

Chapter 5.3

Socio-economic impacts: Agriculture, forestry, urban complexes, coastal erosion and coastline changes

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Overview

- A. Introduction: Socio-economic impacts of current and future climate change
- B. Agriculture and forestry
- C. Urban Complexes
- D. Coastal erosion and coastline changes
- E. Conclusions





A. Introduction: Socio-economic impacts of current and future climate change

BACC II – new subchapter 5.3: Socio-economic impacts

=> choice of impacts on specific land-cover types:

Chapter 5.3.1 Agriculture and forestry (J. Krug et al.)

Chapter 5.3.2 Urban complexes (S. Deppisch et al.)

Chapter 5.3.3 Coastal erosion and coastline changes (T. Łabuz)



→ B. Agriculture and forestry (Chapter 5.3.1)

OVERVIEW

Authors: Krug, J., Köhl. M., Lindner M., Kellomäki S., Eriksson H., Saikkonen K., Heidecke C.

Update of BACC I (Forest Productivity) and new subchapter drawing also on impacts on Agriculture

Climate change affects directly vulnerability and productivity of agricultural and forestry systems

Predominantly by changes in precipitation and temperature patterns

Indirect impacts are altered risks for damage, such as increased stress periods (droughts etc.)



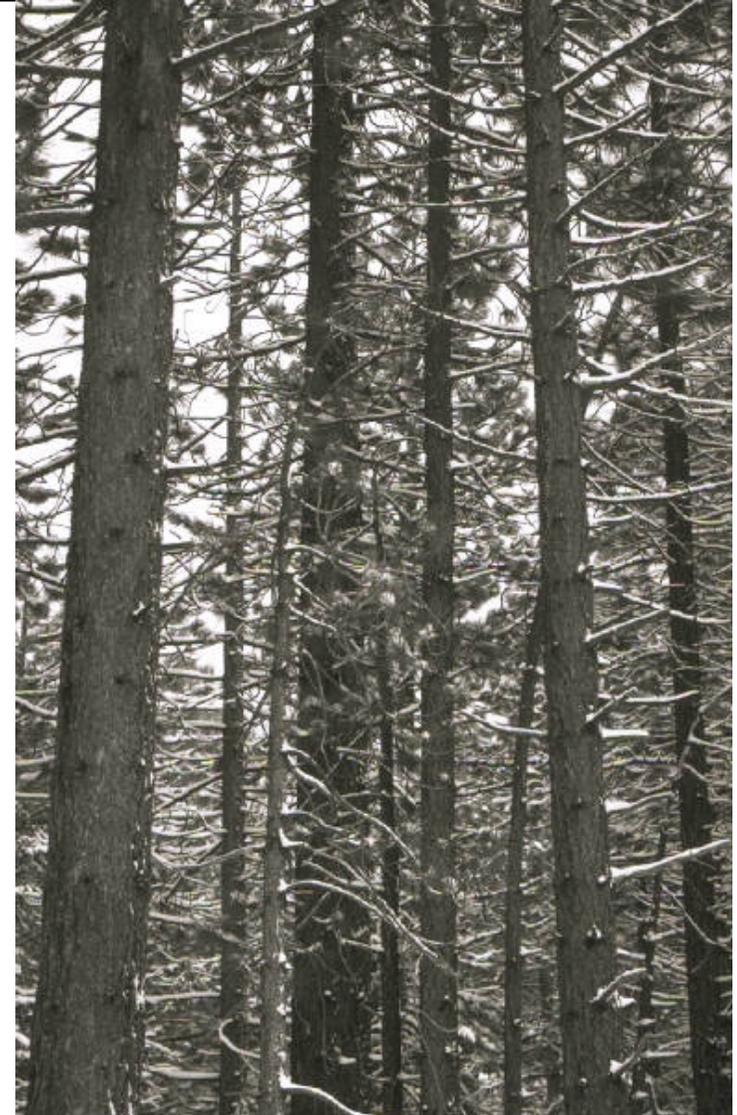
→ B. Agriculture and forestry (Chapter 5.3.1)

KEY MESSAGES:

Improving conditions for forest management in the north may be counteracted by unfavorable impacts in the south.

The review adds on BACC I **where changing conditions are foreseen with different impacts from north to south.**

- **North:** Growing conditions tend to improve
- **South:** Declining growing conditions (reduced precipitation and increasing temperatures)
- This will also **cause changes in forest structures and diversity.**



→ B. Agriculture and forestry (Chapter 5.3.1)

Forest management adaptation is possible, beneficial and required.

New results, compared to BACC I, describe potential adaptation measures required in forest management:

- **Northern part:** management adaptation can lead to substantial yield increases
 - **Southern part:** management adaptation is required to compromise deteriorating conditions.
 - **Potential adaptation measures** are described on empirical evidence and in relation to further goals.
- Both: more unfavorable management conditions** to expect (reduced frost periods, potential calamities etc.)



→ B. Agriculture and forestry (Chapter 5.3.1)

Impacts on agricultural production are highly variable and require adaptation as well, i.e. under consideration of increasing climate variability.

Comparable results as for forest management under consideration of potential adaptation measures:

- **meaningful yield increases** may be expected for **certain crop species**.
- In **southern parts** and for **other species**, **deteriorating conditions and increasing climate variability in general require adaptation measures**.



→ C. Urban Complexes (Chapter 5.3.2)

OVERVIEW

Authors: Deppisch S., Juhola S., Janßen H., Richter M.

New chapter: urban complexes tackled first time in BACC

Impacts differ due to location of urban complexes, be they in the northern or southern part of the catchment, directly at the Baltic Sea coast or more inland.

Every urban complex is a unique mixture of infrastructure and urban services, inhabitants, natural resources and green spaces, built structures, economic and societal factors - hardly possible to generalize potential extent of climate change impacts from single-case studies

Urban complexes are subject to **other change processes** as well (demographic, economic, social, political, technological, land-use) which might interact with climate change impacts



→ C. Urban Complexes (Chapter 5.3.2)

KEY MESSAGES:

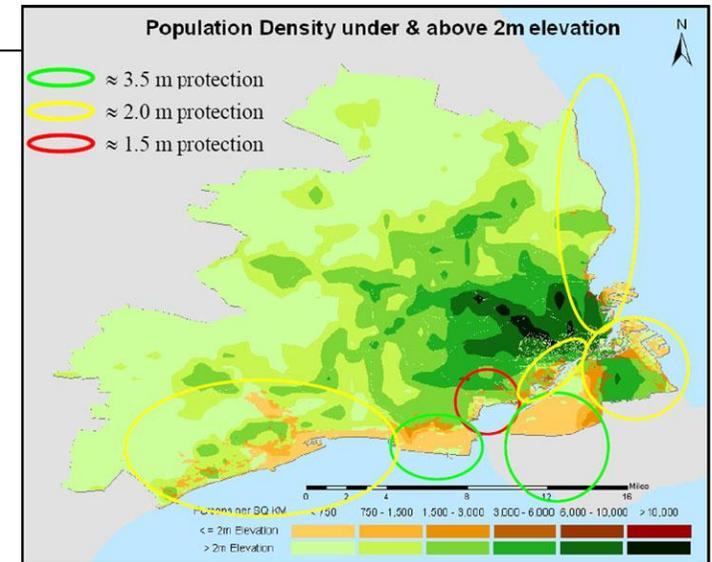
Climate change impacts, which affect urban services and technical infrastructure, building, housing and settlement structures most: sea level rise, extreme events like storm surges and changing precipitation patterns, particularly expected increase in heavy precipitation events => flooding.

As the net-sea level rise is expected to be higher in the southern Baltic Sea, **southern coastal cities such as Gdansk will be more affected**

Wastewater: enhanced runoff, surface floods, overflow of sewage systems

Drinking water supply: decrease in water quality, saltwater intrusion (coastal cities),

Transport: less salting and gritting, threats to roads and railways through sea-level rise and floods



Population density of Copenhagen under and above 2 m elevation, and coastal protection, indicated by colored ellipsoids (green for 3.5m protection; yellow for 2.0m protection and red for 1.5m protection) in the period 1992–2002. (Hallegatte et al 2011)



High tides of 226cm over sea level flood Inner Copenhagen – a high tide which could statistically come every 20 years in 2110 (City of Copenhagen 2011)

→ C. Urban Complexes (Chapter 5.3.2)

Vulnerability of the urban population differs between different groups of society, based on gender, age and further characteristics (state of health, wealth etc.).

Research shows that climate change can have immediate and lasting impacts on the urban population with the main stressors being severe weather events, thermal stress, disease transmission and changes in air quality.

Also here: differences between northern and southern part of the Baltic Sea basin, as e.g. in thermal stress – North less cold stress, south increasing heat stress



→ C. Urban Complexes (Chapter 5.3.2)

Climate change will have manifold impacts on the economic structures in the urban regions around the Baltic Sea

Secondary sector:
impacts on **industrial sites and production**

Tertiary sector:

- **Transport** and its important role for all sectors – disruption in the flow of products can have a devastating impact on the regional economy
- **Tourism:** positive development expected, costs to sustain attractive destination expected to be higher at the southern and south-western coast
- **Insurance sector:** becomes more important as it limits damages and spreads risks



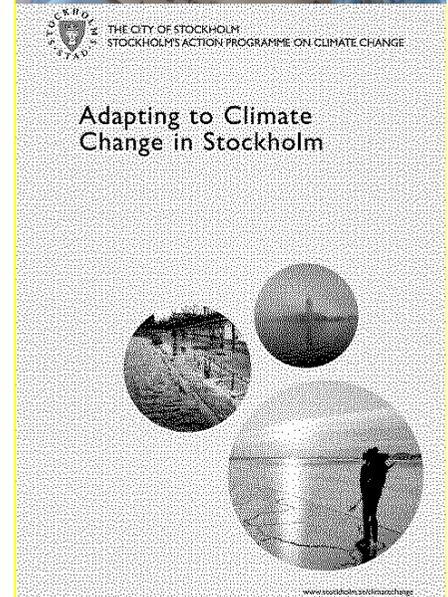
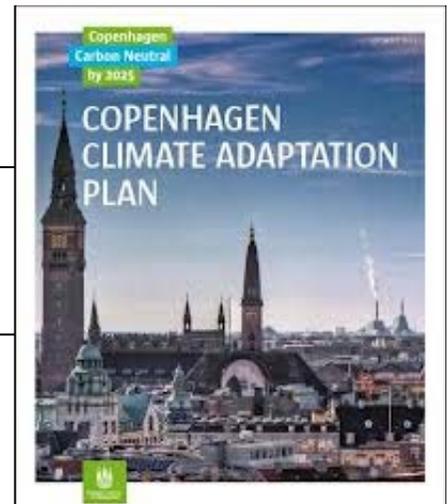
→ C. Urban Complexes (Chapter 5.3.2)

Some urban complexes already have taken steps to adapt to the impacts of these changes.

Examples are Stockholm, Copenhagen or Helsinki.

Many cities have pursued strategies, which identify particular climate change impacts and are in the process of developing adaptation strategies.

Knowledge facilitated by linkages to universities and **research projects play an important role** to enable adaptation at the sub-national level.



➔ D. Coastal erosion and coastline changes (Chapter 5.3.3)

OVERVIEW

Author: Łabuz, T. A.

Many natural and human influences on coasts – difficult to identify specific climate change impacts.

**Key climatic factor for coastal development:
wind driven factors**

Seasonal climate change (high water level, storm events, ice periods, heavy rain) can cause erosion, landslides, flooding



→ D. Coastal erosion and coastline changes (Chapter 5.3.3)

Changes in coastal erosion and coastlines over the last years:

1. **Higher water overflow on the coast during storm surges**, caused by sea level rise and beach lowering.
2. **Bigger rate of erosion of beaches, dunes and cliffs**. Now each Baltic country notices up to 2 m coast erosion per year on average in most threatened places.
3. **Coasts withdraw with higher rate**. Till end of 20th century it was 0.2 to 0.5 m/y, and now it is 0.5 to 1 m/y



→ D. Coastal erosion and coastline changes (Chapter 5.3.3)

4. After above average storm surge (differently in each country) **retreat is 5-10 m of the land** (that cannot be rebuild through calm season due to material scarcity).

5. More flooding of low lying areas or river mouths and lagoons.

6. Heavy rainfall leads to cliff erosion, mud flow accelerate soft cliff retreat.



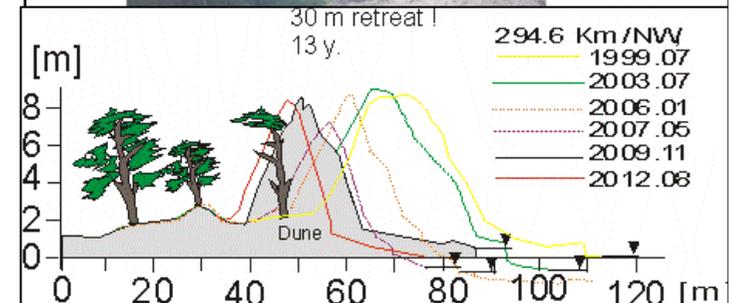
→ D. Coastal erosion and coastline changes (Chapter 5.3.3)

7. Human influence stops natural dune rebuilding by grasses on the sandy coast.

8. Coastal dunes are retreating and entering lowland.

9. Longer coast sections are subject to protection measures. Those are still not sufficient and are further limiting sand sources.

10. More research projects, new techniques of investigation or monitoring are used, but this **knowledge seems to be not enough to understand coastal changes in wider scales than the local scale.**



→ E. Conclusions : socio-economic impacts

Difficult to come to general conclusions:

- **Other changes are occurring** next to climate change – difficult to detect specific climate change impacts
- knowledge seems to be not enough to **understand coastal changes in wider scales than the local scale.**
- There are **lacking general studies** on specific topics or specific fields **taking into account a greater number of urban complexes** in the Baltic Sea Basin
- **Not all socio-economic topics tackled in BACC II and in available literature**

But so far summarized presumable socio-economic impacts:

Potential benefits for tourism, human health in the north (less cold stress), less heating in buildings, improved growing conditions for agriculture and forestry in the north



→ E. Conclusions : socio-economic impacts

Loss of economic values and of private property at the coastline and in cities

Increased costs for society for management of coastal protection, for protection and adaptation of urban infrastructures and settlement structures, for insurances and health care

Worsened conditions for agriculture and forest productivity in the south

But:

Adaptation is possible, presumably beneficial and required in forest management and agricultural production as well as in urban complexes. At the coasts the beneficial strategy depends on the specific place and chosen priority.



Thank you!

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Before and after 3 storm surges...

