



Zentrum für Entwicklungsforschung
Center for Development Research
University of Bonn

Annual Report 2008/2009

Water Governance

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Introduction

by ZEF's Directors

Dear reader,

This year was about capacity building: It was the year of our students. Ten years ago we started with a couple of students in the first doctoral course. So it's time to look at the return on our investment.

By now, more than 400 students from around 80 countries have participated in the Bonn Interdisciplinary Graduate School for Development Research (BiGS-DR). ZEF's Graduate School was one of the first graduate programs for development research in Germany. Today, it is well connected with partner institutions in Europe and all over the world in the fields of development research and cooperation. More than 80% of the students from developing countries have returned to their home regions in Africa, Asia and South America, thus contributing to development efforts at home.

During the conference "Ten years of international graduate training at ZEF: Capacity development for the developing world", that took place at ZEF on October 1–2, 2009 we could see how our alumni have developed their professional capacities and deepened their expertise in development oriented topics since graduation. We see that networks are being built among former and new students, and it is positive and satisfying to see how ZEF has, in its own way, become a global academic player.

However, this Annual Report will also inform you on our research activities on water as well as on our research on climate change, land use, biodiversity and health in Africa, Asia and Central Asia. Whereas some of ZEF's long-term projects are coming to an end, the Center managed to bring some new projects on board. Its success in this respect can definitely be attributed to the expertise which has been developed and quality of the research that was conducted in current and former projects. The project on climate adaptation in Africa builds upon research work done in the GLOWA Volta project in West Africa. The application for setting up a DAAD/ZEF Centre of Excellence in Ghana for Development Studies would certainly not have been successful without the long institutional partnerships that have evolved in the framework of the GLOWA Volta project.

We would like to express our gratitude to our main donors, the German Federal Ministry of Education and Research (BMBF), the German Federal Ministry for Economic Cooperation and Development (BMZ), the German Technical Cooperation (GTZ), the German Academic Exchange Service (DAAD), the Robert Bosch Foundation as well as the Volkswagen Foundation.

We wish you an interesting read.



Solvay Gerke



Ulrich Hiemenz



Paul L.G. Vlek

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Preface

Water: the catalyst for development and change

by Janos Bogardi

Towards the end of the last century, water started to emerge as a genuine global concern. Human existence, development and well-being have always been intricately linked to water. However, the resource, its quality and availability have frequently been taken for granted—at least by those who have access to it. Rapidly deteriorating water quality, potential shortages, but also the recognition of inhuman disparities as far as access to safe water and sanitation and water as a factor of development are concerned have highlighted a mounting crisis in water solidarity and emphasized the limits of the world's water resources. The free-wheeling approach started to fade; instead gloomy scenarios of "water wars in the 21st century" emerged. Whole series of recurring high profile events, summits, the Millennium Development Goals, the Millennium Ecosystem Assessment, the World Water Development Reports mark a process of mentality change and the formulation of

Professor Janos Bogardi is former Director of the United Nations University Institute for Environment and Human Security (UNU-EHS). He was appointed Executive Director of the International Project Office of the Global Water System Project (GWSP) in June 2009.

(binding) goals and commitments. We may be on the right track, but progress is painstakingly slow. While we are still a long way from reaching the water-related Millennium Development Goals (which would still leave about 800 million people without access to safe water and more than a billion without adequate sanitation), we are facing a harsher "water world".

The recent political focus on rising temperatures as an attribute of climate change camouflages the fact that warming the atmosphere means changing the global hydrological cycle. Increasing global temperatures accelerate the hydrological cycle, making it more prone to extremes. Excessive floods may wash away modest successes of development and prolonged droughts mean famine, which may trigger migration and potentially augur conflicts.

The media is full of predictions of temperature increases in degrees Centigrade, whereby this translates into m³s of water on the ground: either too much, or too little. Mighty as it may look, climate change is not a single driver. An increasing population, changing aspirations, growing expectations and needs aggregate to form a new challenge.

Global environmental and climate change is ultimately water change. This simple sentence does not simplify the problem we face. We need to reassess (and continuously upgrade) our predictions, not only as far as the physical and chemical parameters of the resource water, but also as far as its governance and integrated management are concerned. The involvement of multiple stakeholders in formulating objectives and policies and in figuring out how to implement them imply that water resources development planning is no longer a task for professionals alone.



Tono district in Northern Ghana

Development to make the world a more equitable (just) place for all, depends to a large extent on our ability to solve the "water challenges" under different cultural, geographical and economic conditions. Global (water) change, while a physical process, impacts society on different scales. Parallel to the temporal and spatial variability of the occurrence of the resource, we also need to analyze the societal variability of needs and



The Olifants River in South Africa, where ZEF is involved in research on Integrated Water Resource Management (IWRM)

uses, cultural exigencies and the economic dimension of rewards or losses.

ZEF participated in the research on Global Change Research and the Hydrological Cycle initiated by the German Federal Ministry of Education and Research (BMBF). In Ghana and Burkina Faso, ZEF's interdisciplinary research team analyzed the regional impact of global climate change on the hydrological cycle in the West African Volta Basin, including social and economic aspects affecting water management. The project is now transferring its science-based tools and policy recommendations to the local partners and stakeholders to facilitate a sustainable follow-up.

Furthermore, ZEF has been engaging in interdisciplinary water-related research in countries such as Vietnam, where it is a partner in the BMBF-

funded WISDOM project (Water-related Information System for the Sustainable Development of the Mekong Delta), Uzbekistan, where sustainable solutions are being developed to improve water and land use in the Aral Sea Region, as well as South Africa, where ZEF is involved in analyzing and improving concepts for Integrated Water Resource Management (IWRM) in the Olifants Basin.

ZEF as a host of the International Project Office of the Global Water System Project (GWSP) can expect synergies and the rapid transfer of international scientific results to its educational program. This interdisciplinary focus and complexity awareness must be placed in the mindset of the new generation of professionals and scientists as directly as possible. Otherwise today's scientific results will remain pure "water knowledge". Multi-stakeholder approaches need education and the

transfer of information well beyond the limits of the capacity development of professionals if they are to be turned into "water wisdom".

ZEF contributes to the broad dissemination of multifaceted "water awareness" through the monthly water lectures organized jointly with the United Nations University Institute for Environment and Human Security (UNU-EHS), the UN Water Decade Programme for Capacity Development (UNW-DPC) and the GWSP. In addition, ZEF and the GWSP have recently launched a joint initiative to make Bonn "a global water city".

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Lead Article

Hot water after the Cold War. Towards a critical perspective on globalizing water resources governance

by Peter P. Mollinga

Freshwater management for agriculture, industry, hydropower and drinking and sanitation purposes are inherently local and regional processes. Nevertheless, these processes have always been embedded in global processes, both physical and social. Physically through the earth's climate and weather systems, socially for instance through colonial rule that reshaped local and regional water resources management from the perspective of imperial interests, and through development assistance after decolonization. Since approximately 1990, the globalization of freshwater resources management has intensified and taken new forms. These new forms involve the articulation of global governance frameworks and rule systems, policy approaches, knowledge organizations, and other institutional arrangements that endeavor to reshape local and regional freshwater management from a global standpoint.

Peter P. Mollinga is a Senior Researcher in the Department of Political and Cultural Change at ZEF. The phrase 'Hot water after the Cold War' was coined by James Nickum from Tokyo Jogakkan College, Japan during a workshop at ZEF on water resources governance in (semi-)authoritarian settings (March 24–25, 2009).

The present process of the globalization of freshwater resources management began at the particular juncture of the post-Cold War period of the early 1990s. At that moment in time there was a confluence of three 'big ideas': the ideas of market, governance and sustainability. In combination they were thought to express a vision of how to perform water resources management in a better, more comprehensive and development enhancing way. The vision was bundled with financial aid and political and economic reform packages. This amalgamation currently goes under the banner of IWRM, Integrated Water Resources Management. 'Integration' is seen to mark a break with the past, with the earlier 'hydraulic mission' paradigm of water resources management, in which national governments focused on the creation of large-scale infrastructure for water supply enhancement, hydropower generation and flood control (harnessing water for productive purposes). In this perspective, IWRM signals a new phase of 'reflexive modernity' in which economic, environmental and social concerns related to water resources management are balanced in a new paradigm (cf. Allan, 2006).



Water transport in Ghana

Two of these three big ideas were directly related to the end of the Cold War. These were the ideas of the market as the general solution to societal coordination and prioritization problems, and the idea of democracy and freedom western-style. The third big idea was that of sustainability, as internationally profiled particularly at the 1992 Rio Earth Summit, whose timing coincided with the two ideas already mentioned. In the course of the 1990s, these three ideas of the market, (good) governance and sustainability, and the discourses associated with them with regard to water resources were amalgamated in the concept of IWRM. An often cited definition is that of the GWP (Global Water Partnership) published in 2000 for the 2nd World Water Forum in The Hague, the Netherlands:

"IWRM is a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems." (Global Water Partnership, 2000)

WWF 2000 can be taken to represent the moment of 'closure' of the amalgamation process: the global water community thought it to be time to move on from a 'world water vision' to 'frameworks for action'.

The word 'governance' does not appear in this definition, but the GWP and other organizations strongly label the water resources management question as one of governance. The GWP's 2000 *Framework for Action* document states that the water crisis is mainly a crisis of governance. This idea became a much quoted phrase after the 1992 Rio conference, where it was stated somewhat more strongly that 'the water crisis is not a crisis of scarcity but one of governance'. The emphasis on 'water governance' in the global water discourse has steadily expanded since then.

The prominence of global water governance: structural conditions

Three of the mutually reinforcing, structural conditions and processes for the amalgamation process described above and for the prominence of global water governance are as follows:

i. Global environmental policy articulation. Environmental issues have become the subject of national and international concern and policy since the emergence of strong environmental movements in the 1960s and 1970s, particularly in the industrialized world. Since the early 1990s, there has been an intensification of the articulation of global environmental policy, particularly through the UN system, within the paradigm of sustainable (human) development. The articulation of global water policy (ideas) is part of this process.

ii. Commoditization. The intensification and generalization of capitalist development over time has meant the increased integration of water uses and users in the global economy. Water itself has to some extent become a global commodity (cf. bottled drinking water), but more importantly, production processes that depend on freshwater use, notably agriculture, have also experienced this integration and been influenced by it. This, among other things, has produced the concept of the global 'virtual water' trade. Commoditization has entered the institutional sphere through the introduction of tradable water rights, the privatization of water supply services, and other mechanisms, strongly boosted by post-Cold War 'market triumphalism'. The modalities of these forms of commoditization are negotiated on a global scale in the WTO and other international frameworks.

iii. Climate change. The climate change phenomenon is a first in human history in the sense of structural change in the global hydrological and climate system through societal development. Though the scale, magnitude, speed and importance of climate change processes are contested, there seems little doubt that local and regional water resources management are and will be affected by changing global hydrological dynamics. The hydrological cycle is no longer a 'given context'.

Like all development processes, the globalizing of water resources governance should not be taken at face value and warrants a critical perspective. Three elements of a critical stance are outlined below.

How global is the global discourse?

The global discourse on 'good water governance' is dominated by organizations based in the industrialized world and strongly reflects the domestic water resources experiences, problems and debates of these countries (Shah et al., 2006). It has been made part of development assistance through loans, projects and programs to further IWRM, river basin organizations, and other things. These concepts and activities do not always sit very well with regional and local realities and objectives. In many developing countries, the 'hydraulic mission' perspective remains dominant in government policy. It is focused on 'harnessing' water resources to enhance supply to agriculture and industry and to generate electricity as part of an economic growth strategy (cf. Swatuk, 2009 for Southern Africa). But the 'technical fix' approach to water scarcity problems is making a comeback, not only in developing countries but also in a country like Australia (Cruse et al., forthcoming). The world's two major dam-building countries, the People's Republic of China and India, are relatively immune to international pressure. It is thus not surprising that the so called 'global concerns' are often seen as a case of western imposition, or simply as irrelevant. In policy analysis, existing frameworks and approaches have been criticized for being biased in assuming the features of (idealized) western parliamentary democracy to be universal(ly desirable) (Grindle, 1999). Economists have added their bit to this by positing a universal theory of markets. In countries like for instance Uzbekistan and Vietnam, where ZEF is running or joining big interdisciplinary projects on water-related issues, neither the polity nor the economy resemble these assumptions (if anywhere else for that matter); global approaches run into trouble in making sense of the dynamics of such

societies and find it difficult to come up with relevant proposals and strategies for change.

The blue water bias

Much of the thinking on IWRM and water governance has a 'blue water' bias. Blue water is water in rivers, lakes, canals, wetlands and aquifers; green water is water in the root zone available for crop evapotranspiration. Those concerned about dryland agriculture have argued that 'green water' as directly supplied to root zones by rainfall infiltration has been ignored and needs much more attention. This is particularly relevant in sub-Saharan Africa where irrigation (a blue water activity) is of relatively limited importance, although international development assistance is pushing for large-scale investment in it. In this region, the notion of INRM (integrated natural resources management) is being promoted as a more comprehensive approach to water (and other) resources management (Twomlow et al., 2008; also see Molden, 2007). Apart from alerting us to the irrigation-dryland issue, this perspective also makes the important point that water should not be looked at separately, in isolation from other resources. The fact that this often does happen may have to do with the dominance of the civil engineering and hydrology disciplines in water resources science (cf. Linton, 2008 for a discussion of the formation of the concept of the 'hydrologic cycle' in 1931 in the USA as part of the hydraulic mission perspective to water resources development).

Where is the politics?

The debate on global water governance tends to be a very 'sanitized' debate, devoid of explicit reference to 'politics' (Mollinga, Merrey and Meinzen-Dick, 2007).



'Blue water' in Africa

This despite the fact that water resources management is inherently political as it is about who gets how much water, of what quality, when, where, and through what means—a variant of a long-standing definition of politics as being about 'who gets what, when, how' (Lasswell, 1935). The domains of water politics are the everyday politics of water management, the politics of water policy in the framework of national states, the hydropolitics of inter-state water negotiations, and the recently emerged global water politics (Mollinga, 2008). In each of these domains, different combinations of interest groups and publics negotiate the outcomes of water resources controversies in terms of the distribution-patterns part of uneven development: uneven in social, time and spatial terms, distribution of water proper, but also of the ecosystem goods and services produced through its presence, flow and use, rights and entitlements to

the resource, and take part in the decision-making on its value, allocation and use. Part of any analysis of the globalization of water resources governance thus has to be an understanding of the social relations of power that constitute it.

Water governance research: towards a contextualized and comparative perspective

The globalization of water resources governance is a process that is ongoing, advocated and resisted—linking the different domains of water politics listed above in new ways. Research to map the newly emerging processes, linkages, alliances and challenges will have to contextualize and be comparative in approach.

Contextualization means two things. Firstly, it is about finding an analytical course between universal explanatory frameworks that fail to address diversity and

specificity and are overwhelmed by the specificity of each case situation and the resulting diversity. This requires the development of typologies of 'regimes' that prevail, for instance by using a characterization of different state forms as a heuristic for identifying qualitatively different groupings of water resources governance situations with structurally different dynamics. Secondly, contextualization means taking *all* (types and scales of) causal factors that shape water resources governance into account, that is, looking beyond water, multiple scale analysis, and avoiding reductionism. This requires an interdisciplinary approach—both the process and context of water resources management and governance are complex, hybrid systems.

One of the features of water resources studies, particularly of its institutional dimensions, is that it is regionally fragmented. This is visible for instance in the existence of quite distinct English, French and Spanish literatures on water, and so on. This fragmentation not only reflects empirical diversity (contextualization as above), but also represent conceptual diversity. In a comparative research approach, both of these diversities, substantive and conceptual, can be mobilized to serve two main purposes. The first is conceptual creativity and the avoidance of bias and the second is knowledge accumulation and theory formation.

The contextualized and comparative analysis of globalizing water resources governance will—thus—have to be a collective endeavor, to which ZEF strives to make a significant contribution. ZEF's vision of 'transdisciplinary research for sustainable human development' makes mandatory another form of contextualization: answering the question of who is envisaged to benefit from this research and how that affects its design, or the politics of the research itself.

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4 Focus Articles on Water Governance



Climate change and water management in West Africa

Background

The central objectives of the GLOWA Volta Project (GVP) were the analysis of the physical and socio-economic determinants of the hydrological cycle in the Volta Basin in the face of global climate change, the development of decision support tools, and the development of "human capital" through education and the involvement of stakeholders. The main challenges for research and water management are the climatic variability within the basin, limited spatio-temporal data coverage for climate, hydrology, and land use data, as well as the heterogeneous institutional and socio-cultural environment. Key aspects of GVP research

include sampling strategies and scaling techniques to bridge data gaps, and the development of models on land use and land cover change, water supply and demand, as well as to simulate human-environmental interactions.

The main aim is the development of "Decision Support Resources" that will help the authorities in Ghana, Burkina Faso, and the other riparian countries to optimize water allocation. The Volta River Basin drains 400,000 km² of the sub-humid to sub-arid West African savanna zone, and is shared by six riparian countries. The most prominent hydrological structure is the Akosombo Dam, which produces hydropower and formed Lake Volta, the largest man-made lake in Africa. Annual rainfall averages 1,000 mm, but less than 10% is utilizable due to evaporation losses. Agriculture is an important source of income for most of the region's population. Rainfed agriculture is jeopardized due to unreliable rainfall, and irrigation development is still low. Within the next decades, water demand and vulnerability of the population are likely to increase due to climate change and population growth. Large development potential lies in the expansion of irrigated agriculture, but also domestic and industrial water demand is expected to increase. The expansion of irrigated agriculture and other upstream water use, however, stands in direct competition with hydropower generation at the Akosombo Dam.



Agriculture is the main source of income in the Volta Basin

Main research outcome

With the research conducted over the past nine years, the GLOWA Volta Project has provided an integrated assessment of environmental change and its impact. Through interdisciplinary research, the project has developed a suit of "Decision Support Resources" aimed at supporting sustainable water resource management in the Volta Basin. These will help the authorities in Ghana, Burkina Faso, and the other riparian countries to optimize water allocation, and to assess the effects of further development. Capacity building and knowledge transfer

have been pursued throughout the project by conducting most of the research with students and researchers from the Basin and through close collaboration with the GVP research network of Ghanaian and Burkinabe counterparts.

The decision support resources developed in the GLOWA Volta Project address different spatial scales (basin-wide, national, regional, local), according to the needs and interests of the stakeholders. They cover a wide range of tools and models, such as the joint climate-hydrological model to infer the effect of climate change on water availability, the Volta Basin Water Allocation System VB-WAS, a land cover change model using Cellular Automata, a Landscape Management and Planning Tool (LAMPT), a Land-Use Dynamics Simulator (LUDAS), a regional soil water model, groundwater recharge models, and an interactive Institutional Map for Burkina Faso and Ghana to name just a few (for more details see www.glowa-volta.de). The latest additions to this suit of decision support tools are a model to predict

the onset of the rainy season (ORS), a coupled hydro-economic model (M³WATER), and the GLOWA Volta Geoportal.

The onset of the rainy season is of great importance to the largely rural population of the Volta Basin, as rainfed agriculture is widespread. In West Africa, choice of crop, sowing dates and resulting yields greatly depend on the temporal and spatial distribution of rainfall. Misinterpretation of the onset of the rainy season often leads to significant crop loss. Research on the ORS has shown that the rainy season starts regionally up to 30 days later than 40 years ago and is more variable. This greater variability makes it ever more difficult for farmers to determine the sowing dates such that crop loss is minimized. GVP scientists have introduced a model to

predict the onset of the rainy season with an accuracy of 70–80%, which can help farmers to better adapt to the observed variability.

The sound planning and management of water resources and the optimization of water allocation should be based on hydrological and economic considerations. Yet, hydrological and economic models are usually only available separately and lack integration. To support water-related decision making, we have developed a coupled hydro-economic model M³WATER. This decision support tool simulates the impact of different policies and infrastructure development on water allocation and shows decision makers the costs and benefits of different development scenarios, and how these perform under different scenarios of climate change.



The Navrongo-Tono dam in the Upper East Region of Ghana is one of the largest agricultural dams in West Africa

Project title:

The GLOWA Volta Project in the Volta Basin. Climate Change and Water Management in West Africa

Main donor:

German Federal Ministry of Education and Research (BMBF)

Project period: 2000–2009

ZEF project coordinator: Jens Liebe (jliebe@uni-bonn.de)

ZEF PhD students (Capacity Building as of mid 2009):

81 students participate(d) in the program: 57 PhD, 9 Dipl., 15 Masters. 53 students finished their studies so far. 34 students came from Ghana, 28 from Germany, 9 from other African countries, 5 from Burkina Faso, and 9 from other countries.

Homepage: www.glowa-volta.de

Publications: <http://www.glowa-volta.de/publication.html>

Main cooperation partners:

German Aerospace Center (DLR) / University of Würzburg; University of Bonn; Institute for Meteorology and Climate Research (IMK-IFU); Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD) (France); New Mexico Tech (USA); Delft University of Technology (The Netherlands)

West Africa: Volta Basin Authority (VBA), based in Ouagadougou (Burkina Faso)

Ghana: International Water Management Institute (IWMI), United Nations University - Institute for Natural Resources in Africa (UNU-INRA), Savanna Agricultural Research Institute (SARI), University of Ghana, Water Research Institute (WRI), Water Resources Commission (WRC)

Burkina Faso: Direction Général des Ressources en Eau (DGRE); International Institute for Water and Environmental Engineering (2iE); Institut de l'Environnement et de Recherches Agricoles (INERA)



The GLOWA Volta Project in West Africa supports sustainable water resource management

A common problem for research and research-based decision making in regions like the Volta Basin is lack of data, or lack of knowledge of its existence. To help reduce the data scarcity, the GLOWA Volta Project has developed a multi-functional Geoportal. The Geoportal is a web interface to a Geodatabase that is stocked with data generated and collected in the GLOWA Volta Project, and by a growing number of contributors from the Volta Basin. It can be used to search and download data and metadata. It allows interactive mapping such as the composition of thematic maps, or the sharing of new data sets. It is open to the public and can be accessed at <http://131.220.109.6/Geoportal/>.

The research results were presented at the international 'Global Change and Water Resources in West Africa' conference held in Ouagadougou, Burkina Faso, in August 2008. More than 200 researchers, politicians and stakeholders from all over the world attended this conference and discussed the outcome of the African GLOWA projects and options for a follow-up to research projects carried out in West Africa.

Capacity building has been a strong concern and a main pillar of the GLOWA Volta Project. The research

was largely student-based, and more than half of the students came from West Africa. Overall, more than 80 students participated in the GLOWA Volta project to receive PhDs* or MSc degrees. An important figure for the success of the capacity building effort is the high return rate of the African students. Eighty-four percent of them returned to Africa and are strengthening the local scientific community. Throughout the last phase of the GLOWA Volta Project, other local stakeholders were also familiarized with its decision support tools and models through an extensive series of training schemes and workshops. These training schemes help stakeholders to make use of the tools and models in their research or decision making processes.

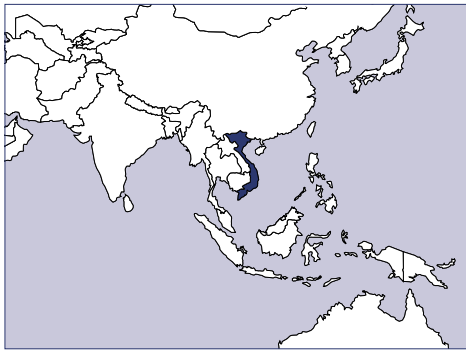
On the institutional side, the GLOWA Volta Project has been a strong supporter of the Volta Basin Authority (VBA) and was one of its first supporting partners. The VBA is a river authority with a transnational mandate that seeks to promote Integrated Water Resources Management (IWRM) in the Volta Basin, to provide scientific support to its members, and to contribute to poverty alleviation and sustainable development in the Basin. The GVP made its Decision Support Tools available

to support the VBA in its mission and will continue to support the VBA beyond the end of the GLOWA Volta Project.

Perspectives

The GLOWA Volta Project is being followed up by a new, 18 month project called "Sustainable Development of Research Capacity in West Africa based on the GLOWA Volta Project". This project will strengthen the research capacity of our partners in the Volta Basin through a series of workshops and training schemes. The Volta Basin Authority remains a pivotal partner in this training process.

* ZEF uses the term *PhD* equivalent to *doctoral*. However, students from the BiGS-DR receive a *doctoral degree* from their respective university faculty.



Water information system in Vietnam

Background

The WISDOM project is a multidisciplinary project with 19 partners in Germany and Vietnam. Its main objective is to develop a water related information system for the Mekong Delta, Vietnam. The system aims at providing a comprehensive set of water related data from various disciplines as well as data analysis tools in order to enhance water resources management and the implementation of integrated water resources management (IWRM) principles.

The challenges for a successful implementation of the project are complex. First of all, there is a strong technical component consisting of the development of a user-friendly web-based set of tools adapted to the Vietnamese technical environment and capacities. The provision of quality data, both from existing data sets and new research is another important requirement. Third, a comprehensive understanding of the national institutional framework is crucial in order to implement and effectively run the system in the specific Vietnamese socio-political context and its given water management bureaucracy.

Main outcome and research highlights 2008–2009

Research approach

ZEF has two main tasks in the project: first, to provide knowledge on the institutional framework and water resources management practices and second, to contribute social science research data to the information system. Empirical research is basically concentrated in one province of the project region (Can Tho City in the Mekong Delta), where ZEF has a small office within the premises of its partner institute at Can Tho University.

Most of the research has just been completed and data analysis is ongoing.

As part of ZEF's contribution to the information system, GIS and clustering approaches are applied for a spatial analysis of the research findings. A databank of state management and water research organizations has been established and will constitute the database of a "Yellow Pages" tool. Quantitative field work data are provided for map creation and other products to be generated by the system. Qualitative data is processed into reports (text files), graphs, organizational charts and so on, all to be fed into the information system, too.

Research findings

Water management

The water sector state management organizations have been undergoing various changes during the past decades, though problems of coordination, competing interests and unclear responsibilities still prevail. There is also increasingly room for other agencies and actors to operate in and influence the sector. For instance, private sector participation in water resources management was very limited in the past, but is now increasing. As a case study of the hydraulic construction sector in Can Tho City shows, there are complex linkages between the local

water management bureaucracy and the private sector. New strategic groups are emerging as a consequence of the changing political economy of water resources management.

The institutional framework

Policy reforms are mostly political and institutional rather than economic or technical. In line with the traditional centralistic planning economy, planning in Vietnam is carried out in a system of bottom-up reporting and top-down decision-making and participatory approaches rarely exist. ZEF is conducting a study on the policy of rural water supply and sanitation, which assesses how the characteristics of the Vietnamese political system shape reforms in planning processes and policy outcomes. The study thus contributes to an understanding of the

Project title: Water Related Information System for the Sustainable Development of the Mekong Delta (WISDOM) in Vietnam

Project period: 2007–2010 (Phase 1)

Main donors: Federal Ministry of Education and Research, Germany (BMBF)

ZEF project members: Solvay Gerke, Hans-Dieter Evers, Gabi Waibel, Simon Benedikter, Sven Genschick

ZEF PhD students: Tatjana Bauer, Judith Ehlert, Huu Pham Cong, Nadine Reis

Main project partners: DLR, UNU-EHS, GFZ, INRES; Can Tho University (CTU) and SISD (Southern Institute for Sustainable Development)

ZEF project coordinator: Gabi Waibel (gwaibel@uni-bonn.de)

Homepage: www.wisdom.caf.dlr.de

internal dynamics, characteristics and causes of policy-making in post-socialist state-centric regimes.

An analysis of the legal framework of the water sector, encompassing more than 300 documents, shows that there are both gaps and overlaps. The results of a case study in Can Tho City reveal that the problems in implementing law and regulations are immense. Moreover, there are clear indicators of legal pluralism in the Mekong Delta, based on a variety of legislation approved at provincial and district levels. The continuous reform of existing legislation also leads to a knowledge problem and the uneven application of laws and regulations.

Knowledge management

As far as research and education are concerned, more than 250 national and regional organizations have been identified in the Mekong Delta, including Ho Chi Minh City as one of the major knowledge clusters in Vietnam. The majority of these knowledge-producing organizations were founded after 1975 (year of reunification). Many of these are directly affiliated with ministries; they are in charge of water resources planning and research, and of the application of the knowledge produced. In addition, research is also undertaken by universities, though their main task is capacity building. Furthermore, the research revealed that there is an abundance of data and information on water resources, scattered in different

agencies and research institutes. Horizontal research cooperation and knowledge sharing between knowledge producing organizations are rare. General conclusions will outline the epistemic culture, which is the culture of knowledge production, of Southern Vietnam.

Perspectives

The project is still in its first phase and data analysis should be completed in the second half of 2010. Currently, a proposal for a second project phase is in preparation, focusing on the implementation of the information system in Vietnam. As it is unique in the Mekong Delta, the WISDOM information system is assumed to be much more than a technical device: Its interdisciplinary design and approach has a high potential for strengthening cross-sectoral and regional cooperation and enhancing knowledge management in the water resources management sector.



A ZEF PhD student during her field research in Vietnam



Integrated water resources management in South Africa

Background

The project aims to devise tools for improving water use efficiency through the optimal allocation of water among the competing users in the context of Integrated Water Resources Management (IWRM). Introduced in 1998, the guiding principles of the South African National Water Act recognize the basic human needs, the need to protect water resources, transboundary obligations and the need to promote social and economic development through the use of water. Prioritizing the above considerations, we model water use among the major water user sectors, namely irrigation, mining and domestic water uses. While the Institute for Environmental Engineering and Management (IEEM) carries out the hydrological and technical part, the ZEF team is responsible for the economic part of the project and the model.

In South Africa, water is becoming increasingly scarce, limiting the growth potential of the country. The lack of perspectives for water resources development is also inducing a shift of policy from a supply-oriented to a demand-oriented management approach. The

government is reforming its water governance system by curbing water demand, exploring the re-use of wastewater through improved waste water treatment plants and developing a multi-dam project in Lesotho (Lesotho Highlands Dam Project). It is therefore crucial to intensify the search for more efficient water use and the optimal allocation of water.

Main outcome and research highlights 2008–2009

Optimal water allocation models require coefficients of the water demand function which govern the allocation practice. Hence, we estimated demand functions for the three major water user sectors in the Middle Olifants: mining, irrigation and domestic.

Mining water demand

Mining is one of the most important and growing sectors in the economy of the country. The major commodities mined in the Middle Olifants include, among others, andalusite, platinum, feldspar, chrome, clay minerals and fluorspar. Results indicate that there is a potential to influence/reduce water use patterns by raising the relative prices of water as well as other non-water inputs. No significant differences in price responsiveness were observed among the different mines investigated. Hence, it is suggested that water charges would bring about water conservation through, for example, greater levels of water re-circulation in mining which would entail an increased capital stock. On the market front, instruments to achieve water conservation goals could include, amongst others, adopting water use taxes and alternatively creating tradable permits for direct water withdrawals.



The South African government is currently reforming its water governance system

Irrigation water demand

The irrigation sector is the biggest water user in the area. Volumetric water prices do not exist; therefore demand functions were simulated using a representative farm model. At present price levels, water demand reacts only marginally to water price changes. This indicates that water demand in irrigation can hardly be influenced by higher water tariffs. Thus, other policies like extraction allowances or changing cropping patterns with lower water use should be considered. Moreover, a comparison of regional water demand figures with "sustainable" water supply figures from the local hydrological model demonstrates that current water uses far exceed sustainable usage, implying a water supply reduction in the "Water Allocation Model" (see below).

Domestic water demand

Households in the study area suffer from significant backlogs in terms of accessing potable water. In order to devise ways to improve potable water provision, a household survey was conducted in 2007 to investigate households' willingness to pay for improved water services. Results show that households' income and current water service levels influence the willingness to pay. Poor households, using basic water services, are found to be very price sensitive. Households are in general willing to pay for better water services in terms of frequency and reliability. The information on willingness to pay can help water service providers to set appropriate water tariffs and design adequate water services. In addition, a domestic demand function has

been estimated based on secondary data (first results are available) which will be fed directly into the "Water Allocation Model".

Perspectives

Water Allocation Model

Maximizing net benefits from water use over all sectors will ensure efficient water use by equalizing marginal values of water which are reflected in water prices at market equilibrium. The optimization of sectoral water uses results in relatively higher water values. In a next step, the estimated sectoral water demand functions (sections a, b, and c above) will be combined to enable the optimum allocation of water among the three sectors. The project is currently on the verge of the



Access to potable water is a problem in the Middle Olifants basin

Project title: Integrated Water Resources Management (IWRM) pilot project in the Middle Olifants sub-basin of South Africa

Project period: August 2006–December 2010

Main donor: German Federal Ministry of Education and Research (BMBF)

ZEF project members: Ulrich Hiemenz and Daniel Tsegai

ZEF PhD students: Julia Kloos and Teresa Linz

Main project partners:

Germany: Institute for Environmental Engineering and Management (IEEM), University of Witten/Herdecke gGMBH (www.uni-wh-utm.de)

South Africa: Department of Water Affairs and Forestry (DWAf); Water Research Commission (WRC) and University of Limpopo

ZEF project coordinator: Daniel Tsegai (dtsegai@uni-bonn.de)

Homepage: www.iwrm-southafrica.de

Publications:

Kloos, J. and D. W. Tsegai. 2009. Preferences for domestic water services in the Middle Olifants sub-basin of South Africa. ZEF Discussion paper series on Development Policy. Number 131.

Linz, T. and D. W. Tsegai. 2009. Industrial water demand analysis in the Middle Olifants sub-basin of South Africa: The case of mining. ZEF Discussion paper on Development Policy. Number 130.

Tsegai, D. W., T. Linz and J. Kloos. 2009. Economic analysis of water supply cost structure in the Middle Olifants sub-basin of South Africa. ZEF Discussion paper on Development Policy. Number 129.

first run of the integrated model using the status quo water availability and water uses. The model will further consider a range of relevant scenarios including climate change, increased urbanization/population and efficient water use (through re-use by developing water treatment plants, water pricing, etc.).



Climate change adaptation in Ghana and Ethiopia

Background

ZEF was invited to participate in the project on "Re-thinking Water Storage for Climate Change Adaptation in Sub-Saharan Africa", which is being carried out under the scientific leadership of the International Water Management Institute (IWMI) in Addis Ababa, Ethiopia. The multi-disciplinary project investigates the continuum of surface and sub-surface water storage options ranging from natural wetlands and water stored in-situ in the soil through to rainwater harvesting ponds and small and large reservoirs in two large river basins; the Volta River basin, Ghana and the Abay/ Blue Nile River basin, Ethiopia.

Through multi-disciplinary research implemented at different scales, we will develop methods for evaluating the effectiveness and suitability of all water storage types under existing conditions as well as a number of future climate scenarios to increase the resilience of vulnerable rural populations to climate change-related risks. The major project output will be guidelines enabling

decision-makers to determine storage needs and decide between different storage options.

Each type of storage has its own niche in terms of technical feasibility, socio-economic sustainability, impact on health and environment and institutional requirements. With so much uncertainty regarding climate variability and change, it is essential to focus on ensuring flexibility in storage systems, possibly combining a variety of types thus taking advantage of their unique characteristics and capacity to cope. While the Ghanaian and Ethiopian project partners mainly conduct research on technical, environmental and economic aspects, ZEF contributes research work on social-political conditions as well as water governance arrangements.

Perspectives

The water storage continuum will be approached in a way that provides a full picture of all water storage options within the six project watersheds (Ghana: Vea/ Yaragatna, Golinga, Saata; Ethiopia: Koga, Gumera,



ZEF works closely with its local partners in Ghana and Ethiopia

Project title: Re-thinking water storage for climate change adaptation in Sub-Saharan Africa

Project period: 2008–2011

Donors: German Federal Ministry for Economic Cooperation and Development (BMZ)

The project is part of a BMZ initiative which started in 2008. The research umbrella program includes eight different research projects, dealing each with the adaptation of African agriculture to climate change and is being funded by the Ministry with nine million Euros for a three-year period.

The GTZ (German Technical Cooperation) and BEAF (Advisory Service on Agricultural Research for Development) coordinate all projects under this program.

Project Team: Irit Eguavoen, Wolfram Laube, both ZEF, and Michael Bollig (University of Cologne)

Main cooperation partners:

Germany: University of Cologne, Ethnological Institute; Potsdam Institute for Climate Impact Research (PIK)

Ethiopia: International Water Management Institute (IWMI); Arba Minch University (AMU); Ethiopian Economic Association (EEA)

Ghana: Water Research Institute (WRI); Institute of Statistical, Social and Economic Research (ISSER)

Contact: Matthew McCartney (IWMI project leader) m.mccartney@cgiar.org, Irit Eguavoen (coordinator of sub-project social-political assessment) eguavoen@uni-bonn.de

Homepages: <http://www.zef.de/1393.0.html>,
<http://africastorage-cc.iwmi.org/Default.aspx>

Guder-Idris) and, respectively, their technical, economic and institutional interdependencies. GIS- based storage inventories have taken place in Ghana and Ethiopia in 2009. These will be complemented with local hydrological studies, a social-economic survey and local case studies on water governance and social implications in 2010.

Since a lot of data on water governance concerning reservoirs and boreholes has already been collected by the ZEF-led GLOWA Volta project in West Africa (Ghana and Burkina Faso), most case studies will be located in the Amhara and Oromiya Regional States of Ethiopia and carried out by six masters students from the University of Cologne and diploma and PhD students from other universities.

In close cooperation with the Ethnological Institute of the University of Cologne, masters students will take part in a training seminar to prepare them for a so-called 'Lehrforschung' (a kind of guided research) in the Ethiopian Blue Nile river basin. This will take place from January to April 2010. The students will develop research proposals and realize individual field research under the supervision of Michael Bollig from the University of Cologne and the tutorship of two ZEF senior staff members (Irit Eguavoen, Wolfram Laube). In addition, the project provides the students with support in the form of a research scholarship and project logistics.

Research highlights 2008–2009

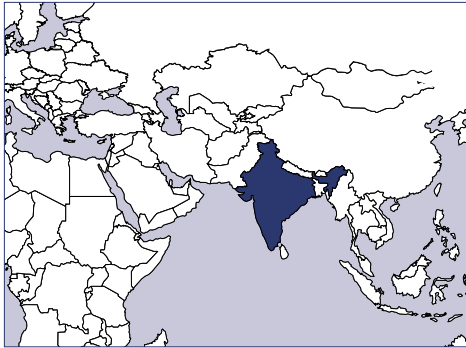
A first program workshop was held in Addis Abeba in June 2009.

During a field visit to the Blue Nile basin in May 2009, several locations were identified, where the students of social anthropology and geography will investigate different aspects of water governance, such as the planning process and local acquisition of water



A lot of data on water governance has been collected in the ZEF projects

storage facilities, leadership and decision-making in water projects, water administration, land and water rights, as well as the impact of the storage facilities on livelihood strategies and social dynamics. The water storage options under investigation will be both small and large dam projects, soil and water conservation projects, boreholes, as well as water harvesting projects at household level (cisterns, roof top harvesting and ponds). The social-economic survey will be conducted at the same time. We expect first results in March and April 2010, when the ZEF/ Cologne working group will present papers at a project workshop in Addis Ababa and at the conference of the German Association of African Studies (VAD) in Mainz.



Integrated water resources management in four twinning river basins

Background

The ZEF research focused on the Tungabhadra basin in south India, which is one of the four basins studied in the project. Tungabhadra river is a tributary of the Krishna river. The research focused on the interaction between irrigated and rainfed farming in the lower Tungabhadra basin, in the border area of the states of Karnataka and Andhra Pradesh. The districts on the Karnataka side are Raichur, Koppal and Bellary, on the Andhra Pradesh side Mahbubnagar and Kurnool.

Main outcome

The project's research has documented:

- The lack of interaction between irrigated agriculture and rainfed agriculture at the levels of government agencies, NGOs and research organizations.
- The 'integration by default' of rainfed and irrigated farming through farmers' practices of the re-use of irrigation water and river lift irrigation.

- The changing scenario in canal irrigation as regards water use and water demands: claims on irrigation water for urban drinking water supply versus the expansion of hydroelectricity generation.
- The continuing and probably intensifying (analysis to be completed) unequal distribution of irrigation water ('heads and tails').
- Ongoing dynamics in irrigation governance reform at state level.
- Changing patterns in village politics in relation to natural resources management.

Perspectives

The project ended on June 30, 2009, with a workshop organized by ZEF in Hyderabad, India. As a follow-up to this workshop a special issue on 'Changing water governance in India: taking the longer view' is being composed for the journal SAWAS South Asia Water Studies, to be published in early 2010. Co-editors are Peter P. Mollinga and S.P. Tucker (Government of Andhra Pradesh).

Rahul Pillai will write a PhD thesis on the basis of the fieldwork data collected in the project period.

A special paper on 'IWRM beyond polarized discourse' is being composed based on a session at the ISSRM conference in Vienna, July 2007. Co-editors are Saravanan Subramanian and Peter P. Mollinga.

A book will be completed in 2010 on the Tungabhadra Left Bank Canal, based on data collected during the project period.

Project title: Strategy and methodology for improved IWRM – An integrated interdisciplinary assessment in four twinning river basins (STRIVER)

Project period: July 2006–June 2009

Main donors: European Commission under SUSTDEV-2005-3.II.3.6: Twinning European/third countries river basins).

ZEF project members: Peter P. Mollinga, Saravanan Subramanian, Daphne Gondhalekhar

ZEF PhD students: Rahul Pillai

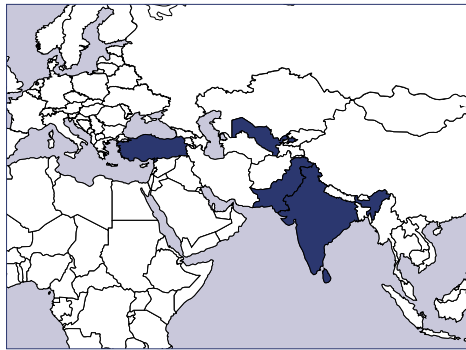
Main project partners:

Indian partners: Soppecom (Society for Promotion of Participatory Ecosystem Management), Pune; ISEC (Institute of Social and Economic Change), Bangalore; SasiWATERS (South Asia Consortium for Interdisciplinary Water Resources Studies), Hyderabad; Jalasbandana (South India Farmers' Organisation for Water Management), Bangalore.

ZEF project coordinator: Peter Mollinga (pmollinga@uni-bonn.de)

Homepage: <http://kvina.niva.no/striver/>,
<http://www.zef.de/1010.0.html>

Publications: STRIVER policy briefs (see STRIVER homepage)



Governance reforms in irrigation: Lessons learnt from Central, South and West Asia

Several countries have designed and implemented Irrigation Management Transfer (IMT¹) programs over the past few decades devolving partial or full responsibility for the governance and management of irrigation systems to the users or local authorities. The ideas for devolution are inspired by models of indirect governance which have evolved over time in various sectors as a shift from direct governance by the public sector to trust-based, principal-agent relationships established to overcome information gaps and asymmetries. While there is a frequent use of the term "governance" together with management devolution in almost all irrigation reform literature, the distinction between governance and management, which are fundamentally distinct domains in irrigation management, is rarely made. The quality of governance strongly influences the long-term

¹ Sometimes in literature the term Participatory Irrigation Management (PIM) is also used in the same or slightly different context. This paper does not distinguish between IMT and PIM as both concepts deal with granting users a bigger role in irrigation management.

performance of irrigation systems. Attempts to analyze irrigation reforms in the past have paid little attention to the governance performance of such reforms.

The concepts related to governance need to be understood in order to analyze irrigation reforms from a governance perspective. Based on a literature review, ZEF researchers have developed a conceptual model for analyzing irrigation reforms from a governance perspective.

Reforming irrigation governance

The irrigation governance reforms encompass several formal and informal, old and new *institutions*, which *intend* change through *instruments* and *implementation arrangements* to achieve *impacts*. The *institutions* in governance refer to the public and private enterprises, interest groups and individuals, societies and organizations, encompassing the whole range of formal and informal actors, political, social, economic and administrative systems, such as the government, political parties, NGOs, citizens, etc. Governance *intentions* are the strategic goals *institutions* would like to achieve and encompass solving problems and creating social opportunities, or steering societies and organizations. Ensuring accountability for performance, facilitating information exchange, enabling tradeoffs, balancing protection with beneficial use, mitigating conflict, enhancing equity, ensuring sustainability and administrative efficiency, as well as ensuring human rights, inclusion and participation are all *intentions*. The governance *institutions* would use a set of governance *instruments* to achieve governance *intentions*. The *instruments* encompass the principles, laws, policies, procedures, and other formal and informal interactions and exchange mechanisms. The *implementation*

arrangements refer to the way *instruments* are applied in reality to effect the desired *intentions*.

Results from case studies from Central, South and West Asia

A group of scientists from ZEF carried out an analysis of reform experiences in India, Pakistan, Sri Lanka, Turkey, and the Central Asian Fergana Valley using the conceptual model. The analysis revealed that governance reform could be frustrated by several types of issues in the IMT programs—those inherent in the design of the program due to conflicting, unclear, or confused *intentions* on the part of the key *institutions*, or the inappropriateness of the *instruments* chosen for achieving *intentions*, or from poor *implementation*. In India and Pakistan, the newly created Water User Associations (WUAs) were at odds with existing local *institutions* called Panchayats. The big landlords were opposed to reforms. The implementing irrigation agencies in India and Pakistan opposed the reform, whereas in Turkey, Sri Lanka and Uzbekistan



Hasankeyf, a city along the Tigris River, Batman Province, southeastern Anatolia, Turkey



Water canal channeling water in Sri Lanka

they favored and supported the newly created WUAs. In almost all cases, the designed *implementation* arrangements and reform *instruments* did not meet the needs of the perceived objectives of improving governance, transparency and democratic governance. While in most of the cases reviewed, enabling legal, policy and regulatory environments had been designed and implemented through formal mechanisms, such as

the enactment of laws and regulations, the functional *implementation* of the same was lacking altogether or remained partial. The Sri Lankan and Turkish cases demonstrated that though the legal regulations were introduced much later, the key factors that led to the success of reform were the appropriate *implementation* arrangements led by enthusiastic staff mobilizing farmers. The partial success of the Sri Lankan IMT program has been attributed to the partial transfer of responsibilities in the design of the program. The reforms tended to succeed wherever the political commitment to IMTs was demonstrated through *institutional* arrangements for *implementation*.

The *implementation* arrangements strongly influenced the quality of governance within the new *institutions*, such as WUAs. Amongst the five cases compared, wherever the state functionaries mobilized farmers, there was a tendency to elect local elites as leaders of the WUAs. In many cases, though WUA members had the right to recall their leadership, this right was rarely exercised because of fear of the local elite. The election of the local elite as the leaders of WUAs might be critical to the success of a WUA in the beginning; however, it might also entail the danger of making WUAs less democratic and thus compromising the effectiveness of governance in the long term.

In most of the cases studied the WUA members were accountable to WUAs, but the WUA leadership had double accountability to their members as well as to the state. The overall accountability within IMTs' programs remained top-down. In none of the cases studied were state organs accountable to WUAs as the penalties for failure of WUAs or WUA members were clearly specified in agreements, but state agencies could not be sanctioned by WUAs or their members. These one-sided contractual arrangements resulted in a monopoly of service-

provision by the state, and caused poor accountability on the part of the service provider towards the clients as the WUAs lacked coercive powers against the irrigation agencies. The effectiveness of governance was therefore compromised.

Conclusions

Though legal and regulatory frameworks are essential ingredients for successful IMT programs, the existence of enabling legal frameworks and policies does not automatically result in accountable *institutions* unless the *intentions*, *instruments* and *implementation* arrangements target these specifically. In many cases, the enabling legislation completely or partially ignored mutual accountability as an essential ingredient of governance. The governance *instruments* such as the contracts between the state and WUAs remained top-down. The deliverables expected from the newly emerging and often poorly trained and resourced WUAs were too high; penalties for WUAs such as cancellation of agreement, withdrawal of responsibilities, or imposition of fines were more specified than similar clauses for an irrigation agency when it fails to deliver on its responsibilities.

In many cases reforms through IMTs are not very transparent. In several cases, the policies and programs are not translated and disseminated in the local languages, resulting in information asymmetries between rich and poor farmers. Due to such information asymmetries, a few better informed local elites take advantage of the situation and have the disproportionate advantage of taking leadership positions. For example, most WUA presidents in the Central Asian republics are people who held important positions during the era of the Soviet Union.



Woman with water container at well, Sri Lanka

accountability and transparency in the enabling legal and policy environment, but also in the design and *implementation* of IMT programs. Even the most well intended IMT programs to-date have not succeeded in making irrigation agencies accountable to the users. The design of governance change mechanisms within the user organizations is generally better, but the *implementation* constraints create initial information asymmetries between the rich and the poor and powerless, and influential members could lead to poor governance. In addition, not all the members are equally capable of bearing the additional transaction costs of IMT, which determines the participation levels of different members in governance functions. Small and poor farmers remain excluded from participation in the governance of WUAs. The analysis using the conceptual model shows that unless all the four "I"s are properly attended to, the desired governance reform *intentions* might not be met through such governance reform projects.

Another dimension of self governance under an IMT is the degree of control that members have over the organization's leaders and staff. As is discussed above, the only control that the majority of members can exercise against poorly performing leadership is the right of the members to recall leaders. Due to the initial information asymmetries, it is mostly local elites that get elected to the key positions. In hierarchical societies, like those in most developing countries, mobilizing other members against a local elite involves an enormous social cost, as it attracts opposition from the people with disproportionate power and resources compared to ordinary members, and the majority might consider it not worth the effort. Even if some members might have enough courage to exercise such a right, they

would need protection from another influential group, which might have the same disadvantages as the first elite. Thus, it is unlikely that the leadership that has been initially elected will change that frequently. Besides, the mechanisms for re-election remain poorly specified in many cases. This discussion explains why a large majority of mayors elected as WUA chairmen in Turkey were never replaced despite promises to hold elections later. Similarly, the first elected general assembly members of FOs in Pakistan, those of the WUAs in Andhra Pradesh and Gujarat states of India, or those in Uzbekistan and Tajikistan have tended to remain unchanged.

In sum, "good governance" in most IMT programs is currently impeded due to many factors; the foremost being the poor specification and elaboration of

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5 ZEF's Interdisciplinary Research

Land Use

The ZEF/UNESCO project on improved natural resource management in Uzbekistan



Background

Khorezm is located in the northwest of Uzbekistan in the lower reaches of the Amu Darya River, the largest former tributary of the Aral Sea. Due to arid climatic conditions, the agricultural production system is dependent on irrigation and drainage management.

Although Khorezm covers a relatively small area, the region serves as a model case for development concepts in Uzbekistan. On a long-term basis, these concepts are intended to be transferred to other parts of the Aral Sea Basin with its 8 Mio ha of irrigated area and more than 40 million inhabitants. The water management in Khorezm is characterized by low efficiency and low yield which have a negative impact on water and soil resources and hence require the restructuring of land- and water use.

Project goals

The overall aims of this interdisciplinary research project are to develop sustainable and economic concepts for the management of land and water resources. Sustainable solutions can only be found through close cooperation among natural, social and economic scientists, as well as through the direct involvement of local stakeholders, which leads to the implementation of wide-spread restructuring measures.

Solutions are being investigated at three levels:

- development of a Decision Support System (DSS) for improved agricultural policies on the national and regional levels;
- institutional restructuring aimed at sustainable natural resource use;

- an integrated 'technology mix' for improving management of land and water use.

Highlights 2008–2009

March 6, 2009. Robert Bosch Junior Professorship 2009 awarded to ZEF researcher

Asia Khamzina was awarded a Junior Professorship by the Robert Bosch Foundation for the "Sustainable Use of Natural Resources". This prize has been awarded annually by the Robert Bosch Foundation since 2007. The selection procedure is chaired by Klaus Töpfer, former Director of the United Nations Environmental Programme (UNEP). Ms. Khamzina did her PhD research within the ZEF/UNESCO project and received her doctoral degree from the Faculty of Agriculture at the University of Bonn in 2006. She held a post-doc position in the project until she received the Junior Professorship. Asia Khamzina will receive funding for her research work and research group on "Competing claims on land use:



Agriculture is strongly dependent on irrigation and drainage management in Khorezm

Opportunities for climate change mitigation through afforestation of degraded croplands in Central Asia".

Training Workshop on "Challenges of sustainable water use in arid and semi-arid regions under conditions of climate change", Tashkent, Uzbekistan, September 28–October 1, 2009.

This international training workshop was funded by the German Federal Ministry of Education and Research (BMBF) and co-organized by ZEF, the Regional Center on Urban Water Management (RCUWM) in Tehran, Iran, and ICARDA-PFU in Tashkent. Around 50 participants from Afghanistan, Belgium, Germany, India, Iran, Oman, Tajikistan and Uzbekistan discussed the scientific implications of climate change on water management in dryland areas and explored concepts, tools, and technologies that can be developed into effective adaptation measures and mitigation strategies. The lectures, presented by experts from German universities and the German Space Agency (DLR), but also by members of RCUMM and ZEF, covered a wide range of topics, including the impact of climate change on glacier melting and regional water availability, developing information systems for climate change analysis, improving agricultural water productivity, adaptive management of cropping systems, enhancing irrigation system efficiency using GIS and remote sensing technologies, sustainable management of freshwater lakes, and urban water management. The first two days of the workshop in Tashkent were followed by a two-day guided tour in the Khorezm region where the participants visited the field as well as the office and lab facilities of the ZEF/UNESCO Project in Uzbekistan and the urban water supply station of the city of Khiva.

Good modeling: Uzbek agro-economist wins prize for best thesis

Ihtiyor Bobojonov is the winner of this year's ZEF Friends Prize for the best doctoral thesis written at ZEF between January 2007 and May 2009. The prize is awarded every two years by the association *Friends of ZEF*. Bobojonov is an agro-economist from Uzbekistan, who did his PhD research at ZEF within the framework of the ZEF/UNESCO project on the topic of sustainable management of land and water resources in Khorezm in Uzbekistan. He wrote his thesis on "*Modeling crop and water allocation under uncertainty in irrigated agriculture in Khorezm, Uzbekistan*" under the supervision of Ernst Berg of the University of Bonn. He received his doctoral degree from the Faculty of Agriculture of the University of Bonn in December 2008. Currently, he has a post-doc position in the ZEF/UNESCO project in Uzbekistan.

Project title: Economic and Ecological Restructuring of Land and Water Use in the Khorezm Region (Uzbekistan): A pilot project in Development Research

Project period: 2000–2011

Main donors: German Federal Ministry of Education and Research (BMBF)

ZEF project members: Ahmad Manschadi; Iskandar Abdullaev; Anik Bhaduri; Anna-Katharina Hornidge, Asia Khamzina, Mehmood Ul-Hassan, Bernhard Tischbein, Julia Schindler

ZEF PhD students: Usman Khalid Awan, Ihtiyor Bobojonov (finished in Dec. 2008), Krishna Prasad Devkota, Nodir Djanibekov (finished in May 2008), Dilfuza Djumaeva, Oksana Forkutsa, Irna Hofman, Aziz Karimov, Kirsten Kienzler, Nargiza Nizamedinkhodjayeva, Lisa Oberkircher, Inna Rudenko (finished in March 2008), Clemens Scheer (finished in May 2008), Tina Schieder, Anastasiya Shtaltovna, Gert-Jan Veldwisch (finished in June 2008), Mina Kumari Wasti

Main project partners: United Nations Educational, Scientific and Cultural Organization (UNESCO); International Maize and Wheat Improvement Center (CIMMYT), Mexico; Tashkent Institute for Irrigation and Mechanization (TIIM), Uzbekistan; SANIIRI (Irrigation Institute Tashkent), Uzbekistan; Uzbek Cotton Research Institute, Tashkent, Uzbekistan; UZGIP, Tashkent, Uzbekistan; UzNIILH, Forestry Research Institute, Tashkent, Uzbekistan

ZEF project coordinators: Ahmad Manschadi (Manschadi@uni-bonn.de); John Lamers (j.lamers@zef.uzpak.uz)

Homepage: <http://www.zef.de/khorezm.0.html>

Publications: see homepage

Conservation and use of *Coffea arabica* in Ethiopia



Background

Science-based concepts for the conservation and use of wild coffee populations and their forest habitat require interdisciplinary approaches, integrating natural sciences, economics and social sciences. Scientists in the CoCE project therefore carried out vegetation studies, molecular genetic analyses, phytopathological and ecophysiological surveys, an economic valuation of the forest and the coffee gene pool as well as an institutional analysis.



The potential economic value of the wild coffee gene pool amounts to 0.4–1.5 billion US\$

Major research results include:

- The montane forests are highly diverse and show regional differences in their species composition.
- Wild coffee is genetically different from landraces and cultivars and shows a high inter-/intra-regional genetic diversity.
- The genetic diversity of wild coffee is reflected in its variability regarding drought and disease tolerance, and in the quality features of its beans.
- Sustainable forest management (including ecosystem services) achieves higher net benefits for society as compared to exclusionary conservation or conversion into arable land.
- The potential global economic value of the wild coffee gene pool as a resource for coffee breeding amounts to 0.4–1.5 billion US\$ (net present value).
- Community-based institutions exist at the local level with hardly any established relationships to formal institutions.
- Forests are state-owned, but informally divided into plots held and inherited by individual households.

Implementation-oriented activities

- With support from the CoCE project, Ethiopian scientists founded an NGO, the Ethiopian Coffee Forest Forum (ECFF). ECFF's activities include public

awareness raising, education as well as strengthening local institutions for the conservation and sustainable use of forest resources.

- Based on the project's research results, CoCE scientists and ECFF members concluded that the UNESCO-MAB biosphere reserve approach is the most suitable option for combining the conservation of the montane rainforests (with wild coffee) and human development.
- A task force consisting of ECFF and stakeholders at village, district and province levels identified an area of 1,670 km² in southwestern Ethiopia to be nominated as Yaya Coffee Forest Biosphere Reserve by UNESCO-MAB.
- The following steps have been taken to prepare for the Biosphere Reserve:
 1. Development of management guidelines for wild coffee and its forest habitat,
 2. Creation of a program called "Darara Buna", including a marketing strategy for wild coffee, regional development activities and research infrastructure,
 3. Establishment of in-situ gene banks for the conservation of wild coffee genetic resources.
- The nomination form for a biosphere reserve was submitted by the Ethiopian partners to UNESCO-MAB in Paris in September 2009.

Project title: Conservation and use of wild *Coffea arabica* in the montane rainforests of Ethiopia (CoCE)

Project period: 2002–2009

Main donor: German Federal Ministry of Education and Research (BMBF)

ZEF project members: Manfred Denich, Franz Gatzweiler, Tadesse W. Gole

Capacity building: The project has funded 13 PhD students (of whom 8 Ethiopian) and 31 MSc and BSc students (of whom 25 Ethiopian)

Main project partners: IBC, Ethiopian Coffee Forest Forum (ECFF), see homepage

ZEF project coordinators: Manfred Denich (m.denich@uni-bonn.de), Franz Gatzweiler (fgatz@uni-bonn.de),

Homepage: www.coffee.uni-bonn.de

Biodiversity monitoring in East Africa



Background

The main project goal is to develop innovative conservation instruments for the preservation of the Kakamega Forest in Kenya. The region is characterized by severe poverty levels and one of the highest population densities in Africa leading to destructive forest use and degradation.

Main outcome and highlights 2008–2009

The project addresses the problem of forest degradation with studies on a number of different policy instruments: i. participatory forest management, ii. auctioning of forest user rights, iii. live fences as an alternative on-farm source of firewood, iv. payments for ecosystem services through reduced emissions from deforestation and degradation (REDD) and carbon sequestration. Outcome so far: Economic experiments showed that cooperative behavior in participatory forest management increases substantially with the use of sanctions to correct non-cooperative behavior. In field trials, the communal income from auctioning forest user rights led to the development of beneficial and financially sustainable community projects

such as the establishment of a brick building plant for the provision of bricks to community members at a low price, and the development of micro-financing mechanisms. The trials also confirmed that private user rights on easily accessible land require group action in terms of monitoring and safeguarding the auctioned forest plots. The success of

Project title: BIOTA East (subproject E13) – Biodiversity Monitoring Transect Analysis in Africa (BIOTA)

ZEF research component: Conservation and Management of Biodiversity for Rural Livelihoods: Developing Sustainable Strategies for Reconciling Stakeholders' Interests in the Kakamega Forest

Project period: June 2007–May 2010 (Phase 3)

Main donors: German Federal Ministry of Education and Research (BMBF), Catholic Academic Exchange Service (KAAD)

ZEF project members: Ulrich Hiemenz, Tobias Wünscher, Lucie Andeltova

ZEF PhD students: Mercelyne Khalumba, Julius Maithya, Stephen Mutie

MSc students: Renata Saizaki, Levi Ouma, George Kariuki

Main project partners: Kenyan Forest Service, Kenyatta University, German BIOTA subprojects E01, E02, E03, E14a, E14b, E14c

ZEF project coordinator: Tobias Wünscher (tobias.wuenscher@uni-bonn.de)

Homepage: www.biota-africa.org

Publications: see homepage

this cooperation depended primarily on the ability of the group members to organize themselves. Rule impositions by external institutions or traditional leadership led to cooperation failure. Live fences as an alternative source of firewood could be shown to be economically much more favorable than firewood extraction from the forest. In addition, local interviewees emphasized the non-economic advantages of live fences including avoiding the harassment of women and arrest by forest guards. With regard to REDD, we are examining the potential leakage effects of forest conservation. Leakage refers to secondary effects such as moving deforestation to other regions or countries. For this study, data are currently being collected in the field.

Perspectives

Results from economic experiments are now being incorporated into a multi-agent model to simulate dynamic decision-making under different regulatory scenarios. The structure of the multi-agent model has been finalized and is being implemented to provide first simulation results early next year. The auction field trials are in the process of being analyzed in detail. The analysis will emphasize social factors that influenced the success of the trials. In addition to the auctioning of user rights, procurement auctions were conducted and will be compared with non-auctioned procurement outcomes by the end of the year. The reports on live fences and carbon sequestration as an income opportunity for small-scale farmers will be finalized by spring 2010. Data collection on potential leakage effects will also be completed by spring 2010. Data collection for an additional study on the use of conservation auctions in payments for ecosystem service schemes will be launched at the beginning of next year.

Biodiversity monitoring in West Africa



Outcome and highlights 2008–2009

New micrometeorological and climatologic stations were installed in the main investigation region of Burkina Faso. The exact locations of the sites were chosen in accordance with their representativeness and overall research questions of BIOTA to achieve maximum



The BIOTA West project focuses on Burkina Faso

synergetic effects with other BIOTA topics. The climatic data are part of the direct monitoring of a-biotic parameters and ongoing research.

Alongside the field data from the project-owned research sites, data from national meteo services in West Africa as well as from international organizations such as the Institut de recherche pour le développement (IRD) and FAO were collected and brought together in a joint data base. Geo-referenced maps of different climatic variables were compiled based on time series analysis and geo-statistical interpolation.

Further experimental field work was carried out in Burkina Faso and Benin. A network of stations measuring precipitation, temperature and humidity was set up in the Pendjari National Park, Benin to gain an insight into the small-scale variability of meteorological surface boundary layer conditions. Measures for capacity building took place through the provision of individual training in the subject of applied biophysical and micrometeorological measuring approaches.

A camera system was purchased for the over-flight missions to map land surface properties and set up first of all in Bonn. A training course was given on its operation, data processing and analysis. For this, the technician from Burkina Faso, Gildas Boko, was specially invited to ZEF for an internship that was part of his training at 2iE, International School for Engineers of Water and Environment in Ouagadougou.

Instruction and testing schemes as well as measures to organize the infrastructure in Burkina Faso were set in place to prepare for the airborne mapping of land surface properties, which is carried out at the end of the dry and the rainy season respectively.

Biophysical measurements that were performed during the BIOTA West project phases were compiled and used to parameterize models (e.g. SVAT, SEBAL/

Project title: BIOTA West (Biodiversity Monitoring Transect Analysis) in West Africa

Project duration: 2001–2010

Main Donor: German Federal Ministry of Education and Research (BMBF)

Main cooperation partners:

Germany: German Academic Exchange Service (DAAD), Institute for Meteorology and Climate Research (IMK-IFU), Forschungszentrum Karlsruhe, Remote Sensing Unit of the German Aerospace Center (DLR), University of Wuerzburg

West Africa: The Volta Basin Authority (VBA), based in Ouagadougou

Burkina Faso: Université de Ouagadougou, Institut de l'Environnement et de Recherches Agricoles (INERA), Service Nationale Météorologique de Burkina Faso, Direction Générale des Ressources en Eau (DGRE)

Benin: Université Abomey-Calavi

Côte d'Ivoire: Université d'Abobo Adjame, Université de Cocody, Station d'Ecologie Tropicale de Lamto, Institut de Géographie Tropicale (IGT)

ZEF project coordinator: Ulrike Falk, sub-project climatology, BIOTA West (ulrike.falk@uni-bonn.de)

Homepage: www.biota-africa.org

METRIC) to characterize and estimate the representative ecosystem and landscape processes.

Application and use of project results

Basic cooperation was established with all subprojects within the BIOTA West network, partially on the basis



Biophysical measurements were carried out in the BIOTA West project to estimate ecosystem and landscape processes

of the service function of the former W02 subproject. Outside of BIOTA, cooperation was intensified with the GLOWA Volta Project and the climatologic and biophysical measurements consolidated in a network at ZEF. Cooperation with the EU framework program Carbo Africa was set-up and possible synergies localized. Further points of contact evolved through the formation of a Virtual Institute, based on collaboration between the University of Bonn and the Helmholtz Society. The aim of this set-up is to investigate horizontal and vertical fluxes of matter in natural savannahs. This research was carried out by ZEF and the Institute of Meteorology and Climate Research (IFU/IMK) in Garmisch Partenkirchen.

BIOTA West's micrometeorological measurements have contributed within this context to the registration of vertical fluxes of energy and water. A major part of the investigations were carried out in the Bontioli National Park in the Dano Region, West Burkina. A similar research site was set in place at Boudtenga, an agricultural site near Ouagadougou in Burkina Faso. Human impact on biophysical processes can also be investigated here in addition to the natural open savannah research site in the Bontioli National Park. The ZEF and BIOTA subprojects have the main goal of improving accessibility and use of water and natural resources for the local population.

The automatization of the Biophysical Observation Network and remote access to the different stations will increase the value of this network for national and transnational hydro-meteorological services, and will make high-precision meteorological data available to political decision-makers. This is underway and first test routes are in place.

Perspectives

Work is currently in process on the validation of remote sensing products by ground truth data based on climatologic and micrometeorological measurements as well as airborne data. Results from models working on different scales (plant, ecosystem, landscape) need to be extrapolated and refined to match the scales of ground measurements that have variable probing areas as well as satellite imagery that has fixed probing areas. A detailed analysis of the different footprints of measurements is necessary in order to proceed with the inter-comparison.

In order to transfer the Biophysical Observation Network to the respective authority, training courses on the operation and maintenance of the climatologic and biophysical stations are planned with the Meteorological Services, project partners, and the trans-regional institution the Volta Basin Authority.

States and stability along the Amu Darya River



Background

The region

The Amu Darya runs through an area of national influence between Afghanistan, Tajikistan and Uzbekistan. It is a historically coherent area with a young history of statehood. Similar local governance mechanisms on both banks of the river were confronted with state-building processes and changed under different national conditions.

Background

In international politics, the state is deemed to be a stabilizing model of organization. Regions not permeated by state structures seem to pose security risks. In this sense, borders and borderlands, being symbols of both state sovereignty and amplified security concerns, are particularly sensitive areas.

This is why development trajectories of state building and local structures stand in the focus of our research. The project focuses on the relations between state-run institutions and informal rules. Knowledge on the history and mechanisms of local governance is indispensable in order to understand the conditions for the development of statehood and the perspectives for stability in this region.

Research focus

The project's analyses aim to exemplify how traditional institutions of local communities have evolved in different state contexts; how they have adapted to state

building processes; and how they overlap with state institutions. These analyses are framed by studies on regional interactions, past and present.

Main outcome and highlights 2008–2009

The project's research received a great deal of attention from academic circles, as well as from the fields of politics, development cooperation and the media. Some project members had the opportunity to give advice to development projects as well as to policy-makers.

The project members aimed to facilitate and achieve an exchange of thoughts among academics and



The Amu Darya project focuses on relations between state-run institutions and informal rules

professionals, reaching out beyond the regional focus of the project. In this context, ZEF organized a three-day international symposium on 'Beyond the State—Local Politics in Afghanistan' in February 2009. This was funded by the "Deutsche Stiftung Friedensforschung", the German Federal Foreign Office and the German Technical Cooperation (GTZ).

Perspectives

The project will end in Winter 2009/10. The PhDs in the project will be finished in the upcoming months. In addition, a number of academic journal articles and three edited volumes on the topics of borders, local politics and the Amu Darya region will be published during the upcoming months.

Project title: Local governance and fragile statehood in the Amu Darya Border Region

Project period: 2005–2009

Main donors: Volkswagen Foundation

ZEF project coordinator: Conrad Schetter (c.schetter@uni-bonn.de)

ZEF PhD students: Hafiz Boboyorov, Bernd Kuzmits, Katja Mielke, Wolf Henrik Poos, Andreas Wilde

Main project partners: University of Termez, German Agro Action

Homepage: <http://www.zef.de/amudarya.0.html>

Publications:

Debiel, Tobias, Glassner, Rainer, Schetter, Conrad & Terlinden, Ulf (2009): Local State—Building in Afghanistan and Somaliland. In: *Peace Review* 21 (1): 38–44.

Kuzmits, Bernd (2007): Grenzüberschreitende Kooperationen – Afghanistan und seine nördlichen Nachbarn. In: *Osteuropa*, 8/9, Sondernummer Zentralasien: 417–432.

Mielke, Katja & Schetter, Conrad (2007): Where is the Village? Local Perceptions and Development Approaches in Kunduz Province. In: *Asien* 104: 71–87.

Schetter, Conrad (2007): Lokale Macht- und Gewaltstrukturen in Afghanistan. In: *Aus Politik und Zeitgeschichte (APuZ)* 39: 3–10.

Research on water pollution and human health

Introduction

Water pollution as a result of man-made environmental changes at local and global scales has emerged as a major public health concern. It is defined as the excessive presence of chemical, physical or biological contamination due to anthropogenic activities that have a harmful effect on the environment. The excessive presence of these so-called pollutants may have serious effects—directly or indirectly—on human health. At present the problem is more acute in low-resource, and fast growing economies in Asia, Africa and Latin America. Understanding the complex ways in which nature and human forces influence water pollution and thereby affect the freshwater aspects of the earth system is a challenge. ZEF is taking on this challenge through its research area on 'water pollution and human health', focusing on low resources and fast growing economies in Africa, Asia and Latin America.

Background

The recently launched ZEF research activities on health have four interlinked objectives:

- i. To understand the global and local forces shaping risk from water pollutants (*risk assessment*).
- ii. To analyze the impacts of water pollutants on socio-cultural and institutional factors (*risk impacts*).

- iii. To examine the socio-ecological and institutional factors influencing strategies adopted by individuals and organizations (development agencies, industries, NGOs and other organizations) to overcome risk posed by water pollution (*risk strategies*).
- iv. To analyze the agents/agencies involved in producing changes in the existing ecology, institutions and socio-cultural factors on various global and local fronts (*risk adaptiveness*).

Main outcome and highlights up to 2009

The research program builds on an extensive review of literature on 'Environment and Health' that identified the importance of understanding the drivers of global environmental change with regard to water pollution and its implications for human health. Concept papers have been prepared on 'Risk Governance in a Complex Society'. They will soon be published by ZEF and will form the foundation for this research program.

In pursuance of this research initiative, ZEF organized a session on 'Water Pollution and its Implication on Human: Challenges Ahead' at the International Human Dimensions Programme (IHDP) Open Meeting in April 2009. The collection of papers is to be published in the journal *Asian Journal of Water, Environment and Pollution* in January 2010. A preliminary field visit was carried out in Asia to identify potential partners and topical issues for taking up research. Secondly, ZEF has submitted a collaborative research project under the auspices of the Indo-German Science and Technology Centre titled 'Socio-Technical Adaptation of Urban Water Technologies in India—Case Study of Surat City'. This call was made jointly by the Federal Ministry of Education and Research, Germany and the Department of Science and Technology, Government of India. A basic



Water pollution is a major public health concern in Asia, Africa and Latin America

research proposal was submitted to the German Research Foundation (DFG) entitled 'Water Resources Institutions and Human Health in a Peri-Urban Region in Surat City, India'.

Perspectives

ZEF is undertaking continuous efforts with partner institutions to establish this transdisciplinary research area. Initial discussions with funding agencies in Germany and with international agencies have revealed growing interest in the topic. ZEF is continuing to organize workshops and conferences on issues related to water and health. A session is to be held at the 21st European Conference on Modern South Asian Studies (ECMSAS) in Germany from 26–29 July 2010. Furthermore, ZEF is keen to invite doctoral candidates who are interested in examining the linkage between water and health in the targeted countries.

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Bonn Interdisciplinary Graduate School for Development Research (BiGS-DR)

The BiGS-DR of the Center for Development Research (ZEF) at the University of Bonn, which was founded in 1999, is unique in Germany and Europe in terms of its interdisciplinary set up, internationality (students from around 80 countries), and size (around 140 students per year). The City of Bonn, where the Center is located, offers a broad network of international science centers, United Nations organizations and research as well as development policy institutions, enabling students to participate in joint conferences and workshops and to benefit from infrastructure and interaction with staff.



ZEF's graduate program offers PhD training to students from all over the world

Program set-up

The program aims at training highly qualified scientific staff, advisers, and managers for both the private and the public sector in a development-oriented context. BiGS-DR offers a broad and interdisciplinary approach to development research, in addition to a sound training in the theories and methods of selected disciplines. Practice-oriented field research is carried out in developing countries or development-related institutions. Combining theories, methods, and practical experience in the areas of social, economic, and ecological change enables students to explore new fields and be competitive on an international job market.

Target group of BiGS-DR

The main target group consists of young scientists from all over the world with an outstanding master's degree or equivalent in economics, political science, agricultural and resource economics, engineering, geography, mathematics, natural science or agriculture. Candidates preferably have work experience in national or international research institutions, governments, or the private sector. Interest in interdisciplinary research is a prerequisite.

Degree

After completing the graduate program at ZEF, the students obtain a doctoral degree, granted by the respective university faculty affiliated to ZEF. Students may pursue their doctoral study under the direct supervision of ZEF professors, but can also be associated with ZEF whilst being supervised by a professor from another university.

Time frame

The complete study period is limited to three years. In the first six to 12 months, the students participate in a course program at ZEF and work with their supervisors on their research plan. Subsequently, the students travel abroad to carry out their field research—taking one to two years—provided that their research proposal has been approved by their supervisors. After completing their field research, the students return to ZEF and a final period of six to 12 months writing their doctoral theses completes the program.

The course program

The course program in the first year consists of a set of block courses given by ZEF professors and senior researchers, as well as by professors from the University of Bonn and guest professors from Germany and Europe. The courses provide students with interdisciplinary skills and disciplinary knowledge as well as with tools for their development-related fields of research. The courses are organized in three modules:



Two-thirds of ZEF's PhD students come from Africa

- **Module I:** A two-month interdisciplinary course.
- **Module II:** Disciplinary courses in economics, social sciences, and ecology.
- **Module III:** Courses on specific topics or specific training for individual students provided in laboratories.
- **Special short courses:** Mathematics and statistics, remote sensing, geographic information systems, intercultural seminar.

Tuition and scholarships

Currently, ZEF raises no tuition fees for the program. However, students need a scholarship or proof that they have adequate financial resources for the whole study period of three years. Living costs in Germany are put at approximately 800 Euros per month, and research costs for the field research at around 20,000 Euros. ZEF awards a limited number of scholarships for candidates from

developing countries, made available by the German Academic Exchange Service (DAAD) and other donors. In addition, individual arrangements are possible to support students with their field research. Short-term stipends are also available for doctoral students who are interested in participating in a particular ZEF doctoral course only (see ZEF homepage www.zef.de for the up-to-date course program).

BiGS-DR birthday celebration: Ten Years of International Graduate Training at ZEF: Capacity Development for the Developing World

Alumni meeting and international conference at ZEF in Bonn from October 1-2, 2009. ZEF celebrated the 10th anniversary of its Graduate Program in Bonn on October 1 and 2. Around 100 participants from science, policy-making and development-oriented institutions as well as around 30 ZEF alumni from all over the world attended the anniversary celebration and conference with a reception



BiGS-DR celebrated its 10 year anniversary in Bonn in October 2009

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at Bonn's old Town Hall, debates at ZEF and a panel discussion with experts at the Deutsche Welle on the conference's overall theme: "Ten years of international graduate training at ZEF: Capacity development for the developing world".

Donors

The main sponsors of BiGS-DR are the German Federal Ministry for Economic Cooperation and Development (BMZ) via the German Academic Exchange Service (DAAD) and the German Technical Cooperation (GTZ), the German Federal Ministry of Education and Research (BMBF), State Funds of North Rhine-Westphalia, the Robert Bosch Foundation and the Volkswagen Foundation.

7

Events and Workshops—a selection

October 25, 2008. ZEF at UN Day in Bonn. More than 30 organizations presented their work on the Millennium Development Goal 7 in Bonn, among them ZEF with its project on "Economic and Ecological Restructuring of Land and Water Use in the Khorezm Region (Uzbekistan)".

November 13–14, 2008. International workshop at ZEF on scientific cooperation with developing countries: An international review of the Swiss Guidelines. Based on the "Swiss Guidelines", around 90 scientists and practitioners from more than 50 universities and institutes from Africa, Central Asia, Europe and the



Working group discussion during the "Swiss Guidelines" workshop at ZEF in November 2008

US discussed the chances and pitfalls of north-south research partnerships. The two day workshop was initiated by the Volkswagen Foundation and hosted and organized by ZEF.

November 20, 2008. International panel of river basin experts discuss pressing issues for developing countries at ZEF within the framework of its "Water Lecture Series". What are the most important factors for establishing successful sustainable hydrological monitoring systems; what successes have been achieved and challenges faced; what makes trans-boundary water management successful; and what role do institutions play? These questions were discussed by: Barry Boubacar from the International Water Management Institute (IWMI) and regional officer of the GLOWA Volta Project in Ghana, Ben van de Wetering from the International Commission for the Protection of the Rhine (ICPR), Mohamed Tawfik from the World Meteorology Organization (WMO), and Winfried Zarges from the German Technical Cooperation (GTZ). The panel discussion was facilitated by Rainer Müssner from the Federal Ministry of Education and Research (BMBF).

December 2008. A piece of a prize: ZEF is part of a prize-winning CGIAR research consortium. CGIAR's biennial "King Baudouin Science Award for Outstanding



ZEF's stand at the UN Day in October 2008

Partnership" was awarded to the Program for Sustainable Agriculture in Central Asia and the Caucasus (CAC). The CAC was established 10 years ago and is implemented by a consortium of partners, among them ZEF. The Center for Development Research contributes to the CAC program with its trans-disciplinary research, linking different disciplines to develop integrated science-based solutions for development issues.

January 12–14, 2009. ZEF involved in "The Economics of Ecosystems and Biodiversity" study. ZEF is collaborating with "The Economics of Ecosystems and Biodiversity" study led by Pavan Sukhdev and hosted a meeting with around 30 leading international scientists in the fields of environmental and ecological economics and ecology contributing to the scientific part of the study. The study is due to be published at the next conference of the parties to the Convention on Biological Diversity (CBD) in Aichi-Nagoya, Japan in 2010.

January 19, 2009. Accra. ZEF plays leading role in DAAD-initiated Centre of Excellence in Ghana. The first batch of students started doctoral courses in the Program for Development Studies of the new Ghanaian-German Centre for Development Studies and Health Research in Accra, Ghana. The Program for Development Studies was set up jointly by ZEF and the Institute for Statistical and Economic Research (ISSER) at the University of Ghana, Legon. The Centres of Excellence in Development Studies in Africa were initiated in 2008 by the German Academic Exchange Service (DAAD), which selected seven proposals out of 70 applications for further funding. The Program for Development Studies will be funded for a five year period with a total sum of 1.5 million euro. The official inauguration of the Centre took place on June 16, 2009.

January 2009. Bonn. Eleni Ayalew is the second ZEF alumna selected for DAAD's "African Good Governance Network". Eleni Ayalew from Ethiopia is the second ZEF graduate to become a member of the African Good Governance Network (AGGN). ZEF alumnus Felix Asante

was selected as the first ever member of the then newly founded network in January 2007. The AGGN is a long-term stipend and education program of the German Academic Exchange Service (DAAD) and a leadership program focusing on students from sub-Saharan African countries studying at German universities or working in cooperation projects in Africa. The program is under the patronage of the German Federal President Horst Köhler. Ms. Eleni Ayalew did her PhD research at ZEF from August 2005 until December 2008. She received her PhD degree from the Faculty of Mathematics and Natural Science of the University of Bonn.

February 26–28, 2009. Symposium at ZEF on "Beyond the State—Local Politics in Afghanistan". Around 50 international experts from Afghanistan, Europe, the US, and Australia discussed the overall question of how local structures in Afghanistan can be better understood and taken into account by international and national policy makers during an international symposium "Beyond the State—Local Politics in Afghanistan". The conference was sponsored by the German Peace Foundation (DSF), the German Technical Cooperation (GTZ), and the German Foreign Office (AA).

"Science for Development": New series of ZEF-GTZ seminars. The goal of this new series is the intensification of cooperation between science and extension organizations such as GTZ. Two meetings have taken place so far: One on the topic of renewable energies (January 2009), the other on water (May 2009). An average of around 30 experts participate. PhD students in particular are given the chance to present and discuss their work with GTZ practitioners.

March 6, 2009. Berlin. Robert Bosch Junior Professorship 2009 awarded to ZEF researcher. Asia Khamzina was awarded a Junior Professorship by the Robert Bosch Foundation during an official ceremony in Berlin. The Junior Professorship for "Sustainable Use of Natural Resources" has been awarded annually by the Robert Bosch Foundation since 2007. Ms. Khamzina is thus the second prize holder. The selection procedure is chaired by Klaus Töpfer, former Director of the United Nations Environmental Programme (UNEP). Asia Khamzina will receive funding for a five year period for her research on "Competing claims on land use: Opportunities for climate change mitigation through afforestation of degraded croplands in Central Asia".

March 24–25, 2009. Bonn. Workshop at ZEF on "Water Policy Dynamics in State-Centric Regimes". A group of eight international water research experts from the US, Australia, Europe, South Africa, Canada, and Central Asia met at ZEF to exchange views, insights and research results on Water Policy, IWRM and State-Centric Regimes.

June 1–4, 2009. Addis Ababa, Ethiopia. ZEF's coffee project holds final workshop. The project on "Conservation and Use of Wild Coffea Arabica in the Montane Rainforests of Ethiopia (CoCE)" carried out its final workshop in Addis Ababa, Ethiopia. Based on results from the social, economic and natural sciences, the project has developed a conservation concept and strategy for the endangered wild coffee forests in southwestern Ethiopia. This concept will be implemented by a local non-profit organization, the ECFE (Ethiopian Coffee Forest Forum), which has been established by former ZEF researchers. ECFE plans to submit a



Symposium at ZEF: "Beyond the State—Local Politics in Afghanistan" in February 2009



Ihtiyor Bobojonov is awarded the ZEF Friends prize for his doctoral thesis

proposal for a UNESCO biosphere reserve, aimed at the conservation of wild coffee forests in a core area and agricultural development in surrounding zones.

May 28–29, 2009. Brussels. STRIVER project holds closing conference. ZEF was a partner in the European Commission-funded research project STRIVER (Strategy and methodology for improved IWRM – An integrated interdisciplinary assessment in four twinning basins). ZEF's research focused on the Tungabhadra basin in south India, which is one of the four basins studied in the project. The research concentrated on the interaction between irrigated and rainfed farming in the lower Tungabhadra basin, in the border area between the states of Karnataka and Andhra Pradesh. The closing conference in Brussels was broadcast live on the Internet.

June 6, 2009. Bonn. ZEF at UNFCCC Land Day. The Secretariat of the UN Convention to Combat Desertification (UNCCD) hosted "Land Day" at the Gustav-Stresemann-Institut in Bonn. The event, attended by 170 participants,

aimed to help climate change negotiators and other stakeholders attending the concurrent Bonn climate change talks consider in detail the linkages between climate change and desertification, land degradation and drought (DLDD). Paul Vlek, Director at ZEF, presented research measuring the Normalized Difference Vegetation Index across Africa over the last 25 years.

June 2009. Interactive data for people and their environment: Geoportal ready to go for West Africa. Scientists from the ZEF-led interdisciplinary GLOWA Volta Project have developed a geoportal in cooperation with the Department of Computer Science III at the University of Bonn. The tool is being introduced through training activities organized for regional users, stakeholders and decision makers, from politics, water resources institutions and science in Ghana and Burkina Faso. The project in the West African Volta Basin is part of the umbrella program "Global Change and the Hydrological Cycle (GLOWA)", which was initiated by the German Federal Ministry of Education and Research (BMBF) in 2000. The geoportal comprises up to 400 datasets on hydrological and meteorological measurements, land use, vegetation and vegetation changes, soil, as well as on settlements, population, households and their consumption patterns. The most remarkable components of this portal are the interactive maps—around 60 so far. Users can combine these with data and create new maps to suit their requirements.

July 5–8, 2009. Vienna, Austria. ZEF organized two sessions at the 15th International Symposium on Society and Resource Management (ISSRM). ISSRM is a trans-disciplinary scientific conference, organized annually by the International Association for Society and Natural Resources. ZEF held a session on "Integrated

Water Resources Management—Challenges and Innovative Strategies from Around the World" as well as a session on "Sustainable Resource Management: The Role of Knowledge, Education and Certification". The latter was organized in cooperation with the Institute for Landscape Development, Recreation and Conservation Planning of Vienna University.

October 1–2 2009. International Conference at ZEF: Ten Years of International Graduate Training at ZEF—Capacity Development for the Developing World. ZEF celebrated the 10th anniversary of its Graduate Program in Bonn on October 1 and 2. Around 100 representatives from science, policy making and development oriented institutions as well as around 30 ZEF alumni from all over the world attended the anniversary celebration including a reception in Bonn's Old Town Hall, a conference with debates at ZEF and a panel discussion at the Deutsche Welle on the topic of: "Ten years of international graduate training at ZEF: Capacity development for the developing world—brain gain or brain drain?"

October 2009. Good modeling: Uzbek agro-economist wins prize for best thesis.

Ihtiyor Bobojonov is the winner of this year's ZEF Friends prize for the best doctoral thesis written at ZEF between January 2007 and May 2009. The prize is awarded every two years by the association "Friends of ZEF". Mr. Bobojonov was awarded the prize on the occasion of the ten year anniversary conference of ZEF's graduate program BiGS-DR for his PhD research on Modeling crop and water allocation under uncertainty in irrigated agriculture in Khorezm, Uzbekistan. Currently, he has a post-doc position in the ZEF/UNESCO project in Uzbekistan.



Budget 2009 / Funding Partners of ZEF (including BiGS-DR)

Indirect Support*)	in Euro	in %
German Academic Exchange Service (DAAD)/ German Federal Ministry of Economic Cooperation and Development (BMZ)	343,625	59.5
Own funds of students	31,225	5.4
German Academic Exchange Service (DAAD) Regional Program/ German Foreign Office (AA)	30,325	5.2
Higher Education Commission Pakistan / German Academic Exchange Service (HEC/DAAD)	21,600	3.7
Government of Lybia	20,000	3.5
China Scholarship Council	17,425	3.0
Katholischer Akademischer Ausländer-Dienst (KAAD)	15,650	2.7
Asian Development Bank	15,400	2.7
Jack Kent Cooke Foundation	13,123	2.3
Fulbright Foundation	13,100	2.3
Friedrich Ebert Foundation (FES)	12,300	2.1
Government of Malaysia	10,250	1.8
Ministry of Education, Indonesia	9,000	1.5
Studienstiftung des Deutschen Volkes	8,900	1.5
National Council of Research, Science and Technology (Comisión Nacional de Investigación Científica y Tecnológica), Chile / German Academic Exchange Service (CONICYT/DAAD)	6,800	1.2
SAP Aktiengesellschaft Systeme, Anwendungen und Produkte in der Datenverarbeitung, Walldorf, Germany	6,800	1.2
Frankfurt Zoological Society	2,050	0.4
Total	577,573	100

External Funds**) Projects	in Euro	in %	
German Federal Ministry of Education and Research (BMBF) via			
• German Aerospace Center (DLR)	BIOTA East project BIOTA West project	4,904,110	78.3
• Forschungszentrum Jülich	CoCE project, Ethiopia		
	Glowa Volta project, West Africa		
	Glowa Africa Conference, Ouagadougou 2008		
	International Advanced Study Courses (IPSWaT)		
	International Project Office (IPO), Global Water Systems Project (GWSP)		
	Olifants project, South Africa		
Uzbekistan project			
WISDOM project, Vietnam			
German Federal Ministry of Economic Cooperation and Development (BMZ) via			
• German Academic Exchange Service (DAAD)	DAAD Funds for BiGS-DR Alumni BiGS-DR 10 years conference	348,394	5.5
• German Technical Cooperation (GTZ)	BiGS-DR Re-Thinking Water Storage project in Ghana and Ethiopia SV Bioenergy		
German Academic Exchange Service (DAAD) / German Foreign Office (AA)	DAAD/ZEF Centre of Excellence, Ghana	229,340	3.6
Robert Bosch Stiftung	Doctoral scholarships Junior Professorship	227,740	3.6
Volkswagen Foundation (VW)	Project on Local Governance and fragile statehood in the Amu Darya Region Workshop on "Swiss guidelines", 2008 Forest Resource & Livelihood Management in East Africa	138,005	2.2
State of North Rhine-Westphalia (NRW)	Glowa Volta project, West Africa	115,862	1.9
European Union (EU)	NeWater project STRIVER project	100,192	1.6
German Federal Environment Ministry (BMU) / European Union (EU)	Workshop on "The Economics of Ecosystems and Biodiversity" (TEEB) study, 2009	39,700	0.6
International Water Management Institute (IWMI)	Shallow Groundwater project	37,792	0.6

German Research Foundation (DFG)	GWSP Workshop on "Global Change and River Basins"	30,000	0.5
Concern Worldwide	Kunduz River Basin Programme	29,412	0.5
Kraft Foods Deutschland GmbH	Situation of Children and Adolescents in Ethiopia	23,122	0.4
German Foundation for Peace Research (DSF)	Symposium "Beyond the State—Local Politics in Afghanistan" 2009	20,000	0.3
Dreyer Foundation	Doctoral scholarship	12,500	0.2
UNESCO	IHDP Open Meeting 2009	4,082	0.1
German Foreign Office (AA)	Symposium "Beyond the State—Local Politics in Afghanistan" 2009	3,292	0.1
Total		6,263,543	100

Core Funds ^{***)}	in Euro	in %
Personnel Costs	1,098,293	76.6
Administrative Costs	290,000	20.2
University Bonus System ^{****)}	46,668	3.2
Total	1,434,961	100

Indirect Support & External Funds & Core Funds 8,276,077

*) Scholarships directly funded by the Donors.

**) Third-Party Projects of ZEF. funds budgeted i.a.w. Annual Financing Plans.

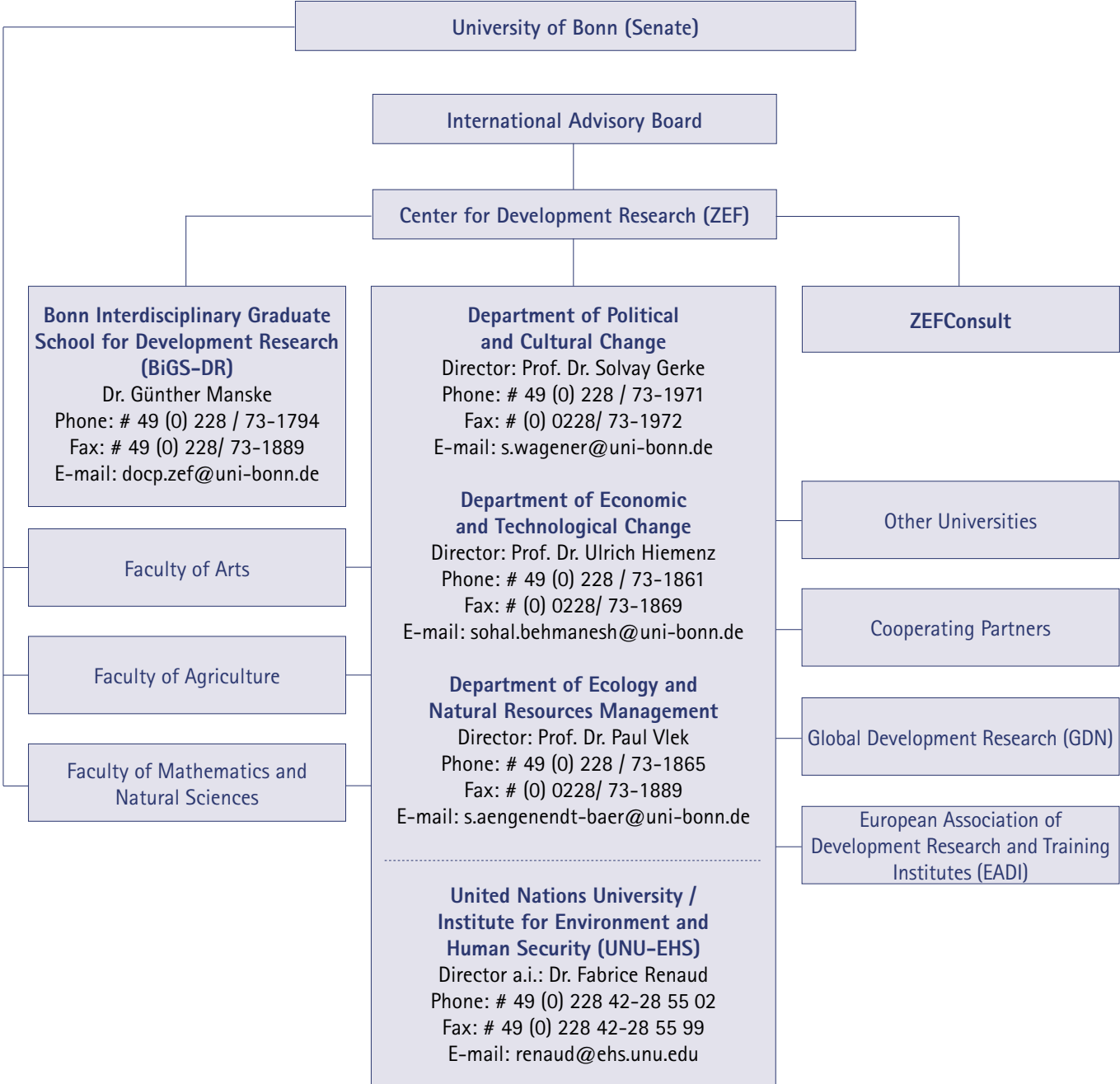
***) University of Bonn. State of North-Rhine Westphalia Funds for ZEF.

****) Bonus of up to 5% of Annual External Funds of ZEF paid by the University of Bonn.

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