



Managing Multidimensional Coastal Conflicts— Coastal Planning and Adaptive Governance

A Paradigmatic Swedish Case Study

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SECOA Conference

Jerusalem, 29.11.-3.12. 2011




solutions for *Environmental* contrasts *in Coastal Areas*

Vellinge Municipality: South of Malmö

Population
1973: 18 000
2010: 33 303
2023: 40 000



Scania
County



**The Falsterbo peninsula—
How can we make our peninsula waterproof...?**

Current Situation & Future

- **Sea level rise**
- **Mean water level rise**
- **Groundwater levels:** Risk for groundwater floods in northern Skanör
- **Waves:** No extreme wave heights and high tide at the same time
- **Wind > 21 m/s**
- **High tide/storm surges:** Higher seawater levels the coming 100 years are estimated to be 190-230 cm
- **Rainfall increases in winter**
- **Sediment transport/erosion**

Falsterbo Peninsula



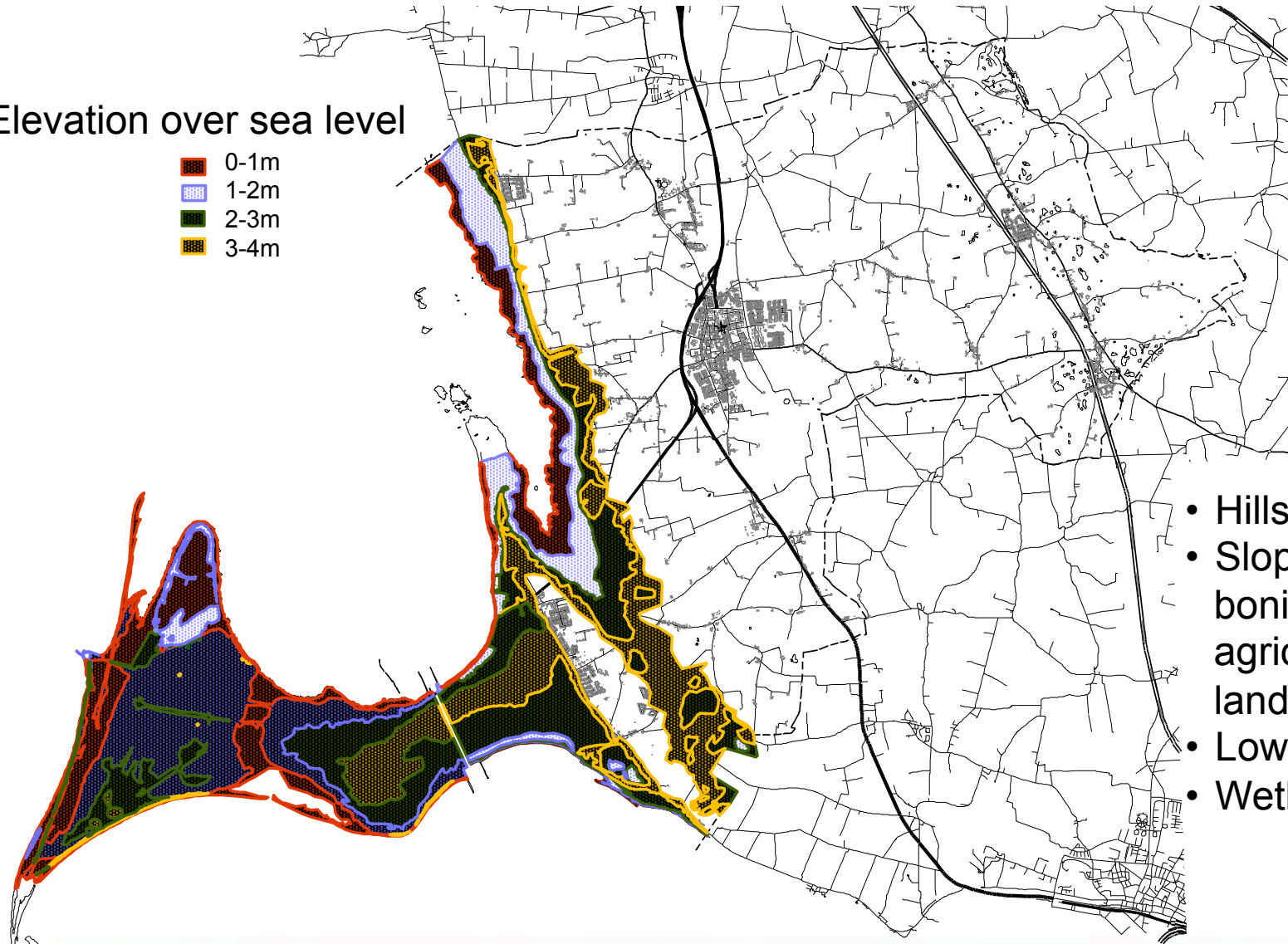
IPCC Forecast

Intergovernmental Panel on Climate Change:

=> expected sea level rise of 0.5 – 1.4m by 2100
compared to 1990

Land Types & Elevation

Elevation over sea level



- Hills
- Slopes: high bonity agricultural land (grains)
- Lowland
- Wetland

Settlement areas: ca. 20'000 residents



Sea Level Rise – A Planning Perspective

Defense: Vellinge municipality choose not to abandon the outer peninsula as a consequence of sea level rise and instead prepares measures to prevent flooding

=> why?

1. Unique historical towns of Skanör and Falsterbo
2. Important tourist resorts / historical beach- & golf resort
3. Complete “modern” towns, with health care, public service and commercial centers
4. Rich natural - and cultural heritage with a broad range of extensive heaths, beaches and moorlands
5. Economic value estimated: 5 billion €

High Water in Jan. 2008



Historical Seaweed Walls: Location



Mjuka, flacka slänter



Skarpa, branta slänter

Vall på betesmarken placerad innanför den befintliga tångvallen.

Skala 1:100



Sea Level Rise – An Economic Perspective

| Protection measures | Price |
|--|--|
| Dikes 10-15 km (à 0.15 –0.2 billion €) | 1.5 - 3 million € |
| Sand fill 10 km (à 30 000 €/km/a) | 0.45 million €/a |
| Stormwater pumping | 0.25-0.4 million €/a |
| Railway tracks to Malmö | 0.2-0.25 billion € |
| Management of nature reserves, recreation areas and beaches | 0.3 million €/a |
| Values to protect | |
| Real estate value Skanör & Falsterbo | 5 billion € |
| Tourism sector | 25 million €/a beaches 7.5-10 million €/a |

New Dikes - Location



Defense/Protection Strategy

- Effects of an inner protective ring to protect urban areas from flooding by short-term high water.
- Effects of an external protective ring for long-term protection against rising mean water level (MWL).
- Managing storm water in the inner ring
- Effects of long-term pumping
- Saltwater intrusion

High Water in Jan 2008



Conclusions: Municipal perspective

“We are not leaving the Falsterbo peninsula” BUT

- Keep inhabitants + municipal investments safe
- Masterplan reserving areas to protect
- Continue working with experts and keep up with new results
- Collect knowledge from other parts of the world with similar problems
- Correct strategic plan: right decisions in right order = municipal management
- Create a system of dikes relating to surroundings
- Right legal tools for protection (short – long term)

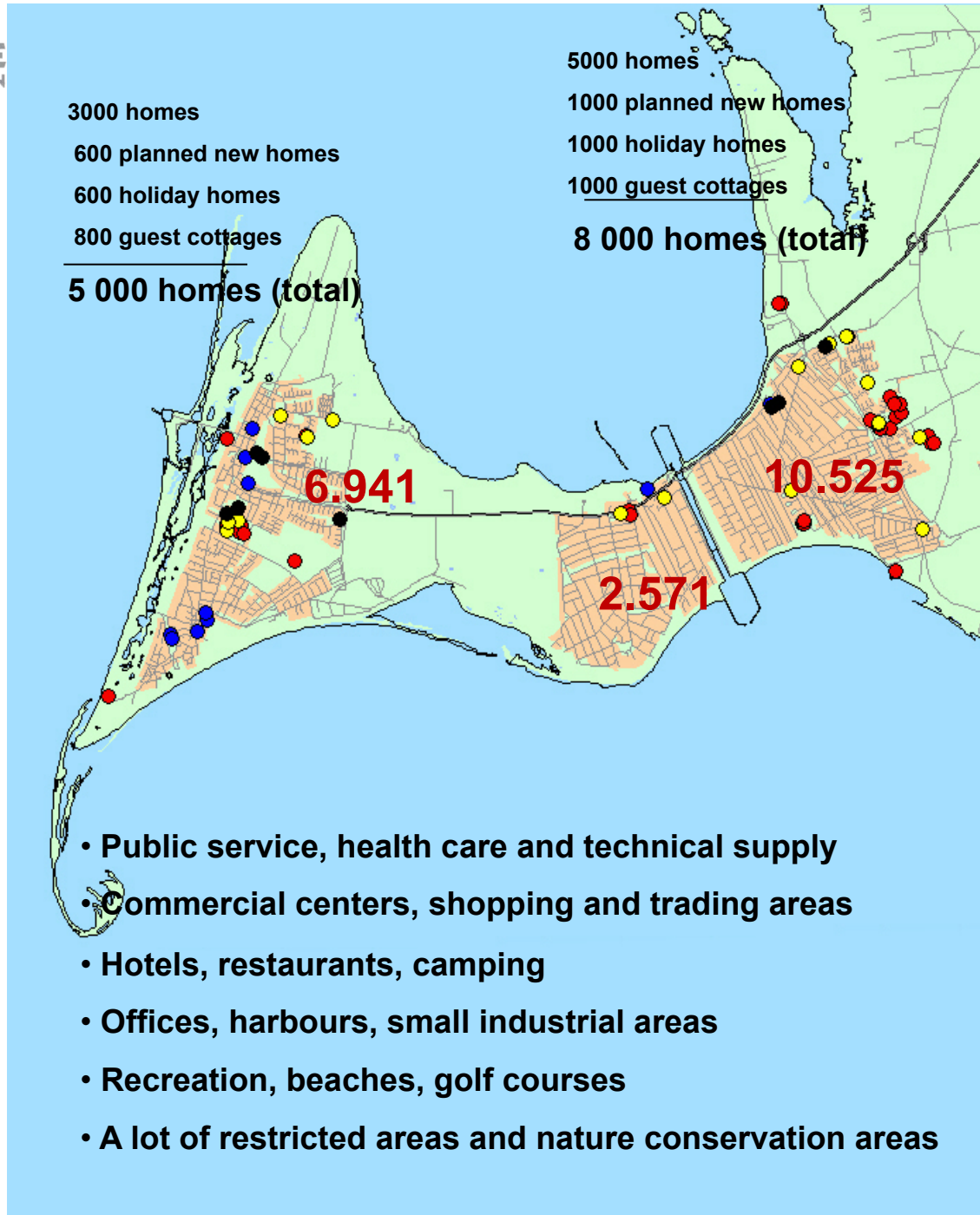


Appendices

Detailed information (for discussion)

Sea Level Rise

- Higher sea level in the long term means higher medium water level and higher high water level
- Not extreme wave heights and high water will occur at the same time
- Rising medium water level leads to beach erosion, but no coastal erosion problems otherwise
- Groundwater levels will rise with higher average water level and more frequent rainfall
- Risk of groundwater flooding in the northern parts of Skanör



20.037
inhabitants
(2010.12.13)

Ca. 13 000
homes

Ca. 3.600
work places

Total real estate
value: more
than 5 billion €

"Protective dikes" – strategy of heights

upon adoption medium water level 2010
+ approx. 1,0 m high water (100/100)
approx. 1.5 m



| Protection-wall exposed to: | Max wave height [m] | Proposed minimum level 2050 | Proposed minimum level by 2100 |
|--|---------------------|-----------------------------|--------------------------------|
| South, North and West (outer embankment in the seaside view) | 1,3 | +4,0 | +4,3 |
| North and West (inner dike in the less exposed mode) | 0,7 | +2,5 | +2,8 |
| East (inner dike in protected mode) | <0,1 | +2,1 | +2,4 |