



Expert Meeting "Developing a Method for Addressing Vulnerability to Climate Change and Climate Change Impact Management: To Index or Not To Index?" Bonn, Germany, 26 January 2004

Vulnerability Indices — An Academic Perspective

RICHARD J.T. KLEIN



richard.klein@pik-potsdam.de
<http://www.pik-potsdam.de/eva/>

OUTLINE

- Would a vulnerability index be useful?
- Conceptualising vulnerability.
- Requirements of a vulnerability index.
- Vulnerability mapping.
- Conclusions.



WOULD A VULNERABILITY INDEX BE USEFUL?

- Useful to whom?
 - Academics — improve the understanding of vulnerability and how it can be assessed;
 - Policymakers — raise awareness of the need to take action;
 - Public — present a complex issue in a form that can be understood.



SOME APPROACHES TO DATE

- Climate change vulnerability indices — UNEP (Downing *et al.*, 2001), Batelle Pacific Northwest Laboratory (Moss *et al.*, 1999).
- Environmental vulnerability index — SOPAC (Villa and McLeod, 2002).
- Coastal vulnerability indices — South Africa (Hughes and Brundritt, 1992), USA (Gornitz *et al.*, 1994), Canada (Shaw *et al.*, 1998).
- Water poverty index — DFID / Keele University (Lawrence *et al.*, 2003).
- Vulnerability Index for Developing Countries — Commonwealth Secretariat (Atkins *et al.*, 2000) .
- Human development index — UNDP.
- Environmental sustainability index — CIESIN / World Economic Forum.



ACADEMIC CHALLENGES

- Comparing and adding up apples and oranges.
 - Requires subjective choices concerning the use of impact indicators and how they should be weighted.
- Impacts are due not only to climate change.
 - Answering policy questions requires separation of climatic and non-climatic factors, which is problematic academically.
- Communication of the results — what does it mean?
 - Information is lost in aggregation; concepts not always clear.



WHAT IS VULNERABILITY?

- IPCC CZMS, 1992: The degree of incapability to cope with the consequences of climate change and sea-level rise.
- IPCC SAR, 1996: The extent to which climate change may damage or harm a system; it depends not only on a system's sensitivity, but also on its ability to adapt to new climatic conditions.
- IPCC TAR, 2001: The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change [...].
Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.



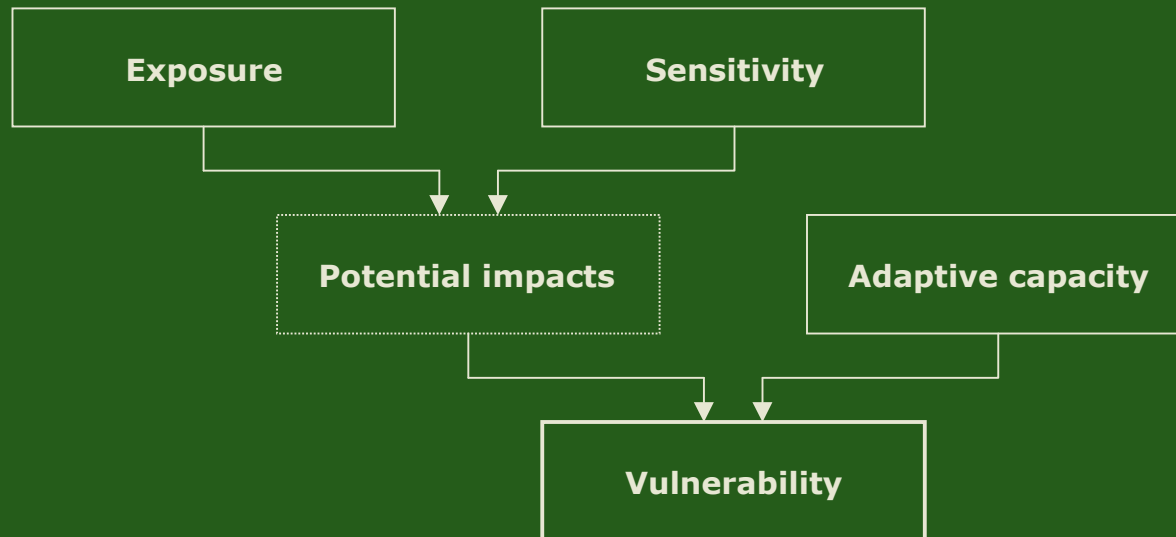
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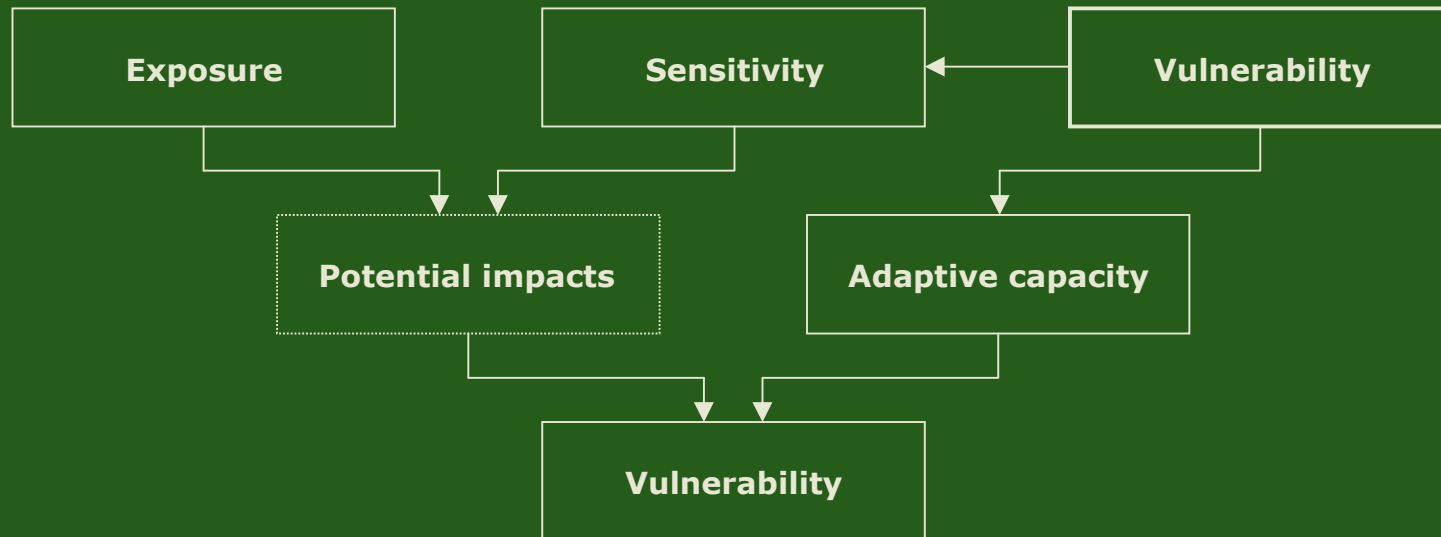
CONCEPTUALISING VULNERABILITY

- Vulnerability = f (exposure, sensitivity, adaptive capacity).



CONCEPTUALISING VULNERABILITY

- Sensitivity, adaptive capacity = f (vulnerability).



REQUIREMENTS OF A VULNERABILITY INDEX

- Consistent with academic theory.
- All relevant factors included (without causing auto-correlation).
- Transparent.
- Conceptually clear.
- Meeting the needs of users.

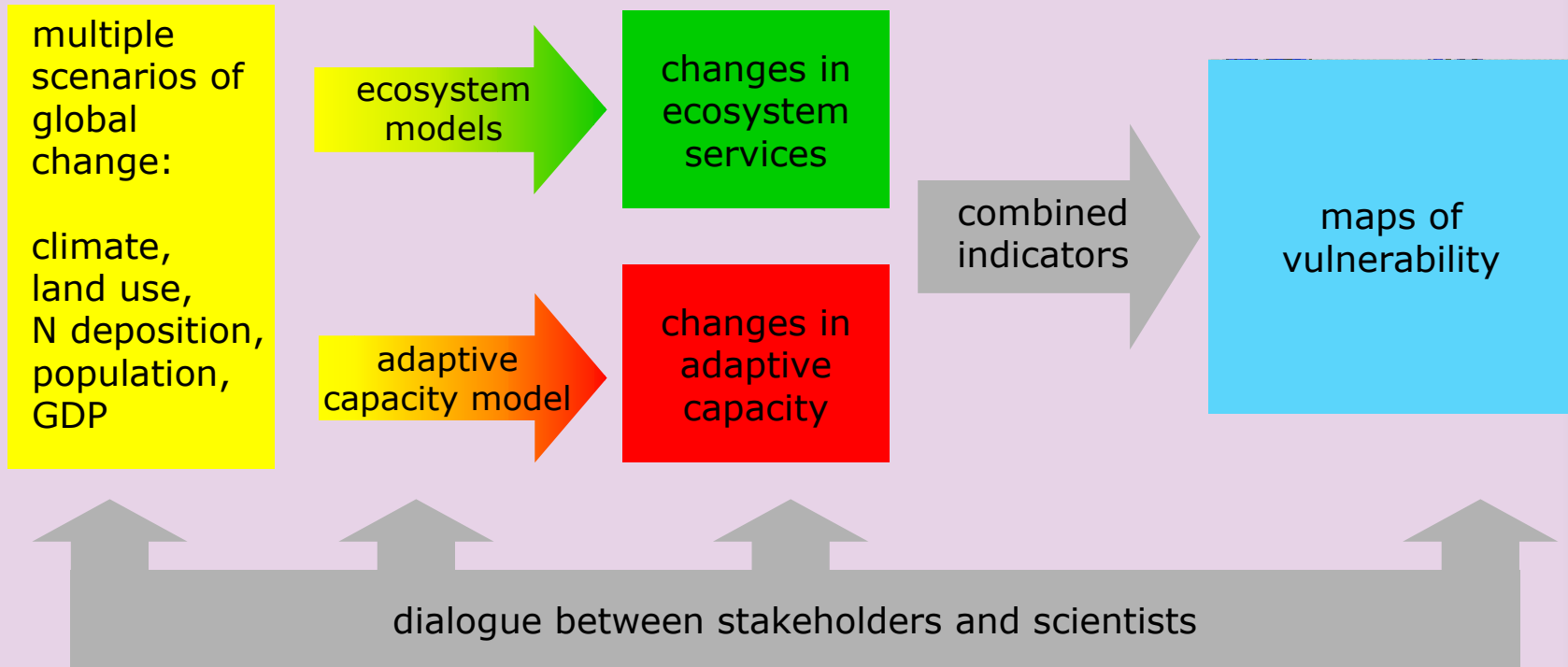


ADAPTIVE CAPACITY

- The ability to plan, prepare for and implement adaptation measures.
- Factors that determine adaptive capacity of human systems include economic wealth, technology and infrastructure, information, knowledge and skills, institutions, equity and social capital.
- Adaptive capacity cannot be measured.



ATEAM: Mapping Europe's vulnerability to global change-induced changes in the provision of ecosystem services.



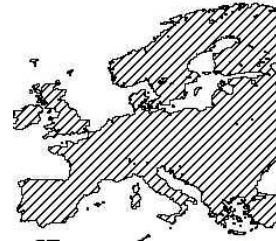
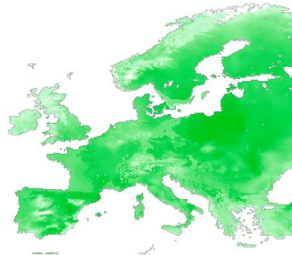
Vulnerability Indices — An Academic Perspective

Changes in ecosystem services (potential impacts)

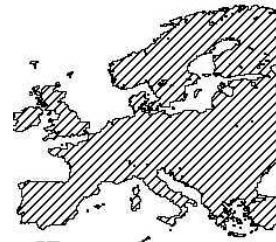
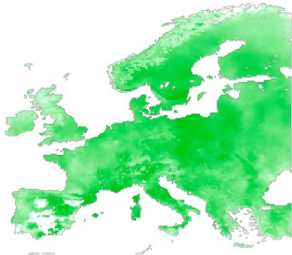
Changes in society's adaptive capacity

Vulnerability

2000

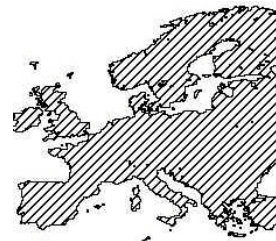
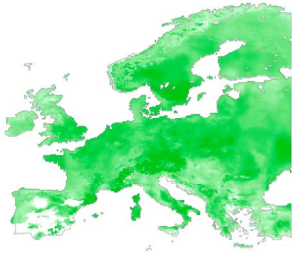


2050



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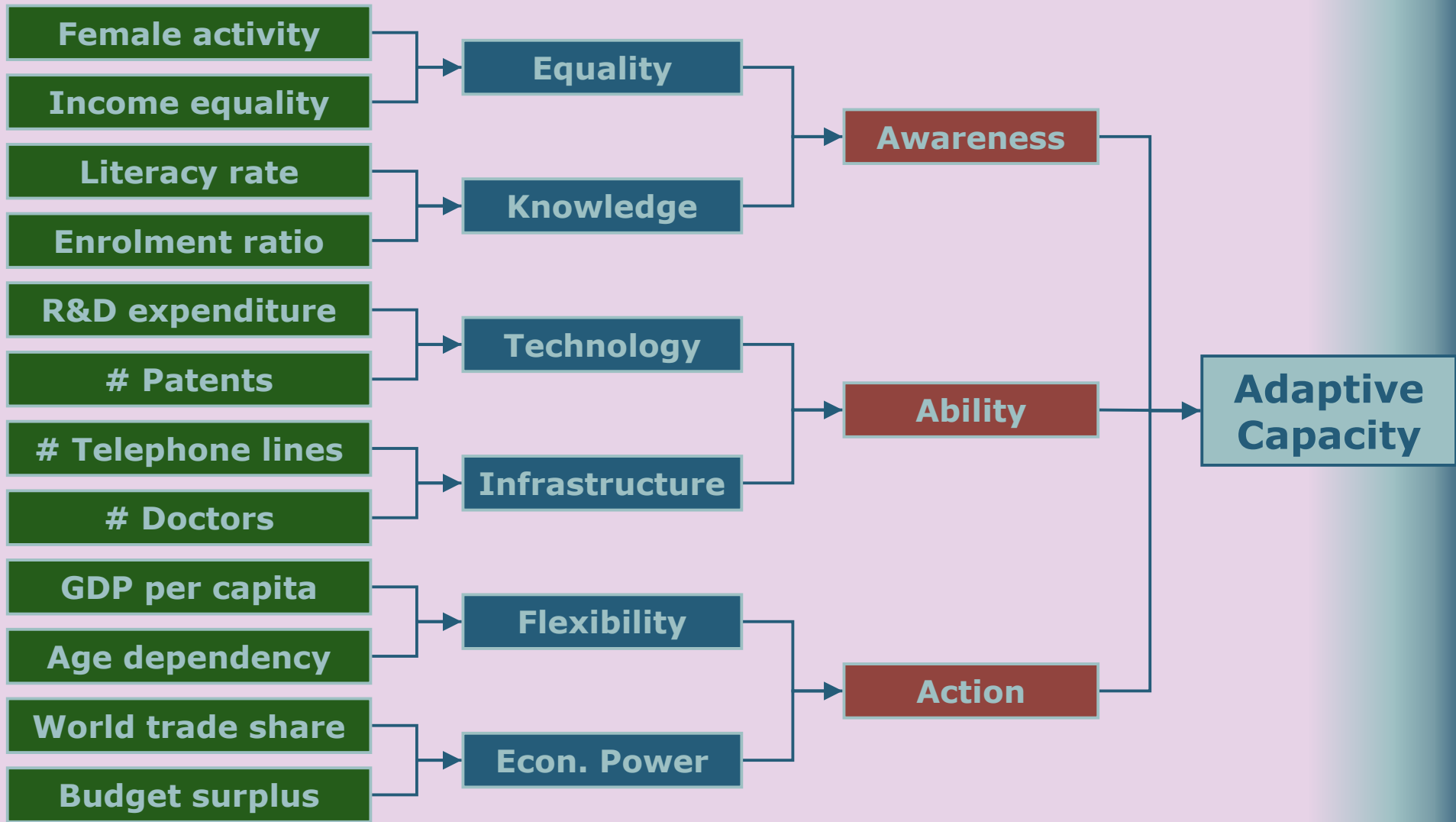
2080



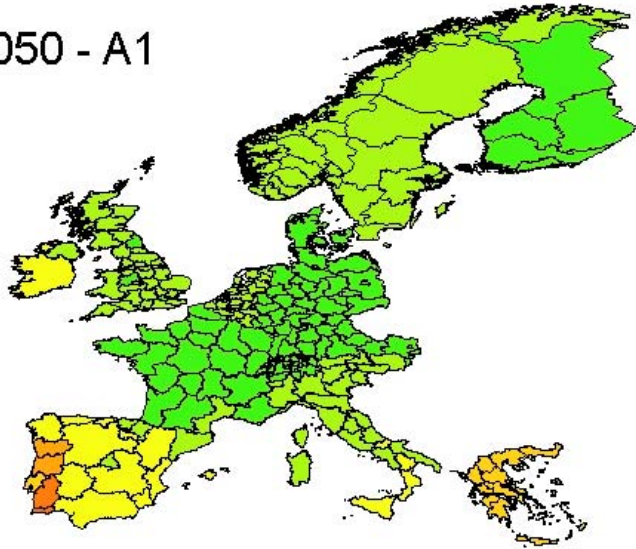
BUILDING A MODEL OF ADAPTIVE CAPACITY

- Based on the literature, choose determinants of adaptive capacity and select indicators for these determinants.
- Collect time series data for all indicators (1960-2000).
- Develop functional relationships between indicators, using population and GDP as the independent variables.
- Build indicator scenarios using the functional relationships and the SRES projections for population and GDP.
- Aggregate indicators into one index of adaptive capacity.

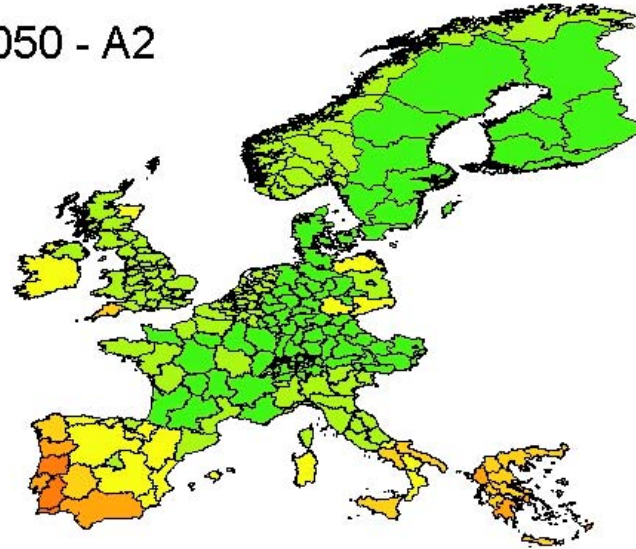




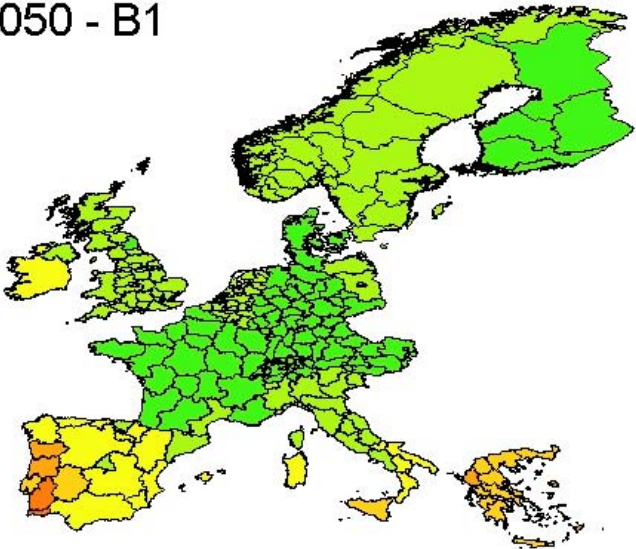
2050 - A1



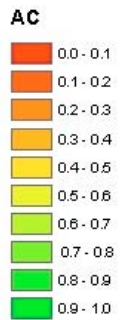
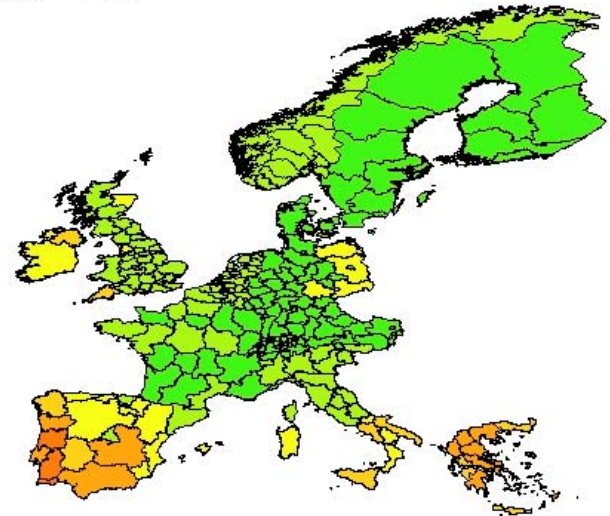
2050 - A2



2050 - B1



2050 - B2



Adaptive Capacity maps, 13 October 2003

CONCLUSIONS

- Several vulnerability indices have been developed, all have been criticised, none have been widely used.
- An index that focuses on one type of impact in one region is likely to be more informative and useful.
- Approaches that retain the multiple dimensions of vulnerability are more informative and useful.
- The development of vulnerability indices continues to present an academic challenge!

