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Value of Water – Different Approaches in Transboundary Water Management

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Value of Water — Different Approaches in Transboundary Water Management

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Foreword

Three years ago the German and the Netherlands National Committees for the International Hydrological Programme (IHP) of UNESCO and the Hydrology and Water Resources Programme (HWRP) of WMO started a workshop series on the value of water, which was designed to be a contribution to the theme Water for Society of the UNESCO IHP Phase VI. Water for Society focuses on the complex relationship between people and their water resources, emphasising the human component of the equation, and the implementation of this theme seeks to answer questions about attitude, relationships, concepts and beliefs. It is also considered to be highly relevant for the IHP PC-CP (Potential Conflict to Co-operation Potential) programme.

The first meeting of experts was held in Delft in 2002. The aim of the meeting was to exchange knowledge on the subject of virtual water trade, to review the state-of-the art in this field, to discuss the various aspects in depth and to set the agenda for future research. In particular the meeting was used as a preparatory meeting for the session on virtual water trade and geopolitics which took place at the Third World Water Forum in Japan in 2003.

The second workshop *Water as a good and a service – decision-making methods and tools for regional water management with respect to uncertainties* encompassed the complex interactions between human beings and water as a natural resource. Water itself, even drinking water, is not a product in the real sense, also not a normal article of trade, but a heritage and an element of the water cycle. The management of water at basin scale requires integrative approaches, e.g. to include the needs, interests and beliefs of a basin's stakeholders, and assessment criteria to be able to provide guidelines to manage water resources in an equitable, sustainable and ethical manner.

The third workshop *Value of Water – Different Approaches in Transboundary Water Management* focused on the very complex relationship between people with different cultural backgrounds and how they relate to their water resources. The main questions were: how can co-operation be improved and how can water-related conflicts be solved? How can socio-economic, cultural, ecological and other values be incorporated into the planning and management of water resources, e.g. under conditions of water stress?

The participants of the workshop came from Austria, Botswana, Canada, Denmark, Germany, Malawi, Namibia, The Netherlands, South Africa, United Kingdom and organisations such as UNESCO and FAO.

This workshop was a joint effort of the IHP/HWRP National Committees of Germany and the Netherlands, together with the Bonn International Centre for Conversion (BICC), UNESCO and WMO. The organisers would like to thank the authors of the papers for their contribution to this workshop.

Professor Dr S. Demuth
Director of the German IHP/HWRP Secretariat

Value of Water –
Different Approaches in Transboundary Water Management
- An introduction to the workshop -

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Preamble

The issue of “value of water” is often treated in an economic perspective. Debates revolve about water pricing, full cost recovery, investment strategies, water markets, the polluter-pays principle, etc. However, there is more to the “value of water” than merely economic considerations. The value of water encompasses the complex interactions between human beings and water as a natural resource. The management of water in a catchment therefore requires integrative approaches and assessment criteria in order to be able to adequately record and consider not only the natural features but also the social, cultural and economic conditions of the catchment area.

"Value of water" has different meanings for people from different societal and cultural backgrounds. The approaches to valuing water vary according to the social context and cultural setting, especially when it comes to questions of conflict prevention, cooperation and transboundary water management. Nowadays it is common wisdom that due to over-exploitation, pollution and mismanagement, freshwater is, for millions of people, a scarce and conflict-prone resource. Because the world’s freshwater resources are not evenly disposed according to political boundaries, water disputes have many characteristics that extend beyond national borders. Conflicts, either triggered as a result of incompatible goals related to control over, access to and unsustainable use of the resources or due to quantity or quality problems by utilising the resources, do not only stem from the economic sphere, they rather have to be seen in a much broader societal-cultural context. In order to prevent, avoid, settle or even to resolve conflict, one has to be aware of the differences in the meaning of "value of water". Otherwise misperceptions and misunderstandings will easily emerge and will make water-related problems even more difficult to tackle.

Hence the planning and the management of water resources under conditions of water stress need not only to incorporate economic considerations, but also cultural, social and ecological aspects. It is obvious that approaches focussing on water as an economic good on the one hand, and cultural and ecological aspects on the other hand can be in competition or even contradict each other.

The aim of the workshop

The international workshop *Value of water – Different Approaches in Transboundary Water Management* provided a forum for presenting and discussing the different approaches to the issue in an interdisciplinary manner, bringing together experts from various scientific and research backgrounds (economics, political science, hydrology, peace research, cultural studies, theology, anthropology) and from different regions of the world. They presented

their respective understandings of the value of water. The aim was to encourage the exchange of knowledge, experiences and management approaches in transboundary river catchments with different societal-cultural backgrounds, to build bridges between various understandings of the "value of water" and to further elaborate "value of water" as a multidimensional concept. Additionally, the importance of groundwater aquifers, which are often disregarded in scientific discussions about transboundary basins, were addressed in the same manner.

The structure of the workshop

As an introduction into the complexities and diversities of the subject the first presentations in the first session of the workshop, ***Value of water in different societies***, confront two extremely different, if not contradictory, views on the value of water, namely *Value of water in modern western societies* and *Water's vulnerable value in Africa*. In contemporary water-management endeavours in less-developed countries, the modern western approach, which is meant to bring "development" to "underdeveloped" regions, only too often clashes with pre-modern traditional concepts of "value of water" that are deeply embedded in the customary life of local communities. Whereas in the context of the modern state and economy an instrumental technocratic and utilitarian approach to water as an exploitable and marketable economic good has become the hegemonic societal concept, in traditional (African) societies water and natural resources in general are integral elements of a holistic world view. For traditional societies water is not only of economic and social importance, but also of cultural and spiritual value. Water and its non-instrumental uses are focal points of community-building, and water has a broad range of non-economic values and meanings, including the spiritual dimension, that go far beyond the modern utilitarian perception.

That spiritual dimension is comprehensively addressed in the third presentation of the first section, *Different religious approaches to the value of water*. Water figures prominently in all the major religions of the world as a sacred gift of god, and the interpretations and rules with regard to the ethically adequate use of water are imperatives that can heavily influence water management endeavours in those parts of the world where religion still plays an important role in the everyday life of societies. Modern enlightened politicians, researchers, engineers and other experts tend to underestimate that religious dimension of the value of water, and this again can easily lead to conflict when it comes to water management under conditions of water stress. The last presentation in the first section, *Boundaries of practice in transboundary river basin management in southern Africa: A look at the role of NGOs*, addresses the issue of "value of water" from a completely different, but maybe comparable, perspective, namely from the angle of local and international civil society. The overall discussion within this presentation aims to reflect on the role of local and international NGOs, their strengths and advantages, individual pitfalls and challenges, and to draw together ideas for how this involvement may be shaped in the future. This presentation again transcends an economic view and includes environmental and other aspects into a post-modern and post-statal approach.

Building on the general concepts provided in the first section, the presentations in the second section, ***Value of water in transboundary basins in different regions***, address concrete cases from two different regions of the world, namely Lake Constance in Europe and the Okavango basin in southern Africa. They both give an overview of transboundary water management and explore what aspects of water value are of relevance in their respective cases. The presentation on *Transboundary water management in Lake Constance – from tradition to cooperation* puts the historical development of cooperation to the fore and emphasises the

importance of traditions for successful basin-wide cooperation. It is stressed that on the one hand pragmatism characterises most of the transboundary cooperation but on the other hand the processes still lack public participation. Whereas the presentation on *Whose values matter most? Water and resource governance in the Okanvango River Basin* shows how particular values of water dominate resource use decisions, both in the colonial past and the contemporary. It is shown that water is also a border and a bargaining pool in regional politics.

This exercise makes a comparison possible between the "North" and the "South", highlighting similarities and dissimilarities which can be contributed to different social constructions of "value of water".

In many places groundwater is available as a significant natural resource. Many aquifers extend across several states and the coordination of transboundary management is necessary to avoid irreparable damage such as overexploitation, salinisation and contamination. Especially in arid zones the boundaries of groundwater catchment areas differ considerably to those of surface watersheds. Two presentations introduce the problems of ***Transboundary Groundwater Management:*** *Transboundary groundwater - A challenge for integrated water resources management* and *TRANSCAT: Water management in transboundary catchments - An example of the Czech-German hard rock region Sumava.*

The third section, ***Value of water under stress conditions***, is once more of a more general nature. The two presentations of this section deal with ecological, economic and political dimensions of the topic with an emphasis on the "water stress" problem. The argument is that under conditions of water stress good water management has to provide for benefits in all three dimensions. The challenge is to increase benefits to the river (the ecological dimension), benefits from the river (the economic dimension) and benefits beyond the river (the political dimension). Only an integrated, cooperative approach to transboundary water management will make those benefits possible. The first presentation in this section, *Water distributions under stress conditions: policy development and operational aspects*, addresses the linkages between policy development and water management with the example of the national water policy in the Netherlands. The second presentation, *Economic and political benefits of transboundary water cooperation*, focuses on the socio-economic and political drivers of transboundary cooperation and the respective constraints. Examples for successful cooperation despite or just because of stress conditions are given.

The fourth and last section of the workshop deals with ***Cooperation despite differing perceptions of the value of water***. This section directly addresses the problem of conflicts in transboundary river basins which, not exclusively but to a considerable extent, can be contributed to different understandings of the value of water. Again, some cases from different regions are presented: the Danube and Mekong basins and Namibian rivers. It becomes clear that conflicts are not confined to the international state-to-state level. On the contrary, conflicts are often characterised by linkages between the local, regional and international levels. For instance, water-related conflicts between local communities and central governments have an impact on the respective international relations; and international water-related agreements have an impact on the local level, thus triggering fresh intra-state conflicts. Water governance that aims at conflict resolution therefore has to be of a comprehensive inclusive nature involving a variety of stakeholders at different levels. The cases of the Mekong, the Danube and the Namibian rivers provide examples of how conflict-prone constellations can be managed and mutually beneficial cooperation can be institutionalised. The presentation on *Intra-state conflict resolution between local*

communities and central governments – Namibian cases exemplifies the Namibian way to address this issue by two assessed basins. By establishing basin management committees in the Kusieb and Cuvelai basins the government integrates by a participatory approach all stakeholders in the planning and management process. By doing so the Namibian government tries to prevent and solve occurring conflicting issues. With the presentation on *Multinational cooperation within the Danube basin* an encouraging example for multilateral cooperation is given. It proves that even between eighteen riparian countries effective tools and mechanisms can be established to ensure cooperation on a basin-wide level. Despite differing regional, social and economic disparities, interests and priorities across the basin certain values and principles can be shared. The last presentation in this section, *Intra-basin conflict resolution in the Mekong basin – Is a reconciliation of water values possible?*, questions the possibility of water values reconciliation. Clashing values between the riparian countries are identified as well as conflict resolution mechanisms and tools.

Based on the presentations and discussions, the workshop closed with a wrap-up and a formulation of conclusions, recommendations and follow-up ideas.

Topic 1

Value of water in different societies

The value of water in modern western societies

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Is the value of water reflected in its market price?

Modern western societies are highly influenced by the economic way of thinking. This might be the reason why an economist was asked to give this presentation. The first idea which arises when non-economists think about the economic value of a good is that this value is somehow connected to its market price. Indeed, if we look at the system of macro-economic accounting to determine the gross national product (GNP) of a country, the notion of "value added" is of central importance. This value is calculated by subtracting the cost of intermediate goods and services purchased from the sales value of the final good produced plus additions to inventory. Since the sales and costs of intermediary and final goods refer to market prices, they possess a vital importance in computing the economic value of national production (Baily and Friedman, 1991: 34). Another way of looking at the value of something is to observe the general level of appreciation of goods and services by the people and to understand demand behaviour, i.e. getting an idea of how much income people are willing to spend in order to consume certain goods. Economists examine such issues in micro-economic studies on consumer and market research. In modern micro-economic theory, the economic value of a good refers to the welfare it generates, and this is the market price *minus* production costs *plus* the total amount of money saved by consumers who would have paid prices in excess of the actual market price (consumer surplus) (Pindyck and Rubinfeld, 1992: 284). Both lines of reasoning, based on knowledge from macro-economic accounting and micro-economic consumer and market research, imply that the market price of a good is highly correlated to its economic value.

Considering now the value of water in modern western societies, it appears that it must be low because in most countries the amount of money that has to be paid for water is relatively low. In fact, in some countries its price is so low that many people have absolutely no idea about the dimension of the price level – it lies below their threshold of perception. Hence, they use it without thinking about its impact on their income – and they might not even appreciate it as a contribution to their well-being. One prominent example to support this hypothesis is the excessive use of irrigation water in agriculture in many southern European countries. There, irrigation water is highly subsidised with almost zero prices and, as a consequence, water is used inefficiently and in an unsustainable manner (European Commission, 2000: 22). Another example stems from market research in Germany. In a survey on consumer behaviour with regard to drinking water in the city of Leipzig, 520 households were interviewed. Among others, people were asked whether they knew how much money they paid for their drinking water. The results refute the idea that a threshold of perception exists: about half of the people interviewed were very poorly informed about the prices of drinking water, 37% could not even give a number and only 29% were able to identify the price range which corresponded to their individual average water price (Messner and Ansmann, 2005). This lack of price perception has two major reasons. Firstly, the frequency of payments for drinking water is low. Usually, households in Germany are charged for drinking water just once a year and the people who live in rented accommodation find the water price listed in an annual cost statement which contains many other items such as heating costs, waste disposal

and the like. Hence, compared to a good like milk or gasoline which has to be paid for time and again when it is bought, the information on the price of water is poor and usually hidden. Secondly, the price level of water and its impact on household income is low, as well. Looking at the litre price of liquids, people more or less know that a bottle of milk costs on average € 0.80, a litre of gasoline € 1.10 and a litre of bottled water € 0.60. Contrary to this, drinking water costs 200-400 times less, about € 0.003 per litre on average (this is valid for Germany, which is known to have comparatively high water prices in the industrialised world). As a result, the water-related impact of drinking water and sanitation costs on net income is low, too. In the German city of Leipzig it is in the range of 0.5 to 6 percent of net income (Messner and Ansmann, 2005). Hence, it is not astonishing that people are not aware of water prices.

However, if we look at the price relations of the goods mentioned above, do they reflect the value of water? Most people might feel uneasy with this idea – and they would be right, because the market price, or what appears to be the market price, is only one part of the economic value story. One explanation from a micro-economic perspective might be that the consumer surplus of goods with low prices is often higher than the price itself. Hence, the price alone may understate the economic value of water. Indeed, there are five complicating aspects regarding the relation of the economic value of water and its price. They are presented in the following.

Complication number 1: water is an essential resource and its services are becoming scarce

Usually, market prices reflect the marginal costs of all human effort to produce a good or a service. However, water itself is not produced by humans. It is pumped from the ground, transferred from one river basin to another, and the like, by humans. This means, it is just transformed by anthropogenic activity to supply one or another water service for a certain price, but water itself is a gift of nature. And, in its function to sustain life on earth it is an essential and unique element that cannot be compared or substituted in this function by any other element. Contrary to this, market prices are based on the fact that goods are substitutable with regard to the function, benefit or well-being they generate. Hence, if there exists a good that is essential for life, not producible by humans and non-substitutable, there is usually no market price attachable to it. Such a good is a heritage to all creatures on earth and should be treated carefully in order to ensure a long-term and sustainable use (Pearce and Turner, 1990: 48). This fact is valid for water on earth, too. For this reason, water also has social, cultural and religious values that are not related to any kind of market price.

However, water is increasingly becoming scarce in some of its functions and it is traded on markets, too. And, since the major task of economics is to understand and support the rational handling of scarce goods and services in society, water is an important issue for economists. *But the focus is on water services and not on water itself.* This difference is crucial because it also implies that the price of *one* water service like drinking water does not reflect the economic value of water on earth in general.

Complication number 2: water as a public good

Not all goods and services are well-suited for trade in markets. Only private goods and services fulfil two basic conditions that are essential for market goods. These conditions are:

firstly, regarding the consumer side, there should be rivalry in use of the goods and services, such that the marginal costs of providing them are larger than zero (otherwise, there would be no incentive to buy a good because consumers could benefit from its consumption without paying for it); and secondly, regarding the producer side, it should be ensured that the benefits of consuming a good or service are excludable (otherwise there would be an incentive to free-ride on the consumption of early buyers). If these conditions are fulfilled, entrepreneurs are willing to offer such goods and services in the market, their trading is likely to be successful and, hence, a market price emerges that reflects an important portion of its economic value (Musgrave and Musgrave, 1976).

With respect to water services, only a few of them can be considered private goods. One example is bottled water. It is traded in a market, several suppliers exist, there is rivalry in use and excludability of other consumers is guaranteed. However, most other water services cannot be considered private goods. They are called public or non-market goods because they do not fulfil one or both of the two private good conditions. As a result, market failure occurs and water services are misallocated and wasted in society. For example, let us consider the recreational water service "overall good water quality", including good water quality in rivers and lakes and also the quality of rain water. If a regional water cycle is in good shape and overall good water quality is realised, everybody can consume this service at many places at zero cost and cannot be excluded from this consumption. If there are clean lakes for swimming all around, fencing in one of them and charging a price to swim there would just not pay for any entrepreneur because everybody could enjoy this service elsewhere for free. The market price for this service would be zero. Let us look at another example: the use of water bodies as a sink for pollutants. Usually, unless a rigorous environmental authority exists in the area, the disposal of waste and pollutants in water bodies is available at almost zero cost, i.e. the costs of using this "sink service of the water cycle" are close to zero and there is almost no rivalry in use. An enterprise which supplies waste disposal services at a certain cost will always have to struggle with the free-rider behaviour of persons who dispose of their waste in the countryside. If national law would not prohibit pollution activities and local authorities would not enforce these laws, no private enterprise would be willing to supply this service because its price would be (near) zero. Finally, even the supply of drinking water is not a purely private good. Of course, if households are connected to the water supply grid, other consumers are usually excluded from its use. However, rivalry in use does not exist in many cases. Rather, households of a region are usually supplied by one enterprise based on the regional water resources and the greater the number of households connected to the grid, the lower the average costs of supplying the water. This means, marginal production costs are near zero. Hence, there is an incentive to connect as many consumers as possible to the water supply system in order to reduce the average cost of supplying water. What is more, drinking water prices are not real market prices because trade in a market usually does not take place and consumers depend greatly on their regional, monopolistic water supplier. Therefore, as is the case for many other non-market water services, the price of drinking water has more the character of a fee, a charge or a distorted monopolistic price.

Such non-private goods are simply not well suited for market trade. The ability to trade a non-private good in a market might be improved by means of institutional arrangements like laws, norms, user rights and the like (Dombrowsky, 2004). But the outcome of this kind of market activities can never be efficient. Either the suppliers of the service do not provide a sufficient amount to meet demand or average production costs are too high or consumers free-ride. Such markets are distorted and the emerging prices (or charges) are artificial and do not reflect the economic value of the respective service. However, to emphasise it again, this

does not mean that public goods like many of the water services have no value, it just means that they are not suitable for trade in markets. To resolve this problem either such goods or services should be supplied by state companies or the state should ensure reliable conditions for the provision of water services by means of institutional arrangements with the private and/or public actors involved.

Complication number 3: water value and external effects like pollution

As a consequence of the fact that many water services, such as the sink service of the water cycle, are non-private goods, they are used without being paid for. Although their use generates a cost to other people in society in the form of pollution, this is not, or only to a certain extent, reflected in the market price system. Economists talk about "external costs" or "externalities" and these are considered to be a major reason for the failure of markets (Baumol and Oates, 1988: 17). Let us consider, for example, the activities of European farmers who apply fertilisers and pesticides on their fields. Fertilisers and pesticides contribute to improved plant growth, but they also pollute ground and surface water. The costless use of the water's sink functions leads to environmental and social costs in form of health effects, degradation of environmental systems and adverse effects on the use of other water functions. In order to correct this market failure, the social and environmental costs of fertiliser and pesticide use need to be incorporated into the cost structure of agricultural activities, such that crop prices reflect all costs connected to their production, including the external costs (for instance, by introducing a tax on fertiliser use, see Hansjürgens and Wätzold, 2000). Economists talk about the "internalisation of social and environmental costs". Unless the external costs of using water services are incorporated in the prices of the goods that need these services as inputs to production, market prices are distorted and the prices of water services are labelled too low. Hence, the economic value of these services is understated and the resource is not allocated efficiently.

However, one might ask whether current practices in water policy of modern societies are not already sufficient to ensure the internalisation of external costs regarding the functions of water services. Indeed, especially as regards industries and urban settlements in Europe, which have extensively polluted water bodies in the past, water regulations of these so-called "point sources" have been successful during the past three decades. Polluters were forced to apply advanced water treatment technologies and, as a consequence of this form of internalisation, major improvements in the water quality of surface water bodies have been realised. Nevertheless, new forms of external effects concerning water functions have emerged during the past few years: non-point pollution by traffic and agriculture is still almost unregulated; pollution and over-exploitation of groundwater resources is still a major problem; and, last but not least, new pollutants like pharmaceuticals and hormones pose a new threat to water functions (EEA, 2003). Although the new water policy of the European Union requires the internalisation of external costs into the prices of water services (Art. 9 of the Water Framework Directive of 2000), the implementation of this new body of European legislature is confronted with many technical and methodological problems (Hansjürgens and Messner, 2002). As a consequence, the internalisation of all forms of external costs of using the manifold functions of water is a protracting endeavour. Therefore, it is foreseeable that market prices will not completely include water-related external effects during the coming decades. As a consequence, water prices will continue to understate their economic value.

Complication number 4: the value of use of water services

In order to shed some more light on the notion of value of water, it is also appropriate to consider the classical approaches of economic thinking. Authors like Adam Smith (1776), David Ricardo (1817) and Karl Marx (1867) distinguished between exchange value and value of use of goods and services. Exchange value is related to the scarcity of a good in the market and to its price. But to be successful in the market every good also needs to have an overall value of use which reflects its usefulness, and this is different among goods. However, the value of use is only a prerequisite for a good or a service to realise a price in the market. The price level in the market chiefly depends on the short-term scarcity situation. The value of use influences the price only indirectly, and it only has an impact on the price level under specific scarcity conditions. Let us consider the example of water and gold to clarify this point. The usefulness of gold is limited. It is a luxury good with some specific functions, but its main feature is its scarcity and therefore it has a high market price. Water is usually not as scarce as gold and therefore it has a low price despite its manifold functions and its essential role to support all life on earth. Nevertheless, if gold and water is offered in a desert, very thirsty people might be willing to pay higher prices for water than for gold. This extreme example shows that the usefulness of goods and services only have a significant impact on the price level if the scarcity situation of the goods and services considered is comparable. It also reveals that market prices are myopic because they only reflect the scarcity situation at one point in time, which is governed by specific supply and demand features (strikes, economic depression, oil crisis, war, over-capacities of production and the like). The fact that goods or services are becoming scarce in the long term due to exhaustion of resources, as is the case for all non-renewable resources, is hardly ever reflected in market prices (Messner 1999: 433). For non-market goods like water services, which are usually not traded in markets, the value of use is even less reflected in its price or charge.

Complication number 5: use and non-use values of water services

Modern micro-economic economists have taken up the idea of value of use in order to analyse the value of public and private goods from the perspective of the demand side. Contrary to the classical economists, their notion of "use value" is not interpreted as an overall value in a qualitative way. Rather, the use valu*es* of a good or service refer to its different use functions which can be quantified in monetary terms. Hence, one good can be considered as a bundle of functions or use values which all can be monetised by means of prices, consumer surplus and consumers' willingness to pay. Different approaches have been developed to quantify use values of non-private goods in terms of monetary measures by analysing market processes which are based on the usage of non-private goods. For example, the use value referring to the recreational function of a wetland can be determined by analysing the travel and spending behaviour of wetland tourists. In the context of the theory on cost-benefit analysis (CBA) several methods have been developed to monetise the use values of non-private goods (Pearce and Turner 1990: 141 ff., Hanley and Spash 1993: 53 ff.).

Some years ago the concept of use values was supplemented by the concept of non-use values and taken together they are said to reflect the "total economic value" of a good or service (Pearce and Turner 1990: 131). Non-use values are qualitative functions of a (public) good or service, which are not related to its explicit usage. Especially, two different forms of non-use values are distinguished. The *existence value* is connected to the appreciation of the pure existence of goods or services. Just the information of their (prolonged) existence is attached with a value. For example, people value the blue whale and are willing to donate money to

support measures for its protection although they will probably never see one. The *bequest value* relates to the desire of people to enable future generations to experience specific goods or services. With regard to water and the water cycle, existence and inheritance values may exist for water-dependent landscapes (like wetlands, floodplains and coasts), popular water-dependent species (like whales or dolphins) and water bodies with specific cultural or religious value. Since such values are usually not reflected in market prices, any price of a water service understates its value if such non-use values exist. In the context of cost-benefit analyses non-use values can be quantified by means of direct survey methods that intend to ascertain the willingness-to-pay (WTP) of people for public goods and services in a hypothetical market. In the United States results of WTP analyses have already been used as a basis to fix the amount of liability payments to be paid by environmental polluters (e.g. in case of oil spills, Marggraf 1999). In this instance, use and non-use values were part of a monetary measure of the (damaged) value of water and related systems.

Indicators for the value of water services

The five complications discussed above make clear that the economic value of water is not sufficiently reflected in the prices and charges of its services. Therefore, in order to take the snags of these complications into account, it is appropriate to consider additional indicators which help to better reflect the value of water in modern western societies. Four types of indicators are proposed.

1. The contribution of water to economic production

The contribution of water to economic production can indicate the current value of use of water for a national economy. If one brings to mind the many functions that water has in society and looks at different economic branches like energy production, the chemical sector and food production, to name just a few, the water quantities needed to produce a unit of value added – and also the cost share of water as far as external costs are taken into account – can be a good indicator to express its contribution to the production of the gross national product. Figure 1 shows the water use per value added produced in Germany in 2001.

About 22.5 litres of water are used on average in Germany to produce one Euro of value added. However, the average consumption in industry production is already about fourfold, while water-intensive sectors like energy and mining need 880-1200 litres of water to generate just one Euro of value added. Taking an average price of drinking water in Germany of about 0.003 Euro per litre, which to a large extent covers private, social and environmental costs of drinking water provision, and relating this to the average water use per Euro of value added, the cost share of water is relatively low, amounting to about 6% of value added. However, applying this water price to water-intensive sectors, which usually employ river or ground water at almost zero prices which do not reflect externalities, the costs of water would be higher than the value added, i.e. water-intensive industries would not be profitable if their water were provided by the usual waterworks. Although this example is not perfectly correct because industry often needs a lower water quality than provided by drinking water suppliers, it indicates that water plays an essential role in the economy – it has a high value of use, even beyond its essential function to sustain all life on Earth.

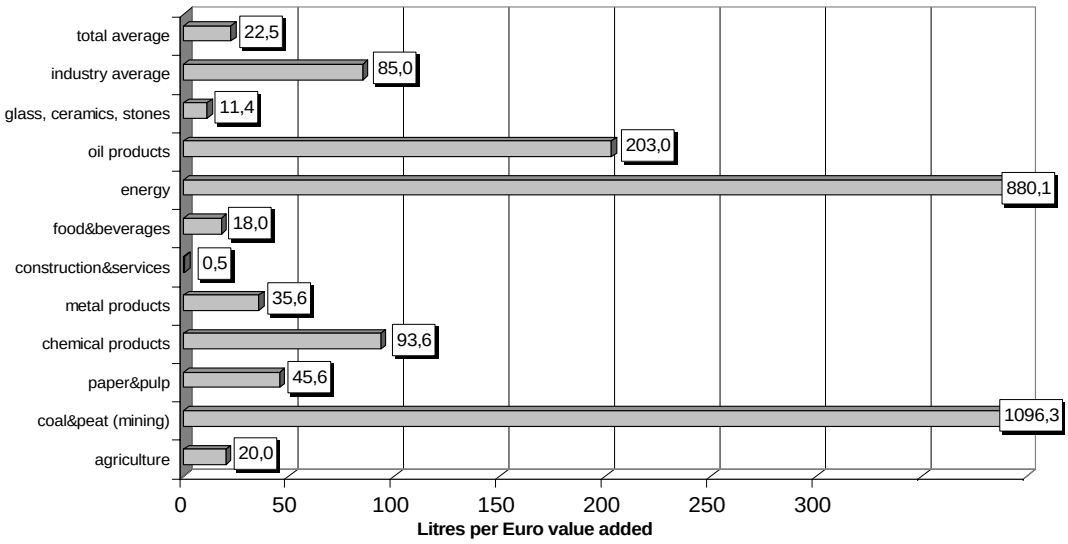

Fig. 1: Water use per value added produced, Germany 2001
Source: based on Statistisches Bundesamt, 2004

2. *Opportunity costs*

In order to get an idea of the value of water in future times with climate change leading to higher scarcity of water in many countries, it is sensible to look at the *opportunity costs of water use in drought years* or to examine the opportunity costs in regions where water already is a scarce good. Opportunity costs of a good are the costs that are related to foregone opportunities to use the good in question in an alternative way. The opportunity costs of water in extreme situations with decreased access or availability of clean water are likely to be much higher than under current circumstances. One first approximation of the opportunity cost of water is the loss that economic sectors suffer if less water is available. Research results of the project GLOWA Elbe, which examined the impacts of global warming on the hydrological cycle and on the water users of the Elbe river, reveal that some economic sectors might be very vulnerable to climate change. Figure 2 shows the impact of climate change (with an average increase of 1.4 K) on the profits of the fish-farming sector in a tributary of the Elbe river. According to these results, climate change leads to decreased water availability such that average profit losses of the sector might amount to about 10% over the next decades (Messner et al. 2004). Hence, the opportunity costs of water in this, and most likely in several other sectors, are going to rise, reflecting the (potential) future value of water much better than current water prices or charges.

3. *Investments in water protection*

In a holistic analysis one should not only talk about the value of water and its services, but also about the value of the whole water cycle as an essential part of nature, which delivers many (non-market) water and ecosystem functions to society. In economic terms, water services are the product delivered to society, while the water cycle can be termed the "natural capital stock" that generates this product. An appropriate indicator for its usefulness to and appreciation by society is *the amount of money spent to keep it intact in its ecological and societal context*. The overall amount of environmental protection expenditure reflects the efforts of society to internalise environmental costs in terms of investments in waste water treatment plants, efforts to supply clean water, regulation of chemicals and the like. These

investments also contribute to the well-being and to the income of people and, therefore, they should – at least partly – be assigned to the value of water, too. In 2001 about 120 billion Euro were spent in the European Union for environmental protection and most of this money was spent to protect water resources (see Figure 3). This is about 1.3% of GNP in the EU (Johansson 2001). This appears to be low, but if we compare this figure to the national GNP of individual EU countries in 2001, it is about as high as the GNP of Portugal or Finland (Biedma 2005). Furthermore, it is very likely that the process of implementing the Water Framework Directive in order to achieve its ambitious water quality goals will require increased amounts of environmental protection expenditures in the future. Considered this way, sustaining nature and the water cycle is highly appreciated in the EU.

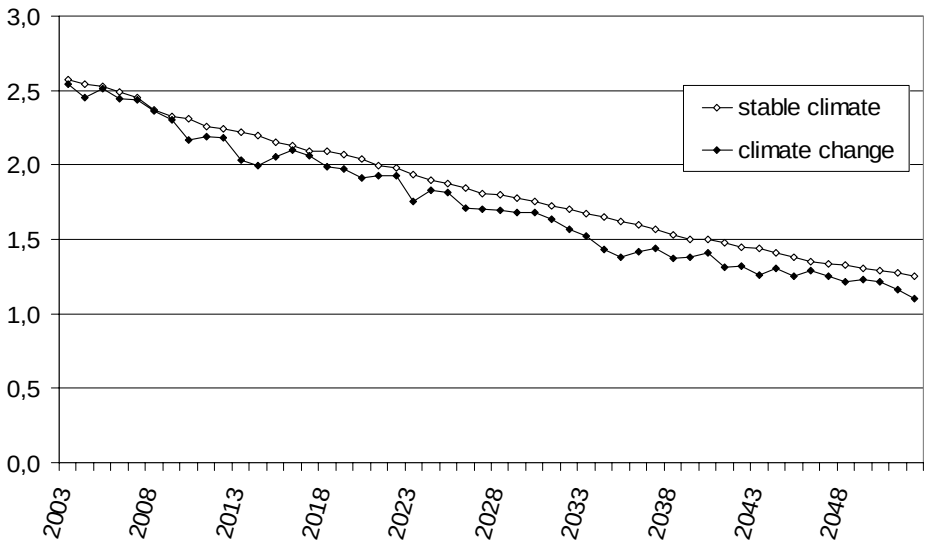

Fig. 2: Fish farming profits under conditions of stable and changing climate, Lausatia region, Germany, million Euro of 2003 (discounted 2%)
Source: based on Messner et al., 2004

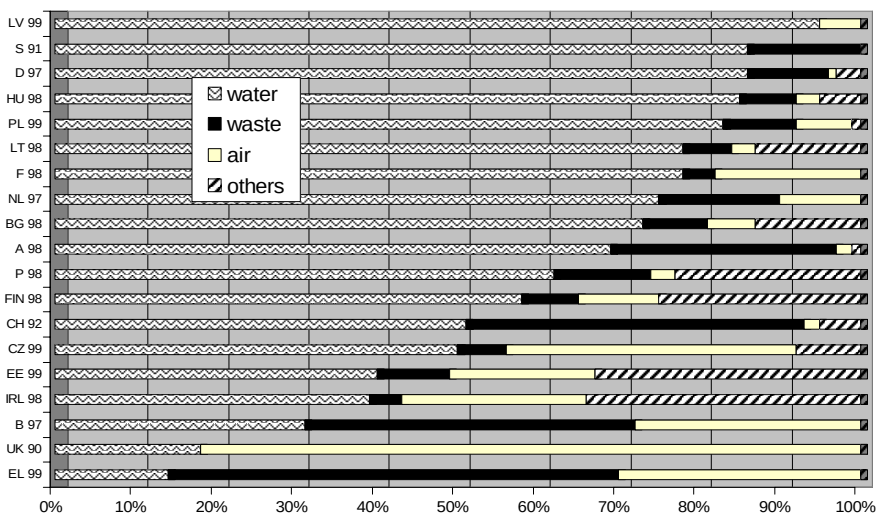

Fig. 3: Distribution of public environmental expenditure in EU countries, in per cent for the most recent year of data availability
Source: based on Johansson, 2001

4. Value indicators for non-market water services

The above indicators refer to water services which are closely related to market processes. Hence, they do not reflect use and non-use values of water services which are not traded in markets or supplied through market-like arrangements. In order to include these values, *indicators for non-market water services* are needed. These indicators could refer to monetary results of cost-benefit studies or they could just indicate people's appreciation of the value of water in a non-monetary way. Regarding the monetary expression of the use and non-use values of water-related services, several economic studies have been published. For example, Gren et al. (1995) analysed the services of the Danube River floodplain and came to the result that the use value of the floodplains as regards timber "production" and provision of clean water and plants amounts to a value of 110 Euro per year and hectare, the sink services for nutrients are worth 212 Euro per year and hectare, while the recreation function of the Danube floodplains was estimated to total 180 Euro per hectare and year. Meyerhoff (2001) examined the willingness-to-pay of people in Germany to protect the coastal landscape of the island Sylt against the possible effects of global warming. Thereby, he examined the use *and* non-use values of consumers and quantified their preferences, including the consumer surplus as an important element of economic value. It was calculated that the willingness to pay to protect this water-related landscape and its services adds up to about 325 million Euro per year. Such results can be interpreted as important contributions to represent non-market use and non-use values of individual water and water-related services in order to estimate the total economic value. Unfortunately, only a few results are available up to now for some selected examples. It would take a lot of effort to estimate all water-related services in one country or region in monetary terms. However, the outcomes of most studies clearly show that the use and non-use values of water services are impressive and that many people highly appreciate the services of the water cycle. This impression can also be supported by survey data which express people's appreciation of water services in a non-monetary way. For example, Messner and Ansmann (2005) found that the water demand of people who do not know the water price highly depends on their positive attitude towards environmental protection. This means, protection of water and the water cycle is a widely acknowledged societal objective and this is an important incentive for people to handle water sparingly.

Conclusion

Summing up, although market prices of goods and services are important indicators to reflect their economic value, they are not sufficient to inform about the total economic value. This is especially valid for the case of water services, which are rarely traded in markets. Looking just at the prices or charges for water services would imply that their economic value in many modern western societies is low. However, five complications must be considered regarding the value of water services. First, water is a gift of nature and is essential for life and economic production. Second, many water services are public goods and not well suited for market trade. As a consequence, market failure occurs such that, third, externalities arise and place social and environmental costs on society which are not reflected in the prices. Fourth, the value of use is not reflected in prices. And, fifth, there are many water services with use and non-use values which are neither traded in any kind of market nor provided by institutional arrangements such that prices (or even charges) are not existing. All these complications imply that prices or charges of water services understate its economic value. In order to consider these shortcomings of water prices to reflect their economic value, four types of indicators have been proposed in this paper. The findings can be summarised as follows: water services contribute essentially to economic production in modern western societies; their opportunity costs under future conditions of rising water scarcity are likely to

be high; modern countries in Europe spend a lot of money to sustain the services of the water cycle by means of environmental protection expenditure; and people highly appreciate the existence of water-related services. Hence, it is to be concluded that water is (still) a cheap good as regards the prices or charges of its services, but it is remarkably valuable for the economy and society at large.

Acknowledgements

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Water's vulnerable value in Africa

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Introduction

If someone were to ask what the value of water is, what kind of answer would that person expect? A definite price with a precise figure? A fairly narrow economistic (McNeil, 1998) treatise on externalities and opportunity costs? An anthropologist's story on the specific cultural value of water in a given society? An environmentalist's judgement of the ecological functions of water? A lawyer's argument in defence of water as a basic human right? An artist's impression of a waterfall with a rainbow?

If I am specifically asked to say something meaningful on the value of water in African communities, it is implied that this value differs from that of other communities. But does it? Perhaps less than one would superficially assume: the value of water in African communities is very similar to that in other communities because no people can survive without it and we are all in need of it (Gaffney, 1997; Savenije and Van der Zaag, 2002).

Yet we all seem to expect that there is indeed a difference in the way societies value things, and in particular such precious and vital natural resources as land and water. In this essay I aim to come closer to answering satisfactorily the question of what the value of water is in Africa by considering a handful of aspects that I think we should take into account.

My argument is that water obtains value in the process of utilising it, whoever we are and wherever we are. Value is an emergent property or an emergent quality that arises in practice, in working with water, knowing it, capturing it, storing it, cleaning it, putting it to use, aligning activities and techniques to it, consuming it, respecting it, returning it to nature or dumping it, polluting it or perhaps even destroying it.

Since communities have different practices with respect to water, they may value it differently. Asking about the value of water is therefore asking about how a society "treats" water. It may be that the manner in which a society treats its water resource is indicative of its level of development, sophistication and, why not, civilisation.

In this article I will review four aspects of water use and explore the effects these have on how the water is valued. These aspects are knowledge, technology, coordination and competition.

Knowledge

Water is valued by humans because of the recognition that we depend on it. Not only that: we realise that other resources we depend on, such as food crops and animals, also rely on water. Further, we care for the resource because we realise that the resource has to retain its capacity of renewal. This presupposes an understanding of the water cycle and of the dynamic relationship between abstraction, use and replenishment and knowledge of sustainable levels

of utilisation. This may be demonstrated by the experiences of various communities throughout the African continent. Here I present examples from Kenya/Ethiopia and Zimbabwe.

The nomadic Boran of northern Kenya and Ethiopia are deeply aware of their dependence on wells (see Box 1). To them water has great symbolic value. Indeed the whole stream of social life is seen to be analogous to the circulation of water through the soil, wells, milk and the bodies of humans. The main sources of water, wells, are associated with particular clans and underground water is metaphorically associated with "underground" kinship connections. In sharing water for livestock, the Boran emphasise solidarity and mutual respect among humans. The Boran are also aware that there are limits to the sustainable use of water. In all, for the Boran water is a key symbol that organises a series of very different discourses - about gender, fertility, territory, kinship and power (Pálsson, 1990: 11-12).

Box 1: Boran hydrogeology and water management

The nomadic Boran of northern Kenya and Ethiopia understand how the different wells in this semi-desert area draw from nine "well-complexes" of permanent waters (*tullaa*). A new well within a particular region may only be dug when the owners of the other wells agree that sufficient underground water is available, as they are aware that wells draw from the same aquifer. Although each well is owned by one clan, any other clan may use it. All have to respect an established order of watering the cattle. The watering of cattle may be labour-intensive if the well is deep and water levels low: long chains of men stand at different levels and pass from hand to hand water buckets made of giraffe skin, all the while chanting rhythmically to ensure the smooth flow of water and to minimise the time each herd spends at the well (Dahl & Megerssa, 1990: 24). Digging a new well normally involves a lot of labour, since wells are generally deep. The workers are fed on meat. This is an interesting dynamic to keep stock at sustainable levels: if the animals are too numerous, there is a need to invest in new wells; digging new wells requires many animals to be slaughtered, reducing stocking rates. As one Boran elder formulated it (Dahl & Megerssa, 1990: 31):

> "That's why we say that the multiplying of cattle is not a serious problem. We can use the excess for the discovery of new sources of water and land. The number of cattle can never be greater than what the land can take."

Boran knowledge of water and hydrology appears to be rooted in historical accounts. This is also the case with communities in Zimbabwe. The Shona of Zimbabwe have only one word (*mvura*) that refers to both water and rainfall. They are keenly aware of their dependence on a good and plentiful rainfall season. Box 2 sketches a few elements of Shona knowledge and beliefs of water.

Box 2: Some elements of Shona knowledge related to water

Shona communities are aware of their dependence on rainfall. Rainfall is believed to be influenced by the ancestors. Vijfhuizen (1999: 34) describes a community where two chiefs are in conflict, Chief A representing the people that first established the community.

> "Chief A is the first to move the clouds and then Chief B follows in moving the clouds, and then the clouds meet. … "

This describes the requirements for rain to fall, in terms of social harmony between two competing chiefs; but also, in some ways in meteorological terms; the quotation perhaps also reflects an understanding of rain-bearing mechanisms. As if to describe climate change, the story continues as follows:

> "But these days Chiefs A and B have separate ideas and there is not a good connection. They should unite as in previous times. Chief B cannot do it alone."

The fact that rainfall, just as land, is linked to the ancestors demonstrates the importance given to rain. The ancestors are considered the owner of a territory and can ensure its fertility (Lan, 1985: 226). In any community the newcomers have to pay respect to the residents; and every year the oldest ancestors have to be consulted and asked to bring rain. The rainmaker, as spirit medium, has to maintain relations with the ancestors. In former times, the rainmakers controlled the natural environment and agriculture. There were areas considered sacred which could not be cultivated. They also decided when to sow and when to harvest (Ranger, 1999; Lan, 1985). But still today, if the rains are bad, it is believed that the ancestors are unhappy about the conduct of the current generation. As one chief stated: "If there is no cooperation, there is no rain" (Vijfhuizen, 1999: 37).

There are still taboos about using cement and concrete in springs and rivers; otherwise, it is believed the water will dry up (see also Chikozho and Latham, 2005). The flowing water is considered a gift. This seems to imply that you should accept it as it is and not try to control it.

Ranger (1999) recounts the emergence of a prophetess in Zimbabwe during the great drought of 1991/1992. She said (quoted in Ranger, 1999: 284-5):

> "The dams are too many and they also use cement to seal the *njuzu's* homes … It had become impossible for Mwali's water spirits, the *njuzu*, to thrive in the streams of Zimbabwe. … This is my job, to teach the people to be humble with each other. … All the elders died – there is no one to teach people. Nobody knows anymore what the causes of all ills in our land are. … The *Njuzu* said: 'Go and teach all people so they will live again according to law and order, so the rains will come again.' … I try my level best to help, so as to prevent drought, but they [the politicians] do not want to listen."

Some aspects of Shona knowledge may seem esoteric. But the basic value is that of living in harmony, both amongst people and between people and nature (Mohamed-Katerere and Van der Zaag, 2003). As Chief Chitanga Chitanga formulated it:

> "Living in harmony is the grain of our life. We live with others, they live with us. If the customs and the laws agree, people live together in harmony. The elders initiated the young in the ways of respecting the land, the soils where the bones of their fathers and mothers rest." (Hove and Trojanow, 1996: 114)

The Boran and the Shona show that both peoples have a profound appreciation of the importance of water for their societies, to the extent that the physical and the social worlds emerge as being mutually constitutive. The realisation of the importance of water not only translates into an attitude of respect for nature, but also, reflexively, nature is presented as a mirror of society. Whereas for the Boran the water metaphor permeates all important societal

dimensions, for the Shona rain emerges as a fundamental value or yardstick; rains may fail if society lacks harmony.

Technology

The value that is ascribed to water may not only depend on whether or not its inter-dependencies and the water cycle itself are being understood. It may also be influenced by the degree to which communities have developed technologies that enhance the effective use of the water or reduce the risk of water-related disasters such as droughts. There are many examples in Africa of technological innovations that achieve just that (see e.g. Reij (1991) for soil and water conservation technologies). Here I give three examples of farming systems that are based on endogenously developed water management technologies:

- capturing rainfall through terracing the steep hill slopes in Biriwiri, Zimbabwe;
- mangrove rice polders in Basse Casamance in Senegal;
- indigenous irrigation furrows of the Sonjo in Tanzania and the Taita in Kenya.

Box 3: Water harvesting on stone-walled terraces in Biriwiri, Zimbabwe

Biriwiri is a small valley in the Eastern Highlands of Zimbabwe, where from time immemorial people have used the waters of the small Biriwiri river for domestic use and for cultivating crops, on ridges along the riverbed or using irrigation furrows. However, most communal farmers do not have access to river water to irrigate their crops, since their plots are located on the steep hills, away from the river. These farmers use rainwater instead to raise their maize, beans, pumpkins and other crops (Van der Zaag, 2003).

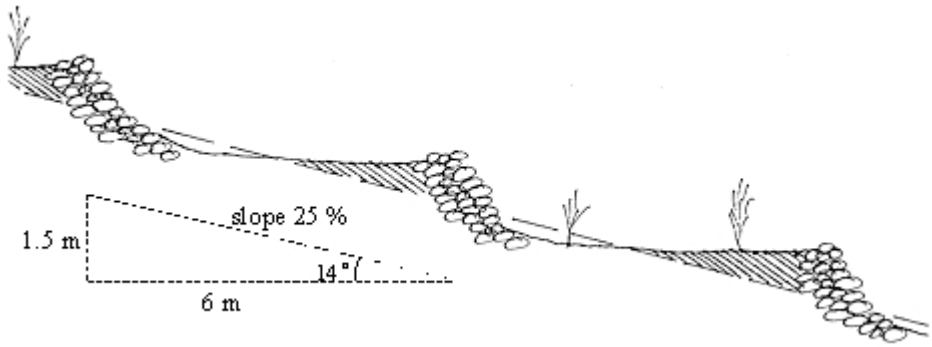

Figure 1: The bench terrace (schematic)

What is special about the Biriwiri hill farmers is that they have eked out their arable plots on hill slopes that the agricultural extension service considers too steep and unsuitable for arable agriculture. To cultivate the steep slopes farmers have developed stonewalled terraces (Figure 1). The Biriwiri terraces form nearly flat mini-catchment areas where rainwater is captured for the cultivation of crops. The way in which the stone walls are laid out implies that soil erosion is minimised, even on the steepest cultivated hills (steeper than 20%). Farmers manure their fields annually and intercrop maize with beans. Farmers also believe that the terraced fields have an internal source of nutrients that sustain yields: while planting the seed with the hoe, stones that seem to 'grow' to the surface are removed and thrown upon the walls, the soil below being `virgin' and nutrient-rich. Farmers have invested vast amounts of their labour in constructing the terraces (about 300 to 550 labour days per hectare as a once-off investment, excluding the annual maintenance works required).

Box 4: Diola rice polders water management technology

Rice polders in the Basse Casamance, Senegal, are located in the tidal marshes of the Casamance river and consist of reclaimed mangrove clays (acid sulphate soils). Central to this rice production system of the Diola is the control of salt and fresh water as well as soil acidity and soil salinity by means of dykes and ponds.

A polder starts from the higher sandy soils where the village is located and extends towards the tidal areas where the mangroves have been reclaimed through the construction of dykes (between 0.5 and 2 metres high) with sluices. In between the rice fields and the outer dyke there are water ponds that serve as buffers between the rice fields and the unreclaimed mangrove soils. The ponds are used for fish cultivation and salt production. With these elements Diola farmers manage water flows so that rice can be grown and soil quality is maintained.

In the dry season, when the rice fields lie fallow, farmers consciously keep the water table in the rice fields very high, through maintaining the water level in the surrounding ponds to its maximum. This is not difficult: at high tide salt river water is let in through the sluices. Through the high water table rice soils do not dry up and acidification is forestalled. At the same time, however, the soils become salty.

The first rains are used to wash out the salts from the ridges. The salts are collected in the furrows and this water is drained through the ponds. This is possible because at that time water levels in the ponds are kept low, and excess water is drained at low tide through the sluices in the outer ring-dyke. After this first washing of the rice fields the ridges are ploughed and turned. With the following rains the fields again submerge and then the rice seedlings can be transplanting.

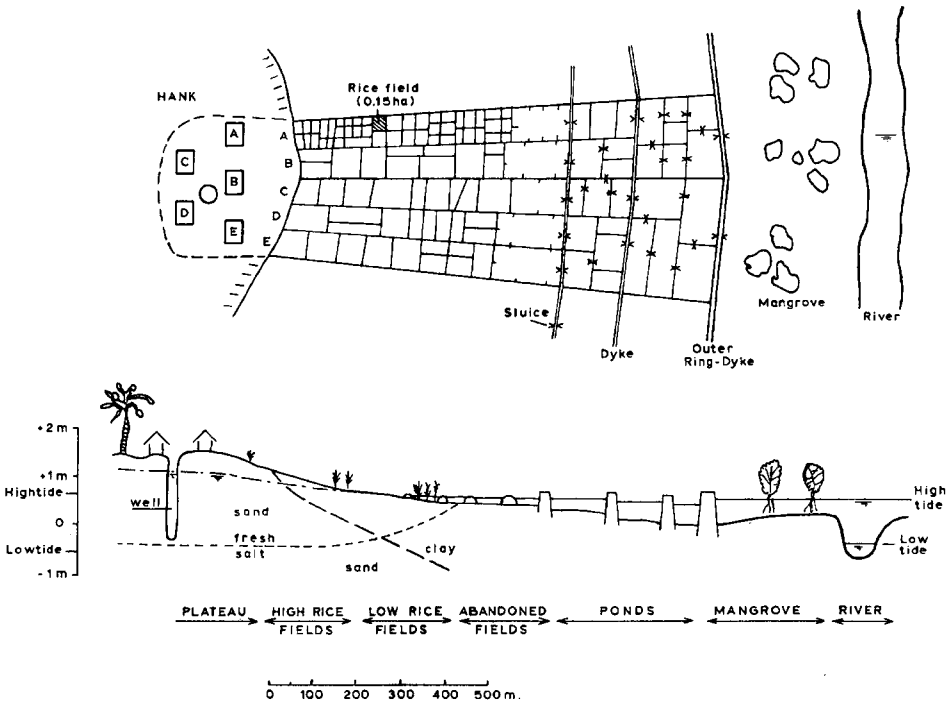

Figure 2: Diola rice polders, Basse Casamance, Senegal (schematic)

Now it is crucial to keep the fresh water collected on the rice fields, because with the rains to come the crop has to be raised. The fresh water can be contained through maintaining a high water table in the fields, and this is possible through keeping a high water level in the fish ponds. The result is fresh water standing on the fields, and a shallow fresh water table in the soil, below which the salty ground water is found. In the soil, and in the furrows, then, the fresh water stands ('floats') on the (heavier) salty water. It ensures that no fresh water can seep away (Figure 2). Farmers have an intricate knowledge of these phenomena.

Box 5: Indigenous irrigation furrows in East Africa

East Africa is famous for its indigenous irrigation development. Here, the Taita in Kenya and Sonjo in Tanzania are briefly described. (The description is based on Fleuret (1985) and Diemer (1988) for the Taita, and Potkanski & Adams (1998) for the Sonjo).

Taita (Kenya)

The Taita live in Coast Province, Kenya, on hills reaching 2,200 meters altitude. Fleuret (1985) describes an irrigation system located along the upper reaches of the Mwatata river. In a stretch of 2.5 kilometres, 16 intake structures built of sticks, rocks and earth feed water into small irrigation canals largely running, some of them for several kilometres, along the contours of the slopes. The canals are 30 to 60 centimetres wide and about 30 centimetres deep. At each field outlets are made by digging away a part of the canal bank. The smallest fields have just one, the largest require more than seven outlets. Within their fields farmers construct temporary ditches to distribute the water evenly. With the succession of generations the layout alters. Men accommodate the needs of their married sons by dividing the plots. Large plots are split from top to bottom, small plots across, by constructing a special ditch at the side of the upper plot to lead water to the lower one. The Taita use their canals and ditches to extend the growing season. When the rains are late, they irrigate and seed. When the rains stop early, the Taita give some supplementary water.

When extending their infrastructure, they meticulously respect the power relationships in which they live, making the lay-out of the canal network reflect their kinship network. Plots are divided as sons become adult and marry or when the father dies. Fathers-in-law may loan plots to their daughters' husbands, and brothers to a sister who is head of a household. The area that a man cultivates thus corresponds more or less with the phase in the domestic cycle. Water is distributed without apparent effort, in an almost incidental way because water relations are governed by, or are even epiphenomena of, social relations. Disputes that may arise between users of different canals when one group's intake structure captures too much water can be solved within the village council of elders. Fleuret (1985: 113) sums up:

> "the canal is not just a water works; it is a physical expression of historical and ongoing social processes."

Sonjo (Tanzania)

Also the Sonjo in Tanzania operate their irrigation furrows according to the local distribution of power. The Sonjo have built their irrigation furrows along the slopes of the Kilimanjaro. Potkanski & Adams (1998) recount that the increasing demand for irrigation water led to scarcity in three villages, especially during the drought of 1992. The hereditary elders enforced their preferential access rights to water and sold water to others. Many ordinary villagers disagreed about this development. In response the District Commissioner organised a public meeting and, while acknowledging the customary rights to water of the ruling hereditary elders, he ordered that the distribution of water be handed to the village council, and the old rotational system of irrigating each area was reintroduced. In face of water shortages, however, the rotations started to lengthen and crops experienced water stress. The incidence of water theft increased. In 1996 uncontrolled stealing of water reached such levels that the lack of power of the village council to control it was publicly recognised. A new agreement was made between the villagers and the ruling elders whereby the role of the latter in water distribution was formalised but kept in check by the village chairman.

What is striking in these three farming systems is that all are based on significant labour investments that are required to build the terraces, the dykes and the furrows. This investment creates and reaffirms the relationship between the investor and his/her investment (see also Von Benda-Beckmann, 1995). Coward (1986a and 1986b) would say that in the process of investment hydraulic property is created, which has to be respected if the farming systems are to remain productive.

But there is more to it. Property relations do not so much define the relationship between a person and an object, they also and specifically define the relationships between humans vis-à-vis that particular object. In the case of the Diola rice polders and the East African irrigation systems it can be seen that ownership of the furrows influences the relationships between the households at village level and also the relationships within the household in terms of gender and age.

In developing technologies and investing in the land, water is better controlled and the landscape is changed. Such investments further enhance the value ascribed to water, at least up to a certain point.

Coordination

In utilising the water resource reference is sometimes made to taboos. In many African villages there are taboos related to the use and protection of water from traditional wells and ponds. Although often expressed in mythical language, often these taboos have a very practical effect: they help to ensure that the source of drinking water is kept clean, is maintained and protected and not polluted, and they impress upon all that access to clean water is not self-evident.

We came across the taboo of using cement and concrete in rivers in Zimbabwe (Box 2). Cement and concrete is said to harm the water creatures or water spirits. In the Eastern Highlands of Zimbabwe the Manica do not allow concrete to be used in diversion weirs that take out river water for their irrigation furrows. This taboo is interesting from a water management perspective. The diversion weirs in the rivers are simple structures made of local materials. This has two important results: they leak (do not divert all river water) and they collapse (have to be reconstructed each year after the rainy season). Instead of considering this technology as being below-standard, we could consider it as the cutting-edge! The leaking weirs ensure that the rivers do not dry up completely which is good for the environment and for the furrows that take out water further down the river. The fact that the diversion weirs have to be rebuilt annually seems to foster cooperation. The irrigators at the head end of the furrow partly depend on the labour input by the tail-enders during the reconstruction of the diversion weir. The latter's labour investment translates into a claim to the furrow's water that cannot be ignored by the others, ensuring that the water reaches the tail (Van der Zaag, 1999: 171). Manica irrigation technology and water management are internally consistent and mutually reinforce principles of equity and ecological integrity, which are globally recognised dimensions of integrated water resources management (IWRM). Note that the many indigenous irrigation furrows in Tanzania and Kenya are based on a similar dovetailing of technology and management principles (see e.g. Fleuret, 1985; Grove, 1993; Adams et al., 1994; Potkanski & Adams, 1998).

The taboos reviewed here have two effects: first, they explicitly express a norm or value and second, they enforce coordinated or collective action.

With a growing population demand for the goods and services that the water systems produce increases. The specific combination of technological and managerial solutions that characterised these systems may not be adequate anymore. These systems increasingly experience stress. Technological and institutional adaptations have to be made to ensure that the systems cope. Frequently this is impossible and the carrying capacity is exceeded. Power struggles ensue that aim at redefining and reaffirming rights and claims to water. This is

exemplified by the struggle over access to irrigation water from the Sonjo furrows (Box 5), but there are many more examples (see e.g. Huggins, 2000; Van der Zaag & Röling, 1996). Sadly, sometimes these struggles develop into violent conflict, such as the recent clashes over irrigation water in Kenya whereby 15 people were killed (BBC, 24 January 2005).

Competition

In many parts of semi-arid Africa the pressure on the water resource has reached serious levels and tensions between water users are on the increase. The challenge is to find suitable procedures and systems that lead to sharing arrangements that are economically efficient and socially acceptable, while having a limited impact on the environment. The decision-making procedures and systems should build on the management practices that already exist, some of which have been briefly mentioned in this paper. Water sector reforms, legal reviews, formulation of IWRM plans and the establishment of river boards and catchment councils, developments underway in many parts of Africa, pose a unique chance of upscaling local level practices. So far the trend has been to import models from outside. Some of these simply do not work under the given circumstances (see e.g. Van Koppen et al., 2004, for Tanzania, and Derman and Ferguson, 2003, for Zimbabwe).

The clash of values is exemplified by Bev Sithole's detailed ethnography of consultations about the new Zimbabwean Water Act, the new water institutions and the new water permit system (Sithole, 2000). One stakeholder asked rhetorically: "This water that you want permits for, who is making it, who is its owner?" (p.8) – essentially rejecting the notion that we control water that is flowing. In rejecting this, the moderator replied, "water is water, no distinction is made about source, it is use that will determine whether water is paid for." A chief in Nyadire, another sub-catchment area, perceptively pointed to the fact that it is difficult to manage water without the infrastructure to store it. He observed: "We cannot share what is running; how do we plan or manage what is not there?" (Sithole, 2000: 11; Chikozho and Latham, 2005: 7-8).

So if indeed the water scarcity problems spread to entire river systems, it may not be enough to adopt foreign management models that are now promoted in Africa. These presuppose a certain degree of control over the water resource that requires certain levels of infrastructure development, i.e. reservoirs. Without this infrastructure, it will be impossible to share the water in a rational, efficient, equitable and peaceful manner.

By way of conclusion: water and value under stress

The value of water is in a state of flux in many parts of Africa. This is a reflection of some important developments that directly impact on the water resource. The increased competition over water has in many places led to water obtaining a monetary value and sometimes it is even being traded. This somehow clashes with the perception that water is god-given and that it should be treated with great respect. This is a dilemma that needs to be acknowledged.

On the one hand we have the perception and the profound understanding that water is a gift that we are not supposed to want to control, that water should retain its special and unique

status,[1] and that it cannot and should not become private property and monetised. On the other hand there is the urgent need and wish for development and modernisation in Africa, hence the need to exploit the water resource, store it in concrete reservoirs, mobilise it in time and space and turn it into an ally of development.

This dilemma not only reflects the difficult and challenging African reality, it is also a reflection of the profound ambiguity of the concept of value: the moment you have precisely fixed the value, it becomes prone to exchange and alienable (Miller, 1987). Better not to try to define the value of the thing you value most, since it may result in you losing it! This is perhaps what the Dutch poet Lucebert wanted to express when he wrote: *"Alles van waarde is weerloos"* ("Everything of value is vulnerable"). A completely different perspective would be to consider it a gift that must be passed on and shared with others. In sharing it, its value increases (see also Hassan, 2003).

All this is related to the modernisation project in general. Once technological developments have reached the stage that people forget and even deny that they depend on nature and are embedded in it, but start to think that they stand above it, nature being de-mystified, then the perceived value of natural resources gradually erodes. It can now be controlled, exploited and utilised for the benefit of man; in the process man alienates himself from nature. While adding value in a narrow sense, another value is being lost.

But what is the value of water if 42% of the population in Sub-Saharan Africa are still without sustainable access to clean water (UN Millennium Project, 2005)? If Africa is to narrow the development gap with the rest of the world, endogenously developed water management has to be upscaled. Water harvesting technologies and small-scale irrigation technologies should spread widely across the continent. But this may not be sufficient in many densely populated areas. In heavily committed river basins large-scale infrastructure development seems to be a prerequisite for equitable and efficient water management. The water management institutions that are now being designed and established throughout the continent will not be able to control and manage the water resource satisfactorily without this hardware, as the Nyadire chief already observed. This conclusion agrees with the new water resources sector strategy of the World Bank that reinstates its conventional focus on infrastructure development (World Bank, 2004).

The ultimate challenge, then, is to reconcile the wisdom embedded in African water management as reviewed in this paper, captured by core values of social equity and ecological integrity, with the urgent need for economic development. The new water management institutions as they are currently being developed, for instance in Southern Africa, have the potential to become governance structures that upscale local natural resource management practices. These will have to dovetail with upscaled local and foreign technologies for water control. The perfect fit that is needed is by no means self-evident. It will require African ingenuity to confront and engage modernity while building on the deeply rooted core values.

In all, the answer to the question of what the value of water is in Africa can be a very short one: *x* Pula per litre. If that is the wrong answer, the correct one will be very lengthy, the value of water being a quality that cannot be entirely captured by, and reduced to, a number.[2]

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[1] Compare with Roman Law that classified water in the category of things that belong to each and everyone (*res omnium communes*), i.e. belonging to citizens and non-citizens, animals and plants. See Uys (1996).

[2] Compare with the critical analysis of the concept of "commensuration" in a water resources context by Espeland and Stevens (1998).

It is just like what the author György Konrad observed: “Asked about the meaning of life, people start recounting their entire life history.”

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Different religious approaches to the value of water

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1 Water isn't just water

Of course it is nothing new to the natural sciences that water is not just "water". But this is also true with respect to social, cultural and, above all, religious interpretations, where water is not defined on the basis of a chemical or biological analysis.

Given a time limit of only a half an hour, it is impossible to describe the relationships various religions of the world have with respect to the value of water. It is also impossible to explain their respective theologies adequately (whether those of Buddhism, Hinduism, Shintoism, Judaism, Christianity, Islam, or even natural religions).

My aim is also not to criticise any religious practice dealing with water.

I want to explain what they have in common in an anthropological, social or religious sense. It is necessary to comprehend the deeper reality of individuals' relationships to water[1].

Let me present a few points for better orientation and understanding.

2 Water has different values in the different religions

This is not only an obvious fact, but also a necessary differentiation in order to understand that the same water can be a different water, holy for one person, unworthy, perhaps even dangerous or completely unnecessary for another. At Buddhist funerals when some water in a little bowl is placed before the dead person, this bowl contains something from the cycle into which the dead person then enters.

For Hindus all water is sacred, but some sources of water are believed to contain "drops of amrta - the nectar of immortality". Advocates of hygiene, having grown up in Western civilisation, may shake their heads in despair when they see pilgrims bathing in and drinking water from the Ganges River at Benares[2].

For Moslems, on the other hand, such water is not only dirty but also impure. Islam insists that clear water or, even better, clear flowing water is necessary for purifying the body and the soul[3]. Other acceptable kinds of water in Islam are rainwater, spring water, well water, water

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[1] Cf. Mircea Eliade, Traité d'histoire des religions. Nouvelle édition entièrement revue et corrigée (Paris 1964) 165-187.

[2] Norbert C. Brockman, Encyclopedia of sacred places (Santa Barbara/California 1997) 295: Benares = Varanasi, "the eternal city" on the banks of the river Ganges. Here pilgrims come to drink from the water to receive eternal life in the next world.

[3] For the prophet Mohammed such ritual washings were one half of one's faith since they were the key to prayer: Thomas Patrick Hughes, Lexikon des Islam (Wiesbaden 1995) 747; Koran, Sure 5, Vers 7: „O ihr Gläubigen, bevor ihr euch zum Gebet anschickt, wascht euer Gesicht, eure Hände bis zum Ellbogen, reibt eure Köpfe

from hail, water from snow and clear water from oceans and rivers. More liberal interpretations allow drinking water to be used for all religious ritual washings.

3 Water at the same geographic place has had different values during history

This is important with respect to the cultural transformations of history in the various steps of historical progress.

As an historian, with speciality in the history of Christianity, particularly church history, I am convinced that most of the various cultural developments enter deeply into human religious feelings and perceptions, more so than is often reflected upon or made the subject of discussion in the field of religion.

One of my fields of speciality is Historical Anthropology. Changes coming from the passage of time are a major factor of transformation. This is not only true for understanding social and religious images, but also for understanding the supposedly scientific constants. You would surely agree that not even plants in the Middle Ages contained exactly the same composition of substances as our plants today. They have evolved.

Not only religions and everyday reality are altered by the respective time factors; apparently unambiguously objective reality is also dependent on a variety of cultural agreements, which change throughout history.

At the same time every area of scientific theory and practice is subject to the danger of self-reference (see Niklas Luhmann).

In addition:

4 The "speed" of water (as a cultural and anthropological argument)

Here I am not referring to the speed of the flow of water, but to the speed with which the value of water has changed in our consciousness, in our way of thinking and in its concrete use. In historical and anthropological terms, for scientists water also has no static measurement, because their intellectual relationship to water changes with their tasks, their point of view and their perspectives. Even this change is not constant but is variable.

The speed with which scientists react also varies, as can be seen by the perception of units of time[4]. On the other hand this also reflects the factor of expectation with which scientific

feucht ab, und reinigt eure Füße bis zu den Knöcheln hinaus; habt ihr euch durch Beischlaf verunreinigt, so wascht euch ganz. Seid ihr jedoch krank oder auf Reisen oder wart ausgetreten oder habt Frauen berührt und ihr findet kein Wasser, so nehmt reinen feinen Sand und säubert euer Gesicht und eure Hände damit“; John Bowker (Hg), Das Oxford-Lexikon der Weltreligionen. Für die deutschsprachige Ausgabe übersetzt und bearbeitet von Karl-Heinz Golzio (Düsseldorf 1999) 1072: Für den gläubigen Moslem werden zwei Waschungen unterschieden: „GUSL“, die vollständige Körperwäsche, etwa nach einem Geschlechtsverkehr, vor dem Freitagsgebet und vor Hauptfesten, auch Tote müssen vor ihrer Beerdigung gewaschen werden; „WUDU“ dagegen ist die kleinere Waschung (Gesicht, Mund, Nase, Hände, Arme bis zum Ellbogen, Füße bis zu den Knöcheln, das Kopfhaar feucht abgerieben), um eine rituelle Unreinheit zu beseitigen.

[4] For example how long a driver waits at a red light before driving on the green light varies. Vgl. Robert Levine, A Geography of Time (New York 1997); deutsch: Eine Landkarte der Zeit. Wie Kulturen mit Zeit umgehen.

results are demanded. With this short reflection, I would like to draw your attention to the fact that this acceleration of time is an essential factor of change with respect to dealings with water.

To simplify: The change in people's concept of water means they no longer draw water in order to enjoy it or to strengthen themselves or even for washing; they want to attain quick access in order to use water. In this way there is no real connection to water or through water, as is often the religious connotation. Instead there is only concern with consuming water, generally without any conscious thought. Often enough thoughts are somewhere else entirely while one flushes the toilet or stands under the shower to prepare himself for the next event.

These preliminary comments aside, I still would like to first address the issue of cultural factors. These are seen in the older religions, less often in modern religions which have just arisen in the last two centuries.

5 Water isn't just for drinking

For before, after, or during meals: It is not only a food for the purpose of maintenance of biological and physiological processes.

Water does not just have a purpose, it has a deeper meaning. There is perhaps a religious dimension beyond that of necessary, pure utility, often taken for granted.

Therefore:

6 "Holy" or "sacred" water is often not the same water as normal drinking water

Within the context of history this is very important. In almost all cases, "holy" or "sacred" water is another kind of water altogether! Whether it springs from a certain source at the foot of mountains, or has a special location on the banks of a river like Benares on the Ganges, or whether it is set apart through prayers and blessings by priests or by men or women, or whether it is given only at certain days in the year. Such a holy water can be touched, can be used for washing and can also be drunk. Yet it is often surrounded by taboos. Not all things can and may be done with this water! Only some special practices are allowed. Abuse is always punished.

Mostly, in the tradition of the “pre-modern” religions:

7 "Holy" water makes people and things pure

But watch out: This does not refer to the concept of hygiene, which first established itself in the nineteenth century. Religious purity is more of an inner purity. Purity, to begin with, was originally not an externally visualised purity, even if this aspect certainly was present. Ever since the "middle-class" or bourgeois nineteenth century, people have begun to deny the unwashed beggars a direct connection to God because they are not clean. In contrast, for the “pre-modern” religious mentality the exaggerated spruced-up person (decorated with

Aus dem Amerikanischen von Christa Broermann und Karin Schuler (München - Zürich 2001) hier besonders 200-205.

perfumes and otherwise cleanly washed with no unique characteristics of the individual human body remaining) would be the impure human being. He would lack that instinctive individual consistency which identifies the people within their group and which they recognise in each other.

But I do not deny that religious purity and cleanliness have a connection. Let me remind you of the ritual washings demanded of women during theirs periods, as found in Jewish tradition, Christian antiquity, Moslem tradition, and as mentioned by Isidor of Seville. Within the traditions of Catholic Christianity "churching" was common until the Second Vatican Council. This ceremony gave a special blessing to the mother of a newborn and newly baptised baby, in order to make her pure again, or rather to place her in this special, beneficial atmosphere which is created through holy water. Water served as the medium in this religious setting. Naturally a living creature, a place, or an object can be made pure or can become pure again with holy water.

8 Water makes you healthy

In all “pre-modern” religions there is a certain interdependency between religious salvation and health. Traditional religions did not, as so often in modern Western civilisations, only promise life after death. They provided help and experience for this world, and assisted human beings in understanding their connection to everything which is beyond human experience.

Water purifies that which comes before health. In this respect holy water should serve as a path to health. In many traditional religions people make a pilgrimage to holy places, where there are holy springs, holy wells, holy rivers or holy beaches. During their visits they combine prayer with drinking these holy waters (or bathing in them). This is for the greater, the eternal salvation, but also for current health, which they need now.

Part of the interpretation of this practice has separated the religious from the medicinal aspect in the course of history. This began approximately with the cultural differentiation process that came about through Humanism, the Reformation and also in the Catholic Church after the Council of Trent (1545-1563). This was when people began to distinguish between health care and religious rites. This secularised separation was quite distinct in Calvinism, the religion most highly influenced by intellectual impulses. Calvinism considered the connection between health and religious rites to be superstition. This separation put an end to the "material piety" of the late Middle Ages. Religion was now to be spirit, and therefore it was not to be confused with the material world.

Later in connection with René Descartes, who did not necessarily think that way himself, but rather just wanted to pursue this train of thought for the sake of argumentation, more and more of Western consciousness developed toward the direction of spirit and matter no longer touching or changing each other.

The Catholic Church however remained resolute in its understanding that the blessing of a priest or other holy actions could change matter or even reality, that God can, will, and does intervene in this world, that He provides help and salvation.

But this is no simple automatism. Here we have within the Western world the longest tradition of a primal religious interaction with physical elements, especially with water.

9 Water as the substance which carries the Spirit of God

Only a few religions support such superlative claims about experiences with water. Certain parts of Hinduism do, as does above all Christianity, and not only during its early and medieval manifestation.

Such statements, that water carries the spirit of God, reflect, to be sure, something of the original experience and may seem rather strange to us today. Theologically, however, they are thoroughly compatible with the biblical Gospels according to St. John. Especially the multidimensional theology of the Gospels according to St. John uses water over and over again in order to portray the multiple facets of the relationship of Jesus Christ to the believers. What water means is shown by the woman of Samaria meeting Jesus at Jacob's well. She sought "water to drink, but returned with living water"[5] after her encounter with Jesus.

"Water symbolises Jesus, the message he proclaims and the possibility of new life he represents"[6].

The way proceeds from that drinking water which supports life to that water which is more than every other water and from which every other water has its source. This water comes from God Himself[7]. It is the reality of God himself, as represented by Jesus.

"As a symbol of Jesus himself, water may serve as a sacramental symbol, but its meaning and function certainly transcend that."[8]

Especially the medieval interpretation of these theological teachings recognised in holy water the spirit which promised Jesus. The water itself was not the spirit, but rather the water carried the spirit.

In Western civilisation every blessed water, every sacred water has its origins in this theology. This holy water changes and vitalises. In an historical and anthropological sense one cannot make a clear separation between Biblical/Christian theology and pagan natural piety. Both interlink with each other like archetype and reform or like the basis of creation and the coronation of salvation.

10 The common rite with water binds together

The rites of initiation almost always involve water in the various religions. For the moment, let us ignore the question of whether this is in fact holy water, as for example in baptism in the Catholic Church, or whether, as in most Protestant denominations, a normal, everyday water is used. The person to be baptised is sprinkled with this water or even submerged in this water, usually in the name of God, the God of the trinity, and thereby becomes a member of a community of salvation in a church. Conscious participation in a rite of water creates a shared identity within this group.

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[5] Larry Paul Jones, The symbol of water in the gospel of John (= Journal for the study of the New Testament supplement series 145) (Sheffield 1997) 255.
[6] Ebd., 225.
[7] Ebd., 230: "Water symbolizes Jesus himself. He is the one who can end all thirst".
[8] Ebd., 238.

11 Point: All human beings have a right to their own holy water

This refers to the Universal Declaration of Human Rights and its statements about freedom of religion and freedom to practice one's religion. Article 18 from the Universal Declaration of Human Rights states: "Everyone has the right to freedom of thought, conscience and religion". This includes "teaching, practice, worship, and observance" of religion also in dealings with water.

12 What about normal water?

Most religions lay claim to a certain competence of interpretation with respect to the everyday and to the scientific areas. Within the religious world water is understood to be a part of creation, a gift to humanity, not just as economic capital which only needs to be administered. All of this has definite consequences for the administration and the economics of water.

12. 1 Water is there for everyone

According to the Universal Declaration of Human Rights, Article 22: “Everyone … is entitled to … through national effort and international co-operation and in accordance with the organisation and resources of each State, the economic, social and cultural rights indispensable for his dignity and the free development of his personality”. Water, being indispensable for life, is covered by these rights and has become more and more dependent on this international cooperation. In a way, you can see in the historical perspective a secularised version of the Christian love of one’s neighbour. This is also true for dealings with water resources. Other religions also are acquainted with similar rules of behaviour.

12.2 Even the technological dealings with water change the value of water (as anthropologically defined)

Because human beings move in varying cultural stages - however this does not mean that all non-Western cultures first have to go along with every nonsense of the West - and because all people move in varying cultures, their attitude toward water therefore also varies. Especially in cultures dominated by sensitive, religious ideas, the technocratic systematic methods using planning and calculation - instead of relationships and intuitions - are seen as a brutal approach to something which human beings did not create, with which, however, they deal as if they were the supreme creators of all things. I can understand when many people who did not grow up with the Western culture have the feeling that this is a cold and unkind way to act and therefore regard the water that results from such a treatment as dead water[9].

Even the circumstance of whether water has to be taken from cold, metal, mechanical devices or is scooped up with the cupped hand changes the water, at least changes the perspective of people to this water. The fact that these feelings are generally given a religious interpretation shows simultaneously how closely piety is bound to its archaic perceptions and attitudes and that is indeed not a projection or mere wishful thinking[10].

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[9] Cf. Mubabinge Bilolo, La religion africaine face au défi du christianisme et de la techno-science: Présence Africaine (1981) no. 119, 29-47.

[10] For example: Most of my time I live in Austria. I say that there is a difference between eating a cinnamon roll made by hand by a baker and eating one that has been produced in a bakery factory. Test it yourselves! Perhaps you can also taste the difference. If you cannot believe my claim, make the blind taste test. Put on a

This, however, does not mean that a rational, responsible treatment of water is impossible. But it will also always be necessary to leave people certain niches, where they can experience more intense human relationships to nature, water, air and other precious riches of this Earth. It would be very wrong to eliminate human capacities with regard to treatment of water. The realm of experience, as defined by anthropology, belongs to the primary or secondary intelligence, whereas technocratic science and mentality are farther removed from the human experience. Naturally these abstractions, and they do not claim to be anything else, can offer solutions to problems which human intuition in its limitations cannot discover.

Maybe I can explain what I mean when I tell you what I experienced in the three years I lived in Rome. If you want a refreshing drink of water or water for an excellent minestrone soup, you do not get it from the technologically produced water out of the faucet which gives you such an intensive blast of chlorine that your eyes begin to water. Who can stand that? Rather, you go to the old Roman water pipes that the popes kept in good repair through the centuries. For newcomers to Rome this water can be a problem, as diarrhoea and other stomach disorders can result from various little creatures swimming around in these old pipes. But after living there for a while, you begin to appreciate this refreshing water travelling through over 30 kilometres of ancient trenches from the mountains to the city. And this is only one example from the area of drinking water, which, however, can be transferred well to religious practice with respect to water.

In conclusion

To be perfectly clear: Water is there for everyone - and if not, then it should be made available to all people, very simply for religious reasons. Water is something that human beings did not create, but rather it is something which all human beings and all living creatures should have available.

If you create a special relationship to water, then you are already within a context of a relationship which is not dissimilar to the religious. You feel a certain connection to water, a relationship with something that in its Latin roots "religio" means relationship or bond. This is not necessarily religion, but perhaps a preliminary step in that direction. Here is where contemporary, esoteric understanding can come in.

For some, this exquisite wetness might be understood as the gift of a great, giving God, the God who lets rain fall on all, whether good or evil. For most people in this world water - whether as a spring or even as an ocean - is related to God or to one of many deities. Just as God lets the rain fall on all of us, it is incumbent upon us human beings to make sure that water is available to all people.

It would behoove human beings to adopt something of this generous attitude.

We dare not forget that water is also the force of chaos[11]. In the beginning, in various stories of creation, water was "tohuwabohu", Hebraic for "complete chaos". The biblical story of Noah and the great flood also shows that human beings cannot dominate the waters[12].

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blindfold and try to determine a difference. However, sight and appearances also play an outstanding role with respect to water.

[11] Cf. Harald Haarmann, Geschichte der Sintflut. Auf den Spuren der frühen Zivilisationen (München 2003).

[12] Peter J. Harland, The value of human life. A study of the story of the flood (Genesis 6-9(Leiden – New York – Köln 1996); Florentino García Martínez, Interpretations of the flood (Leiden – Boston – Köln 1999).

However, people need to make an effort to deal with water. For this I am grateful for your skill, expertise and continuing research.

Boundaries of practice in transboundary river basin management in southern Africa
A look at the role of NGOs
Based on IWRM and river basin management experiences in Namibia

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Introduction

NGOs have not always been active in the area of water in southern Africa as water was handled mainly as a supply issue either directly by local communities through their own collection or by the government in terms of infrastructure and services. NGOs have not traditionally had a prescribed role in this area. However, as the water sector itself has been changing in southern Africa towards greater provision of infrastructure to local communities, need for cost recovery, decentralisation of authority over water and in general greater need for water, there have been major changes in the water arena in individual countries in southern Africa. Scarcity of water pervades this region and, as development and industry show marked increases, so too has the need for water and the greater sourcing of a supply of this precious resource. More and intensified use of water systems has threatened the supply through over-abstraction, pollution and diversion of water courses, and has also had implications for natural ecosystems, local communities, and issues of sovereignty and transnational relations. Further, a greater recognition of the intertwined nature of water and related resources has come into the limelight with the emergence of the Integrated Water Resources Management (IWRM) concept, and the resultant programme and agenda have opened the water sector to NGO involvement.

The opening of a niche for NGO involvement in the water resources arena has seen a flood of NGOs on both the local and international level entering into this field from numerous angles. What has NGO intervention brought with it and what have been the implications of involvement by different levels of NGOs are important questions to be explored. This paper seeks not to present a diatribe on the subject but rather to engage in a dialogue on the topic of NGO intervention from local and international levels. Rather than a situation of confusion and competition, the ideal should be engagement and interaction leading to cooperation and commitment to achieving common goals. Drawing on experiences from Namibia, special focus is given to NGO involvement in water-related projects. Within the framework of its Water Desk a local NGO, the Desert Research Foundation of Namibia, initiated and implemented a basin management approach through the Kuiseb River Basin Management project (ELAK) funded by the EU. The NGO facilitated the introduction of the basin management approach and the creation of a basin management committee (BMC). Following the mandate of the still-to-be-enacted new water resources management bill which devotes a whole chapter (Chapter 4) to the formation of BMCs, this process in the Kuiseb was spearheaded and facilitated by the NGO in partnership with the Department of Water Affairs and worked strongly on the principle of wide participation, with the stakeholders driving the

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process through a FIRM BasE. From this and other experiences it is possible to explore the advantages and challenges faced by the local NGO within this type of project centred on water-based issues. While this is an example of local NGO implementation in a transregional river basin solely within the boundaries of Namibia, it can serve as a platform for learning lessons and projecting questions and ideas beyond this scope. It can be seen as a microcosm of some of the same conditions and issues faced in transboundary systems.

So, having looked at the involvement of local NGOs, what about international NGOs, which have also become heavily and widely involved in water-related projects and issues? This paper also attempts to look at the involvement of international NGOs in the water sector. The overall discussion within this paper aims to reflect on the role of local and international NGOs, their strengths and advantages, individual pitfalls and challenges and drawing together some ideas for how this involvement may be shaped in the future. One of the central questions of the workshop *Value of Water – Different Approaches in Transboundary Water Management* is how cooperation can be improved and how water-related conflicts can be solved. A dynamic process of interactive learning and action should characterise activities in the water sector, laying strong emphasis on partnerships and local empowerment. In this quest there is a special place for NGO intervention, with international and local NGOs occupying different roles but working together with all other stakeholders towards a common goal of effective integrated water resources management to achieve peace, conservation and sustainable development.

In most societies there are three main categories of actors – state, market and civil society. These three main actors are or can be involved to different degrees at different times. In the case of water there are different scenarios of involvement by the three main actors illustrated in Figure 1. Much work has been done and much discussion has been held over the role of the state in water demand, supply and management. New methods of balancing water supply and demand and improving management have involved the use of market forces through the privatisation of water sources, supply systems and management bodies. However, in all of

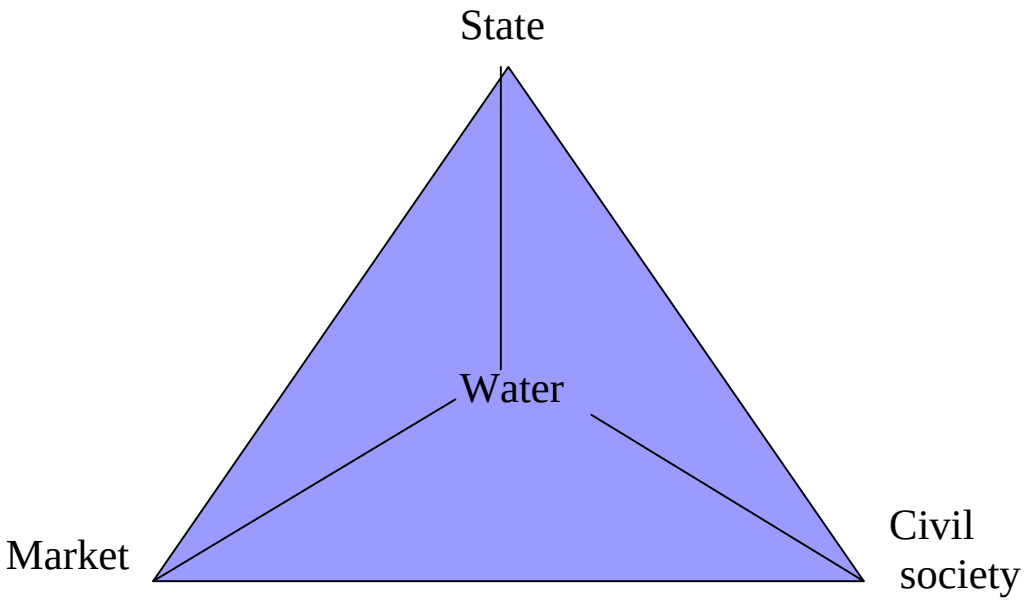

Fig. 1: Relationship between the main actors in the water sector
(Adapted from Hobley and Shields, 2000)

these various methods of water sector organisation, civil society has increased its engagement with structures especially in the realms of advocacy and representation for marginal groups and also for the voiceless elements of the environment. The role and responsibilities of the various civil society actors are an interesting component of the water sector to explore. In addition to their own actions, there are interesting interface zones between the various actors which create boundaries of practice. In this particular study we explore the boundaries of practice of civil society through the work of non-governmental organisations operating at different levels from international down to small local-level organisations.

Setting the scene

Namibia is an arid to semi-arid country experiencing large variations in the amount of rainfall, spatially and temporarily. The total rainfall averages about 250 mm ranging from less than 50 mm along the west coast to a high of approximately 600 mm in the north-east. Much of the rain that falls is lost through evaporation (83%), especially in the more arid western areas. There is an uneven distribution of water resources across the country and these are generally found far from demand centres (Heyns et al., 1998). The only perennial rivers in Namibia are shared, transboundary watercourses situated on the country's borders. These systems are important resources, supplying around 38% of Namibia's water requirements (Heyns et al., 1998). The remaining water requirements are met through dams on ephemeral rivers and through groundwater aquifers.

Namibia and its population are dependent on these limited water resources and over time there has been an increase in pressure on these resources, exacerbated by population growth. Namibia's present population of approximately 1.8 million people, in the opinion of some, already exceeds the carrying capacity of the land, the water and its resources. Increasing pressure on natural resources has led Namibia to adopt a number of measures to address this through appropriate management. One mechanism employed has been the development of strategic political frameworks through policies and legislation that help to regulate resource use, development and management activities. Since independence, several natural resource-related policies have been revised and as a result now either directly or indirectly provide support for more integrated management towards sustainable development. These include, *inter alia*, Article 95 of the Constitution of Namibia, the Agricultural (Commercial) Land Reform Act (1995), Forestry Act (2001), Environmental Management Bill, Water Policy (2000), and draft Water Resources Management Bill.

The Namibian government has been making steady progress towards devolving control and management responsibilities over natural resources to local communities (Kruger and Kambatuku, 2003). The draft Water Resources Management Bill, amongst others, promotes community involvement and decentralisation through the appointment and training of community-based water point committees responsible for local-level water resource management. It also promotes the establishment of basin management committees to facilitate a more integrated approach to planning and natural resource management of each surface or groundwater basin.

However, despite these new measures, the resulting situation is still very often that natural resources are managed in a multitude of ways by various organisations, government ministries and other interested parties. While all the groups have good intentions to monitor, better understand, promote awareness of and conserve natural resources, there has been very little coordination of such efforts. This lack of coordination stems from often simple gaps in

communication, lack of information-sharing, limited integrated planning systems as well as individual agendas and approaches.

The Kuiseb basin, while only crossing intra-national political boundaries, can serve as a microcosm for conditions and actions on an international boundary level. The Kuiseb basin will be looked at in the context of the attempts made to manage this system as a holistic basin involving stakeholders. The project implemented to fulfil this was undertaken through an interface between the three main actors previously mentioned – state, market and civil society. While the project was managed by a local NGO, this was done in partnership with the Department of Water Affairs, the responsible state structure, and worked closely with the market-oriented parastatal NamWater.

Kuiseb basin experience

The Kuiseb Basin has as its backbone the Kuiseb River, one of Namibia's twelve westward flowing ephemeral rivers. This 'dry' river extends 503 km from the Khomas Hochland area just west of Windhoek, the capital city, in a winding path towards the coast, meeting, occasionally, the Atlantic Ocean at the town of Walvis Bay. The Kuiseb Basin covers an area of approximately 21,800 km^2, but more than a third of this area has such low rainfall that it produces little to no runoff. As an ephemeral river system, the Kuiseb is not characterised by constant or consistent surface water flow. Rather, the river usually only flows a few days a year, and not at all some years. The flow of the river is dependent on both the amount and intensity of rainfall in the upper catchment of the basin where rainfall is highest (300–350 mm per season in the eastern-most reaches). There is minimal input from rainfall in lower parts of the basin as rainfall decreases to less than 20 mm/annum on the Namib coast. Data from the Gobabeb Training and Research Centre located on the river in the Namib Desert some 340 km from the river's source show variations, since 1962, in the number of days of flow that range from 0 some years to 102 days but the river most commonly flows for a mean of about 16 days per year (9 days a year median). Only in years of exceptional rainfall does the river reach the sea; the water usually evaporates, seeps into the sandy bed of the river or is caught in storage dams long before it gets to the lower reaches of the river. There is minimal input into the system from alternative sources such as fog.

The Kuiseb Basin can be divided into three parts based on physical and socio-economic characteristics – the upper, middle and lower Kuiseb. In its upper reaches, the Kuiseb River and surrounding well-drained land supports a community of farmers producing livestock and wildlife on a commercial basis, and a growing tourism industry. The middle Kuiseb receives little rain, but alluvial aquifers fed by the occasional flows of the river support a riparian woodland in an otherwise sparsely vegetated, desert landscape. Here, the river also supports a number of Topnaar communities of small-scale farmers, a training and research centre at Gobabeb, and much of the fauna and flora of the Namib-Naukluft Park. Further west, towards the delta of the river, substantial groundwater aquifers supply the coastal town of Walvis Bay with all of its fresh water, as well as helping other towns and various mining and quarrying industries in the area to meet their freshwater needs.

The upper Kuiseb (9,600 km^2) receives relatively good rains (350–200 mm per year), and being mountainous and characterised by stony soils and hard surfaces, forms a well-developed drainage system. To support their livelihoods in the upper Kuiseb, farmers have built impoundments in the form of earth dams to take advantage of the runoff. Groundwater is limited with hard-rock aquifers characteristic of this upper area; however, boreholes are used

to abstract water from fractures in the geological make-up to meet the water needs of these commercial farmers. There are approximately 109 farms in the Kuiseb River Basin, with an estimated 750 farm dams (Amoomo et al., 2000). Concerns have been raised, especially by stakeholders downstream, that these dams reduce flow to the lower Kuiseb to such a degree that they affect recharge of the alluvial aquifers downstream. However, these dams are relatively small (less than 20,000 m^3) and research suggests (Angula et al., 2001) that the reduction in river flow caused by farm dams is not as significant as was earlier surmised.

The middle (11,200 km^2) and lower (1,000 km^2) Kuiseb areas are characterised by low rainfall (less than 200 mm per year) and sandy soils. The sandy riverbed supports alluvial aquifers, which are extensive in the lower Kuiseb. Between 300 and 500 of the 3000-strong Topnaar community are resident along the Kuiseb River most of the year. The majority lives in Walvis Bay. The communities along the river use boreholes powered by solar energy to obtain water from the alluvial aquifers. In the past, they obtained water from hand-dug wells ranging from1–4 m in depth. The Gobabeb Centre abstracts a small amount of water from an aquifer in the river using a borehole. Wildlife and vegetation are supported by the aquifers in these middle and lower reaches.

The aquifers of the lower Kuiseb not only supply the communities living along the river, but also the town of Walvis Bay and its industries. Walvis Bay is one of the largest settlements in Namibia with a population estimated to be 41,000 (Silverman, 2004). The town has an exceptionally high growth rate, estimated to be between 5% and 6.5% per year (Billawer and Ekobo, 2002) since its reintegration in 1994, largely due to migration. The town offers hope of employment in secondary industries, such as fishing, manufacturing, mining and construction.

Abstraction in the lower Kuiseb is lowering the water table. The aquifers are only significantly recharged when exceptional rains in the upper Kuiseb produce substantial floods to these lower reaches – an event that has happened twice in the past 20 years. The vegetation along the lower reaches is showing signs of stress. This vegetation uses an unmeasured amount of water, thought to be significant, and which is becoming an important component for consideration in resource planning and development. The water sector and stakeholders are presently working to establish a programme that will investigate environmental water requirements for the basin.

The basin concept aims to include surface and subsurface water, an expansion of the previous concept of catchments, which sought only to demarcate areas of water input and surface water in the system. The basin concept now recognises the larger system containing subsurface storage and movement of water used by the people, flora, fauna and landscape of a particular geographical area – sometimes out of the catchment area itself. This basin concept recognises a basin as one system and that an action in one part of it can have positive or negative effects on other parts, supporting the IWRM approach to integrated land and water use and management.

The case in the Kuiseb involves a series of first stakeholder meetings and then basin management stakeholder forums, from 2001 to 2004, totalling over one hundred and twenty stakeholders representing over twenty different sectors within and associated with the Kuiseb Basin. At each meeting there have been on average fifty stakeholders representing close to twenty sector groups. The sectors represent users and service providers, those within and outside the basin boundaries and private and public sectors. The groups include commercial farming, communal farming, coastal municipalities, regional councils, a wide cross-section of

government ministries, directorates and departments, non-governmental organisations, and NamWater, as well as scientists, researchers, donors and other interest groups. The varied stakeholders bring to the process high-level decision-making, advisory capacity, technical expertise and experience, extension services, research and knowledge of the area.

Role of local NGOs

- Ability to design and implement frameworks e.g FIRM BasE
- Water Desk example – umbrella idea
- Facilitation
- Bringing different players together
- Creating trust (which is often lacking in government)
- Integrating force between themes and issues (government is more sectoral, not able to merge issues so easily)
- Flexibility

Challenges for local NGOs

- Tied to country politics
- Local agendas

Suggestions for international NGOs

- Better funding
- Access to global networks
- Out of political, social context
- Greater recognition, vision to be given to project on global scale
- Access to specialists, technicians, expertise
- Greater advantage perhaps in regional context for transboundary

Problems/disadvantages

- Do not know/understand context
- Little manoeuvrability within the society

Difficulties as NGOs working in basins

- Antagonism
- Critical view of NGOs
- Working with policy framework (especially hard if do not agree with it)
- Limited voice in policy formulation
- Trying to gain legitimacy through involvement of government
- Working on government time scale and according to government whims, bureaucracies and systems

- Inconsistency of government players, actions and principles (also between ministries, sectors etc.)

Recommendations

- Partnerships between local and international NGOs
- Need to strengthen local partners through capacity building and support of local processes
- Engage in private-public partnerships

Conclusion and take-home message

There is no general blue print which can be designed and followed for taking actions in transboundary water management programmes. Rather, it is essential to look at local context and to define the best arrangement based on the particular characteristics and conditions in place. In short, the cry could be: "Do your homework!". Further, it is necessary that components of sustainability be included in projects for after project time is over.

Questions

A number of questions still need to be considered in all of this:

- Is it always advantageous to work through NGOs? If so, why? (Need to consider atmosphere towards NGOs)
- How is the buy-in of government ensured (especially if it is or seen to be a NGO-run project)?
- Given the need to take a low pace to keep stakeholders on board and comfortable, how can funding be sustained?
- If working with international NGOs, how can external domination be avoided?
- How can the fulfilment of goals be ensured from the local level rather than the global level?
- How can the capacity-building of local partners be ensured when international NGOs come in?
- What can international NGOs offer?
- How can the targeted mandate of international NGOs (which is unlike the local NGOs which work more broadly and in many areas due to inability of context to support too much specialisation of work) be balanced with the often complex situation needing a wide breadth of support and actions?
- How can sustainability of projects be ensured to avoid dependency on international partners who will eventually leave at some time?

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Topic 2

Value of water in transboundary basins in different regions

Transboundary water management in Lake Constance: from tradition to co-operation

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Local background

Lake Constance is the second largest European lake in the Alpine foreland in area (536 km²) and in volume (48 km³) and is shared by Germany, Austria and Switzerland. About 1.2 million inhabitants, local high-tech industries, intensive agriculture and 2 million tourists per year surround a drinking-water reservoir for more than 4 million people (Fig. 1). Due to increasing human impact, the lake and its catchment has undergone drastic ecological changes, causing reactions from the inhabitants and their representatives. Therefore, cross-border cooperation has a long tradition and today almost 10 large and approximately 200 small transboundary associations work in the Lake Constance region (Blatter, 2000; Schröder, 2004).

- Altitude a.s.l. 395 m
- Total surface area 535 km²
- Maximum depth 254 m
- Volume 49 km³
- Length of shoreline 273 km
- Overall length 63 km
- Overall width 14 km
- Catchment area 11 500 km²
- Mean outflow ca. 370 m³/s

- 1,500,000 people living in the catchment area of the lake
- Local industry (engines, aircraft and spacecraft equipment) and agriculture (hops, apple trees, vineyards) together with the inhabitants discharge sewage water equivalent to 3,200,000 people.
- Until the early 1970s the major part of sewage entered the lake without any treatment.
- Major tourist area in Germany
- More than 2,500,000 visitors per year
- 55,000 boats registered at the lake
- Drinking water source for more than 4 million people (drinking water pumped at 25 sites at depth > 30m)
- 170,000,000 m³ water / year = less than 2% of annual outflow
- Water export from largest drinking water plant in Sipplingen via pipeline network to 500 cities and villages in Southern Germany

Fig. 1: Facts about Lake Constance

Boundaries between countries result from historical events and do not coincide with the boundaries of the catchment basins. The larger part of Lake Constance, also known as Upper Lake Constance, is the only region in Europe where national boundaries have never been defined. Therefore, Lake Constance is a curiosity for international law. Clearly defined national frontiers between Switzerland and Germany exist in the smaller lower lake but in the upper lake only the shallow water area from the shoreline to 25 m water depth is treated as the national territory of the bordering countries. The major part of Upper Lake Constance is considered as common property, a so-called "condominium".

During the medieval period Lake Constance and its catchment belonged to the central part of one Suabian country. Neither at the end of the Thirty Years War in 1648 when the Swiss cantons became independent, nor in 1815 after the collapse of the Holy Roman Empire were the boundaries of Lake Constance fixed. Consequently no national administration felt responsible for the lake and rules as well as regulations concerning its usage were missing.

Since the time about 6,000 years ago when the first human settlements were established on Lake Constance, fishery has played an important role for the native people. During the 19th century radical socio-economic changes and demographic development promoted the rapid impoverishment of numerous fishermen in the region. Excessive fishing ignored the ecological and economical consequences and exhausted the supply of usable fish not only in Lake Constance but also in other waters. Therefore in 1841, an international agreement for the protection of juvenile salmon between France, the state of Baden and some Swiss cantons was reached for the Rhine region. First attempts to regulate fishing in Lake Constance were made in 1869 but due to the political situation the negotiations were long and complicated. In 1881 administrative delegates of the countries concerned proposed that all countries should work out their own national regulations in a similar manner. These so-called "Lindau decisions" indicated a first important step towards an international treaty. In 1893 the "Agreement of Bregenz" marked the beginning of a sustainable cooperation between the countries of the Lake Constance basin (Löffler, 1990). However, the condominium situation of Upper Lake Constance remained untouched by the convention.

International Conference of Deputies for Fishery in Lake Constance (IBKF)

The goal of the "Agreement of Bregenz" in 1893 was the sustainable development of fishery in the lake by protecting and increasing valuable fish species across the whole lake (Keiz, 1993). Therefore it was decided that an international conference of deputies for fishery in Lake Constance (Internationale Bevollmächtigtenkonferenz für die Bodenseefischerei IBKF) be held once a year. The IBKF works on a consensus; its decisions are not directly binding by international law but the bordering countries realise them according to their own national law (Strubelt, 1993). Besides ecological aspects, the IBKF is also involved in economic decisions, e.g. restriction of fishing licenses or the definition of closed seasons. In addition to the successful struggle for sustainable fishery in Lake Constance, the IBKF has also been an important nucleus for transboundary water protection and water management. During the 1950s fishing was directly affected by the consequences of eutrophication. Algal blooms, increasing biomasses and oxygen depletion in the deep water body were clear symptoms of this development and in 1951 far-sighted people set up a committee within the IBKF to support eutrophication research and the creation of a wastewater plan. This formed the basis for the foundation of the International Commission for the Protection of Lake Constance (IGKB) in 1959. In the 1960s the IBKF returned to its original purpose and fought against overfishing with a bundle of measures, e.g. mesh-size management and improved fish

hatchery. Since 1979 the IBKF has been successfully engaged in the protection and support of threatened fish species.

International Fishermen's Association of Lake Constance (IBF)

In 1909 the International Fishermen's Association of Lake Constance (Internationaler Bodenseefischereiverband IBF) was founded as an international community of interests for the fishermen of Lake Constance. Since 1912 the IBF has been represented within the IBKF and struggles for the needs of the fishermen, often in agreement with the IBKF but sometimes also with opposing views. The latter was the case whenever a limitation of net quantities or an extension of closed seasons occurred. The International Fishermen's Association of Lake Constance can claim fatherhood for the International Commission for the Protection of Lake Constance (IGKB): in 1950 a wastewater commission was established within the IBF (Entringer 1993); later on, in 1951, this commission became a committee of the IBKF and there it formed the nucleus for the IGKB foundation in 1959.

International Commission for the Protection of Lake Constance (IGKB)

In the first half of the 20th century the IBKF was the only intergovernmental institution in the Lake Constance region. During the 1950s obvious changes in lake ecology such as algal blooms and high biomass production attracted public attention. Besides the activities of the IBKF wastewater commission, in 1953 a memorandum of the state of Baden-Württemberg called upon taking joint action for the protection of Lake Constance. One year later the water economy associations around the lake appealed for similar activities and long-lasting international negotiations started. Finally, the International Commission for the Protection of Lake Constance (Internationale Gewässerschutzkommission für den Bodensee, IGKB) was established in 1959 as a result of an international agreement between Baden-Württemberg, Bavaria, Austria and Switzerland. The main duties of the IGKB are: observation of the lake, confirmation of the causes of its pollution, recommendation for coordinated preventive measures and discussion of planned utilisation of the lake.

The IGKB commissioners meet at least once a year and the deputies determine measures on the principle of unanimity. As a consultant agency the commission cannot decide on rules and actions connected with environmental protection, but by agreement the regional governments are obliged to transform the recommendations of the IGKB into national law. A technical and scientific board of experts serves as official consultant to the commission (Fig. 2). The experts study the scientific and technical problems proposed by the commission and examine the research carried out. The results are summarised and published in so-called green reports (annual investigation data of the lake monitoring) and blue reports (case studies and special topics). In 1998 IGKB established a GIS-related "Lake Constance Water Information System BOWIS" providing limnological data of the lake.

In 1967 the first guidelines for the prevention of pollution were published as a standard for national jurisdiction. Later, in 1972 and 1987, these guidelines were revised and today a step-by-step adaptation to recent environmental requirements is in progress. In 1987 the IGKB published a memorandum in which, for the first time, an ecosystem approach was presented in a European cross-border region. IGKB has mainly concentrated its efforts on the problem of eutrophication. In order to preserve the lake ecosystem from further degradation, more than 4 billion € have been invested for sewage treatment facilities. The result is a significant

Fig. 2: Structure of the IGKB

reduction of the phosphorous concentration in the lake and a recovery of the lake ecosystem (Güde et al., 1998; Müller, 2002). During the last decade hydrophysical modelling of water bodies and long-term observations of chemical and biological parameters came to the fore of discussions. Since 1994 the IGKB has published twice a year the popular leaflet "Seespiegel". This brochure has a circulation of 15,000 copies and offers actual information about Lake Constance and the IGKB. Electronic “Seespiegel” copies as well as selected blue reports and general information about the IGKB (in German) are offered on IGKB's website www.igkb.org. Since 2003 the yearly green data report is available in a digital version on the IGKB website. In 2004 the IGKB book "Der Bodensee: Zustand – Fakten – Perspektiven" (Lake Constance: state – facts – perspectives) outlines the environmental situation of Lake Constance.

Syndicate of the Waterworks in the Lake Constance-Rhine region (AWBR)

In 1968 the Syndicate of the Waterworks in the Lake Constance-Rhine region (Arbeitsgemeinschaft der Wasserwerke Bodensee-Rhein, AWBR) was founded as an international non-governmental organisation. Due to their responsibility for the water supply of more than 10 million people, the 72 municipal waterworks play an important role for the prevention of water pollution. The AWBR is a politically and economically independent association with a scientific reputation, long-standing experience with monitoring programmes as well as considerable personnel capacities. It supports efforts and measures to preserve the purity of lakes, rivers and related groundwater bodies and fights dangers to the municipal water supply within the national and international scale. In cooperation with the board of directors a technical and scientific advisory board works on actual problems concerning water protection, drinking water supply and legislation. AWBR initiates scientific investigations, performs its own monitoring programmes and works out alarm plans. Besides an annual general meeting, workshops and seminars are carried out, and statements and papers are published on water-relevant topics. Public relations work is done by means of press releases and its own

homepage (www.awbr.org). The AWBR sees itself as an attorney for clean water and tries to sensitise the population with information.

International Conference of Heads of Governments (IBK)

On the recommendation of Baden-Württemberg the International Conference of Heads of Governments (Internationale Bodenseekonferenz, IBK) was founded in 1972. It is a "soft-law" organisation without formal agreement or legitimation by the national parliaments (Höhn, 1997). Nevertheless, the participation of the government leaders gives this commission at least great political importance. At its beginning the IBK was an informal platform for discussions concerning regional planning and environment protection. Later on, also political issues became part of IBK´s agenda and an institutionalisation took place. In 1995 a formal statute was enacted and a budget for public relations and IBK's own projects was provided.

The conference of government leaders meets once a year. A permanent board of leading officials prepares the annual conferences and takes decisions with the help of seven commissions (education, science and research; culture; public relations; environment; traffic; economics; health).

In 1994 a development concept for Lake Constance was adopted to create a long-term transboundary perspective. The aim of this concept is the protection of regional characteristics and further development in a sense of harmony with nature, culture and economy. An overview of the structure and activities of IBK is given on the website www.regio-bodensee.net.

International Navigation Commission for Lake Constance (ISKB)

Since the Middle Ages free navigation has been practised on Lake Constance and in 1867 the bordering states agreed on a first international regulation for navigation and harbours on Lake Constance. In 1973 this agreement was revised and the International Navigation Commission for Lake Constance (Internationale Schiffahrtskommission für den Bodensee, ISKB) was established as a regulatory body for navigation by Austria, Switzerland and Germany. Navigation is part of the federal policy and therefore representatives of federal authorities are members of the ISKB. The commission cannot decide on rules but by agreement the regional governments are obliged to transform the recommendations into national law. For practical reasons the lake area was subdivided into three parts where the national authorities execute control missions.

The Lake Constance Navigation Rules were defined in 1975 and transformed to national law one year later. According to technical progress and environmental needs the rules were continually revised and in 1996 strict regulations to minimise the exhaust fumes of boat engines became valid.

Compared to IGKB the environmental commitment of ISKB is weaker because technical and administrative navigation purposes form the points of main interest. ISKB is not active in publicity.

The Lake Constance Foundation / Environmental Council Lake Constance

The Lake Constance Foundation (Bodensee-Stiftung) was founded by six private environmental organisations from Austria, Germany and Switzerland as an international non-governmental organisation in 1994.

The Environmental Council of Lake Constance (Umweltrat Bodensee) is formed by 18 private environmental organisations and acts as the scientific advisory board of the foundation.

The promotion of sustainable agriculture, tourism and economy in the Lake Constance region is a fundamental goal of the foundation besides traditional activities for the protection and development of nature, landscape and natural resources.

A team of seven full-time activists works on projects such as environment education, protection of water and nature, leisure activities and tourism, agriculture, traffic and municipal environment protection. The foundation is sponsored by private companies and works in national and European government projects.

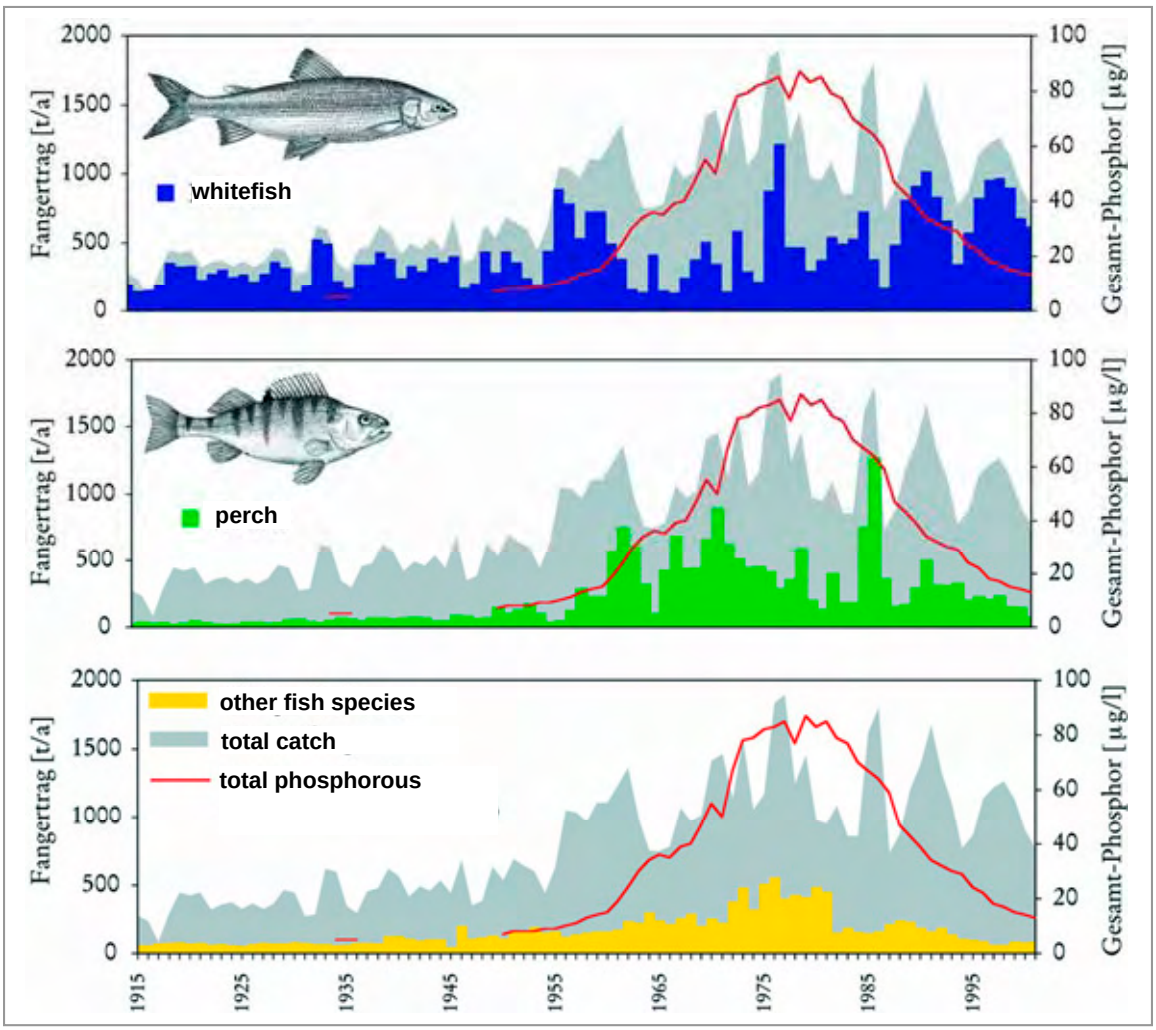

Fig. 3: Development of some fish species in Lake Constance

As a non-governmental organisation The Lake Constance Foundation has long-standing experience with public relations and presents its activities on the website www.bodensee-stiftung.org.

Conclusion

Pragmatism characterises most of the transboundary cooperation in the Lake Constance region. The federal structure of all the countries bordering Lake Constance leads to considerable involvement by the local people in the commissions' work. Inhabitants of the states and cantons outnumber respectively the representatives of the federal administration from Vienna (Austria) and Bern (Switzerland) in the commissions. German federal representatives attend the annual commission meetings as observers only because of the self-governing power in water management of the regional states.

Transboundary cooperation in Lake Constance was established decades before the Aarhus Convention in 1998. Information was and to a large extent is still used as a kind of technical device in cooperation processes. Dissemination of information is almost restricted to the administrative sector. Therefore, transboundary cooperation lacks public participation. Due to the successful technical management focussing on the elimination of excessive phosphorous loads from larger human settlements of the last decades (Fig. 3), the public has not been much involved in the environment protection policy.

The different character of the international organisations in the water management of Lake Constance is mainly the result of historical development. Nowadays, public interest becomes more and more important and also stakeholder organisations claim for their interests with greater emphasis. On the other hand, eutrophication, as one of the biggest challenges in the past, has been successfully overcome by the traditional commission IGKB. Therefore, the commissions are in a certain phase of re-orientation and by doing so public information and public participation will become increasingly important. Moreover, a more intense collaboration between the transboundary organisations towards an international network will additionally strengthen the international cooperation in the future.

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Whose values matter most?
Water and resource governance in the Okavango River Basin

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1 Introduction

> Water is a problem of governance, above all.
> - Global Water Partnership

> All policy making discourse is partial in that it is made by coalitions, which reflect those who can best construct and deliver the most persuasive arguments. … Policy is not made on the basis of rational science. Although well observed science can play a role if its messages are as effectively constructed as those of other participants in the policy-making process.
> - Tony Allan (2003: 2)

When one speaks of the Okavango River a variety of images come to mind. How one thinks about and values the resources of that river depend very much on where one sits and what one does while sitting. For a conservation desk officer located in Berlin or London or Washington, starved of green spaces and horizons, whose senses are brutally assaulted by late-modern life, the Okavango is both idyllic symbol of the pre-modern and functional storeroom of the biosphere. For a Motswana, squatting in a delta reed bed during the high flow season, collecting reeds or fish, livestock grazing and watering nearby, the river is a life-sustaining artery flowing variably through a harsh physical environment. For a member of the Department of Water Affairs, sitting in Windhoek, worrying about dam levels, AGOA-driven development directives and population influx, the river appears primarily as a factor of production, a resource that must be harnessed if standards of living are to be maintained and livelihood options improved not only in Windhoek but throughout the central highveld.

The value of the river differs slightly for a member of Botswana's inner elite – someone in Cabinet, or a Permanent Secretary perhaps. Well-paid and interested in business opportunities, you are late in recognising the economic potential of tourism in the delta region. The river for as long as you can remember has been very far from the cut and thrust of every day politics in Gaborone, though there was that unfortunate incident some fifteen years ago when a government proposal to dredge the lower Boro river, upstream of the village of Maun, and transfer water to Orapa Mine did raise a significant public outcry among residents of Ngamiland. Thus, the tourism sector is dominated by foreigners – tour operators from South Africa, Australia, England, the United States – and you are now interested in getting in on the action. The lower Okavango, particularly the delta, to you is also a factor of production, but tourism is mainly a non-consumptive, post-industrial service industry.

Of all riparian state and basin dwelling actors, the Okavango resides furthest from the minds of policy makers in Luanda. Beleaguered for decades by a pernicious rebel movement, UNITA, assisted variously by South Africa and the United States, you have long been

preoccupied with economic and political survival. Moreover, your party and your interests are very much Luanda and north of Luanda-centred. The oil from Cabinda is your lifeline, not water from the Cubango and Cuito river systems that ultimately join to form the Okavango. Indeed, there are many rivers and much water in Angola; the Okavango is of little concern to you. But you do know that your neighbours, Namibia and Botswana, long allies in the struggles against colonialism, apartheid and more recently war in the DRC, are very interested in the resources of the Okavango River Basin (ORB). You want to accommodate them, but you have interests in other river basins shared with Namibia. Perhaps you can use the Okavango as a bargaining chip for mutual gain. At the same time, as a participating member of the Southern African Development Community (SADC) in the post-civil war era, you would like to play by the regional rules – although, unsure of what these mean for your sovereign right to act as a state, you have ratified almost none of the regional protocols.

Aside from these actors, if truth be told, the Okavango River system is unknown to most of the world. At best, only a smattering of citizens in the Western world may know only of the Okavango Delta through numerous wildlife documentaries. Proposed and on-going activities in the ORB, therefore, reflect the values, needs and concerns of special interest groups. As highlighted above, each comes to the region with different perceptions of the value of the resource base. Some of these conceptions may overlap and/or be simultaneously held by one person, group or organisation. How are these special interests being met? What is the (emerging) structure of governance? Whose interests dominate? Whose values matter most?

In this paper, I discuss the various ways in which water and other resources are valued in the ORB. I relate this discussion to existing and emerging structures of governance and highlight the political nature of these activities. I set the specific discussion within the conceptual framework of 'governance' and argue, following a theoretical framework provided by Allan (2003), that activities in the ORB, while appearing logically consistent and progressive, are in fact fraught with political in-fighting born of possibly non-compatible views of the value of the resource base. In the search for sustainable forms of resource governance, these issues must be openly acknowledged, not ignored.

2 Governance

The Okavango River Basin is geographically specific to Africa but its emerging governance structure is international in both scale and scope. Given that the river rises in the Bie Plateau region of Angola, forms part of the Angola-Namibia border before passing through the Caprivi Strip and empties into the vast swamplands of the Okavango Delta in Botswana, much is being made of the need to consider inter-state interests in any institutional set-up (Turton, Ashton and Cloete, 2003). Much is also being made of the need to include local people – defined as 'riverine communities' – in all resource use decision-making networks (ODMP, 2005a and 2005b).

Where international actors are involved, their efforts are almost always characterised as 'facilitatory': from DED, SIDA and USAID to IUCN, Conservation International, the Natural Heritage Institute and the South African Peace Parks Foundation. Rarely are the activities of these actors regarded as determining.

Similarly, Central State activity, though emanating from outside the basin in Luanda, Windhoek and Gaborone, is almost always characterised as undertaken in the 'national

interest', with their role portrayed as strictly developmental. Moreover, this national interest is said to be not pre-determined, but derived from broad-based stakeholder forums.

Three specific activities are pointed to as evidence of the coherence of emergent river basin governance in the ORB: the tripartite inter-state Okavango River Basin Commission (OKACOM); the community-based, transnational Every River Has Its People (ERHIP) project; and the Botswana-specific Okavango Delta Management Plan process. The first is put forward as evidence of inter-state cooperation for joint benefit-sharing of the resources of the ORB. The second is said to be evidence of riverine community involvement in resource use planning at basin level. The third is flagged as a significant step toward overcoming resource use conflicts and unsustainable practices among relevant stakeholders in the Botswana portion of the ORB, so also providing an important learning tool for the other basin states variously engaged in complementary activities.

Two related activities are often pointed to as evidence not only of benefit-sharing but of the peace-building potential of transboundary resource management: the Four Corners 'super park' project, and the Okavango and Upper Zambezi Integrated Tourism (OUZIT) project. Each of these bring states, (I)NGOs, donors, private companies and basin-specific CBOs together in pursuit of sustainable ecosystem management for mutual profit.

Central, but less overtly acknowledged, to all of these efforts are a series of linked discourses emanating from Western state houses, think tanks and interest groups and filtered down ultimately to ORB states and societies via global (e.g. Dublin, Rio, Johannesburg, The Hague, Bonn) and multilateral (e.g. EU-AU, EU-SADC, Commonwealth) forums and other network activities (e.g. multi-stakeholder meetings on wetlands, protected areas, biodiversity, forests, trade, human rights, democracy and debt). Increasingly, these seemingly separate issue areas (e.g. protected areas and free trade) are subject to the same criteria amassed under the general term 'good governance': stakeholder participation, transparency and accountability, sustainable development through entrepreneurship and capable state oversight but limited intervention – in other words, good governance is the intellectual justification for a liberal world order. 'Governance', understood as sustainable management of resources for mutual and equitable benefit among and by all relevant stakeholders, permeates environmental and conservation discourses: river basin governance (SIWI), ecosystem governance (IUCN), natural resources governance (USAID), to highlight three.

So, water is linked to ecosystems, and ecosystems are linked to other historical, sometimes wider (the state, international law) or narrower (a fishing cooperative among several villages, a borehole syndicate) forms of governance. Whose interests should hold sway among this complex array of interested and unequally empowered groups? This is a matter of some debate, but a complementary narrative of resource 'crisis' put forward by particular transnational interest groups has attempted to bring science to bear in the matter. Newson (2000) highlights some of these claims: resource 'scarcity' due to population growth (what Falkenmark (1999) calls 'demographic scarcity') is leading the world and arid regions in particular down a 'Malthusian funnel'. If nothing is done we face the prospects of 'hydrocide' (Lundqvist, 1998), 'water wars' (World Bank, 1995), and heightened and prolonged 'conflict' (Gleick, 2000). Thus, sustainable resource management must take place at the level of the resource if the direst of these scenarios are to be avoided. Given the centrality of water in all human and non-human activities (Falkenmark and Rockstrom, 2004), the river basin, itself comprising numerous ecosystems, is argued to be the proper management unit (IUCN; EU Water Framework Directive). Slater (1997) aptly labels this 'catchment consciousness'.

3 Theory

Water has been a global issue, off and on, for more than 30 years (although Aldo Leopold talked about the 'paramount value of watersheds' as far back as 1924). Since the early 1990s, a global community of experts has been steadily moving toward support for integrated water resources management (IWRM) (Van der Zaag, 2004). IWRM is conventionally understood as management practices that ensure equitable, efficient and environmentally sustainable water for all for ever (Jonker, 2004). At the same time, this same group of people has been moving steadily away from reliance on supply-side interventions as the primary basis for 'solving' the world's water crisis (WCD, 2001). Rather, judicious supply-side projects should be complemented by vigorous water demand management (Goldblatt et al, 2000; Winpenny, 1997).

Almost all formal documents related to water resources use and management begin with the claim that 'water is life' – from the World Water Vision to the Africa Water Task Force, from the World Water Council to the Global Water Partnership, from the SADC Protocol (revised) on Shared Watercourses to the Okavango Delta Management Plan Project. Managing the water resources of the ORB, therefore, is an instance of global governance and global governance is portrayed as provision of a moral good (Swatuk, 2004).

In truth, however, all ORB management activities are at a very early stage of development, face substantial difficulties and constitute more hope for the future than current reality. When confronted with this fact, supporters of these activities emphasise the importance of process as a learning tool for developing best practice defined as transboundary resource good governance. Fair enough, but if we agree with the opening epigram from the Global Water Partnership that 'water is a question of governance', we should also recognise the profoundly political nature of arriving at water resource management regimes, be they sustainable or otherwise. Mark Twain's observation that 'whisky's for drinking and water's for fighting over' was not a harbinger of coming water wars, understood as acute conflict between sovereign states. It was, rather, to highlight that since water is central to all human uses, and some uses require more water than do others, deciding on who gets water when and why is essentially a political question. Indeed, given the need for large-scale finance in establishing water delivery systems, it is essentially a question of political economy. Hence the importance of Allan's quotation in the second epigram.

Analytical and project-oriented approaches that take 'governance' as their point of departure, however, underestimate the role of politics and the relevance of history in resource management. Rather, they focus on capacity, particularly human resource capacity and institutional/legal frameworks: properly skilled people sitting in right-sized institutions working within a conducive legal framework will lead to resource good governance. Yet, the fascination with basin-scale governance '[i]n the modern world, notably in the twentieth century … has become popular beyond its proven record of success' (Newson, 2000: 210). Basin-level management regimes, involving complex abstraction, transfer and storage schemes, undertaken in service of a progress-driven 'hydraulic mission' (Allan, 2003) account for the current world water 'crisis'. And while per capita consumption in the West has declined while industrial output continues to rise, there remains a direct correlation between water consumption and political economic power on a world scale. Low-consumption countries argue that their hydraulic missions are incomplete. Thus practices regarded by conservation-oriented actors in the West as environmentally unfriendly and ecologically unsustainable (e.g. large dam construction and inter-basin water transfer) will continue in the global South – for political as well as developmental reasons.

Coalitions of influential Western actors (e.g. USAID, Conservation International, World Wildlife Fund) invoke 'science' as the basis for their resource-specific interventions. A host of international and regional protocols governing resource use decisions have their basis in generally accepted principles of, for example, biodiversity preservation, climate change, the water cycle, keystone species, stocking rates, fire regimes, invasive species, deforestation, desertification and soil degradation. Thus, the IUCN as key advisor and technical backstopper of the ODMP project argues that all actors must understand the 'ecosystems approach' and have it centrally in mind when making resource use decisions in the ORB (IUCN, 2005). As missionaries of environmental 'truth', these actors set themselves up for disappointment when their suggested interventions are resisted or bent to fit local interests.

What these groups would do well to remember is that 'management' priorities are a function of perceived need which itself is a sub-set of held values. Decisions regarding the allocation and use of key resources such as land and water thus reflect a complex inter-play or negotiation between and among competing values. Neither is the decision water-specific; rather, the value of water is itself a reflection of broader social/cultural values – Weltanschauung. Current practices reflect a hegemonic consensus, i.e. the value structure of those actors capable of influencing the discourse. For Allan (2003), this consensus constitutes a paradigm. Given that discourse is dynamic, the perceived or generally accepted value of a resource will change through time – for social, economic, cultural, environmental and technological reasons. At a global level, Allan argues that water resources management has passed through four paradigms and is now entering a fifth, of which IWRM constitutes its core (see Figure 1).

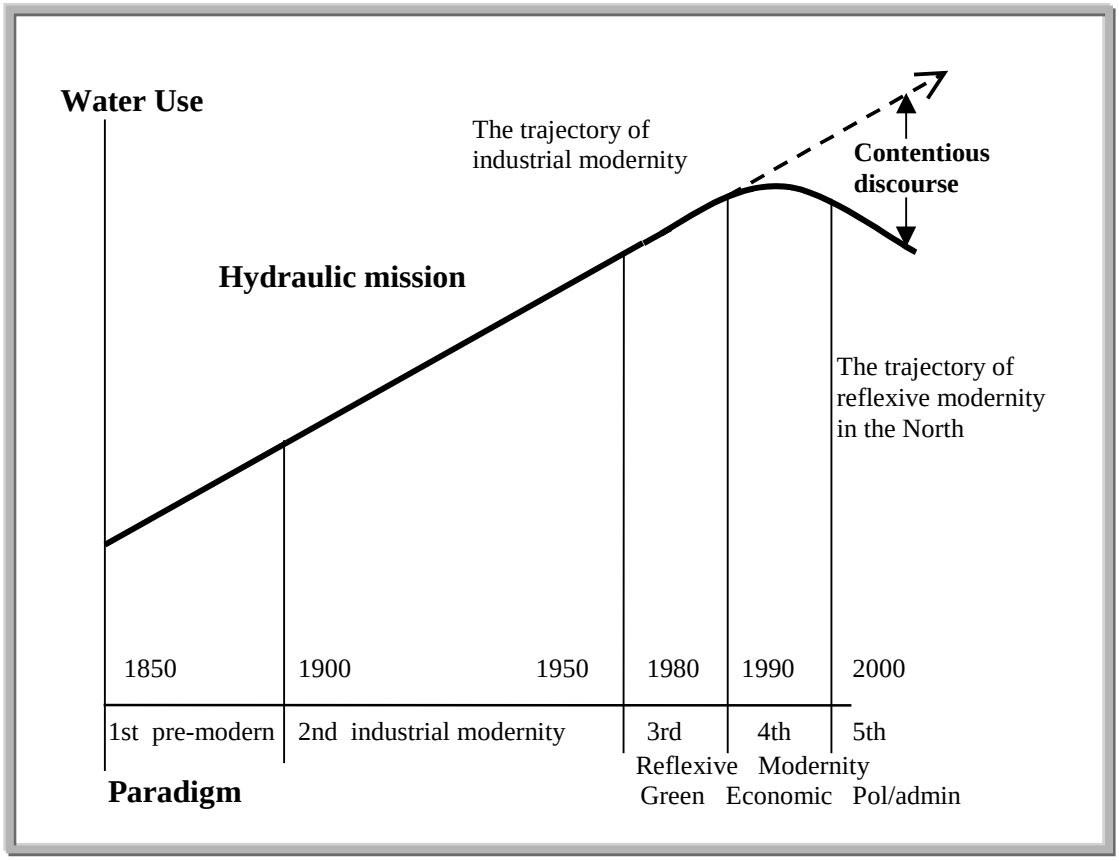

Fig. 1: Neo-liberal modernity and the water sector in semi-arid countries: Sourced from Allan (2003)

Briefly stated, the first paradigm is associated with pre-modern communities with limited technical and organisational capacity. The second paradigm is that of industrial modernity where the state and private sector activities, assisted by developments in science and technology, gave shape to the hydraulic mission (i.e. harnessing water resources for human needs). Allan argues that the next three paradigms result from society-wide skepticism in the North regarding the ability of science to find solutions to problems deriving from human activity, an era Beck (1995) and others have labelled 'reflexive modernity'. The third paradigm reflects the interests of environmentalists in reducing the human impact on the natural world. The fourth paradigm 'was inspired by economists who had drawn the attention of water users in the North to the economic value of water and its importance as a scarce economic input' (Allan, 2003: 11). 'The environmental and economic phases are still in train … [T]hey are being supplemented by a new fifth paradigm, which is based on the notion that water allocation and management are political processes' (Allan, 2003: 11). Stakeholder participation is perhaps the key political idea behind IWRM. Whereas other paradigms were pushed by partial interests (i.e. civil society, government, social movements, business), the fifth paradigm argues that all of these actors are central to the policy-making discourse.

A key observation made by Allan (2003: 15) is that, whereas the 'semi-arid plural North' can be seen to have accepted most of the ideas of the reflexive modern period, 'the South, where about five-sixths of the world's population live, is still very much involved in its hydraulic mission – the second paradigm'. Thus, '[t]he water policy discourses in the North and South are different. Those "outsiders" from the North who insist on preaching the environmental and economic values of water have little impact on the "insider" Southern water management discourses'.

As shown in the ORB case study below, although policy makers in SADC state houses have signed many late-modern reflexive era documents and written policy accommodating Northern interests, activities undertaken reflect the often conflicting interests of pre-modern and industrial modern actors located within and beyond the basin. Conservation-oriented actors in the North and their epistemic counterparts in the South recognise this fact, hence the palpable sense of urgency (e.g. Conservation International's 'hot spot' approach) in their on-going interventions on behalf of the ecosystems of the ORB.

4 The Okavango River Basin

The ORB is currently of great interest to the international community and to Basin state governments. This has not always been so. Lying in a remote and inhospitable area of central/southern Africa, only about 600,000 people reside in the entire basin, with possibly an influx of a similar number of people previously displaced from the basin due to civil war in Angola and liberation struggle in Namibia (Porto and Glover, 2003). The ORB has always been of interest to those who live there, especially at the headwaters and along the middle-to-lower reaches.

Rising in the highlands of Angola, the river has two main arms, the Cubango River and the Cuito River which join at Dirico, just past the Namibian town of Rundu and upstream of the Botswana-Namibia border at Mohembo (see Figure 2). The Cubango system, itself a complex of many tributaries, contributes roughly 55 per cent of total flow, whereas the Cuito contributes approximately 45 per cent. Rainfall patterns vary dramatically from north to south, with Huambo town receiving roughly 1300 mm/a, Rundu at mid-stream receiving

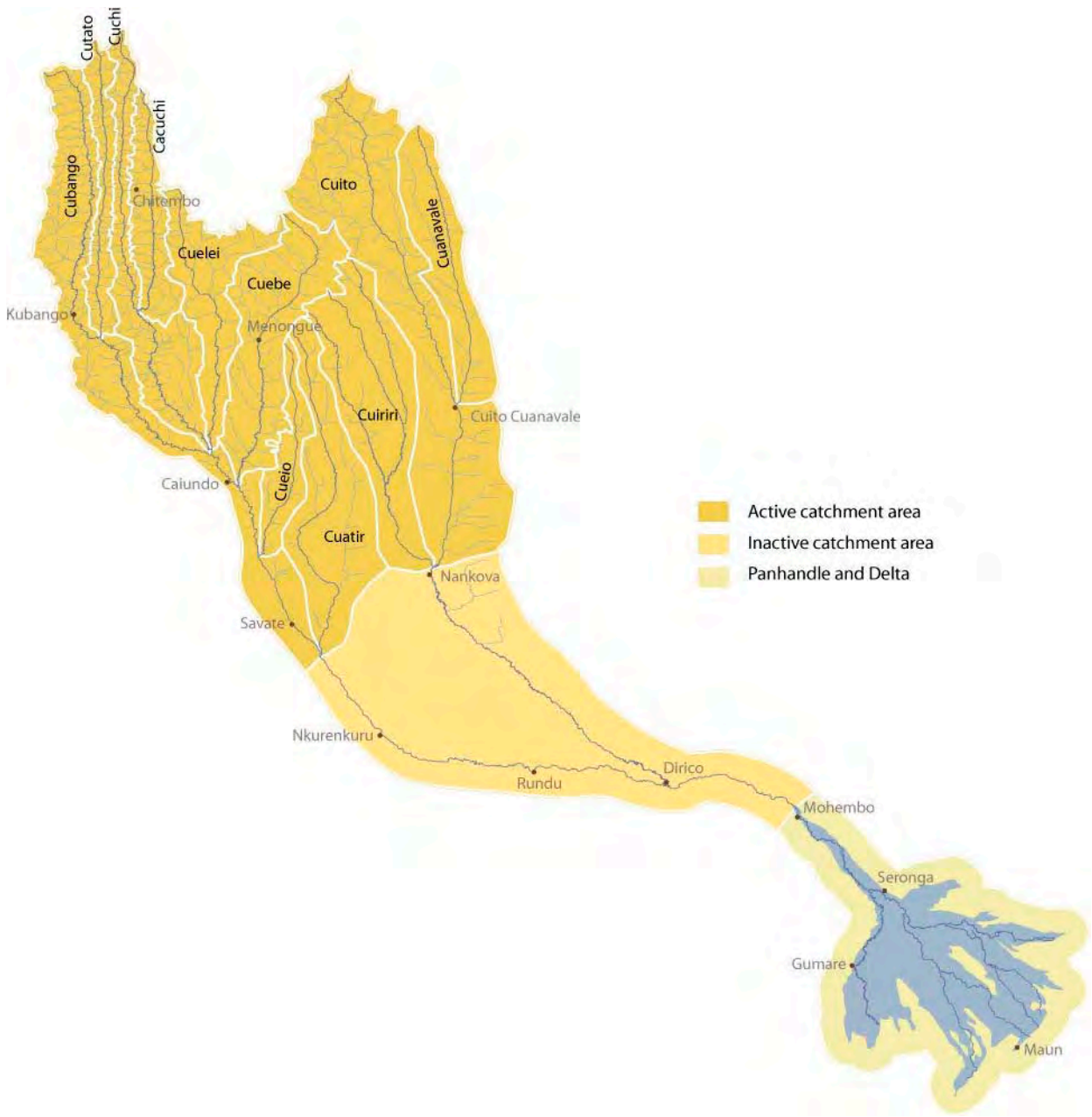

Fig. 2: The Okavango River Basin

roughly 560 mm/a, and Maun at the downstream end receiving roughly 450 mm/a (Mendelsohn and Obeid, 2004: 63). Flows can vary dramatically as shown in Table 1 below.

Table 1: Annual flows in cubic kilometres per season at selected points in the ORB

Place and years of data	**Average (cubic km/ year)**	**Minimum (year)**	**Maximum (year)**
Rundu (1945-2001)	5.207	2.260 (1971/72)	9.810 (1962/63)
Mohembo (1933-2001)	9.384	5.313 (1995/96)	15.977 (1967/68)
Maun (1951-1999)	0.271	0 (1995-1997)	1.174 (1954/55)

Source: Mendelsohn and Obeid, 2004: 83

The river is often described as a linear oasis as it passes through regions of poor quality soils (arenosol predominating). For example, it is estimated that only 7 per cent of Kavangoland in Namibia is suitable for cultivation (Moyo et al, 1993: 177). The farming of drought-resistant crops such as sorghum and millet predominate in the basin, with maize and manioc being farmed in the better watered uplands of Angola, and mixed maize, sorghum and millet in the Delta. With regard to livestock, the great majority of cattle are held in the mid-stream and Delta regions of Kavangoland and Ngamiland. While livestock numbers are increasing in the region, and land degradation is evident in communal areas of Namibia and Botswana, Mendelsohn and Obeid (2004: 152) state 'that most increases occurred away from the river and that livestock numbers have been rather constant close to the Okavango and Delta'.

Current Central state and international actor interest in the ORB stems from several factors. As Namibia's population grows and as pressures to diversify development away from minerals increases, questions have arisen regarding adequate water resources for these various activities. The perennial waters along Namibia's borders (Cunene, Okavango, Orange) have therefore become a focus of attention. For Botswana, tourism without real government interest has developed into the second largest contributor to GDP. Batswana, as a historically pastoral society, show more interest in cattle than kudu. Also typical of pastoralists, they tend to regard predators (lion, leopard, hyena, wild dog) and large herbivores (elephant, rhino, hippo) as pests to be eradicated. However, the large parks system established by the colonial powers was inherited by and largely retained by independent Botswana. Concern for these areas was minimal as they were located far from the centres of human settlement. Today, however, these remote areas have become centres of wealth creation, so drawing the interest of the state and its citizens alike. Given that tourism depends on healthy ecosystems, Botswana's interest in the Delta and panhandle stresses limited consumptive use. This perspective coincides with the interests of the international community, the bulk of which is conservation-oriented. The ORB is perceived by the Western world as a 'near pristine' 'oasis in the desert' and 'one of the last unindustrialised rivers in the world' (Earle and Mendez, 2004). Perceived possible pressures on the system from Namibian Central state activity (inter-basin transfer, large-scale irrigation of cash crops, hydropower projects), from riverine communities themselves (population increase, unsustainable livestock numbers, streambank cultivation, haphazard irrigation) and from the Angolan provincial/central states (hydropower schemes) have led to a flurry of international actor interventions in the region (Turton, Ashton and Cloete, 2003). Most of these activities seek to provide a coherent institutional and legal basis to all resource use activities, with an overall view toward sustainable ecosystem governance. The Angolan government interests in the ORB are somewhat unclear, as discussed in Section 5 below.

5 Valuing water: actor interests in the ORB

Table 2 highlights the central actors involved in the resource governance discourse in the ORB.

Table 2: The Value of Water in the Okavango River Basin: Actor interests in the colonial and post colonial eras

ACTOR	'WATER' IN COLONIAL ERA	'WATER' IN POST-COLONIAL ERA
Riverine community (intra-basin, ecosystem people, limited technology, circumscribed political power – 'negative power')	Livelihood source (dependent on location in basin – soil profile, geography)	Livelihood source (food crops/livestock/fish/crafts)
Luanda (extra-basin, biosphere people, modern technology, primary political power)	Factor of production hard path (agriculture/hydropower)	Factor of production (hydro/agric) Bargaining tool
Windhoek (extra-basin, biosphere people, modern technology, primary political power)	Factor of production hard path (uban/industry/hydro/agric)	Factor of production (hard and soft options)
Gaborone (extra-basin, biosphere people, modern technology, primary political power)	Factor of production hard path (mining)	Factor of production (hard and soft options) Mining/agric/tourism Department dependent
Regional government (intra-basin, possibly extra-basin, eco/biosphere mix, limited technology, circumscribed political power – 'middle power'	Take cue from central government	Take cue from central government/ limited autonomy/ stakeholder forum
World Bank (as representative of IFIs) (extra-basin, extra-Africa, biosphere people, modern technology, economic and scientific power)	Factor of production hard path	Factor of production (within ecological limits)
Regional Bodies (e.g. SADC, SAPP)		Take cue from central state actors and consider extra-basin, extra-region and extra-African positions
Think Tanks (e.g. IWMI, DRFN, AWIRU, CSIR, HOORC) (intra- and extra-basin, biosphere people, modern technology, scientific power)		Poverty alleviation/ traditional management structures/ gender mainstreaming/ conservation/biodiversity
Business (Banks/Construction) (extra-basin, possibly extra-Africa, modern technology, economic power)	Factor of production (consumptive)	Factor of production (consumptive and non-consumptive
Environmentalists (CI, IRN, NHI) (extra-basin, extra-Africa, biosphere people, modern technology, scientific power)		Late-modern Symbol/ biodiversity preservation/ intact ecosystems/ peace maker

The Table can be made both more and less complex. For example, it could be made more complex by introducing the competing interests of the various provincial governments both in and near to the basin. In Angola this includes Moxico, Huambo, Bié, Huila, Kuando Cubango and possibly Cunene provinces. In Namibia, this directly includes Kavango, but also Otjozondjupa, Omaheke and Caprivi. In Botswana, the affected districts are Ngamiland, Central and Chobe. It could also be made more complex by including the twelve different language groups living within the basin (excluding native English, German and Afrikaans speakers resident in towns and villages), and showing how their geographic location helps to determine their resource use interests. Delineating urban/peri-urban/rural/peri-rural settlements and interests would also further complicate the picture.

Table 2 can be made less complex, however when one considers the top-down management styles of each of these three states. Resource use decisions particularly regarding water, in both Namibia and Botswana are very much dominated by ruling parties located in Windhoek and Gaborone. Regional governments lack both capacity and autonomy to challenge Central government decisions. Thus, all provinces/districts take their cues from Central government directives.

However, post-war settlement deals struck in Angola between the governing MPLA and the former rebel group UNITA means that former UNITA strongholds and traditional tribal areas have been 'awarded' to UNITA by MPLA. This includes ORB provinces such as Cuando Cubango. However, MPLA officials have warned UNITA that this does not give them 'free rein' in their jurisdictions (personal communication, name withheld). Nevertheless, it does suggest that sustainable management of the upper basin may depend more on UNITA interests – as the governing 'party' of the region – and less on what Luanda's interests are. Although one suspects that Luanda regards the ORB first and foremost as a bargaining chip, it may be willing to trade in exchange for agreements made regarding resource use in more heavily populated basins such as the Cunene (personal communication, name withheld).

Beyond central state actors, Table 2 may also be reduced to two other key actors: riverine communities and conservation-oriented actors (both official and non-governmental). Other identified interest groups (e.g. IFIs, Think Tanks, business) tend to act on invitation and thus as extensions of one of the three main interests: national, local and international. As highlighted in Table 2, each of these main actors brings different conceptions of the value of water and the resource base generally to bargaining tables. Each wields power differently and unequally. For example, riverine communities generally lack power vis-à-vis both the central state and the international community. Their primary power is 'negative', that is, as those residing within the resource base, they have the power to disrupt various extra-basin initiated interventions as well as to hold other interested actors to ransom via the threat of resource degradation. Often, these groups will enter into smart partnerships with international donors to their mutual advantage and sometimes against the wishes of central state organisations. A good example of this is the way in which the ERHIP project, funded by SIDA, has provided to local communities through the language of 'participation' a voice within the inter-state, expert-dominated institution OKACOM.

Sustainability, benefit-sharing and equity are the core concepts framing discussions of appropriate governance structures in the ORB. As with 'sustainable development' generally, and 'IWRM' specifically, there is no general agreement regarding the ways and means of realising these ideals. Donor states, conservation IGOs and IFIs interested in 'ecological best practice' seek to influence basin-specific decision-making through a mix of conditional capital, technical expertise, and scientific and moral argument. Their efforts have

overwhelmingly focused on the creation of new institutions and in facilitating the rewriting of riparian state laws and policies in line with norms, rules and procedures generally adhered to by Western states and espoused in global forums. In the ORB, examples of this include *inter alia* Natural Heritage Institute support for ORB-specific decision-support tools, USAID support for the development of an OKACOM Secretariat, SIDA support for ERHIP, as well as SIDA/IUCN support for the ODMP project.

Basin states, however, may or may not accept these interventions as delivered, choosing instead to engage in elaborate stakeholder forums, consultations, commissions and the like before 'buying in' to, rejecting, or altering the proposed regime form (ODMP, 2005a and 2005b; Conca, 2005). Each state frames its interests differently. For example, Botswana derives large amounts of revenue from non-consumptive tourism activities. This revenue is dependent in part on the state of the resource base. The government, in 1997, chose to list the Okavango Delta as a wetland of international importance and to sign and ratify the Ramsar Convention. It has also managed to have the Delta listed as a World Heritage Site. In this way, the government pursues state-centric interests by appealing to wider international communities (Swatuk, 2003). This is not to suggest that the government of Botswana is solely interested in non-consumptive use of the waters of the ORB. Rather, it suggests the creation of an ecological benchmark for consumptive use. Given the symbolic appeal of post-industrial development in the lower ORB, few outside observers ask questions regarding the benefits deriving to riverine communities from such policy positions. These benefits, I would argue, are very small, and the negative outcomes (e.g. population influx to tourism bases such as Maun in search of elusive jobs, resource-raiding by Gaborone-based and international companies) are large indeed.

In stark contrast, the government of Namibia has chosen to frame its interests in terms of state sovereignty and the moral imperative to harness ORB resources for developmental purposes in a water-scarce region (Heyns et al., 1998). Government has stated unequivocally that it will use these resources and that it is its sovereign right to do so. Recently, the Department of Water Affairs was directed by former President Nujoma to conduct a feasibility study of shifting water from the headstream of the Congo River to the Cubango/Cuito system for transfer not only to Namibia's central plateau, but to the Okavango Delta and the south-western Kalahari as well. Nujoma was confident that he could get this project to 'green the desert' endorsed by SADC as a regional good (Heyns, personal communication). Whatever one thinks of such a plan, it is clear that in the state houses of the region, the hydraulic mission is considered far from complete.

The government of Angola is less forthright in its interests which, it seems to me, are minimal at best. As shown in Table 2, there were colonial and post-colonial plans to harness some of these waters for hydropower use. However, in the post-war era the government is clearly Luanda-centric, with roughly one-sixth of the entire population residing in the greater Luanda area, much of it in dismal 'musseques' or shanty towns. As highlighted in Moyo et al (1993: 26), the government is pre-occupied with economic and political survival. It will therefore exploit oil with little consideration of other resources. Recent multi-billion dollar deals struck with China add testimony to this fact. The Central Highlands of Angola were its pre-war 'breadbasket', but given its well-watered character, if large-scale food and cash cropping resumes, this will be rain-fed. Modelling by Wolski (2004) and evidence provided by Ashton and Neal (2003) suggest that these activities will have minimal impact on the character of the river. In the basin, de-mining will be the central concern of provincial government as well as land rehabilitation around war-devastated Huambo and Bié. Will de-mining lead to a huge influx of peasants in the basin? This is unlikely – it is not only because of the war that less

than two per cent of Angola's population reside in Cuando Cubango province, it is an extremely inhospitable environment with poor soils (Mendelsohn and Obeid, 2004).

6 Governance structures

Actors currently involved in ORB governance reflect the uneasy coexistence of existing structures with proposed, emerging and partially implemented new ones. In the case of the former, central, district/political and traditional mechanisms are integrated hierarchically. Their actions are informed by national vision and policy statements, as well as the terms and conditions of international and regional laws, treaties, conventions and agreements. Riparian states, through OKACOM, are bound by treaty to keep each other informed regarding potential resource use decisions. Though formal approaches to resource governance are changing to accommodate new thinking (in line with Allan's third-to-fifth paradigms), resource use and allocation decisions overwhelmingly reflect historical power relations and inherited values of the resource base. Modernist views and desires translate into water/natural resources as factors of production (Allan's second paradigm). The historical and physical remoteness of the ORB from centres of colonial/post-colonial power means resource use decisions have favoured those with the will to develop/exploit them and governance has proceeded often in an ad hoc/open access fashion.

In terms of the latter, newly emerging structures, these reflect the competing interests of actors based on both old (modernist) and new (late-modern, reflexive era) thinking about the value of water (e.g. the 'environmental reserve') and associated basin resources. For example, OKACOM was initially envisioned as an inter-state dialogue mechanism comprising water sector ministers and expert technical committees to help guide resource exploitation away from potentially conflictful paths (second paradigm). Ten years later, however, it is evolving into an entity based on the central tenets of IWRM, though technical experts continue to worry about the disruptive capacity of local community groups affected by central government decisions (fifth paradigm). Similarly, the ODMP brings together all relevant stakeholders within the boundaries of the Okavango Delta Ramsar site. The draft Final Inception Report frames the project in terms of both wetland management and an ecosystem approach (ODMP, 2005b). However, the proceedings of the Inception Report Workshop (ODMP, 2005a) show, quite clearly, how each of the twelve main components reflect the partial, disintegrated, sometimes fractious and often competing interests of government departments, donors and research associates.

As highlighted by Dovers (2001), institutions reflect the past rather than anticipate the future. Creating new institutions or changing existing ones will meet resistance from those currently benefiting from present structures and past practice. Rather than frame the new resource governance structures as the logical outcomes of epistemic community interaction, it seems to me to be better to regard them as discursive sites where differently empowered actors attempt to shift the discourse – through argument, science, money, threat and action – to their favour. This may or may not result in sustainable development outcomes. Given the high degree of importance placed on the resources of the ORB, it is unlikely that competing actors, particularly those already empowered, will be easily moved from current practice.

7 Conclusion: whose values matter?

Central state interests will continue to have a determining impact on forms of governance in the ORB. Invoking sovereign rights and developmental goals, basin states will continue to pursue their hydraulic missions. International interests will not easily accept this fact. They will continue to invoke various truth claims regarding biodiversity preservation and ecosystem sustainability in the effort to shift government action from second to fifth paradigm thinking and practice. They will also continue to court riverine communities whose knowledge is partial, interests are parochial and power is limited. They will remain recipients of policy at every turn.

Thus inter-state and basin state-international community interactions will continue to frame the discourse and determine the outcome. Emergent structures will reflect this struggle. They will be localised and will operate as weak partners to central state interests. Subsidiarity, therefore, is unlikely; decentralisation, perhaps; devolution of power, definitely not. Basin states will act and invoke sovereign rights when and as they see fit. Historical relations between these actors will mitigate against acute conflict, but there is no direct correlation between inter-state cooperation and ecosystem sustainability. For all those keen to see the death of the second paradigm, it is important to recognise that states are complex, not unified entities, and that interests and values change over time. Thus, those in search of fifth paradigm practices must continue to conduct better science, make better arguments and recognise that moral appeals will fall on deaf ears. For small, weak, developing states seeking survival in an international system of states, arguments must be based on the tangible (political and economic) benefits of certain courses of action. Whose values matter most? Those with the capacity to influence the discourse. Where this leaves riverine communities is at the centre of the resource base but at the bottom of the ladder of power.

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Transboundary groundwater
A challenge for integrated water resources management

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Introduction

The overall concept of Integrated Water Resources Management (IWRM) has been generally accepted and forms the framework for modern water management throughout the world. However, the particularities of the sources for the water supply and the various kinds of water resources are often inadequately dealt with in IWRM. This leads to hidden agendas and masks problems of a sustainable use of the water resources.

The basic IWRM concept takes note of all kinds of social, economic and environmental sustainability issues connected with the use of water and the discharge of used water, so called waste water. It closes the loop of the natural and man-made water cycle and considers the water uses and the interaction between man, nature and water. This excellent overall concept, however, usually does not consider the resources of the water in detail, but rather follows an end-of-the-pipe view. The IWRM concept has little understanding for the variability of the nature of water resources, in particular the groundwater resources, which are so vital in many semi-arid or arid regions of the world. Therefore, it needs to be enlarged, on a scientific basis, to include aspects about groundwater, in order to identify the different parts of the water cycle and clarify their interrelationship.

German development policy has for decades fostered the river basin management concept. It has been successfully applied to European international river basins such as those of the rivers Rhine and Danube and currently forms the cornerstone of the European Water Framework Directive. At the International Freshwater Conference in Bonn in December 2001, this concept was internationally accepted. It is now incorporated worldwide in Integrated Water Resource Management (IWRM) strategies. The concept of managing water resources coherently in river basins applies very well to the humid regions of the world, where surface water and groundwater form a single resource and where the boundaries of surface and groundwater bodies usually coincide. In contrast, this single water resource is split into two rather separate regimes in semi-arid or arid regions, where the surface water is to a great extent decoupled from the deep groundwater system. Hence, there is hardly any exchange between both systems because the two individual regimes may be separated by an unsaturated zone which is generally several tens or hundreds of metres thick. This setting has to be duly considered in IWRM and under such conditions in the semi-arid and arid zones the river basin concept has to be complemented by a groundwater basin component, to pay due consideration to the particularities of groundwater and surface water resources.

Particular hydrologic settings of semi-arid and arid regions

In the arid and semi-arid regions of the world the location, size and delineation of the surface river basin system and the underlying deep aquifer system may vary greatly, which makes the delineation of a relevant management area highly complicated or even impossible.

One of the most prominent examples is Northern Africa where the river basins and aquifer systems are totally different (cf. Figure 1). A comparison of the two maps showing the surface water (river basin) and the groundwater (aquifer system) settings clearly demonstrates that the river catchment basins extend chiefly in the Sahelian region flowing to the south and west. Only the River Nile crosses the Sahara Desert in a northerly direction.

In contrast, the deep groundwater basins are located much further north, mainly below the hyper-arid Sahara Desert. They form extensive coherent, transboundary aquifer structures that are known from oil exploration drilling. These deep aquifers contain huge freshwater resources, which were formed several thousand years ago when the climate of the Sahara was much wetter than today. A surface water network is non-existent in this area.

The groundwater resources in the deep transboundary structures are considered fossil or non-renewable because they are not recharged regularly during the course of a year. These palaeo-groundwater resources do not participate in the present-day water cycle. The situation is comparable to a huge capital in stock which does not contribute to the actual balance, but can be mobilised if the situation becomes critical. It is a common fact in many river basins in semi-arid to arid regions in North Africa and the Middle East that considerable amounts of palaeo-groundwater are pumped to the surface and added to the present-day water cycle. The current water balance is thus continuously upgraded by add-ons from the deep palaeo-groundwater systems.

Conclusion for water management and IWRM

Water supplies usually rely on both surface water and groundwater, depending on the availability of the resources. In arid regions, surface water is rather unreliable because of the high variability of rainfall, both in time and space. Therefore, drinking water supplies are chiefly based on groundwater wells in most parts of semi-arid to arid Africa, namely the Saharan and Sahelian zones. In several North African countries, e.g. Tunisia and Libya, groundwater accounts for more than 80 percent of the water supply. Besides relatively small amounts used for domestic supplies, the groundwater is increasingly used for crop irrigation and industrial development. This might put the deep and old groundwater resources in jeopardy because much larger quantities are required for the agricultural sector.

To ascertain the sustainable development of the water resources in arid and semi-arid regions, surface water resources and groundwater resources have to be considered separately in the first instance. The water balances of both complementary resources have to be taken into account in detail and the interchange fluxes have to be quantified. In particular, the amount of palaeo-groundwater presently pumped and added to the present-day water cycle needs to be recorded, in order to adjust the water balance measurements and calculations. Only after this quantification of the surface and groundwater fluxes, of their interrelationship and the recharge to groundwater, can all volumes be integrated into IWRM strategies.

The surface water has to be considered in its natural unit, the river basin, while the groundwater resources need to be linked with their natural environment, the aquifer basin. Although both resources are, in principle, complementary, they have to be dealt with individually because of their extremely low natural connection and they should only be combined in the final process of integrated water resource management, in larger entities comprising both river basins and groundwater basins.

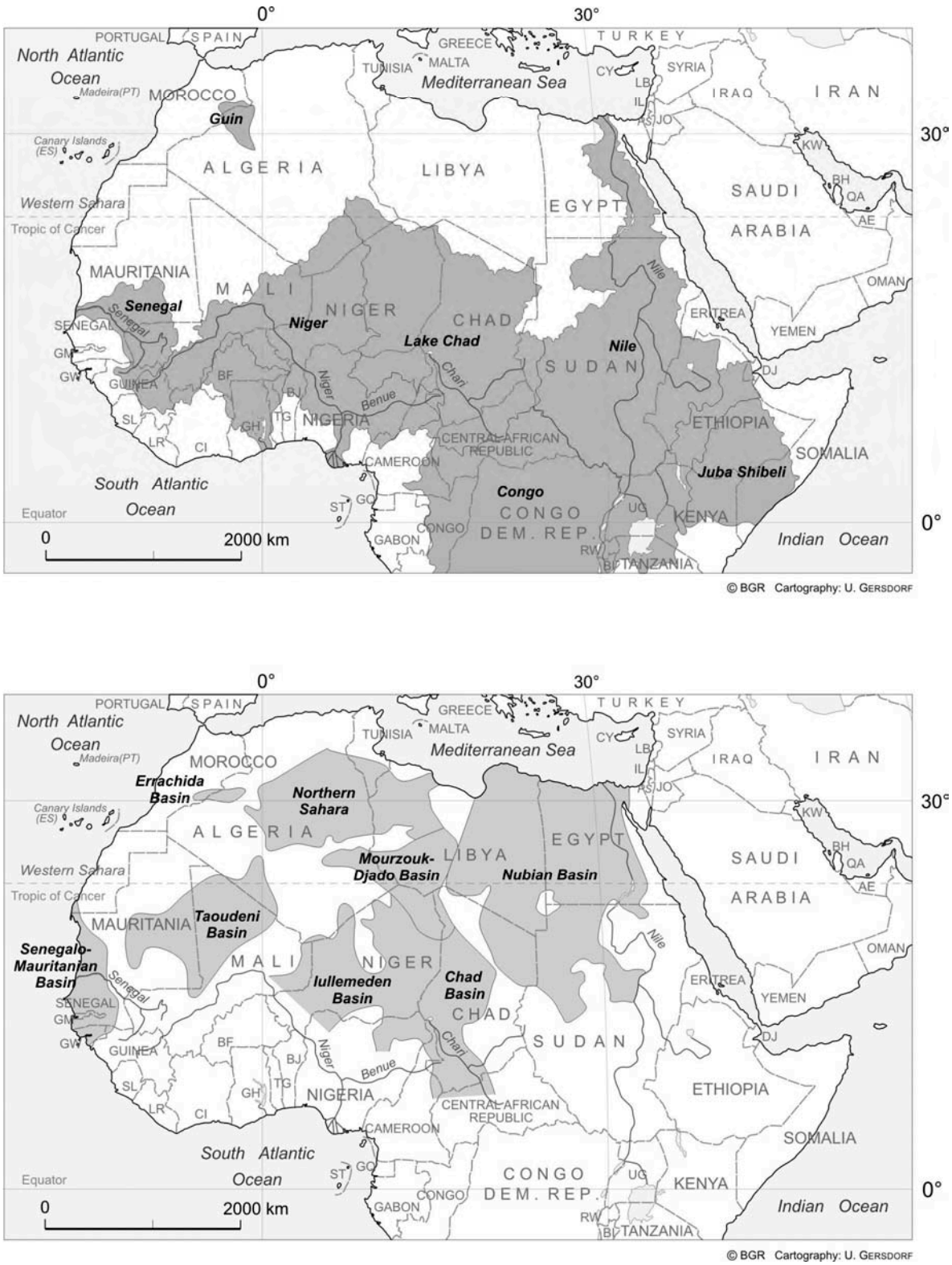

Fig. 1: River basins (top) and transboundary aquifers (bottom) of northern Africa

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TRANSCAT: Water management in transboundary catchments
An example of the Czech-German hard rock region Sumava

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Introduction

In Europe, border areas usually belong to the most problematic regions of many countries in view of social and cultural development as well as inadequate ability of coping with environmental problems due to the nature of cross-border problems. Hard rock regions combine the disadvantages of limited groundwater reservoirs and an unfavourable geographical location. The project TRANSCAT, funded by the European Commission (EC), focuses on the integrated water management of these transboundary catchments. In five selected pilot sites covering typical environmental conditions all over Europe data are collected and evaluated from twelve partners of nine European countries. The establishment of an integrated comprehensive Decision Support System (DSS) follows the new demands of the EU Water Framework Directive (WFD), associating spatial data from GIS systems with socio-economic indicators. Still, in most cases, there exist only local plans for water management, which is due to disinterest concerning transboundary water management approaches. Regarding hydrogeological questions, the main problems are caused by the nonconformity of national borders and boundaries of groundwater catchments. To ensure a reasonable and successful water management the entire catchments have to be monitored. Therefore, the national border may not be considered as a line limiting interests of local or national authorities, for in fact all users of a transboundary catchment are responsible for water management. To simplify water-related decisions and to consider the EU Water Framework Directive, the main goal of the EU project TRANSCAT is to create an operational and integrated comprehensive Decision Support System (DSS) for cross-border water management.

Water management in Southern Germany is mainly focused on groundwater regions with predominating porous aquifers, such as the hydrogeological region of the Alpine foothills moraine belt (Bender et al., 2001). Their groundwater yield is high due to a combination of high precipitation rates (950-1500 mm/a) and thick porous aquifers. In contrast, the hydrogeological situation of hard rock areas is characterised by lower recharge rates due to steeper morphology and restricted storage conditions in higher elevated areas. Difficulties for the field of water management in the area of the Czech-German border are caused by insufficient understanding of the hydrogeologic system as well as by minor interest of the responsible governmental agencies and the private institutions involved.

Pilot areas within the EU project TRANSCAT

The final goal of TRANSCAT is the development of a DSS for integrated water management of transboundary catchments. Input data for developing and verifying this tool originate from five pilot sites across Europe (Fig. 1). Due to the fact that a lot of problems occur in river

systems with different adjacent countries, four pilot areas were selected to address typical questions related to contamination (agriculture, livestock farming, industrial activities and settlements) or unregulated water consumption in the surface water. The exceptional position of the fifth pilot area, Test Site Sumava, is due to the fact that only small transboundary surface water catchments exist in the area, while the extent of transboundary groundwater catchments is uncertain.

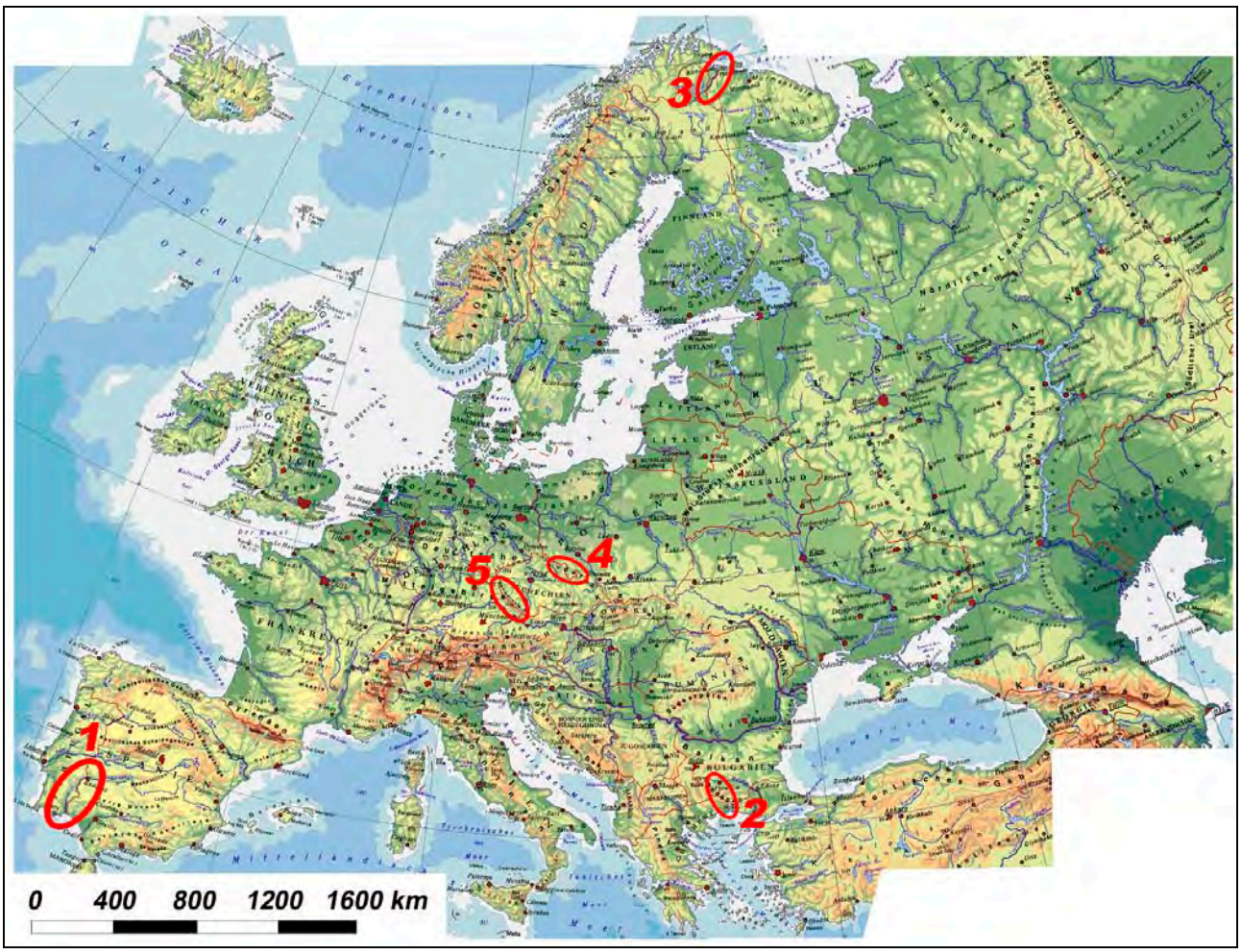

Fig. 1: Location of the five pilot areas within the EU project TRANSCAT (map from Michler, 1988)
1) Guadiana River – Spain-Portugal
2) Nestos River – Bulgaria-Greece
3) Pasvik River – Russia-Norway
4) Bela River – Czech Republic-Poland
5) Test Site Sumava – Czech Republic-Germany

Transboundary catchment Test Site Sumava

The Czech-German catchment-cluster, Test Site Sumava, consists of Upper Regen region (headwaters of the river Schwarzer Regen) and the Sumava region (National Park and Protected Landscape Area Sumava) (Fig. 2). The mountain range of Sumava, which is part of the Bohemian massif, forms a natural border between the Czech Republic and Germany. Due to the political circumstances (Iron Curtain during the Cold War), the use of the area was mainly controlled by military actions. Therefore, the natural development of the environment

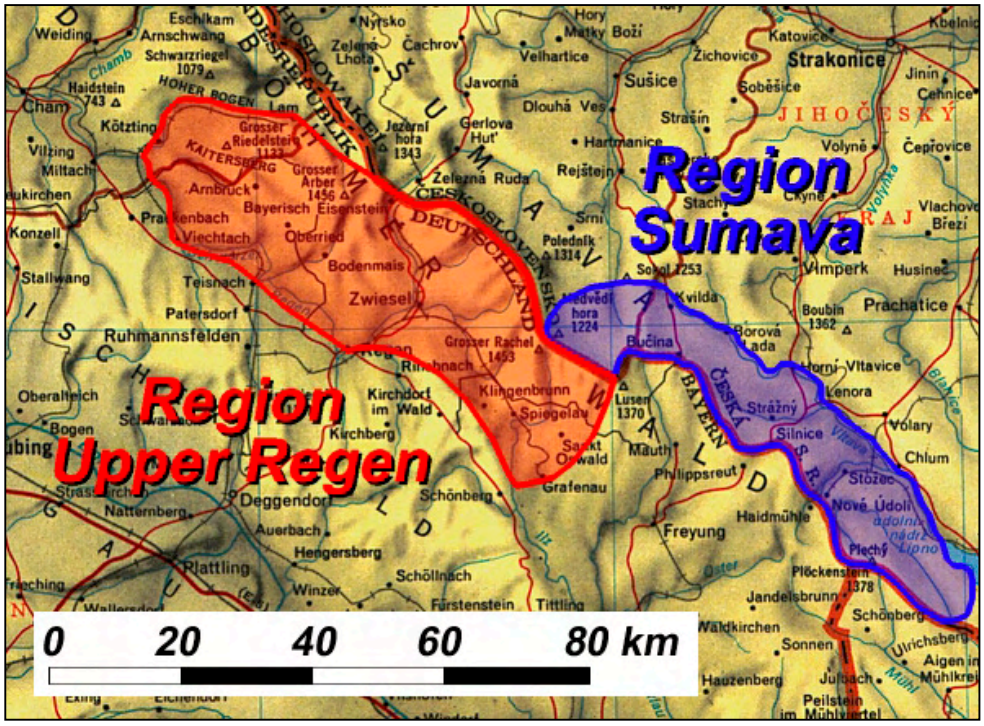

Fig. 2: Location of the pilot area Test Site Sumava (map from Michler, 1988

has hardly been influenced. The area is characterised by a predominance of protected forest regions with emerging tourism and a weak economic basis. The risk of anthropogenic impacts on soil and groundwater is relatively low.

Concerning hydrochemical, morphological, hydrogeological and climatological characteristics as well as land use, this region can be divided into two parts (Vornehm et al., 2003).

- The more elevated areas, as part of the Bavarian Forest National Park (Germany) and Sumava National Park (Czech Republic), are predominantly characterised by forest (mainly spruce).
- The morphologically lower regions (mainly on the German side) are composed of farmland, forests and settlements with small industrial sites.

While the more elevated regions are more interesting for nature park administration, the lower regions are highly important for local water management. Unfortunately, the interests of both groups are focused on different goals, so that management strategies have to be divided into two parts, respecting the particular spheres of interest.

Geologically, the Test Site Sumava mainly consists of hard rocks, namely paragneisses and granites, which both generally show a very low permeability. Nevertheless, local parts with increased hydraulic conductivity can be found, such as the transition zones between lithological units, intensively stressed tectonic zones and former circulation paths. However, groundwater circulation mainly takes place within the weathering zone and covering layers, which show an extent of up to 40 m and more in depth (Breuer, 1997).

The hydrogeological situation at Test Site Sumava is characterised by a combination of shallow porous aquifers and fractured hard rock aquifers of the basement beneath. Within the subterranean catchment, transboundary groundwater fluxes most probably occur (Fig. 3). Spring systems can be influenced by upwelling groundwater from deeper aquifers (Bender, 2000).

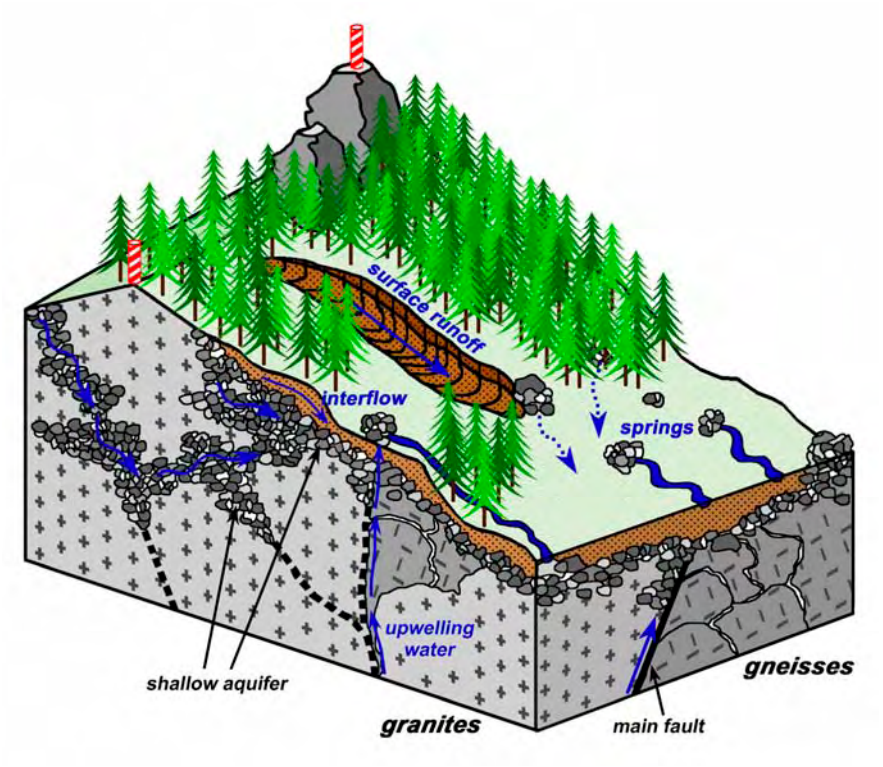

Fig. 3: Scheme of the hydrogeological situation in transboundary hard rock regions (Mieseler et al., 2004)

One of the main problems in these mountainous regions is the acidification of soil and groundwater due to the low buffer capacity of soil layers and weathering zones (Bender et al., 2005).

As a further result of bark beetle activities or lumbering in combination with spruce monocultures and input of atmospheric deposition (SO_2, NO_x) groundwater gets more acidic, enhancing the mobility of heavy metals and aluminum. Creation of pollution load maps using the risk analysis methods of Hrkal (2001) point to the high vulnerability of morphologically higher parts. As a result of this risk analysis Figure 4 displays the vulnerability regarding acidic atmospheric deposition in the Bodenmais area (Vornehm et al., 2003). This theoretical vulnerability map was created by evaluating four subprocesses influencing the acidic vulnerability of groundwater: geology and petrology, elevation, prevailing wind exposure as well as vegetation cover. To validate this risk study, several groundwater samples were taken. As can be seen in Figure 4, there exists a high conformity between measured pH-values and theoretical risk assessment.

Conclusion and Outlook

The main task of the TRANSCAT project is the development of an integrated flexible DSS, which consists of several modules for simulation of climatic, environmental, hydro(geo)-logical or socio-economic processes. Working in a pilot area which is predominantly characterised by extremely heterogeneous natural conditions as well as a heterogeneous data base of existing information, the field of “data acquisition” is highly important. First of all, for an optimised usage of the DSS, the cooperation of countries on both sides of the border is essential. To account for existing problems, communication between local steering group

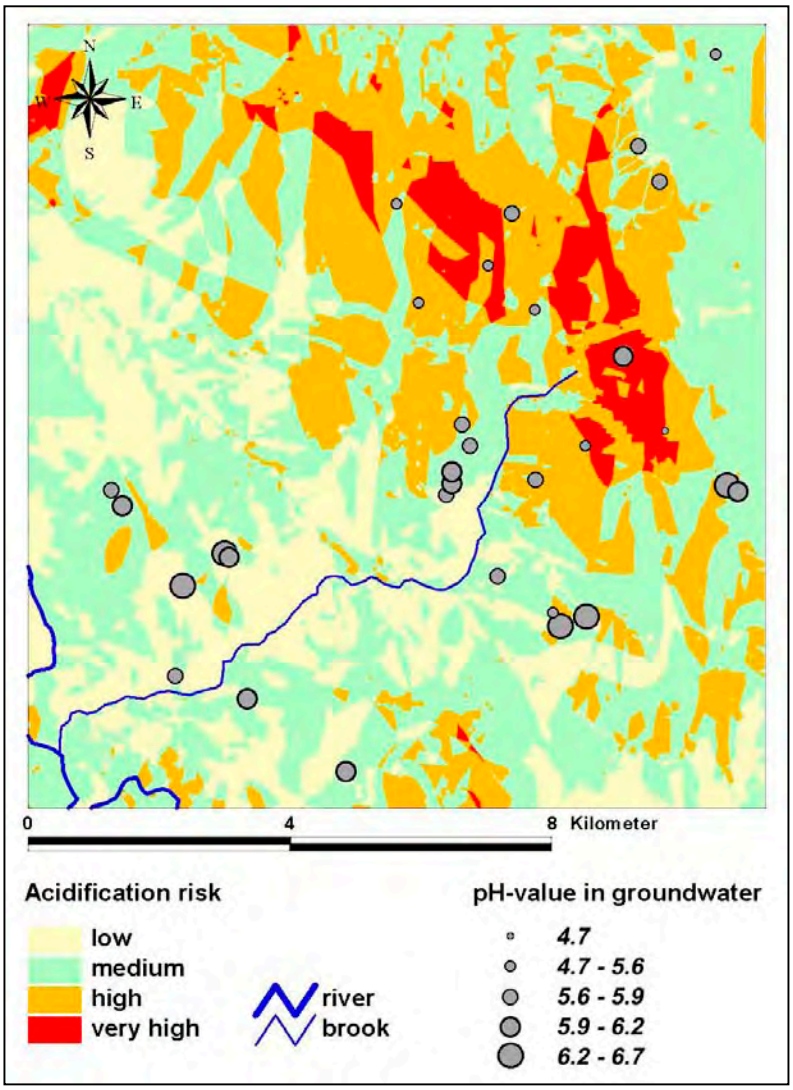

Fig. 4: Vulnerability for acidic atmospheric deposition in the Bodenmais area (Vornehm et al., 2003)

members including representatives from governmental authorities, municipalities and local water suppliers must be promoted. Regarding water management in hard rock areas, it is necessary to find evaluation methods enabling predictions of the hydraulic and hydrogeologic interactions in these complex systems. Starting points for an approach are GIS-based calculations using available areal data in combination with weighted levels of parameters and indicators (Hrkal et al., 2003) or anthropogenic impacts (street salt, nitrate fertilisers) which can be used as tracers to understand hydraulic processes.

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Topic 3

Value of water under stress conditions

Water distribution under stress conditions: policy development and operational aspects

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Abstract

The value of water in this paper is examined as its value in situations of shortage. Two recent shortage events (1976 and 2003) are briefly examined, their effects on the formulation of national policy and operational effects explained.

In order to be prepared better for future water shortage events, the Dutch National Study on Water Shortages was launched in 2002. The method that this study has adopted to assess the value of the use of water, or its absence, is explained. The conclusion is that the best estimate the author can give of the value of water will be the table of effects, combined with the decisions taken.

The value of water

With respect to the value of water, three aspects or states can be considered: the value of water when it causes inundation or flooding problems, when it is available in the right amounts and acts as an important element of appreciation of our natural surroundings, and when it is in shortage. The main emphasis in this paper is on water shortage situations. However, in the Netherlands, from a historical perspective, one might argue that the main value of water was when it caused inundations. In those conditions it has helped to shape society from the medieval period on, as a focus point of coordinated action.

The value of water is determined by the so-called 'frames' of the people looking at it. A frame is used here according to the definition provided by Craps (ed.) (2003): 'The gradual "cutting out" of a part of the ongoing reality, in interaction with other social actors and attributing it a problematic character.' A certain grouping can be found in peoples' frames. Whatever the categories used, the main point is that these frames must all be considered valid and that people decide on the value they attribute to water, measures to deal with it, nuisance or dangers it causes, etc. on the basis of their frame.

Policy development for water shortage situations

National policy in the Netherlands concerning water management has two main drivers: the WFD and a policy outline called 'Water Management 21st century'. The latter mainly deals with water quantity aspects, in reaction to a series of incidents with high-intensity rainfall and to the near-inundations during the floods of 1993 and 1995 along the Rhine and Meuse. These two drivers were developed more or less independently but are currently being

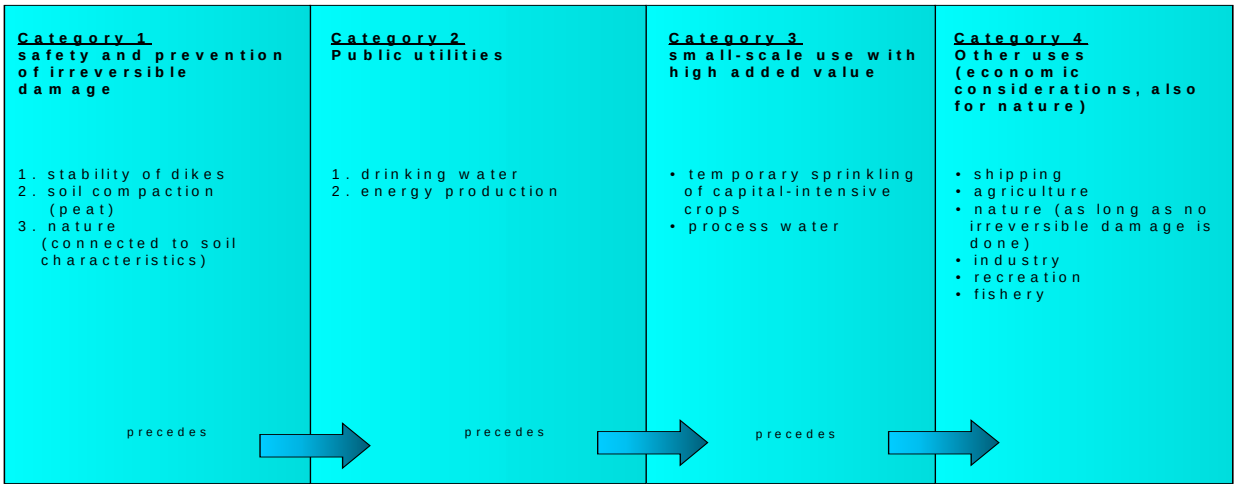
combined into working programmes and a renewed version of the National Water Policy Document, planned for 2009.

The incentive for the development of a policy for drought management in the Netherlands was the drought of 1976. During that summer a lack of data and knowledge for optimal management of the scarce water resources made itself felt. This resulted in the development of an integrated 'model train' called PAWN (Policy Analysis for the Water management in the Netherlands) (RIZA and WL/Delft Hydraulics, 1990). This model comprises surface water flow, saturated and unsaturated groundwater flow and several user function modules, such as agriculture, shipping and drinking water supply. The model train is being developed continuously, but still provides the calculations of the technical part of today's policy justification.

The summer of 2003 was, in the Netherlands, not an extreme event in terms of river discharge or evaporation surplus; both had a frequency in the order of once in 10 to 15 years. 2003 was extreme, however, in terms of water temperature of the Rhine and Meuse and in terms of inland navigation problems. Moreover, two regional dikes, made of peat, desiccated to a degree that they lost their stability and caused small-scale inundations. No lives were threatened and the resulting damage was not extensive, but it worried water managers all over the country and it received a lot of attention in the press. The aspect of the attention of the media played a role in all matters concerning the drought and high temperatures, much more than in the much drier summer of 1976.

Some general principles of the standing policy are:
- the available water is distributed in such a way that on a national scale, the minimum damage is caused by shortages;
- in assessing damage, economic, ecological and socio-cultural contributions are considered;
- all relevant water uses and functions are considered;
- no fees are due for surface water extractions.

The resulting policy in the field of droughts and water shortages is translated to the operational field by way of a priority list for the water-related functions. This list is based on a combination of (calculated) technical optimisation and political optimisation. Details in the priority list are developed on a regional level. In the first two categories, the subcategories have a number as a sign that this order is maintained in water distribution prioritisation. The subcategories of categories 3 and 4 are not prioritised on a national scale. These decisions are made according to the situation and regional characteristics.



Operational aspects

Under normal conditions the available water is distributed in accordance with regional water treaties between the national and regional water managers. If water quantity or quality no longer permits full demand to be satisfied, the problems are upscaled according to an emergency and communication upscaling scheme. The allocation will follow the priority order depicted above. Formally, in extreme situations, the final decision was taken by the minister. Because nowadays problems with heat discharge are making themselves felt more than ever, a separate upscaling scheme has been developed for heat discharge problems.

Information needs and exchanges

The lessons learned in 2003 showed that much friction can be avoided by improving the basic rules for information exchange. This was found both at the level of water managers, considering the situation and mitigation options at the technical level, and for managers and politicians. Obvious as it may seem, it was still concluded that this topic had not received sufficient attention. Action has been taken since to improve practices. A website where all relevant information or links to it are brought together has been developed for water managers, thus making the information needed readily available. For managers a communication scheme was developed and approved at governmental level.

The National Drought Study

In order to reconsider the national policy for water shortage situations, a major study was started in 2002 (see www.droogtestudie.nl, mainly in Dutch but with some summaries in English). The first phase of this study was aimed at reassessing the nature, severity and magnitude of water shortage-related problems, partly because the existing policy dated back to the 1970s, partly in order to define the possible impact of climate change.

After the first phase, which mainly dealt with updating the PAWN model train, the results were published and discussed with stakeholders in a number of meetings and workshops. The idea of defining standards for water shortages was considered, but rejected.

At present, work is aimed at the development of two additional aspects, to be finished by mid-2005:

- the definition of the so-called 'water tasks' for water shortages. This is the theoretical water shortage in m^3, with given recurrence intervals, per subbasin and per user function, and the part of that water shortage that, according to water managers, can and should be prevented;
- the development of the so-called 'transparency tool', i.e. a calculation method (no calculation results) for regional water managers to assess their situation with respect to water shortages and droughts. This tool is aimed at the promotion of well-documented, transparent information supply and decision-making in the field of water shortage management.

In a follow-up phase, mitigation measures at national level will be defined and their effects calculated.

The value of water in the National Drought Study

In the calculation of the optimal water distribution and feasibility of mitigating measures, the effects of the measures are expressed in three main categories: economic effects, effects on the natural system, effects on human perspective. These main categories are subdivided into categories and subcategories, as indicated in Table 1. The next step is to define, for each of the categories, the indicators that will be measured or calculated, how this measurement or calculation will be performed, and the units in which the results will be expressed. Then for each of the measures or combination of measures the table is completed, resulting in the so-called 'table of effects'.

The definition of the table of effects requires a lot of attention. As it will form the backbone of the intercomparison of future options or alternative strategies, all effects that are relevant and resulting from the measures should be included in the table. Special thought must be given to the question if and how aspects that are relevant for decision-making processes only should be addressed in the table of effects. An example: in the original table of effects, no attention was paid to the effects of the measures on the salinity of the groundwater. Neutrality to this process was considered a boundary condition that all measures must meet. However, this effect was included, on request of the decision-makers, just to show that it had received proper attention.

Apart from the usefulness of the table of effects for future decision-making, it has proved very helpful in discussions between partners in water management. It clearly defines what is considered important and what not, and it provides a checklist of items to be addressed.

Some specifics of the table of effects of the National Drought Study are:
- it refers to the national level;
- effects on ecology and human perspective are not monetarised;
- no measures are considered that have a negative effect on safety or that cause irreversible changes in the natural system.

For agriculture the water shortage damage is calculated as the yield reduction in kg or €, with respect to the yield in an average year. Multipliers are used to account for the effects in pre- and post-processing industries and services. For the calculations in future situations (horizon 2050) prices for products are reduced as a result of the expected decrease of prices by 10 to 20 percent in 2050. Even so, agriculture is the category of use most affected by water shortages.

The next most affected user function is shipping. Damage by water shortage to shipping is mainly caused by low water depths on the Rhine and its tributaries. This forces shippers to reduce their payload, use smaller, less efficient ships, choose alternative (longer) routes or temporarily store their goods. On the Meuse, which is equipped with weirs that maintain a minimum water depth, extra costs are caused by water-saving measures at the locks, such as pumping back the water, increased waiting times for ships, etc.

The third most important category to suffer from water shortages is energy production. Although this sector does not actually use much water, it affects quality of the water by increasing its temperature.

The other sectors are less seriously affected (considered on the national level).

Table 1 Table of effects of mitigation measures

main category	category	sub-category	indicator	measuring or calculation method	unit	option A	option B	etc.
economic effects	costs of measures		investment and maintenance costs per year on national scale	various	€/yr			
	agriculture	grass production	damage by shortage, surplus and salinity	PAWN-Agricom	€/yr			
		akkerbouw	id.	PAWN-Agricom	€/yr			
		capital intensive crops	id.	PAWN-Agricom	€/yr			
	shipping	Rhine + tributaries	extra costs of underloading, detours	PAWN-shipping	€/yr			
		Meuse	operational costs of ship lock operation	PAWN-shipping	€/yr			
		other water bodies	id.	PAWN-shipping	€/yr			
	electricity production	use of cooling towers	energy costs of production	Prosym (Henwood, 2002)	€/yr			
		use of sub-costoptimal power plants	operational costs	Prosym	€/yr			
		costs of surplus capacity	operational costs	Prosym	€/yr			
	recreation	bans on swimming due to quality	loss of expenditures	SEO-model	€/yr			
		number of recreants as function of the weather	loss of expenditures	SEO-model	€/yr			
	drinking water		extra production costs by reduced reliability of quantity and quality	after first estimations not quantified	€/yr			
	industry		extra production costs by reduced reliability of quantity and quality	after first estimations not quantified	€/yr			
	households	after first estimation not determining factor	costs of sprinkling gardens, damage by insufficient supply	after first estimations not quantified	€/yr			
	indirect effects	after first estimation not determining factor		not quantified	€/yr			
natural system	size of valuable ecosystems		area in national water bodies	PAWN-Demnat (Van Ek et al., 2000)	ha			
			area in regional water bodies	PAWN-Demnat	ha			
			area in terrestrial areas	PAWN-Demnat	ha			
	shifts in quality of valuable ecosystems		quality of national water bodies	PAWN-Demnat	quality index			
			quality of regional water bodies	PAWN-Demnat	quality index			
			quality of terrestrial areas	PAWN-Demnat	quality index			
	changes in phys. system	changes in undesired groundwater salinisation		PAWN-quality, Sobek/Delwaq	[Cl], depth			
		others to be decided						
human perspective	use	recreation	area, diversity, attractiveness	statistical database, counting	areas, number			
		living	available services, social quality, view	statistical database, counting	numbers indexes			
		mobility	travel time, barrier, model split	statistical database, counting	hr, km			
		nature	diversity, size	statistical database, counting	area, indexes			
		landscape	authenticity, unicity	statistical database, counting	indexes			
	perspective	acceptance	recognition of need, logics of causes and consequences, egality	statistical database, enquiries	numbers of people			
		perception of safety	mental, physical	statistical database, enquiries	id			
		hindrance	number of people affected	statistical database, enquiries	id			

Effects on the natural system include, in the first place, such effects as groundwater table drawdown, increase of salinity and irreversible subsidence of peat areas. The second category includes the effects on ecosystems, subdivided into those on aquatic and terrestrial systems. A number of studies have been devoted to the quantification of ecological effects in financial terms. In the ongoing studies, however, this is not deemed necessary. The resulting difficulties in comparing economic and ecological effects are accepted and to a large extent left to the political level.

Effects on the human perspective are of the type of nuisance during implementation of measures, accessibility, etc. These effects have been listed, based on existing literature, mainly concerning large-scale infrastructural projects. In the course of the ongoing study some experience will be gained in the way these principles are applied in the specific setting of water shortage problems and measures. No efforts will be made to translate social effects into monetary terms.

After all of the above effects have been listed and quantified (as accurately as possible), the tasks of the scientists are reduced and those of decision-makers increased. The next step, that has not yet been taken in the study, will be to standardise the effects. This means the comparison of the effects of various alternatives on a particular (sub)category and their quantification. For example, if alternative 1 results in 20 ha of wetlands and alternative 2 in 60 ha, will this imply that alternative 2 is three times better? Or only twice? Or not better at all? This step is relevant in particular for those categories that are not monetarised, ecology and human perspective. The assumption is that for economic effects, expressed in €, standardisation is a simple linear function of the net effects.

The third step is to weigh up the relative importance of each of the (sub)categories. For example, if the net extra yield in agriculture of an alternative is 10 m € , resulting, however, for many people, in local hindrance during execution valued at '- - - ', how will the net effect be valued?

After the weighing-up phase is concluded, the alternatives are ranked according to their scores. Before this is presented to decision-makers, a sensitivity analysis is performed. What will be the ranking order if the main assumptions are changed in predetermined ways? In other words, how robust is the result with respect to shifts in the underlying assumptions? The sensitivity analysis can also be used to identify 'low-risk' solutions: solutions that may not be the optimal ones, but show little sensitivity to assumptions with a high degree of uncertainty.

The value of water in water shortage situations

The approach sketched above is very useful in that it gives direction to the necessary data collection and provides a systematic way of archiving assumptions and subsequent results. The time when these results directly led to decisions by decision-makers is behind us. One reason is that not all information needed is available at the central level, another is that these types of decisions will only be effected when broadly supported.

An important continuous activity besides the calculations described is, therefore, the exchange with stakeholders (in present practice, mainly scientists, regional water managers and organised stakeholders) and with the future decision-makers. It is here that the notion of framing the problem comes in; it helps to build links between the various stakeholders.

All in all, one may conclude that major efforts in the fields of data acquisition, modelling and integration have been accomplished. This certainly has helped to make matters clearer. Still, the value of water is diffuse and, to an important extent, determined by such ill predictable factors as political support. This being said, the best approximation we can give of the value of water in the Netherlands will be the completed tables of effects of measures and scenarios, in combination with the decisions taken.

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Economic and political benefits of transboundary water cooperation[1]

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1 Introduction

The economic and political nature of cooperation on transboundary rivers has received considerable attention in scientific literature in the last decade. Despite these activities, our general knowledge of the nature, design and variation in the performance of existing approaches to international river management is still limited.[2] Still, economists have been able to demonstrate that cooperation on transboundary rivers cannot only result in better resource conditions but economic net benefits are expectable, too. Consequently, there is usually a positive economic value stemming from international river management schemes even if cooperation costs (transaction costs, etc.) are taken into account. Economists, however, tend to discuss transboundary water management problems on the basis of pure theory while empirical analysis of institutional approaches to transboundary water management play a minor role. In this paper, some general economic aspects of transboundary water cooperation are outlined. Then, the focus is put on empirical findings relating to existing approaches to interstate cooperation. In this context, the main discussions concern the mechanisms that riparian states use to share the economic benefits (or the costs) of water cooperation.

2 Economic benefits from transboundary water cooperation: conceptual considerations

The analytical starting point of most economic analyses of transboundary waters is the specific nature of this resource in terms of transboundary externalities.[3] In economic terms, such externalities may stem either from the provision of water-related infrastructure or the appropriation of the resource (e.g. extraction of groundwater or surface water). In this context, economists usually distinguish so-called collective (good) problems with reciprocal externalities from unidirectional externality problems (see Rogers, 1997; Marty, 2001; Dombrowsky, 2005). Collective problems relate to issues in which all riparians have, at least in principle, a similar interest. Examples are the ecological restoration of a transboundary lake, the sustainable management of a shared groundwater aquifer, or flood protection on rivers forming the boundary between states. Symmetrical interests of the riparians can also characterise dams on international waters. In contrast, unidirectional externality issues show the typical upstream-downstream constellation and, accordingly, the asymmetrical interests of the riparians. For instance, water diversions and pollution upstream usually have negative impacts on the downstream water usability and the preservation of downstream freshwater ecosystems. Other upstream activities show positive impacts on downstream riparians, e.g.

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[1] The main conceptual arguments and the empirical cases that are presented in this paper were originally studied in the framework of a recent research project on Transboundary Water Management in Africa. The German Ministry for Economic Cooperation (BMZ) generously financed this project. See Klaphake (2005).

[2] See Bernauer (2002) for a survey of recent studies.

[3] In general, externalities occur when the impact of one entity's actions (e.g. activities in one riparian country) on another entity's welfare (e.g. welfare in another riparian country) is not considered in monetary terms. An example is transboundary pollution, insofar as the polluting country does not take the impacts of the pollution on another country's welfare into account.

water infrastructure development may reduce downstream flood risks and/or enhance water availability in dry seasons.

Transboundary externality problems arise from the simple fact that the area of jurisdiction differs from the area of environmental concern. For transboundary rivers, the problems occur when the upstream states affect the resource base of the downstream states, but usually not reciprocally. Exceptions are the navigability of a river that clearly depends on downstream activities (e.g. access to the sea) and large-scale dams that can cause upstream inundations and, herewith, a loss of land. Albeit less obvious, there might be further, non-physically but property rights related externalities working from downstream countries to upstream riparians: downstream states could harm the upstream by reducing future available water flow – and herewith foreclose upstream water use opportunities – because of downstream claims of historically acquired water use rights. This is of particular relevance in river basins with powerful downstream states that dispose of means not only to articulate but also to enforce their claims.[4]

The main consequence of collective problems and/or (positive or negative) unidirectional externalities is that an efficient cooperation between the riparians is not guaranteed because adequate cooperation incentives might not be in place. In the case of collective problems, theory[5] would predict an underprovision of common goods, e.g. an inefficient management of a transboundary aquifer. In literature, specific attention has been given to repeated negotiations in creating incentives for cooperation and making opportunistic behaviour of individual states less likely (Axelrod, 1994). Apparently, and this is the positive result of this branch of research, states are able to "learn" cooperative behaviour in the case of repeated situations and symmetrical interests. In addition, there is usually a small and well-defined group of riparians making free-riding behaviour more complicated and cooperative management easier. Although symmetrical externalities have these comparatively favourable characteristics, efficient and stable transboundary cooperation might, however, depend on the mechanism to share costs or benefits from cooperation (Mitchell and Keilbach, 2001). Another negative result is that only few transboundary management issues have the characteristics of a purely symmetrical situation.

In contrast, cooperation is less likely in the case of unidirectional externalities and the evidently diverging interests of the riparians could be a source of conflict. Obviously, upstream and downstream countries do not necessarily share common interests because the upstream country usually benefits from the non-cooperative status quo while the downstream riparian would clearly gain from cooperation.[6] Consequently, water management decisions are often perceived as zero-sum games because water resources are finite and one use of the resources always impacts on (or even precludes) another.

In context, economists have demonstrated that the non-coordination of riparians could not only potentially create tensions between states but also cause significant welfare losses for the group of riparian states as a whole. For example, an integrated basin-wide perspective on water use can help to channel water into productive uses and, herewith, enhance the overall water productivity in a basin (Sadoff et al., 2002). Water cooperation, leading to an optimised water use and river flow, can significantly contribute to yield more goods and services from the water (e.g. food). Equally, cooperation can help to develop water infrastructure, which, provided environmental and social effects are carefully taken into consideration, can enhance

[4] The Nile basin is considered an important example of such a hydropolitical constellation.
[5] In game theory, collective problems are usually conceptualised as Prisoners' Dilemmas.
[6] As mentioned above, this might be reversed when a powerful downstream riparian claim acquired water rights.

the countries' welfare via increased water availability and increased food and/or energy production. Cooperation in water pollution control can show positive economic effects, too (overall reduced costs of pollution control, downstream welfare gains that outweigh upstream costs, etc.) (see Ströbele, 1991). Furthermore, coordinated flood control policy might significantly reduce the costs of protection measures and coping strategies. Finally, a basin-wide coordinated protection of important freshwater ecosystems may reduce the costs of nature protection and contribute to the preservation of species that show a high economic benefit.

But if these economic benefits can be taken for granted, why do states have so much difficulty in cooperating? One simple answer is that unidirectional externalities (or other "perceived" asymmetrical constellations) imply an uneven distribution of potential welfare gains from cooperation. Consequently, even significant economic gains as a result of cooperation in a river system might not be a sufficient prerequisite or enough motivation for cooperative actions if the distribution of the gains is (or would be perceived to be) significantly inequitable. On the other hand, as long as the welfare gain from coordination in the downstream country is higher than the welfare loss resulting in the upstream country, the "winner" (e.g. the downstream country) would have an incentive to compensate the loser (e.g. the upstream country) for the welfare losses from cooperation. The distribution of any gain that exceeds the losses of the "loser" is a question of negotiation, bargaining power, considerations of fairness and other determinants. The sketched upstream-downstream compensation – in economic literature known as "Coasean bargaining" – is the economic rationale of the oft-cited slogan "benefit sharing instead of water sharing"[7]: Unless compensation mechanisms are in place, the problems stemming from strongly asymmetrical cooperation incentives can hardly be overcome (see Barrett, 2001; Mitchell and Keilbach, 2001).

In principle, two basic forms of compensation mechanism could be implemented (Klaphake, 2005; Marty, 2001). First, riparian states can agree on side payments that are either explicit interstate financial transfers or implicit payments (e.g. via trade preferences, purchase contracts, investments). Second, governments could agree on issue linkages, i.e. the resolution of one issue (e.g. water pollution control) is made dependant on the solution of another (e.g. navigation, water allocation, etc.). In general, issue linkages mean the agreement on a further project or agreement that channels a benefit stream to one riparian in exchange for losses (Table 1).

However, agreements on compensation and the sharing of benefits face a couple of political, economic and institutional challenges. Interstate compensation might simply fail because of the divergent fairness perceptions of the countries. In particular, downstream states often do not agree to "pay" for cooperation. In other cases, upstream governments can barely communicate that they "sell" cooperation. Furthermore, even if states principally agree to cooperate, the definition of an exact distribution of benefits is not a trivial task in economic and political terms. Some authors have taken the view that the objectives of equity and efficiency are inseparable and potentially at odds with each other (Rogers, 1997). Since international water law does not provide for a clear assignment of water use rights to individual countries[8], water negotiations typically face the problem that governments have to simultaneously negotiate both an initial allocation of water use rights and the mechanism

[7] Many international actors and organisations (e.g. World Bank) currently promote 'benefit sharing' and perceive it as a possible way to overcome conflicts over scarce water resources.

[8] Basic principles of international water law (no significant harm, equitable and reasonable utilization) do not provide clear criteria for the allocation of water use rights.

providing for an acceptable sharing of cooperation's benefits and/or costs. Equally, since benefit sharing often implies international financial transfers, there are a couple of open institutional questions, e.g. the organisational backing in the form of joint management structures, monitoring, cost control, etc. Clearly, benefit or cost-sharing mechanisms can be expected to imply high transaction costs that hamper possible cooperation.

Table 1: Systematisation of different benefit-sharing mechanisms

Benefit-sharing mechanism		**Examples**
1. Side payment	Direct	Non-earmarked financial transfers
		Contribution to water management costs (e.g. joint financing of infrastructure, costs of pollution control)
		Payments for the (temporary/permanent) transfer of water/water rights
		Water-related investments/joint ventures, etc.
	Indirect	Preferential agreements on energy/water deliverance
		Other trade-related agreements
2. Issue Linkages	Intra-sectoral	Linkages are being made between several water projects/agreements (e.g. water pollution, navigation)
		Linkages are being made between the disputes over different waters.
	Intra-sectoral	Linkages between water management and another policy field (e.g. trade liberalisation, security and border issues)

Transaction costs can also result from incomplete information (hydrological data, economic data). Against this background, it is expectable that states behave strategically and will not be willing to fully disclose their information. Equally, some economic benefits and losses from cooperation, particular the long-term effects, are difficult to assess, making the consolidation of a broadly accepted information base a challenge (Bernauer, 1995). Furthermore, internal politics of the countries play an important role and it is unclear whether, and if so to what extent, agreements on transboundary rivers are rewarded on the internal political "markets". In other cases, theory might underestimate cooperation prospects because not all actors behave "rationally" according to economic theory but may agree on cooperation even if this can imply short-term economic losses for the country. Equally, political actors might perceive water cooperation as a means to promote other political objectives. Finally, the degree of regional political and economic integration is an important contextual factor (Durth, 1998).

3 Which role do benefit-sharing mechanisms play in practice?

In order to assess the empirical relevance of compensation schemes on international rivers, an analysis of existent agreements on transboundary waters was carried out and, in addition, several in-depth studies of relevant cases, in particular in Africa.[9] Even if there is not enough room for presenting the results in depth, some of the main findings can, however, be summarised.

[9] Detailed descriptions of the individual cases can be found in Klaphake (2005).

Somewhat contrary to the expectation expressed in parts of social science literature, there are already a significant number of benefit-sharing mechanisms in place. Although the majority of international agreements on transboundary water still primarily concern technical issues (monitoring, infrastructure management, information sharing, etc.) or the allocation of water flow, an increasing number of cooperation cases include linkages with financial transfers / cost sharing / transboundary capital investments, etc. and/or linkages with other projects (e.g. land use, political concessions).[10]

Examples in Europe and North America:

- Columbia Treaty (USA, Canada): Downstream benefits from flood protection and hydropower are shared in exchange for provision of storage capacity.
- River Rhine (France, Germany, Switzerland, Netherlands): cost sharing in implementing water pollution control, financial transfers from downstream countries to upstream France
- River Scheldt – Meuse (Netherlands, Belgium, France): win-win solution by linking downstream navigation and harbour projects to the improvement of water quality upstream + cost sharing
- River Tijuana (USA-Mexico): USA (mostly) finances the treatment of upstream-polluted water.
- Meric River (Bulgaria-Turkey): Turkey has occasionally paid Bulgaria for the release of additional water for irrigation purposes in dry periods.

Examples in Asia:

- Syr Darya "Bishkek Agreement" (Kazakhstan, Kyrgiyzstan and Uzbekistan): in-kind compensation of curbing water releases in the winter period. Intention to barter coal for water supplies in the summer.
- Mekong River Basin (Thailand, Laos): joint development of hydropower generation, even in times of highly tense political relations.
- India-Bhutan: India has predominantly financed a dam for hydropower production. In return, India receives electricity for 99 years at a tariff determined on the basis of a formula. The electricity generated is, however, used first to satisfy Bhutan's own needs. Bhutan has agreed to make available, free of cost, land and timber required for the project.
- Kosi Project (India-Nepal): India completely financed a dam, provided compensation for inundated land and upstream afforestation. In turn, Nepal receives hydropower and water for irrigation.
- Pancheshwar Project (India-Nepal): The benefits of the planned multipurpose dam in terms of hydropower production, irrigation and flood control will be shared whereby the cost of the project will be borne by the countries in proportion to the benefits accruing to them. Mainly because of diverging fairness perceptions, the project has not been implemented yet.

[10] Hamner and Wolf (1998) estimated that ca 30 of all available agreements on international waters provide for payments/capital investments.

Examples in Africa:[11]

- **Lesotho-Highland Water Project** - LHWP (Lesotho, South Africa): Construction of two huge dams in water-abundant Lesotho with the main purpose to transfer water to South Africa. South Africa is responsible for 95% of the entire project costs while Lesotho is responsible for the costs related to the associated hydropower generation on its own territory. The agreement provides that South Africa undertakes to share the net benefits of the project with Lesotho, by way of royalty payments, on the basis of 56% on the part of Lesotho and 44% on the part of South Africa. The net benefit is calculated on the basis of a cost comparison between two projects: the LHWP and another project entirely within South Africa (the so-called Orange-Vaals Scheme). From a South-African perspective, the LHWP was much more cost-effective compared with the "national" project for which net benefits are guaranteed. The royalties are comprised of a fixed component, based on a comparison of the respective investment costs, and a variable component, the calculation of which is based on a comparison of operation and maintenance costs. The variable components are converted into unit rates whereby the total sum paid by South Africa depends on the quantity of water delivered. In addition to the royalties, Lesotho receives the benefits from the opportunity provided to generate hydropower.

  Far-reaching institutional provisions, including modern project management structures and dispute-resolution mechanisms, characterise this bilateral agreement. Important contextual factors (i.e. political factors) of the project's genesis were the Apartheid Regime in South Africa, the specific foreign relations in Southern Africa in the 1980s, South African security interests in relation to Lesotho and internal political developments in Lesotho. The project is contested because of assumed negative environmental and social impacts and a low degree of local stakeholders involvement.

- **Senegal River Development** (Mali, Mauritania, Senegal): In response to droughts in the 1960/70s, the three riparian states agreed on the recognition of the international status of the Senegal river ("International River", 1972 agreement) and a joint development (and ownership) of water infrastructure. The realised infrastructure mainly comprises two dams, one upstream dam in Mali and a further dam in downstream Senegal. Important components of the project are irrigation development (main benefit for Mauritania and Senegal), and improvement of navigation and hydropower production (main benefits for Mali). Major provisions of the agreement concern cost sharing, joint ownership and operation of the Manantali and Diama dams according to the "principle of benefit sharing" rather than allocation of the water itself. The riparians used an economic model that separated the costs of the infrastructure from the benefits each country would gain to devise the burden-sharing formula (clé de repartition). The riparians succeeded in jointly raising external investments. Apart from the jointly developed physical infrastructure, the riparians agreed on far-reaching institutional provisions and a complex organisational approach to transboundary water management.

  Still, joint river regulation caused negative environmental and social effects in parallel, whereby negative impacts on traditional flood recession farming are the most cited (and criticised) effect on livelihoods in the basin. In addition, the project's development was a long-lasting process and could not prevent serious conflicts between Mauritania and

[11] There are plenty of further examples of benefit-sharing agreements dating from the Colonial era and relating to individual dams, e.g. Assuan Dam, Owen Falls, Kariba Dam, Cahora Bassa, etc.

Senegal. Organisation failures and unstable financial support caused the programme to drop well behind schedule. The hydropower component was eventually realised in 2003.

- **Cooperation in the Incomati-Maputo Basin** (South Africa, Swaziland, Mozambique): Most of the agreements are of a bilateral nature and concern cost and benefit sharing between South Africa and Swaziland in the context of dam constructions (e.g. Driekoppies and Maguga dams) whereby the main benefits of the dams are development of irrigation and production of hydropower. While these benefits mainly occur in South Africa and Swaziland, there are rather negative impacts of the water infrastructure on the Incomati river on downstream Mozambique, in particular in terms of flood risks, ecosystem preservation and local livelihoods. However, there has been some recent progress to involve Mozambique in a basin-wide cooperation. With the inclusion of the Maputo basin, new combinations of negotiation positions were suddenly possible and the three riparian countries agreed on a formula and mechanism to share water flows. One country could score "more" on the one basin and was somewhat "flexible" on the other, depending on that particular country's needs. This broadening of the scope of negotiations, therefore, offered more options, enhancing the chances of a positive outcome. Another instance of broadening the scope of the negotiations was when a joint expert study added the environment to the list of water-using sectors. The recognition by the upstream countries that indeed the environment required water gave a fresh argument in favour of an old issue that had been the subject of negotiations ever since the Incomati river fell dry for the first time in 1982, namely the establishment of minimum flows. In general, the cooperation on the Incomati-Maputo basin illustrates the possible effectiveness of issue linkages.

A brief summary of the important characteristics of the analysed cases

- The majority of the existing benefit-sharing agreements is sector-oriented and bilateral whereby dam construction and the allocation of costs/benefits in the context of dam development is, by far, the most important issue. Accordingly, most of the existing benefit-sharing mechanisms emerged in the context of the classical engineering water management paradigm while water resources protection measures are rarely implemented in explicit cost or benefit-sharing approaches.
- Hydropower plays a very important role. A possible explanation is that hydropower benefits are easily quantifiable because market prices are available and usually accepted. Equally, there are established institutional options for sharing hydropower benefits (investments, joint ventures). In general, benefits and win-win solutions must be visible and respective assessments dependable (mathematical formula, economic models, etc.) to convince political actors.
- In line with the theoretical discussion, fairness and trust are of pivotal importance. A highly illustrative example is the cooperation between India and Nepal.
- Benefit sharing strongly depends on institutional prerequisites (bilateral commissions, monitoring, conflict resolution mechanism, etc.).
- Existing agreements mostly allocate benefits of "new" water resources whereby a transboundary reallocation of water rights (in the context of water scarcity and "closed" international basins) is very scarce (apart from short-term agreements) and face important obstacles in institutional and political terms.
- In general and in line with the conceptual discussion, benefit sharing is most likely in the case of symmetrical interests and, apparently, still possible in positive externality cases (see Lesotho). In contrast, long-lasting disputes are the most likely in the case of negative

externalities. Here, the Rhine cooperation with its "victims pay" approach is a rare, albeit not uncontroversial, exception; another interesting case is the Syr Darya agreement.

- Even oft-cited "best cases" (e.g. Senegal, Lesotho) face the problem of adequately integrating local interests and environmental objectives.
- Benefit sharing occurs in a political environment; political actors do not solely maximise an abstract economic value. Furthermore, the emergence of benefit sharing must be analysed and interpreted in a regional political context. Consequently, there is no "archetype" genesis of the benefit-sharing mechanism.
- In all examined African cases, donor involvement played a key role (financial support, facilitator, mediator, "no objection" rule) but this contextual factor has certainly not been sufficiently studied in international literature.
- Cultural and historical ties are of pivotal importance for the explanation of the emergence of specific cooperation forms (e.g. Senegal).
- While the international water discourse currently focuses on transboundary waters, many of the analysed approaches show deficits in realising intra-national or regional benefit sharing, which raises the question of whose benefits and costs (national elites, local people, environmentalists, etc.) should, in general, count in the design of international cooperation.

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Topic 4

Cooperation despite differing perceptions of the value of water

Intra-state conflict resolution between local communities and central governments – Namibian cases

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1 Background to water resources management in Namibia

Water is the basic human need – for health, food production, improved livelihoods, and the basis for all development. When it comes to allocating water for use in Namibia, priority is given first to meeting domestic use and second to the reasonable protection of aquatic and wetland ecosystems. Namibia is a dry country where water resources are scarce and getting increasingly vulnerable and valuable in a competing (arid) environment. Rainfall (Fig.1) is low and extremely variable, and droughts are common. The country's only perennial water occurs at the borders which are far away from demand centres and all the internal rivers are ephemeral rivers which flow only in direct response to rainfall. The availability of water from these shared perennial rivers depends on agreements with other basin countries and development upstream.

Until recently, water management was based on the Water Act of 1956. This Water Act was designed to serve commercial farming, mining and the major urban centres through increasing supply as a means to cope with water scarcity. Relatively few resources were directed toward Namibia's indigenous rural population. The Water Act distinguished between private and public water. Although there were no property rights in public water, private water vests sole and exclusive use and enjoyment in the owner of the land where such water is found (MAWRD 2, 2000) (riparian rights). As a result, most water rights were in the hands of private landowners with the exception of groundwater in the government-controlled areas where a permit was required to sink a borehole or build dams with capacity greater then 20 000 m^3. The doctrine of riparian rights is not consistent with modern tenets of water resources management because it does not provide equitable access to water. There was as well a lack of consideration for diffuse environmental interests and basic human needs. The main function of central government was then to control, conserve and use water for domestic, agricultural, urban and industrial purposes by means of the old Water Act. This was done with a top down governance system without the involvement of the relevant stakeholders.

Since independence in 1990, Namibia's water policy has been re-oriented to get rid of the old water management system. It started out with the introduction of the Water and Sanitation Policy (1993), which set priorities of water use and put communities in charge of their water supply services. The community-based management programme under this policy enables communities to own their water supply infrastructure and be responsible for its operation and maintenance, while the government as directorate of rural water supply provides technical support and coordination. The Water Policy White Paper promotes principles of equitable access to water by all Namibians (as all water belongs to the State according to the Constitution), public awareness of Namibia's fragile environment and relevant stakeholder participation in planning and management of water resources and water services. With a newly approved Water Act, the principles of basic human right of access to safe drinking

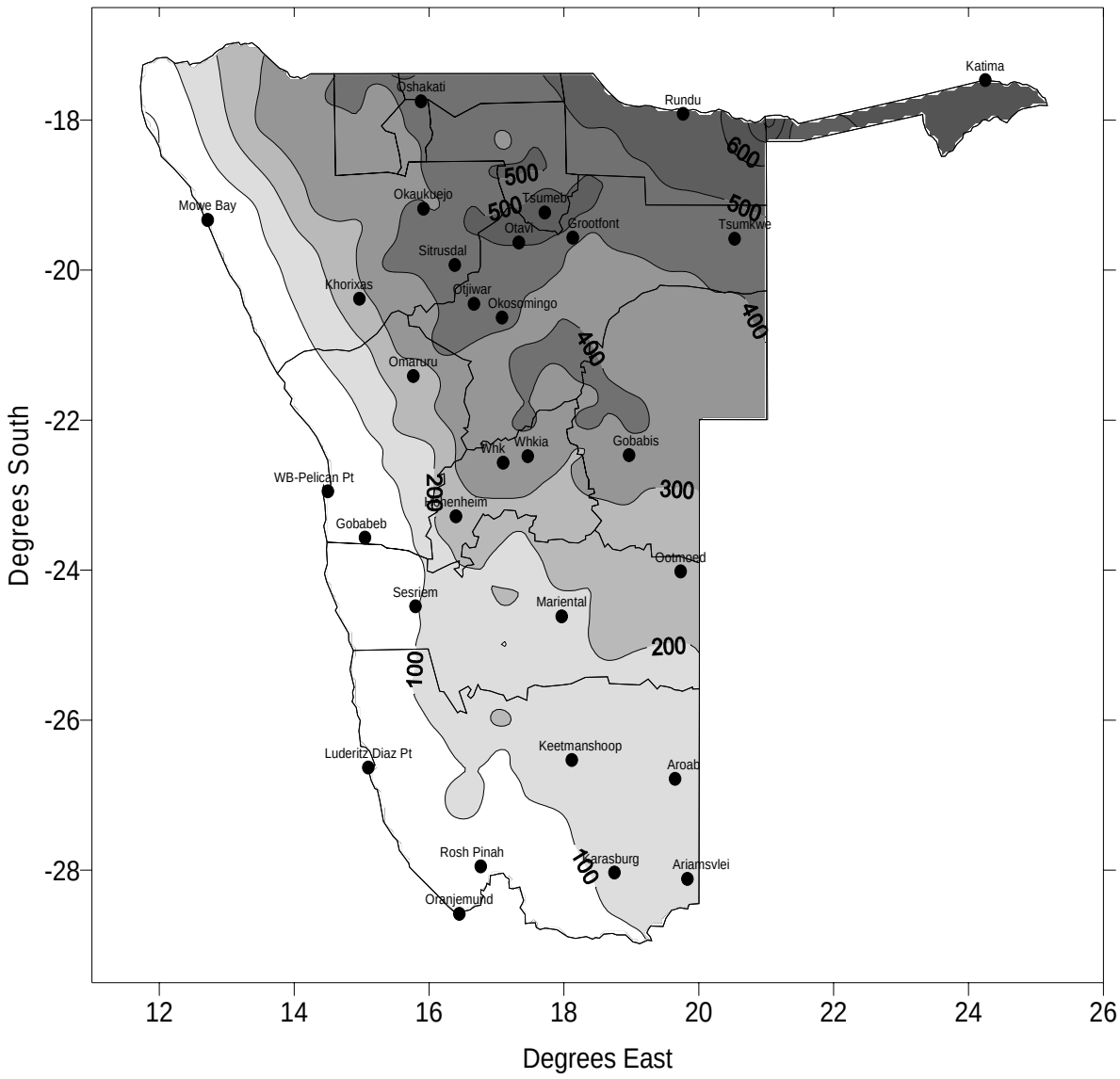

Fig. 1: Spatial distribution of mean annual rainfall (mm) in Namibia

water, equitable access to water resources by all citizens to support a healthy and productive life, and integrated planning and management of water resources to promote economic and sustainable development of the country as a whole will be enacted.

Other water sector principles include (i) integrated water resources management which promotes the coordinated development and management of water, land and related resources in order to maximise economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems (GWP, 2000) and (ii) full cost recovery to appreciate the economic and cultural value of water.

2 Water in crisis

Because of Namibia's colonial and apartheid history, access and use of water resources have been inequitable and unreasonable. In the post-independence period, population growth and economic development have resulted in cases of water disputes between different users. This is evident at both the local and international level, i.e. wherever water is shared. Many

economic activities in Namibia and its basin partners (e.g. Angola, Botswana, South Africa) require water, which in many basins is inadequate to meet the need of such activities and users. Upstream users and landowners have a secure water supply while the downstream users must wait for their share. Other uses of the river basin can cause damage to aspects of the basin, such as land, water plants and animals which either harm the functioning of the basin as a whole or cause problems of access or quality of the scarce resource (DRFN News, 2004). It is essential to identify and integrate all issues relating to the resource base both for reasons of efficiency, and to address the socio-economic and environmental challenges Namibia faces.

3 Cooperation and Conflict

To avoid conflicts and/or minimise their negative effects, there needs to be a shared vision for the management of water and other natural resources within any water basin. A joint institutional framework to develop appropriate joint strategies for the planning, development, management, utilisation and protection of the water resources is required. For this reason, Namibia has moved towards the adoption of an integrated basin-scale framework for water resources assessment and management by establishing basin management committees (MAWRD 1, 2000). It is stated from time to time that basins are the appropriate units for operational management. In Namibia the country has been demarcated into 11 water management basins (Fig. 2). Development and management of natural resources policy are more effective if implemented over a whole water basin, reflecting the relation between water, land, vegetation and fauna, and the water basin's ecosystems (Amakali and Shixwameni, 2003).

The Water Resources Management Act thus states that, for the purpose of proper management of the water resources of the basins in Namibia, the Minister or interested persons within the basin may establish a Basin Management Committee (BMC) (MAWRD, 2004).

Their objectives are to:

- oversee and co-ordinate natural resource management activities at water/river basin level
- plan for achieving sustainable natural resource management for the water basin in partnership with Government at all levels
- encourage the most beneficial use with a view to maximising social and economic benefits
- embody full consultation and participation by local committees and stakeholders
- incorporate wide sectoral involvement in relation to the impact of development on the natural resource base in a river basin.

The BMC approach is aimed at providing the opportunity for basin communities and government to work together to ensure that total water basin management is achieved and conflicts are avoided. Their main function is to advise on the way water, land and other natural resources are used and to develop plans for the basins, by integrating the interests of different stakeholders, including the environment. Other functions include promotion of community participation, collection and sharing of information, development of a research agenda and resolution of conflicts relating to water resources in its basin.

Basin management committees have been formed in the Kuiseb and Cuvelai basins. A participatory approach was used where all stakeholders were able to contribute towards the formation of the committee. Throughout the formation process, stakeholders came together through workshops and discussed, analysed and considered issues of the basin as well

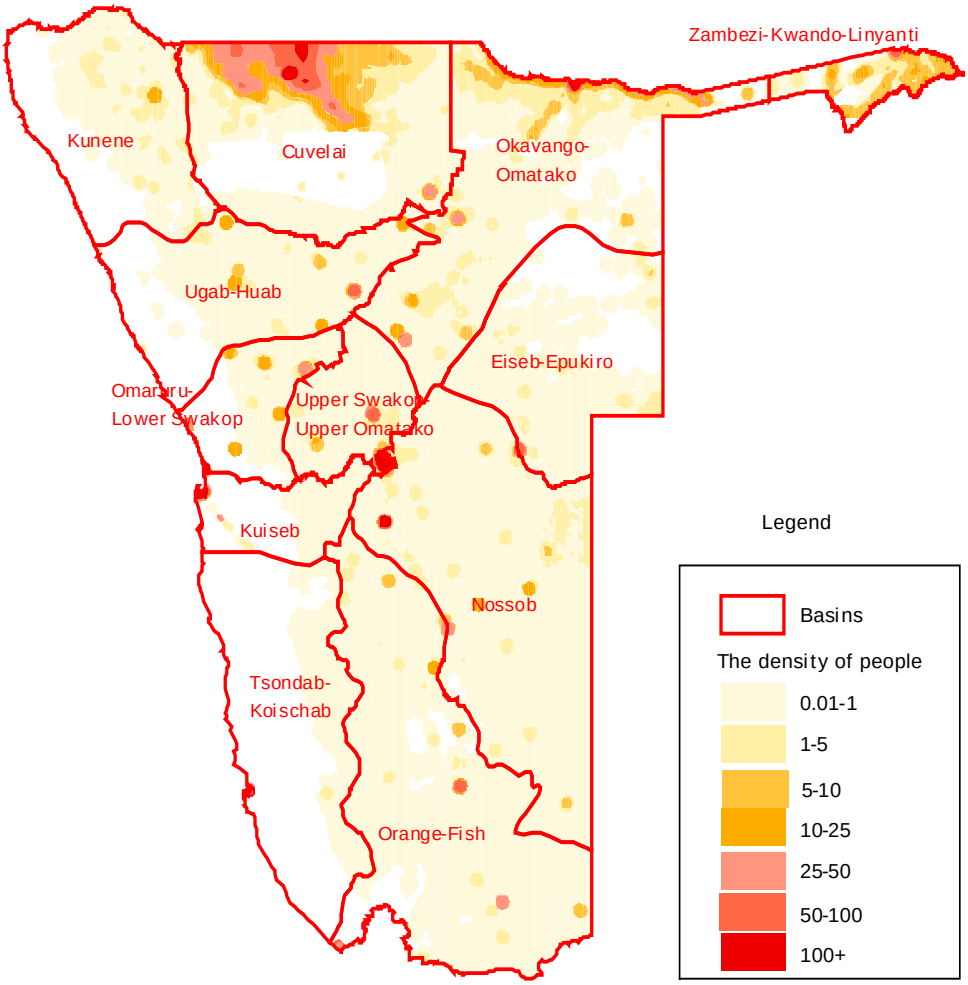

Fig. 2: Water management basins in Namibia

different activities that can be carried out. In the end they were able to develop a common vision in each basin.

Kuiseb Basin case

The Kuiseb River rises in the Khomas Hochland, with the uppermost part of the Kuiseb basin only about 15 km to the west of Windhoek. The mean annual rainfall is about 350 mm. The upper part is used for commercial cattle farming and there are a large number of farm dams. Good rains are also experienced in this part causing tributaries to flow frequently. Midway, the mean annual runoff of the Kuiseb river reaches a maximum of 20.43 mm^3/a. This value steadily reduces to 4.33 mm^3/a as the river crosses the desert at Gobabeb. Apart from Walvis Bay there are no major settlements in the catchment, but the large number of farmers, both commercial and subsistence, account for around 30 000 inhabitants. A large part of the basin falls within the Namib Naukluft Park, supporting the park's wildlife and communal farmers, and supplying water to the coastal towns of Walvis Bay and Swakopmund (MAWRD 3, 2000).

As such, water from the Kuiseb river basin experiences different uses by humans, animals and industries in the coastal towns, such as brewing, fish processing and mining activities. All these activities, uses and demands are growing. These users use water productively without purposely wasting it (DRFN News, 2004). It is generally accepted that water resources of the river Kuiseb are being used close to or in excess of the sustainable capacity (MAWRD 3, 2000). The river experiences frequent droughts but also rare flood events that sometimes replenish the river.

Cuvelai Basin case

The Cuvelai basin is located in the northern central part of Namibia. It forms a delta that drains southern Angola and brings water to Namibia, and gradually converges into the Etosha Pan. On average, high floods occur in four out of every ten years. Local rains also contribute to surface flow in the basin.

Almost half of the Namibian people reside in the rural part of this basin. Rapid population growth, currently at 2% p.a., is the biggest threat to achieving sustainable development in the area. Most of the people in the basin are communal farmers and rely on land and vegetation for their livelihood. The most important crops are pearl millet and sorghum, while cattle, goats, donkeys and poultry dominate livestock numbers. Droughts are frequent in the basin, causing lack of food, water and grazing, at times. Although floods occur, water in the larger part of the basin is saline and fresh water is deeper and expensive to draw. Growing population and bad land use practices, therefore, place severe stress on the already strained natural resources base of the region. Climate change has added its own stress; few floods occur and their magnitude has decreased. Increasing competition for water among users and the lack of an equitable and efficient allocation system leads to shortages and degradation of the resources.

For many years development in the basin took place in isolation. Each sector (e.g. commercial farming, smallholders) cared mainly for itself neither considering other users nor the long-term effects of their activities on the environment. The different users often accused each other of being the reason why water was inadequate for their activities or for the development of new activities. This was one of the main reasons why stakeholders came together to establish a forum for water management. The BMC approach facilitates communication, cooperative learning and action amongst all stakeholders in the basin. Access to relevant and acquisition of new information through research is also a major part of this approach as informed people make better decisions. For example, research studies were carried out to establish the truth behind the allegations mainly directed at the upstream commercial farmers and their farm dams. The results were presented and explained to all the stakeholders.

4 Conclusion

As a developing country, demand for water has increased rapidly due to population growth and economic development. At the same time this has led to several cases of water disputes between users mainly because of inequitable allocation and unreasonable use of the resources. In any country's internal river basins, water is shared among many different users, such as farmers, industries and the environment. Namibia's existing water law was written to serve

partial interests, reflecting its colonial and apartheid heritage. Lack of adequate information regarding the resource base among users contributes to conflict. The on-going legal reform process and new basin-wide structures of governance are helping to move Namibia toward better management of water resources and conflict resolution.

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Multinational cooperation within the Danube basin

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The Danube river basin is the second largest river catchment area in Europe and covers 801,463 km² in 18 different countries. This makes it the world's most international river basin. More than 81 million people, with different cultures, histories and languages, from the Black Forest in Germany down to the shores of the Black Sea, call the Danube basin their home.

The Danube River Protection Convention was developed against this background and came into force in 1998. Today, 13 Danube river basin countries use it as the legal basis for their efforts geared towards the protection and sustainable use of water and the related ecological resources. In addition to the European Union, parties to the Convention include Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Moldova, Romania, Serbia and Montenegro, Slovakia, Slovenia and Ukraine. The main objectives of the Danube River Protection Convention are to:

- ensure sustainable and equitable water management;
- ensure conservation, improvement and the rational use of surface waters and ground water;
- control discharge of waste waters, inputs of nutrients and hazardous substances from point and non-point sources of emissions;
- control floods and ice hazards;
- control hazards originating from accidents (warning and preventive measures);
- reduce pollution loads in the Black Sea from sources in the Danube catchment area.

ICPDR

The International Commission for the Protection of the Danube River Basin (ICPDR) was created to make the Danube River Protection Convention a living tool. Since its establishment, the ICPDR has grown into one of the largest and most active international bodies of river basin management expertise in Europe. Its ambitious mission is to promote and coordinate sustainable and equitable water management for the benefit of the Danube river basin countries and their people.

The ICPDR pursues its mission by making recommendations for the improvement of water quality, developing mechanisms for flood and accident control, agreeing on standards for emissions and by assuring that these are reflected in the Contracting Parties’ national legislation and applied in their policies.

The ICPDR is formed by the contracting countries' national delegations, which consist of representatives from the highest ministerial levels, technical experts, and representatives of the civil society and the scientific community.

ICPDR Expert Groups

In order to make the ICPDR effective and operational, international expert groups have been set up to develop strategies and guidelines for themes of importance for the Danube basin. Regular expert group meetings on different levels ensure close cooperation and efficient information exchange between the basin countries.

Cooperation

In order to achieve its goals, the ICPDR cooperates with regional and international organisations, non-governmental agencies and the scientific community.

To encourage public participation in the assessment and governance of environmental measures and in the decision-making process, efforts have been made to strengthen and develop the NGO community in the Danube Basin. These organisations play an important role in environmental awareness-raising and the implementation of projects on nature protection, wetland rehabilitation, ecological farming and urban sanitation.

Challenges

The challenging tasks of the ICPDR are not likely to decrease in the future; on the contrary, they will increase as the European Union grows and consolidates. In order for the Danube region to thrive, it is critical that socio-economic innovation be pursued without jeopardising the basin's important ecological resources and values. This can only be done if international cooperation in the Danube basin is further developed and enhanced.

The ICPDR strives to contribute actively towards this goal by launching a number of initiatives, such as further reduction of pollution and restoration of the ecological network, which should make the Danube basin a showcase for sustainable water management in a changing world.

The strategy for the future is based on the EU Water Framework Directive, the key elements of which are:

- setting of uniform standards for water policy throughout the EU;
- requirement of cross-border cooperation for the development of integrated and coordinated river basin management;
- stipulation of a defined time-frame for the achievement of the good status of surface water and groundwater;
- introduction of the economic analysis of water use in order to achieve the most cost-effective combination of measures in respect to water uses;
- inclusion of public participation (general public and stakeholders, including NGOs) in the development of river basin management plans.

To achieve these goals special basic issues have to be considered:

- economic analysis
- transboundary issues
- public participation

- Danube GIS and mapping criteria
- typology and reference conditions of water bodies
- artificial and heavily modified water bodies
- significant pressures and impacts
- effects from human activities on groundwater
- register of protected areas (species and habitats)

The tasks of the ICPDR are to coordinate projects, to encourage information exchange, to develop a strategy for the River Basin Management Plan, to harmonise methods and

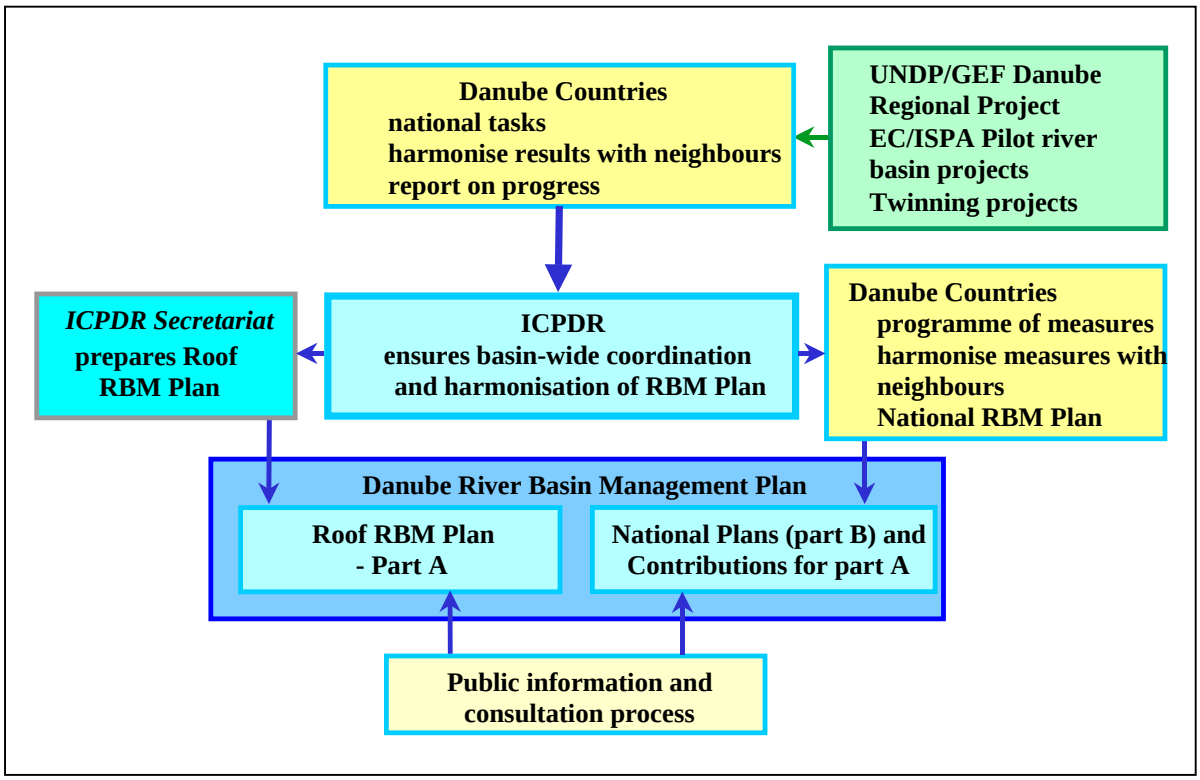

Figure 1: Development of the Danube RBM Plan - implementation phase

mechanisms and to report to the European Commission.
The result is the Danube River Basin Management Plan (DRBMP) including a programme of measures. The future steps to be taken for the DRBMP can be explained as follows:

Part A: The "roof" for the DRBMP: all issues of basin-wide importance

Part B: The national sub-unit plans: all further information at national level

Part C: The sub-basin plans: development, planned for 2009, of sub-basin plans for the DRBMP

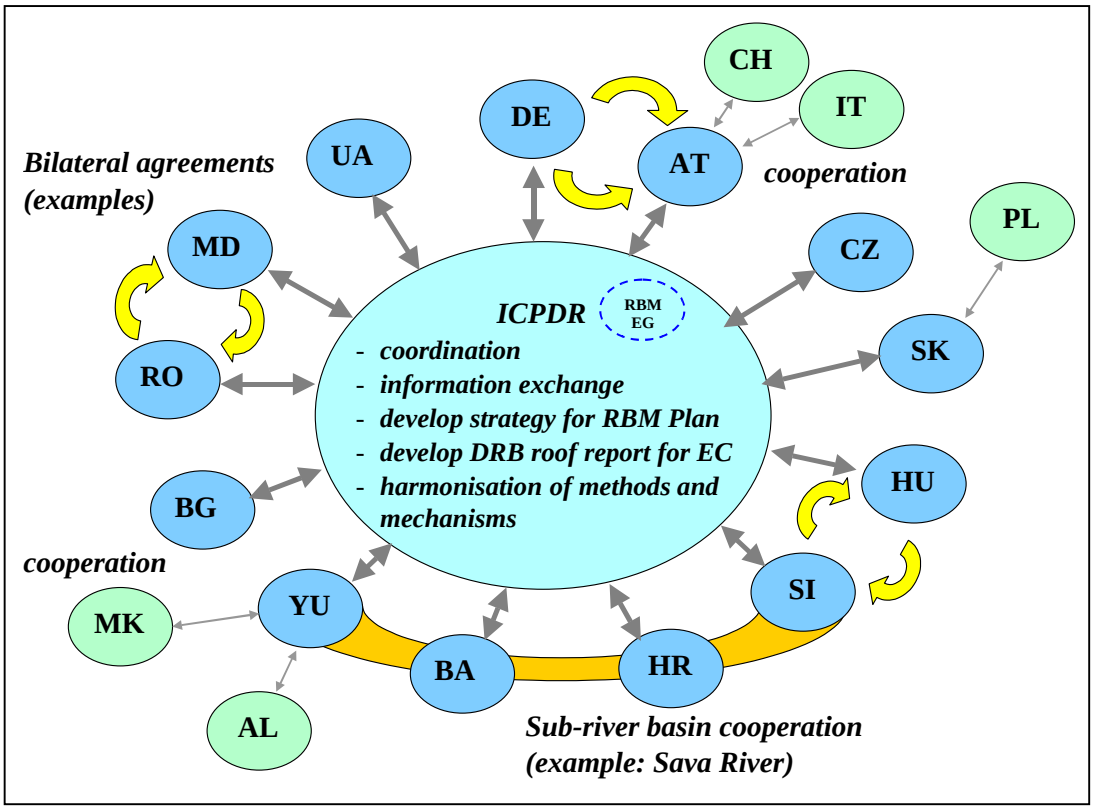

Figure 2: Coordination mechanisms – ICPDR Secretariat with all the river basin countries and bilateral agreements between individual countries

International Cooperation

International cooperation is also essential to assure sustainable management of the Black Sea into which the Danube flows. Here the coastal areas are of particular significance. The ICPDR cooperates with the Black Sea Commission. In addition, the Danube Regional Project, an international project financed by the UNDP/GEF, gives specific support to the ICPDR for the implementation of the EU Water Framework Directive. Key areas of support are the assessment of hydro-morphological pressures and their impacts, the development of a typology for the Danube river and definition of its reference conditions, as well as the economic analysis of water uses.

Conclusion

Despite the diversity of problems, the regional, social and economic disparities, interests and priorities across the Danube river basin, the Danube countries share certain values and principles relating to the environment and to the conservation of the Danube environment. The experience of the last 10 years has shown that the Danube river basin countries have been able to develop effective tools and mechanisms to ensure the cooperation on the basin-wide level.

Intra-basin conflict resolution in the Mekong basin: Is a reconciliation of water values possible?

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Introduction

Writing a paper on "Water wars in the Mekong basin" would have been a quite convenient title to deal with. There are no open water wars in the Mekong basin today. Whether there might be some intense tensions of that kind in a more or less distant future is another question, to which this paper will try to provide elements of an answer.

Rather, the title chosen for the communications made at the workshop Values of Water – Different Approaches in Transboundary Water Management deals with conflict, conflict resolution and reconciliation of values. Mapping conflicts and social tensions can be more difficult than locating open wars on a map. Conflicts and tensions are usually of a more diffuse nature, hence less likely to be captured in cause-consequence relational frameworks and explanations. We have indeed accumulated some knowledge about *wars*, but how clear is our understanding of *conflicts*? Conflicting values over the Mekong waters appear to be a matter of topics, players and scales.

As shown in the early 2000s by the world-wide survey conducted by Aaron Wolf's team (Oregon State University, OSU) and publicised in the Internet-based Transboundary Freshwater Dispute Database (TFDD), there have been few wars fought for water, if any. Although water, when quantitatively scarce or qualitatively poor, does indeed act as an irritant that aggravates pre-existing tensions (geopolitical, social, religious, ethnical, etc.), it is not the causal determinant of wars. Similar results have been produced since January 2001 by the UNESCO-GCI project From Potential Conflict to Co-operation Potential (PC-CP). Hence, the understanding of water-related tensions needs careful consideration of other topics, possibly not directly related to water.

Theoretical and applied research conducted in Southern Africa by A.R. Turton and L. Ohlsson (and world-wide by P.H. Gleick) has also shown that water scarcity is not only a problem supply. Scarcity can be socially constructed, for instance when social resources such as institutions fail to implement a socially acceptable (if not equitable) sharing of available water resources. This institutional approach echoes in transboundary river basins, where the lack of appropriate and flexible mechanisms (environmental regimes) for water management has been found to aggravate inter-state tensions. Besides, it has been proven that the historical, state-centred approaches to water-related disputes quickly fail to provide a satisfactory picture of water-related tensions. These indeed involve other scales and water issues appear as multiple-level games that mobilise governmental and non-governmental as well as national and international players.

The Mekong basin appears to be a crucible of these water-related topics and scales. Talking about conflict resolution in this region thus requires a preliminary definition of what these conflicts actually are, what issues they encompass and, more importantly, what values they

reveal. These conflicts are different in nature, scale and in terms of what players they involve. Consequently, tensions emerge from clashing values and visions of what the development patterns of the Mekong basin should look like. Due to limitations in allocated time and space, only three key values involved in current tensions are detailed below.

Only after this clarification can the very issue of resolution be addressed and the Mekong picture then is one of a coexistence of multiple conflict resolution tracks, mechanisms, tools and processes. Maybe a reconciliation of the heterogeneous Mekong values is not possible. However, conditions for a pacified development process are suggested.

Clashing value 1: Basin development as a geopolitical tool

After the Second World War the United Nations Organisation (UN) needed political legitimisation to help nations develop peacefully and technical credibility in order to achieve this. The Lower Mekong hydraulic resources and its countries offered an invaluable playground to the UN. The war also left the United States with a credo that the world should be protected from communism – here, from China. Gathering Lower Mekong countries within one institutional and programmatic framework was a way to exclude China from the regional integration process. (Besides, the country was not a member of the UN until 1971). In that sense, the establishment of the Lower Mekong's Secretariat for the Coordination of Technical Studies in 1957 was a hydraulic instrument of the US geopolitical doctrine of containment.

China and riparian governments have, since 1957, been prone to consider **cooperation values** (western style) related to river basin management mainly as a geopolitical tool.

Clashing value 2: Sustainable development as an imported concept

The principles of sustainable development are recent in the Mekong basin and thus trigger tensions. Until the creation of the Mekong River Commission (MRC) in 1995, the leading paradigm for developing the basin had been hydraulic and hydropower development (with navigation and flood forecasting). It is only in 1995 that sustainable development joined the plan. It has been acknowledged that the views of both UN agencies and donor countries have been instrumental in this programmatic shift. As the same players fund the MRC today, the situation is unchanged. These principles have huge consequences in terms of how the development agenda is set: protection of fragile ecosystems and biodiversity, public access to environmental information and discourse, democratisation of basin development planning, social justice and equitable allocation of water resources and derived benefits, etc. These features of sustainability are often in direct contradiction to the political culture of the political authorities and elites in the riparian countries.

The principles of sustainable development have clashed with the existing **decisional and development values** and paradigms of the Mekong riparian countries.

Clashing value 3: Institutional mechanisms as a two-edged sword

Institutional development (environmental regime) is considered as a key tool in the process of establishing an environmental regime for the sustainable governance of a river basin. In

particular, a river basin organisation (RBO) is expected to be instrumental in devising and implementing a sound policy, basin-wide. This includes ecological, hydrological, social and political aspects. Such a RBO needs to be technically credible, legitimate in its funding sources and to have sufficient bargaining clout when dealing with the governments of riparian countries. Difficulties experienced today by national and international staff and experts of the MRC Secretariat show that the latter might not have been achieved at this stage. Indeed, a strong RBO means that governments are confronted with a counter-power likely to temper their discourses (over water, over development), to criticise their actions or to alter or slow down their water-related projects. This is often perceived as an unacceptable infringement of these countries' sovereignty. However, these countries expect a basin institution to help channel international funding. This paradox features conflicting perceptions and remains unsolved.

The establishment of a basin institution clashes with **sovereignty values** of member states.

Conflict resolution mechanisms and tools

The background paper to this workshop stresses that wise management of water-related values requires "integrative approaches and assessment criteria are needed to (…) record not only the natural features but also the social, cultural and economic conditions of the catchment's area".

At first sight, the structure and modus operandi of the MRC seems fit to identify and tackle value-based differences, tensions or clashes.

First, we can witness the proactiveness of the MRC Agreement in terms of conflict avoidance and resolution. Indeed, the Agreement is inspired by the principles of concerted water resources management devised in the 1997 UN Convention on Transboundary Water Courses. By signing the Agreement, the parties or member states commit themselves to follow certain rules or procedures. These include: notification, prior consultation, proposed used, etc.

Second, the Secretariat's objective over the past few years has been to design the Basin Development Plan in a participatory manner. This process has involved several decision-making levels, from governmental to local.

Third, the relatively large number of departments created within the MRC Secretariat since 1995 seems to cover these multiple dimensions, or values, of water. Only non-commercial, water-related activities and hence dimensions seem to be lacking.

In addition, conflict resolution mechanisms, including those for water resources sharing and management, have been identified at local level. These may differ from municipality-level or government-level, legislation-based mechanisms and are not likely to influence the way intergovernmental talks are conducted. However, these negotiation tools or conflict-solving techniques can help governments negotiate more easily with water users at local level in order to embed their national water policies in existing social practice.

However tensions remain that materialise mostly in water-related discourses. These are developed mainly by NGOs originating from both MRC member countries (e.g. Terra, Thailand) or from abroad (e.g. International Rivers Network, IRN). Foreign scholars, mostly

from western countries (including those in the Pacific) also conduct research on water-related perceptions, fears, tensions or clashes.

Is a reconciliation of Mekong values possible?

Tensions or clashes over water-related values in the Mekong basin derive from diverging or opposing visions of both what the socio-economic development of the basin means, and how this development should be planned. In particular, contending issues related to development planning include that stakeholders should have a say in the process and how they can contribute.

A tentative conclusion at this stage is that asymmetry in the production of and access to environmental information is a key feature of tensions triggered by diverging views or visions of the development of the Mekong. There is little hope that a reconciliation of water-related values in the Mekong basin can be reached in the near future. However, encouraging steps forward might include the following:

- Public access to environmental information and justice (Aarhus Convention)
- Establishment of national legislation fostering environmental accountability
- Updating of development paradigms but still with national ownership
- Increased freedom for NGOs and possibility to develop public debates
- Broader, democratic changes in state activity and public communication decontrol

Still, there remain major obstacles in the way to greater flows of environmental information and to a more equitably shared knowledge base on environmental features and issues in the Mekong basin. The case of hydrological data offers a good illustration of the multiple, interwoven technical, financial, political and strategic implications of data control and dissemination.

Field observation[1], with interviews at national hydrological and meteorological services of Mekong countries, as well as with staff of the Mekong River Commission Secretariat, shows that the dissemination of hydrological data faces obstacles both within and among countries of the basin. Hydrological data appear to have a multi-dimensional value for data holders and users. It is not new that first, data is information, second, data is knowledge and power, third, data is money. What is relatively new at this stage is an evolution of our analytical capacity to deal with this issue and understand it. We have become increasingly able to break down the multiple, functional values (or valuations) of hydrological data. Two major context-level features influence data-sharing in the Mekong basin.

First, Mekong countries, including China, have undergone major changes over the last 20 to 25 years. A key feature is the transition from command to market economy. Consequently, the role of the state is being redefined. In some cases, its actual capacity is being discussed or challenged. The water management sector, together with flood management activities, has been influenced by these macro-economic changes. The overall picture is one of institutional instability. State services in charge of water-related issues are confronted with major or repeated organisational changes. Consequently, power relations are jeopardised, allocation

[1] PhD. fieldwork in Mekong countries in 2004-2005 (except Myanmar: contacts made and visit plans under discussion at the time of writing this paper – April 2005)

criteria for public spending are revised and salaries are kept low, if not reduced. In this context, hydrological data are a key asset to navigate through these rough institutional waters.

Second, although often perceived as such, water is not so far a resource under quantitative stress. However, water is a matter of competition among users – at least among those with political and economic bargaining clout that is sufficient for voicing views or concerns. Because of competition over water in the form of upstream hydraulic/hydroelectric developments (both on the Mekong main stem and major tributaries), national authorities consider that sharing water-related information opens the door to a more transparent understanding of hydrological impacts caused by their projects. Consequently, sharing data is perceived as a potential risk of later criticism emanating from downstream stakeholders.

A tentative typology of constraints to the exchange of hydrological data is suggested below. It shows that data sharing is challenging because of the multifaceted, total value of hydrological data.

- Operational: Data enable informed decision-making and help reduce negative externalities.
- Economic: Data as a commodity help data owners make up for insufficient budgets or salaries.
- Organisational: Data help civil servants negotiate power deals through institutional instability.
- Financial: Exclusiveness of data enables owners to report first to authorities allocating funds.
- Strategic: Non-transmission of data helps planners conceal environmental impacts of projects.
- Political: Control over data helps authorities limit public scrutiny and protests about water issues.

In a broader sense, hydrological data appear to be a currency for any kind of transaction involving one or several of the following elements: hierarchical level, administrative organisation and restructuring, decision-making capacity, political status, access to funding, and participation in water-related projects. This analysis can be considered as a contribution to our understanding of what role data (production and exchange) play in shaping agreements and cooperation mechanisms (e.g. environmental regimes, river basin organisations, etc.) in transboundary river basins.

Conclusion: Is the Mekong River Commission sustainable?

The tenth anniversary of the signing of the Mekong River Agreement (5 April 1995 – 5 April 2005) coincided with the Third Annual Flood Forum (AFF, 7-8 April 2005). Both events took place at the Mekong River Commission headquarters in Vientiane, Laos PDR. Interviews with MRC Secretariat staff as well as discussions during the AFF have provided insights useful to the conclusion of this paper.

Discussions with delegates of National Mekong Committees (NMCs) confirm that some issues developed within MRC sectors, programmes or activities have been perceived by countries as being “imported” into the Mekong region as a consequence of influential donors or "western" aid agencies. The part of expenses reserved for salaries of international (mostly western) experts has also been a matter of discussion, if not direct criticism. In a broader

sense, aspects of sustainable development, such as conservation for instance, have gained little attention, if any, from riparian governments. Although with differences when it comes to implementation details, all countries seem to share the view that the MRC should now focus on operational activities, namely structural options for water resources development (basically: dams and reservoirs). It seems clear that the approach of the new Chief Executive Officer (CEO) of the MRC shares this view and considers that MRC activities should be integrated in Greater Mekong Subregion (GMS) programmes and projects.

This perceived change of strategy of the MRC questions the future mandate of the organisation. On the one hand, the 1995 Agreement is not likely to be re-negotiated by countries. Such re-drafting of the MRC mandate would probably allow more room for the MRC to develop as an operational water resource development agency. This would mean reduced investment in ecology, social fairness, studies and research – a perspective that causes much concern among donors, mostly Scandinavian ones. The Asian Development Bank (ADB) and the World Bank (WB) are expected to be more supportive of the new strategic direction of the MRC. However, it is still unclear at this stage whether the CEO as an individual and the MRC as an institution will be able to convince "historical" donors to remain MRC partners.

In addition to these broad political and strategic issues, the institutional capacity of line agencies to commit to MRC agreements remains a major challenge. This is, for instance, the case with the need for hydrological administrations of each country to deliver adequate data to the MRC's forthcoming information system (MRC-IC). The question remains the same with two other ongoing activities: the appropriate hydrological network implementation project (AHNIP, started in 2001) and the regional Hydrological Cycle Observing System (Mekong-HYCOS). Despite efforts and investment both projects are still confronted with major obstacles and debates, both in national line agencies and within the Secretariat itself.

A sustainable future for the MRC as an institution is possible. Maintaining the MRC is in the interest of both Lower Mekong governments and donors. These players have a lot to gain (funding, visibility, political support, etc.) from continued support to the Commission. However, the MRC probably needs to be reformed or restructured at this stage if it wants to become a more professional and operational sub-basin agency. The other question is: how will the NGO community react to these changes?

Workshop Wrap-up

The aim of the workshop was to encourage the exchange of knowledge, experiences and management approaches in transboundary catchments with different cultural backgrounds. Three regions were represented: Europe, Africa and South-east Asia. The presentations introduced the subject matter. However, the exchange of experiences and ideas during the discussions was an important element of the workshop. The workshop ended with a general discussion resulting in the following conclusions, recommendations and follow-up ideas.

Topic 1 – Value of water in different societies

Conclusions

- Water is not produced, so it does not reflect its production costs. It is a gift of nature.
- The value of water cannot be expressed in one number. It is a multi-faceted good.
- Modern societies are heavily dependent on water availability for many functions. It is a cheap but valuable resource.
- The value of water is a quality rather than a quantity. It is there to fulfil a need rather than a want.
- Water can be used for spiritual/religious purity as well as for physical cleanliness.
- Values form our practices.

Recommendations

- The wisdom embedded in traditional water management, captured by core values of social equity and ecological integrity, should be reconciled with the urgent need for economic development.
- The value of water should be seen not only instrumentally but also holistically.
- The participation of local communities should be encouraged to help to identify different values of water.
- Public policy and economic valuation should not dominate; different dimensions of sustainability should be considered.
- The water cycle is the capital stock, so it has to be protected and sustained because there is no substitute.

Follow-up

- Development of methodologies for participation processes
- Upscaling of local practices and institutional arrangements
- Development of methods how to communicate the value of water to society

- Economics of water surplus
- Need for a comprehensive set of water value criteria.

Topic 2 – Value of water in transboundary basins in different regions

Conclusions

- In regions with a common tradition and language transboundary water resources management can be successful.
- Those close to the resource, ecosystem people, value water as a central factor in sustainable livelihood practices whereas biosphere people, those living outside the basin, value water primarily as a commercial resource.
- Water governance is neither apolitical nor technocratic, it is highly political and shaped by power relations.
- Global actors try to implant integrated water resources management (e.g. 5th phase, Allan, 2003[1]) in developing countries that are still aspiring to fulfil their "hydraulic mission" (e.g. 2nd phase, Allan, 2003[1]).
- There are comparative social dynamics behind river basin commission formation.

Recommendations

- Global actors must appeal to tangible political and economic interests; moral appeals or imputed “we know better” will not work.
- Adapted, sustainable use of lakes and river basins and their catchment areas should include groundwater, and the interests and behaviour of users outside the basins.
- Permanent consideration of the environmental goals by everyone at all levels at all times during all actions and measures.

Follow-up

- More research on local ownership of transboundary water agreements
- Definition of criteria for the evaluation of transboundary water regimes
- Side measures enabling national administration to engage in transboundary agreements
- Evaluation of upstream-downstream relationships
- Study of asymmetric relationships of reparians.

[1] Allan, T. (2003): IWRM/IWRAM: a new sanctioned discourse? Occasional Paper 50, SOAS Water Issues Study Group, University of London, April.
Cf. page 61 Swatuk, L.: Whose values matter most? Water and resource governance in the Okavango River Basin

Topic 3 – Value of water under stress conditions

Conclusions

- Water can also be perceived as a threat. In this case its value lies in keeping it outside a certain area.
- Cooperation in international rivers is always and fundamentally a political activity, but an economic perspective can help clarify the trade-offs inherent in political decisions and provide an adequate analytical and terminological framework for the analysis of transboundary river management.

Recommendations

- Riparian states should avoid conflictive negotiations about water allocation in favour of benefit sharing.
- Benefits and win-win solutions must be visible. Tools are mathematical formulae or economic models, etc.
- Water-sharing and benefit-sharing: property rights must be assured.
- Decisions concerning the value of water under hydrological stress conditions must be transparently communicated.

Follow-up

- Ecological effects of heat discharge
- Assessment of the human perspective and operationalisation of the indicators
- Investigation of conditions under which benefit-sharing does not work
- Analysis of economic, social and ecological vulnerability under conditions of stress
- How to strengthen social, economic, ecological and farming systems resilience
- Exploration of bargaining and negotiation strategies at the interstate, interdepartment and intradepartment level.

Topic 4 – Cooperation despite differing perceptions of the value of water

Conclusions

- Despite the diversity of problems between riparian states, certain shared values and principles relating to the environment can ensure basin-wide cooperation.
- Clashing values can cause or aggravate tensions regarding the development of a basin.
- Lack of and asymmetry in information can be a key feature of tensions in tranboundary river basin areas.

Recommendations

- Basin-wide structures of governance are needed to achieve better management of water resources and conflict resolution.
- For cooperation to function in strongly disparate transboundary catchment areas, legally binding rather than voluntary concepts are the driving forces.
- International cooperation is essential to assure sustainable management of international waters.

Follow-up

- Definition of what are shared values and which vision can be developed
- Comparative evaluation of existing participatory approaches in transboundary water resources management
- Definition of how to quantify perceptions of the value of water
- Understanding of the dynamic of strategic behaviour of riparian countries under conditions of asymmetric access to water.

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