Regional Vulnerability Mapping in Germany

Marc Zebisch
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written by Georg Leitinger

Dr. Marc Zebisch, senior researcher at the European Academy Bolzano (EURAC), presented the study '**Klimawandel in Deutschland - Vulnerabilität und Anpassungsstrategien klimasensitiver Systeme',** prepared for the Federal Environmental Agency in Germany (UBA).
This study was carried out by Marc Zebisch, Torsten Grothmann, Dagmar Schröter, Clemens Hasse, Uta Fritsch, and Wolfgang Cramer at the Potsdam Institute for Climate Impact Research (PIK) and can be downloaded at:
http://www.umweltbundesamt.de/uba-info-medien/mysql_medien.php?anfrage=Kennummer&Suchwort=2947

The aim of the study was to convert the results of the ATEAM project to the national level of Germany. To do so, data of exposure and potential impacts (climate change and land-use changes) from the ATEAM project were used in a conceptual model of vulnerability in order to find out 'WHO, WHERE and HOW' is Germany vulnerable
By the UBA, the following sectors should be analysed: Agriculture, Forestry, Water, Biodiversity, Tourism, Human Health, and Traffic. Altogether, the study aimed at the compilation of existing knowledge on Global Change and its impacts on Germany for these seven topics.
Germany is faced with increase of temperature and shift of precipitation into winter season. In eastern Germany, precipitation is slightly decreasing, whereas in western Germany an increase is possible. The next years, more heat extremes and less cold extremes will occur, whereas more extreme precipitation events in winter are likely. But also in summer, a likely higher frequency of weather conditions with extreme precipitations and extreme temperatures is highly probable. Until now, a change of storm frequency was not proved.
Marc Zebisch presented the results and impacts for two of the seven investigated topics, Water and Human Health, in detail.

Water
All four SRES-scenarios revealed a general decrease of water availability and therefore a risk of droughts and lowering ground level. Agriculture, forestry, energy production, and industry especially in Eastern Germany will be highly affected. Concerning river floods, a remarkable accumulation of '100 year river floods' in the 90s was observed. This trend could be continued, whereas the increase of risk focuses mainly to winter and spring. The expected shift of precipitation to winter could lead to incidents with melting water peaks – especially in the Alps. Still there is an uncertainty about summer floods due to the inaccuracy of the scenarios for the regional level. This uncertainty is increased by the fact, that there is almost no existing data on river floods. Most information relies on various models and expert knowledge.
Summing up, there will be an increase of river floods in all regions, particularly in the Alpine regions. The water shortage will primarily affect eastern Germany
The adaptation to river floods is considered as medium; for water shortage a low adaptive capacity is stated.

Human Health
The heat wave in 2003 killed at least 7000 people in Germany, and 50000 lyme disease cases per year are observed. According to this, general climate impacts are expected on: heat, cold, vector-born diseases, air, water, and extreme events.
The adaptive capacity to heat extremes is considered as medium. After the heat wave in 2003, a warning system was installed. If this measure will reduce the number of victims in case of heat waves is not proved until now. However, the adaptation to vector-borne diseases is very low.
The highest vulnerability for the sector human-health is stated for south-west and south-east of Germany.

Marc Zebisch concluded, that all regions of Germany are vulnerable, particularly eastern and south-eastern Germany. The most affected topics will be floods, vector-borne diseases and tourism.

General concept – and what we have learned

- Don't be afraid of qualitative approaches
- Multi-scenario approaches reveal uncertainties
- Don't be afraid of contradictions
- Learn from historical trends and events
- Diversify your methods or at least: compare to others
- Uncertainties are difficult to accept and to communicate
- **BUT:** climate change is apparent → adaptation is necessary, even under uncertain conditions

Marc Zebisch alleged that until now, assessment of vulnerability is 90% assessment of potential impacts and only 10% assessment of adaptive capacity. **But:** vulnerability adds extra value to impact assessments

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Discussion
Rik Leemans took a stand to the last remarks of Marc Zebisch: The results are now much more robust than 10 years ago → we know the change of climate since 10 years, but in former times we had more uncertainties. → We must communicate the increasing robustness and not the uncertainties!