

Climate Change in Africa

The Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) projects a warmer climate for Africa, a drying in subtropical West Africa, and an uncertain rainfall trend in tropical West Africa. From a state-of-the-art regional model operated in IMPETUS taking into account land-use changes, it turns out that in the future a general decrease in rainfall together with a prominent surface heating can be expected for sub-Saharan Africa and north of the Sahara until 2050. It is very likely that anthropogenic climate change in combination with soil degradation and migration will impact hydro-climate with a weakening of the hydrological cycle in tropical and subtropical West Africa and with the implication that a decreasing fresh water availability is opposed to an increasing water demand. With the ongoing GLOWA initiative the German government has set up in the year 2000 a long-term research strategy to mitigate the anticipated global change effects in the water sector.



GLOWA

The GLOWA Research Program

The development of integrated strategies for a foresighted and sustainable management of regional water resources is of paramount importance to mankind, and thus, the aim of the research program on global water cycles (GLOWA). It is taking into account ecosystem as well as socioeconomic contexts, analyzing larger watersheds (approx. 100.000 km²) as examples. Consequently research aims at assessing the interrelations between the hydrological cycle, large-scale climatic variability, and changes in the biosphere, with their influence on water availability. All GLOWA projects are developing simulation tools which will create and support decision-making processes.

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Meteorological Institute, Bonn
Geographical Institute, Bonn
Geological Institute, Bonn
Institute of Crop Science and Resource Conservation, Bonn
- Dept. Plant Nutrition
- Dept. Crop Science and Tropical Crops
Institute for Food and Resource Economics, Bonn
Institute of Cultural and Social Anthropology, Cologne
Institute for Medical Microbiology, Immunology & Hygiene, Cologne
Institute for Virology, Cologne
Botanical Institute, Cologne
Geographical Institute, Wuerzburg

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IMPETUS

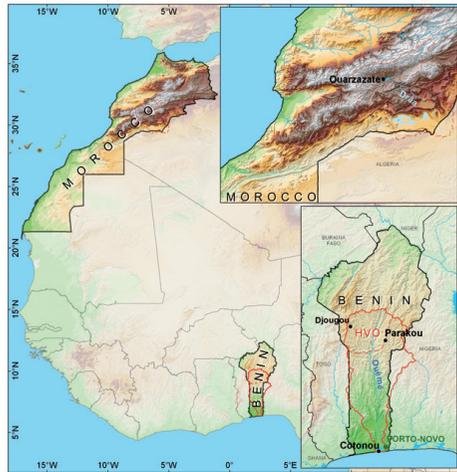
An Integrated Approach to the
Efficient Management of Scarce
Water Resources in West Africa



3rd Project Phase 2006 - 2009

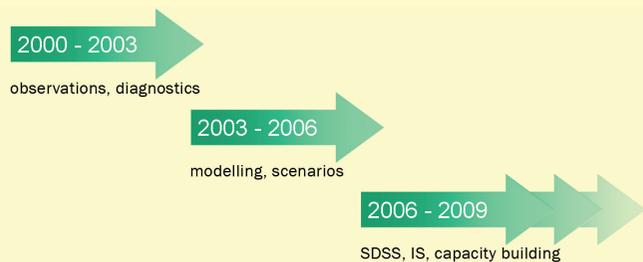
IMPETUS Synopsis

IMPETUS assesses the hydrological cycle of two watersheds in West and North-West Africa in a multidisciplinary approach, involving natural, socio-economic, and health sciences. The upper Ouémé river in Benin is representative of sub-Saharan tropical West Africa, the wadi Drâa in Morocco of the subtropical North Africa.



The first project phase was dedicated to the comprehensive assessment of the *status quo*. In the second phase, qualitative and quantitative models were adapted or newly developed for both regions. Projections of future developments were derived from scenario calculations and from expert knowledge. In the current project phase, spatial decision support and information systems are developed within a set of multidisciplinary “problem clusters”.

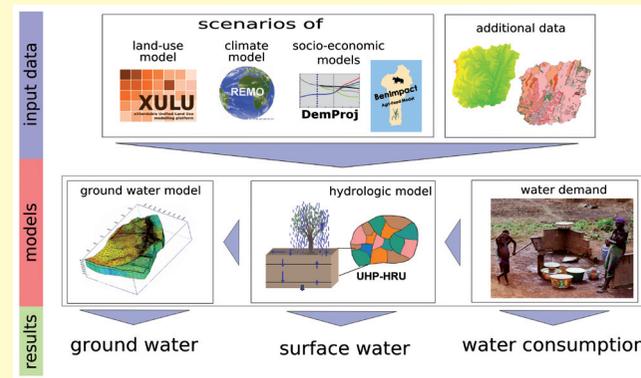
Project Phases: From science to application



What is an IMPETUS problem cluster?

No single solution exists for complex decision-related questions. To handle the complexity adequately, numerous problem clusters were defined. These are meta-problems which require a multi-disciplinary analysis in order to allow for drawing conclusions with respect to future developments.

Example of a problem cluster: “Water Availability in the Upper Ouémé”



IMPETUS 3rd Phase

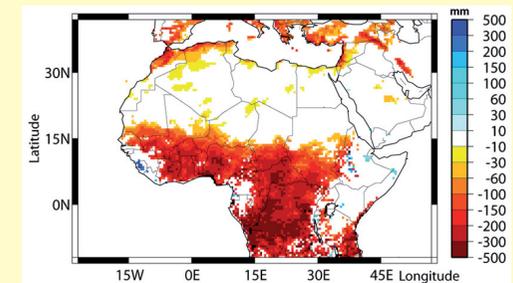
Sustainable water management in the watersheds of the Drâa and the Ouémé requires reliable data and projections for regional planning and political decision makers. For this purpose nearly for every problem cluster a spatial decision support system (SDSS) or information system (IS) is developed which provide tailored tools for decision making. Functions of the SDSS/IS range from information retrieval from the database up to the simulation with dynamically-coupled models. In addition the effects of certain measures (interventions) can be studied on the basis of different scenarios.

Project Region Benin

Benin is actually not suffering from an acute water deficit, but the provision of the population with hygienically safe drinking water is inadequate. The Ouémé region is characterised by a high population growth, enhanced by migration, and consequently rapid changes in land use. The situation is further aggravated by a pronounced decrease of rainfalls with increasing variability. On the basis of this information and in close cooperation with stakeholders, scenarios are defined for the project region. These scenarios form the basis for modelling and projections until 2025 within 19 problem clusters.



Projected changes in precipitation for 2050 according to IPCC SRES A1B scenario



Project Region Morocco

General water shortage and severe local water deficits bear a high conflict potential. IMPETUS is focussing on the Drâa valley which shows a climatic gradient from semiarid regions of the High Atlas down to the northern Saharan foreland. An efficient use of available water resources and an improvement of water management is the prerequisite for adequately dealing with



water shortage. In close cooperation with stakeholders IMPETUS develops realistic scenarios until 2020 and management options for local decision makers within 11 problem clusters.