Controversies in climate change adaptation

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Version 1.0, Date: 29 May 2012

Climate skeptics controversies (not in the scope of EMAPS)

There are some very popular controversies about the general question what climate change is all about. However, these controversies often are "ghost discussions" (Rahmstorf & Schellnhuber 2006, p. 89) which are carried out in the media and do not at all reflect the state of the art in climate change science. Some of the most popular arguments (of denial of climate change) of the so called climate change skeptics are (there are further arguments on the scientific approaches, political influence etc.):

- There's nothing happening
- We don't know why it's happening
- Climate change is natural
- Climate change is not bad
- Climate change can't be stopped
- etc.

The website skeptical science provides an overview of the most popular arguments and the state of the art in science (http://www.skepticalscience.com/argument.php). A similar website is the grist website on climate skepticism (http://grist.org/series/skeptics/).

The EMAPS project will not focus on these general discussions but will go deeper into specific questions of climate change adaptation. Some of the above mentioned websites, however, list controversies that touch the area of climate change adaptation.

Climate change adaptation controversies

1. *Need for downscaled climate change exposition data for spatial planning decisions for spatial planning*

In many cities or regions you can find stakeholders and/or politicians that accept that climate is changing and that it may cause severe negative effects on regional and urban development. However, they often shy away from taking any action to adapt to climate change because they argue that it is not sure yet when and to which extent climate change impacts will hit their region or city. Due to the existing uncertainties it cannot be politically and financially justified to already take action. Instead they proclaim that they would wait a few more years until climate change modeling will finally lead to reliable results for the prediction of climate change impacts at the regional or local scale.

This attitude can be easily comprehended as especially politicians dislike basing their decisions on obviously uncertain or vague knowledge. However, in the near future it will most likely not be

possible to generate predictions of climate change impacts for the regional or local scale due to model-immanent uncertainties that will always exist (e. g. models are based on normative scenarios, uncertainty about some model parameters etc.). The IPCC summarises in Chapter 8 of WG I's contribution to the Fourth Assessment Report that "models continue to have significant limitations, such as in their representation of clouds, which lead to uncertainties in the magnitude and timing, as well as regional details, of predicted climate change" and further mentions that "the ultimate source of most such errors is that many important small-scale processes cannot be represented explicitly in models, and so must be included in approximate form as they interact with larger-scale features (IPCC 2007, p. 601).

As a result, there is a controversy about which kind of information is needed on regional/local climate change impacts before regional and local stakeholders start to take action which is – following the precautionary principle – in many regions most likely necessary already today.

2. Different concepts and terms

When local or regional stakeholders are confronted with possible impacts of climate change that are in the range of their responsibility they are often looking for the right terms when communicating this to other stakeholders or to the public. Climate change hazards, risks, impacts, vulnerability are often used synonymously and often mixed. This expresses the confusion that often hits politicians and/or laymen and reflects more or less the scientific discussion about concepts to assess the negative effects of climate change.

Füssel & Klein (2004) describe the evolution of climate change vulnerability assessments and identify different assessment stages which are all represented by different concepts. This is – as they conclude – not surprising because "climate change vulnerability assessments are performed for different purposes: to increase the scientific understanding of climate-sensitive systems under changing climate conditions, to inform the specification of targets for the mitigation of climate change, to prioritize political and research efforts to particularly vulnerable sectors and regions, and to develop adaptation strategies that reduce climate sensitive risks independent of their attribution. Each of these purposes has specific information needs and thus requires a targeted approach to provide this information" (p. 324).

Especially for the purpose of climate change adaptation Füssel & Klein suggest the adaptation policy assessment conceptual framework in order to address the information needs of adaptation decision-makers.

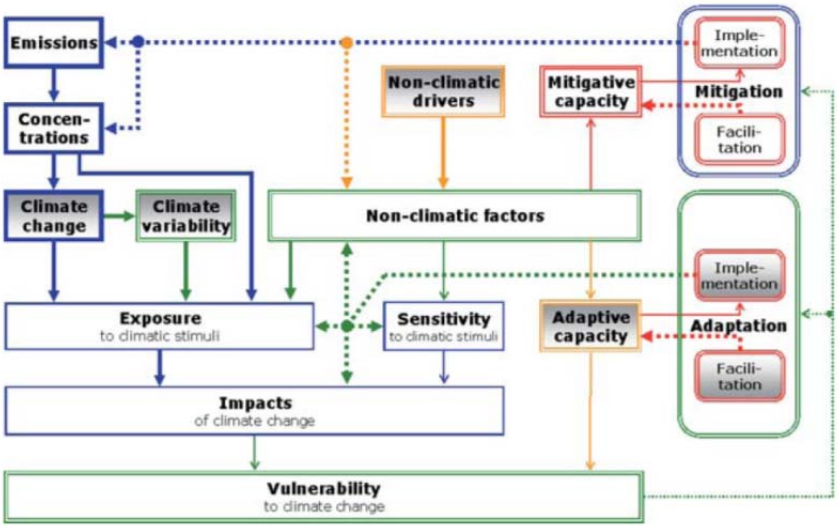


Figure: Conceptual framework for an adaptation policy assessment

Source: Füssel & Klein (2004), p. 322

Although this concept has become quite well accepted in the meantime it is nevertheless only one of many assessment concepts that are currently used.

If we go beyond the climate change community there are even more concepts that can be found when assessing the effects of climate change. The disaster risk community, e. g. knows various approaches to measuring vulnerability at different spatial scales – from global to regional. (It should be mentioned here that the term *vulnerability* in the disaster risk community has a completely different meaning than in the climate change community!) Birkmann (2006) collected different approaches to vulnerability and detects six different "schools of vulnerability" which – similar to the climate change community – are used for different purposes at different spatial scales. The following model presents vulnerability to disasters as a process involving the exposure, coping mechanisms, and potential intervention tools in the form of a feed-back loop and to a certain extent integrates different conceptual approaches to disaster vulnerability.

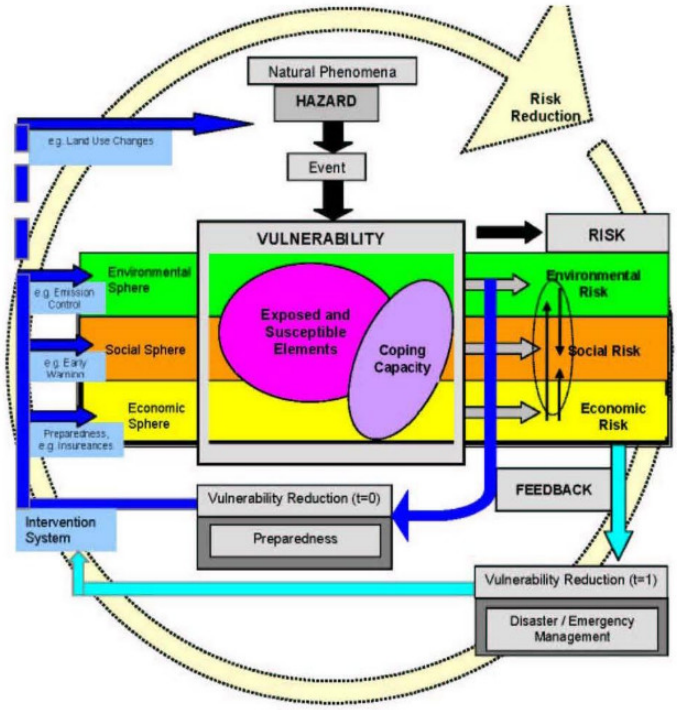


Figure: "BBC conceptual framework" on vulnerability to environmental hazards
Source: Birkmann (2006)

Some scientists have used the disaster risk community approach to assess climate change vulnerability or climate change risk, respectively. Regardless of the appropriateness of this approach for climate change purposes it shows that there is a broad range of different approaches, terms, definitions that on the one hand are needed to meet the required needs of stakeholders or decision-makers but on the other hand make it complicated for politicians and laymen to discuss appropriately about choosing the right approach.

Thus, there is a controversy about appropriate terms and concepts and this controversy always restarts when purposes or the group of addressees change.

3. Increase of extreme events

When looking at data of extreme events which are often followed by disasters one can observe an increase of such events in recent years as shown in the following figure which is based on data of Munich Re. The figure below only lists climate related weather events. Other natural hazards such as earth quakes or tsunamis are not listed there.

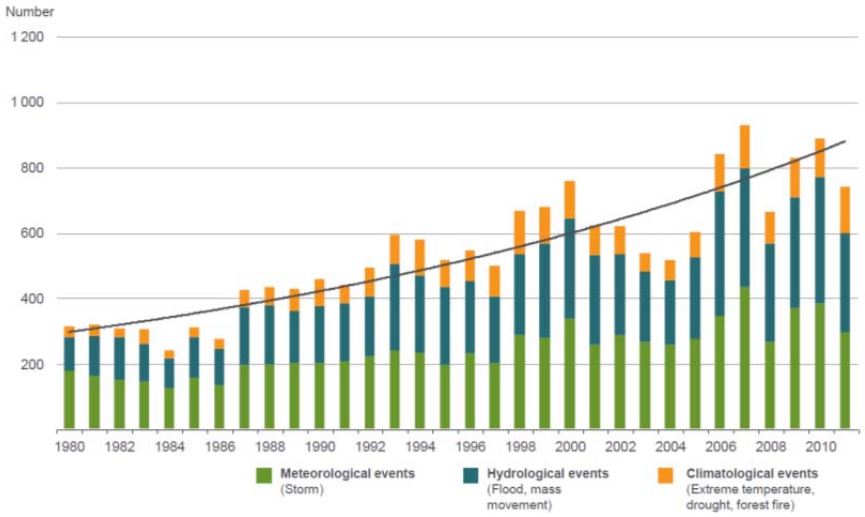


Figure: Weather catastrophes worldwide 1980-2011: Number of events with trend
Source: Munich Re (2012)

The trend might suggest that the number of disasters increases because the effects of a changing climate. The hypothesis is that extreme weather events will happen more often and more intensive in the future because of a more dynamic (because warmer) climate system. The link between climate change and extreme weather events is shown in many publications for flash floods, river floods, storms, forest fires (however, there is still a discourse on this, too). On the other hand nations and economies generally become wealthier, population grows and people tend to move more and more to urban agglomerations and settle more and more in hazard-prone areas. This also leads to an increase of disasters – because a natural event only becomes a disaster if economic or social losses occur. The following figure shows the trend of economic losses for the past three decades.

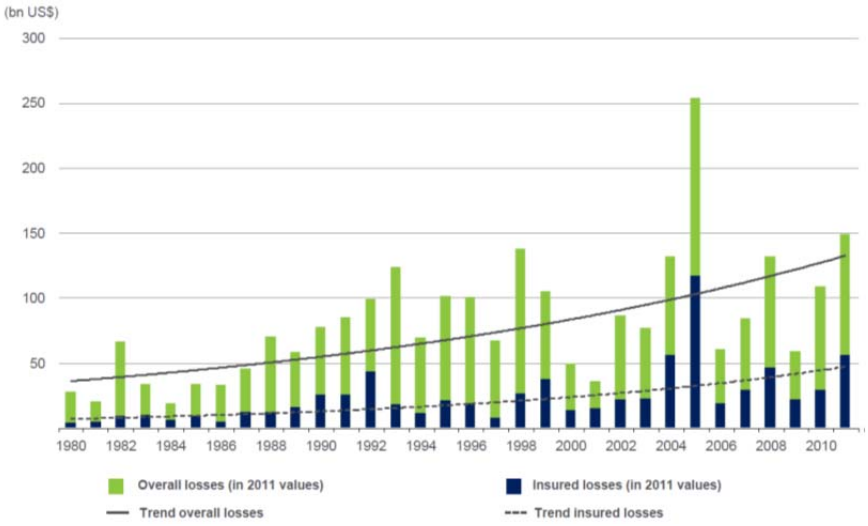


Figure: Weather catastrophes worldwide 1980-2011: Overall and insured losses with trend
Source: Munich Re (2012)

It is not yet clear to which degree the increasing trend in extreme events is a result of changing weather conditions due to climate change (which are described as “exposition” or “hazard”, respectively) or a change in the spatial distribution of socio-economic values (which are described as “sensitivity” or “vulnerability”, respectively).

The controversy thus is about the share of climate change or sensitivity/vulnerability in the increase of extreme events and thus also about where to focus adaptation measures.

4. Multiple changes, multiple challenges

The world is permanently changing. Society, economy, the environment are part of a dynamic system. Although climate change is considered to be one of the main determinants for our changing future there are still other important changes. The following figure shows – by the example of freshwater resources– the multitude of impacts of which climate change is only one of many ("global and regional climate change" in the blue "atmosphere" box).

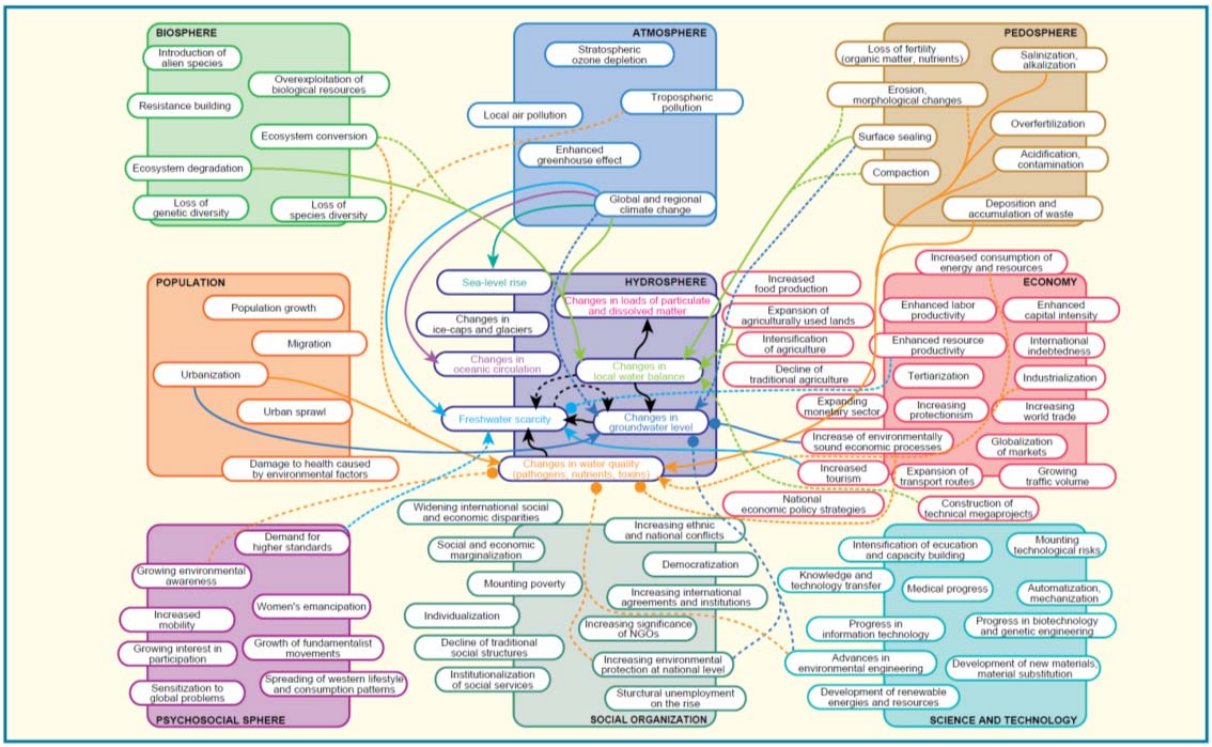


Figure: Water-centered Global Network of Interrelations (solid lines denote a permanent causal link)
Source: WBGU (1999, p. 115)

The patterns of climate change and other changes differ worldwide from country to country and within countries from region to region. Global Change in general, globalisation, ageing/demographic change, regional structural/economic change, large social and/or political changes including wars and other crises, financial situation of public budgets etc. form a specific set of impacts on our economy, society and also the environment. These impacts mean different challenges for policy makers. Whenever adaptation actions shall be taken there is always the question of prioritising these against other relevant changes.

There is thus a controversy about which challenges and actions shall be prioritised at which time, taking into consideration the multiple changes that exist apart from climate change.

5. Temporal scales

Climate change projections have time scales from about 50 to 100 years. Most projections look at the climatic situation in 2100 and sometimes also at periods in between. Spatial (development) plans or contracts for regional development, respectively, are set up for time spans of about 10 to 15 years.

Strongly connected to this question is the fact that most of the existing climate change impact and vulnerability assessments on the one hand look at the climate situation of the year 2100 but on the other hand use recent data on sensitivities for modelling the impacts. The reason it is even more uncertain to model socio-economic development than climatic parameters.

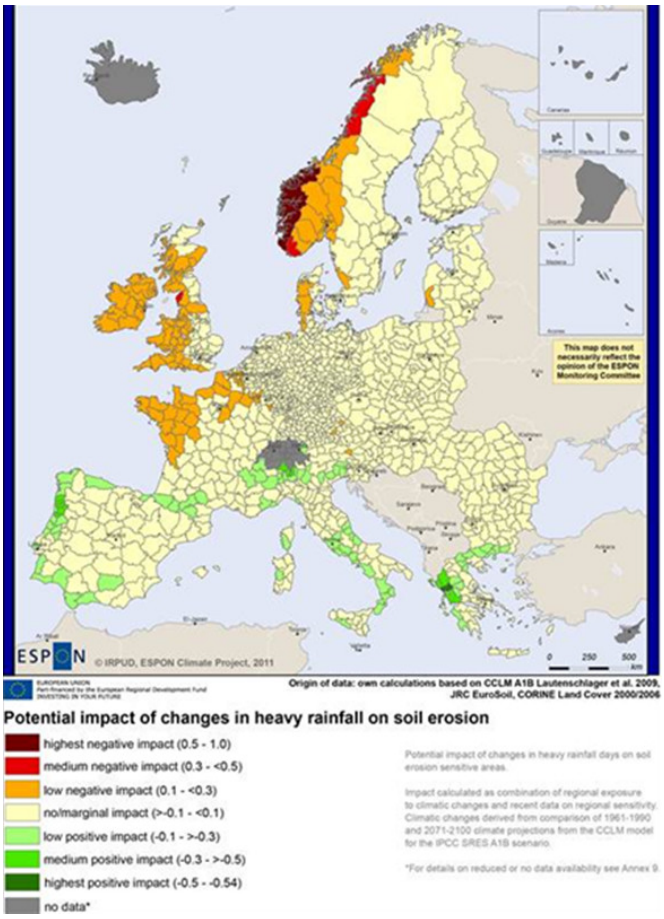
So there is the general controversy about the relevance of climate change impact assessments for regional planning and regional development because of different temporal scales and uncertainty of the future development of socio-economic parameters.

6. Dependency of vulnerability assessments

Climate change vulnerability assessments depend on the temporal (see above) but also on the spatial context. Young (2002, p. 19ff.) addresses this as the so called “problem of scale”. According to Young, scale has to do with the levels at which phenomena occur in the dimensions of space and time. Much work on regimes dealing with common-pool resources, for example, is based on the study of small-scale, typically local arrangements devised to deal with human uses of natural resources. At the same time, many observers have noted the fact that some global systems like the Earth’s climate system, also exhibit the defining features of common-pool resources. Therefore it has to be asked whether propositions derived from the study of small-scale systems apply to global common-pool resources as well and vice versa.

For climate change impact and vulnerability assessments and finally the adaptation action that shall be taken this means mainly the following:

- Indicators that may be appropriate for a vulnerability assessment at the national level (e. g. illiteracy rate, corruption index) are completely inappropriate at the sub-state level, especially in smaller and/or homogeneous countries.
- Large-scale vulnerability assessments which cover areas with extreme amplitudes in the assessment results and which are normalised (in order to have relative scales that can be combined over several sectors) cannot be used for selecting measures and actions at the regional or even local scale (see figure below).



Potential impact of changes in heavy rainfall on soil erosion
Source: ESPON (2011, p. 105)

The figure shows that – regarding the whole of Europe – a broad range of impacts exists from highest negative to highest positive. Thus, the map for Europe shows where in Europe the main needs for action exist and where not. But this addresses only decision-makers at the European level (such as the EU commission), e. g. as a basis for designing European funding schemes for combatting soil erosion. Due to the normalisation this map does not necessarily differentiate between the impacts on regions within countries. In this example the map shows no/marginal impact for all Central European countries (Germany, Poland, Czech Republic, Austria and others) in relation to the maximum/minimum impact. Nevertheless, it could be that even within these countries there are significant differences between the regions. However, it is quite obvious that the map above cannot serve as a basis for decision making at the country or even regional level. For these purposes the data must be normalised again.

This controversy points at the fact that vulnerability assessments depend on scale and time and that each assessment can only provide policy advice for the scale of analysis.

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