Biodiversity, Environmental Change and Regional Cooperation in the Hindu Kush – Himalaya

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1. Introduction

Under the headline of Biodiversity it is stimulating to welcome the representatives of UN-Organisations, Governments, Global Mountain Programs, Universities, non-governmental organizations, development agencies, conservation specialists and others. The spectrum of topics for this conference extends from "Land Use and Biodiversity to Protected Areas and Transboundary Parks" and we should keep in mind that we shall discuss these topics in a time of ongoing climate and environmental change. The natural and human driving forces are influencing the biodiversity, the mountain ecosystems, the mountain water resources and in the near future most probably also the livelihood of the mountain communities.

But what does biodiversity mean in such a huge mountain system, representing eight countries, 10 big river systems, about 200 million people in the mountains and perhaps more than 1.3 billion people in the surrounding lowlands? Extending from West to East over a distance of about 3500 km, the varieties from arid mountains with less than 400 mm of annual precipitation in the West to 4m in the East and to more than 10m in Cherapunjee on the Meghalaya Hills are overwhelming and are overlapped by the South – North differences from a summer monsoon precipitation regime to a boreal winter circulation regime over Tibet and the northern mountain chains. These dimensions create not only high diversities from genetic resources to species diversity and whole mountain ecosystems, but determine also the natural and cultural landscapes. What are the consequences of this too short description? Without a solid knowledge about climate and water as basic elements for soil formation and vegetation growth, for land use and land cover and especially also for biodiversity, we have no possibility to develop scenarios about potential impacts of climate change and extreme events, we have no concrete answers to the questions of mitigation and adaptation measures. The necessary basic and comparable data with longer and reliable series all over this mountain system are missing. How should we tackle biodiversity conservation and management for such a huge mountain system? How do we organize the urgently needed better knowledge about Biodiversity and about the so-called "Hot Spots" in order to preserve the mountain resources for the benefit of the highland and the lowland people?

2. A proposal for a concept at regional scale

With precise studies on selected mountain test sites in several South – North transects from West to East, as it is shown in this map (fig. 1) of ICIMOD's Hindu Kush – Himalayan Region (HKH), we could improve our knowledge enormously. Eklabya Sharma, Nakul Chettri and the whole team have begun to study the localization of especially interesting places, where a certain ecological and environmental knowledge can be expected, e.g., Protected Areas (IUCN, Categories I – VI), so-called

Biodiversity “Hot Spots”, World Heritage Sites, Mountain Biosphere Reserves, important Bird Areas, Ramsar Sites, etc. On this map you can see a first draft with four well selected transects, in color especially seven interesting transboundary complexes. It is obvious that these transboundary complexes are quite open towards the north. We hope that our Chinese friends will help with the selection of northernmost test sites, so that the change from the monsoon regime in the south to the Tibetan climate situation can be fully understood and documented. In these test sites we need a good knowledge and a longer term monitoring about the different altitudinal belts in all aspects, based on the necessary data about climate, water, biodiversity and ecosystem services. This knowledge will be essential to plan conservation and development strategies and to integrate these stations in a global network, called GCOS (Global Climate Observing System), so that the HKH region will receive a higher attention in the climate change projections and in the next IPCC report (Intergovernmental Panel on Climate Change). We should keep in mind, that the Himalaya is quite not existing in the last report (IPCC 2007). The maps of Asia show the changes of temperature and precipitation from South Asia to the Polar Sea, but it is difficult to identify the great barrier of the Himalayas. It was often said, that these HKH region is a “white spot”, and this means, the today available data are not sufficient for modeling and projections into the future. The consequences are very clear: If the HKH countries are not developing a better transboundary cooperation, then they will be missing a better integration into the global change science community.

Considering this map (Fig. 1), the question will come: What can be done for the big gaps between the different transects? We must clearly state that an exhaustive cover with field stations and field studies all over the whole Hindu Kush – Himalaya is not possible, But if we have well studied and well equipped test sites, then we can use remote sensing methods and techniques for the space in-between, and these results can be calibrated with the knowledge of test sites. This approach will need a transboundary cooperation. Therefore all the countries must be involved, as the seven transboundary complexes and four transects may show, summarized in Fig 2.

3. A proposal for a concept at local scale

The global and regional climate change projections are highly generalized and it is highly difficult to downscale the results on the level of a valley or village, especially in mountain areas. However, higher temperatures and more extreme events can be assumed. If we want to apply these changes to a certain place or village with its population, then we have first of all to understand the natural - human system (see fig. 3). An instructive example has been developed for the village of Bagrot in the Karakorum (Winiger and Börst 2003). The authors analyzed climate and hydrology, irrigated and non-irrigated land use systems and the altitudinal belts with summer and winter grazing land. Based on this knowledge the potential and the limitations could be evaluated, certain changes in the natural and the human systems could be integrated and used for certain projections into the future, e.g. what are the consequences of melting glaciers, shorter snow cover, changing precipitation and runoff, impacts on vegetation and biodiversity, etc. Without going in more details about this very interesting case study (see also Messerli 2008), we can say that this knowledge should exist in a so-called test site, so that new information from regional knowledge centers can be reflected on a local scale and observations on a local scale can be transmitted to the regional scale institutions. But in view of the big gaps

between the different transects it is most important that observations from local places outside the test site can be calibrated and advice can be given back to these outside local communities.

4. Global support to regional and local initiatives

GCOS (Global Climate Observing System) as a common undertaking of WMO (World Meteorological Organisation), UNESCO, UNEP and ICSU (International Council for Science) has been started and it is most fascinating to see that measuring stations have been designated also by the countries of the HKH region. Figure 4 shows the list of the six countries with the total number of stations and the stations above 1000 m altitude. I could not localize precisely all these stations, but I assume that quite a group of stations is planned for the HKH region. We may be quite astounded to see on figure 5 that besides the normal climatic data also observations of glaciers, snow cover, permafrost, land cover, water, soil moisture, biomass etc. are demanded and this means, a lot of basic data for land use and biodiversity would be available, even across all political borders: A new era in research for development in the HKH region would begin! But, let's be realistic, it will be a long process. Besides some difficult political decisions we should keep in mind that these stations will be very expensive and their satisfactory function will depend on a quite highly qualified staff. For the moment, 13 countries have elected a coordinator and have made a certain progress in the planning of a national network, China is one of these advanced countries. Until now 142 countries have nominated only so-called focal points, institutions or personalities with a responsibility for this global program. Of special interest is the planned cooperation between CGOS and GEOSS (Global Earth Observation System of Systems) to intensify the continuous observation of the Earth surface processes, also in connection with climate change. This could open new possibilities to survey the big open space in-between the transects and the test sites and let's keep in mind, that both programs, GCOS and GEOSS place a particular emphasis on the application of their results for weather, agriculture, water, energy, biodiversity and climate change. Is it not astonishing that biodiversity is especially mentioned again?

Finally, figure 6 is an appeal for interaction and cooperation in the HKH region. Interaction means to participate in global and regional programs (macro level) with the responsibility to downscale as far as possible their observations and experiences to the lower levels (meso and micro level). On the other hand the leading persons or institutions on the local level have the responsibility to upscale their observations and experiences to the higher levels. Cooperation means the exchange of data and experts across borders, because mountains and the adjacent lowlands are units which can not be separated, if we want to avoid serious conflicts in the future.

List of references:

GCOS (2008) GCOSJPO@wmo.int, GCOS Secr. c/o WMO, Box 2300, 1211 Geneva 2, Switzerland

IPCC (2007) *Climate Change. The Physical Science Basis. Contribution of Working Group I to the fourth assessment report of the Intergovernmental Panel on Climate Change*. Cambridge University Pres, UK: 976 p.

Messerli, B. (2008) *The Hindu Kush - Himalayan Region, Common Goods or Common Concerns?* (Publ. ICIMOD in prep)

Winiger, M.;Börst, U.(2003) Landschaftsentwicklung und Landschaftsbewertung im Hochgebirge: Bagrot (Karakorum) und Lötschental (Berner Oberland) im Vergleich. In: Welt der Alpen – Gebirge der Welt. 54. Deutscher Geographentag. Eds: Jeanneret F., Wastl-Walter D., Wiesmann U., Schwyn M., Haupt Verlag, Bern: 45 – 60

List of Figures:

Figure 1 – Map: The Hindu Kush – Himalayan Region. Proposal for four South – North transects and seven transboundary complexes from the arid mountains in the West to the humid mountains in the East (For explanation see text).

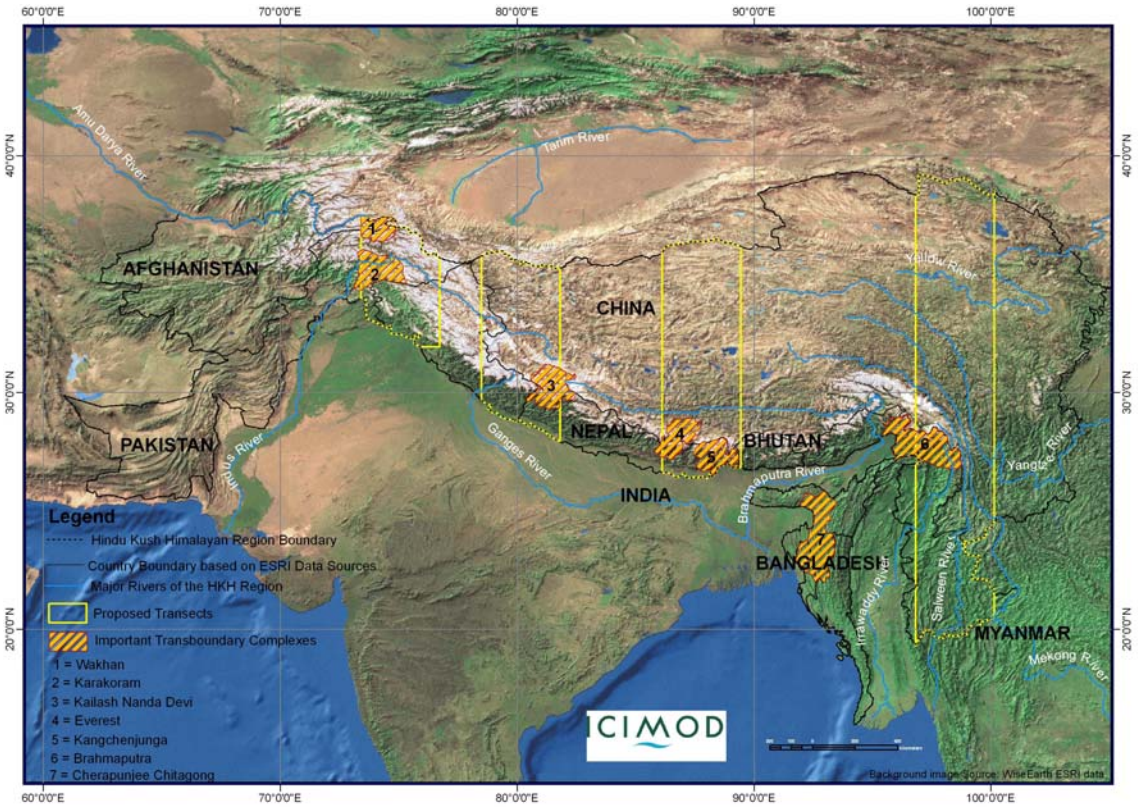

Figure 2. Proposed transboundary landscapes/transects and involved countries.

Proposed Transects: W – E and S – N

Involved Countries

1. **Wakhan:** China, Afghanistan, Pakistan, (Tajikistan)
2. **Karakorum:** Pakistan, China
3. **Nanda Devi, Kailash:** India, China, Nepal
4. **Everest:** Nepal, China
5. **Kangchenjunga:** Nepal, India, Bhutan
6. **Brahmaputra:** India, China, Myanmar
7. **Cherapunjee, Chitagong:** Bangladesh, India

Figure 3. Conceptual analysis of the village of Bagrot in the Karakorum, Pakistan. This basic knowledge is an important tool to observe or measure future environmental changes (slow trends and extreme events) in order to understand and disentangle natural and human driving forces and to prepare in the right time the necessary adaptation measures. (Winiger and Börst 2003).

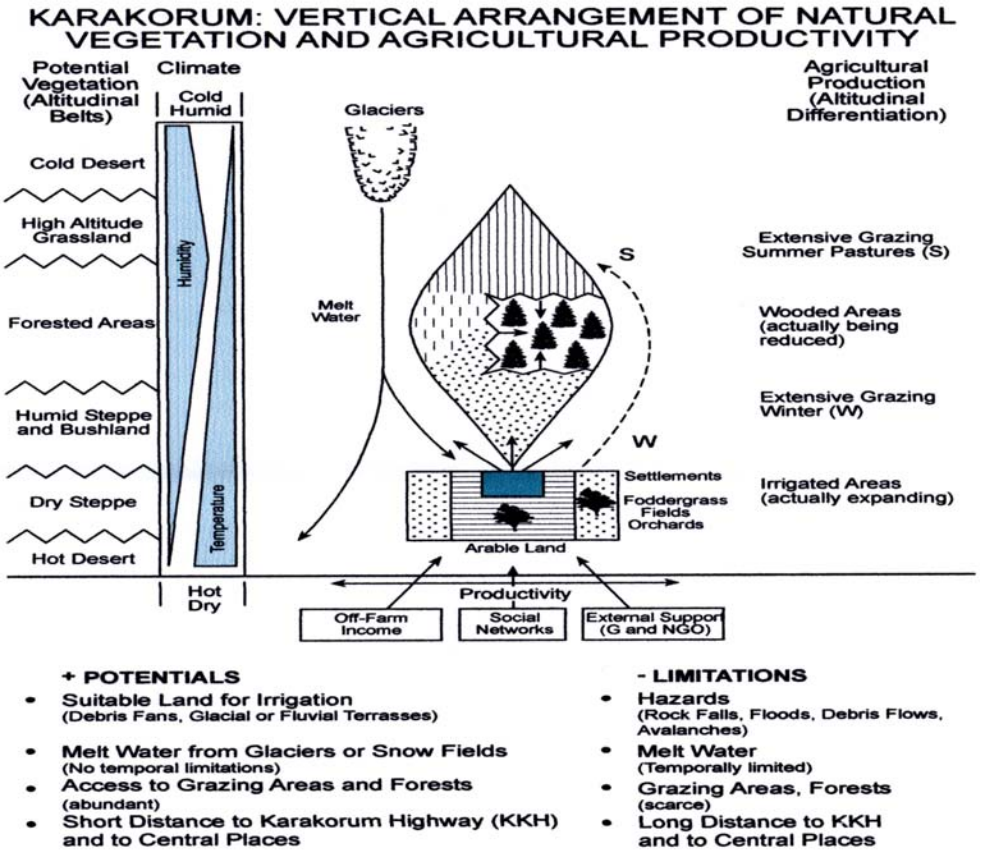

Figure 4. Proposed stations for the GCOS program. It is not yet clear how many stations will be in the Hindu Kush – Himalayan Region.

GCOS - Global Climate Observing System

Countries	Total Stations	Stations above 1000 m
Afghanistan	1	1
China	33	10
India	21	4
Myanmar	3	--
Nepal	1	1
Pakistan	6	2

13 countries have a coordinator (China), all the others have only a focal point. A message is in preparation to urge all the countries to appoint a national coordinator and a national GCOS – Committee.

Figure 5. Essential Climate Variables in the GCOS – Program and the planned cooperation between GCOS and GEOSS.

GCOS – Agreement WMO, UNESO (IOC), UNEP, ICSU

Essential Climate Variables

Atmosphere: Temperature, Precipitation, Air pressure, Surface radiation budget, Wind speed and direction, Water vapour.

Composition: Carbon dioxide, Methane, Ozone, Aerosols.

Terrestrial: River discharge, Water use, Ground water, Lakelevels, Snow cover, Glaciers, Permafrost, Land cover, Fraction of absorbed photosynthetically active radiation, Biomass, Soil moisture, Fire disturbance.

GEOSS Global Earth Observation System of Systems
GCOS Global Climate Observing System
GCOS is recognized as the climate component of the GEOSS.
Application: Weather, Agriculture, Water, Energy, Biodiversity

Figure 6. Interaction between different scales and cooperation between Highlands and Lowlands across political borders.