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Territories and climate change: a spatial planning challenge for Europe

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Why is adaptation important?

- Climate change cannot be totally avoided
- Anticipatory adaptation can be more effective and less costly than “retrofitting” or “emergency adaptation”
- Climate change may be more rapid and pronounced than currently known
- Immediate benefits from adaptation to current climate variability and extreme events
- Avoid maladaptive policies and practices
In Europe changes in climate and their impacts are already visible and projected to become more pronounced.
Economic losses from weather related events

- Costs of weather and climate related events double each decade
- Since 1990, insured losses are on average $16 billion annually
- 2004 was costliest: $40 billion.
- Annual costs of European flooding could increase by €100-120 billion by the 2080s on top of the €6.5-8 billion paid today

Source: Sigma Database, Swiss Re.
### Vulnerable regions in Europe

<table>
<thead>
<tr>
<th>Regions</th>
<th>Climate change impacts</th>
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| **Coastal zones, floodplains and wetlands** | Changes in water quality due to algae blooms  
                                      Coastal erosion due to sea level rise  
                                      More frequent floods due to extreme events                                 |
| **Mediterranean region** | More frequent droughts and fires  
                                      Land degradation due to salinisation                                           |
| **Arctic, Greenland**    | Economic and cultural impacts on indigenous communities  
                                      Loss of endemic species  
                                      Reduced seasonal sea ice  
                                      Thawing of permafrost                                                        |
| **Mountain regions**     | Retreat of glaciers  
                                      Changes in water discharge  
                                      Changes in avalanche frequency  
                                      Less frequent and secure snow cover  
                                      Loss of endemic plant species                                                 |
Coastal zones

- Sea level is projected to rise for centuries (0.09-0.88 m from 1990 to 2100)
- 9% of all European coastal zones are below 5 m elevation (85% for NL, BE), potentially vulnerable to sea level rise and related inundations
- Coastal zone ecosystems are threatened
- Future increase in storm frequency and intensity (uncertainties)

Data-source: EEA, 2006 (forthcoming)
What impacts can climate change have on the coastal system given the existing anthropogenic pressures to the coasts?

Often a region or sector is already under pressure today.
Built up area in the distance to the coastline
by European regional sea basins

Distance to the coastline (km)

% of built up area

Atlantic
Baltic
Black Sea
Mediterranean
North Sea
Living by the sea

Very different and unequal situations in socio-economic terms

Expected climate changes pose a real challenge to the population at sea to adapt, especially to sea level rise
EEA: 12% of all EU coastal zones is lying below 5 m elevation and are potentially vulnerable for sea level rise and related inundations.

JRC: 19% of total EU-25 population (86 million inhabitants) live in 0-10 km coastal zone.

Vulnerability of coastal systems

EUrosion: annual sediment deficit at European coasts 100 Mt
Sediment deficit at the coast increases vulnerability to climate change

- Increased threats from sea-level rise, storm surges, coastal erosion
- Development of river dams and abstraction of water has reduced sediment discharges to the coast

  - On a global scale, some 25% of the current sediment load from land to the coastal zones is trapped behind reservoirs.
  - In Europe, almost all main rivers are dammed. For ex. River Ebro (Northern Spain) delivers 1% of solid discharge volume of 1900.
European summer temperature 2003

- Very likely that greenhouse gases have doubled the risk of summer temperatures as hot as 2003
- Such a heat wave is now four times more likely. By 2050 every other summer could be as hot as 2003

Data-sources: IPCC, WMO, CRU, Stott et. al. (in Nature, 2004)
Demographic change
Proportion of elderly in population

Heat waves...

Source:
IASA
Heilig 2002
Projected precipitation changes in 2080

- Precipitation is projected to increase in northern Europe but decrease in southern Europe
- More frequent droughts and intense precipitation events are likely

Data-source: Hadley Centre HadCM3 model, B2 scenario
NAVIGATION: Rhine at Mainz, Germany
...two extremes in one year!

August 14th, 2003
Gauge: 1.63 m
Minimum 1949: 1.10 m

January 6th, 2003
Gauge: 6.30 m
Maximum 1882: 7.70 m
Urbanisation over past decade

- 2% - 5%
- 5% - 10%
- more than 10%
- Urban morphological zones 1990, population < 50000 hab.
- High natural potential: 100
- Low natural potential: 0
Flooding on the floodplain ...

... natural

The river Rhine has already lost four-fifth of its natural floodplains. Similarly, at the river Elbe only 15% of the natural floodplains remain. What about coasts? (IKSE, 1996; BMU, 2002).

... and developed
Water resources

- Temperature rise and changing precipitation are likely to exacerbate the water shortage in southern and south-eastern (increasing demand for irrigation in agriculture) and eastern Europe (increasing demand for households and industry)

Data source: Henrichs and Alcamo, 2001. Hadley Centre HadCM3 model, baseline scenario
Scaling information and modeling

Future Temperatures (GCM Simulation)

Assessment of Impacts

Regionalisation for South Germany
Impact, Adaptation, Vulnerability

exposure

impact

sensitivity

vulnerability

adaptation, adaptive capacity
Vulnerable sectors

- Ecosystems and biodiversity
- Agriculture and forestry
- Water resources, flooding, water quality
- Coastal zones, marine resources, fisheries
- Tourism
- Energy (supply and demand)
- Built environment, infrastructure
- Human health
- Land management, regional planning (cross-cutting)
- Insurance services
Climate Change Adaptation and Spatial Planning: Interaction with different sectors
Data held on a standardised 1km x 1km Europe wide grid which enables construction of a different ‘zonal accounts’ including those for:

- Regions
- Biogeographical zones
- Mountain areas
- Coastal zones
- Major sea basins

E.g. Sprawl of artificial areas 1990-2000 on European coasts, by dominant land cover types, km²

Legend
- D1 - Composite landscape
- C2 - Open semi-natural or natural landscape
- C1 - Forested landscape
- B2 - Rural mosaic and pasture landscape
- B1 - Broad pattern intensive agriculture
- A2 - Dispersed urban areas
- A1 - Urban dense areas
PRELUDE (land use) scenarios for 2035
Agriculture change over past decade

Net conversion to agriculture
- 5% - 10%
- 10% - 20%
- more than 20%

Net conversion from pasture to crop land
- Net increase of arable/harvestable land >30%
- Net increase of arable/harvestable land 5% to 30%

Net conversion of pasture to arable 5% to 30%
Net conversion of pasture to arable >30%
Withdrawal of farming (total)
- 5% - 10%
- 10% - 20%
- more than 20%
Vulnerabilities by biogeographical regions

AT: Increased coastal erosion and flooding; stressing of marine biocomplexes and habitats; increased tourism pressure on coasts; greater winter storm risk and vulnerability of transport to winds.

BO: Waterlogging; eutrophication of lakes and wetlands; increased coastal flooding and erosion; increased winter storm risk; reduced ski season; severe fires in drained peatland.

CE: Increased frequency and magnitude of winter floods; increased variability of crop yields; increased health effects of heat waves.

MT: Glaciers disappearing; reduced snow-cover period; upward shift of tree line; severe biodiversity losses; reduced ski season.

ME: Reduced water availability; increased drought; severe biodiversity losses; increased forest fires; reduced summer tourism; reduced suitable cropland areas; increased energy demand in summer; reduced hydropower; increased land losses in estuaries and deltas; increased salinity and eutrophication of coastal waters.

TU: Thawing of permafrost; decreased tundra area; increased coastal erosion and

ST: Decreased crop yield; increased soil erosion; increased SLR with positive NAO; increased salinity of inland seas.
Norfolk Broads (UK)
SPA with unfavourable conservation status due to sea-level rise and salination of freshwater habitats.
If you want to puzzle...

...don’t lose the pieces!
A climate proof future...?
Adaptation strategies at national level

- National adaptation strategies are currently under preparation in Denmark, Finland, France, Germany and the UK.
- Adaptation measures are included in National Climate Change Action Plans of several countries.
- The latest Spatial Policy of the Netherlands recognises the need for adaptation to climate change in spatial planning.
- Several countries (e.g. Finland, Hungary, Portugal, the Netherlands, Spain, UK) are undertaking comprehensive multi-sector national assessments of climate change.
- In many EEA member countries (e.g., Austria, France, Sweden, the Netherlands, Belgium, Italy, Switzerland), adaptation measures are taking place in the context of natural hazard prevention, environment protection, and sustainable resource management.
The Netherlands case - Lowering the levees
Constructing by-passes
National adaptation strategies and local variations

• Assessments of regional and sector adaptation needs still rare

• More local variations and higher relevance to regional and local conditions is needed, because this is where practical management is happening
EU policy developments, adaptation

- Many EU policies, including environmental, do not yet address climate change impacts
- Commission communication on post-2012 (Feb. 2005) and Environment Councils (2005) mentioned adaptation, complementary to mitigation
- Floods Directive in 2005
- ECCP II started in October 2005, including a working group on adaptation, 10 sectoral/issue meetings April-June 2006, Green Paper in July 2007
Current adaptation measures: reactive or proactive?

- Regional and local governmental organizations, NGOs and the private sector have started to adopt new policies, regulations and standards accounting for climate change (role of insurance sector)

- Measures mainly in areas with a long tradition of dealing with climate extremes such as flood defence

- Many adaptation actions have been initiated because of the substantial losses from extreme weather events in recent years

- Policies and measures designed to address long-term climate change impacts have not been developed to the same extent
Challenges for integration of adaptation into other policies and measures

- Scientific uncertainty (low level of confidence in climate change scenarios of extreme events at high spatial resolution)
- Policy action at regional/local level (need for stakeholder involvement; gaps in knowledge on potential adaptation policies and measures; lack of resources)
- Costs of adaptation and benefits assessments (gaps in knowledge; how to identify “win-win” or “no-regret” options, justified under many plausible scenarios)
- Coordination between sectors (how to enhance efficiency and effectiveness of measures with many organisations involved)
Conclusions

• Need to develop policy framework at European, national and regional/local levels

• Integrate ("mainstream") adaptation into other policies and measures

• Enhance research (EU and national) on vulnerability assessments (including scenarios), good practices and costs and benefits, with stakeholder involvement

• Improve management practices for non-climatic reasons, as potential to reduce vulnerability

• Exchange experiences amongst relevant stakeholders (public and private; EU/national/regional/local)

• Communicate risks clearly to those affected and the actions they can take
Don’t let your business go under

There are steps you can take to stop your assets being liquidated. Just when were you planning to take them?

Act now. Be prepared for flooding. For more information and a free guide to protecting your business premises, call the Environment Agency’s 24 hour Floodline.

Floodline 0845 988 1188
ENVIRONMENT AGENCY

www.environment-agency.gov.uk/floodline
Thank you for attention,

More information on EEA web page
http://eea.europa.eu

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