PROCEEDINGS OF THE SPECIAL SESSION "SOCIETAL CONCERNS AND CAPACITY DEVELOPMENT" ORGANIZED BY UNU-FLORES AT THE SYMPOSIUM OF EUROPEAN FRESHWATER SCIENCES (SEFS 8)

PROCEEDINGS - No.3

UNITED NATIONS UNIVERSITY

UNU-FLORES

Institute for Integrated Management of Material Fluxes and of Resources

UNITED NATIONS
UNIVERSITY

UNU-FLORES

Institute for Integrated Management
of Material Fluxes and of Resources

Proceedings of the Special Session on "Societal Concerns and Capacity Development" organized by UNU-FLORES

Stephan Hülsmann and Reza Ardakanian

Symposium of European
Freshwater Sciences (SEFS 8) in Münster, Germany,
01-05 July 2013

About UNU-FLORES

BACKGROUND

The United Nations University Institute for Integrated Management of Material Fluxes and of Resources (UNU-FLORES) was established in Dresden, Germany in 2012. The institute is supported by the Federal Ministry of Education and Research (BMBF) and the Ministry for Higher Education, Research and the Arts (SMWK) of the Free State of Saxony, Germany. As part of the United Nations University (UNU), the institute helps to build a bridge between the academic world and the United Nations. The UNU was founded in 1973 as an autonomous organ of the UN General Assembly. It encompasses 16 research and training institutes and programmes in 12 countries around the world. UNU as a whole aims to develop sustainable solutions for pressing global problems of human survival and development. Through a problem-oriented and interdisciplinary approach, UNU aims at teaching, applied research and education on a global scale.
Find more information under: unu.edu

VISION

The Dresden-based institute of UNU-FLORES acts at the forefront of initiatives promoting a nexus approach to the sustainable management of water, soil and waste. UNU-FLORES acts as a think tank for the United Nations and its member states, in particular addressing the needs of developing and emerging countries. As a think tank, UNU-FLORES will be an internationally recognized hub and intellectual focal point promoting integrated management strategies. Additionally, UNU-FLORES will attract high-calibre students for postgraduate study and research programmes in cooperation with other research institutions. The institute will build the capacity of future leaders in the area of environmental resources management and develop innovative concepts for target- and region-specific knowledge transfer.

MISSION

UNU-FLORES develops strategies to resolve pressing challenges in the area of the sustainable use and integrated management of environmental resources such as soil, water and waste. Focusing on the needs of the UN and its member states, particularly the developing and emerging countries, UNU-FLORES engages in research, capacity development, advanced teaching and training as well as dissemination of knowledge. In line with UNU's general mission to promote sustainability, UNU-FLORES also considers impacts of global change on resources management.

THE NEXUS APPROACH

Advancing a nexus approach to the sustainable management of the environmental resources water, soil and waste is the main mission of UNU-FLORES. The nexus approach is based on the belief that vital environmental resources are strongly interconnected and require a integrated perspective to manage them sustainably. Such a nexus perspective must take into account different sectors and disciplines in both research and capacity development and strive for holistic management strategies.

RESEARCH AREAS

UNU-FLORES aims at a truly integrative and global perspective on resources management, considering interrelated resources in a comprehensive manner. This holds also true for impacts of global change and its nexus to green economy. In all of the following research areas of UNU-FLORES, the institute will cooperate closely with other universities and research institutions in both research and teaching:

- Water inventory and fluxes;
- Soil and land use management;
- Management and treatment of waste;
- Systems and flux analysis;
- Resources quality and quantity; and
- Global change assessment.

EDUCATION AND CAPACITY DEVELOPMENT

UNU-FLORES will engage in the following areas of postgraduate education, capacity development and trainings:

• UNU-FLORES will establish PhD as well as other postgraduate programmes together with its partners, especially with the Technische Universität Dresden (TUD). The programmes will focus on each of the research areas of UNU-FLORES and will include course work according to a pre-defined scheme.

• Additional capacity development and training programmes will focus on the further education of professionals who are working in the area of environmental resources management.

A unique feature of all education activities will be the emphasis on the global dimension of the covered issues. One aspect of this global nature will be international exchange programmes for students and teachers as well as internships with other UNU and UN bodies.

Proceedings of Special Session on "Societal Concerns and Capacity Development" organized by UNU-FLORES

Contents

Introduction to the proceedings of the special session

Reza Ardakanian and Stephan Hülsmann
UNU-FLORES

The main theme of the 8th Symposium of European Freshwater Sciences (SEFS 8), sponsored by the European Foundation of Freshwater Sciences (EFFS) and hosted by the German Society of Limnology (DGL) in collaboration with the University of Münster (WWU Münster) was "Freshwater Science for Nature and Society". SEFS 8 provided a trans-disciplinary platform for delegates from 36 countries, contributions ranging from fundamental to applied research and from genes to ecosystems, with a strong focus on anthropogenic pressures on freshwater systems and management options.

In line with this focus of SEFS 8, the special session on societal concerns and capacity development was organized by the United Nations University Institute for Integrated Management of Material Fluxes and of Resources (UNU-FLORES) to provide a forum to

- raise awareness for global challenges for securing water resources in terms of quantity and quality;
- make a case for integrated approaches to manage freshwater resources to address these challenges and in particular
- present and discuss tools, approaches and case studies on capacity development activities related to freshwater, focusing on developing or emerging countries.

In the call for papers for the special session we argued that many topics in freshwater science, fundamental or applied in nature, require a global perspective and involve cooperation with partners in developing or emerging countries. In this session we aimed at attracting contributions from projects and initiatives engaged in research and capacity development in developing and emerging countries on water issues, discussing results, challenges, implementation strategies and introducing case studies. Whether the research focus was applied (addressing e.g. problems concerning water resources management in the respective countries) or fundamental in nature, requiring cooperation with local universities or agencies, contributions were expected to address aspects of capacity development in a broad sense, based on mutual interests of involved partners. This could mean any measure for training of trainers, postgraduate education, institutional development etc.

The responses to our call for papers, as well as attendance of the session during the symposium, showed that the issue indeed was taken up with great interest. The proceedings presented here represent a collection of contributions covering all major aspects addressed during the special session.

We were happy that the session was opened by a presentation by Brian Moss, School of Environmental Sciences, University of Liverpool and former president of the International Society of Limnology (SIL). For the proceedings he transformed his presentation into an allegory. His "lessons from Oceanus" speak for themselves and anyone may draw conclusions since "earth has, of course, progressed a little differently from Oceanus, though there are many parallels". "The equivalents of the third tribe" have to face and take their responsibility to educate and help and probably to lead during the needed shift from unsustainable resource use (exemplified for water) of modern societies to a (hopefully) future sustainable global model of societies. To this end capacity development in a broad sense is clearly and badly needed.

The contribution of Sina Marx, Global Water System Project (GWSP) provides a good example of the challenges faced in development projects on climate change adaptation and water resources management. The intended empowerment and ownership of local communities is difficult to achieve in case of institutional confusion and leaving marginalized groups out of the decision making process. The required capacity development activities cannot be effective without sufficient human resources and without a clear and long-term concept how to involve those marginalized groups which are – at least should be – targeted by these activities. In addition, the case study shows that indeed an integrated approach is required, an approach that considers other water uses than the main one, in this case irrigation.

Daniel Tsegai and colleagues from the UN Water Decade Programme on Capacity Development (UNW-DPC) emphasize the need for a multi-stakeholder approach to capacity development in integrated water resources management. They argue that "the absence of cross-sectoral linkages can lead to uncoordinated water resource management resulting in unnecessary duplication of efforts and waste of the already limited resources. Therefore, the inclusion of diverse stakeholders, and the proper coordination among them, is fundamental for fostering effective water management." Examples from various projects provide evidence that workshops and training programmes involving all stakeholders related to the topic adds value to capacity development. Besides the training component, providing a platform for communication and coordination as starting point for developing coordination mechanisms between stakeholders (ministries, agencies etc.) is an essential aspect of the multi-stakeholder approach.

The contribution of Marco Leidel, TU Dresden, and colleagues summarizes the experiences obtained in various projects and case studies that were part of the International Water Research Alliance Saxony (IWAS). IWAS focused on the implementation of Integrated Water Resources Management (IWRM) in various hydrologically sensitive regions of the world, each facing specific challenges. Capacity development was a crucial element of IWRM approaches from the outset and proved to be essential for the success of single projects. Thus, the main conclusion is that IWRM needs to include capacity development at all relevant levels, the individual, the institutional as well as the enabling environment. For all levels they provide examples from different regions of the world.

Ralf Ibisch, Helmholtz Centre for Environmental Research (UFZ) and colleagues in their contribution take a similar approach and summarize lessons learnt during numerous research projects within the funding initiative "Integrated Water Resources Management" of the German Federal Ministry for Education and Research (BMBF) from 2006 to 2015. They worked out a set of fundamental principles for sustainable capacity development in the frame of IWRM,

highlighting in particular: stakeholder participation, capacity assessment as a basis for concept development, prioritization of measures and activities, review mechanisms and the need for a multi-level approach. They also report on results from a survey and elaborate on requirements for future capacity development concepts.

The conclusions drawn from Ibisch et al. as well as from the other contributions are highly relevant for the fine-tuning of capacity development activities of UNU-FLORES, which was officially opened in December 2012. As institute of the UNU, it has a particular mandate to address capacity development directed to all levels (individual, institutional, enabling environment) and focusing on the needs of developing countries. UNU-FLORES advances a nexus approach to the sustainable management of water, soil and waste, taking an even broader approach than IWRM by considering these closely inter-connected resources in a holistic way. The nexus approach, by minimizing trade-offs and increasing resource use efficiency is instrumental for sustainable development and for adapting to and mitigating impacts of global change. Among the suite of capacity development activities which are currently initiated by UNU-FLORES, the joint PhD programme with TU Dresden and the establishment of a partner institute in Maputo, Mozambique are highlighted here.

The main points put forward in the contributions to the special session, partly resulting from the lively discussions between the talks and at the end of the session may be summarized as follows:

- Capacity development needs to take a multi-level approach, considering the individual and the institutional level and the enabling environment;
- CD cannot be imposed to stakeholders by a top-down approach. The success of any measure depends on the readiness and willingness of actors to contribute to the successful implementation of sustainable resources management, both at the individual and the political level;
- Specific instruments need to be developed and regionally adapted to address different target groups;
- At the individual level curricula on integrated management of environmental resources needs to include socio-economics and should place a strong focus on implementation and governance;
- E-learning can be a good means of individual CD if implemented appropriately;
- At the institutional level successful examples include the establishment of inter-organizational mechanisms to foster communication and coordination across sectors and the involvement of stakeholders from the very beginning;
- The effectiveness and success of CD measures should be evaluated and improved and adapted if indicated;
- CD in general is a long-term process (with repetitious elements) of which sustainability has to be ensured.

Lessons from Oceanus: an allegory

Brian Moss[1]
School of Environmental Sciences, University of Liverpool, UK

Oceanus, a new planet

Oceanus, newly discovered in a solar system close to ours, is a fortunate planet; it has abundant water and seas cover two-thirds of it. From outer space it looks blue, in contrast to the reds and greys of its barren sister planets. The water maintains equable conditions for living things that base their existence on the compounds of carbon, and in turn the activities of the organisms keep temperatures, in extensive areas of the surface, between 0 and 100 °C, which allow liquid water and life to persist. Oceanus has a long history, some 4 billion years or more, in which processes of evolution have taken place through a variety of mechanisms. Primarily these have used a self-evident natural selection, in which those individual organisms that were best able to gain food and energy among their fellows reproduced more prolifically, so that their offspring were more likely to survive. It is a system that depends on mechanisms of heredity that allow new features to be passed on, subject to natural selection, to future generations. This system has the supreme characteristic that as conditions at the surface of the planet fluctuate, as indeed they have to a large degree over time, the organisms can adjust and adapt to the changes.

There has been another trend that has helped survival of Oceanus' organisms. They evolved mechanisms that allowed them first to specialise and become individually more efficient at carrying out particular processes (the fixation of carbon and nitrogen from simple inorganic compounds into the complex components of their cells are examples). They also adjusted to the very different conditions of temperature and water availability, among many other features, that were inevitable in a sphere spinning on an axis tilted towards the prime source of energy, a distant star, and rotating around it. As time progressed, the contrasting advantages of remaining very small, reproducing rapidly, but living for very short periods, or of becoming bigger, living longer, and developing mechanisms for surviving difficult periods over a longer life, were discovered and exploited. This has led to a hugely diverse range of organisms, each of them individually unique for the most part, despite their countless numbers, but with groups of them obviously related in form and function. Species, and tribes within species, are recognisable. Even so, the numbers of these are so great that only crude estimates are possible.

About a million years ago a group of ape species developed on Oceanus that through natural selection had acquired not only the ability to respond to changing conditions, but also the means to manipulate these conditions. The apes adapted lumps of wood, bone and stone with which they could more efficiently extract or kill potential food; they took fire from natural lightning strikes and stored it in embers until they could learn to create it anew and use it to make plants, previously inedible, into palatable meals.

1 Brian Moss (Emeritus Professor)
School of Environmental Sciences
3rd Floor Nicholson Building
University of Liverpool
L69 3GP
brmoss@liverpool.ac.uk

They discovered, by trial and error, experiment if you like, that shelters could be constructed to protect against inclement weather and to shield them from their own predators. About 100,000 years ago, in the most recent 0.002% of the time that Oceanus had existed, one of these ape species emerged as the sole survivor of the group and began a population increase largely unfettered by competition, food shortage or predation, for it had become extremely clever at tool production and had a brain capacity that could foresee its own actions, anticipate dangers and avoid them. It learned the lesson which natural selection had imposed on other creatures, that when conditions were steady, or could be kept steady, specialisation at particular tasks could be a great advantage, whilst if the environment was unpredictable, flexibility was the better strategy.

Three tribes of apes

Currently, in comparatively steady conditions, three main tribes of this ape exist. The first is scheming and deceptive[2]. It has acquired control of most of the planet's resources. It is inventive and acquisitive, has developed methods for mining and manufacture, husbandry and agriculture and economic systems that allow their trading in complex ways, using tokens that can themselves be traded, thus creating an additional industry in the manipulation of money. In the myths of the tribes there are stories about how the garden of Oceanus came to be recognised and its first fruit, an apple, taken; and of how there was tension between those who valued the wild nature of the land for hunting, and those who wished to clear and cultivate it. Bound up in the stories are also lessons in good and evil, foolishness and wisdom, about what is right and what is wrong. The scheming and deceptive apes have little truck with those. Their aim, like that imposed by natural selection on all the other organisms, is to guarantee their own immediate survival irrespective of any consequences.

Often this means using warfare, sometimes overt when resources that are needed are threatened, sometimes psychological when they use their understanding of the mind to create markets for the goods they make, even though those goods may be damaging and not in the interests of those to whom they are sold. By creating these demands, the scheming apes have also enslaved the other tribes to work for them so as to be able to pay for the goods. These apes have even convinced the other tribes that their activities are essential to survival and that the apparent problems they are creating, not least a major change in the climate and in the availability of the always precious water on the land, are easily solvable. In this they show their innate dishonesty for they have no solutions.

The second tribe is more subservient and trusting. Indeed many of its members are quite saintly. They put great importance on relationships among each other, on fairness in sharing resources, and on caring for the variously disadvantaged among them. They recognise that the uniqueness of the individual means that each has strengths and deficiencies, that some are not so physically strong or mentally acrobatic as others, but that each has something to contribute.

2 This description comes from (Rowlands 2008). Mark Rowlands, an academic philosopher, bought a wolf cub, which became, with his dogs, a much-loved part of his household as he travelled and worked in North America and Europe. His book describes what he learnt about human beings from comparison with the behaviour of his wolf and dogs. Humans did not compare favourably.

They recognise that the differences in physical environment in different places on Oceanus pose different problems and limitations, and they see co-operation and fair barter as ways of mutually benefitting from the limitations that every sub-group of this tribe must face.

This basically caring and co-operative group is much more abundant than the scheming and deceptive tribe, but its trusting nature makes it vulnerable to the latter, which preys upon it. The co-operators are not stupid, however. They realise what is happening, but their values inhibit them from changing matters. They favour change through consent and have developed systems to foster this, but the systems do not work if the scheming apes do not accept them, and frequently the latter will use their much larger resources of money and power to undermine them. In these circumstances the honest co-operators, though lauded by the scheming deceivers, and frequently given token recognition for their endeavours, buckle down to making the best of what they have. They are bolstered, perhaps, by a blind faith that the more powerful group, having created many advantages for everyone in terms of living standards, will be able to solve the problems of climate change and increasing scarcity of freshwater and of some essential resources like phosphorus that are needed for maintenance of the status quo.

The third tribe

The third tribe is quite small and intensely curious. It sees itself as independent of the politics, of ruthless acquisition or sensitive caring, of the other two tribes. This is a tribe that notes in great detail the activities of first two tribes and how they conflict with each other and what their influences are upon the planet. Its members are clever, indeed very clever, at developing methods of investigation and recording and are adept at sharing their information. Some of them, the writers, compose imaginative interpretations in a form called fiction that buries the essential truths they note in stories and poetry that are the modern equivalents of the ancient myths; others, the artists, do much the same thing in sculptures and paintings. Yet others, the scientists, are more prosaic and record their findings in articles and papers that are backed by minute details and calculations but often written in styles that make them understandable for the most part only among themselves.

The scientists argue with themselves much of the time and have developed rigorous ways of scrutinising their information and testing its consistency. They are restless and self-critical, and although not totally objective, their view of the world is likely to be the best approximation to the truth. Unfortunately, this group has only minimal influence on the tribes of schemers and co-operators, though its findings are selectively used when convenient to either and indeed the tribe depends on the other two for support of its activities. Many of the findings are unpalatable to the schemers for they suggest that the hitherto gains that the schemers have admittedly made in stabilising food supplies, increasing comfort, meeting natural cravings and keeping the rest of the population amused are causing so much damage that they cannot go on for much longer without consequences that might bring grave danger to all three tribes. The findings are also unpalatable to the caring co-operators for they suggest that apes are not in charge of their own destiny. They find it difficult to accept that the manipulations of other organisms are necessary to maintain equable conditions on Oceanus. They also reject the idea that the approach of the deceptive schemers may have some merits or, in some contradiction, that

a continuation of the present state of relative comfort may not be maintainable. The three tribes are unable to agree on what to do. The problems are intensifying. There is an increasing uneasiness on Planet Oceanus.

Lessons for Earth

Earth has, of course, progressed a little differently from Oceanus, though there are many parallels. We have five species of apes, four of which are in decline owing to the activities of the fifth, which strangely outcompeted its closer relations over a million years or so, but allowed persistence of the less clever chimpanzees, gorilla and orang-utan in large numbers until its very recent destruction of much of their habitat began to endanger them. This fifth species, ourselves, has all the characteristics of an invasive species: we are omnivorous, hardy, fecund, and versatile and we do exist, in a sense, in three distinct tribes, as does the dominant ape on Oceanus, and we are continuing to increase in numbers, but there is a difference. The slightly greater age of Earth, and the development of great movements of individuals among the land masses, has meant considerable interbreeding, so that in each of our heads are the characteristics of each tribe, in an infinity of different balances so that although we each have particular tendencies, we are not so fixed in our tribalness. The future of Oceanus is in jeopardy for the groups appear to be rigid and separate and unable to avoid catastrophe. The future of Earth, which faces similar problems because of the activities of the dominant ape, is more hopeful, for our heads contain the elements of a solution in that changes in balance and emphasis are possible. The ultimate problem appears to be how to bring about those changes.

It seems logical that they can only be effected by the triumph of truth and reality over presumption and belief. The beliefs of the scheming and deceptive are perhaps the strongest and least easy to change. There is a long track record of improving circumstances. The world is still a difficult place for many billions of people, but in general the lot of most people has improved as a result of technical achievement. The United Nation's Millennium Development goals will not all be achieved by the intended date of 2015, but progress has been made in most of them. The scheming and deceptive have frustrated this overtly in places where dictatorships have been able to persist. Elsewhere their activities have replaced some of the burdens of the past, like huge child mortality, famine and widespread slavery, with new, and more subtle ones of self-induced disease, intrusive surveillance and greater working stress. But for many of the world's people, conditions have undeniably improved.

Equally, however, it is undeniable that three quarters of the land surfaces have been denuded of the natural ecosystems that provide the fundamental regulatory systems that partly control climate and that the other component, provided by the oceans, is being equally damaged; there are still numerous small wars, many of them concerned with access to the resources needed for maintenance of essentially luxury conditions for a minority of the world's population. The scheming part of our natures covers these issues up in euphemisms like 'rendition', 'growth', 'prosperity' and 'collateral damage'. It fails to contemplate that the fundamental and underlying reasons for terrorist activities might be within its own policies and activities. It has no workable solution to climate change, and has reverted to a deceptive lobbying to undermine the accumulating evidence and denigrate it.

The problems

The way that we have organised our societies since the invention of agriculture has inexorably led us to this point. Agriculture has allowed the maintenance of steady food supplies but demanded large amounts of labour. The coercion and management of this labour led to the development of hierarchies from the wealthiest and most powerful to the poorest and least privileged. In turn philosophies were developed to justify this otherwise clearly infamous position, and sometimes fix the hierarchies, by reference to divine intention. Successive revolts and protests have disturbed the hierarchy for limited times and in limited places but it has always re-established, for it provides obvious benefits. On the other hand, as the system has developed and intensified over the last 13,000 years since Earth last demonstrated that it could mobilise huge disruptive forces (in that instance the formation of huge amounts of ice), its impacts have become more and more obvious.

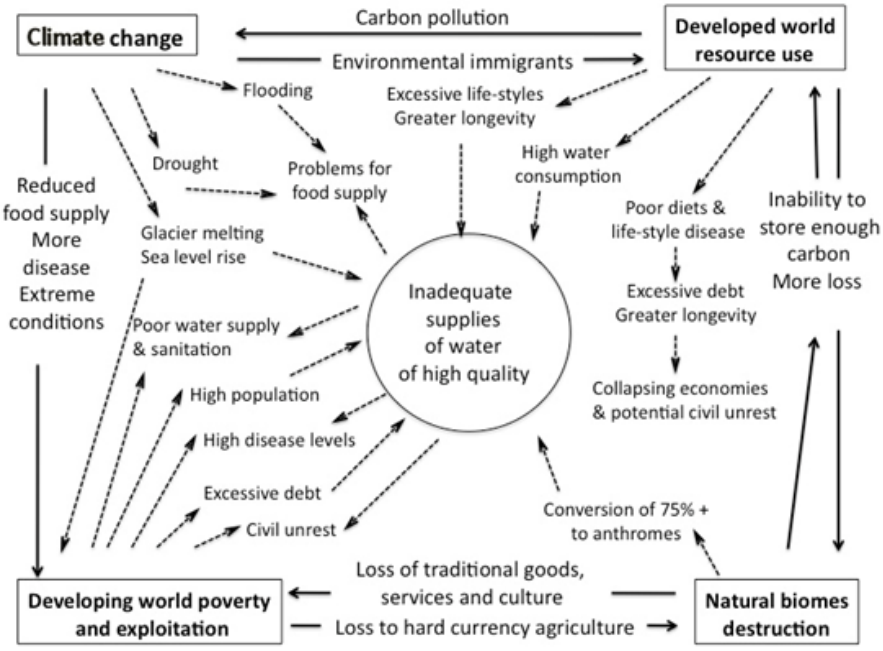

Figure 1: Some interrelationships among four main groups of problems (at each corner of the figure) and the availability of high quality water on Earth

Figure 1 suggests how the impacts are related to one another and to the availability of the key resource of freshwater. Climate change (upper left), caused by excessive consumption of fossil fuels, is leading to rising temperatures, floods in already wet places, intense droughts in already dry ones and extreme weather events as the atmosphere is continually forced to adjust.

The benefits brought by the scheming parts of our natures are starting to have repercussions (upper right) in the wealthier parts of the world in self-inflicted diseases such as obesity, whilst our population continues to grow not so much from increasing birth rates as in the past but through what would seem to be the boon of greater longevity. It is probable that stress levels are much higher than previously.

The developing world (lower left) has seen some gains; the number in abject poverty has declined but relative poverty has increased, life expectancy is still low and access to high quality water still very limited. Finally (bottom right) we have destroyed about three quarters of our natural land biomes, which provide part of the essential ecological service of regulating the composition of the atmosphere and therefore the degree of retention of heat radiation. The remaining area of land biome, largely in the tundra, taiga and tropical forests, is no longer able to cope through carbon storage with rising carbon dioxide emissions, and temperatures will not begin to fall until annual carbon storages are greater than emissions. The gap widens each year[3] ; calculations suggest that we will need to restore over one third of the existing agricultural land to halt the rise in temperature. This may be possible if we readjust our farming and food distribution systems to produce less meat, and to waste much less food overall.

Our problem is that the scheming sides of our natures have been adept at convincing our trusting and sympathetic sides that there is no real problem. So long as we organise charitable activities to support the poor, maintain a few nature reserves and national parks to preserve the remnants of biodiversity, and can see pandas in wildlife films, we have accepted the pabulum. An education system that puts emphasis on technology and market economics, exploitation and obedience rather than ecology and steady-state economics, restrained use and critical questioning, is undermining the chances of making changes for whole generations of children increasingly separated from their natural environment and unable to see its essentiality to them. We measure the progress of our countries by Gross Domestic Product, which ignores the detrimental costs of environmental damage and ill health, but embraces the profits of environmental remediation and health care, thus inadvertently encouraging further damage and declining health.

Realistic measures, such as the Genuine Progress Index, which counts such damage as a cost[4], are rejected, for they suggest that we have made little or no progress over the past several decades, despite a burgeoning GDP. Moreover our leaders are not experienced or educated in environmental science. Seventy-five per cent of 194 heads of state come with backgrounds in economics, politics and administration, law, business, the military and engineering[5], the professions particularly favoured by the scheming apes, who believe everything can be manipulated and controlled. Only one such leader has any sort of environmental training. It is unlikely that most of them have any fundamental understanding of the importance of natural processes for maintaining a comfortable and civilised future for us all. They will think and operate in the limited and limiting prisons of their past education

---

3 (Le Quéré et al. 2012) calculate that currently there is an excess of 4.2 gigatonnes of carbon per year accumulating in the atmosphere, from about 9.1 gigatonnes being released. Storage in land biomes and the ocean is around 2.5 gigatonnes each. Thus if we are unable to reduce our emissions significantly (and we have yet to halt an annual rise) we need almost to double the natural storages.

4 (Constanza et al. 2009) suggest that 'the social & institutional barriers to better measures of progress are primarily based on resistance to change. These barriers include the dominance of the "growth is good" paradigm, lack of leadership, and the power of those with a vested interest in maintaining the status quo'.

5 (Moss 2012).

The equivalents of the third tribe

Where, on Earth, are the equivalents of the third tribe of Oceanus apes? As befits a clever but varied group they are doing many things, though none of them highly co-ordinated. The writers have warned of the problems in novels that describe highly controlled futures, replete with state surveillance and suppression of any dissension[6]; these works have been widely lauded and many of their predictions have come true, but they have been neutralised as classic 'works of art'. The artists have created sculptures and paintings of great meaning that likewise are mostly kept in the safe remoteness of galleries and museums where they have minimal effect. The scientists have written some fifty million journal articles, mostly unread because of the arcane language of their writing[7], the high cost of many of the journal subscriptions that the scheming apes have set, and the anti-science propaganda of some of the caring co-operators that says that this material is irrelevant to social development and must be placed in a laager and ignored. The schemers sometimes even try to claim it is falsified or biased, when it conflicts with their plans.

But, nonetheless, there are many of these creative people who realise that matters cannot go on as they are. Some work independently, but most are grouped in institutes, often associated with Universities. The schemers would like to harness the Universities to their own ends by supporting mostly research that contributes to a market economy and keeping the dangerous areas of ecology, environment, sociology and anthropology as minority subjects. They sense it is not wise for information to become widely available that tells of alternative societies that have been or are being suppressed, but which have important lessons to give about how sustainability might be achieved. There is however, a thread of questioning, a maverick tendency, an independence, that has preserved universities, or their equivalents in the classical world, as permanent institutions for a very long time. The role of a University, its unique function, is to question the workings of everything, from an atom to an organism, from an idea to a philosophy, from a tribal band to a nation state, from the globe in its entirety to the origin and future of the Universe.

Universities are fundamentally the property of everyone; their independence is precious; they are the insurance policies for a human future. They are not the tools of any one interest group; they can be entirely a force for good. But only if their members are not cowed, are not forced into or allowed to maintain isolation, turning inwards to look after subject areas of ever narrowing esotericism. Only if they look outwards to serve the entire community by making their research and ideas widely known, using language and techniques that everyone can understand, can they be of service. And in the end, if the schemers cannot be trusted to look after any other than themselves, and the saintly and cooperative are unwilling to see that we have a biology as well as a soul with which to deal, it will have to be the intellectuals of both the sciences and humanities who will have to lead. That leadership will mean the training of more and more people, especially in the developing world, as liberal- and open-minded leaders themselves, as well a close and sensitive attention to the needs and understanding of people everywhere. The history of the future must not be the propaganda of the victors, but the triumph of those who value truth and understanding.

---

6 For example George Orwell's 'Animal Farm' (1945) and 'Nineteen eighty-four' (1949) and Aldous Huxley's 'Brave New World' (1932).

7 (Moss 2013) has analysed the clarity of a stratified random sample of 239 journal articles using standard techniques and criteria, and has calculated an obscurity index for each. Obscurity has steadily increased since the 1960s. The language of managerialism, used increasingly by institutions, even University administrations, is equally obscure and frequently used by the schemers to hide their intentions.

References

Constanza, Robert, Maureen Hart, John Talberth, and Stephen Posner. 2009. "Beyond GDP: The Need for New Measures of Progress". 4. Pardee Paper. Boston: Pardee Center for the Study of the Longer-Range Future, Boston University.

Griffiths, Jay. 2013. Kith: The Riddle of the Childscape. London: Hamish Hamilton.

Le Quéré, C., R. J. Andres, T. Boden, T. Conway, R. A. Houghton, J. I. House, G. Marland, et al. 2012. "The Global Carbon Budget 1959–2011." Earth System Science Data Discussions 5 (2): 1107–57. doi:10.5194/essdd-5-1107-2012.

Moss, Brian. 2012. Liberation Ecology: The Reconciliation of Natural and Human Cultures. Excellence in Ecology 24. Oldendorf/Luhe, Germany: International Ecology Institute.

———. 2013. "Is Something Rotten in the State of Our Scientific Writing?" SILnews 63: 6-9.

Rowlands, Mark. 2008. The Philosopher and the Wolf: Lessons from the Wild on Love, Death, and Happiness. London: Granta.

Challenges of capacity building in irrigation management. A case study of the Koga Project, Blue Nile Basin, Ethiopia

Sina Marx[1]
Global Water System Project (GWSP), Bonn, Germany

Abstract

Capacity building has been widely acknowledged as a central objective to address water-related problems on global, regional and local scale, not only since the launch of the International Decade of Action "Water for Life": Water problems can only be addressed appropriately if water education is provided at all levels and for all stakeholders.

As the world's largest water user, agriculture has long been identified as a focal area of capacity building needs in water. Water management in agriculture calls for strong individual and institutional capacities to cope with increasingly complex linkages, e.g. crop water needs, climate variability and uncertainties, competing users and uses. The case study of the Blue Nile, drawing on ethnographic research in Ethiopia, illustrates these complexities and the need for capacity building.

For the past years, Ethiopia tried to make better use of the Blue Nile waters by building large infrastructure for water storage. The Koga project is the first large-scale irrigation scheme in the basin since the 1970s. Field research was conducted to study the local process of adaptation, farmers' capacities to manage the system and the means undertaken for capacity building at different levels. As a major development project, the Koga scheme is subject to certain principles agreed upon on the level of global environmental politics, such as the IWRM approach. These principles, including capacity development and participation of different stakeholders, reflect back onto different scales through the impact of IOs. This is also true for Koga, where "the most important positive impact of the project will be to build the capacities of farmers in practicing the demand-driven approach", as stated by the donor AfDB.

At national level, new policies were designed to incorporate IWRM principles into Ethiopian legislation. As this altered existing roles and allocation of power, the policies were contested among the government agencies; an institutional confusion that was passed on to the farmers.

Incompatibility with local conditions led to a situation in which IWRM principles contribute to conflicts and a reproduction of power on the grounds. Marginalized groups with low capacities, including women and the poorest, were left out of decision making.

1 Sina Marx
Global Water System Project (GWSP)
International Project Office
Walter-Flex-Str. 3
53113 Bonn, Germany
marxs@uni-bonn.de

Introduction: Capacity Development under climate change in Africa

"The single greatest challenge to effectively meeting the Millennium Development Goals in East Africa is the lack of capacity"
(Adeel and Schuster-Wallace 2011)

While Africa has contributed the least to anthropogenic climate change caused by greenhouse gas emissions, it suffers most from its impacts. Climate change has and will have negative effects especially on Africa's agriculture. Options for adaptation to climate change in agriculture to reduce negative effects include the adoption of new agricultural techniques that fit the changed conditions, e.g. by crop diversification, by using new crop varieties, by changing cropping patterns or through water storage.

For millions of smallholder farmers, storing water for times of shortage can be the difference between plenty and famine, so that increased water storage is widely promoted as a major component of national adaptation strategies. This study has been conducted as part of the research project „Re-thinking water storage for climate change adaptation in sub-Saharan Africa"[2] (for other results of the project cf. (Eguavoen and McCartney 2013; Eguavoen et al. 2012; Eguavoen and Tesfai 2012; Eguavoen and zur Heide 2012; McCartney and Menker Girma 2012). However, adapting to climate change also requires the capacities to do so. Therefore, the project not only evaluated the biophysical implications of different climate change scenarios on different types of water storage, but also examined the social and economic suitability of different water storage options in various physiographic and socio-political conditions.

The seemingly paradox situation of about 110 billion m^3 of water flowing across Ethiopia's borders every year, while a majority of the population lives in a state of constant undersupply with water, is created by a high variability in rainfall and lack of infrastructure. Since smallholders account for nearly 90% of the overall agricultural production in Ethiopia and at the same time present the group most vulnerable to the uncertain climatic conditions, the national food security is accordingly low. Hence, Ethiopia has a high stake in water resources development as an acknowledged strategy for economic development and poverty alleviation. Water storage and irrigation schemes are therefore embedded both into Ethiopian national strategies for poverty reduction and climate change adaptation.

The study site is Ethiopia's first large-scale irrigation scheme designed as farmer self-managed as well as self-financed, and is the first large-scale scheme in a whole slew of planned projects in the Nile Basin. As such, the Koga project is an important experiment in the Ethiopian water resource management.

2 Funded by the German Federal Ministry of Economic Cooperation and Development, this interdisciplinary project evaluated the need for various water storage options in the Volta River basin in Ghana and the Blue Nile River basin in Ethiopia, as these two countries are predicted to be affected differently by climate change.

According to the project donor and the Ethiopian government, the rationale behind the Koga project is to increase food security and decrease the vulnerability to droughts:

> *„Drought is the single most important climate related natural hazard impacting the country from time to time. Drought occurs anywhere in the world but its damage is not as severe as in Africa in general and in Ethiopia in particular" (MoWR and NMA 2007).*

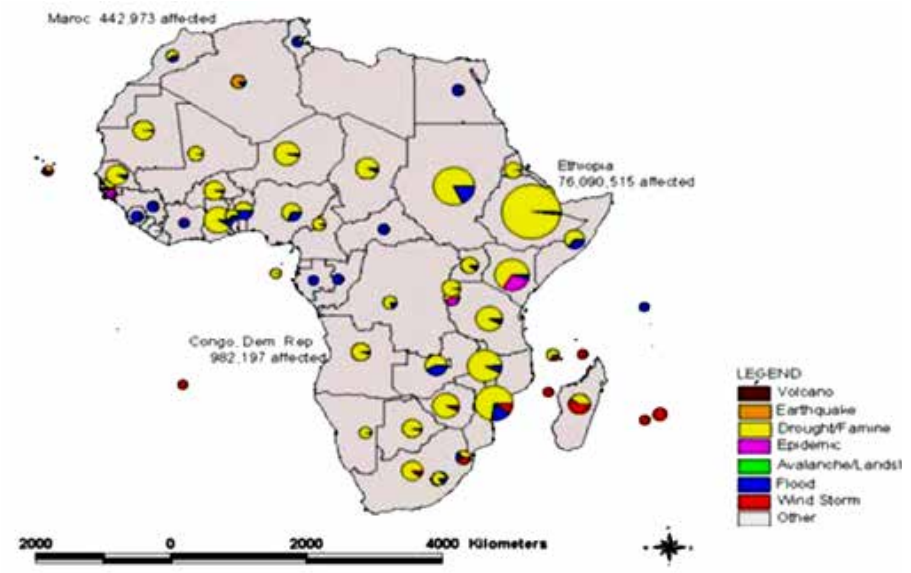

Figure 1: Distribution of people affected by natural disasters in Africa, 1975 – 2001
Source: (EM-DAT 2010)

Looking at both the long history of famines in Ethiopia and more recent catastrophes, this is indeed the case as shown in Figure 1. The decisive question is why the impact of natural events such as droughts is more disastrous in Ethiopia than in other countries - otherwise these impacts cannot be mitigated effectively.

One explanation is the combination of lacking infrastructure as well as institutions, which could alleviate the impacts of rainfall variability, and a lack of functioning markets, that could counterbalance food deficits by supplying agricultural goods from areas that are not affected, which leaves the country's economy consequently highly dependent on rains (Grey and Sadoff 2007).

Variability in rainfall and temperature mean that in many places access to fresh water is unpredictable. As the world's climate changes, increased variability in precipitation and higher temperatures will pose great challenges for agriculture's use of fresh water. While water storage is a key approach to adaptation, it does not remain undisputed: when the World Commission on Dams published its final report in November 2000, it criticized past dam projects harshly. It stated that besides the benefits of dams „in too many cases an unacceptable and often

unnecessary price has been paid to secure those benefits, especially in social and environmental terms […]. Lack of equity in the distribution of benefits has called into question the value of many dams in meeting water and energy development needs when compared with the alternatives" (World Commission on Dams 2000).

Therefore, infrastructure projects for water storage need to be designed very carefully to actually provide support to those least capable of coping with the adverse impacts of climate change, while dealing with increased uncertainties due to climate change at the same time. This dynamic has also been examined during research on the Koga irrigation project.

Study Site: The Koga irrigation project

The Koga irrigation scheme was designed to improve watershed management in the catchment area of about 22,000 ha of and supply irrigation to the more than 7,000 ha of command area.

Located in the highlands of Amhara Region (see Figure 2), at an altitude of 1,900 to 3,200 meters above sea level, the region is subject to the intertropical convergence zone, resulting in a single rain-fed cropping season.

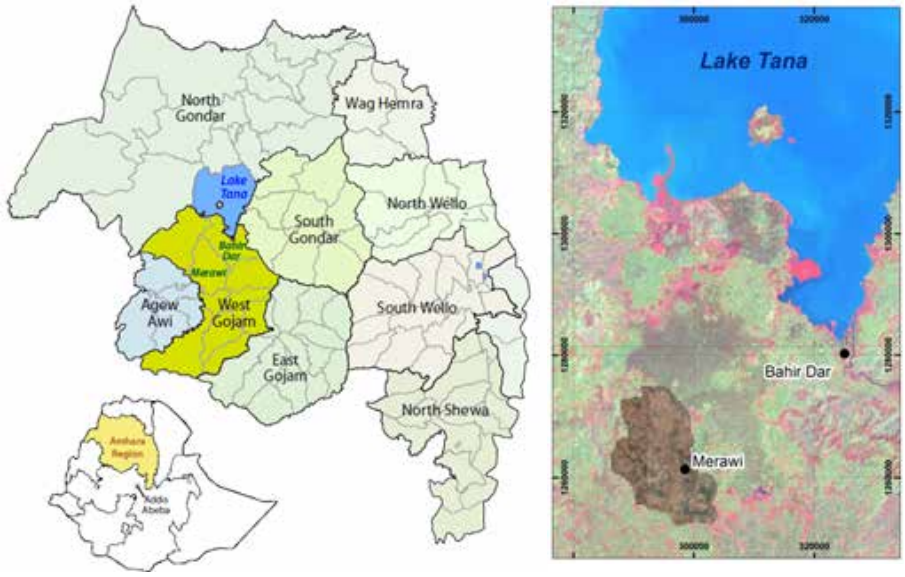

Figure 2: Location of Research Site (Source: (Vigerske 2008))

Koga includes two management components, one for the irrigation infrastructure and another for the watershed.

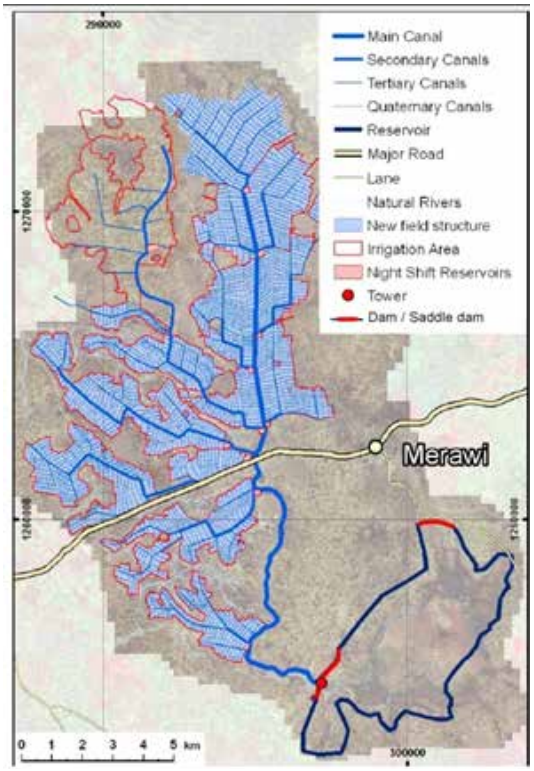

Figure 3: Koga Reservoir and Command Area

The latter concerns capacity building in the up-stream area of the dam for the management of grazing, forestry and soil conservation measures to ensure the sustainability of the irrigation project, which could otherwise suffer from siltation and loose technical efficiency. In practice, the project has focused greatly on the irrigation side and neglected the watershed component, especially with regard to capacity building and the promised improvements in infrastructure and health services in the upstream areas (Gebre, Getachew, and McCartney 2008).

The research area has already been considered for the implementation of potential irrigation schemes in the 1980s under the military regime. In 2002, the project was launched after the African Development Bank (AfDB) agreed to finance the project:

„The most important positive impact of the project will be to sustain and build the capacities of farmers" (AfDB 2001).

These local capacities to handle irrigation, as well as the effects of the Koga irrigation scheme on that capacity, are described with respect to the potential of water storage to function as a strategy for adapting to climate change. The focus of this study lies on local communities` participation in the irrigation scheme and the respective decision-making fora, and particularly on the participation of women.

Institutional confusion – The challenge of self-management

As described above, the Koga project was designed to be self-managed. However, the understanding of what "self-management by the beneficiaries" should involve has been inconsistent and has undergone a number of changes. Whilst in 2001 the division of management duties was outlined in spatial terms (infrastructure down to secondary canals managed by experts, infrastructure up to secondary level managed by farmers), the entire responsibility and duty of management and operation were ascribed to the beneficiaries in 2004 by the Cooperative Promotion Bureau (CPB) in the course of establishing an irrigation cooperative (IC). Then, the organizational framework was reverted to the initial plan of a jointly managed scheme intending to rely on the professional Project Management Unit to take care of the primary and secondary structures as well as guide and support the non-professional IC in fulfilling the remaining duties. The IC is supposed to include all farming households within the command area and shall be responsible for water distribution, the adoption and enforcement of its members' rights and obligations, conflict management and the collection of water fees.

The legal status of the IC, however, remains unspecific. The title was usually applied by farmers and officials in an undifferentiated way from Water Users' Association (WUA), which is the form of farmers' organization put forward by the Ministry of Water Resources. Similar to other case studies, "no institution like the WUA formally exists. However, farmers mention them […] they claim to be a member of it" (Leidreiter 2010). The legal non-existence of WUAs is due to the fact that in Ethiopia the term usually refers to groups of irrigating farmers, who organize themselves without official registration, while cooperatives are legally recognised by the Cooperative Societies Proclamation No. 147/1998. These non-profit WUAs focus solely on water distribution, management and operation of the infrastructure, but are "sometimes threatened by parallel established government-supported cooperatives, which have broader operational scopes and have stronger links with government institutions" (Haileslassie et al. 2008). However, it should be noted that in the Koga case both the existing IC and a potential WUA would be government-installed rather than driven by farmers.

Donors have contributed to this conceptual and legal confusion by imposing the internationally established concept of the WUA. As the World Bank stated with regard to the Ethiopian Nile Irrigation and Drainage Project, "Water users in Ethiopia have so far been mostly organised into legally recognized Water Users Cooperatives, in accordance with the Cooperatives Act and with the assistance from the Ministry of Cooperative Promotion. However, under the project, Water Users Groups are understood to include both Water Users Associations and Water Users Cooperatives. The project will sensitize communities on WUAs and encourage the formation of these in view of the comparative advantages as demonstrated in other countries" (World Bank 2007). In 2009, the World Bank published a draft for the proclamation of WUAs, as well as for by-laws and contract agreements, "to assist the Government of Ethiopia in the definition and adoption of the legal framework for the establishment of Agricultural Water Users Associations for the sustainable development and management of irrigation and drainage infrastructure" (BRL Ingénierie 2009).

Training on international WUA principles started at Koga before the legal inauguration of the proclamation for the establishment of WUAs. This caused confusion and resulted in difficulties

for CPB and project staff in figuring out the actual legal status of the current IC. Members of the CPB and the Bureau of Agriculture and Rural Development are reluctant to shift to the new WUA institution, since responsibilities now resting with them would then most probably be transferred to the MoWR. Some clarification of terminology and legal status will have an impact on property and power relations in Koga. The existing IC could then itself become an association or remain a cooperative, but would lose control over the irrigation infrastructure and its management which would fall to the future WUA.

Furthermore, the tasks of organizations differ, as WUAs focus on irrigation management while a cooperative is also in charge of the distribution of agricultural inputs and credit. The potential members of any user organization preferred a multipurpose framework to one specializing in water only, and thus communicated a preference for the farmers` cooperative. Hesitation or suspicion due to bad experiences with cooperatives during the socialist Derg era, as reported by other literature (e.g. Deneke, Mapedza, and Amede 2011), were also observed in Koga since peasant associations were established by the Derg regime in 1975 as a political instrument through which the regime „literally controlled every village and every human activity in the vast rural areas of Ethiopia" (Aadland 2002). The fact that farmers still opted for a cooperative may indicate their urgent need for agricultural inputs such as improved seeds, seedlings and chemicals, and not just for irrigation water.

As the farmers had no or very little experience within irrigation agriculture, training sessions were offered by the project on how to apply adequate farming techniques, build and maintain canals and form WUAs. The lack of technical knowledge greatly affects the economic benefits farmers can get out of a project; severe knowledge gaps about cropping patterns and the water requirements of crops will inevitably lead to less productivity. Furthermore, reluctance to use fertilisers is caused partly by economic reasons and partly by inexperience. Besides the tremendous challenge faced by the farmers to operate and maintain irrigation infrastructure, this lack of experience may also affect marketing of the produce, which again could minimise the potential benefits from irrigation.

To overcome these knowledge gaps, identified key project persons such as priests and elders from each irrigation area received training on these topics and were then supposed to distribute their knowledge amongst the other farmers. However, trainers only started to work for the project at the end of 2009, when irrigation was already functional in the first units. But while the only means of supporting farmers to learn and thereby overcome this lack of knowledge would be to employ enough support staff, financing was insufficient and accordingly, the responsible project unit KIDMO was severely understaffed. Thus, the lack of capacity building for both project staff and farmers is seriously endangering the success of the project.

Gender bias: Women, Water and Capacity Development

Lack of women´s participation

Capacity building at the local level cannot succeed without the full participation of women. (Hartvelt and Okun 1991)

According to the Global Gender Gap Reports, gender equity in Ethiopia is among the lowest in Africa (World Economic Forum 2013). Therefore, the strengthening of women is considered a crucial point in most development projects in Ethiopia. It has, however, almost become an automatism to pay lip service to „gender mainstreaming" and to see the issue as a technical problem that can be overcome by applying certain tools of gender frameworks (Coles and Wallace 2005). The Koga appraisal report (AfDB 2001) also envisaged gender mainstreaming as a project „outcome":

„A positive impact on women will be social and economic empowerment as well as improved family livelihoods" and that „farmers' participation will be promoted at all stages, taking into account the needs of rural women". This section examines how the introduction of irrigation has impacted on women and how the goal of women empowerment has been pursued throughout the implementation.

In the rural context, the involvement of women into decision-making fora is especially difficult:

„The involvement of women water users in stakeholder consultations and forums demands specific attention and approaches. The current tools used in multi-stakeholder consultations are mainly suited for an educated, literate group, and will require adaptation for use at the local level" (Gender and Water Alliance and United Nations Development Program 2006).

This bias in participation of stakeholders is also present in the institutional set-up of the Koga Irrigation Cooperative. Not only are women severely under-represented, or not represented at all, in leading positions of the organization (during the time fieldwork was conducted no leader position was filled by a woman), they also hardly participate in elections of representatives. When asked about the amount of women in meetings for elections, one female interviewee answered that „there were a lot of women, at least five" - out of an estimated 200 people in total. Furthermore, she said that her decision for one of the candidates was not based on her personal preference, but that she „raised the hand when all the others raised their hand". Another one pointed out that she had been wondering why she had been invited to a „men's meeting" in the first place.

In Amhara region, most women are denied oxen-ownership through cultural taboo, leaving them without the chance to participate in the full set of agricultural activities even if they own land themselves: „Those who did not exercise rights over animal traction [...] through gender (all women) had little opportunity to exercise the de jure rights they might have enjoyed through the land tenure system"(McCann 1995). Thus, female-headed households have an especially difficult standing within the farming community. On top of the prohibition to plough, they are also marginalized with regard to access to land, inputs and labor force. The situation is aggravated by the virtually non-existing female participation in the cooperative. When asked if they were a member of the Irrigation Cooperative, women in male-headed households

usually responded rather perplexed that they „of course" were not. Since only one member per household was to participate in the cooperative, this was naturally their husband. Thus, women in female-headed households were usually the only women participating in the Cooperative's group meetings attended by the author (i.e. zonal meetings and water user group meetings). In this case, however, the term „participation" actually describes a situation of mere attendance. The proportion of active contributions by women in these meetings tended to be minimal if any.

The need for multiple water uses

Not adequately involving women in the institutions for water management also has implications for the enforcement of its rules. Since women are the ones concerned with the supply of water for practically all purposes other than irrigation, i.e. domestic water uses like drinking, cooking, washing, gardening as well as livestock watering, they are most likely to violate rules that prohibit the abstraction of water for these purposes from the irrigation structures. Other sources of available water have to be accessed by walking and carrying water - which is generally of rather poor quality - back to the homestead. This takes them between 60 and 180 minutes, depending on the location of their homes, with an average frequency of at least 5 trips per day. Thus, ownership among women has to be extremely high to prevent them from taking readily available water from the canals in front of their houses. Unsurprisingly, women and children under the observation of their mothers do not comply to these rules even if informed about their existence - which most of them are according to their own statements: „Although we are not even allowed to take one spoon of water we still wash our clothes and the children in the canal and take water from it to the house."

This issue has also been raised in the attended trainings and especially in zonal meetings where members were repeatedly asked to inform their families about the regulations and to enforce their abidance. First of all, it is questionable whether the prohibition of withdrawal for domestic purposes, especially in the head-end command areas, where people's homesteads are located only a few meters away from the irrigation structures, is actually realistic; and secondly, whether this rule would have been adopted in the first place if a more participatory approach in formulating by-laws would have been applied. Case studies from other countries imply that explicitly allowing for the use of production water on household level in areas with a lack of alternative sources of water supply or water storage can significantly facilitate the maintenance and improvement of livelihoods. Moreover, it can advance the sustainability of irrigation schemes by creating incentives for the entire community to maintain irrigation structures (cf. Moriarty, Butterworth, and von Koppen 2004).

Irrigation water is never an end in itself but a means to improve agriculture for one's livelihood. Water is not a single purpose resource only used for agriculture but just as much for maintaining and improving other bases of existence. Water obviously affects household production and income earning opportunities far in excess of agricultural production alone. Improved domestic water supply has a strong association with a decrease in the average time spent fetching water, resulting in significant time saved for household members. Besides the fact that this could enable women to participate in off- and non-farm employment, female interviewees reported that they now have significantly more time for farming than before irrigation. Therefore, if an

actual integrated approach to water resources management would be exercised, irrigation water could serve people's needs far better: „The sector […] also needs to take account of the importance of both small-scale productive uses for households and other non-agricultural water uses, which can even have higher priority for the users, such as domestic uses" (ibid: 22). Further means to facilitate access to water on household level had been discussed, but no specific solutions had been found during the time of research. The issue of domestic water will remain to be a problem, unless significant progress is made in that direction.

Means to combat the marginalization of women in the project have been rather simple, if not naïve, like asking the elders to send more women to trainings. As this did not happen, the facilitators asked the participants in one training session for the reasons for the low participation of women in trainings and meetings. Thereupon, members of the group stated that first of all „mostly zonal and quaternary canal leaders do attend the trainings and since none of these are female there are no women in the training". The leader of the respective area added that if they selected women for trainings the husbands of the women would not let them attend - since that was „none of their business". This reaction shows how the concept to primarily select respected elders, priests and leaders of the organization as communication channels for effective distribution of knowledge gained in trainings, only makes sense at first glance. De facto, it leads to an exclusion of marginalized groups from decision making processes and knowledge transfer. This problem had already been pointed out in the feasibility study more than 15 years ago and, accordingly, the (AfDB 2001) appraisal report states that: „The project will strive to balance the participation of both men and women, in order to achieve sustainable development and increased food production. However, specific and focused intervention will be targeted to involve and attract women in the project activities such as, representation in WUAs, access to and control of Land User Rights, livestock production and agriculture, natural resources conservation activities. In addition, women will have equal access to technical training related to project activities, and micro-credit". The „specific and focused intervention" can obviously not be achieved by (male) agronomists or engineers. The lack of focus on and funding for human resources development in general, as well as for gender-mainstreaming in particular, leads to a situation where project staff is naturally overstrained with tasks that go well beyond their scope of duties and expertise. Thus, as long as no specific gender approach is applied and financing is attributed to make sure that increases of human capital in form of knowledge and competences in irrigation will also reach marginalized groups, the project runs the risk of consolidating social inequalities rather than alleviating these.

Decision making and the reproduction of inequalities

On top of the discrepancies and inequalities between different segments of the local communities regarding their benefit from irrigation, the process of decision making also substantially reproduces social inequalities, i.e. the opportunity to participate in decision-making processes depends on a person's position within the community.

Those who already possess power in the respective areas also fill the most important positions within the irrigation cooperative. The mechanism of reproducing power is rather simple according to both the leaders' perceptions why they were voted for and the members' statements why they

voted for someone. According to interviewees, the most important characteristics a person had to have in order to be voted for were (in descending order of importance) literacy, experience in dealing with government officials and the belief in their capabilities to arrange for a just and equal management and distribution of water. The criterion of literacy reduces the number of possible candidates considerably, taking into account that about 80% of the rural population in Amhara is illiterate.

Table 1: Literacy of population aged over 10 in Amhara Region 2001 (Shenkut 2005)

	Total			Rural		
Region	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**
Amhara	24.8	34.1	16.0	19.7	29.2	10.3

It also makes the election of women into leadership positions even less likely considering the differences between male and female literacy (see Table 1). Those women participating in meetings usually confirm their participation rather by fingerprint than by signature and during research no women were or had been active in any position of the cooperative. Since basic literacy (also mathematical) is actually crucial to fulfil the tasks that come with the official positions within the organization, the reproduction of power along already established hierarchies makes perfect sense in a technocentric understanding of farmers' institutions. In reality, the problem is that the basic skills needed cannot be acquired by most. The second point of dealing with government officials especially applies to the higher positions within the organization and narrows the potential candidates down to a small proportion of politically active people. Being familiar with handling administrative affairs and dealing with bureaucratic structures in the rural context is usually linked to working for political parties or administrations. Accordingly, most of the board members had held such a position in the past or are still active in local party politics. Therefore, the composition of the cooperative's committees implies a political bias highly favoring more powerful actors within the communities.

At the same time, the project does not even remotely have enough staff to support all the farmers in the project area. At the time of research, the team responsible for capacity building within the project (called KIDMO) consisted of only five experts, who could obviously not care for the capacity building of some 14,000 households. The team, who is trying to help the farmers, is constantly overstrained, as one of KIDMO worker explained:

> *„The project is new and we are the only officials here, but there is no additional staff or resources and we do not have the ability to advice all the beneficiaries with the number of staff we have."*

And another one pointed out:

> *„We don't have sufficient human resources. The project document says there should be experts on site level. These experts should be affiliated with the Agricultural Bureau but there is no coordination yet. The documents also say there must be one Development Agent per 50 ha but there is more than 200ha per DA."*

This might even be an understatement. Only two out of all interviewed farmers said that they had access to extension services besides the trainings received from project staff. This lack of capacities among the KIDMO team has also been explicitly voiced in project documents:

> „The newly appointed team of the agricultural wing of KIDMO are doing activities related to some farm activities, but we are not sure whether they can effectively manage the command areas now ready for next dry season irrigation".

Seen in the light of other issues, like the lack of knowledge regarding new farming techniques, and the lack of participation and ownership described above, capacity building is a key problem. None of these issues can be resolved without adequate funding for staff working with the farmers.

Conclusion

The case study showed that the more powerful actors within the communities could consolidate their power through the process of introducing irrigation, while marginalized segments of the community were being left out of the decision making process. Means taken to mitigate possible impacts of climate change and resultant extreme events have to effectively include marginalized groups. However, while the concept of Water User Associations was actively promoted to engage users, it did little to decrease social inequalities by increasing the participation of these groups. Emerging from global policies, the term and its institutional implications have been incorporated into the requirements for international loans and thus into national policies for sector reform plans. While continuously contested between different Ethiopian state agencies, the concept found its way down to street-level bureaucrats, who now had to deal with contradictory models of implementation which needed to be communicated to the farmers. The fact that farmers' preferences were in opposition to the proposed concept was shrugged off as ignorance by those higher level actors in favor of it and embraced by those who suspected interference within their field of responsibility.

Neglecting the users` opinions as soon as they do not comply with governmental agencies preferences will obviously not lead to empowerment and ownership. To build capacities, one has to consider where one is starting from and to know the starting point one has to listen to those whose capacities are meant to be built.

References

Aadland, Ø. 2002. "Sera: Traditionalism or Living Democratic Values? A Case Study of the Sidama in Southern Ethiopia." In Ethiopia: The Challenge of Democracy from Below, edited by Bahru Zewde and Siegfried Pausewang, 29 – 44. Stockholm: Nordiska Afrikainstitutet ; Forum for Social Studies.

Adeel, Zafar, and Corinne Schuster-Wallace. 2011. "Where Is the Capacity to Meet the East African Water Crisis? Unlocking the Potential of Communities and Institutions." In Proceedings

on Research and Capacity Development on Water Resources Management by the United Nations University. Focus on Africa: Special Session at the 12th WaterNet Symposium Maputo, Mozambique., edited by Reza Ardakanian and Jens Liebe, 26–35. UNW-DPC Proceedings No. 9. Maputo, Mozambique.

AfDB. 2001. "Koga Irrigation and Watershed Management Project: Appraisal Report." Appraisal Report. Abidjan: African Development Bank.

BRL Ingénierie. 2009. "Consultancy Services to Prepare Regulation for Agricultural Water Users' Associations: First Draft Model Agreements". Prepared for the Ethiopian Nile Irrigation and Drainage Project.

Coles, Anne, and Tina Wallace, ed. 2005. Gender, Water and Development. 1st English ed. Cross-cultural Perspectives on Women. Oxford ; 7 New York, NY: Berg.

Deneke, Tilaye Teklewold, Everisto Mapedza, and Tilahun Amede. 2011. "Institutional Implications of Governance of Local Common Pool Resources on Livestock Water Productivity in Ethopia." Experimental Agriculture 47 (S1): 99–111. doi:10.1017/S0014479710000864.

Eguavoen, I., and M. McCartney. 2013. "Water Storage: a Contribution to Climate Change Adaptation in Africa." Rural 21 47 (1): 38 – 41.

Eguavoen, Irit, Sisay Demeku Derib, T. T. Deneke, M. McCartney, B. A. Otto, and S. S. Billa. 2012. "Digging, Damming or Diverting? Small-scale Irrigation in the Blue Nile Basin, Ethiopia." Water Alternatives 5 (3): 678–99.

Eguavoen, Irit, and W. Tesfai. 2012. "Social Impact and Impoverishment Risks of the Koga Irrigation Scheme, Blue Nile Basin, Ethiopia." Afrika Focus 25 (1): 39 – 60.

Eguavoen, Irit, and F. zur Heide. 2012. "Klimawandel Und Anpassungsforschung in Äthiopien." Zeitschrift Für Ethnologie 137 (1): 97 – 118.

EM-DAT. 2010. "The OFDA/CRED International Disaster Database. Université Catholique de Louvain, Brussels, Belgium". Database. www.emdat.be.

Gebre, A., D. Getachew, and M. McCartney. 2008. "Stakeholder Analysis of the Koga Irrigation and Watershed Management Project". Unpublished IWMI (International Water Management Institute) Study Report. International Water Management Institute.

Gender and Water Alliance, and United Nations Development Program. 2006. "Resource Guide: Mainstreaming Gender in Water Management". Resource Guide.

Grey, David, and Claudia W. Sadoff. 2007. "Sink or Swim? Water Security for Growth and Development." Water Policy 9 (6): 545 – 571. doi:10.2166/wp.2007.021.

Haileslassie, Amare, F. Hagos, Everisto Mapedza, Claudia W. Sadoff, S.B. Awulachew, S. Gebreselassie, and D. Peden. 2008. Institutional Settings and Livelihood Strategies in the Blue Nile Basin Implications for Upstream/downstream Linkages. IMWI Working Paper 132.

Colombo, Sri Lanka: International Water Management Institute.

Hartvelt, Frank, and Daniel A. Okun. 1991. "Capacity Building for Water Resources Management." Water International 16 (3): 176–83. doi:10.1080/02508069108686113.

Leidreiter, A. 2010. "Community Participation in Common Natural Resources Management in the Lake Tana Watershed, Ethiopia". MSc. Thesis, Amsterdam: Graduate School of Social Sciences, Universiteit van Amsterdam.

McCann, James. 1995. People of the Plow: An Agricultural History of Ethiopia, 1800-1990. Madison, Wis: University of Wisconsin Press.

McCartney, Matthew P., and Michael Menker Girma. 2012. "Evaluating the Downstream Implications of Planned Water Resource Development in the Ethiopian Portion of the Blue Nile River." Water International 37 (4): 362–79. doi:10.1080/02508060.2012.706384.

Moriarty, Patrick, John Butterworth, and Barbara von Koppen. 2004. Beyond Domestic: Case Studies on Poverty and Productive Uses of Water at the Household Level. Technical Paper Series 41. Delft: IRC International Water and Sanitation Centre.

MoWR, and NMA. 2007. "National Adaptation Programme of Action of Ethiopia". Addis Abbaba: Ministry of Water Resources (MoWR) & National Meteorological Agency (NMA). www.preventionweb.net/files/8522_eth01.pdf.

Shenkut, M. K. 2005. "Ethiopia: Where and Who Are the World's Illiterates?" Background paper prepared for the Education for All Global Monitoring Report 2006, Literacy for Life.

Vigerske, M. 2008. "3D-Visualisierung des Projektes ‚Koga Irrigation and Watershed Management'". Master Thesis, Berlin: Technische Fachhochschule Berlin.

World Bank. 2007. "Ethiopia - Irrigation and Drainage Project". Washington, DC: World Bank. http://documents.worldbank.org/curated/en/2007/05/7683906/ethiopia-irrigation-drainage-project.

World Commission on Dams. 2000. Dams and Development: a New Framework for Decision-making. London: Earthscan.

World Economic Forum. 2013. The Global Gender Gap Report: 2013. Geneva: World Economic Forum. www3.weforum.org/docs/WEF_GenderGap_Report_2013.pdf.

Institutional Capacity Development in water resources management: A multi-stakeholder approach

Daniel Tsegai[1], Erick Velazquez, Reza Ardakanian
UN-Water Decade Programme on Capacity Development (UNW-DPC), Bonn

Abstract

Capacity development plays a key role in improving water management and governance by enhancing the capability of local stakeholders in various sectors including policy makers and water professionals at large. Traditional capacity development initiatives - including technical, managerial and financial aspects - have been mostly donor-driven, devoid of promoting stakeholders' roles and participation and pursued essentially in isolated approaches. However, ensuring effectiveness and sustainability of capacity development requires a holistic, multi-stakeholder and participatory approach. Supported by practical examples from the activities of the UN-Water Decade Programme on Capacity Development (UNW-DPC), this paper argues that a multi-stakeholder approach for institutional capacity development has strong potential to better equip water professionals, policy makers and other local stakeholders at all levels with skills necessary for improving water management and governance for sustainable capacity development. The paper deals with governance structures and institutional arrangements for capacity development in the water sector and introduces readers to capacity development initiatives of UNW-DPC and to the different opportunities and challenges in building institutional capacity of stakeholders. Furthermore, the values of such tools are explored, implementation challenges are discussed and some of the required skills and expertise in various settings are identified.

Background

Water is vital in many facets of life and across different economic activities including cultural, social and spiritual aspects. Beyond technical knowledge, the complexity of managing this important resource requires skills which cross sectoral and disciplinary boundaries.

During the past century, water-related issues were commonly addressed by channeling large investments on infrastructure, such as the building of dams and river diversions (World Commission on Dams 2000). This approach, also known as the 'Hard Path Approach', or 'Hydraulic Mission' (Wolff and Gleick 2002; Allan 2000) has its limitations, especially when dealing with uncertainty. Factors including climate change, population growth, migration, changes in consumption patterns, among others, make it more complicated to accurately forecast future water needs.

1 Daniel Tsegai
UN-Water Decade Programme on Capacity Development (UNW-DPC)
United Nations University
UN Campus
Platz der Vereinten Nationen 1
53113 Bonn, Germany
tsegai@unwater.unu.edu

It is becoming more evident that resolving water-related issues, under these levels of uncertainty, should greatly involve other elements, such as institutions, policies, legislation, communication with water users and mechanisms of incentives, among others. The effective integration and coordination of all those different elements across water sectors and institutions in order to maximize the welfare of all the stakeholders involved is commonly known as Integrated Water Resources Management (IWRM) (World Water Assessment Programme and UN-Water 2012). The concept of Integrated Water Resources Management (IWRM) is inherently embedded on a multi-stakeholder approach. IWRM highlights the importance of linking water to other essential natural resources and the prospect of the whole water cycle together with human interventions as the basis for sustainable water management.

The increasing importance of institutions in supporting the different aspects of the water sector requires a clear path for addressing a particular problem, hence the importance of Integrated Water Resources Management. Weak IWRM is partly a consequence of a lack of appropriate institutions at different levels, or the ineffectiveness of the existing institutional arrangements; and it can strongly diminish the capacity of a country to respond to a given issue (Lenton, Wright, and Lewis 2005). IWRM plays a key role in the design and implementation of different public policies for sustainable water management. While absence of appropriate policies limits the functionality of institutions, weak institutions cause ineffective implementation of policies. The great challenge with water-related issues is that they touch upon a variety of sectors (social, economic, political, etc.); therefore it is difficult to have a unified system of management.

However, the lack of institutional capacities is frequently identified as the biggest hindrance to fully comprehend the benefits of IWRM. Thus, advancing the capacities of institutions that cross disciplines and do away with silos is required. Institutional capacity development - which captures a combination of organizations' capacities and the creation of an enabling environment for a proper utilization of gained knowledge - is thus critical to build an informed and transparent framework for the realization of a comprehensive and participatory water and water-related resources management. The cross-cutting nature of water requires an optimal mix of competent individuals and an enabling environment to encourage and maintain the interdependence among water and other vital natural resources.

This paper reviews the multi-stakeholder approach to capacity development in the water sector and then presents case studies supporting the approach by providing examples from the works of the UN-Water Decade Programme on Capacity Development (UNW-DPC).

(http://www.unwater.unu.edu/)

A multi-stakeholder approach to capacity development in the water sector

Owing to the multi-purpose of water, responsibility for water management is shared among many sectors and institutions. Overlapping responsibilities and functions among water institutions is fairly common in many countries. In addition, in some cases, a particular water issue (e.g. drought mitigation or sanitation) is also addressed by various departments and sub-sections within the water and water-related sectors. The absence of cross-sectoral linkages can lead to

uncoordinated water resource management resulting in unnecessary duplication of efforts and waste of the already limited resources. Therefore, the inclusion of diverse stakeholders, and the proper coordination among them, is fundamental for fostering effective water management. Countries are at different stages of their institutional water development and some of them need substantial capacity development and support.

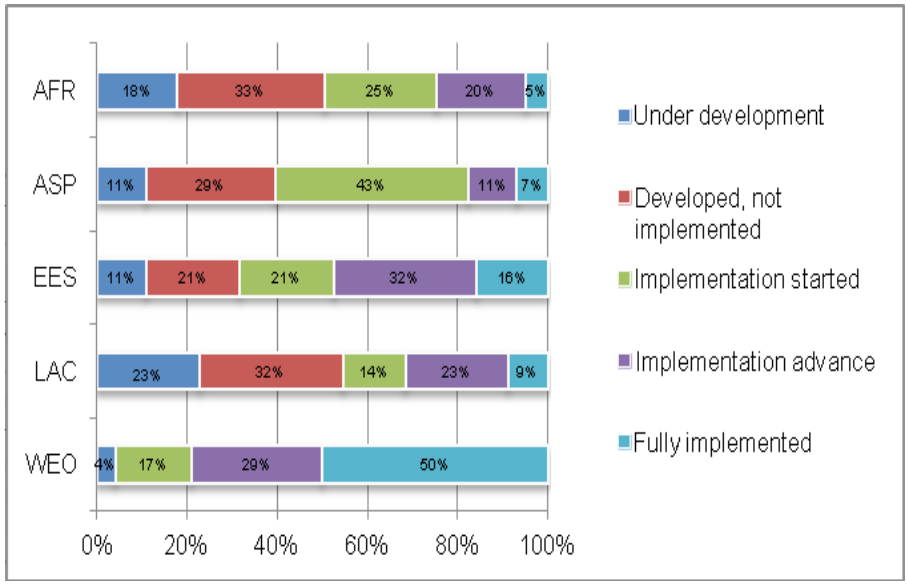

Figure 1: Stakeholder participation in water management by region (including access to information, and involvement of different groups) Source: Adapted from United Nations Environment Programme (UNEP) 2012, p. 23

Key: AFR=Africa; ASP= Asia and the Pacific; EES= Eastern European States; LAC= Latin American and the Caribbean; WEO=Western Europe and Others

Examples and case studies from the UN-Water Decade Program on Capacity Development (UNW-DPC)

The UN-Water Decade Programme on Capacity Development (UNW-DPC) started work on August 2007 (http://www.unwater.unu.edu/). The aim of the programme office is to strengthen the activities of the more than two dozen members and partners cooperating within UN-Water2, and to support them in their efforts to achieve the Millennium Development Goals (MDGs) related to water. This is not only a matter of capacity development related to water, but also of education, training and institutional development on issues linked to water and beyond.

UNW-DPC cooperates with different UN-Water members and partners with the objective of promoting cooperation between the various institutions at national and regional levels on water and water-related issues. These projects attempted to assemble capacities in different areas to a diverse set of stakeholders, in order to disseminate the specific capacities to various relevant sectors. Figure 2 below illustrates the cooperation that UNW-DPC has fostered in the last six years. Each line represents a project or activity; the thickness of the lines represents the number of activities, ranging from 1 (thinnest) to 26 (thickest).

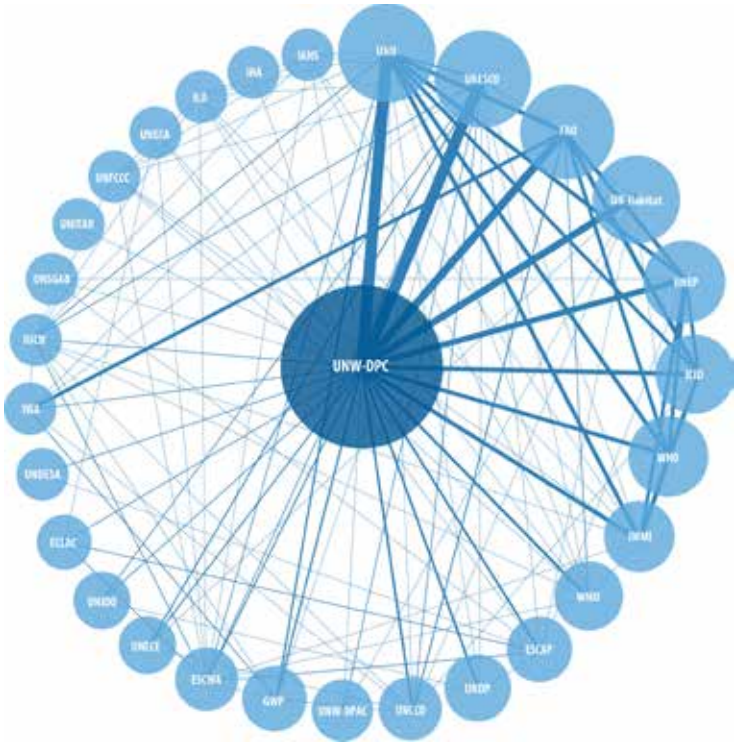

Figure 2: Cooperation map of UN-Water members and Partners in activities coordinated by UNW-DPC between 2007 and 2013

For more information on UN-Water Members and Partners, please visit:
www.unwater.org/about-us/members-and-partners

2 UN-Water is an inter-agency mechanism created to add value to UN initiatives by fostering greater co-operation and information-sharing among existing UN members and outside partners. For more information on UN-Water and UNW-DPC, please refer: www.unwater.unu.edu

The following projects are examples of the efforts for supporting capacity development through an inclusive multi-stakeholder approach.

Drinking Water Loss Reduction

Water loss reduction is one of the vital initiatives that illustrate the relevance of multi-stakeholder approach to capacity development. In September 2008, UNW-DPC together with UN-HABITAT launched an international workshop on "Drinking Water Loss Reduction: Developing capacities for applying solutions". This was followed by a series of regional workshops on the topic. The aim of the regional workshops was to disseminate recommendations from the international workshop, to document available know-how and best practices and to recommend new approaches for more efficient water management approaches with a focus on water loss reduction by water utilities and water operators. The workshop included case study presentations and panel discussions addressing topics such as technical solutions, contextual conditions for creating enabling environments and national and regional initiatives supporting water and sanitation sectors in the region. These workshops also encouraged follow-up projects and the establishment of exchanges between policy makers, water managers, researchers and providers of technical solutions. Through a series of regional workshops for Latin America and the Caribbean countries, Arab countries and South East Europe region, this training initiative reached around 500 participants from 37 countries, representing the different water utilities in the countries.

For more information visit: www.unwater.unu/read/water-loss-reduction

Safe Use of Wastewater (SUWA)

UNW-DPC, under the auspices of UN-Water, addressed the issue of the safe use of wastewater by bundling the competencies and experiences of its members and partners. The SUWA project promoted the inclusion of multiple stakeholders as both organizers and participants. SUWA brought together experts from six UN-Water members and partners coming from different fields including agriculture, water treatment, irrigation, health, environment and related themes: The World Health Organization (WHO), the Food and Agriculture Organization of the United Nations (FAO), the United Nations Environment Programme (UNEP), the United Nations University Institute for Water, Environment and Health (UNU-INWEH), the International Water Management Institute (IWMI) and the International Commission on Irrigation and Drainage (ICID). The organizers shared their expertise through five regional training workshops held in Africa, Asia, and Latin America and an international wrap up workshop conducted in March 2013. The participants of the regional workshops represented from different countries and disciplinary backgrounds and sectors: 71% from government, 16% from research and development, with the rest coming from the civil society and water utilities. This allowed the diverse group of stakeholders to exchange views; build professional networks and learn from each other. SUWA facilitated improved capacities among stakeholders including decision makers and experts by creating a common platform for the exchange of knowledge and experiences.
For further information, please visit: www.ais.unwater.org/wastewater

National Drought Management Policies (NDMP)

Another initiative with a multi-stakeholder approach deals with Capacity Development to Support National Drought Management Policies (NDMP). The aim of the initiative is to develop institutional capacities to support countries apply proactive, risk-based drought management policies to reduce the impact of droughts instead of implementing emergency and recovery strategies that regulate disaster response after droughts have taken their toll.

The initiative was launched jointly by the World Meteorological Organization (WMO), the Food and Agriculture Organization (FAO), the United Nations Convention to Combat Desertification (UNCCD) and the UNW-DPC and recently joined by the Convention on Biological Diversity (CBD). The initiative is being undertaken under the umbrella of UN-Water. This initiative is implemented through regional capacity development workshops with stakeholders from diverse ministries, covering Eastern Europe, Latin America and the Caribbean, Asia and the Pacific and Africa. Given the diversity of countries and the nature of drought they face, NDMP does not prescribe a definitive set of elements for national drought policy, but it rather provides a set of elements guiding the policy development in each country's specific situation. To this end, each country is represented by various ministries ranging from meteorology to agriculture, environment and water, so that any outcome towards national policies is based on a multi-stakeholder approach. The first two regional workshops, for Eastern European and Latin American countries have taken place in Bucharest/Romania and Fortaleza/Brazil respectively.

For further information, please visit: www.ais.unwater.org/droughtmanagement

Conclusions

These activities illustrate the recognition of the importance of multi-stakeholder approaches by UN-Water member and partners. All of them include diverse stakeholders and the promotion of communication and cooperation among them in order to reach common goals.

Nowadays water resources management is understood as an ongoing process involving multiple stakeholders (Global Water Partnership 2004). These different stakeholders share water resources and the challenges surrounding their effective management affect them all. In this sense, a stakeholder could be seen as a either an active or passive member of a network. Therefore promoting the cooperation among the different stakeholders in each network is highly important when addressing different water-related challenges, particularly in policies for developing countries, which often are formed through a top-down approach, disregarding the input of local stakeholders. The inclusion of a multi-stakeholder approach supports the strengthening of national institutions.

The multi-stakeholder approach to institutional capacity development in water and water related issues has many facets. Water is a connector among various sectors. Thus, raising capacities of stakeholders dealing with water issues in order to strengthen national institutions as such requires the involvement of all sectors which deal with water.

As explained above, the initiatives at the UN-Water Decade Programme on Capacity Development (UNW-DPC) are distinctive in that key stakeholders from a number of UN organizations put together their efforts to carry out the capacity development workshops. What is even more appealing is that the beneficiaries of the capacity development themselves are also varied stakeholders coming from diverse fields related to water including environment, health, climate, agriculture, meteorology, etc. Creating a common platform for stakeholders at different levels and different settings and sectors from various disciplines adds value to capacity development.

References

Allan, J. A. 2000. The Middle East Water Question: Hydropolitics and the Global Economy. London: I.B. Tauris.

Global Water Partnership. 2004. "Catalyzing Change: A Handbook for Developing Integrated Water Resources Management (IWRM) and Water Efficiency Strategies". 5. Background Paper. New York: United Nations Department of Economic and Social Affairs.

Lenton, R. L., Albert Morgan Wright, and Kristen Lewis. 2005. Health, Dignity, and Development: What Will It Take? Task Force on Water and Sanitation. London ; Sterling, VA: Earthscan.

United Nations Environment Programme. 2012. "UN-Water Status Report on the Application of Integrated Approaches to Water Resource Management". Nairobi, Kenya: United Nations Environment Programme (UNEP).

Wolff, Gary, and Peter H. Gleick. 2002. "The Soft Path for Water." In The World's Water 2002-2003: The Biennial Report On Freshwater Resources, edited by Peter H. Gleick. Washington D.C.: Island Press.

World Commission on Dams. 2000. Dams and Development: a New Framework for Decision-making. London: Earthscan.

World Water Assessment Programme, and UN-Water. 2012. United Nations World Water Development Report 4 : Managing Water Under Uncertainty and Risk. World Water Development Report 4. Paris: UNESCO.

Fostering water management through capacity development - Lessons from the International Water Research Alliance Saxony (IWAS)

Marco Leidel [1], Jörg Seegert [2], Steffen Niemann [3], Catalin Stefan [4], Hoang Mai Phan [4], Corinna Weigelt [5] , Jens Grundmann [1], Franz Lennartz [6], Christian Bernhofer [1]

[1] Technische Universität Dresden, Institute of Hydrology and Meteorology, Germany
[2] Technische Universität Dresden, Institute for Urban Water Management, Germany
[3] Helmholtz Centre for Environmental Research (UFZ), Department Aquatic Ecosystems Analysis and Management, Germany
[4] Technische Universität Dresden, Institute of Waste Management and Contaminated Site Treatment, Germany
[5] DREBERIS GmbH, Germany
[6] UAE University, Department of Aridland Agriculture, Al Ain, United Arab Emirates

Abstract

The global water community acknowledges more and more that integrated water resources management (IWRM) is an important concept for improving water management. Its implementation is a long and difficult process with several obstacles that have to be overcome. It is increasingly recognized that inadequate governance structures and especially the gap between existing and required capacities in the water sector constrain an enhanced water resources management.

Therefore, a key objective of the International Water Research Alliance Saxony (IWAS) is to support the implementation process of IWRM by developing and executing capacity development (CD) concepts and ensuing problem specific CD measures. IWAS addresses the most pressing challenges in the water sector, esp. focusing on drinking water and sanitation, agricultural irrigation and surface water quality to develop innovative solutions in different model regions worldwide To foster the implementation of such approaches a specific IWRM concept was developed which integrates CD and its measures on all relevant levels: the individual, the organisational as well as the enabling environment, i.e. harmonising processes of IWRM and capacity development

This approach is illustrated by successful case studies: on the individual level through an electronic learning module on IWRM jointly developed with the German IHP/HWRP Secretariat, as well as a pilot farms programme in Oman; on the institutional level by setting up a water competence centre in Vietnam, an installed IWRM office in Oman and the strengthening of the

1 Marco Leidel
Technische Universität Dresden, Institute for Hydrology and Meteorology
01062 Dresden, Germany
marco.leidel@tu-dresden.de

Ukrainian water association; on the systemic level by strengthening the river basin management approach in the Ukraine.

Based on the selected CD measures we show the high relevance of harmonizing both concepts (IWRM and CD), its inherent links to modelling, technology and socio-economic aspects as well as lessons learnt from this complex process in an international context.

Introduction

Acknowledging the fact that IWRM is an important concept for improving water management, it is nevertheless clear that its implementation is a difficult process that is still in its infancy.

Several key challenges have been identified by (Charbit 2011) and (OECD 2012) that constrain effective and efficient water management, namely the administrative gap, policy gap, objective gap (i.e. contradicting targets), accountability gap (i.e. lack of transparency), funding gap, information gap and the capacity gap. It is still an object of research, how such factors contribute to a successful and sustainable implementation of IWRM. One promising factor in this respect is capacity development and its alignment with water resources management (Alaerts and Kaspersma 2009; Leidel, Niemann, and Hagemann 2012).

The International Water Research Alliance Saxony (IWAS) aims to contribute to an Integrated Water Resources Management in hydrologically sensitive regions by developing specific system solutions (Eastern Europe-Ukraine, Central Asia- Mongolia, South-East Asia- Vietnam, Middle East- Oman and Saudi-Arabia, and Latin America- Brazil). More than 100 scientists and collaborators from Germany and the model regions address the most pressing challenges in the water sector, especially focusing on drinking water and sanitation, agricultural irrigation as well as surface water quality to develop innovative solutions in the model regions (Kalbus et al. 2012). Another crucial point of IWAS is the integration of cross-cutting issues like scenario and system analysis, governance, the development of technologies and its implementation and capacity development in order to comprise all facets of water management.

Capacity Development within IWAS

One essential research question within IWAS was how to support effectively the implementation process of IWRM by adequate capacity development measures that fit to the existing water resources problem.

Within IWAS, we refer to the definition of the UN Development Programme Capacity Development Group (2008) that Capacity development (CD) is the "process through which individuals, organizations and societies obtain, strengthen and maintain the capabilities to set and achieve their own development objectives over time".

At the outset, an adapted IWRM concept integrating CD was developed, setting the stage for more context and regional specific CD concepts within the model regions on the

individual as well as on the institutional level (organisational level and enabling environment, (Leidel, Niemann, and Hagemann 2012). That means that a multi level approach was applied distinguishing between different levels of CD measures, namely between the individual level (education and training), the organisational level (organisational development) and the enabling environment, i.e., the improvement of the societal and political system (cf. Van Hofwegen 2004; Alaerts 2009).

Moreover, it could be shown that harmonising processes of IWRM and CD foster the implementation process (Leidel, Niemann, and Hagemann 2012). In particular systems analysis/ modelling, governance analysis and capacity assessment have to be interrelated and aligned for supporting water management. As important as the analysis of the biophysical processes is therefore the identification of social and political boundary conditions and the available capacities. In this context the identification of all relevant stakeholders is decisive , not only for bringing existing competencies forward but also for anticipating problems towards a context-specific IWRM.

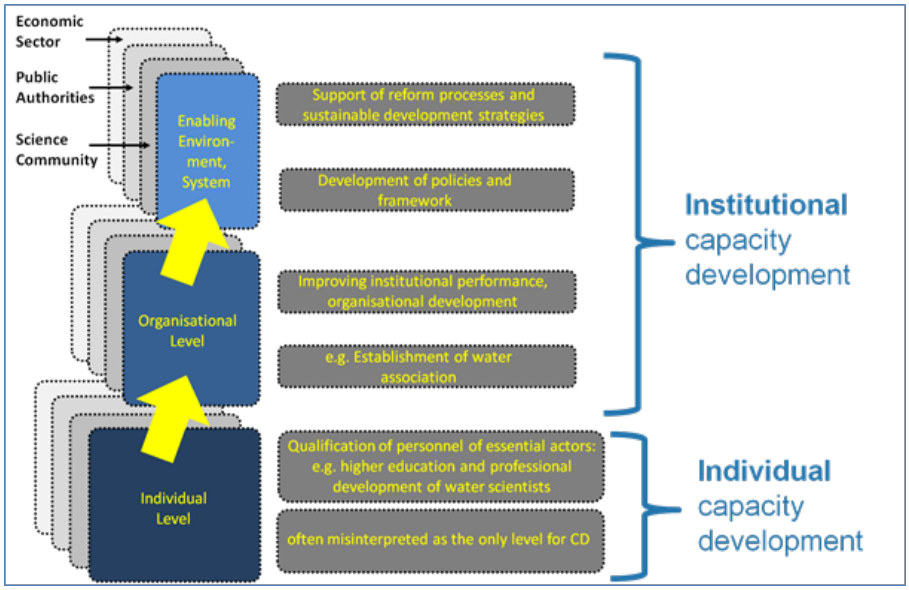

Figure 1: Multi-level approach within IWAS (modified from (Leidel, Niemann, and Hagemann 2012)

A central part of the CD strategy in the model regions was to conduct profound capacity assessments in order to identify the needs and to evaluate what kind of development is possible in the short and long-term. Therefore, in cooperation with the actors in the model region we identified the future requested status of the water resources management, and in some regions the desired status of a specific part of water management. This is to be followed by an analysis of available capacities in the water sector and eventually by the development of a CD strategy with the identification of feasible solutions. For assuring the implementation of this strategy drafting of a work plan and a schedule together with the commitment of stakeholders is important.

Capacity Development measures within IWAS

Within IWAS, various CD measures on the individual level have been planned and executed based on the capacity assessments mentioned above. The target groups for the measures were the scientific community, the public authorities, and the economic sector as well as the public in general, for instance schools. As it can be seen in Figure 2 the institutional as well as the individual level is addressed.

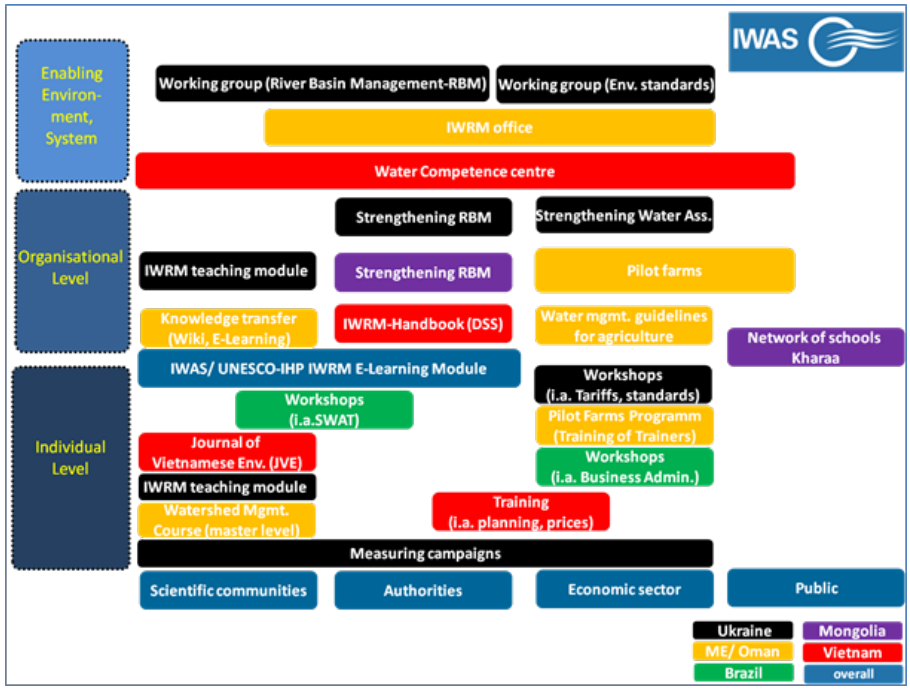

Figure 2: Overview of CD measures within IWAS

Capacity Development measures within IWAS - individual level

On the individual level two examples are explained within this article. The first is an e-learning module on IWRM called IWRM-education that has been jointly developed by IWAS and the German Secretariat of the International Hydrological Programme of UNESCO and Hydrology and Water Resources Programme of WMO (IHP/HWRP)[2].

This module was developed, because the worldwide implementation of IWRM is still dissatisfying and therefore, the IWRM education has to be improved. IWRM-education is expected to complement learning options at universities as well as at vocational training centres instead of substituting it.

2 This work was funded by the German Federal Ministry for Education and Research (BMBF) within the project "IWAS—International Water Research Alliance Saxony" and by the German Federal Ministry for the Environment (BMU). It would not have been possible without the enormous contribution by participating lecturers.

It is one possibility to highlight the linkages within IWRM between natural, social, and engineering sciences and to support probably the implementation of IWRM (Leidel et al. 2012). Since no lecturer can cover all IWRM aspects and their interrelations in detail, the module interlinks lectures, i.e. interdisciplinary thematic correlations are shown (e.g. climate change) and appear as hyperlinks between the lectures (ibid.). This enables the user to switch and navigate between the lectures. Relevant topics have been selected for a broad representation of current water issues while acknowledging that it is impossible to cover the full range of IWRM topics. At the moment, more than forty interlinked lectures and case studies are available, yet further lectures and hyperlinks will be integrated. IWRM-education can be found under the following URL: http://www.iwrm-education.de.

Figure 3: Screenshot of the e-learning module IWRM-education

The second example of an individual CD measure within IWAS was the pilot farms programme, developed in the project region of the Sultanate of Oman. The region is infected by saltwater intrusion into a coastal aquifer system due to overexploitation of local groundwater resources by irrigated agriculture. Since irrigation is performed quite inefficient, the major goal of the pilot farms is to demonstrate best management practices for irrigated agriculture using modern irrigation techniques as well as controlled deficit irrigation strategies within a train-the-trainer programme. Such techniques are beneficial, since they show increased irrigation efficiency (more crop per drop) and decreased nutrient leaching, performed either by fully automated (sensor-based) irrigation control or site specific irrigation calendars (Fig. 4). Fields for demonstration of traditional versus modern irrigation practices on pilot farms are monitored intensively in order to allow for a comprehensive comparison of results (e.g. crop yields, applied water, soil water

and plant status) and to convince farmers that similar (or higher) yields can be obtained with less water. In this context, the pilot farms serve as knowledge transfer centres for farmers. They are supported by a local farmer association with awareness programmes, further education and practical training e.g. on farm management recommendations (crop pattern, fertilisation, economy, etc). Eventually, the trainers train then the farmers, i.e. an on-farm-programme is deployed and thus having a cost free consulting to every farmer. One of the products used for the pilot farms programme is an illustrated guide book of best management practices in irrigated agriculture. It contains site specific irrigation calendars as a graphical representation of irrigation schedules with reduced text elements, since most of the workers on the farms are illiterate, respectively cannot read Arabian language that is spoken in Oman (Fig. 4). The calendar illustrates when and how long a crop should be irrigated within its different stages of life (valid for the settings displayed in the box of Fig. 4). Additionally, the pilot farms are also an example for knowledge transfer from science to practice since irrigation schedules (resp. calendars) are obtained by applying highly sophisticated scientific methods (Schütze and Schmitz 2010; Grundmann et al. 2012). Thereby, physically based crop growth modelling together with custom made evolutionary optimization are used for optimal irrigation scheduling considering climate variability. Methods were tested by field experiments performed by Omani PhD students.

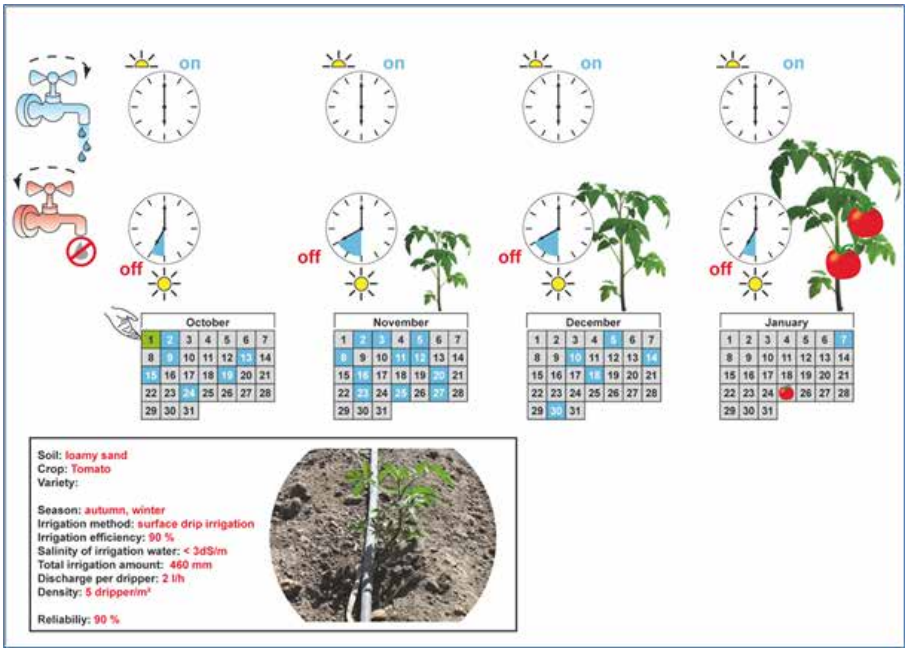

Figure 4: IWAS Oman: Pilot farm programme- site specific irrigation calendar from guide book of best management practices for irrigated agriculture; source: (Schütze, Kloß, and Schmitz 2010)

Capacity Development measures within IWAS - institutional level

Measures on the individual level are important for strengthening the water sector, yet they are only sustainable if they are combined with an institutional capacity development strategy. Consequently, IWAS was elaborating on the institutional capacity development level as well. Out of this bundle of measures, two examples are shown here.

Firstly, within the model region Vietnam, a Water Competence Centre is currently established for streamlining CD activities and as a hub and focal point for CD in the Vietnamese water sector. The Vietnamese Prime Minister and the responsible ministries have approved the project, inter alia the Ministry of Construction (MoC). This is flanked by a partnership project in Vietnam between German Water Partnership (GWP) and Vietnam Water and Sewerage Association (VWSA) where the development of partner associations is supported as well as to strengthen VWSA in the dialog with the politics[3]. Moreover, the exchange and mutual learning for members of associations will be facilitated inter alia by developing and implementing curricula for education and vocational training.

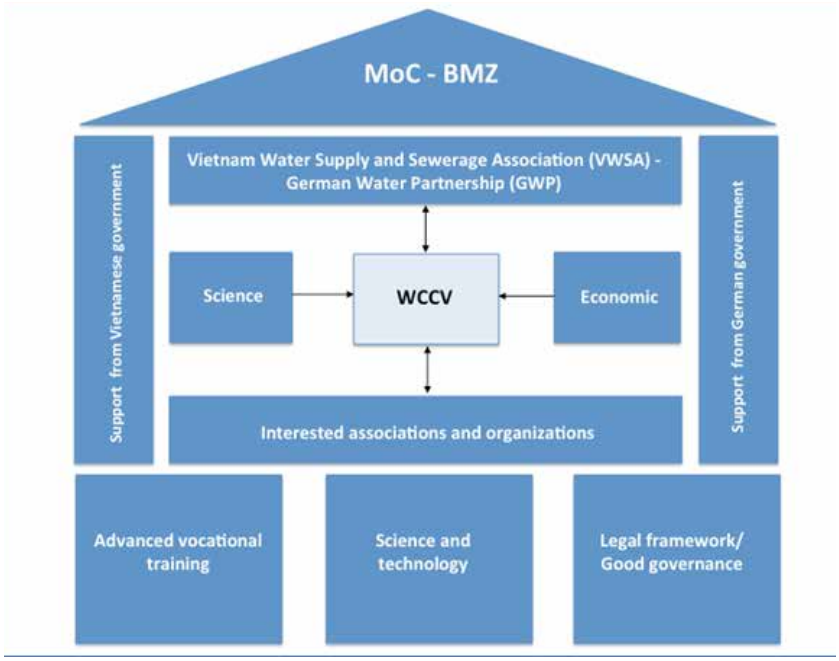

Figure 5: Water Competence Centre Vietnam (WCCV)

A further example for institutional capacity development is the strengthening of a water association in Ukraine. The objective is to support the Ukrainian sector association "Ukrvodokanalekologia" with knowledge transfer and to facilitate cooperation between GWP and Ukrvodokanalekologia. In this respect, IWAS and GWP established a working group together with the Ministry of regional

3 Funded within the Chambers and Associations Partnership Programme (KVP), by the German Federal Ministry for Economic Cooperation and Development (BMZ). Project duration: June 2013 – May 2016 with potential prolongation for further 3 years.

development, construction, housing and communal economy, the National Commission for the regulation of communal services and Ukrvodokanalekologia. Topics covered within the working group comprise among other things standards and standard setting, as well as cost and tariff regulation. These measures were again embedded in a profound capacity strategy for the model region Ukraine, where institutional capacity development was combined and interrelated with individual measures for water services provider, the scientific community as well as environmental and especially water authorities (cf. Leidel, Niemann, and Hagemann 2012). Among other things, curriculum development for IWRM courses at universities was elaborated. Moreover, a dialogue within a working group towards a better river basin management with the environmental authorities was initiated that lead to the first meeting of the river basin council within our model region (Western Bug River Basin) since six years. These combined and adapted individual and institutional measures contributed to strengthen the river basin management approach in Ukraine.

Lessons learnt

It was shown within the IWAS project that a combined IWRM and CD process is a necessary factor for supporting IWRM implementation, i.e. an adaptation to the respective context. Thus, understanding of the man-environment system is essential in terms of the biophysical processes as well as the socio-economic and governance system and its available capacities. Project work within the model regions showed that systems analysis and capacity assessments have to be carried out simultaneously and have to be attuned to each another for improving water management on all levels. Furthermore, previous studies have necessarily to be considered, in our case for instance from World Bank Independent Evaluation Group (2008), that showed the mutual dependency of institutional and individual capacity development, which was confirmed within the IWAS project.

IWAS experience also revealed that CD is a long term and continuous process, and that institutional CD is a highly political and social process, where the identification of the relevant key actors followed by close personal contacts and trust building are decisive factors for success.

Our self-conception was to act merely as initiator and facilitator for the CD process, since CD should be an endogenous process, i.e. a process that is realised by the members of society in the model regions (q.v. Ubels, Fowler, and Acquaye-Baddoo 2010) respecting the different hierarchies to develop and adopt the specific measures. Therefore, a focus was on strengthening the communication and collaboration between actors as well as the strengthening of associations embedding the resultant measures in robust and long lasting structures. This is accompanied by narrowing the knowledge gap by means of dialogue, information systems, curriculum development and competence centres. We conceive knowledge exchange as facilitator for learning within the realm of water resources management and thus for supporting water sector evolution. Moreover, the facilitation of the CD process and the knowledge exchange contributed to narrow the science-policy-interface.

Last but not least, it has to be emphasized that IWRM is a political process, and thus the willingness to act is essential next to the factors mentioned above. Consequently, a major factor is to encourage actors to support the change process, which is normally time consuming

and requires a lot of staying power. Therefore, it is important to verify the applicability of the measures and prepare the follow-up process at an early stage of the running activities. The transition and knowledge transfer from medium-term research and implementation projects like IWAS to follow up projects, e.g. more long-term projects within the development cooperation, has to be assured. Within the EU, for instance, twinning projects for water authorities, i.e. the collaboration of authorities from EU member countries with authorities from other neighboring countries are a well-proven method for capacity development and knowledge transfer.

References

Alaerts, G. J. 2009. "Knowledge and Capacity Development (KCD) as Tool for Institutional Strengthening and Change." In Water for a Changing World: Developing Local Knowledge and Capacity, edited by G. J. Alaerts and N. L Dickinson, 5 – 26. The Netherlands: CRC Press.

Alaerts, G. J., and J. M. Kaspersma. 2009. "Progress and Challenges in Knowledge and Capacity Development." In Capacity Development for Improved Water Management, edited by M. W. Blokland, G. J. Alaerts, J. M. Kaspersma, and M. Hare, 3 – 30. London: CRC Press.

Charbit, C. 2011. "Governance of Public Policies in Decentralised Contexts: The Multi-level Approach". OECD Regional Development Working Papers 2011/04. OECD Publishing.

Grundmann, Jens, Niels Schütze, Gerd H. Schmitz, and Saif Al-Shaqsi. 2012. "Towards an Integrated Arid Zone Water Management Using Simulation-based Optimisation." Environmental Earth Sciences 65 (5): 1381–94. doi:10.1007/s12665-011-1253-z.

Kalbus, Edda, Thomas Kalbacher, Olaf Kolditz, Elisabeth Krüger, Jörg Seegert, Gunda Röstel, Georg Teutsch, Dietrich Borchardt, and Peter Krebs. 2012. "Integrated Water Resources Management Under Different Hydrological, Climatic and Socio-economic Conditions." Environmental Earth Sciences 65 (5): 1363–66. doi:10.1007/s12665-011-1330-3.

Leidel, M., S. Niemann, and N. Hagemann. 2012. "Capacity Development as a Key Factor for Integrated Water Resources Management (IWRM): Improving Water Management in the Western Bug River Basin, Ukraine." Environmental Earth Sciences 65 (5): 1415–26. doi:10.1007/s12665-011-1223-5.

Leidel, Marco, Steffen Niemann, Alemayehu Habte Saliha, Johannes Cullmann, Niels Seidel, Dietrich Borchardt, Peter Krebs, and Christian Bernhofer. 2012. "International Viewpoint and News: IWRM Education: E-learning Module on Integrated Water Resources Management." Environmental Earth Sciences 68 (2): 609–13. doi:10.1007/s12665-012-2059-3.

OECD. 2012. Meeting the Water Reform Challenge. OECD Studies on Water. Washington: OECD doi:10.1787/9789264170001-en.

Schütze, N., S. Kloß, and G. H. Schmitz. 2010. "Evaluating Potentials and Corresponding Risks of Optimal Deficit Irrigation Strategies in Oman Under Climate Change." In , edited by W. Al-Zubari. Muscat, Oman.

Schütze, Niels, and Gerd H. Schmitz. 2010. "OCCASION: New Planning Tool for Optimal Climate Change Adaption Strategies in Irrigation." Journal of Irrigation and Drainage Engineering 136 (12): 836–46. doi:10.1061/(ASCE)IR.1943-4774.0000266.

Ubels, Jan, Alan Fowler, and Naa-Aku Acquaye-Baddoo. 2010. "Learning About the Field of Capacity Development: Characteristics, Practitioner Challenges and Future Perspectives." In Capacity Development in Practice, edited by Jan Ubels, Naa-Aku Acquaye-Baddoo, and Alan Fowler, 295 – 306. London ; Washington, DC: Earthscan.

UN Development Programme Capacity Development Group. 2008. "Capacity Development Practice Note". New York: United Nations Development Programme.

Van Hofwegen, P. 2004. "Capacity-building for Water and Irrigation Sector Management with Application in Indonesia." In Capacity Development in Irrigation and Drainage: Issues, Challenges and the Way Ahead, edited by Food and Agriculture Organization of the United Nations, 53 – 62. FAO Water Reports. Rome: Food and Agriculture Organization of the United Nations.

World Bank Independent Evaluation Group. 2008. Using Training to Build Capacity for Development: An Evaluation of the World Bank's Project-based and WBI Training. Washington, D.C: World Bank.

Lessons learned with multi-level approaches for capacity development in applied research projects

***Ralf Ibisch*[1], *Dietrich Borchardt* [1], *Steffen Niemann* [1], *Ruth Goedert* [1 2], *Marcela Muñoz* [2], *Anna-Katharina Hornidge* [3], *Muhammad Ikhwan* [4], *Alexia Krug von Nidda* [5], *Jörg Felmeden* [5], *Oliver Schulz* [5] *and Marco Leidel* [6]**

[1] *Helmholtz Centre for Environmental Research GmbH – UFZ*
[2] *Training & Demonstration Centre for Decentralized Sewage Treatment – BDZ*
[3] *Center for Development Research (ZEF), University of Bonn*
[4] *Karlsruhe Institute of Technology (KIT)*
[5] *Institute for Social-Ecological Research – ISOE*
[6] *Technische Universität Dresden, Institute of Hydrology and Meteorology*

Abstract

The German Federal Ministry of Education and Research (BMBF) has supported numerous research projects on Integrated Water Resources Management (IWRM) within the funding initiative "Integrated Water Resources Management" from 2006 to 2015, with partners from universities, research institutes and commercial enterprises. The scientific accompanying project "Networking the BMBF-funding activity on Integrated Water Resources Management" has encouraged dialogue between all actors in science, politics, administration, economy and civil society in order to achieve synergy effects from the various activities. Important synergies have resulted from the founding of the BMBF funding initiative "Global change and the Hydrological Cycle" (GLOWA) for example, and "Research for the sustainable development of the megacities of tomorrow". One of the accompanying project's aims is to initiate and support, compile and prepare content-driven dialogue on cross-cutting topics.

This paper encompasses and summarises current concepts and core issues of capacity development as a core element in the realisation of Integrated Water Resources Management in developing countries. We present findings from workshops and working groups which took place from 2009 to 2013. The necessity and goals for conducting capacity development will be presented first, followed by a brief overview of the literature on conceptional approaches in order to derive the necessary demands for an implementation strategy for capacity development. The results of a survey on current capacity development strategies in 17 joint research projects will be presented, and conclusions drawn for the structuring of future concepts.

1 Ralf Ibisch
Helmholtz Centre for Environmental Research – UFZ
Department Aquatic Ecosystem Analysis and Management
Brueckstrasse 3a, 39114 Magdeburg, Germany
ralf.ibisch@ufz.de

Introduction

The Federal Ministry of Education and Research (BMBF) supports the concept of Integrated Water Resources Management (IWRM) in developing countries, through its funding initiative. The aim of all research projects supported within the context of the funding initiative is the development of adaptable and transferrable IWRM strategies. Research groups are confronted with comparable challenges, but work under strongly varying political, socio-cultural and environmental conditions. A whole variety of topic-related projects and programs also exist that, with BMBF support, work on similar thematic complexes on the integrated management of water resources (see www.bmbf.wasserressourcen-management.de). A central focus of the IWRM collaborative research projects within the BMBF funding initiative is the transfer of specific and affordable water system technologies and services for the solution of regional water problems. Many of the system solutions requiring implementation are based on know-how and the expertise of German scientific institutes and companies.

Against this background the capacity of individuals, organisations and societies for action is a greatly significant prerequisite for the achievement of the sustainability approach in the IWRM process and thus for realising of the Millennium Development Goals. Strengthening personal responsibility in the development of solution strategies (ownership) and adhering to a participatory approach e.g. introducing of a balance of interests between various water-use requirements, are central elements in the capacity for action. The implementation of specific water technologies in model regions must continue to be accompanied by specific training programmes in order to avoid user errors and increase long-term personal responsibility in the operation and maintenance of technical installations. Not least, sensitising the public to the sustainable handling of the resource water plays an important role in the acceptance of national IWRM strategies.

This paper bundles and conceptualises experiences with capacity development from the IWRM joint research projects and places them in the context of international efforts for sustainable development. The aim of this paper is to document sustainable approaches and concepts within capacity development.

Capacity Development

There is currently no internationally broadly accepted definition of the term "capacity development". The authors of this paper however follow the United Nations definition, whereby capacity development is defined as an integral process for the mediation, strengthening, preservation and further development of individual, organizational and societal capabilities, in order to i) realise functions, ii) solve problems and iii) set and achieve sustainable goals (UNDP 2009). This approach is essentially comparable to the approach taken by the German Development Cooperation: "Capacity development is an integrated process in which people, organisations and societies mobilise, preserve, adapt and develop their ability to structure their development in a sustainable manner (GTZ 2007). The aspect of achievement potential for good governance is emphasised in other publications however (Ernstorfer and Stockmayer 2009).

In recent years the transformation of the term from capacity building to capacity development has been completed (Lopes and Theison 2003), and increasingly more weight has been placed on locally available, endogenic potentials. "Capacity" in this context is to be understood as the abilities of individuals, organisations or systems to perform certain functions in an efficient, effective and sustainable manner (UNDP 1998). In this older definition, three aspects become clear: 1) "capacity" is not a passive condition but a continual process, 2) human capital and its use must continually adapt to change, and 3) strategic capacity development must consider the context in which organisations perform their functions.

According to Alaerts (2009) "capacity" is to be understood as the ability of a society to (i) identify and understand situations and/ or problems, (ii) label these problems, (iii) learn from experience, and (iv) increase knowledge, in order to master future problem areas.

The concept of capacity development is oriented integratively to the environment and the whole system, in which individuals, organisations and societies act and interact. Even if the focus is for example on the development of an organisation or administration for the realisation of a certain task, this cannot take place without consideration of the legal and political environment. Capacity development does not mean that capacities are fully absent in a certain region, but that existing capacities are to be developed and enhanced so that certain functions can be performed.

Measures for the solution of water problems can only be sustainable when the generated knowledge of possible problem solutions is rooted in the regions themselves and adapted to the locally specific environmental, social, technical and institutional conditions.

Levels of Capacity Development

"There is enough water for everyone" was stated in United Nations World Water Development Report in 2006. Problems result not from insufficient water but from insufficient water management. Extensive knowledge and capabilities for the efficient handling of water are needed in order for this to improve. This effects all water users, organisations directing the water sector and societal systems as well as the framework conditions which ultimately determine the available room for development within the water sector. Capacity development is thus particularly significant in realisation strategies and the implementation of integrated water resources management, and plays a fundamental role in the BMBF-supported research projects in developing countries.

The basic concept of capacity development is established on various levels and takes the specific requirements of a target region into account. The definition of target groups and target levels is directed by the specific needs of each, and, in the international literature is structured as follows in the relevant context:

- Target levels: Individuals, organisations and societies (often also used in the context of international development cooperation)

- Target groups: Schools, science, economy, administration, general public, users and communities
- Laypersons, decision makers, users (of technical installations), water users (Schramm 2009)
- Decision makers, users and general public (Borgmann et al. 2009)

We also briefly present the multilevel approach according to van Hofwegen (2004) and Alaerts (2009) (Fig. 1), which encompasses three action levels: 1) the individual level, 2) the institutional level and 3) the "enabling environment", which describes the legal and/or political framework conditions.

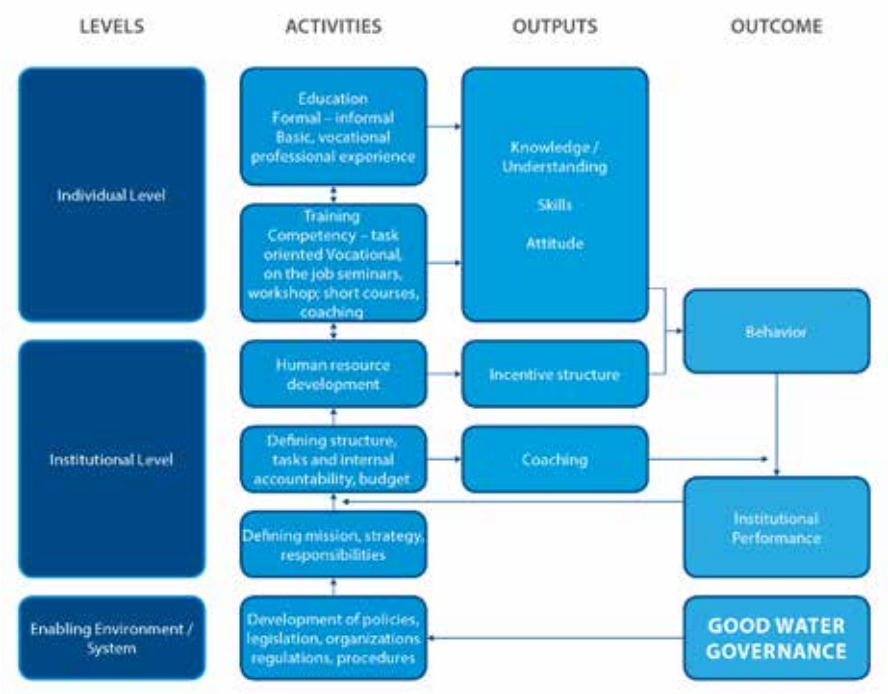

Figure 1: Multilevel approach for Capacity Development (according to van Hofwegen 2004 and Alaerts 2009, adapted by the authors)

The individual level encompasses educational measures and training courses offered by various stakeholders, serving all aspects of learning (knowledge, understanding, acquisition of skills and attitudes) so that sustainable success of the measures can be expected. The individual level is embedded in organisational structures, i.e. on the institutional level. On this level fundamental measures for organisational development are realised: the development of strategies, allocation of responsibilities and accountabilities, amongst others.

The framework conditions (the "enabling environment"), i.e. legislation, the development of administrative regulations etc., are by contrast usually covered indirectly by measures in individual and institutional sectors, or directly through political consultation. Note that all target groups, i.e. school, general public, administration and science are represented on all three levels and are closely interlinked (Leidel et al. 2012).

The "enabling environment" can be divided into the areas of institutional framework conditions and the civilian population. The knowledge and capabilities of individuals determine the productivity and efficiency of higher-level institutions. The power of these organisations depends on the one hand on the behaviour of individuals, and on the other hand on the organisation's own structural capacity (qualifications, incentive procedures and administrative processes). Knowledge, understanding and abilities are transferred to the individual through knowledge tools such as education and training.

Government representatives and other actors on the "enabling environment" level must therefore also learn these skills and their ability to lead is judged accordingly. Political decision-makers learn mostly from international sample projects in which sustainable processes have been implemented with the concept of "good professional practise". These capacities exist in society as social capital or traditional knowledge. Networks, technical consulting and peer-learning activities also serve for the exchange of knowledge (Blokland et al. 2009).

Fundamental principles for sustainable Capacity Development

The BMBF funds research projects on Integrated Water Resources Management in developing countries: The IWRM concepts which are to be developed refer to entirely different water problem situations and take place in strongly varying environmental, social, technical and institutional framework conditions. Capacity development measures must always be oriented to local conditions in order to take the proffered orientation to sustainability principles into account. General concepts in capacity development are thus to be understood as conceptual guidelines and do not refer to concrete capacity development measures. These measures are to be specifically adapted to the local situation, to institutional structures and local requirements for capacity development as far as possible.

The following guidelines can be outlined based on experiences gained within the IWRM projects:

1. Capacity development is to be seen as a central element in the implementation of IWRM concepts. Without the ability of actors involved in the water sector to develop, carry out and continue a specific IWRM concept, efforts by the research projects for the sustainable implementation of research results in developing countries will not succeed in achieving their goals. The development of an implementation strategy for capacity development should thus run complementary to the development of an IWRM roadmap. As both processes on capacity and IWRM are mutually dependent, early harmonisation of both processes should be prioritised up to the stage of operational

IWRM implementation (Leidel et. al 2012). Capacity development requires a long-term approach in order to take the requirements for supporting sustainability into account.

2. Capacity development is to be understood as activities that extend above and beyond knowledge transfer on the individual level. Capacity development is a broad approach which is only successful when measures on the institutional and systematic level are addressed and when action competencies of various actors are strengthened within the IWRM context (see definition).

3. Capacity development is an adaptive and iterative process which reacts with a constant follow-up to changes, and integrates the needs of the actors in emerging economies (demand-oriented) and actors in the research projects (supply-oriented). Ideally the process chain for capacity development can be represented as a spiral (Fig. 2). It begins with contact to important stakeholders, the establishment of a broad network, clear (political) commitment and collaborative working towards goals (what can be achieved with capacity development?).

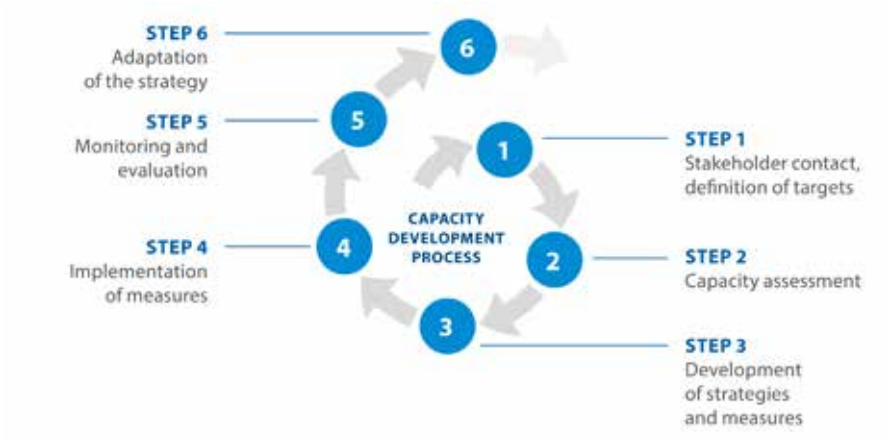

Figure 2: Continuous implementation strategy for Capacity Development as an adaptive and iterative process (according to UNDP 2009, expanded)

4. The conception and subsequent implementation of measures is always based on a preliminary and profound needs assessment (capacity assessment). A review of existing environmental and engineering science resources should be conducted in advance, in order to reflect the close dovetailing with the IWRM implementation process. Capacity assessment should also encompass or precede an analysis of actors if possible, and an analysis of the institutional framework conditions in order to derive existent or absent competencies (capacity gaps) for an operational IWRM. The needs assessment must not necessarily be performed by research projects. There are needs assessments already available for many countries (e.g. by GIZ for Zambia, Tanzania, Bolivia) which can be referred to.

5. The development of measures must be prioritised as duration and financial resources for research projects are limited and measures must be cost-effectively structured. Simultaneous planning for the long-term implementation of the capacity development approach for each target nation should take place, e.g. through networking with other educational providers. In Germany there is a range of carriers and offers on capacity development which is fundamentally worth considering for networking: GIZ, KfW, Water Sector Professional Associations (e.g. DWA), universities (collectively through IPSWAT / DAAD, corporations (e.g. the Education and Demonstration Centre for Decentralised Waste Water Treatment - BDZ e.V.), consulting companies, research projects and the German Water Partnership.

6. An implemented concept for capacity development requires the involved actors to evaluate and review individual measures and the overall strategy (OECD 2006). In a best case scenario, leading on from the results of evaluation lessons learned will be derived and subsequent further development of the concept will also be pursued. The need for external evaluation of strategy and individual measures can not be definitively assessed at the present time. Comprehensible and objective standards should be established in advance for self-evaluation. A targeted approach to CD-measures is decisive for evaluation. Impact monitoring would be necessary in principle, but is often not financially feasible within the scope of research projects. Impact monitoring requires use of suitable indicators (an indicator catalogue can for example be made available by institutions for development cooperation).

7. Broadly defined capacity development measures follow a multilevel approach. The various groups of individuals, institutes and societies named in the international literature must be addressed in different ways. However measures for individuals also are relevant for institutions and societies, so that the term multilevel approach is not always sharply defined. On the individual level measures must be developed which cover all three aspects of learning (knowledge, abilities and attitude) and thus guarantee the greatest possible success for the measures. For sustainable water management it is however necessary not only to conduct measures on the individual level but also on the institutional level. In cases of cross-border water resources management it is institutional capacity development in particular that will play a key role (Ardakanian and van der Schaaf 2009).

8. The weighting of capacity development measures on different levels shifts during the progression of an IWRM process (Fig. 3). At the outset of an IWRM process the emphasis is on a review of resources, governance analysis and the development of IWRM strategies, whereby capacity development components are particularly strong on the scientific level. With the progressive implementation of IWRM concepts and technical solutions the transfer of technical know-how and responsibility for the functioning of technical solutions gain increasing importance.

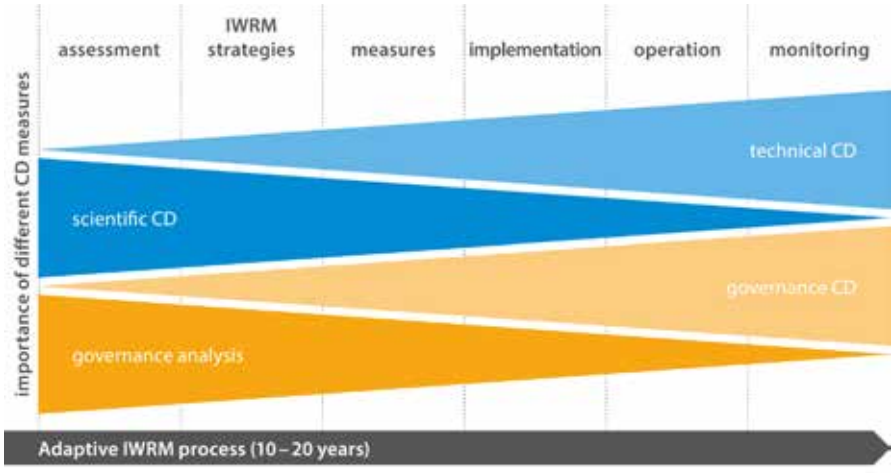

Figure 3: Schematic of the weighting of various capacity development (CD) levels during the progression of an IWRM-process

9. Capacity development is a transcultural process and must orientate itself to local realities. Certain cultural values associated with water must be considered in the development of capacity development measures.

10. Capacity development, participation and governance questions are closely linked. Measures must lead to the strengthening of administrative and public structures and procedures so that IWRM concepts can be implemented. Supporting the establishment of river basin councils and further education measures would also be feasible. The possibilities for influence within the scope of research projects are however limited to consulting services in this regard. Research project structures are not suitable for developing good governance (in contrast to international development cooperation). Research projects should however conduct a substantiated analysis of existing governance structures.

11. Capacity development in IWRM projects generally takes place in the context of further capacity development measures, for example in the establishment of alumni-networks (e.g. IPSWAT), a cooperative education collaboration on the university level (e.g. student and postgraduate exchange programs) or twinning projects (a partnership for administrative structure).

Capacity Development in applied research projects

An assessment of the strategies for capacity development within the IWRM funding initiative was conducted based on the results of an IWRM conference (IWRM Dresden 2011, Borchardt & Ibisch 2013), and a survey amongst project leaders and project coordinators in September / October 2009. The following statements can be made:

1. Underlying data: 17 joint projects were surveyed with a questionnaire on capacity development. The following projects agreed to participate in the survey: IWRM China, WISDOM, IWRM South Africa, LiWa, SMART, GLOWA Jordan, IWRM Mongolia, IWAS Mongolia, IWAS Ukraine, IWAS Middle East, IWAS Vietnam, IWRM Uzbekistan, IWRM Vietnam, GLOWA Volta, IWRM Namibia, GLOWA Elbe and IWRM Indonesia.

2. The significance of capacity development as an integral part of the implementation of IWRM concepts was recognised by all surveyed joint projects. In ca. 75% of projects a separate working package on capacity building / capacity development has subsequently been established. Only a few projects had independant, scientific personnel responsible for conducting these measures (37.5 % of the projects). The measures were often conducted by scientists who originally and primarily worked on scientific topics. Technology providers cooperating with the projects were also sometimes directly involved with capacity development measures.

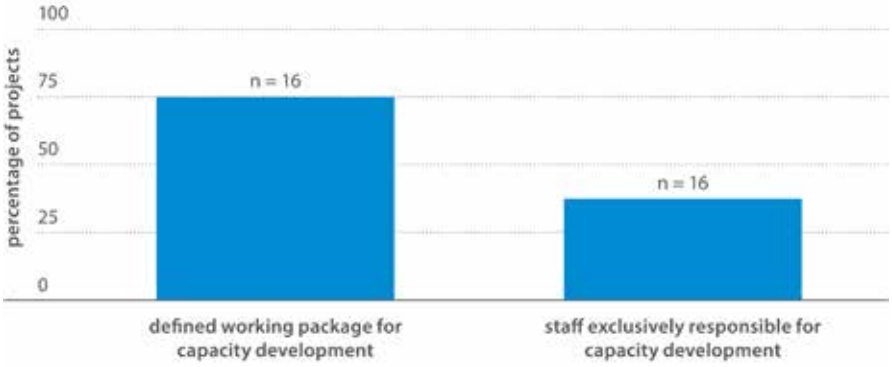

Figure 4: Weighting of capacity development in the project context (as a percentage of the evaluated questionnaires)

3. The first step in the design of capacity development strategies is direct contact to stakeholders and a mutual definition of goals. All of the surveyed projects had established large networks in the model regions for this purpose. However there has not been an emphasis on conducting a comprehensive needs analysis with regards to an integrative approach (Fig. 5). The reasons for this can only be guessed at present: 1) unclear terms for "capacity assessment" to date (a needs analysis was conducted, without the use of the term), 2) lack of time and personnel, measures are implemented immediately and directly with project partners, or 3) a comprehensive needs analysis could not be conducted due to existing (political) framework conditions. A needs assessment in cooperation with national and international organisations (such as GIZ, BGR, NGOs) has also been given minor significance.

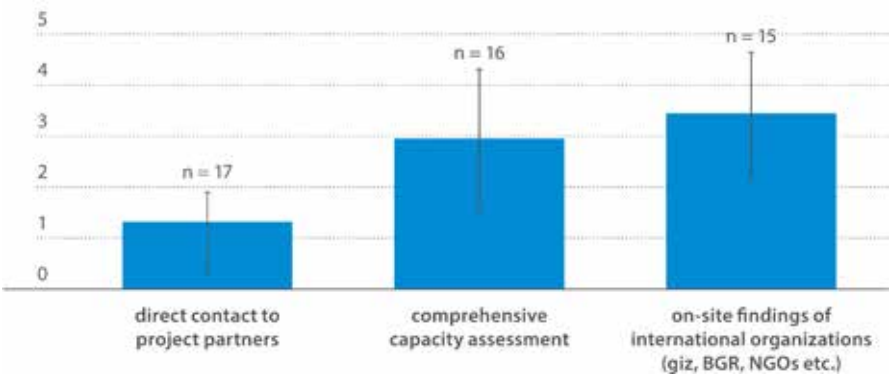

Figure 5: Development of capacity development measures in IWRM collaborative projects (represented as mean value ± standard deviation across the evaluated questionnaires; 1 = main focus in project, 5 = not considered at all)

4. The IWRM collaborative projects did not generally cover the entire scope of levels, target groups and measures. The activities were concentrated on particular main problem areas, which were given priority accordingly. Almost all projects supported scientific education in universities in the model regions (Fig. 6). The willingness to cooperate on a scientific level was generally high, associated with mutual interest in the support of scientific training and collaboration (university cooperation).

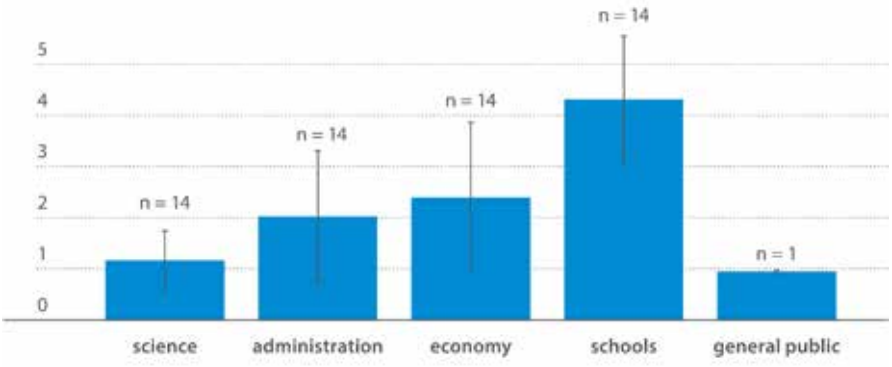

Figure 6: Consideration of various target groups in capacity development within the context of IWRM research projects (represented as mean value ± standard deviation across the evaluated questionnaires; 1 = main focus in project, 5 = not considered at all). Capacity development measures for users and the general public were not separately addressed in the survey (added by IWRM Namibia)

Young scientists from the model regions were thus integrated into research activities. Scientists (from Germany) working through seminars, lectures, practical method training and the establishment of complete teaching and learning modules in university programs helped to locally disseminate know-how and interdisciplinary knowledge of water management system solutions. Specialist and executive personnel with university scientific education worked as multiplicators for IWRM in the future. The long-term integration of students e.g. within the context of doctoral theses is to be seen as a sustainability measure. Companies were also involved in education in their own projects, e.g. in the training of technicians for machinery (e.g. IWRM Indonesia Project).

5. The levels of "administration" and "economy" had comparatively less significance. Only a few research projects had focussed on the area of (primary) school education in the selected partner nations (example: SMART project) and developed measures; this however must be seen as a substantial contribution to the raising of public awareness for the sustainable handling of water. Around 70% of research projects aimed to achieve a know-how transfer for the strengthening of administrative units (relevant ministries and their subordinate authorities), with these measures, using for example training and field trips for the members of a basin council, consulting for water management administration staff for strategic planning or quality assurance, discussions on norms, regulations and organisational development. The following preconditions were considered essential: 1) formulation of mutual goals, 2) clarification of expectations 3) clarification of areas of responsibility.

6. Depending on the degree of reliance on technology, measures for technical knowledge transfer had been conducted in all research projects such as for example training of practitioners and/or technical training courses for local engineers and administrators, talks for local engineers and the exchange of knowledge and experience with scientists, contractors, staff from regional and national administration departments and other experts from the model regions in local workshops. A particular goal was the maintenance and operation of water infrastructure, whereby capacity development measures were applied at the interface between investment/ construction and the operation/ function of infrastructure. Research projects also profit from the integration of industrial partners and their know-how.

7. IWRM research projects focused on workshops, seminars and technical trainings as priority capacity development measures. Isolated talks were given a less significant role (Fig. 7). The establishment of an independent PhD program was reported only 3 times (SMART project, Uzbekistan project, GLOWA Volta project), field trips were reported 4 times (SMART project, IWRM Mongolia, IWRM Vietnam, IWRM Indonesia projects).

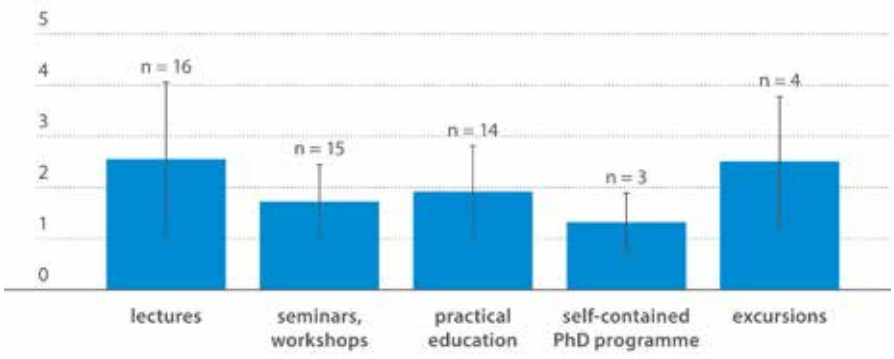

Figure 7: Levels of capacity development measures in IWRM collaborative projects (represented as mean value ± standard deviation across the evaluated questionnaires; 1 = main focus in project, 5 = not considered at all)

8. Thematically, an emphasis on technology was emerging (waste water and drinking water) and integrative topics, in addition to the traditional water disciplines such as e.g. hydrology and water engineering. Large differences between the projects in the GLOWA program and the IWRM funding initiative projects became apparent. Technological topics were addressed much more frequently within the IWRM projects. There was a further emphasis on integrative events, in which numerous topics are addressed e.g. in project progress workshops. In the context of capacity development law, sociology and administration played a lesser role, however.

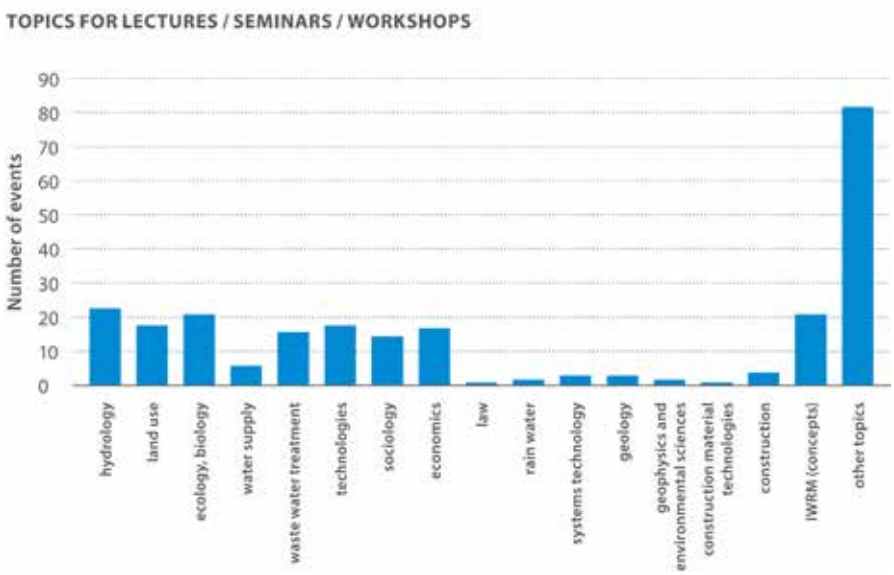

Figure 8: Topics for lectures / seminars and workshops in the IWRM joint projects (number of events given as total sum across all projects)

9. A similar picture was seen for the topics of practical training measures. The classic water disciplines were addressed, whereby practical courses were given on e.g. groundwater monitoring, groundwater modelling, hydrogeological field recordings or the handling of hydrological models. Practical courses for relevant plant technical staff had been conducted on the topic of drinking and waste water in the broader sense; for example: modelling of waste water systems, sewage treatment plant simulators, online measuring techniques etc. (Fig. 9). The topics of sociology and law played a less significant role in the context of practical training measures and were addressed in only a few projects (e.g. WISDOM project: The legal system in the water sector inVietnam).

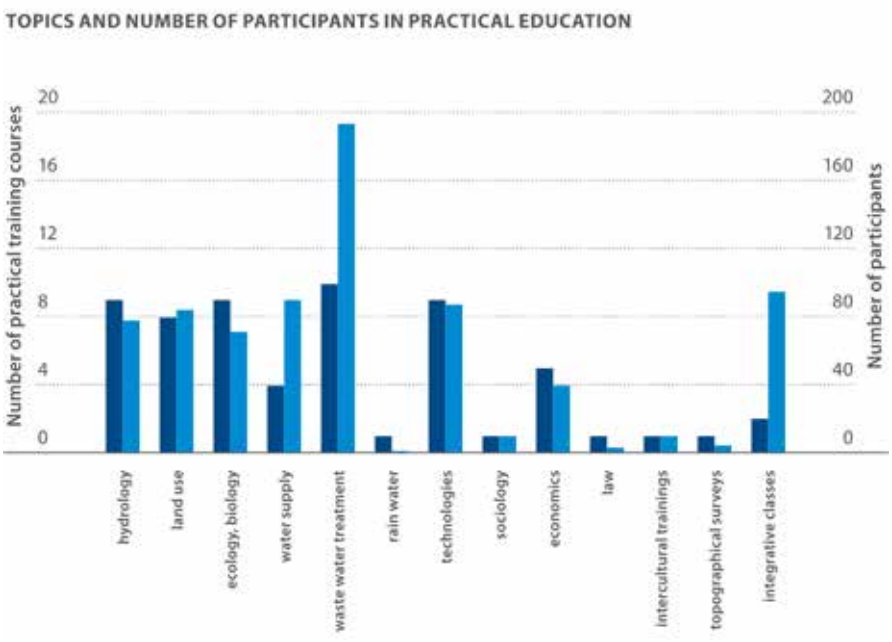

Figure 9: Topics of practical training courses within the IWRM joint projects (dark blue: number of courses, light blue: number of participants, both given as total sum across all projects)

10. An assessment of the sustainability of implemented measures is not trivial and was addressed in the questionnaires through self-assessment. Self-assessments will presumably give more positive results than objective evaluations based on set criteria. An objective evaluation of capacity development measures was however not available for any of the surveyed projects (or if there is, it is not currently known to the authors). Based on the self-assessment, the long-term involvement of colleagues and doctoral students in project processes is seen as a particularly sustainable measure (Fig. 9). The involvement of doctoral students is realised in all projects to a varying extent. Once-off lectures as an educational measure are seen as less sustainable, however they were

graded with 1.8 on average (on a scale of 1 = very sustainable to 5 = not sustainable). Ultimately the experiences gathered so far have shown that the continual local presence of capacity development personnel, continuous collaboration and the carrying out of regular events can significantly increase the effectivity of capacity development measures.

11. Measures for advising national and local administration were also graded with 1.8 (on average) (on a scale of 1 = very sustainable to 5 = not sustainable). Associated with this however was the experience that research projects can generally only make a limited contribution to the development of administrative structures. A sound analysis of existing structures and processes is necessary in order to show deficits in competencies and the executing of functions. Institutional analysis is an important component in most projects (mean value of 1.75 on a scale of 1 = main focus of joint project to 5 = not considered at all during project, n = 16).

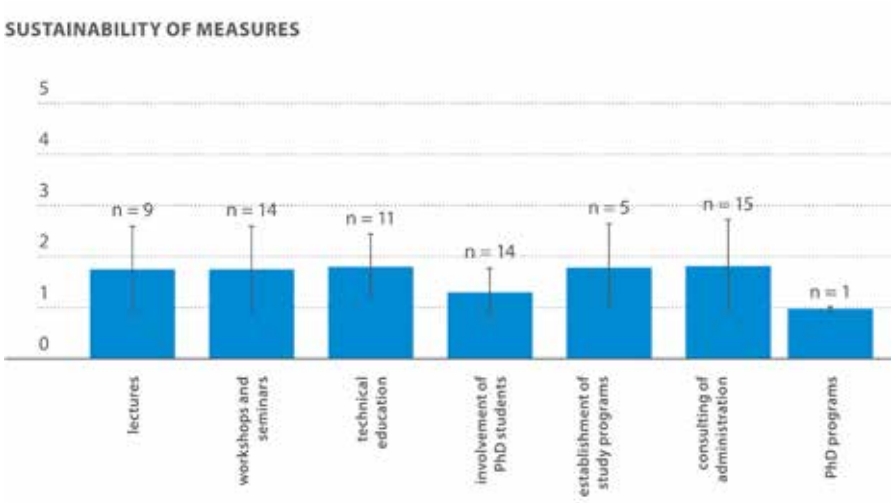

Figure 10: Assessment of sustainability of implemented capacity development measures on the basis of self-assessment by relevant project coordinators (represented as mean value ± standard deviation across the evaluated questionnaires; 1 = very sustainable, 5 = not sustainable)

12. There were some difficulties in the implementation of capacity development measures in target nations which in some cases led to termination of the measures. Examples of note are below:

    a. Language problems occurred repeatedly, however many training courses were realised in the local language and TOT (Training of Trainers) measures were also offered. In order to prevent language barriers, educational materials should (partly) be published in local languages, whereby sufficient time (and financial resources) would be required.

b. Insufficient postprocessing of measures: reports were not written or outstanding data analyses not conducted. A possible countermeasure would be longer presence of the educational team on the ground.

c. A lack of individual responsibility (ownership) for technical systems was addressed in capacity development, but this can only be achieved in the long term. This was often made more difficult by unclear institutional responsibilities and structures, and frequent changes in personnel.

d. Abandonment of qualification works.

e. Scholarships for doctoral students are generally available and are often realised (e.g. through DAAD or university scholarships). However a lack of funding possibilities for bachelor and master students has been identified as well as for further training measures for experts, technicians and skilled workers.

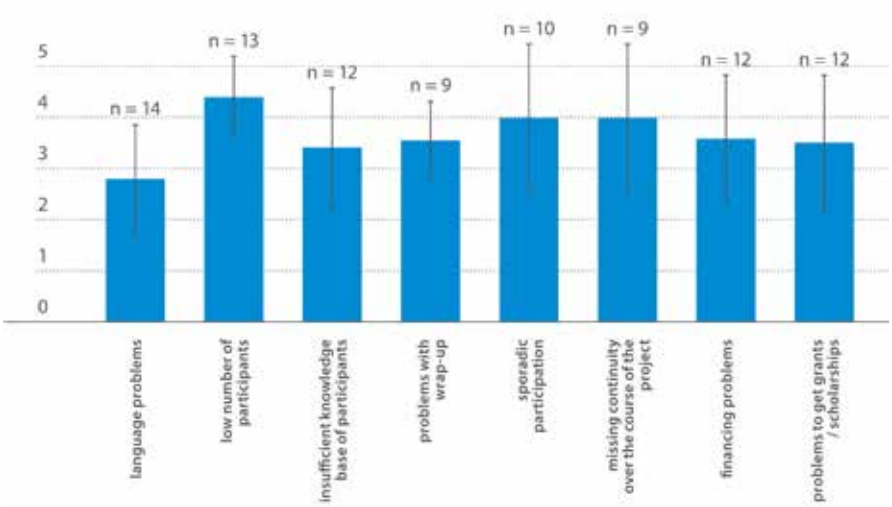

Figure 11: Difficulties in the implementation of capacity development measures in model regions (represented as mean value ± standard deviation across the evaluated questionnaires, strong deviation from the mean value in individual projects; 1 = significant problem, 5 = no problem)

13. Conducting study tours is an important element in capacity development: specialists and executive personnel from administration, ministries, science or economy are given training on specialist topics during a short stay in Germany and made familiar with conditions for water management in Germany (e.g. the structure of water associations, independent plants in waste water disposal, etc.).

14. Combining all activities shows a mixture of various measure packages on capacity development with various focal points depending to the local situation in target nations. The transferring of systems understanding and the networking of sectoral and disciplinary approaches extending to an integrative view is decisive for the support of sustainable system solutions in the water sector.

Capacity Development in the mutual context of research projects and international development cooperation

Internationally there are numerous carriers which contribute to capacity development in numerous regions of the world. GIZ has taken on an important role in the development of the water sector in numerous partner nations on behalf of the German government, in the context of international development cooperation.

Good networking between actors is necessary in order to structure measures and contribute to sustainable development in the water sector of target nations. The comparative advantages of research projects and organisations for development cooperation must be taken into account in order to derive synergies from a network:

1. Research projects have limited durations; the implementation of measures for capacity development is therefore only possible over a limited timeframe. The development of administrative (decision) structures and technical systems is a long term process which often extends beyond the project duration. Development cooperation is however established for the longer-term, but does not achieve the in-depth expertise of a research project.
2. The comparative advantage of research projects is in the power of innovation for technical improvements and method development. The result of research projects can be adapted and new technologies developed in order to overcome problems in the water sector.
3. The comparative advantage of development cooperation is based on a long-term approach, organisational support, continual local presence and financial support.
4. Due to the long-term approach taken by development cooperation there are often years of local experience and knowledge on the needs for the water sector which should be referred to by research projects.

Synthesis and requirements for future concepts

Several aspects for the future structuring of strategies for capacity development have resulted after consideration of the general terminology on capacity development, possible strategies for implementation and knowledge transfer measures in the IWRM research projects. Based on the results presented in this paper the following aspects are significant in the future implementation of capacity development in research projects:

1. The establishment of networks in partner countries on the different levels (schools, science, economy, administration, public, user and communities) is a fundamental precondition. The building up of functional academic and economic networks should enable the intensive exchange of experiences for actors.

2. At the outset of the activities, stakeholders and institutions must be identified and integrated into the strategy for capacity development ("stakeholder and institutional analysis").
3. The development of competencies is an ongoing process which must be carried by the involved actors in partner nations. This assumes a high degree of identification and commitment from all stakeholders for the desired changes.
4. The required actions must be recognised, evaluated and prioritised ("capacity assessment"). The implementation of needs analyses is urgently necessary and should be incorporated into research projects as a separate topic with its own working package.
5. Measures for capacity development must be reviewed for their effectivity and adapted to the capacity development strategy, as capacity development is an adaptive and iterative process which must be able to react to change.
6. Synergy effects between the involved institutions are to be created, integrating the competencies of all partners. The relevant interfaces must also be identified.
7. Capacity development should not be understood as an accompanying measure but as an integral part of an operational IWRM process. Strong harmonisation of the processes of IWRM and capacity development are necessary for this purpose.
8. Adaptation of the concepts for capacity development or measures is necessary to the diverse needs of a region, so that continuation of the developed concepts beyond the duration of the research projects is possible. Third party funded research projects are generally limited with regards to duration. With the stipulation of focussing on "good governance" the aim is to network activities with non-state partners and institutions (e.g. GIZ, DWA, German Water Partnership). Concepts must be implemented over the long-term in order to achieve the long-term strengthening of sustainable procedures.

Acknowledgment

This work was supported by a grant from the German Ministry of Education and Research (BMBF No. 02WI1000). This support is gratefully acknowledged.

Literature

Ardakanian, Reza, and Charlotte van der Schaaf. 2009. Proceedings of the International Workshop on Institutional Capacity Development in Transboundary Basins. Lessons learned from practical experience. Bonn: UNW-DPC Publication Series.

Alaerts, Guy. 2009. "Knowledge and capacity development (KCD) as tool for institutional strengthening and change." In Water for a changing world - Developing local knowledge and capacity, edited by Alaerts, Guy, and Dickinson, N.L., 5-26. London: Taylor & Francis.

Blokland, Maarten, Guy Alaerts, Judith Kaspersma, and Matt Hare. 2009. Capacity Development for Improved Water Management. Delft: UNESCO-IHE Institute for Water Education and UN Water Decade Programme on Capacity Development.

Borchardt, Dietrich, and Ralf Ibisch. 2013. Integrated water resources management in a changing world: lessons learnt and innovative perspectives. London: IWA Publishing.

Borgmann, Andreas, Katrin Brömme, Sandra Greassidis, Sylvia Jaschinski, Christian Jolk, Florian Klingel, Björn Zindler, and Harro Stolpe. 2009. Experiences in capacity building in the frame of water and environmental projects in Vietnam. Ruhr University Bochum: Policy paper (in German).

Ernstorfer, Anita, and Albrecht Stockmayer. 2009. Capacity Development for Good Governance. Munich: Nomos.

GTZ – Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH. 2007. Capacity Development in the Water Sector. How GTZ supports sustainable water management and sanitation. Eschborn: International Water Policy Project.

Leidel, Marco, Steffen Niemann, and Nina Hagemann. 2012. "Capacity development as key factor for integrated water resources management (IWRM): improving water management in the Western Bug River Basin, Ukraine." Environmental Earth Sciences 65: 1415-1426.

Lopes, Carlos, and Thomas Theisohn. 2003. Ownership, leadership and transformation. Can we do better for capacity development? London: Earthscan.

OECD – Organisation for economic co-operation and development. 2006. The Challenge of Capacity Development. Working towards good practice. Paris: OECD Publishing.

Schramm, Engelbert. 2009. "Capacity Development in water management. An overview." Paper presented at the workshop "Capacity Development as an instrument for implementation of Integrated Water Resources Management", Magdeburg, Germany, October 01-02.

UNDP. 1998. "Capacity Assessment and Development. Technical Advisory Paper No.3." http://www.energyandenvironment.undp.org. Accessed October 23, 2009.

UNDP. 2007. "Capacity assessment methodology - user's guide." New York: UNDP.

UNDP. 2009. "Supporting Capacity Development – The UNDP approach." New York: UNDP.

van Hofwegen, Peter. 2004. "Capacity-building for water and irrigation sector management with application in Indonesia." Rome: FAO Water Reports 26.

Advancing a nexus approach to the sustainable management of environmental resources: Capacity development activities of the United Nations University Institute for Integrated Management of Material Fluxes and of Resources (UNU-FLORES)

Stephan Hülsmann[1] and Reza Ardakanian
UNU-FLORES

Abstract

The United Nations University (UNU), as an autonomous organ of the United Nations, bridges the academic world and the UN system, its overarching theme being sustainability. In pursuing its mission, UNU performs problem- and policy-oriented research and offers postgraduate programmes, focusing in particular on problems and needs of developing countries. By doing so, UNU's role is to enhance individual capacities (via research and postgraduate education), but also institutional capacities and functioning as a think tank for the UN system and the UN member states. In line with this general UNU strategy, the UNU Institute for Integrated Management of Material Fluxes and of Resources (UNU-FLORES) engages in capacity development in a broad sense in the area of sustainable use and integrated management of the environmental resources water, soil and waste. The integrated management of these closely interconnected environmental resources may be termed a nexus approach. The water-soil-waste nexus represents the resources perspective towards the water, energy and security nexus promoted in particular by and since the Bonn 2011 conference on the issue.

Supporting its think-tank function UNU-FLORES engages in policy-relevant research, post-graduate education and capacity development. One important element to emphasize the links between science and decision making is a nexus observatory which will be developed to facilitate policy and programme implementation particularly in developing and emerging economies. As further measure to enhance cooperation with developing countries and facilitate capacity development, UNU promotes the establishment of partner institutes of its existing and future institutions, such as UNU-FLORES, interacting both in research (joint projects) and teaching activities (exchange programmes for students and lecturers) with their UNU counterparts. For UNU-FLORES Mozambique has been identified as suitable location of a partner institute. In close cooperation with local partners and by establishing and strengthening a strong network within the region, the partner institute of UNU-FLORES in Maputo, is envisioned to act as a regional hub for integrated management of material fluxes and of the resources water, soil and waste.

1 Stephan Hülsmann
United Nations University
Institute for Integrated Management of Material Fluxes and of Resources (UNU-FLORES)
Ammonstrasse 74
01067 Dresden
Germany
huelsmann@unu.edu

Its establishment is expected in 2014. In conclusion, capacity development, using a wide range of approaches and addressing the individual as well as the institutional level is an integral part of the nexus approach to the management of water, soil and waste promoted by UNU-FLORES.

Introduction: UNU-FLORES and the Nexus

Addressing societal concerns and capacity development is among the main mandates of the United Nations University (UNU), an autonomous organ of the United Nations, founded in 1973. UNU is designated to contribute, through collaborative research and education, to resolving the pressing global problems of human survival, development and welfare that are the concern of the United Nations, its peoples and the member states (UNU 2013). In line with the general mission of the UNU to foster sustainable development, as one of the 15 UNU research and training institutes and programs around the world, the UNU Institute for Integrated Management of Material Fluxes and of Resources, UNU-FLORES is the only UNU institute that focuses on inter-connected environmental resources of water, soil and waste as systems and fluxes, emphasizing capacity development and governance in parallel. UNU-FLORES contributes to the development of integrated management strategies for the sustainable use of water, soil and waste, considering the impacts of global change on resources management and its nexus to green economy, thus advancing a nexus approach to environmental resources management.

With respect to environmental resources management, the term nexus approach is most commonly used for the water, energy and food security nexus, referring to the Bonn 2011 conference, which argued that this approach can result in improved water, energy and food security by integrating "management and governance across sectors and scales", reducing trade-offs and building synergies, overall promoting sustainability and a transition to green economy (Hoff 2011). The nexus approach therefore would be instrumental to meet the current challenges of growing resource demands, climate change, urbanization and globalization. When looking at this nexus from an environmental resources perspective, thus asking which resources would have to be managed in an integrated way to achieve the sought integrated and sustainable management, it turns into a water-soil-waste nexus: the production of food relies on water and soil, with waste being an important factor for the provision of nutrients and organic material. The same holds for the production of biofuel and energy from biomass. Additional links to energy exist for water (hydro power, cooling water for power plants) and waste (biogas, thermal energy from waste). The nexus of water, soil and waste results from various material flows and transitions (blue to green water, recycling of organic material and nutrients etc.), clearly calling for an integrated, thus nexus approach to managing these resources (Lal 2013). Overall, the interconnected management of the resources water, soil and waste may increase the resource use efficiency while at the same time environmental risks and ecological degradations can be minimized. The nexus approach to the sustainable management of water, soil and waste, promoted by UNU-FLORES is thus closely related to the water, energy and food security nexus, looking at it from an environmental resources perspective.

Sustainable management strategies for water, soil and waste have to be based on consistent and comprehensive systems and flux analysis approaches taking into consideration the impacts of changes in demography, urbanization and climate. UNU-FLORES is supposed to extend and

upscale the concept of integrated resource management through adopting a truly integrative perspective by considering inter-related resources (water, soil, waste) and emphasizing fluxes of resources between phases and compartments. Thus instead of traditional input-output models, UNU-FLORES explores the consistent tracing (follow up) of resources as fluxes (passage, flow, transport, transfer), which is essential for closing cycles and a prerequisite for sustainable management. Besides closing cycles, the nexus approach requires linking cycles, in particular considering the linkage between water, soil and waste and the associated materials as briefly outlined above.

Environmental resources management always needed and needs to cope with uncertainties and changing boundary conditions, but the challenges are becoming more pressing in times of concurrent global trends in terms of climate, population growth, urbanization etc. and correspondingly accelerating material flows. As an example, not only does climate change accelerate the "large" hydrological cycle, but also globalized markets accelerate the flow of virtual water around the world. This issue cannot be neglected in the context of water management and offers opportunities for adaption via economic incentives and regulations. Another driver of the water cycle is land-use change, e.g. deforestation affecting evapotranspiration patterns. Conversely, land-use management can be used as a tool for water management. Within a nexus approach, this could be combined with other aspects of "Climate-smart" agriculture, which has been promoted in recent years (FAO 2009). Changing land-use and agricultural practices may also enhance carbon sequestration as one aspect of climate change mitigation. Adaptation to climate change through a nexus approach may also be applied in urban areas, as exemplified in the blue green dream initiative (http://bgd.org.uk).

The role of Capacity Development in the Nexus approach

The integrative perspective of the nexus approach not only emphasizes the inter-relations of resources, but, given the focus on management, needs to consider also the cycle from research to implementation, thus focusing on governance, the enabling environment as well as on individual capacity development. The complex relations between demands, resource availability and quality and financial and physical constraints can be addressed by knowledge based policies and reform of professional practice. The nexus approach recognizes the urgent need for this knowledge and its interpretation in a policy- relevant setting that is guided by the understanding that there is a lack of blueprints for development based on integrated management of water, soil and waste resources in developing countries. Generation and application of knowledge is both a priority for individual but also institutional capacity development, taking a multi-level approach (compare Leidel et al. and Ibisch et al., this volume).

Individual capacity development in a nexus context focuses on providing information and knowledge on improved approaches and management tools whose adoption can advance the nexus approach to management of environmental resources. These measures need to be region- and target-specific. Individual support could cover arrangements for financing study programmes, pedagogy and didactic methods for study and course assessments. On the other hand institutional capacity development is focused on identifying needs for organizational reform and developing matching programmes that address these needs. Examples of

institutional capacity development could include Trainer of Trainer (ToT) workshops, sandwich PhD programmes involving partnerships between universities covering supervision and course work. Partnerships between universities and training institutes could cover research consortia and nodal centres of excellence that focus on optimizing human resources with a regional perspective. One example for this approach is given below (partner institute). Both individual and institutional capacity development are extremely important because they can potentially further the establishment of alternative management practices, organizational norms and protocols for monitoring and evaluation.

The water-soil-waste nexus concept outlined so far is consistent with the academic functional structure of UNU-FLORES (see Figure 1). UNU-FLORES was established in 2012 (Ardakanian et al. 2013) as a direct response of UNU to the increasingly recognized need for an integrated resources management beyond sectorial borders. The water-soil-waste nexus is, as outlined above, closely related to the water, energy and food security nexus promoted by the Bonn2011 conference. The organization of UNU-FLORES into five academic units: three core scientific units dealing with the interconnected resources (Water Resources Management (WRM), Waste Management (WM) and Soil and Land use Management (SLM) supported by two cross cutting units (Systems and Flux Analysis considering global change assessment (SFA) and Capacity Development and Governance (CDG) supports the think tank function of UNU. The importance of governance was one of the main items worked out in the White Book on Advancing a Nexus Approach to the Sustainable Management of Water, Soil and Waste (Hülsmann and Ardakanian 2014). How to implement a nexus approach to environmental resources management, which institutional frameworks will be best suited and how they can be developed and improved are among the main questions to be addressed. Closely related to this issue is the need for capacity development, taking a multi-level approach.

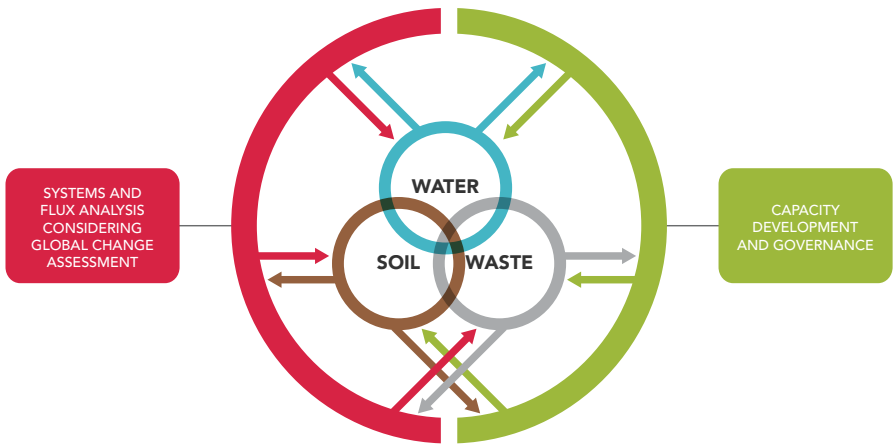

Figure 1: Academic functional structure of UNU-FLORES, reflecting the nexus approach to the management of water, soil and waste, see flores.unu.edu

UNU-FLORES will pursue the achievement of sustainable environmental outcomes by serving as a think tank that promotes integrated resources management. Examples of its capacity development activities are given below.

Nexus Observatory

An important mandate of UNU-FLORES is the development of an Observatory. It is envisaged that the observatory will document approaches and methodologies for capacity development that would advance the nexus approach to management of environmental resources. The nexus observatory will emphasize the links between science and decision making and highlight important aspects of policy and programme implementation in developing and emerging economies. The observatory will not offer solutions or comparative judgements (*of which situation is better or worse*) but will focus instead on empowering decision makers with the information that they require to pose policy relevant questions. The generation of the required evidence could be based on research on aspects of the soil, water and waste nexus. For this reason the nexus observatory will emphasize establishment of robust interfaces between education, research and policy dialogue and consultation, providing the framework for virtually all capacity development activities of UNU-FLORES, as well as for various types of publications addressing scholars and students as well as environmental managers and decision makers.

Post-graduate education programmes

In cooperation with its partner university, the Technische Universität Dresden (TUD), rated as one of 11 "excellent" universities in Germany, UNU-FLORES currently prepares for the launching of a joint PhD programme in the area of integrated management of water, soil and waste in 2014. The proposed PhD programme is intended to provide students with opportunities to gain and generate knowledge that integrates multiple areas beyond traditional subject boundaries. It also provides research skills to analyse environmental resources as systems and fluxes and novel methodologies to strengthen and develop individual and institutional capacity to advance integrated management of water, soil and waste. These knowledge and skills will allow the graduates not only to serve the dissemination of innovative knowledge, but also to be resourceful in this field in the international communities.

The close linkage of the proposed programme with research activities within the research network of the UNU-FLORES will ensure that the PhD students have access to cutting-edge scientific results, instrumentations, methods and approaches. The students will benefit from the primary partnership of the UNU-FLORES with TUD, in particular the Faculty of Environmental Sciences which houses three departments of Hydro Sciences, Forest Sciences and Geo Sciences. The co-supervision of the PhD students will further catalyse cooperation in research with TUD. The students of the proposed programme will also avail themselves of the international network of the UNU-FLORES within the UNU and with UN agencies, such as FAO, WHO, UNESCO-IHE, UNCCD, etc. and other academic and management organizations.

As a part of the commitment of the UNU-FLORES to contribute to the resolution of pressing challenges in the area of sustainable use and integrated management of water, soil and waste, the proposed programme will necessitate and aid in a constant introduction of innovative knowledge and skills. Moreover, the planning and conceptualizing of, and improvement in, the research topics addressed along with the direct feedback and requests from students will help shape research questions and projects relevant to the integrated management of water, soil and waste for sustainable development at the UNU-FLORES and within the UNU. This will also ensure a close relationship between research and teaching and the coherence of the activities of UNU-FLORES and the UNU.

Considering the fact that the theme of the proposed joint PhD programme is new to the world (having no equivalent as of yet), the prospective students are expected to have variety of backgrounds. To bring them all to an adequate level of competence and also to introduce the basic concepts of water-soil-waste nexus, the proposed programme is comprised of course work (predominantly during the first and second semester) in addition to the research work, which starts already during the first year of the expected duration of 7 semester of the programme. Course work will include a mandatory introductory module to the nexus concept as well as a module on governance besides elective courses, e.g. on methodical aspects.

E-learning

Distance learning programmes enable UNU-FLORES to respond to requests from member states for tailor made courses and curriculum on applied topics. Three online learning courses are currently under development covering the following topics: (a) life-cycle cost assessment of infrastructure projects, (b) multiple use of water services and (c) inter-governmental fiscal relations. The E-learning programmes emphasize nexus themes of sustainability, interactions among different levels of government and equity issues relating to use of environmental resources. They will be integrated into the nexus observatory and linked to the PhD programme and offered (besides UNU-FLORES) by selected partners, such as the partner institute under development (see below).

Workshops and conference

In November 2013 UNU-FLORES organized jointly with TUD and various co-conveners an International Kick-off Workshop on advancing a nexus approach to the sustainable management of water, soil and waste which aimed to prepare the ground for a regular biyearly Dresden Nexus Conference. The kick-off workshop successfully gathered a large community of researchers from universities and international research institutes as well as stakeholders from UN agencies and policy makers from selected UN member states to discuss in four sessions (i) opportunities and (ii) challenges of adopting a nexus approach, (iii) to define capacity development programmes addressing the nexus and (iv) institutional arrangements and governance structures for implementing a nexus approach. As part of the conceptual preparation for the kick-off workshop a draft White Book was compiled thematically structured according to the four

workshop sessions. Based on workshop discussions and input received from participants, the White Book was revised and published in early 2014 (Hülsmann and Ardakanian 2014). Results of the workshop will be summarized in workshop proceedings. In addition, a collection of case studies presented during the workshop will be published. The final version of the White Book will represent a roadmap for the future Dresden Nexus Conference series, the first of which is planned for 2015.

In the intervening year between conferences regional Nexus Observatory Workshops are organized. The Nexus Observatory Workshops focus on engaging the scientific community and policy makers to discuss nexus related themes. For example, in 2013 UNU-FLORES organized an Asian regional Nexus Observatory Workshop on the topic of life-cycle cost assessment of infrastructure projects. The overall objective of the Nexus Observatory Workshop is to facilitate cross-fertilization of ideas on applications of new approaches and tools that advance the nexus approach by encouraging piloting and field level implementation. Nexus Observatory Workshops may also result in policy guidance on institutional and management good practice for different geographic regions and member states.

Partner institute of UNU-FLORES in Maputo, Mozambique

UNU-FLORES is committed to pursue its mission in close cooperation with partners, a major partner for research and education being TUD. Given the mandate of UNU to focus on challenges of sustainable development, thus addressing the needs of developing countries and engage in areas relevant for sustainable development goals (SDGs) which are currently defined, close contacts and cooperation with developing countries is essential. One approach to address this requirement is the development and establishment of partner institutes, which would be a form of institutional capacity development, but also address individual capacity development via research and the planned education programmes. An initiative to establish a partner institute of UNU-FLORES started concomitantly to the establishment of UNU-FLORES in Dresden and aims at creating a regional hub for environmental resources management in southern Africa. A project funded by the German Federal Ministry of Education and Research (BMBF), explored the feasibility of establishing a partner institute of UNU-FLORES in Mozambique, to set-up a consensus based work plan and to meet all legal and institutional pre-requisites to table the proposal to the Council of UNU.

Based on conceptual preparations in two scoping workshops (Ardakanian et al. 2011, 2012) and in close contact with the Ministry of Science and Technology (MCT) of Mozambique and the Eduardo Mondlane University (UEM) in Maputo a MoU was signed on the occasion of the opening of UNU-FLORES in Dresden in December 2012 (Ardakanian et al. 2013). Based on this achievement a working group was established to organize the implementation of the MoU. The working group agreed on details of in-kind and in-cash contributions of Mozambique as well as on the required scientific support of UEM, which was the basis to receive the endorsement of the Council of UNU to establish the partner institute as an Operating Unit of UNU-FLORES in Maputo in late 2013. During a regional workshop (Hülsmann and Ardakanian 2013) a network with universities and research institutions from all over Africa was established to ensure the envisioned role of the partner institute as regional hub for research and education in integrated

management of water, soil and waste. Based on a list of research topics identified in earlier workshops, four research projects were defined during the regional workshop. Mapping studies on these topics have been conducted and research proposals are currently worked out for external donor support. Once established these projects will provide excellent opportunities for the partner institute to get involved in research. The operating unit of UNU-FLORES will take up activities in 2014.

Summary and conclusion

The nexus approach to the sustainable management of water, soil and waste promoted by UNU-FLORES takes the inter-connectedness and intricate linkage of water, soil and waste into account, based on coherent systems and flux analysis and considering the cycle from research to implementation. Capacity development, similar to IWRM, is therefore an essential element of the nexus approach. UNU-FLORES´ engagement in policy-relevant research, postgraduate education and capacity development on integrated resources management is in line with the general mission of UNU to function as a think-tank for the UN system and for member states. The water-soil-waste nexus is closely related to the water, energy and food security nexus, which has gained wide recognition in recent years and which is of high relevance for sustainable development, mitigating impacts of global change and increasing resource use efficiency. Novel approaches to postgraduate education by developing a nexus curriculum and target-specific E-learning modules on nexus topics and close cooperation with developing countries, namely in Southern Africa via partner institutes are expected to promote the nexus approach effectively.

References

Ardakanian, Reza, Stephan Hülsmann, and Jessica Johmann. 2011. Proceedings of the 1st International Scoping Workshop on the Establishment of the United Nations University Institute for Integrated Management of Material Fluxes and of Resources (UNU-FLORES) & Its Twin in Mozambique,11-12 November 2010, Dresden, Germany. Bonn.

Ardakanian, Reza, Stephan Hülsmann, and Jessica Johmann. 2012. Proceedings of the 2nd International Scoping Workshop on the United Nations University Institute for Integrated Management of Material Fluxes and of Resources (UNU-FLORES) & Its Twin in Mozambique, 24-25 October 2011, Maputo, Mozambique. Bonn: UNU-ViE.

Ardakanian, Reza, Stephan Hülsmann, and Benjamin Zhu, ed. 2013. Opening Ceremony Proceedings UNU-FLORES, 10 December 2012. Proceedings 2. Dresden: UNU-FLORES.

FAO. 2009. Coping with a Changing Climate: Considerations for Adaptation and Mitigation in Agriculture.

Hoff, H. 2011. Understanding the nexus. Background Paper for the Bonn2011 Conference: The Water, Energy and Food Security Nexus. Stockholm Environment Institute, Stockholm.

Hülsmann, Stephan, and Reza Ardakanian. 2013. Proceedings of the Regional Workshop on Establishment of a Network for Partnership of UNU-FLORES Based in Maputo, Mozambique. Proceedings 2. Dresden: UNU-FLORES.

Hülsmann, Stephan and Ardakanian, Reza, eds 2014. White Book on advancing a Nexus approach to the sustainable management of Water, Soil and Waste. Dresden: UNU-FLORES.

Ibisch, Ralf, Dietrich Borchardt, Steffen Niemann, Ruth Goedert, Marcela Muñoz, Anna-Katharina Hornidge, Muhammad Ikhwan, Alexia Krug von Nidda, Jörg Felmeden, Oliver Schulz and Marco Leidel. 2014. Lessons learned with multi-level approaches for capacity development in applied research projects. This volume.

Lal, R. 2013. The Nexus of soil, water and waste. Lecture Series –No.1. UNU-FLORES, Dresden.

Leidel, Marco, Jörg Seegert, Steffen Niemann, Catalin Stefan, Hoang Mai Phan, Corinna Weigelt, Jens Grundmann, Franz Lennartz, Christian Bernhofer. 2014. Fostering water management through capacity development -Lessons from the International Water Research Alliance Saxony (IWAS). This volume.

UNU. 2013. "United Nations University - 2012 Annual Report". Tokyo: United Nations University. http://unu.edu.

ISBN: 978-3-944863-08-5

e-ISBN: 978-3-944863-09-2

This publication should be cited as:

"Hülsmann, Stephan and Ardakanian, Reza, eds. 2014. Proceedings of the special session "Societal Concerns and Capacity Development" at the Symposium of European Freshwater Sciences (SEFS 8). Dresden: UNU-FLORES".

UNITED NATIONS
UNIVERSITY

UNU-FLORES

Institute for Integrated Management of Material Fluxes and of Resources

The United Nations University Institute for Integrated Management of Material Fluxes and of Resources (UNU-FLORES) was established in Dresden,Germany in 2012 with the support of the Federal Ministry of Education and Research (BMBF) and the Ministry for Higher Education, Research and the Arts (SMWK) of the Free State of Saxony, Germany. As part of the United Nations University (UNU), the Institute helps to build a bridge between the academic world and the United Nations. The UNU encompasses 16 research and training institutes and programmes in 12 countries around the world. UNU as a whole aims to develop sustainable solutions for pressing global problems of human survival and development.

UNU-FLORES develops strategies to resolve pressing challenges in the area of sustainable use and integrated management of environmental resources such as soil, water and waste. Focusing on the needs of the UN and its member states, particularly the developing and emerging countries, the institute engages in research, capacity development, advanced teaching and training as well as dissemination of knowledge. In all activities, UNU-FLORES advances a nexus approach to the sustainable management of environmental resources.

Find more information under: **flores.unu.edu**

ADVANCING A NEXUS APPROACH TO THE SUSTAINABLE MANAGEMENT OF ENVIRONMENTAL RESOURCES

UNITED NATIONS UNIVERSITY
Institute for Integrated Management of
Material Fluxes and of Resources (UNU-FLORES)

Ammonstrasse 74
01067 Dresden
Germany

Tel.: +49 351 8921 9370
Fax: +49 351 8921 9389
E-mail: flores@unu.edu

flores.unu.edu