

## **Sustainable Water Management in a Globalized World**

A brief description for the kick-off-meeting

“Economics for Sustainability“ (02.-03.11.2010)

### **Duration and financial scope**

Duration of project: 01/04/2010 – 31/03/2013

Financial scope: Euro 573,288

### **Project team**

Dr. Hermann Lotze-Campen (main applicant), Dr. Dieter Gerten, Dr. Anne Biewald,  
Marianela Fader, Holger Hoff  
*Potsdam Institute for Climate Impact Research (PIK)*

Prof. Dr. Dr. h.c.von Witzke, Doreen Burdack  
*Humboldt University of Berlin, Department of International Agricultural Trade and  
Development (HUB)*

Prof. Dr. Dr. Johannes Wallacher, Martin Kowarsch  
*Institute for Social and Development Studies (IGP) at the Munich School of Philosophy*

### **Topic**

Many developing countries as well as those with emerging markets depend on agriculture and are exposed to water-related problems due not only to an increasing demand for water but also due to changed rainfall patterns as a consequence of climate change. Even if water scarcity increases only regionally, due to international trade the resulting problems would get a global dimension.

Reasons for water scarcity are often not only the physical shortage of water but also inadequate institutional and legal frameworks, insufficient economic incentives, as well as the absence of technological capacities for sustainable water management. Hence, the reason for the present water crisis in many regions is mainly a failure of water management or water governance. This failure could be offset by useful combinations of different regional arrangements including agricultural trade with the goal of improvements in water productivity, water availability, and water access.

Water usage is closely connected to ethical aspects: particularly to the question of a fair allocation of water to different user groups (intra- and inter-generational), taking especially ecological concerns into account. The project “Sustainable Water Management in a Globalized World” uses an interdisciplinary approach to integrate economic, legal, technological, and ethical aspects of regional and global water management in global and regional studies.

### **Scientific and application-oriented goals**

- Quantitative analysis of future water scarcity considering climate and socio-economic changes (on a global scale and in specific regions)

- Analysis of different potential water management strategies (increase of water use efficiency in agriculture, expansion of arable land, virtual water trade) to minimize regional water stress
- Survey about the present debate of water-ethics as well as a consolidated analysis of different water management strategies from an ethical point of view
- Development of policy strategies for effective, efficient, and just regulations of water resources (on a global scale and in specific regions)
- Development of approaches to reduce over-utilization of water as a common good.

**Methodology** (split into 6 working packages (WP) equivalent to the structure of the project)

**WP-1 & WP-6:** Human rights and a concept of justice with three dimensions (basic needs fulfillment, sufficient opportunities, and fair procedures) derived from human rights are the basis for the development of general ethical guidelines for freshwater management which are also compared with other water ethics approaches (WP-1). At the end of the project (WP-6), these guidelines are used to evaluate more concretely the options, institutions, and scenarios we analyze to find solutions for global and regional problems of water management. The underlying model assumptions will thus be subjected to a critical philosophical and ethical reflection.

**WP-2:** Using LPJmL, a global water and vegetation model developed at PIK, a biophysical analysis of future water scarcity of green and blue water resources and virtual water trade with agricultural products (global, 50x50 km scale) with different scenarios of climatic conditions and population will be accomplished. Additionally, we use MAgPIE, a model of agricultural production also developed at PIK, to calculate the scarcity of water based on shadow prices of water. With this analysis we are able to define, from a multi-methodological perspective, regions where water will be scarce in the future and where water saving strategies will have high benefits.

**WP-3 & WP-4:** Based on two case studies (South Australia, East Africa), specific problems of water availability and access and potentials of implemented water management strategies and policies are analyzed and evaluated under economical and ethical aspects. Focal points are the different costs for technical and social measures as well as potential region-specific strategies concerning water allocation, water usage, water storage, increase of water productivity, and reduction of water consumption.

**WP-5:** On the basis of WPs 2-4 and using the models LPJmL and MAgPIE, future potentials of specific water management strategies can be determined. Thereby, we include a quantification of present virtual water trade, potential future changes of trade flows in response to water scarcity, as well as opportunities to enhance and optimize virtual water trade. In this context, a welfare economic analysis of regional water management strategies is to be undertaken. For this purpose, we determine economic impacts of regional water policies on international trade, prices for agricultural products, producer and consumer surplus, as well as ground ground rents using MAgPIE.