Geophysical Research Abstracts,
Vol. 10, EGU2008-A-05272, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-05272
EGU General Assembly 2008


# Global significance of mountain regions for lowland water resources: a spatially distributed analysis

**D. Viviroli** (1), H. Dürr (2), B. Messerli (1), M. Meybeck (3), R. Weingartner (1)

(1) Institute of Geography, University of Berne, CH, (2) Department of Physical Geography, Utrecht University, NL, (3) UMR 7619 Sisyphe, Université Pierre et Marie Curie, Paris, F (viviroli@giub.unibe.ch)

Mountains and highlands provide essential freshwater for populations both upstream and downstream; therefore, they are often called the world's natural "water towers". Since freshwater resources are under increasing pressure, this contribution needs to be clarified. Extending concepts which were elaborated in earlier case-study-based assessments, a first spatially explicit, global typology of the so-called "water towers" is presented. Critical regions are identified where the disproportionality of mountain runoff as compared to the lowlands is extraordinarily high. Additionally, lowland climate conditions are used to assess the mountains' contribution in context of the ecosystem perspective, resulting in four different types of "water towers". Finally, including the human dimension, the potential significance of water resources in originating in mountains is assessed relative to the actual population in the adjacent lowlands and its water needs. With the resulting maps in 0.5° x 0.5° resolution, the disproportionality of mountain runoff is identified on a cell-by-cell basis, and statements for individual basins, climate zones and relief types are summarised from this data.

The results show that more than 50% of mountain areas world-wide have an essential or at least supportive role for downstream region hydrology. When the actual lowland water use is considered, 7% of global mountain area has an essential role in water resources, while another 37% provides important supportive supply. This is of special importance in arid and semiarid regions where vulnerability for seasonal and regional water shortage is high.

Our approach provides the basis for identification of critically important regions on a global scale. This is especially of importance when considering effects of climate change and population growth which are expected to worsen water resources supply significantly, particularly through altered discharge patterns from mountains and increasing demand for food production.