Executive summary and conclusions of the seminar “Biodiversity and water within development cooperation” 27 July – 1 August 2008 International Academy for Nature Conservation Isle of Vilm/ Germany

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The main objective of the seminar was to understand the relationships between the water cycle and biodiversity in the framework of the German development cooperation by:

- **analyzing the differences in the perception of the topic by different sectors**
- **understanding the importance of ecosystems (and their quality) for the water cycle**
- **fostering awareness for integrating biodiversity conservation into water policies**
- **exploring options/approaches and instruments that maximize mutual benefits for water and biodiversity**
- **Institutional and social aspects to be considered.**

Introduction

The seminar seeked to explore, analyse and discuss possible links among the water cycle and biodiversity to understand the interplay between both sectors and consider intersectorial management options to ensure the continued availability of water regimes as well as other benefits that biodiversity and healthy ecosystems supply to society. Thus, this interplay implies that biodiversity relies on the flow regime but at the same time the flow regimes rely on ecosystem functions that are inseparable from biodiversity (Tognetti, 2008). However, sectorial policies and management approaches concentrate most of the times on single or fragmented aspects of the whole hydrological cycle, making an integrated and sustainable management of environmental resources, services and ecosystems difficult.

In line with this, conceptual inputs on the relations between Biodiversity and Water together with approaches, instruments and methodologies that can give an intersectorial perspective were presented and discussed. The concept of Integrated Watershed Management (IWRM) can bridge the gap among the sectors since it considers different types of water allocation for different types of users, while framing at the same time, environmental, institutional and management aspects. The need to have appropriate policies and institutional frameworks to make approaches and instruments work was also discussed. Furthermore the presentation of concepts, instruments and concrete examples of Payments for Environmental Services

(PES), Collective Action, and Strategic Environmental Assessment (SEA) provided concrete possibilities to create synergies among the two sectors of water management and biodiversity conservation to work towards a balanced water allocation that can contribute to meet development and environmental needs.

Projects and programms from Peru, Bolivia, South Africa and Kenya were analyzed to identify the possibility to intertwine the two sectors. The findings of the discussion may serve as cornerstones for future research needs, development strategies and project implementation.

Perception of sectors

While there was a clear understanding of the role and function of water for sustaining biodiversity, the concept of biodiversity (the variability among genes, species and ecosystems) and its importance for the water sector seemed to be less concrete and needed to be specified. The distinction and the linkages between biodiversity and ecosystems, i.e. their functions and services required a comprehensive explanation. In order to build the bridge among the two sectors and have a common understanding for possible synergies, it was decided to focus on ecosystems and their services as they provide more tangible benefits for the water sector**.**

Nevertheless, biological diversity is considered as a key component to enhance the stability and resilience of ecosystems, since it ensures their functionality. Biodiversity is needed to provide ecosystem services but moreover biodiversity should be considered as a service itself.

However, the question of how much biodiversity is needed to maintain the functionality of ecosystems (e.g environmental flows) and minimize the possibility to reach “the tipping point”, or the point where ecosystems can not function anymore, is still unknown[1] in many cases. The role of particular species in maintaining these functions may also not become evident until there is a change in conditions. Due to this uncertainty about how much biodiversity “is enough” to keep an ecosystem work, it is difficult to communicate the contribution of biodiversity in particular to other sectors and this therefore hinders its integration in the corresponding approaches. However, it is necessary to demonstrate these relationships, to the possible extent, to make the case for placing the value on ecosystem services in intersectorial policies.

There are different methods to value biodiversity and its multifunctional services (benefits) in order to be integrated in economic calculations e.g. in the water sector. Since there are different methods, it can also be difficult to get exact values. However, different valuation methods can help to make the benefits as well as the costs for unsustainable management

[1]An example of a tipping point could be the collapse of the ecosystem on 2008 in Amvrakikos, Greece where about 700 tonnes of fish were reported dead in the marine waters because of the reduction of freshwater inflow into the gulf (Suhkev 2008). However, there were no well dissiminated studies before warning that this could happen.

practices and its effects for biodiversity and water more tangible, thereby enabling to influence the decision-making process. Unfortunately, many of these valuations happen once the damage was made, as it happened in the Murray Darling Basin[2], calculating the cost of restoration and those resulting from the damage of ecosystems.

Understanding ecosystem functions enables greater appreciation of the role of biodiversity for human well-being. The Millennium Ecosystem Assessment (MEA) and the “Report on the Economics of Ecosystems and Biodiversity (TEEB)”[3] helped to draw great political attention to the wider services provided by ecosystems and biodiversity. The concept of ecosystem services has gained increased recognition as an effective approach to make the value of services nature provides more visible and translate it into language understood by planners and decision makers. Ecosystem services are the benefits people obtain from nature. If the services provided by an ecosystem are recognized and exploited by humans, they will be valued by these people who then become stakeholders. Depending on whether services are experienced by people as advantageous (e.g. water supply) or hazardous (e.g breeding of malaria mosquitoes), their value will be positive or negative. Different people can value the same service in different ways (Slootweg 2008).

Understand importance of ecosystems (and their quality) for the water cycle

Some of most significant functions and elements of biodiversity relevant for the water regimes are

i) Microbial processes in soils,
ii) appropriate vegetation types,
iii) landscape patches and patterns.

It is important to stress that biodiversity refers not only to genetic variability and numbers of species, but also to the ecosystems themselves (elements, structure and functions). Species are parts of functional groups that regulate and support ecosystem processes. The highest biodiversity is found in soils, which play a key role in partitioning the flow of water between runoff and infiltration, in the capacity of the soil to store not only water, but also carbon, and in purifying the water. The availability of water for human use depends on the amount consumed by vegetation, which also stabilizes and protects the soil. At the landscape scale, the flow of water is filtered by patterns of vegetation that are, more often than not, the result of land use decisions. (Tognetti, 2008).

Peatlands and other wetlands provide important services for the supply of water (quality and quantity) and the buffering of floods, depending on the intactness of their water regime (Couwenberg, 2008)

[2]Main environmental problems in Murray Darling Basin (Australia) consist of land degradation, increased salinity as well as nutrient and algae pollution. The costs of water and land salinity are substantial, being estimated at $130 million in agricultural costs, $100 million in infrastructure costs, and $40 million in environmental costs (MDBC, undated). Other costs include loss of farming land, damage to buildings and farm equipment, reduced water quality in dams, streams and rivers, vegetation loss affecting shade and shelter; soil erosion, decreasing enterprise flexibility; (for more information see http://www.mekong.es.usyd.edu.au/case_studies/rbm/home.html).

[3] The second part of TEEB still in progress, interim report available at: http://ec.europa.eu/environment/nature/biodiversity/economics/index_en.htm

Forests ecosystems provide important services with regard to the water cycle (supply, storage, filtration, erosion control, groundwater recharge, evapotranspiration, precipitation, maintenance of aquatic habitats). Extent and quality depend on topography, soil, species, and structural composition. Maximum water flows mostly coincide with natural vegetation, but not always. Healthy ecosystems are more resilient towards stressors e.g. anthropogenic or climate change induced.

Many of the benefits/ services that protected forests provide in terms of water are not exclusively provided because of the existence of the trees, but rather because by protecting the forests it is possible to prevent conversion to other, usually more degrading forms of land use. Different land uses can have impacts on:

iv) the quantity or total water yield;
v) the evenness of water flows; and
vi) the quality of water.

However, the relations among land uses and impacts are not very simple. Specific assessments are necessary, tools are available and models exist to take account of the impacts of land use change on water balance (e.g. Soil and Water Assessment Tool (SWAT), Rapid Hydrological Appraisal and Fog Interception for the Enhancement of Streamflow in Tropical Areas or FIESTA).

Removal of old growth forest at large scale (10.000 km^2) in humid parts of the world reduces rainfall between rainy and dry seasons. Annual effects are modest (5-10 %) but are higher during the transition time. In line with this, forest removal from larger areas has negative impacts on the hydrological cycle. Forests in general cannot buffer extreme events but on the other hand, it was also proved mangroves do play an important role in such events.

Natural grasslands can provide better water services than afforested grasslands with inadequate species composition.

A learning approach, drawing on local knowledge as well as on science, is necessary to develop land use strategies appropriate to particular places. Local knowledge and perceptions can be useful, especially when you have lack of information and it might serve as a starting point to deal with uncertainties.

Although the water services of ecosystems are relatively well understood, some uncertainties about the linkages still remain. Policies and management will have to deal with scientific uncertainties and approximations.

Water services are often of local nature. This close spatial relationship between ecosystems and water services offers particular opportunities for local, place-based approaches and for creating synergies between water management and ecosystem conservation. According to the MEA the extinctions of local population could be more significant than the global ones because of the role they play in particular ecosystem functions.

Foster awareness for integrating biodiversity conservation into water policies

So far, the water sector does not take the hydrological services sufficiently into account. Up to now the protection of ecosystems and the preservation of biodiversity is not often perceived as an interest of the water sector. There are several reasons for that:

i) lack of knowledge regarding the important contribution of biodiversity for water services,
ii) ecosystem services are taken for granted,
iii) natural ecosystem services are provided for free,
iv) services can be partially substituted by technical means (even though they might be by far more costly when summed up properly),
v) activities of the water sector that are detrimental to biodiversity might produce high benefits for people in the short run, and
vi) sectoral thinking.

Opportunities for awareness raising and for changes in habits or management practices arise mostly when there is a perceived crisis or scarceness, e.g. with regard to the provision of water for agriculture or for drinking water. Such situations give the opportunity for, or enforce, the reconsideration of priorities. The water supply side has then the chance to incorporate changes into policies or management strategies.

Managing water includes not only the resource water (environmental good), but also the water regimes (environmental flows), and therefore ecosystems (elements, functions and structures). Again, this is related to the management of natural resources and to the way people organize themselves to deal with them. This includes managing different interests, conflicts and the need to work in collaborative action.

Economic valuation of ecosystem water services seems to be a necessary step (whether economic/ direct monetarisation or not, depends on the planning stage) – because when the environmental services are not properly valued, they might be overlooked in decision-making processes. The implementation of non-regulated valuation schemes can also imply a change of property rights (on water and/ or biodiversity, etc). The risks of such upcoming schemes as well as their social equity benefits have to be carefully studied.

Payments for Environmental Services are not only an economic incentives tool, but can also be considered as a governance tool, depending on the kind of process to design and implement the scheme. “Non-income effects” such as communication and conflict resolution might occur in parallel to PES procedures, acting also as an awareness raising tool.

Explore options/approaches and instruments that maximize mutual benefits for water and biodiversity

The water and the biodiversity sector have a common interest in keeping the availability of different kinds of water (green and blue). Green water is considered to be the one included in the vegetation, while blue water is in the sea, lakes and rivers. Vital common interests are also the protection of watersheds, prevention of erosion, restoration of degraded ecosystems etc. However, there is not always a coincidence of water and biodiversity high priority areas.

Most conflicts arise while allocating water to different sectors/ uses (e.g. blue vs green water or water irrigation and water dams vs biodiversity conservation). There is a trade-off between regulating and supporting ecosystem services and the provision of water for other human uses. Allocation of water is a matter of societal choice. Participants of the seminar discussed about how to strengthen the pathway “water for ecosystems” together with the legitimacy of the different allocation claims. One of the major question was how a greater voice could be given to ecosystems/ biodiversity in such negotiation. Up to now, the negotiations are driven by existing values and management systems (institutions, knowledge, capacity, governance structures and processes). An important tool to change allocation priorities can be a stakeholder process where different interests are put into a balance. This can help to define different scenarios with their economic, social and environmental impacts.The ecosystem services approach can contribute to stress the values of ecosystems and biodiversity in negotiations.

Biodiversity conservation approaches offer opportunities to the water sector, e.g.:

- The concept of protected areas is increasingly applied in order to protect water resources, since many community protected areas coincide with protection areas of water sources; in this form biodiversity conservation is achieved as a “co-benefit”;
- Experiences and approaches in conservation and natural resource management such as a regional upscaling of institutions or perspective, environmental governance and PES could be useful for the water sector;
- The integration of biodiversity conservation and integrated water management increases options to respond to climate change;
- Water services from ecosystems are provided for free;
- The maintenance of soil functions is important for agricultural systems. A reduced degradation of soil functions contributes to improve production systems and water regimes.

Conservation of Biodiversity can gain from the water sector:

i) new arguments for conservation;
ii) stronger political support;
iii) financial resources raised for water purposes for conservation of biodiversity contributing to the provisioning of water.

The concept of integrated water resources management (IWRM) sets the frame to build the bridge among different sectors since it considers the three main areas (ecological, social and

economic) needed for a balanced allocation of water needs and setting the basis for an intersectorial work. Integrated water resources management (IWRM) has been defined as ‘a process which promotes the coordinated development and management of water, land and related resources, in order to maximize economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems’ (Global Water Partnership, 2000). However, this approach implies huge challenges for inter-institutional dialogue and stakeholder participation.

An ecosystem services approach is a key issue to reach a better integration of biodiversity into water-related decisions. The approach

i) delivers an identification and recognizes the value of the ecosystem services for the development,
ii) assists the development of indicators that can be used for more environmentally friendly decision-making,
iii) fosters investment in nature for development, and
iv) protects nature from adverse effects of development.

This involves a variety of methods, incl. an assessment of ecosystem water service interdependencies and impacts, an ecosystem water service evaluation, and a stakeholder analysis.

The application of the ecosystem service approach should take place at several scales:

- improve data bases and strengthen capacities for assessing water flows/ hydrological balance
- assess water and land use interrelationships
- assess the valuation of water ecosystem services
- incorporate the sustainment of water services into the protected area site selection procedure
- use zoning to keep land available for priority water ecosystem services
- use economic incentives (e.g. fiscal incentives as tax deductions to encourage investment in ecosystem services for water and/ or establish fees for the use of resources or services in exchange for improving or maintaining the ecosystems (PES)
- implement SEA for (water) sector policies that include assessments of ecosystem water services and their possible derogation. SEA is an important instrument for the integration of different objectives, institutions and policies.
- develop integrated watershed management plans for river basins/ catchment areas that include water flow and ecosystem services analyses and valuation; linking water resources and biodiversity and their contributions to social and economic development
- explore the potentials to restore ecosystem functions
- raise awareness on and communicate the interlinkages of water and ecosystems
- approach the private sector, foster Corporate Social Responsibility for providing incentives for restoration or maintenance of water ecosystem services

It is worth mentioning that to use water more efficiently is also key for a wiser use of water resources benefitting both humans and biodiversity.

Institutional and Social Aspects to be considered

In the context of IWRM one needs to identify objectives, use scenarios and have some basic information to take better decisions that could balance environmental, economic and social needs. Objectives and scenarios can be best defined with multi-discipline expert teams and stakeholder representatives. These are important aspects in IWRM, PES and SEA processes, since all these instruments and approaches offer the possibility to enhance good governance improving institutions, collective action and the outcomes of the actors interaction.

In a broader sense, there are three important factors which condition the outcome of the resource management and ecosystem management. The factors are:
(1) the physical and technical characteristics of the goods and services available,
(2) the characteristics of the community using the resource (size and internal structures) and
(3) the institutional arrangements (rules and norms) regulating the resource use.
These factors strongly influence the local organisation (in terms of patterns of interaction) concerning their natural resource management and therefore they also influence the conditions of the resources (Rasmussen and Meinzen-Dick 1995). The different institutional arrangements in form of rules and norms include the consideration of the property rights. Indeed, property rights are important because they may connote the type of relationships among social actors, defining who has (and how) which type of access to certain resources.

Multiple types of property rights regimes are used to govern water depending on the water resource type, location, and use. Given the complex institutional setting of water, the multiple types of property rights systems involved, and the multiple actors concurrently exercising rights in any given setting, better governance is a critical, but difficult task. The variety of ways in which people may exercise their property rights so as to undermine or limit the property rights of others should be considered focusing on the interactions among actors at different social levels of organization, particularly communities and national governments.

Watersheds are characterized by an important biophysical and socioeconomic heterogeneity of actors and connect people vertically by water flows, making relationships among users of water more complex. The connection among actors in a watershed involves coordination and cooperation in the management of natural resources to improve their collective action. Trust and reciprocity are important in a relationship that involves externalities and coordination failures, and these factors are enhanced by the awareness of dependence among participants (Ostrom 1998; Ostrom and Gardner 1993).

The location of the people along the watershed defines their roles in the provision and appropriation of water. Verticality in watersheds imposes a challenge to collective action. Most of social interaction and individual behavior depend on the individual gains and how these are interconnected. Therefore, the role of cooperation, coordination and conflict resolution between actors according to the payoffs structure of the social interaction and the institutional set to solve these social dilemmas have to be taken into account. Economic games are a way to understand human behaviour and to persuade resource users from the benefits of collective action (Cárdenas et al. 2008). In this way economic games can be a

method to understand the type of social interaction in a particular region and on the other hand a means for environmental communication.

All these approaches, mechanisms and instruments help to mainstream IWRM at different levels, in a project as well as in a policy cycle, building the bridge between water and biodiversity by fostering an integrated and a more sustainable ecosystem use. We can contribute to this improvement, learning from different concrete experiences and bringing the lessons learned into the process in a way that they can contribute to developing? appropriate policies which at the same time can set the framework to make these experiences work for a long term, disseminate an ecosystem approach and maintream sustainable development.