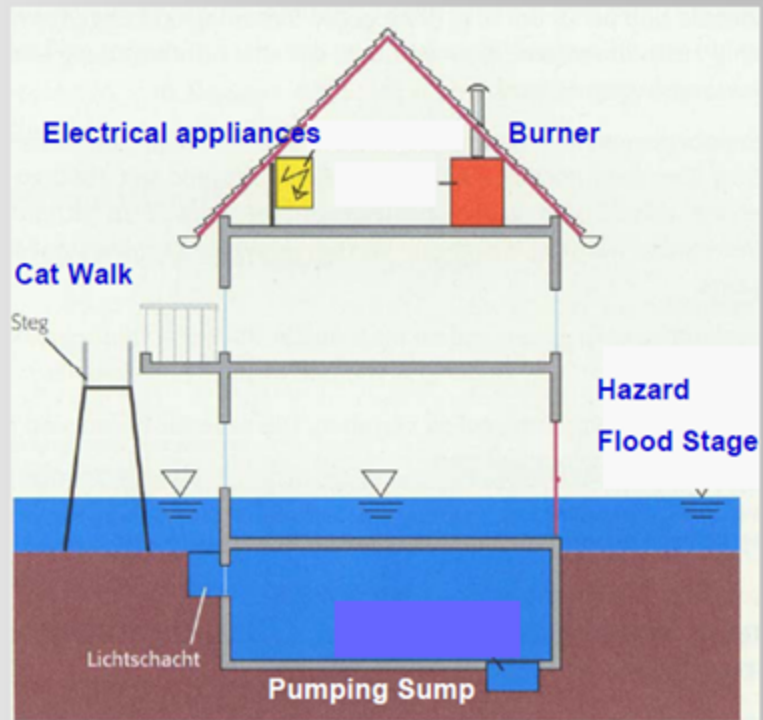
Temporary measures

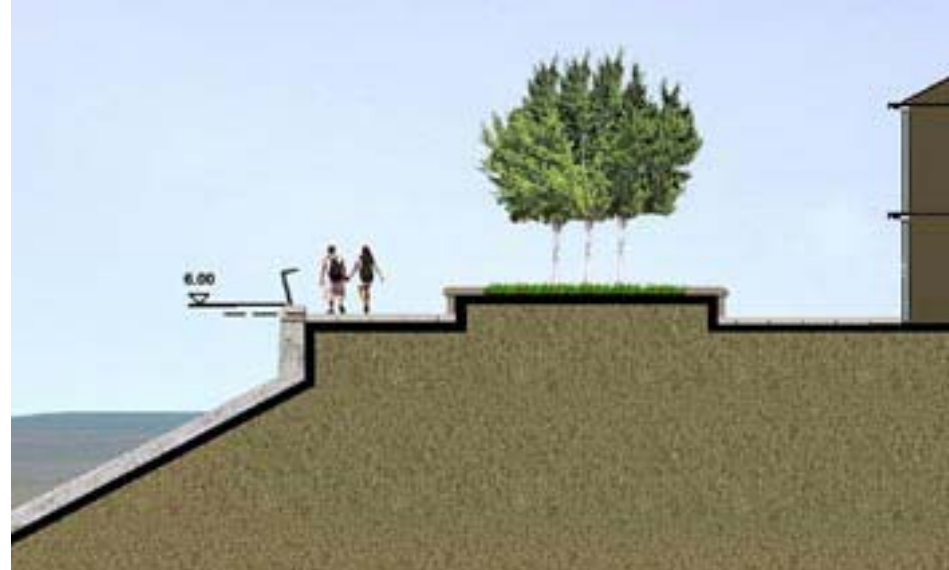


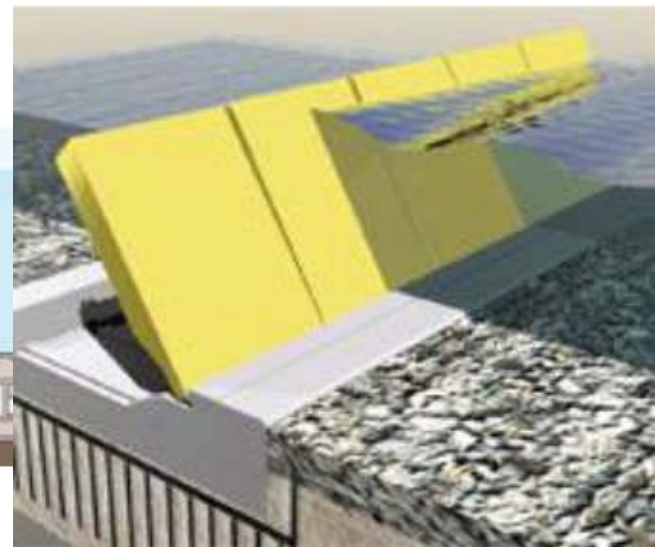
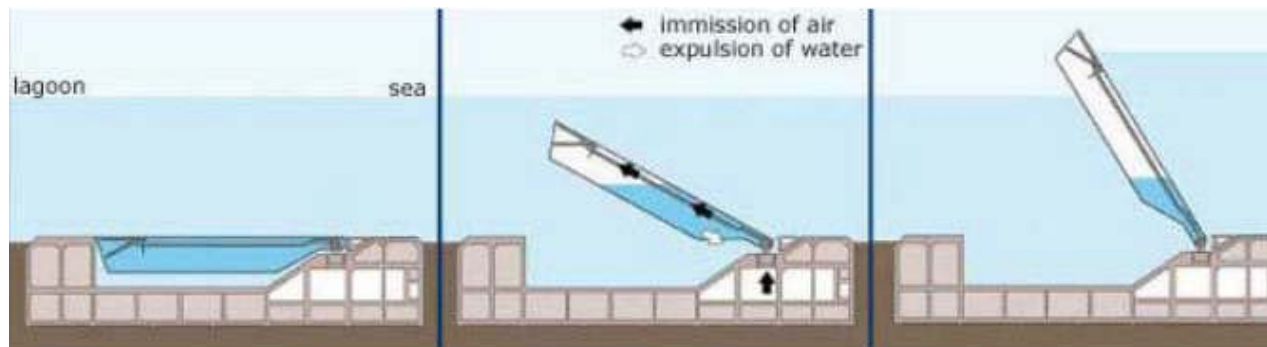


Wet-Proofing Strategy
Move all supply elements to the top of the building

Provide temporary escape ways

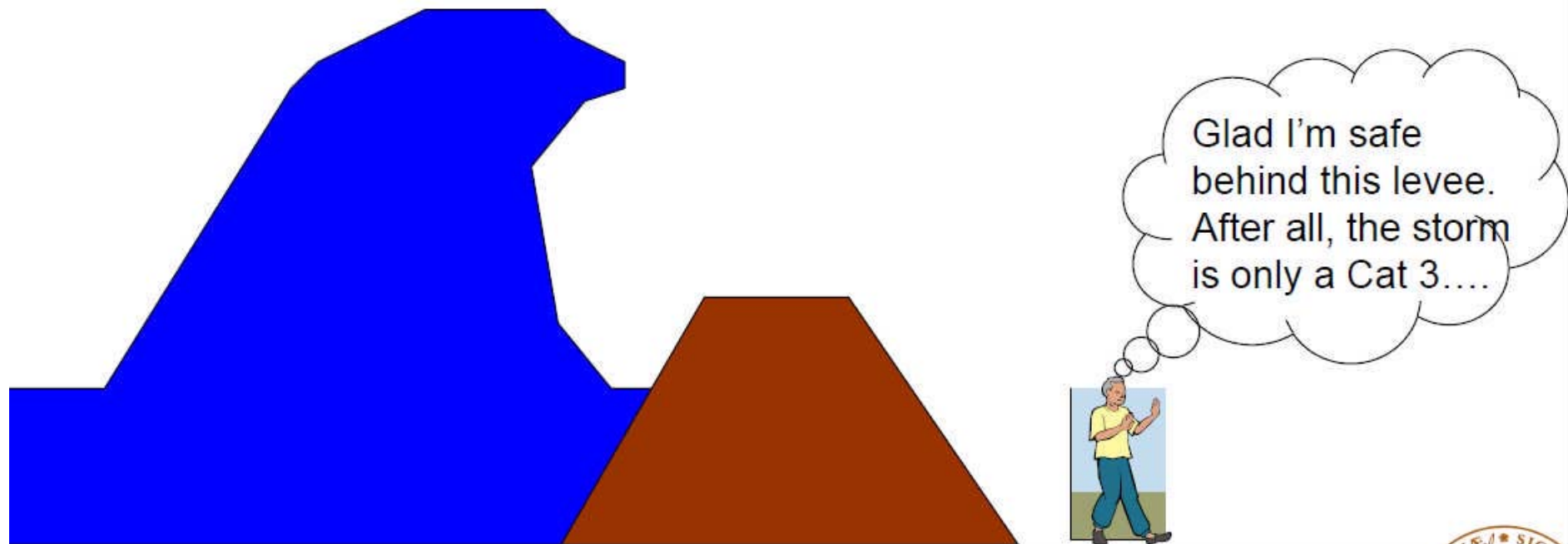






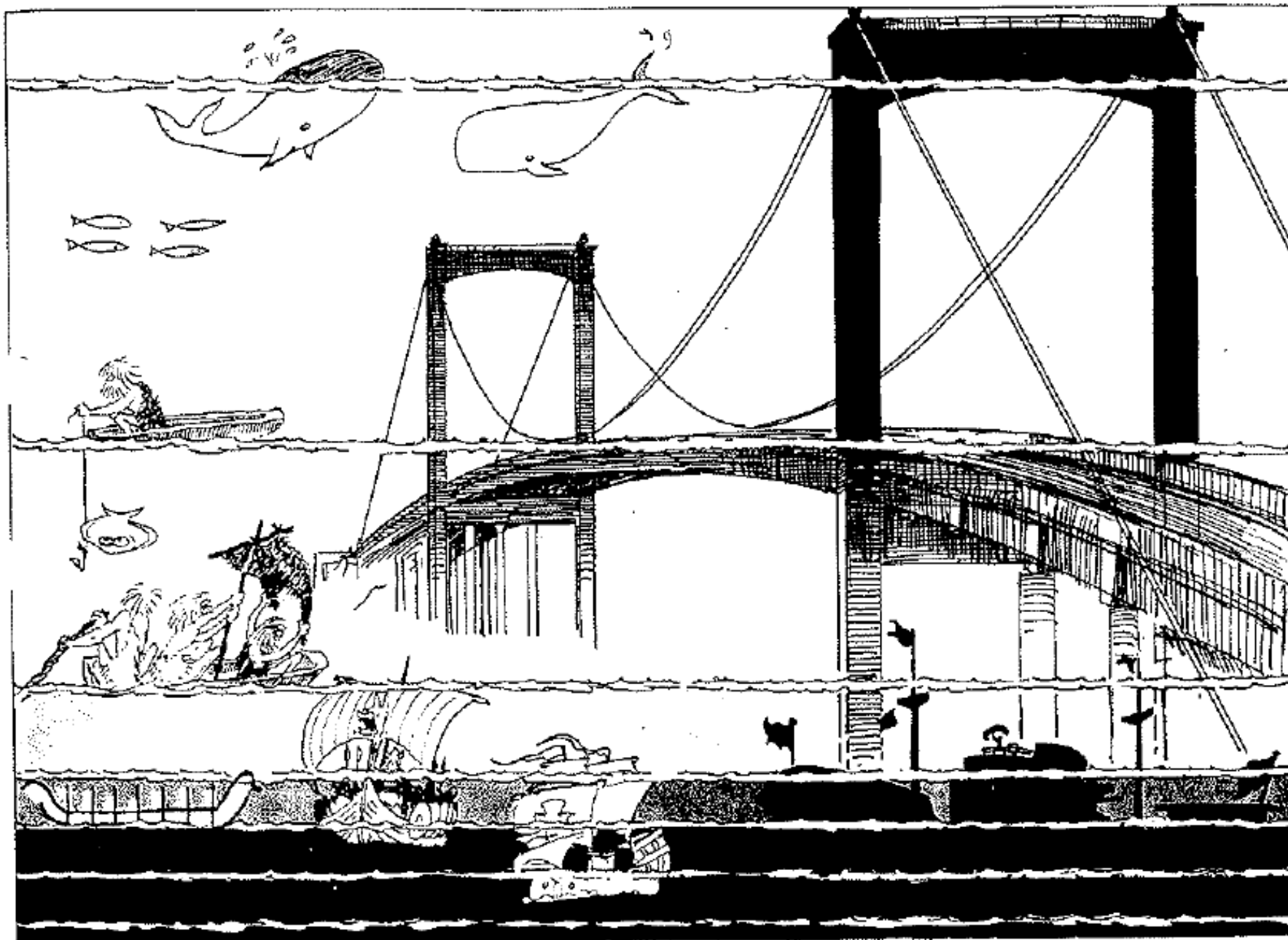
Residual Risks

- Lesson 1: Application of a design storm that the public is “protected” against is not appropriate and should not be used. There are always “residual risks” that must be communicated.



Corps: Safety Providers → Risk Managers





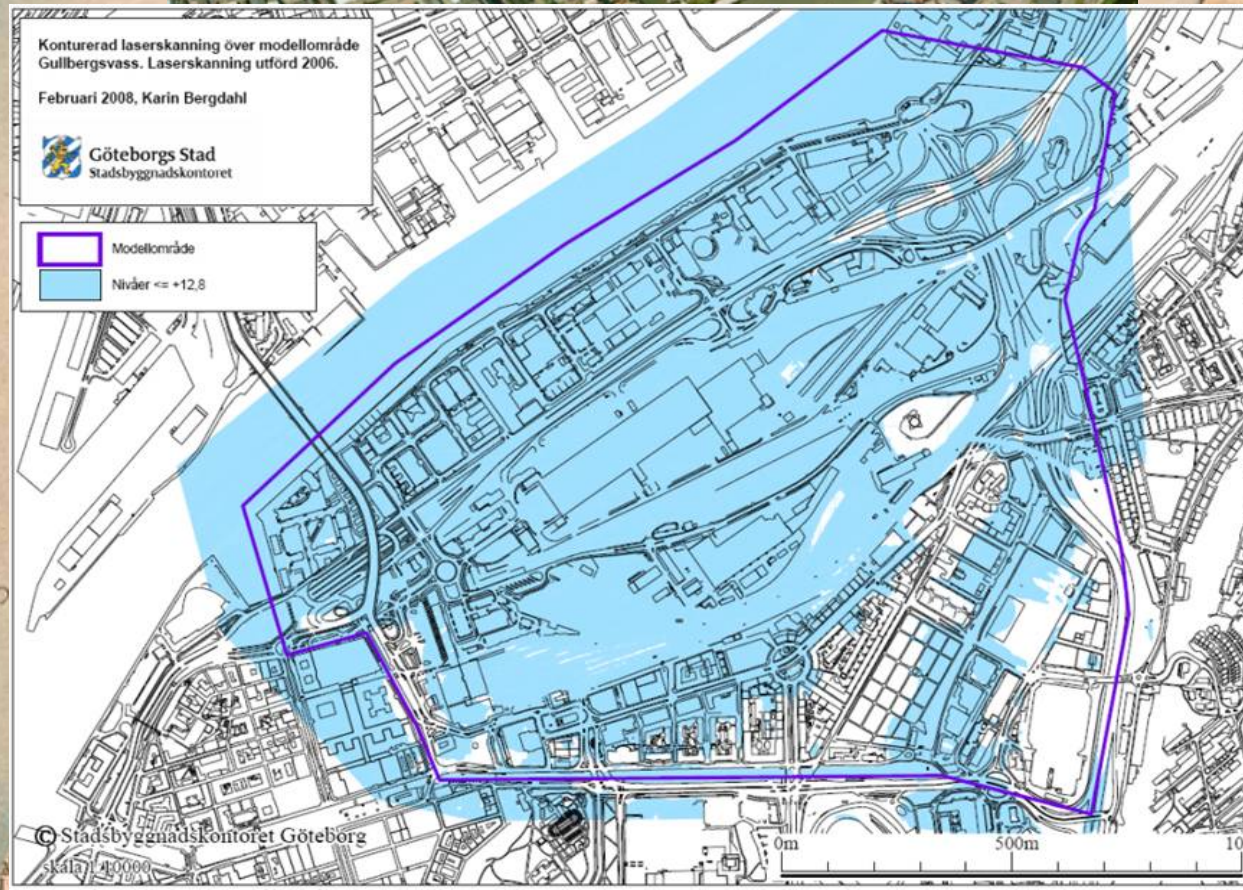
Situations Charta af GÖTHEBORGS Stad

*Inväruppi det af Kongl. Maj^{stet} och
Rikens Cammar Collegium/ anbe-
falte Fullstaquetet anvises.*

History and future

Today's extreme water level

Tomorrow's extreme water level, Costs 180 million Euro



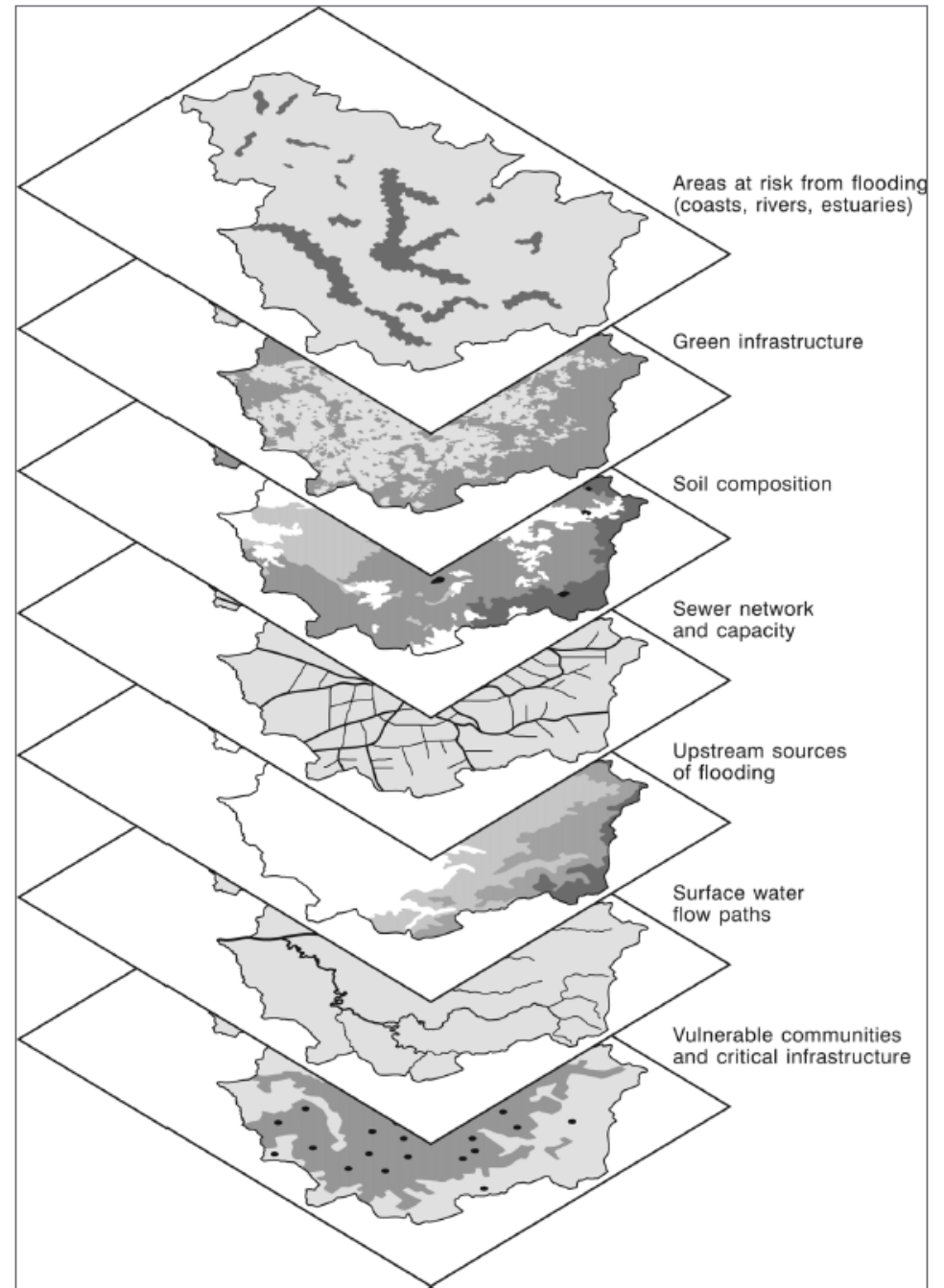
Hydro model Gothenburg

Planning

Prognoses

Test scenarios

Information



Joint probabilities analyses

- Coupled frequency analyses of all 3 threats gives more realistic scenario
- Instead of combining worst case for all 3 threats

Extreme sea level	10 year return period	100 year return period	200 year return period
Flow in Göta älv river and tributaries	Mean	100 year return period	200 year return period
Surface water run-off	10 year return period	100 year return period	200 year return period



Municipal future work

Hydro model

Prestudy november

Risk analysis

Water level meter

november 2011

Website water level meter

work has started

Material depots for temporary protections

Organizations för crisis risk

increased comission
for temporary
protections and
evacuation

Planning for protections

TK, SBK, GBG vatten

Statens ansvar?!



Water judgement

Protection measures Planning and building act

More money

Directive calculation slope stability

Time 50, 100 200 år??

Who is responsible



MISTRA URBAN FUTURES

An international
centre for sustainable
urban development
in Göteborg!



LÄNSSTYRELSEN
VÄSTRA GÖTALANDS LÄN
County Administrative Board

CHALMERS



GÖTEBORGS UNIVERSITET

MISTRA

STIFTELSEN FÖR MILJÖSTRATEGISK FORSKNING



City of
Göteborg

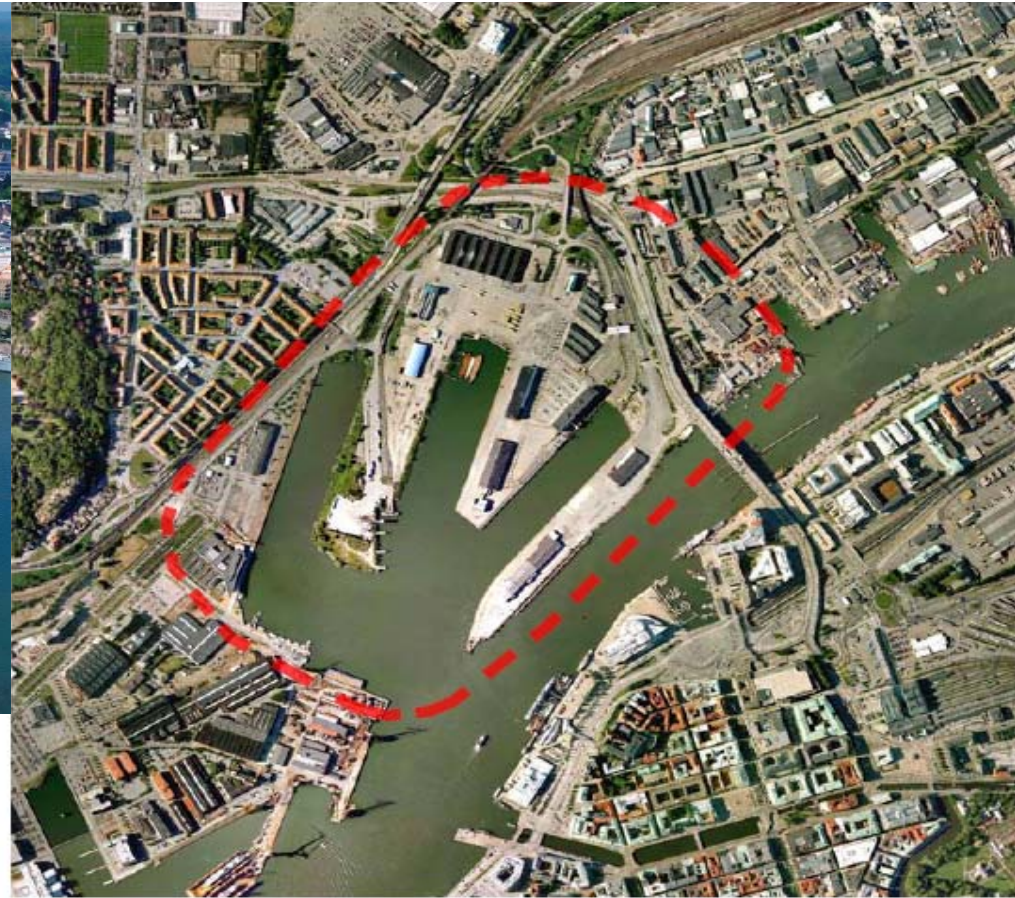


IVL Svenska
Miljöinstitutet



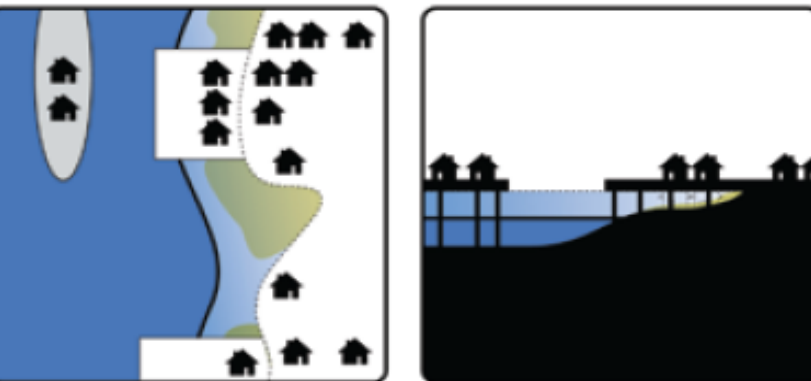
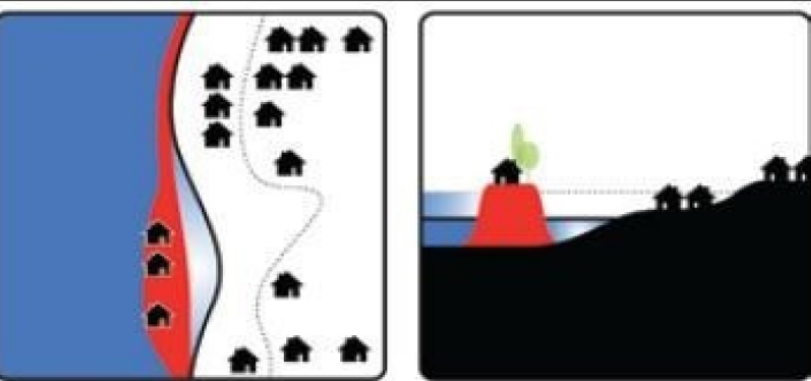
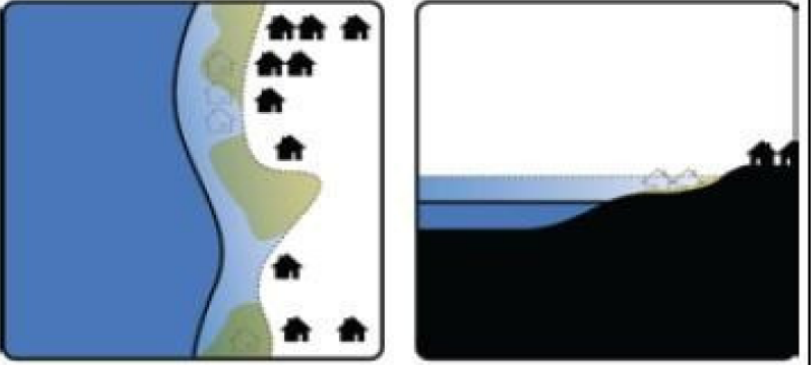
REGION
VÄSTRA GÖTALAND

Climate adapted city structure scenarios for Future Frihamnen



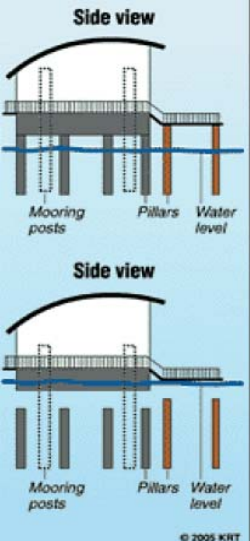
MISTRA URBAN FUTURES

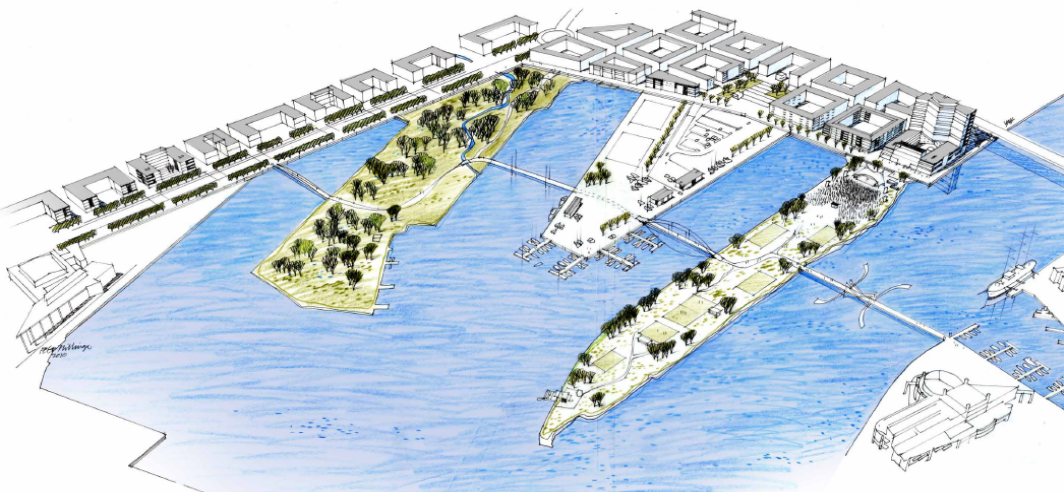
Retreat, defend, attack



PLAN

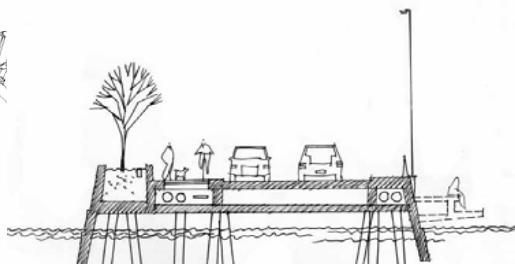
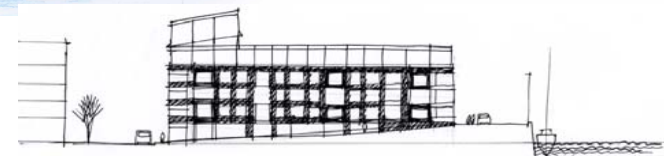
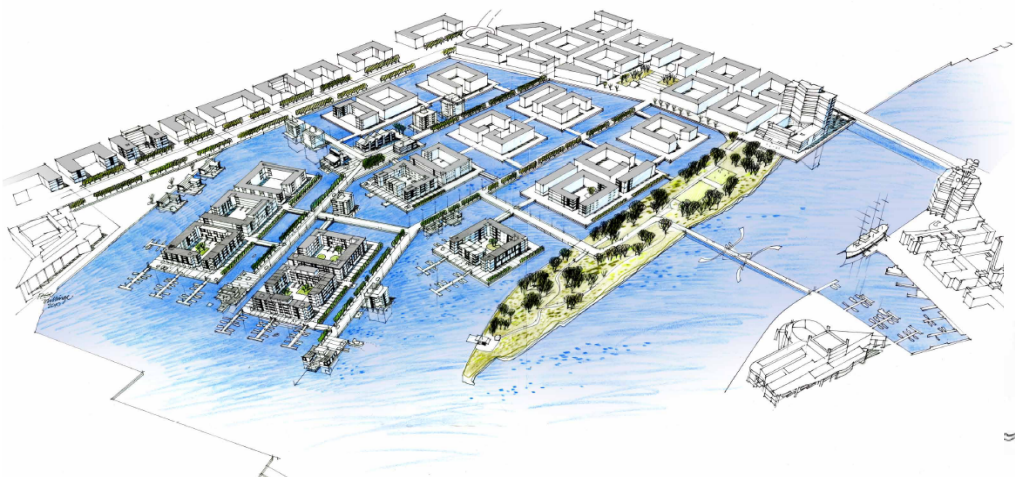
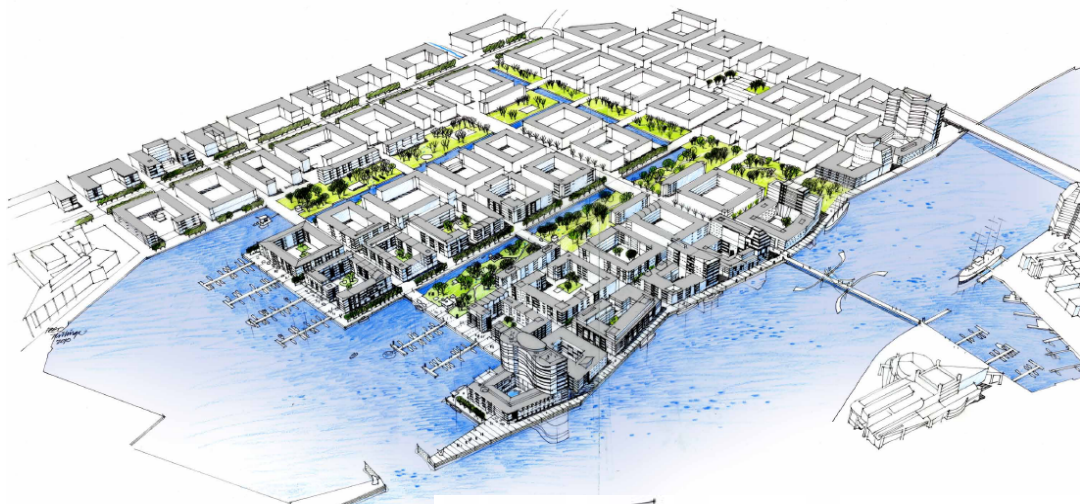
SECTION





Frihamnen i Göteborg **Attack**

MISTRA URBAN FUTURES



MISTRA URBAN FUTURES

Ekonomiska konsekvenser

Sociala konsekvenser

Miljökonsekvenser

Impact assesment

Economical

Social

Ecological



MISTRA URBAN FUTURES

Adapting cities to climate induced risks – a coordinated approach

Reserachers: University of Gothenburg, Swedish Geotechnical Institute, Linköping University and Chalmers University of Technology

Intersectoral experts: City of Gotheburg, WSP and Hifab

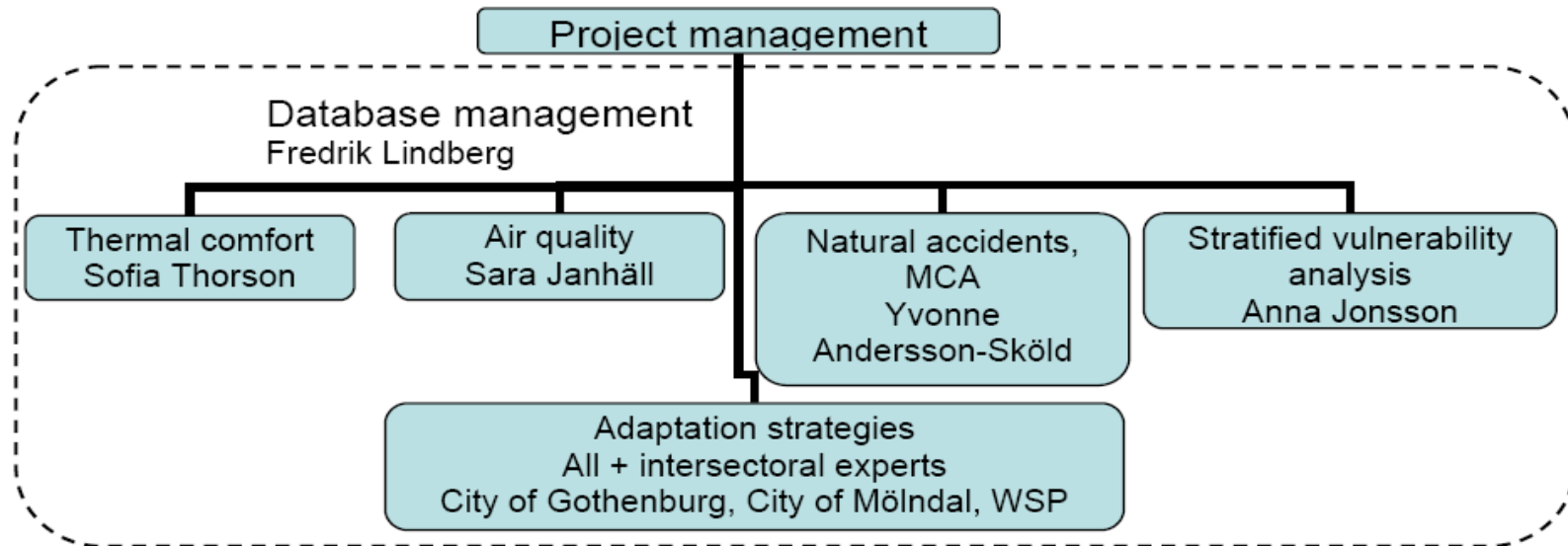


Figure 1. Project organisation





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ulf.moback@stadsbyggnad.se

