ISSN 1020-1203

FAO
WATER
REPORTS

30

Stakeholder-oriented valuation to support water resources management processes

Confronting concepts with local practice

Imperial College London

IUCN
The World Conservation Union

IWMI
International Water Management Institute

FAO
FIAT PANIS

Cover photographs:
United Republic of Tanzania. Courtesy of G. van Halsema.

Copies of FAO publications can be requested from:

SALES AND MARKETING GROUP
Information Division
Food and Agriculture Organization of the United Nations
Viale delle Terme di Caracalla
00100 Rome, Italy

E-mail: publications-sales@fao.org
Fax: (+39) 06 57053360
Web site: http://www.fao.org

Stakeholder-oriented valuation to support water resources management processes

Confronting concepts with local practice

FAO
WATER
REPORTS

30

by

Leon Hermans
Daniel Renault
FAO Land and Water Development Division
Rome, Italy

Lucy Emerton
Danièle Perrot-Maître
The World Conservation Union
Gland, Switzerland

Sophie Nguyen-Khoa
International Water Management Institute
Colombo, Sri Lanka

and

Laurence Smith
Imperial College London
United Kingdom of Great Britain and Northern Ireland

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 2006

ISBN 92-5-105477-0

Contents

List of figures

List of tables

Acknowledgements

This publication reports on some first exploratory steps in using water valuation to move from a sectoral to a functional perspective on water resources management, recognizing the role of water resources as components of a more extensive set of interrelated systems. As such, it builds on FAO Water Report No. 27 *Economic valuation of water resources in agriculture* and the outcomes of the FAO/Netherlands Conference on Water for Food and Ecosystems. Stakeholders are central in this publication, exploring how water valuation can support stakeholders in managing their local water resources. The empirical core of the present report is formed by three case studies in which a stakeholder-oriented approach to water valuation has been explored.

The Tanzania case study is based on the written publications and fieldwork carried out for the project “Water productivity for vulnerable groups in the Mkoji subcatchment”, funded through the FAO–Netherlands Partnership Programme. This project was implemented by FAO–AGLW and Sokoine University of Agriculture through the work done by Professor Henry Mahoo and the other members of the Soil Water Management Research Group. FAO’s input was coordinated by Gerardo van Halsema, who also provided useful comments on earlier drafts of this publication.

The chapter on the Sri Lanka case was written by Laurence Smith and Sophie Nguyen Khoa. It presents findings of the research on “Impacts of irrigation on inland fisheries and their role in rural livelihoods” that both authors conducted together with Kai Lorenzen. This research was made possible by the Department for International Development (DFID) of the United Kingdom of Great Britain and Northern Ireland and support from the Comprehensive Assessment of Water Management in Agriculture.

The chapter on the Cambodia case was written by Lucy Emerton. It is based on the written publications and fieldwork carried out by Joanne Chong of IUCN’s Regional Environmental Economics Programme for Asia. It reports on a study carried out between August 2004 and January 2005 as part of the DFID-funded project “Integrating wetland economic values into river basin management” and the UNDP/GEF funded project “Mekong River Basin wetland biodiversity conservation and sustainable use programme”, which IUCN is implementing in conjunction with the Mekong River Commission.

Thanks are due to the external reviewers, who took the time to read through an earlier version of this report and provided useful feedback and constructive comments: Bruce Lankford from the University of East Anglia (United Kingdom of Great Britain and Northern Ireland), Petra Hellegers from the Agricultural Economics Research Institute (LEI, Netherlands), and Hartmut Brühl, international consultant with the Technical Committee of the Global Water Partnership. Any mistakes or omissions in the final text remain solely the responsibility of the authors.

Summary

Growing pressures on water resources, increasing interdependencies between users, uncertain impacts of climate changes, the use of modern precision technology and an associated increase in demands for reliable water services are some of the factors underlying an ever-increasing complexity in water resources management. As a result, one of the main questions today is how to best support stakeholders in managing their water demands in a context of increasing competition and interdependency. This question is especially significant for agriculture as it is the largest water user globally and faces increasing difficulty in securing a share of water resources that is sufficient to meet the needs of a growing world population and in managing the impacts of its activities on the resource base.

Supporting stakeholders in managing their water resources means supporting stakeholders to make choices and to reach a common understanding on the necessary arrangements for sharing and allocating water-related goods and services. Valuation is implicit to this process as making a choice for one use implies valuing that use over other possible uses. Therefore, assessing and communicating the values associated with different water-related goods and services is the basis on which stakeholders have to seek a well-informed decision. This explains the growing focus on water valuation as a means to support water resources management.

Water valuation means expressing the value of water-related goods and services in order to inform sharing and allocation decisions. It covers both use and non-use values, extractive and *in situ* use values and consumptive and non-consumptive use values. The notion of scarcity is central and this can refer to aspects of water quantity and quality and can have both temporal and spatial dimensions. This scarcity may be induced by limitations of the physical water resources, the means to access them, or by inadequate management of the resource base.

Various methods have been developed that help to express the value of water-related goods and services in quantitative, monetary units. Although potentially very useful, these methods are complicated and demanding in terms of the expertise, time and data required for their application. This hinders their widespread application, especially in developing countries, which often face more constraints on the availability of expertise, data and resources for the execution of value assessments. As a result, their development in the field of water valuation has been mainly academic and there is a need to apply valuation results and processes to support water resources management and decision-making effectively.

This report explores how to improve the connection between analytical efforts to place a value on water resources and the actual water resources management processes. It does so by comparing concepts from literature on integrated water resources management (IWRM) and water valuation with practical experiences from three recent cases where an effort was made to embed existing valuation tools and methods into ongoing decision-making processes by stakeholders. Using the lessons from these three cases, it provides a first outline for a stakeholder-oriented water valuation process that could support the integration of valuation into ongoing and adaptive processes of water resources management.

A review of the existing literature on water valuation indicates that several water valuation frameworks are available to provide stakeholders with an explicit, transparent and scientifically sound valuation of water resources. These frameworks enable one to compare and integrate the different components that make up the value of water,

building on concepts such as total and full economic value, water accounting and the water value flow concept. The total economic value and the similar full economic value concepts are often used. The advantage of these frameworks is that they offer a relatively straightforward procedure for aggregating different value components into one overarching value. However, although the social and environmental values can be captured conceptually in these frameworks, the emphasis in their use in practice is on monetary expressions of producer and consumer values.

Furthermore, there are additional factors that complicate an accurate use of valuation methods in practice. Among these are the cognitive, information and knowledge constraints, which are an important factor in valuing interrelated and partially overlapping water-related goods and services. Determining what it is that stakeholders care about in a particular situation is already difficult, but assessing how this is supported or impaired by different activities or policy alternatives is often almost impossible. Causal relationships between interconnected and interdependent water uses are difficult to establish, while the need to establish how values are affected by small changes in dynamic water systems further complicates matters.

Thus, water valuation is difficult and fraught with uncertainties and results in value estimates that are necessarily crude and inexact. Combining the analytical complexity with the complexity caused by the involvement of different stakeholders in political decision-making processes, clarifies why a comprehensive, complete and undisputed valuation is virtually impossible to achieve. Therefore, valuation should use whatever partial information is available or affordable to take forward processes of multiobjective decision-making. In practice, it may be better to reach an agreement based on imperfect value estimates rather than continuing theoretical disputes over the "real" value of water resources.

This means that valuation should be viewed in a broader perspective, not solely as an objective or neutral means to place a quantitative value on water resources. Valuation may be biased and partial, but it can make an important contribution to water resources management by offering a structured and transparent mechanism that supports a multistakeholder dialogue, helping stakeholders to express their values and to reach jointly a certain level of agreement on the use and management of scarce water resources.

Realizing such a stakeholder-oriented approach to water valuation is not self-evident. It requires stakeholders and experts to overcome several challenges throughout the valuation process. Some of these challenges are related to strengthening the links between water valuation as an analytical activity and water valuation as it is being done, implicitly or explicitly, by stakeholders as part of their water resources management process. These are central to this report, and three of these are identified here:

- An analytical challenge, to broaden the scope of valuation to include economic, social and environmental values, to provide insight into stakeholder-specific values as well as relevant trends and dynamics. Transparent and valid assessments of a diverse range of values are required, while still providing insight into the overall picture.
- An adaptive challenge, to adapt to the working conditions for local water resources management in developing countries, requiring one to adapt valuation to the existing institutional setup and to the available data, knowledge, expertise, time and resources (and to the limitations thereof).
- A participatory challenge, to embed water valuation in local stakeholder processes, combining stakeholder judgement, local knowledge and scientific inputs, through a process that is driven by stakeholders.

The practical implications of these challenges are explored through the use of three cases in which valuation practitioners and stakeholder confronted these challenges and developed some practical responses to address them. As these cases were done independently from one another by different organizations, there are substantial differences between them. The first case is located in the Mkoji subcatchment in the United Republic of Tanzania and focuses on the value of water resources to support different local livelihood activities in different locations while also meeting environmental requirements. The second case concerns the Kirindi Oya basin in Sri Lanka and focuses on the value of water resources to support different functions that are potentially conflicting: irrigation and fisheries. The third case discusses water valuation for the Stoeng Treng Ramsar site in Cambodia, focusing mainly on the *in situ* value of water resources for the provision of various wetland goods and services that support local livelihoods. The methodological approaches used in the three cases show a strong convergence as they all emphasize the use of water valuation to support local stakeholders in the context of IWRM, but their point of departure is somewhat different.

The differences in the cases reduce the possibilities for a detailed comparative review of the valuation approaches used. However, the independence of the cases makes a strong argument for the common elements and strategies that nevertheless appear in them. Therefore, in-depth descriptions of these three cases are used to learn about the strategies developed in practice and to extract some of the common features and practical responses that were considered useful by those involved to address the threefold challenge for water valuation. This is not to say that the lessons learned from the cases offer the final answer to all valuation problems. Rather, they serve a purpose in highlighting recent attempts in moving towards a more stakeholder-oriented valuation approach. The observed responses have been framed as recommendations to consider for future water valuation efforts:

- Differentiate, providing insight in different value components and for different stakeholders, within a loose overarching framework.
- Focus on livelihoods as a driving force and integrating element.
- Link valuation to possible solutions/alternatives.
- Combine various methods, indicators and data to build a more complete picture.
- Use an adaptive and learning approach, building confidence to take action.
- Ensure links with existing institutions while building social capital.
- Use tools and techniques for participatory analysis, with specific attention for stakeholder representation.
- Mix expert and stakeholder inputs.
- Focus on use of participatory valuation to build agreement on actions.
- Use methods with a certain degree of simplicity to facilitate participatory efforts among broad groups of stakeholders.

These responses are based on an underlying perspective of water valuation as an intrinsic part of a water resources management process. Together with the conceptual approaches to IWRM and water valuation from literature, they can be moulded into an outline of a stakeholder-oriented water valuation process. This process consists of seven elements, which are linked to one another in a more or less logical sequence of activities:

1. Identification of the main triggers for the process, problems to be addressed and key stakeholders involved.
2. Identification of values at stake through a structured overview of stakeholders' objectives.
3. Assessment of values associated with these objectives for current practices.
4. Identification of possible solutions and the stakeholders that control them (or do so in part).
5. Assessment of values associated with expected impacts of solutions.
6. Evaluation, refinement and negotiated choice of preferred set of solutions.

7. Implementation, monitoring and evaluation by involved stakeholders.

Just as the descriptions of the IWRM process, this stakeholder-oriented valuation process should not be seen as a blueprint but rather as pointing to useful directions for subsequent actions in a participatory and iterative valuation process. Although a valuation process as outlined here may rarely be found in practice, its internal logic makes it a useful tool for practitioners who seek to support stakeholders by adding an analytical and rational component to the essentially political water resources management processes. By using this approach, efforts are made to bring valuation in line with stakeholders' needs, providing insight into disaggregated value estimates to reflect differences among stakeholders, and using valuation to identify and evaluate possible measures to improve water resources management.

An adaptive and learning approach is an important element of this process, in which the absence of complete data sets is not taken as an excuse for not starting improvements. This reflects the view that the aim of valuation is not to find the "right" answer to the question of what the value of water is, but to help stakeholders to reach a point at which they feel confident to take action. It requires a collaborative effort between experts and stakeholders, where stakeholder ownership of the valuation process is central from the outset, asking them to bring forward their problems and their perceived needs/solutions. The outlined approach has the further advantage of leading the process to the key problems and the underlying values of stakeholders.

Although the cases described cover mainly the first part of the outlined process, the evidence suggests that stakeholder-oriented valuation provides a promising means to take account of the broad range of values related to water resources and their uses, to deal with uncertainty and practical constraints, and that it can become part of an integrated, participatory and adaptive approach to water resources management. Such stakeholder-oriented valuation processes are likely to have benefits in terms of improved outcomes, i.e. better decisions, implementation, etc., and benefits in terms of the establishment of processes and capacity within local civil society to participate in water resources management.

While stakeholder-oriented valuation helps to improve the transparency and fairness of water resources management processes, it does not offer an easy solution. The case material in this report offers a useful basis to build an argument for the stakeholder-oriented valuation approach presented here. However, it does not offer the broad basis of experiences that would be needed to validate the stakeholder-oriented valuation approach beyond its initial elements. Therefore, several challenges remain, partly owing to the scope and focus of this report, which leave several important questions open for future work.

Among these questions are those related to the implications of upscaling the stakeholder-oriented participatory approaches to national or international level and replicating valuation processes over time. The analytical details of valuation methods have not been at the core of this report and there remains a need to further improve the analytical tools for assessing social and environmental values and to examine the use of multicriteria decision-making tools to support the analysis of trade-offs between values. In addition, stakeholder-oriented water valuation puts a whole new demand on the professionals traditionally involved in water valuation as it requires them to embed their activities in multistakeholder processes. This requires a new set of tools and skills for the facilitation of participatory processes, conflict management, adaptive management and dealing with existing power structures and inequalities. In short, more experience with the stakeholder-oriented valuation approach is needed. This requires a broader sample than the three pilot cases discussed here and one covering a longer period in order to better evaluate the impacts of the approach on policy processes and decisions.

List of acronyms

CBO	Community-based organization
CEPA	Culture and Environment Preservation Association (Cambodia case)
EIA	Environmental impact assessment
FFS	Farmer field school
GDP	Gross Domestic Product
GEF	Global Environment Facility
GWP	Global Water Partnership
IUCN	World Conservation Union
IWMI	International Water Management Institute
IWRM	Integrated water resources management
KOISP	Kirindi Oya Irrigation and Settlement Project (Sri Lanka case)
MRC	Mekong River Commission
MSC	Mkoji subcatchment (Tanzania case)
MWBP	Mekong Wetlands Biodiversity Conservation and Sustainable Use Programme
NGO	Non-governmental organization
NTFP	Non-timber forest product
PfD	Partners for Development (Cambodia case)
PRA	Participatory rural appraisal
RRA	Rapid rural appraisal
UNDP	United Nations Development Programme
WUA	Water users association

Part I
Introduction and literature

One of the main questions today is how to best support stakeholders in managing their water demands in a context of increasing competition and interdependency. This question is especially significant for agriculture as it is the largest water user globally.

Chapter 1 introduces the role of water valuation in addressing this question. It takes stock of existing approaches to water valuation, identifying the need to complement these existing approaches with one where stakeholders have a more central role.

With this in mind, Chapter 2 reviews the relevant concepts from literature on water resources management and water valuation. This results in the identification of three main challenges that need to be addressed in order to embed water valuation more effectively in the water resources management processes that are driven by stakeholders.

Chapter 1
Introduction

WATER RESOURCES MANAGEMENT AND THE NEED FOR VALUATION

The increasing complexity of water resources management

Water resources are increasingly under pressure with demands that are growing in volume and with different uses and activities affecting their quality and quantity as well as the timeliness of their availability. Water resources provide multiple goods and services that are essential to human development, such as water for food production, drinking-water and sanitation, conservation of natural ecosystems, recreation and hydropower. These goods and services are interrelated and partially overlapping, e.g. water reservoirs that may benefit power generation, irrigation, drinking-water supply, fisheries and recreation, depending on their location, design and operation. Furthermore, externalities are often involved where the use of water resources by one group of users affects the possibilities for water use by other users; upstream uses may lead to reduced quality or quantity of water resources at downstream locations.

Interdependencies exist between riparian users in a river basin, between groundwater users that extract their water from the same aquifer and even between users in different water systems. In this last case, the interdependencies may be caused by the migration of wildlife or cattle, by interbasin water transfers and by virtual water trade, through the trade of goods that consume water as part of their production process. Finally, although surrounded with uncertainties, climate change impacts add further complexity to the management of fresh water resources and their availability over time.

Mounting pressures on water resources, increasing interdependencies between users, uncertain impacts of climate changes, the growing use of modern technology and increasing demands for reliable water services are only some of the factors that drive the ever-increasing complexity of water resources management. These developments have a significant impact on agricultural water management because agriculture is the largest water user globally and faces increasing difficulty in securing a share of water resources that is sufficient to meet the needs of a growing world population and in managing the impacts of its activities on the resource base.

Stakeholders and managing competing demands for water

Water resources management involves various stakeholders with multiple objectives. In this context, stakeholders are considered to include all individuals, groups or organizations that have some interest (stake) in the use or the management of water resources. This means that stakeholders include water users such as households, farmers and industries but also government agencies on different administrative levels that have an interest based on their official mandates. These stakeholders have to find ways to cope with the increasing complexity and to manage the various competing demands for water resources. Potentially, everyone is a stakeholder in water resources management. Public health concerns may be the main driver for water quality improvements, environmental grounds may trigger investments in wastewater treatment, and agricultural interests may drive the development of water control infrastructure. While not everyone may be able to participate in decision-making on water resources management, ongoing trends towards democratization, privatization and globalization are leading to expansion of the network of involved stakeholders to include local households, local companies, transnationals, international organizations and a multitude of other stakeholders.

Stakeholders can be regarded as part of a network, being linked to one another through the same basis of shared water resources. In these stakeholder networks, none of the stakeholders is generally powerful enough to realize its objectives without the support of others. Consequently, different stakeholders have to reach an agreement on the measures and arrangements to allocate and manage their shared water resources. Top-down regulation of water resources is not sufficient, it has to be complemented by bottom-up approaches and stakeholder processes, adaptive management and an increasing reliance on market-based approaches. Today, water resources management is seen as an ongoing process and different stakeholders as an essential part thereof (GWP, 2000).

In the context of increased competition and interdependency, a major issue is how to best support stakeholders in managing their water demands. Where additional water resources can be developed, this will offer a relatively easy strategy. However, in the more frequent situations of limited water resources, water productivity gains are likely to be a necessary part of the solution, generating water savings for beneficial use elsewhere. Water productivity gains, producing more with less water, have been common practice in agriculture in recent decades. For example, it is possible to estimate that the water needs for food per capita in Europe decreased between 1961 and 2001 from about 5.4 m^3/day to 3.6 m^3/day (Renault, 2003). Such water savings, in the example almost 2 000 litres/day/capita, have enabled the world – at a global level – to accommodate the food demands of an almost doubled world population.

Nevertheless, water productivity gains will not always be sufficient to meet the rising water demands. Therefore, very real and particularly harsh choices will also be inevitable in a growing number of cases. As these are often likely to benefit some stakeholders at the expense of others, conflict looms and there is a need to support negotiation, conflict prevention and conflict resolution. There is a need for tools and approaches that help stakeholders to reach agreement on the necessary arrangements for sharing and allocating water-related goods and services, particularly in the face of scarcity.

Valuation is implicit to the process of making choices on the use and allocation of water-related goods and services, as making a choice for one use implies valuing that use over other possible uses. Therefore, assessing and communicating the values associated with different water-related goods and services is the basis on which stakeholders will have to seek a well-informed decision. This explains the growing focus on water valuation as a means to support water resources management.

WATER VALUATION AS A MEANS TO SUPPORT STAKEHOLDERS

Terms and definitions

Values are generally considered to define what stakeholders care about in water resources management. Therefore, understanding what drives stakeholders means understanding the values that water resources represent to them (Keeney, 1994a; Pearce, 2002). This report uses a basic definition of the concept of value as a starting point, here defining values as the principles for evaluating the desirability of an existing situation or any possible alternatives and consequences (Keeney, 1994b).

Valuation is the process of expressing the value of a particular action or object (Farber, Costanza and Wilson, 2002). This is important because these values determine whether stakeholders consider an existing situation to be problematic and whether they regard a certain solution as favourable. In water resources management processes, stakeholders value certain actions or objects depending on their contribution to the goals and objectives (here including economic, social and political objectives, as well as objectives that are culturally defined, related to tradition or religion). Therefore, valuation requires insight into stakeholders' objectives and how certain actions or strategies affect them (Keeney, 1994b).

Water valuation means expressing the value of water-related goods and services in order to support their allocation and sharing. It covers both use and non-use values, extractive and *in situ* use values, and consumptive and non-consumptive use values (NRC, 1997; FAO, 2004). The notion of scarcity is central and this can refer to aspects of water quantity or quality and can have both temporal and spatial dimensions. This scarcity may be induced by limitations of the physical water resources, the means to access them (related to financial, infrastructural and legal aspects), and by inadequate management of the resource base (as may be the case for pollution affecting water quality).

Water valuation in practice

In agriculture, the growing focus on water valuation has led to the development of various water productivity indicators in order to assess whether water is being used in a productive way, i.e. contributing to a valuable output. Commonly, water productivity is expressed in terms of yield per unit of water (in kilograms per cubic metre) or "crop per drop", or using the economic equivalent of the yield, as in monetary units per cubic metre (Molden *et al.*, 2003). Social benefits of agricultural water use are also receiving increasing attention through indicators such as "nutrition per drop", "jobs per drop" and "sustainable livelihoods per drop" (Renault and Wallender, 2000; FAO, 2003).

To date, water valuation in a systematic way has mainly been the domain of economists. They have developed various methods that help to express the value of water-related goods and services in quantitative, monetary units (Gibbons, 1986; NRC, 1997; Rogers, Bhatia and Huber, 1998; Pearce, Pearce and Palmer, 2002; Emerton and Bos, 2004). Although potentially very useful, these methods are quite complicated and demanding in terms of the expertise, time and data required for their application. This hinders their widespread application, especially in developing countries, which often face more constraints on the availability of expertise, data and resources for the execution of value assessments (FAO, 2004). As a result, development in the field of water valuation has been mainly academic and there is a need to improve the connection with the actual water resources management processes (WWDR, 2003).

The insight is emerging that valuing water should go beyond its current focus on economic efficiency and also take into account social and environmental values (e.g. GWP, 2000; Moss *et al.*, 2003; FAO/Netherlands, 2005). However, the available methods for water valuation focus predominantly on the economic benefits from direct and indirect uses. Only recently has attention shifted to methods to address environmental values, such as environmental base-flows (Dyson, Bergkamp and Scanlon, 2003; World Bank, 2003). Methods for assessing social values remain largely absent, with perhaps the exception of the Water Poverty Index. The Water Poverty Index represents an attempt to develop an integrated water management measure that goes beyond hydrological considerations. It has its limitations and is not confined to social aspects of water management, but it does have a principal focus on the value of water resources as a critical asset for sustainable livelihoods. It is composed of different indicators, similar to the Human Development Index, based on five key components of resources, access, capacity, use and environment (Sullivan and Meigh, 2003).

Water valuation: beyond economics and embedded in the decision-making process

There is a need to complement the existing mainly economic approach to water valuation with an approach that places stakeholders more at the centre. Such a stakeholder-oriented approach would need to view water valuation in a broader perspective, not solely as a means to put a monetary value on water resources, but rather as a structured and transparent mechanism to help stakeholders express the values that water-related goods and services represent to them. It differs from classic economic valuation approaches in that it is embedded in the water resources management process, of which it forms an intrinsic part, rather than being an outcome of external analysis brought into the process by outside experts. Water valuation should become a means for conflict resolution and decision-making, informing stakeholders, supporting communication, sharing insight and joint decision-making on priorities and specific actions through a combination of expert knowledge and scientific method with stakeholder judgement.

AIM AND SCOPE OF THE REPORT

This report explores the question of how to improve the connection between analytical valuation efforts and actual water resources management processes. It does so by taking stock of lessons learned from recent efforts to embed existing valuation tools and methods into ongoing processes of decision-making by stakeholders. Using the lessons from three pilot cases, it provides a first outline for a stakeholder-oriented water valuation process that could support the integration of valuation into ongoing and adaptive processes of water resources management.

The literature on water resources management processes and water valuation is compared with the local practice of using water valuation to support these water resources management processes in three cases in Cambodia, Sri Lanka and the United Republic of Tanzania. These cases cover very different situations and processes but they have in common the fact that in all of them an effort was made to link valuation and stakeholder processes. In-depth descriptions of these cases provide the practical insights that help to outline a direction for a more stakeholder-oriented approach to water valuation that can usefully complement the existing suite of economic valuation methods.

The focus of the report is less on further improving water valuation analytically and more on using the existing suite of valuation tools and methods to support real-world water resources management processes. As the current state of the art in this area leaves significant scope for learning, the report has an exploratory character, exploring emerging trends and approaches rather than testing specific guidelines. The three case studies that provide the empirical basis for the findings are all concerned with water resources management on the local level. Therefore, the extrapolation of the findings to the national or international level is not warranted without additional research.

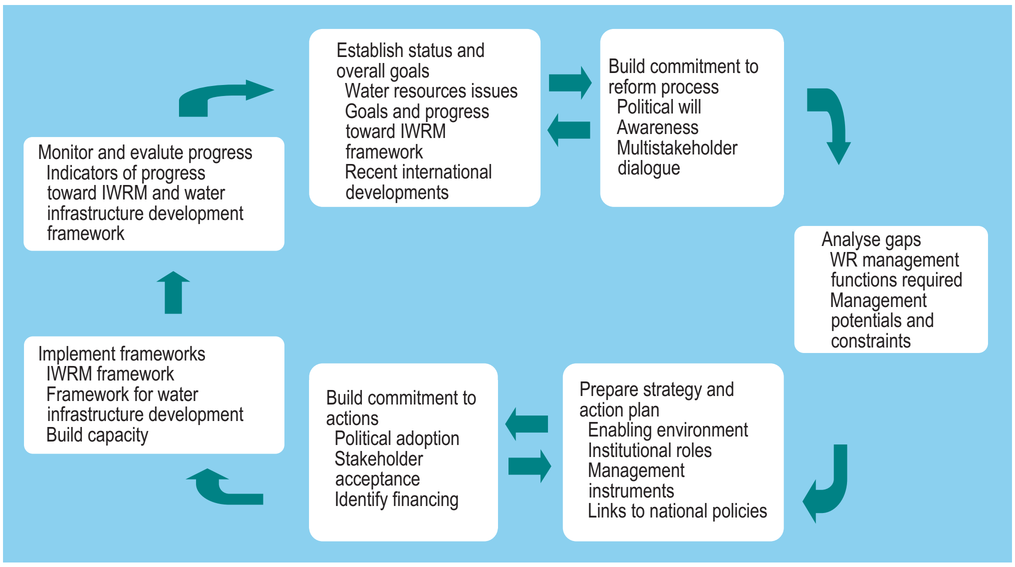
Chapter 2
Challenges for using valuation to support water resources management

WATER RESOURCES MANAGEMENT AS A STAKEHOLDER PROCESS
Water resources management processes and planning cycles

One of the most widespread definitions of integrated water resources management (IWRM) is that provided by the Global Water Partnership (GWP). It defines IWRM as "a *process* which promotes the coordinated development of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems" (GWP, 2000). In this process, the involvement of all concerned stakeholders is universally recognized as a key element in obtaining a balanced and sustainable utilization of water. More recently, the GWP (2004) has described IWRM as an ongoing process that is long-term and forward moving but iterative rather than linear in nature (Figure 1). The IWRM process is described as an iterative cycle, building on previous conceptions of policy development and strategic planning by adding commitment building and stakeholder dialogue to the steps outlined in earlier publications, e.g. World Bank, 1994 (Figure 2).

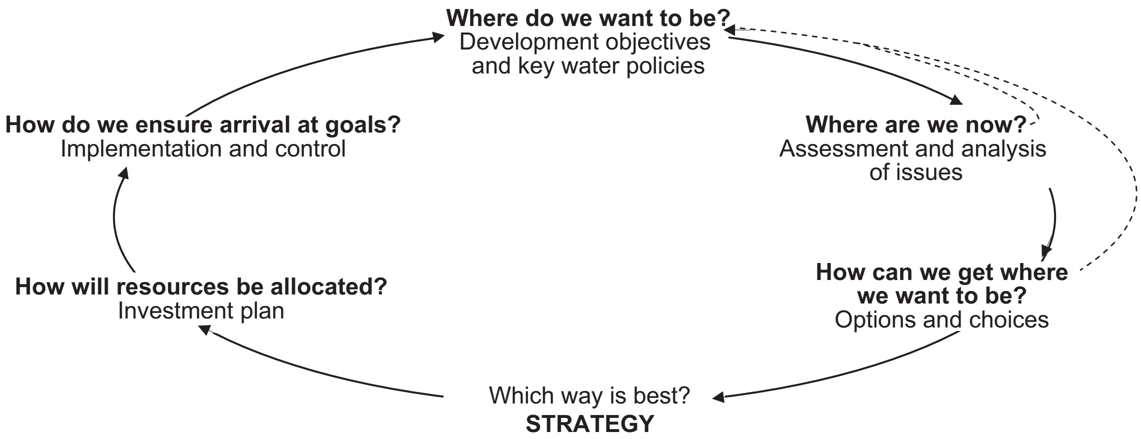
These conceptions of water resources management as a process are appealing because they offer a logical sequence of steps to follow in the development of policies and strategies. However, seminal studies in policy sciences have long indicated that reality rarely meets the expectations raised by this "textbook process" (Nakamura,

FIGURE 1
IWRM as an ongoing process



Source: GWP, 2004.

FIGURE 2
The strategic planning cycle for water resources management



Source: World Bank, 1994.

1987). Cognitive, knowledge and information constraints limit the possibilities to determine "which strategy is best" and, therefore, it is usually more realistic to strive for a satisfactory rather than the best or optimal solution (Simon, 1945). Furthermore, actual decision-making processes are often characterized by capriciousness and unpredictability and may be described more accurately as incremental processes of "muddling through" (Lindblom, 1959). Problems are not obvious, precise or singular and neither are solutions; rather, the art is to identify and formulate problems worth solving (Wildavsky, 1992). Thus, it is necessary not to minimize the difficulties involved in combining a rational planning approach with capricious political decision-making.

In IWRM literature, this issue has become increasingly clear as more experience has been gained with the implications of viewing IWRM as a process. Within the literature on IWRM, some strategies have been identified for better dealing with the complex process aspects, such as: the need to recognize and mobilize relevant stakeholders; the need to understand competing needs and goals; the need to take time and go through several rounds to bring politicians and stakeholders to agreement on trade-offs, realistic planning with resource requirements that stay within reach of government (Cap-Net, 2005); the need for a problem-based approach triggered by specific challenges that can be linked to broader development goals; and the need to mix top-down and bottom-up approaches in order to ensure broad participation by a diverse range of stakeholders in a well-organized and time-bound fashion at appropriate stages of the process, two-way communication among stakeholders, sharing knowledge, etc. (GWP, 2004). Although these strategies are not easy to implement and need to be translated to specific actions for each particular case, they convey the best available knowledge. Thus, the message is not to do away with the rational planning approaches or IWRM cycles, but to realize their limitations in practice and to use them in a flexible way.

Problems and solutions

Both the ideal-type textbook processes as well as the other descriptive theories of policy processes point to two main elements that stakeholders juggle with in any decision-making situation:

- Problems – perceived gaps, now or in foreseeable future, between actual and desired situation. Problems are connected to stakeholders. Different stakeholders may have different problems and they may differ about the nature and importance of problems. Water-related problems feature aspects of quantity, quality and availability at specific times and at specific locations.

- Solutions – measures, strategies and actions to solve problems by closing the perceived gaps. Solutions relate to problems and, thus, to stakeholders. Different stakeholders will exercise control or partial control over different solutions. Solutions may include: the construction and operation of physical structures such as irrigation channels, weirs and sluices; the adoption of economic measures such as charging for water use or pollution; and the putting in place of legal and institutional arrangements.

Problems and solutions are the most basic substantive elements in a water resources management process and there is likely to be a continuum between problems and solutions. Solutions may turn into problems after they are implemented, or a solution for one stakeholder may constitute a problem for another. For example, a dam and reservoir might have been constructed as a solution to a past problem of a lack of power-generating capacity and a need for improved irrigation water control. However, once in place, some negative impacts, e.g. on fisheries, may also have become apparent, triggering a new process to identify mitigation measures and possibilities for improvement. Something similar can be said for solutions to establish protected areas that benefit nature conservation but that may create livelihood problems for local communities.

Ultimately, water resources management should help stakeholders to address their specific problems and to identify solutions that can help to improve their situation. At any given point in time, a stakeholder may perceive certain problems and certain solutions. These need to be articulated in the stakeholder process in order to win sufficient recognition of perceived priority problems and support for the implementation of favoured solutions. Both problems and solutions will be evaluated and prioritized, selecting which problems to tackle first or which solution to implement. The main stakeholders involved do this through a process of implicit or explicit valuation.

EXISTING APPROACHES TO WATER VALUATION

Frameworks to assess the value of water

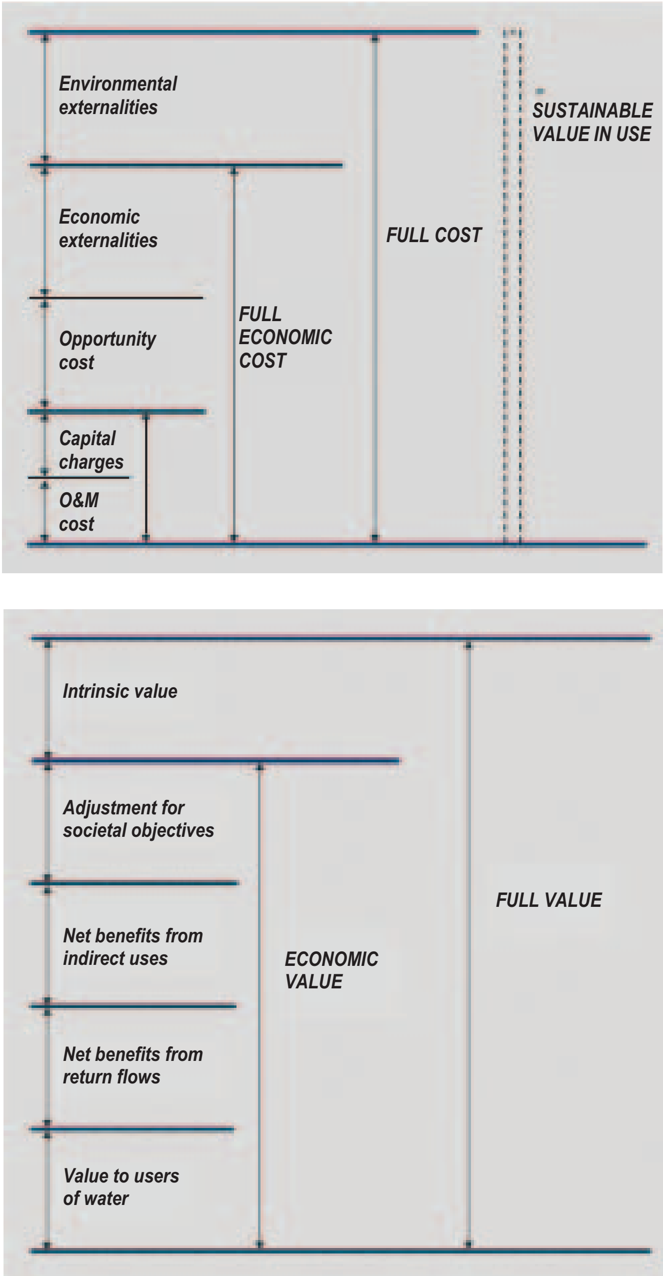
In order to provide stakeholders with an explicit, transparent and scientifically sound valuation of water resources, several water valuation frameworks have been developed. These frameworks enable stakeholders to compare and integrate the different components that make up the value of water, building on concepts such as total and full economic value (Georgiou *et al*., 1997; NRC, 1997; Rogers, Bhatia and Huber, 1998; FAO, 2004), water accounting (Molden, 1997) and the water value flow concept (Hoekstra, Savenije and Chapagain, 2001). The total economic value and the similar full economic value concepts are often used for water valuation. These fairly straightforward frameworks consist of a careful summation of the different components of the value of water, which together constitute its full or total economic value.

One of the full economic value frameworks often cited in relation to water valuation is that developed by Rogers, Bhatia and Huber (1998) for the GWP. Underlying this framework is the notion that at the margin, i.e. for the last unit of water used in a given use, the full economic costs of water supply per unit of water should equal the full economic value per unit in order to achieve economic equilibrium and maximize social welfare. Figure 3 illustrates the full economic cost and full economic value concepts from this framework.

Complicating economic valuation: marginal values

The advantage of the full and total economic value frameworks is that they offer a relatively straightforward procedure for aggregating different value components

FIGURE 3
GWP framework for full economic cost and value of water use



Source: Rogers, Bhatia and Huber, 1998.

into one overarching value. However, behind the apparent simplicity of the frameworks, there are some factors that complicate an accurate use in practice. The first of these is the distinction between marginal and average values, which is particularly relevant for water valuation.

Marginal values assess the value of incremental changes in the available units of water for a certain use. This is useful when considering different options for re-allocation of water resources, making more or less water available to different uses. Marginal values generally differ significantly from average water values (Ward and Michelsen, 2002) and they are much more difficult to assess. Difficulties increase even further when dealing with the links between water and ecosystems, as ecosystems may have sudden threshold levels. This means that an ecosystem may be stable up to a certain point after which a boundary is passed and some irreversible changes may occur (Daily *et al*., 2000; FAO, 2004). Similar problems can also apply to the assessment of marginal costs of provision of water services, particularly where there is a strong indivisibility ("lumpiness") in costs, e.g. for water storage and supply infrastructure.

It may not always be possible to assess the values associated with incremental changes. However, if water valuation intends to support water resources management processes, it should at least be able to assess the values associated with the changes that are to be expected from different possible policy alternatives. Stakeholders and policy-makers should use valuation as a means for evaluating the trade-offs involved in policy choices; that is, an assessment of benefits and costs should be part of the information set available to stakeholders in choosing among alternatives. In particular, it should value the changes in water-related good or services attributable to a policy change (NRC, 2004).

Complicating economic valuation: the time dimension

The time dimension adds further complexity to attempts to assess the values of water-related goods and services. This time dimension manifests itself in at least three ways: (i) assessing short- and long-term values; (ii) dealing with periodic fluctuations in water values; and (iii) making valuation outcomes available at the right time to be of use in the water resources management process.

The aspect of short-term versus long-term values manifests itself in trade-offs between short-term economic gains at the expense of long-term ecosystem conservation. Generally, economists have dealt with this aspect through the use of discount rates, which help to express values at a future time in terms of values at the present time (FAO, 2004; NRC, 2004). However, this does not differentiate between stakeholders' values. Certain stakeholders may perceive risks and uncertainties in a different way. Some stakeholders avoid risks in order to ensure that current values are maintained for the future and are not jeopardized by their actions. Other stakeholders are willing to take certain risks in order to have a potentially higher value in the future, and still others deliberately opt for a "mining" approach, maximizing current values at the expense of future values with a shift of activities in mind (e.g. farmers mining non-renewable groundwater resources anticipating that future generations will work outside the agriculture sector). These dimensions may be incorporated into water valuation in different ways, including methods such as the use of a maximin rule (this means maximizing minimum values when choosing between alternative policy options and dealing with an uncertain future – it entails selecting the alternative with the highest minimum value when expecting the worst case scenario for each alternative), safe minimum standards or the application of the precautionary principle (NRC, 2004).

Water values tend to fluctuate over time. Water systems are dynamic systems in which the availability and demand for water fluctuates over time, resulting in corresponding fluctuations in associated values. In areas characterized by a wet season and a dry season, the value of a small amount of water may be very high in periods of scarcity, while this value may be much lower at other times of the year. Moreover, for agriculture, marginal values for crop growth or livestock production may be very high when the available water resources are close to the minimum amounts of water needed to avoid the loss of a harvest or cattle. This is what is called the short-term or tactical value of water, which is usually much higher than the strategic value of water that refers to the value of water on the moment prior to sowing, when farmers decide on their cropping strategies (Tardieu and Préfol, 2002). The time dimension also relates to periods when water is abundant, when floods add value periodically to floodplains or when floods cause damage to infrastructure and agricultural land. Finally, fluctuations in water values are also caused by the fact that the objectives of stakeholders (and their relative importance) may change over time, e.g. in relation to economic cycles.

The perspective on water resources management as a process introduces a third element of time. Valuation results need to be available at the right time in order to help stakeholders in making the trade-offs they are facing, which may sometimes require acute decision-making and urgent action. Valuation needs to be adaptive and flexible, to meet the needs of the decision-making processes, which may sometimes be unpredictable and capricious.

Inclusion of social and environmental values

A socially optimal allocation requires a maximization of the social welfare function that represents what society wishes and that includes social and environmental objectives, such as equitable income distribution, food security and healthy ecosystems. This is included in the valuation framework in Figure 3 through the components of economic and environmental externalities, intrinsic value and adjustment for societal objectives. However, the assessment of costs and values in Figure 3 becomes progressively more complicated as one moves further away from the elements at the bottom that are concerned with the direct water uses. The assessment of the societal and environmental values requires the use of more complicated methods to provide crude proxies. These methods require considerable expertise and are quite difficult for ordinary users to comprehend.

Thus, the social and environmental values can be captured conceptually in the existing economic valuation frameworks through a certain "adjustment for societal objectives", as for the framework shown in Figure 3, or a "stage 2 policy impact analysis" that examines the impacts of an economically efficient allocation on welfare distribution, market failures and institutional aspects (Groom, Koundouri and Swanson, 2003). However, the practical applications of these frameworks focus mainly on the consumer and production values of direct and indirect uses to analyse economic efficient allocation. The social and environmental values of water are treated as a secondary step of, or an added component to, this economic valuation. The emphasis is on the development and use of methods to assess the economic costs and benefits of direct and indirect uses. The valuation of components related to social equity and environmental sustainability receives much less attention even though it may well be much more complex.

Furthermore, most practical applications of the existing economic valuation frameworks seek to express all value components in a common unit of measure and, generally, monetary units are used for this. This enables aggregate values or value functions to be determined and relatively easy comparative analyses of the different value components and water-using sectors. However, it can also put unnecessary limits to water valuation, suggesting that ultimately the achievement of all objectives can be measured meaningfully with a common denominator. For example, it ignores the fact that food security and social equity refer to social objectives that are usually considered important regardless of their virtual monetary value. While sometimes closely related, social and economic values may also be fundamentally different. A monetary expression of values is one aspect of valuation, useful to address objectives of economic efficiency and producer and consumer values. However, water valuation should also include values related to social and environmental objectives, expressed in their own appropriate standards and units. Ultimately, the value of water valuation may be to reframe a water resources management problem in terms of a multicriteria decision-making problem rather than one of economic optimization.

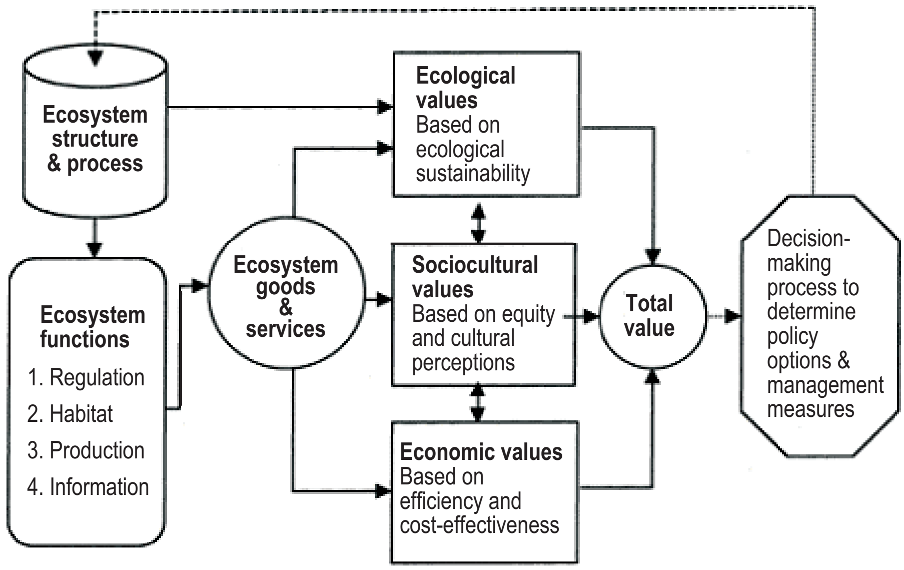
Although social and environmental values can be included in the existing economic valuation frameworks, the emphasis in practice is still on monetary expressions of producer and consumer values. Therefore, it may be useful to complement these economic valuation frameworks with valuation frameworks that recognize environmental values and social values more clearly as separate values alongside economic values. Such frameworks would: (i) recognize total economic value as one element of total systems value (FAO, 2004); (ii) consider the total value to be a function of ecological values, sociocultural values and economic values (De Groot, Wilson and Boumans, 2002); or (iii) recognize the equal importance of economic, social and environmental values as a triple bottom line (Christen *et al.*, 2005). Figure 4 shows an example of such a framework. Although developed for ecosystem functions, goods and services, and, therefore, broader than just water resources management, it helps to illustrate the points made in this section. In many cases, the result of applying such frameworks is more likely to provide a picture of the diversity of values, resulting in a "basket of value components" rather than one aggregated value or function (Burrill, 1997).

CHALLENGES FOR LINKING WATER VALUATION AND STAKEHOLDER PROCESSES

Potential of water valuation to support stakeholders despite limited accuracy

Values define what stakeholders care about. This indicates that valuation is indeed key to the process of water resources management. It helps to assess the importance of

FIGURE 4
Framework for integrated assessment and valuation of ecosystem functions, goods and services



Source: De Groot, Wilson and Boumans, 2002.

problems as well as the desirability of alternatives to solve these problems. In the water resources management process, where different stakeholders have to reach agreement on joint management strategies and actions, expressing values helps individual stakeholders to evaluate different courses of action and supports communication and negotiations among stakeholders.

Cognitive, information and knowledge constraints are often an important factor in dealing with interrelated and partially overlapping water-related goods and services. Expressing values is useful but also difficult. Determining what it is that stakeholders care about in a particular situation is already difficult, but assessing how this is supported or impaired by different activities or policy alternatives is often close to impossible. Causal relations between interconnected and interdependent water uses are difficult to establish, while the need to establish marginal values in dynamic water systems further complicates matters.

Thus, water valuation is difficult, fraught with uncertainties (Costanza *et al.*, 1997) and results in value estimates that are necessarily crude and inexact (Gibbons, 1986, Pagiola, von Ritter and Bishop, 2004). Combining the analytical complexity with the complexity caused by the involvement of different stakeholders in capricious decision-making processes clarifies why a comprehensive, complete and undisputed valuation is virtually impossible to achieve. Therefore, valuation should use whatever partial but accurate information is available or affordable to take forward processes of multiobjective decision-making. Sometimes, it may be better to reach an agreement on imperfect value estimates rather than continuing theoretical disputes over the "real" value of water resources.

This means that valuation should be viewed in a broader perspective, not solely as an objective or neutral means to put a quantitative value on water resources. Valuation may be biased and partial, but it can make an important contribution to water resources management by offering a structured and transparent mechanism that supports a multistakeholder dialogue, helping stakeholders to express their values and to jointly reach a certain level of agreement on the use and management of scarce water resources (Moss *et al.*, 2003).

A stakeholder-oriented approach to water valuation is proposed, one which is embedded in the water resources management process of which it forms an intrinsic part, rather than a result of an external analysis that is brought in by outside experts. In this way, water valuation is part of a process of social learning and of the development of a shared frame of reference among stakeholders, while also contributing to stakeholders' capacity building and empowerment. Experts will continue to play a role in such a stakeholder-oriented approach as it will need to draw on a large set of potentially suitable analytical tools to combine stakeholder and scientific knowledge, to support stakeholder judgement with scientific inputs, and to facilitate the water resources management process where necessary. However, they should recognize that they are involved jointly with local stakeholders in a learning process (Pretty, 1995) and that, ultimately, stakeholders rather than experts are driving the process.

Three specific challenges for stakeholder-oriented water valuation

Realizing a stakeholder-oriented approach to water valuation as proposed above is not self-evident. It requires stakeholders and experts to overcome several challenges throughout the process. Some of these challenges relate to further improvements of the validity and analytical accuracy of existing water valuation approaches. Others relate to strengthening the links between water valuation as an analytical activity and water valuation as it is being done implicitly or explicitly by stakeholders as part of their water resources management process. The latter challenges are central in this report, and three of them are identified here.

Analytical challenge

Water valuation needs to provide transparent and reliable assessments of values that are of importance to stakeholders. This requires that valuation cover economic, social and environmental values. Values may differ between stakeholder groups and it will be useful to complement insight into aggregated values for society as a whole with values that are stakeholder specific. The time dimension is also important in expressing values, dealing with long- and short-term values and periodic fluctuations. The challenge is to address this need for diversity while still enabling stakeholders to comprehend the overall picture, which is necessary for IWRM.

Adaptive challenge

Water valuation needs to be practically feasible. This means that it should be able to cope with limits in available data, expertise and time as well as uncertainty and knowledge gaps. Valuation should be able to cope with these gaps and limitations while still supporting processes of multiobjective decision-making. Here again, there is an important time dimension, as the timing of valuation processes should ideally match that of the, at times unpredictable, stakeholder process. The challenge is to cope with these various limitations while adapting to ongoing processes, incorporating a certain degree of flexibility through the use of adaptive approaches that stress iteration and learning.

Participatory challenge

Water valuation needs to be embedded in stakeholder processes. This means that it needs to be participatory, combining subjective stakeholder judgements with scientific inputs and more objective knowledge. It should cater to stakeholders' information needs, leaving them to decide which aspects of water resources and related goods and services should be valued. The challenge is to implement valuation in a participatory fashion to better support deliberation and learning, but also negotiating and making harsh choices, confronting the full complexity of multiple uses, numerous stakeholders, different perceptions, conflicting objectives and delicate power relations.

Part II
Cases

The next three chapters each present one case in which the people involved confronted the three challenges identified in Part I and developed some practical responses to address them. As these cases were done independently from one another and by different people and organizations, there are substantial differences among them. The methodological approaches used in the three cases show a strong convergence as they all emphasize the use of water valuation to support local stakeholders in the context of IWRM, but their point of departure is somewhat different.

Chapter 3 presents the case of the Mkoji sub-catchment in the United Republic of Tanzania and focuses on the value of water resources to support different local livelihood activities in different locations while also meeting environmental requirements. In this case, a farming system and sustainable livelihoods approach provided the methodological starting point.

Chapter 4 discusses the case of the Kirindi Oya basin in Sri Lanka and focuses on the value of water resources to support different functions that are potentially conflicting: irrigation and fisheries. The basis for the valuation methodology here was provided by the principles of environmental impact assessment.

Chapter 5 discusses the case of the Stoen Treng Ramsar site in Cambodia, focusing mainly on the valuation of insitu uses of water resources for the provision of various wetland goods and services that support local livelihoods. This valuation process distinctly featured different participatory rural appraisal methods.

Chapter 3
Valuation to support local water resources management in the United Republic of Tanzania

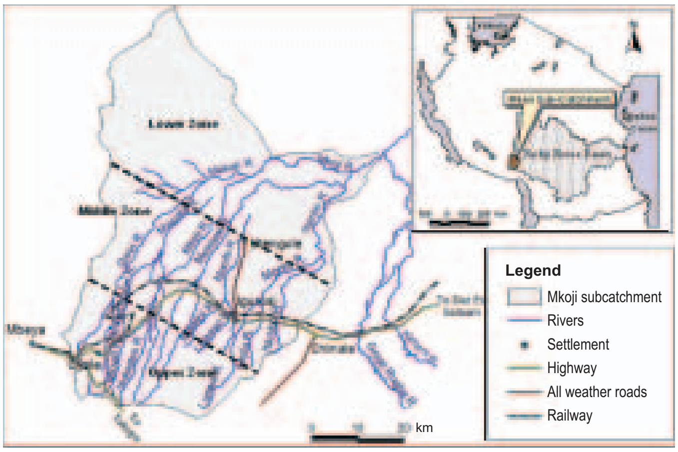
INTRODUCTION
Context of the valuation project
In the United Republic of Tanzania, some areas face severe situations of water scarcity as water demands have been increasing, particularly for hydropower and agricultural production: “Past uncoordinated planning for water use, inadequate water resources data, and inefficient water use have resulted into water use conflicts between the energy and irrigation sectors, between irrigation and the water ecosystems, hydropower and the ecosystem, and between upstream and downstream users.” (Tanzania National Water Sector Development Strategy 2005–2015). In order to address these problems, the Government has developed a new policy and legal framework and it has embarked on important institutional reforms. Responsibilities for water resources planning and management are being transferred from the national level to local levels, through river basin water organizations and water users associations (WUAs). These decentralized management structures are still being formed and/or strengthened, working towards increased involvement of local stakeholders in the process of IWRM.

The water scarcity concerns and water-use conflicts acknowledged in the national policy documents are visible in the Mkoji subcatchment (MSC), a rural area in the southwest of the country. Here, the local water resources are increasingly under pressure and new water management structures are being shaped. In the MSC, water valuation was done as part of an effort to enable the local stakeholders to engage in a process towards implementing IWRM principles, based on a solid background analysis of the linkages between local conditions and the value of water, with specific attention for vulnerable groups. This should support the local stakeholders in coping with their current water scarcity problems within the context of the ongoing process of institutional reform. The project was carried out between June 2003 and January 2004 and is reported in more detail elsewhere (FAO, 2005; Hermans, Van Halsema and Mahoo, forthcoming).

Water resources management in the Mkoji subcatchment
The MSC covers some 3 400 km^2 and is a part of the larger Great Ruaha River basin, which in turn is a part of the Rufiji River basin (Figure 5). The activities and concerns of stakeholders within and outside the subcatchment fuel the pressures on the water resources in the MSC.

Within the MSC, competition for water between different groups of water users has increased in recent years. Different groups of water users can be identified on the level of the subcatchment, based on the identification of three distinct agro-ecosystems from upstream to downstream in the MSC. In the upper zone, relatively favourable conditions allow for year-round cultivation, consisting of high-value rainfed agriculture with supplementary irrigation. The middle zone of the MSC is dominated by paddy rice cultivation, which is possible in large parts of this area because of the presence of suitable soils. The lower zone is inhabited by pastoralists who raise their cattle in

FIGURE 5
Location map of the Mkoji subcatchment



the lower zone plains during the wet season, when some rainfed agriculture is also practised. The expansion of irrigation by farmers in the upper parts of the MSC has led to increased competition and conflict in recent years. Competition among irrigators has increased, especially between paddy farmers in the middle part of the subcatchment, as well as competition between farmers and cattle-holders and, in general, between upstream and downstream water users.

Outside the MSC, the drying up of the Great Ruaha River in the dry season causes important problems for the environment in the Ruaha National Park and is loosely associated with reduced hydropower generation downstream of the Mtera Reservoir (Lankford *et al*., 2004). In response, downstream stakeholders, including national politicians, environmental non-governmental organizations (NGOs) and national park officials, are looking increasingly to the water users in the MSC to release more water for downstream uses.

The national and local concerns over the increasing pressures on the water resources of the MSC have triggered efforts to address the water scarcity problems by promoting the use of IWRM principles in the area. This process is linked closely to institutional reforms in the water sector, as well as in the general institutions for public administration, which promote participatory approaches and decentralization. These reforms place more emphasis on the roles of the government districts, the Rufiji Basin Water Office and local WUAs.

Table 1 summarizes the main stakeholder groups that are involved directly in water resources management in the MSC and the main reason for their involvement, i.e. problems or concerns related to the water resources of the MSC or official mandates for their management. The water-using communities are organized in different ways

TABLE 1
Main stakeholders involved in water resources management in the MSC

Stakeholders	Involvement in water resources management (concern or authority)
Upper zone (irrigating) farmers	Depend on water for year-round farm production as main source of food and income
Middle zone paddy farmers	Depend on water for paddy rice production and/or dry season irrigation; increasing competition over water for paddy and for irrigation
Lower zone pastoralists	Depend on water for rainfed agriculture and to raise their cattle; dry season pasture grounds and water resources are becoming scarce
District councils	Regional-level government, responsible for rural development in their regions, including agriculture. Main districts involved: Mbeya Rural and Mbarali
Water user associations	Platform for local water users to manage their water resources and lowest level water management institutions in the United Republic of Tanzania
Rufiji Basin Water Office	Responsible for water allocation and regulation within Rufiji river basin, including administering water rights, user fees and conflict resolution
National park officials	Responsible for protection of national parks from illegal activities (grazing)
Environmental NGOs (WWF)	Interested in environmental protection and nature conservation, especially in downstream wetlands
Ministry of Water and Livestock Development	National-level government institution responsible for water policy and strategy and for livestock development, involved mainly through district councils
Ministry of Agriculture and Food Security	National-level agency responsible for agricultural development, involved mainly through district councils

and are supposedly represented in various ways in official water resources management processes. The government agencies and institutions are expected to watch over their interests as part of the broader general public interest. Some villagers or water users have also organized themselves through local institutions such as village water committees, irrigation associations, WUAs, farmer field schools (FFSs) and farmers' cooperatives. Generally, the level of organization tends to be better in the upper parts of the MSC, with a low degree of local organization among the lower zone pastoralists.

WATER VALUATION APPROACH

Participatory action research approach

A participatory approach was used to conduct the water valuation. The combined use of different participatory problem analysis and data collection methods was expected to provide an improved understanding of the dynamics in the study area, and to create a sense of ownership of the results, thus providing a good starting point for a participatory IWRM process in the MSC.

Local communities were represented through a sample of six villages, two for each of the three main farming systems. In these villages, a rapid rural appraisal (RRA) was conducted. This included a wealth-ranking exercise to identify different stakeholder groups within the villages based on wealth. This first information was then used in the design of a household survey, covering a stratified random sample of 246 households in the six villages. The results of the household survey were combined with historical data available from rainfall, climate and gauging stations and results of previous studies to provide a good overview of various trends, problems and associated values.

Based on a preliminary analysis of the data gathered in this first phase, it was concluded that a better qualitative understanding of IWRM problems, possible solutions and associated values was needed. Therefore, another round of focus group discussions was conducted. These focus group discussions included representatives from the villages and key officers from the Mbeya Rural District and the Mbarali District, the Mkoji Water User Association Apex body that was being established and a local FFS.

In the last phase of the project, a three-day stakeholder workshop was organized where the preliminary results of the prior phases were presented and used as basis for discussion among stakeholders. The stakeholders then structured the different problems and concerns and worked towards a joint strategy for IWRM in the MSC. Participants in the final workshop included representatives of the villages, district officials, local training institutes and FFSs, experts from the national ministries, and representative of NGOs.

Analytical frameworks to support water valuation

The water valuation was based on the use of two complementary analysis frameworks: (i) an IWRM framework to identify and organize the different components that make up the value of water; and (ii) a sustainable-livelihoods analysis framework to enable more in-depth understanding of the underlying factors influencing the value of water for local stakeholders.

The IWRM framework was based on the framework proposed by the GWP (2000), in which three overriding criteria are identified for IWRM, along with some important complementary elements that support effective water resources management. The three overriding criteria provided the main entry points for valuation: economic, social and environmental values.

A sustainable-livelihoods analysis framework was adopted to complement the IWRM framework, based on the frameworks described by Ellis (2000) and Nicol (2000). Together, the elements in this framework describe the impacts and dynamics of rural livelihoods within a farming system, which determines the availability and use of water resources and their associated values. This livelihoods framework enabled a structured assessment of the local livelihoods based on different types of capital (natural, physical, human, financial and social), institutional mechanisms, external shocks and trends, and resulting livelihood strategies.

OVERVIEW OF MAIN OUTCOMES

Seasonal water availability

Insight into the availability and uses of water resources provides the necessary background for water valuation, giving a first impression of water scarcity concerns and the main water-using sectors. Table 2 shows estimations of the main water uses associated with human activities as well as some estimates of evapotranspiration by natural vegetation. It shows that the water supplied through rainfall exceeds the water use during the wet season, leaving a significant part of the water available for groundwater recharge, evaporation and runoff to downstream areas. It also shows that dry-season water consumption exceeds the seasonal rainfall, using some of the wet-season water stored in soils and drawing on water from elsewhere, for example through migration of livestock to seasonal grazing grounds outside the MSC. The deficit increases from the upper to the lower zones, meaning that the situation worsens gradually when moving from upstream to downstream in the MSC. This is further underscored by the fact that streams dry up annually half-way through the MSC in the dry season. Owing to variable rainfall, the actual situation can differ significantly from year to year.

Indicators used for water valuation

Three basic dimensions can be identified, which together cover most of the various aspects that constitute the value of water: the economic, social and environmental dimensions. For each of these dimensions, different value indicators were identified that matched the known valuation methods with access to data. Table 3 provides an overview of the indicators used. For some of these indicators, the relevant trends and dynamics have also been assessed, where appropriate and feasible.

TABLE 2
Seasonal water availability in the Mkoji subcatchment

	Wet-season uses				Dry-season uses			
	Upper	Middle	Lower	Total	Upper	Middle	Lower	Total
	(Mm³)							
Water use								
Agriculture (excluding rice)	10.8	12.3	19.4	42.5	7.5	4.9		12.4
Paddy rice		14.6	20.5	35.1				
Livestock MSC*	0.2	0.3	1.0	1.5	0.3	0.5	0.4	1.1
Migrated livestock*					0.1	0.3	2.0	2.4
Brick-making					0.1	0.1	0.0	0.2
Domestic	0.4	0.3	0.1	0.9	0.4	0.4	0.1	0.9
Natural vegetation	208.5	506.8	725.7	1 441.0	8.6	15.2	2.4	26.2
Total seasonal use	**219.9**	**534.3**	**766.7**	**1 521.0**	**17.0**	**21.4**	**4.9**	**43.2**
Total seasonal rainfall	**604.3**	**1 051.4**	**808.0**	**2 463.7**	**15.6**	**6.4**	**0.5**	**22.5**

* Livestock water-use figures here are related only to direct drinking needs. Hence, they do not reflect the true total water use.

TABLE 3
Overview of different value components in the project area

Economic values	Social values	Environmental values
Economic crop water productivity in different zones	Food security in different zones	Environmental base-flows
Economic value across water-using sectors	Access to drinking-water	Environmental changes
Income derived from water-related production activities	Conflicts over water	

Economic value of water

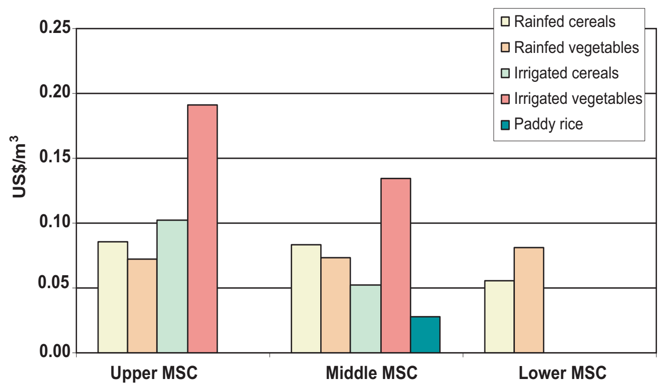
Economic crop water productivity in different zones

Insight in crop water productivity was deemed useful, as crop cultivation forms the main component of human-related water consumption in the MSC. Economic crop water productivity was assessed on the basis of reported yields and farmgate prices, combined with crop water requirements calculated using local data and FAO CROPWAT software. Figure 6 contains an overview of economic crop water productivity for the three zones in the MSC.

Generally, economic productivity decreases from upstream to downstream, with the exception of rainfed vegetables. This decline in economic productivity is explained by the climate conditions that are more favourable in the upstream parts of the MSC and the fact that irrigation modernization has been more widespread in the upper zone villages.

FIGURE 6

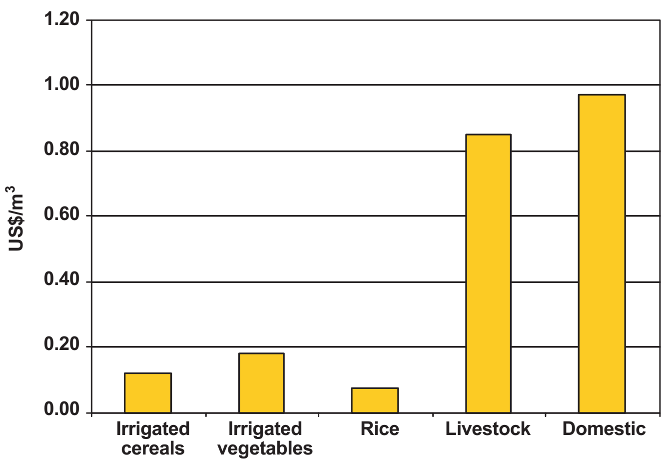
Economic crop water productivity in different zones of the Mkoji subcatchment



Note: US$1 = TSh1 030 for reference year 2003.

FIGURE 7

Economic water values for different sectors in the Mkoji subcatchment



Note: US$1 = TSh1 030 for reference year 2003.

Economic water values across water-using sectors

In addition to economic crop water productivity, economic values in other sectors were also assessed, using primarily household survey data. Livestock water productivity was assessed using reported annual income from livestock together with estimates of livestock water consumption using literature on tropical livestock-keeping. Domestic water productivity was assessed both through a simple variant of contingent valuation as well as observed market prices for commercially sold water. Figure 7 shows the results.

All the values shown in Figure 7 cover higher level estimates for all sectors as they refer to gross income. The values exclude estimates for production costs, the bulk of which would consist of labour costs for working the land, herding, fetching water and other activities. However, these labour costs are especially difficult to estimate for the rural economy of the MSC. Therefore, it was decided to omit production costs altogether in order to allow for at least comparable output in terms of water productivity based on gross income.

The high productivity value for domestic uses is commonly observed in cross-sectoral water productivity estimates (FAO, 2004). This may be explained by the fact that domestic uses are linked directly to human health and are relatively low in terms of volume. Nevertheless, the value shown is thought to indicate an upper limit, expressing a willingness to pay. The reported household income levels suggest that it will not be possible for most households to pay such prices for their domestic water all year round (see section on the social value of water for details on income levels). This indicates a discrepancy between the households' willingness to pay and their ability to pay.

The high value of livestock water productivity is explained by the high market value of cattle and the fact that the productivity estimates are based only on water withdrawal for direct consumption, excluding the water needed to produce the food for the cattle. The exact economic water productivity for livestock in agropastoral farming systems is difficult to estimate owing to the relations and overlaps between different water-using activities. Livestock consumes a considerable amount of water through the water embedded in its fodder, but simply accounting all this embedded water as livestock water consumption misses the point that livestock may graze on crop residues that would otherwise be lost. Complications are not confined to the MSC as cattle herds are taken outside the MSC in the dry season to graze in wildlife parks, where they compete for water with the wildlife. It also means that the migrated cattle import a considerable amount of "virtual" water from outside the subcatchment.

Dynamics in economic value

The economic value of water for crop production fluctuates based on the timing of planting and marketing the crops, owing to the impact of price volatility. For example, the price for rice fluctuates considerably during the year in direct relation to the quantity of produce offered on the market. Rice marketed early in the season (April/May) fetches a price that can be up to three times higher than the average price later in the season (July/August). This results in fierce competition for water early in the growing season.

Water to support livelihood activities

Table 4 summarizes the contribution of water-related activities to the income of average households. It shows that more than 90 percent of household incomes in the MSC depend on water as a critical input. However, poor households are more reliant on off-farm activities as sources of income than are the average households. This is probably because of their limited access to land and water resources. In fact, there seems to be a trend towards off-farm livelihood diversification by poor households in the MSC. In the lower zone, a shift away from cattle holding towards rainfed agriculture can be observed. As described in the section on livelihood strategies, this is caused by the diminishing seasonal floods during the wet season and the closing of the seasonal grazing land in the Usangu Plains.

Social value of water

Food security in different zones

The annual production of cereals in the MSC can be reviewed for its nutritional value in terms of energy and compared with the annual energy requirements, which are about 2 550 kcal/day or 0.9×10^6 kcal/year for an average active adult as based on body weights from a sample low-income country (Cameroon) (FAO, 1997). Although this is a very rough estimate and there are more requirements to a healthy and balanced diet, the results in Table 5 provide a first indication of the food security situation.

TABLE 4
Percentage of income derived from water-related production activities

	Irrigated agriculture	Intermed. agriculture (paddy)	Rainfed agriculture	Livestock-keeping	Total sum	Total for poor households
	(%)					
Upper Zone	45	0	44	1	90	50
Middle Zone	6	39	24	23	92	75
Lower Zone	0	9	19	69	96	92

Table 5 indicates that, on an annual basis, enough food is produced in the MSC to meet basic energy requirements, but that the margins are not very high, especially in the upper zone. Here, the food security situation seems precarious for a considerable part of the poor and very poor households that are below the average levels shown in the table, especially in view of the risks involved in maize storage and production.

TABLE 5
Food security in the Mkoji subcatchment

Output	Upper	Middle	Lower	Requirement
	(10^6 kcal/capita/year)			
Dry-season cereals	0.5	0.1	0	0.45
Wet-season cereals (including rice)	0.9	1.6	3.9	0.45
Total	1.4	1.7	3.9	0.9

Households in the middle and lower zones are almost entirely dependent on wet-season food production. This means that they have to bridge an important period using their wet-season harvests and non-agricultural livelihood strategies, but possibilities for this are currently limited. Using storage facilities or increasing access to markets may help to improve the food security situation and, thus, the social value of water here, even though at first sight these measures may seem to have little to do with water resources management from a narrower perspective.

Access to drinking-water

A special concern is the availability of domestic water in the lower zone in the dry season, when the water situation is critical and water availability is reduced to a level that makes it difficult to meet even basic household water needs. People from lower zone households often have to travel long distances to obtain drinking-water in the dry season. This seriously threatens the health of lower zone households and reduces the availability of human capital in the dry season.

Conflicts over water

Information about conflicts over water provides an indication of the social value associated with existing water management practices. Where many sever conflicts occur, this indicates that such practices contribute to social instability. Table 6 shows that water-related conflicts in the MSC occur in the dry season and at the onset of the wet season. The conflicts are concentrated in the middle zone, where conflicts among farmers competing for irrigation water are the most severe and may erupt in violent fights.

Environmental value of water

Environmental base-flows

Environmental base-flow requirements are regarded as the minimum flows to ensure sustainable river environments and flora and fauna. A specific environmental base-

TABLE 6
Water-related conflicts in different zones of the Mkoji subcatchment

	Upper zone	Middle zone	Lower zone
Typical conflicts	Upstream – downstream conflicts within and between irrigation schemes	Conflicts within and between irrigation schemes. Conflicts between irrigators and cattleholders	Conflicts among cattleholders over grazing lands. Conflicts of lower zone cattleholders with water users or authorities in other zones
Occurrence	In dry season	In dry season, and at the onset of the wet season (peak)	In dry season
Severity	Low - Usually solved informally or through irrigation committee	High - Several court cases reported, sometimes violent fights	High – mostly with middle zone over water and pasture; observed: a lack of local-level conflict resolution mechanisms

flow requirement could not be assessed for the MSC within the time, resource and information constraints of the current project. However, as the streams used to be perennial, it is safe to assert that at least a constant minimum flow is required in the MSC throughout the year. In the MSC, increased river abstractions in recent years have affected existing base-flows; in the lower zone, there is no water flow in the dry season. This indicates that the current practices have a negative value for sustaining the existing environment.

The lack of base-flows is also apparent further downstream of the MSC in the drying up of the Great Ruaha River. As mentioned above, this causes environmental and economic problems that receive a lot of attention at national level, where restoring the environmental base-flow for the Great Ruaha River has been given priority. As a consequence, pressure is put on upstream water users, including the MSC, to use less water. Moreover, measures have been taken to protect wildlife through the establishment of game reserves, which affects communities in the MSC directly.

Observed environmental changes

Another indication of the environmental value of existing water management practices comes from observed changes in the MSC ecosystems. Such changes are most noticeable in the lower zone, where an observed reduction in seasonal flooding allows for the reclamation of floodplains for agricultural purposes. Although this might be a positive development in a socio-economic sense, it also indicates that the current flow regimes are not sustaining the original ecosystems in the lower zone.

Insights obtained from disaggregated values

The different components that make up the value of water show results that may seem contradictory at first. A closer look into these apparent contradictions among the indicators generates useful insights, which may well have been missed if the indicators had been aggregated into one overall figure. For example, water for rice does not have a very high economic value compared with that for other crops. Nevertheless, the social value assessment shows that water for rice is one of the main sources of conflict in the subcatchment, indicating a high social value. Apparently, this high social value is explained by other factors that make rice a desirable crop, outside economic water productivity. An examination of the broader picture of rural livelihoods indicates that rice is preferred because it is a non-perishable crop that is relatively easy to market and provides a more reliable source of income regardless of its water needs.

Another observation is the shift from cattleholding to rainfed agriculture in the lower zone. Although the water used for cattle in the lower zone has a high economic value compared with rainfed agriculture, a shift away from cattleholding can be observed in the lower zone. This reflects political decisions to close off the outside wetlands for grazing, but also the distribution of water resources within the MSC, where all the little water available in the dry season is used in upstream parts. As a result, this economically highly valued water use is currently under threat in the MSC.

Identification of stakeholder alternatives for improved IWRM

In the focus group discussions and the final stakeholder workshop, the stakeholders identified several options for improved water resources management. They selected the most promising ones during the final stakeholder workshop, based on their assessment of the preliminary outcomes of the analysis offered to them by the project team. This process was supported by a structured approach, using problem trees and score cards to link the main water resources management problems to measures.

Options to address the value of water resources for economic production activities included: the construction of charco dams to store excess runoff and make it available for productive uses; and the training of farmers in on-farm water management techniques to promote water conservation and increase crop water productivity. The option of shifting to crops with lower water requirements was also identified.

The assessment of the social values associated with the current water resources management arrangements indicated the need for improvements, for example to reduce conflict and to ensure equal access to water resources for livelihood activities. Related to these social values, options were identified to increase fairness and equity and to ensure that water management practices would not lead to social instability. These included a review of the existing system of water rights allocation and management, as well as the continued formation of local WUAs throughout the MSC as a platform for dialogue and negotiation.

Furthermore, the valuation results also suggested the usefulness of options that at first sight do not seem directly related to water management but that nevertheless could be linked to the water valuation study as they could help farmers to generate more value per unit of water. These options included increasing farmers' access to storage facilities and low-cost farm inputs, such as agrochemicals, and supporting farmers' associations. In particular, rice producers associations that coordinate the joint marketing of rice may benefit the region. If farmers can agree on a system to share the benefits of coordinated marketing, they can increase their income and income stability as compared with the existing competitive model that is conflict-prone and adds social risk factors to the already significant natural risk factors.

All the stakeholders participating in the workshop were asked to identify the measures that were feasible for them to initiate and that they would commit themselves to. A distinction was made between short-term and long-term measures in order to ensure a balance between long-term sustainability and much needed short-term improvements. Most stakeholders were willing to commit themselves to the implementation or further exploration of some of these options, especially the construction of small dams and the provision of training at various levels.

POTENTIAL CONTRIBUTION TO STAKEHOLDER DECISION-MAKING

The valuation process included the use of participatory approaches, such as focus groups, discussions and participatory workshops, putting stakeholders' problems and values at the centre. This participatory approach contributed to the local water resources management process by facilitating communication among stakeholders, helping them to explicate and communicate the values that water resources represent to them. In this case, the valuation also pointed to possible room for flexibility and negotiation among stakeholders, for example by indicating the high economic value of downstream cattleholding, and by indicating the scope of organized rice marketing rather than individual conflict over irrigation water.

Nevertheless, the use of a participatory approach alone is not sufficient to ensure a contribution to decision-making by local stakeholders. For this, water valuation processes also have to take the institutional context into account. The results of the Mkoji case showed that the lack of well-functioning water management institutions was an important impediment to allowing stakeholders to manage water in a way that reflected its value. Especially for social values, related to the distribution of costs and benefits associated with water uses (and non-uses), well-functioning institutional structures are essential. In the MSC, institutions were only at the beginning of a long process of reform and development.

Therefore, an explicit effort was made in the MSC to link the water valuation to the work of public organizations that had a key role in the new institutional setup for water resources management: the Rufiji Basin Water Office, WUAs and the district authorities. This was done through involving them and through targeting some of the measures and recommendations at issues that fell under their particular mandates. For the Rufiji Basin Water Office, this meant in particular the question of water rights and the representation of local water users through WUAs and their catchment-level apex body. For the districts, this was done through generating input that could be taken up in the district agricultural development plans, which should be established on the basis of local input.

Through involving stakeholders throughout the MSC, the valuation process also supported the start of an organization process among those stakeholders that had previously not organized themselves to deal with water management issues. This was especially important for the lower zone pastoralists, to ensure that their voices would also be heard in the debate over water resources management in the MSC in addition to those of the better organized upstream farmers' communities. The solutions that resulted from the valuation process made very clear that a minimum level of local organization would be a precondition for the successful implementation for all of them.

In conclusion, there are ample indications that the valuation process followed in the MSC made a useful contribution to helping local stakeholders manage their water resources. The explicit identification and establishment of links with the existing institutions and planning processes are believed to be crucial and useful to ensuring that the valuation process is indeed linked to decision-making by local stakeholders. This is important not only in order to ensure an institutional anchorage of the valuation process and its outcomes, but also to support the development of new, and the functioning of existing, institutional structures by offering stakeholders a structured process for communicating and reflecting upon the different values involved in managing local water resources.

Chapter 4
Valuation for improved management of irrigation and fisheries in Sri Lanka

INTRODUCTION

Context of the valuation project

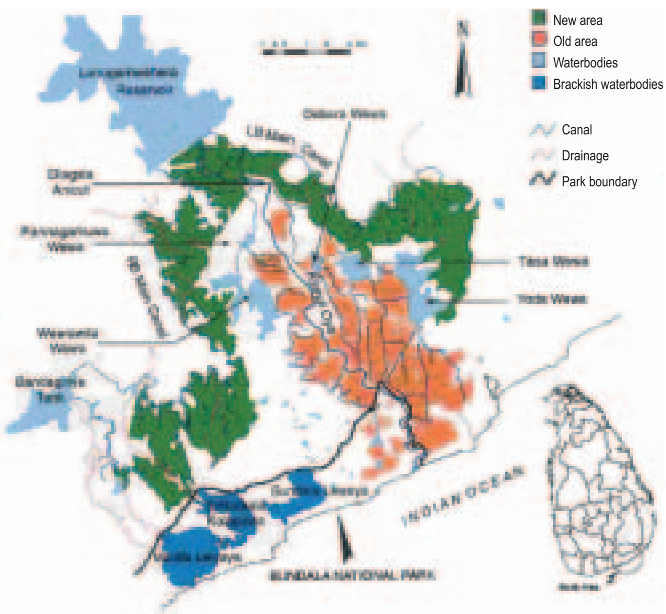
Fisheries are the exploitation of living aquatic resources (mainly fish but also invertebrates and some insects) held in some form of common or open access property regime (in contrast to aquaculture, which implies active husbandry and private ownership of stocks). This case concerns artisanal inland fisheries and refers to freshwater systems that include rivers, lakes and wetlands, as well as brackish lacustrine and estuarine systems. Such fisheries often contribute significantly to incomes and food security in rural areas. Although there are exceptions, the combination of open access and low costs can make fishing an important activity for poor people.

The development and operation of irrigation systems can have a range of impacts on fisheries. Changes in flow patterns, size and connectivity of aquatic habitats, and water quality can affect species diversity and productivity. Changes in the physical accessibility or rights of access to waterbodies can affect who is able to benefit from the resource and when. Healthy and productive fish stocks depend on particular quantities and seasonal timing of flows in rivers and into waterbodies. Thus, trade-offs can arise between the consumptive use of water for agriculture and the conservation or provision of non-polluted instream flows, or inflows to and resident volumes of waterbodies and wetlands (Nguyen Khoa and Smith, 2004). Although non-consumptive users of water (apart from incremental evaporation when retained specifically for a fishery), fisheries can thus preclude or constrain other water uses.

Although change is almost always detrimental to aquatic biodiversity, some water management actions can be neutral or beneficial for fishery production and livelihoods. For example, reservoirs, canals and drains can frequently compensate for aquatic habitat modification or loss by supporting productive fisheries, and loss of livelihoods in fishing may be compensated by improved opportunities in farm production or in farm and other labour markets. Thus, there is considerable complexity and a range of possible trade-offs and complementarities between irrigated farming and fisheries. There is potential for fisheries to coexist with irrigation systems, contributing to the overall productivity of water use, to the livelihoods and food security of rural communities, and to the sustainability of land and water management.

This case study explores the scope for achieving such aims for the Kirindi Oya Irrigation and Settlement Project (KOISP) in Sri Lanka, the approaches that may be needed, and the positive role that stakeholder valuation of competing water uses can play. It arises from work done to develop and test an approach to deal with the linkages between irrigation development and fisheries (Nguyen Khoa, Smith and Lorenzen, 2005a, 2005b). The KOISP was selected because important fisheries existed within the catchment but significant negative project impacts and competition for water between farming and fishing had not been mitigated or resolved. Secondary data on the project's performance and the fisheries were also available, and the logistics, scope and duration of the assessment matched the resources available.

FIGURE 8
Map of the Kirindi Oya watershed and the KOISP irrigation system



Source: Matsuno, van der Hoek and Ranawake, 1998.

Kirindi Oya Irrigation and Settlement Project

The KOISP is a major agricultural development project implemented from 1986 in the eastern part of Southern Province and the dry zone in Sri Lanka (Figure 8). The project rehabilitated and incorporated an older irrigation system into a cascading network consisting of a large headwater reservoir, five existing shallow reservoirs (known locally as tanks) and existing and new command areas. The tanks supplied an area of 4 200 ha, which was expanded by a further 5 400 ha, and a substantial population was encouraged to migrate and re-settle within this new command area. Drainage is via the Kirindi Oya River to the Indian Ocean, apart from the new right-bank command area, which extends into and drains from a neighbouring watershed into two coastal lagoons. The project was designed for a diversified cropping pattern but rice has been the main crop grown. As a result, the demand for irrigation water has been higher than expected and overall economic performance lower. Nonetheless, the project is considered to make an important contribution to the economy of Southern Province (IIMI, 1995).

Inland fishery production is almost entirely concentrated in the head reservoir, tanks and lagoons as the Kirindi Oya floodplain and irrigated rice fields of the command areas have an innately low production potential. This is the result of the relatively steep gradient of the river channel and of rainfall patterns that result in negligible or only short-term flooding and, thus, low natural water retention within the catchment. Thus, even in the pre-project situation, inland fisheries were the product of irrigation development in so far as they were confined mainly to the existing tanks. Exceptions to this are the lagoons. These have been a high-value fishery for shrimp and other species. However, they are vulnerable to overfishing although nominally protected by their recent designation within a national park and wildlife conservation zone (Nguyen Khoa, Smith and Lorenzen, 2005a, 2005b).

The main biophysical impacts of the KOISP that were negative for fisheries were the reduced productivity and biodiversity of the lagoon fisheries caused by drainage inflows that raised water levels and reduced salinity. In order to lower water levels, farmers also drained the lagoons to the sea more frequently, harming fishing by allowing the escape of shrimp and other stocks. Other negative impacts within the basin were the loss of floodplain habitat and small tanks inundated by the head reservoir, and reduced river flow and flooding below the dam. Although these areas were little used as a fishery prior to scheme development, this had an impact in terms of lost potential productivity and more significantly for biodiversity.

The main positive impacts of the project were the creation of a new fishery in the large head reservoir, and the retention of five large tanks as fisheries but with modified patterns of water inflow and release. The project evaluation report (IIMI, 1995) states that water levels in these tanks increased after construction of the head reservoir, but stakeholders complained of reduced water levels and interruptions to the pre-existing drainage inflows. A combination of recent droughts and increasing demand for irrigation had increased the frequency with which reservoir levels were drawn down to meet crop needs. In extreme cases, tanks had been drained completely. However, even at water depths of about 1.5 m or less, fish stocks declined under conditions of high density, given natural factors and overexploitation.

Thus, the main conflicts arising were between farming and fishing interests concerning the management of the reservoirs and lagoons. The key stakeholders were the local farmers and fishers, recognizing that some households engaged in both activities, particularly in villages located near to the reservoirs. The other important stakeholders were the national, provincial and district-level government agencies responsible for irrigation, water resources, agriculture, conservation, and inland and coastal fisheries. All faced the challenge of achieving more productive and sustainable use of land and water within the Kirindi Oya basin in the face of increasing demands for these resources. Stakeholder valuation and prioritization of alternative water uses had the potential to inform and improve decision-making and the implementation of management options.

WATER VALUATION APPROACH

Principles

The principles of environmental impact assessment (EIA) were adopted as a framework for the valuation approach for this case, with particular emphasis on the following aspects. First, the valuation needed to achieve holistic coverage that integrated types and sources of knowledge (expert, technician and stakeholder), disciplines (hydrology, fisheries, agronomy, engineering and socio-economics), sectoral and wider societal interests (fisheries, agriculture, employment, food security and living standards), and governmental priorities (local, regional and national).

Second, there needed to be genuine participation by stakeholders, defined as their active, creative and continuous contribution to the understanding of key issues and to decision-making – corresponding to "interactive participation" in the typology proposed by Pretty (1995). Among the known benefits of participation, capture of local knowledge and an understanding of the values and priorities of affected groups were particularly sought. The interests of fishers have been relatively neglected in the development of the KOISP, but an understanding of these was paramount in this exercise. Thus, particular emphasis was placed on gaining the participation of community representatives for both fishing and farming interests.

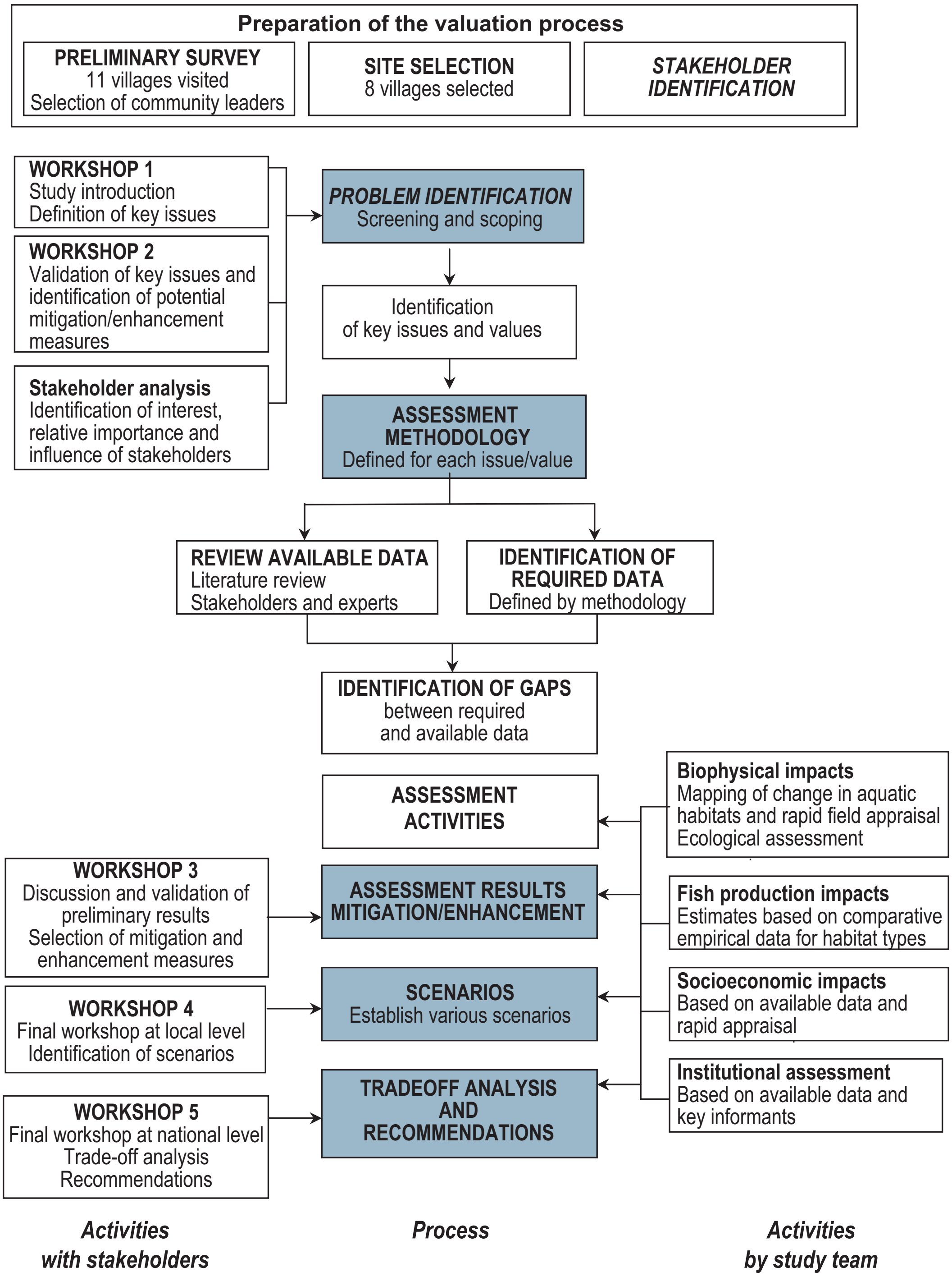
Third, the valuation needed to consist of a sequential process capable of progressing to decision-making and action, but within which learning was inherent. This recognized that the progress and outcomes of a valuation process should be monitored and evaluated continually, with iterative adaptation a necessary response to the inevitable complexity and uncertainty that arises. Not least, the study team needed to learn how best to facilitate participation and utilize the diverse knowledge and values of stakeholders. This also reflected the view that improvements in water resource management at a catchment level will generally need to be achieved through a dynamic process of change rather than as the outcome of a single point in time analysis and its recommendations.

Stages of the approach

Following conventional practice for EIA, the valuation approach involved sequential stages of preliminary assessment, screening, scoping, impact assessment and identification of mitigation or enhancement options (Figure 9). This would be followed by monitoring and evaluation of implementation of measures selected.

As illustrated in Figure 9, this process was implemented through a series of stakeholder workshops (Table 7 lists the participants). These were the principal

FIGURE 9
Stages of the valuation approach for fisheries in the Kirindi Oya catchment



fora for participation and facilitated interaction between experts, stakeholders and policymakers. They were interspersed with research activities including the collection and review of secondary information, consultation with key informants, and field surveys. A knowledge base was assembled by a multidisciplinary team of specialists (fisheries ecology and management, irrigation engineering and management, and rural development economics) and this was used to support the analyses conducted with stakeholders at the workshops.

TABLE 7
List of workshop participants and their respective affiliations

Stakeholder	Organization	Positions of participants
Villagers	8 villages	Community leaders
District level	3 divisional secretariats within the lower river basin	Divisional secretaries
	Irrigation Management Division	Project manager (KOISP)
	Fisheries	Assistant director & fisheries inspector
	Department of Agriculture	Assistant director
	Central Environment Authority	Environmental officers
	Coastal Conservation Department	Director of Coastal Resources Development Division
	Southern Development Authority	District director
	Farmer societies (2)*	Chairpersons
Provincial level	Department of Irrigation	Chief irrigation engineer (Southern)
	Department of Wildlife Conservation	Assistant director (Southern)
National level**	National Aquatic Resources Research Development Agency	Researchers
	National Aquaculture Development Authority	Extension officers
	University of Kelaniya	Researchers
	Water Resource Secretariat	Officer

* Farmer societies were not represented at the first workshop.
** Stakeholders from the national level doubled their representation at the final workshop.

The preliminary assessment of probable impacts on fisheries for the KOISP was paralleled by, and completed through, a stakeholder analysis. This analysis included initial determination of both likely impacts that affected the values of importance for different groups and the role or influence of those groups in relation to decision-making and management. The screening stage considered whether the possible impacts on fish production, livelihoods and biodiversity that had been identified justified further assessment. Given limited resources, it is never possible to investigate all possible impacts for all relevant values in detail, and the scoping stage refined the decision to proceed by defining the key issues to be addressed and depth of data collection and analysis needed for each.

Establishment of contact with and participation by all relevant stakeholder groups was also completed during this stage. Thus, the workshop at the scoping stage involved reaching agreement on the key issues, their mechanisms and their urgency, and on the locations and groups most affected. The following activities in the valuation process then focused on these key issues through comparison of the current "with project" situation with its reconstructed pre-project state. Such analysis led to identification of mitigation and enhancement measures specified in the form of management options that could be compared and appraised by workshop participants.

Data collection and analysis

Time and resource constraints and the economic scale of fisheries in the catchment determined that primary data collection could consist of small and narrowly focused rapid surveys only. Similarly, the valuation relied mainly on simple comparative analyses using existing secondary data and comparable data from other locations as much as possible.

Primary data collection consisted of the following activities. For the preliminary assessment, a reconnaissance survey of 11 villages selected to be spatially representative of relevant zones within the river basin assessed the nature and importance of fisheries at each site. These zones were upstream of the head reservoir, the vicinity of the reservoir itself, the floodplain and command areas downstream of the reservoir, the vicinity of the lagoons, and the river mouth. Eight villages were judged subsequently as representing adequately the fisheries of concern, and these provided stakeholder representatives and locations for more detailed investigation of impacts.

Key informant interviews were conducted in the eight villages. The respondent was a leader of the community and in most cases of the village fishing society. Information was collected about the fishery, village economy and local labour market. Attention focused on the proportion of households engaged in fishing and its relative importance compared with other employment. Ad hoc early morning interviews of fish traders and fishers were also conducted when fish catches were being returned to shore.

Five of the eight villages were identified as representative of the most important fisheries and project impacts. These covered the head reservoir and largest existing tanks (3 villages) and the coastal lagoons affected by drainage inflows (2 villages). In these villages, households for which fishing was a significant full-time or part-time activity were interviewed to provide more detail on the contributions of fishing to livelihoods and the impacts of both the irrigation scheme and a recent severe drought. Two poor, two middle-income and two rich households were interviewed in each village, with selection being based on a simple wealth ranking conducted with the key informant.

Secondary data sources included project evaluation reports, other relevant studies and locally available statistics. Information was also gained from key informants in the Division Secretariat and wildlife, fisheries and irrigation departments, and from their participation in workshops.

Analytically, a composite approach evolved that made selective use of a range of methods. Changes in aquatic habitats and their connectivity were assessed using standard topographic maps and participatory mapping exercises to compare the current and pre-project situations. Fisheries production estimates for the pre- and post-project habitats were derived from existing local survey data for the reservoir and lagoon fisheries. Comparable data from other Asian regions were used for the pre-project river floodplain and for flooded rice fields. All production estimates were cross-checked with consumption and market estimates and validated by presentation to stakeholders. Using a livelihoods framework (Smith, Nguyen Khoa and Lorenzen, 2005), the socio-economic analysis used data from the household interviews, stakeholder knowledge and secondary information to assess the resource endowments, vulnerability and livelihood strategies of affected households. Key factors in the policy and institutional environment and recent trends in these and the rural economy were also considered.

Four workshops were held in the project area, plus a final one conveniently accessible to the national capital (Figure 9). This was the minimum needed for the assessment of impacts, but further sessions were needed to complete the design and selection of mitigation and enhancement measures and to plan their implementation. All the workshops involved 20–25 participants representing the selected communities and agencies (Table 7). The exception to this was the final workshop, which lacked adequate national-level representation from the Irrigation Department despite its location. This highlighted the fact that participation from the highest levels of government can be difficult to include in such processes even though it may ultimately be essential for effective decision-making.

OVERVIEW OF MAIN OUTCOMES

Table 8 shows that the aggregate value of the waterbodies in the catchment was influenced positively by the KOISP project in terms of their potential to support fisheries. Catchment-scale production potential had increased by about 75 percent, although its monetary value had only increased by up to 35 percent because of the decline in the high-value lagoon fishery (for which output and value estimates are more uncertain). Table 8 shows that the impact of scheme construction had been to increase the aggregate production potential of fisheries in the catchment. However, it was found that scheme operation and water management were having a negative impact on the actual production of the pre-existing reservoirs and lagoons, particularly in drought

TABLE 8
Impact of the KOISP on production potential and monetary value of fisheries

Waterbody	Before KOISP			After KOISP		
	Catchment area (ha)	Production (tonnes/year)	Value (SLRs1 000)	Catchment area (ha)	Production (tonnes/year)	Value (SLRs1 000)
Floodplain	6 200	124	50	0	0	0
Lagoons	1 500	150	225	1 500	150	60
Head reservoir	0	0	0	3 200	1 344	538
Tanks	1 608	1 013	405	1 608	1 013	405
Small tanks	300	189	76	200	126	50
River	0	35	14		0	0
Total	9 608	1 511	769	6 508	2 633	1 053
Change				-3 100	1 122	284

Note: 1999 has been used as reference year with an exchange rate of US$1 = SLRs70.
Source: Nguyen-Khoa, Smith and Lorenzen, 2005a.

years. At the time of the study, actual production was much lower than that shown in Table 8. This emphasized the fact that conflicts over water resources in the reservoirs and lagoons were the main issues of concern to stakeholders, rather than the overall impacts of construction of the project itself.

An indication of the value of various waterbodies to support fisheries as a livelihood activity in various locations was obtained by assessing the number of households engaged in fishing full time and part time in different villages. Only 5–15 percent of households in villages near to the tanks and head reservoir fished these regularly (Table 9), but more than half of these were landless or marginal farming households for whom fishing was the primary source of livelihood. The remainder were both farmers and fishers, for whom fishing was an important supplementary source of food and income.

In villages near the coast, 7–30 percent of households had been regularly engaged in fishing from the lagoons (Table 9), with up to 400 households relying primarily on shrimp fishing in the early 1990s (IIMI, 1995). Fishing was the main source of income for 88 percent of all households that fished in that district, with farming and fish retailing as the main alternatives. In addition, some households engaged in fishing on a part-time basis, and many "non-fishing" households fished in the lagoon for their own consumption only. The average monthly income in 1996/97 for full-time lagoon fishing households was reported to be three times that of non-fishing households in the same area (Kularatne, 1999).

At the time of the study, fish stocks and catches in the tanks and lagoons had declined to a level at which fishing had become only a livelihood of last resort for those

TABLE 9
Value of fishing as a livelihood activity: proportion of households in surveyed villages engaged in fishing, 2002

Village	Location in catchment	Fishery	No. of households	No. of fisher households (full- and part-time)	% of households engaged in fishing
Ranawaranewewa	upper catchment	small tanks	196	15	8
Kudagama 1	new command area	new reservoir	240	15	6
Bandagiriya	old command area	ancient tank	1 500	200	15
Malakapupathana	old command area	ancient tank	282	17	6
Nadiganwila	banks of Kirindi Oya	ancient tanks and river downstream of reservoir	265	30*	11
Pallemalala	near coast	lagoon	350–388	102**	25
Udamalala	near coast	lagoon	435	30	7
Sippikulama	near coast	lagoon	450	140**	30

* Mainly opportunistic and "leisure" fishing in the river.
** Few fishing during prevailing drought.
Source: Nguyen-Khoa, Smith and Lorenzen, 2005b.

households with no alternatives. Given local population growth and unemployment rates, particularly among the landless second generation of scheme settler households, this had provided an important safety net but little relief from poverty. Alternative livelihoods among the landless and unemployed included firewood collection, shell mining and lime making, but these are environmentally damaging.

It was beyond the scope of the assessment to quantify accurately the value of water use in fisheries compared with farming, but the available data give some indications of the relative values. Overall, about 7 percent of households within the project area engaged in fishing as a regular activity, generating an estimated gross income from fishing of about US$1.4 million/year (expressed in 1999 values, with US$1 = SLRs70), 13 percent of the total income from farming and fishing in the scheme. Catches in the reservoir and lagoon fisheries before their decline generated returns to labour up to four times higher than did wage rates for farm labour (Table 10), with an even higher disparity in the case of the lagoon shrimp fishery. This provides further indications of a relatively high value of water use in fisheries.

In any case, such values only take account of the productive value of water use in farming or for fishing. The importance of stakeholder involvement was in allowing account to be taken of the wider societal values of these competing water uses. Although non-quantified in monetary terms, stakeholder valuation went beyond the consideration of only fish and farm production by taking account of the full range of productive, societal and environmental values that were relevant to the trade-offs between fishing and farming.

For example, the value of water use in fisheries for local livelihoods depends on the objectives of households that fish, the functions fishing performs in their livelihood strategies, their access to fisheries and their alternative livelihood opportunities. Valuation must look beyond incomes and consider the wider benefits provided by fishing as part of a diversified livelihood strategy. These benefits can include buffering against shocks, managing income risk, and smoothing consumption and labour use. Fish can also be valuable for nutrition, for cash income, for reciprocal exchange in social networks and simply recreation. The household interviews provided examples of such benefits, and stakeholder assessment provided an effective means to weigh the importance of these at reasonable cost.

Relatively less weight was given to environmental values in contrast to the fact that conventional EIAs tend to focus on issues of biodiversity and ecological integrity when considering fisheries. For the KOISP, irrigation development was deemed to increase the production potential of fisheries and related livelihood opportunities for the local population despite negative impacts on biodiversity and ecological integrity. Thus, for example, restoration of the river's natural flow patterns and lateral connectivity would help preserve original aquatic biodiversity. However, this was not a priority of local stakeholders and would be unlikely to yield significant productive and societal benefits.

The outcome of the process was that two principles received universal support from the participants. The first was that priority should be

TABLE 10
Estimates for income from fishing and alternative male employment

Employment	Income per day 1997 (SLRs)	Income per day 2002 (SLRs)
Tank/reservoir fishing	200–800	50–150
Lagoon fishing (fish)	200–800	Nil
Lagoon fishing (shrimp)	700–5000*	Nil
Fish retailing (freshwater only)	300–1000	100–200
Farm labour	145–180**	200–250
Construction sector:		
Colombo	185**	255
Locally	110–145**	150–200
Saltpan	160**	220

Notes:
Reference year is 1999 with exchange rate US$1 = SLRs70.
* Reported income range prior to decline of shrimp fishery.
** Inflation adjusted estimates for 1997 from 2002 figures (Colombo Consumers' Food Price Index, Department of Census and Statistics).
Source: Nguyen Khoa, Smith and Lorenzen, 2005b (from household interviews, village survey, February 2002).

given to the needs of the poorest sections of communities and that the livelihood contributions provided to them by the reservoir and lagoon fisheries should be restored and sustained if possible. The second was that it was both imperative and possible to improve water-use efficiency within the catchment in order to better meet the needs of both fishing and farming, the achieving of a more optimal allocation of water between these two uses being seen as having the potential to raise the aggregate benefits from water use in the scheme.

Stakeholders agreed that fishery interests should be considered in irrigation water management and suggested that fishers be represented at the seasonal planning meetings that determine irrigation allocations. It was recognized that further awareness creation and accompanying institutional measures would be required to support this initiative and to improve the planning and management of irrigation. Similarly, it was recognized that more empirical research is needed to develop improved management regimes for the reservoirs and lagoons. A set of scenarios capturing possible management options was developed with the workshop participants and initial selection of the most appropriate and feasible options was made based on the priorities and values of stakeholders. Through this process, a consensus emerged that a combination of improved and better integrated water management measures across the catchment was most likely to deliver preferred outcomes and a more equitable distribution of benefits from water use at a feasible cost.

POTENTIAL CONTRIBUTION TO STAKEHOLDER DECISION-MAKING

The role of stakeholder-oriented valuation

While valuation of the impacts of irrigation development on fisheries is important, the costs incurred for it must be reasonable in relation to the expected benefits. In this project, emphasis was placed on the judicious use of comparative empirical information and the understanding of mechanisms, within a process based on combined expert judgement, local knowledge and stakeholder participation. The aim was an integrated and holistic assessment of the relative values of alternative uses and management practices for water and of the processes of change that had affected these. Stakeholder valuation helped identify priorities and establish a consensus that the fisheries in the project area should be restored and sustained if possible, recognizing that at the very least this would require improvements in the efficiency of water management for irrigation.

Where the final stage of a stakeholder-driven approach is supported adequately by valid empirical analysis from expert input and includes government agencies responsible for decisions and their implementation, it can potentially function as a decision-making process. Depending on their scale and significance, recommendations may still be subject to final approval at ministerial or parliamentary level. However, where government endorses the process from the start, the reversal of recommendations emerging from a stakeholder analysis should be an exception rather than the norm. More commonly, and as was the case here, stakeholder valuation will serve to better support and inform decision-making by the responsible authorities. Compared with a narrow technical assessment alone, the results and management recommendations arising from this study were well adapted to site-specific conditions and issues, and reflective of both scientific rationales and societal choices. The key conflicts of interest were identified and means to resolve them explored.

A specific orientation on the values and needs of the stakeholders played an important role at each stage of the process. During the preliminary assessment, the perceptions of the diverse stakeholders (Table 7) ensured that a holistic and comprehensive list of issues of concern was generated. The screening and scoping stages narrowed this list progressively and established consensus on priorities. For example, pollution of tanks and lagoons by agrochemicals was considered a future potential threat but not a critical issue at the time of the assessment. Ultimately, there was agreement that attention should focus on the following issues:

- declining dry-season water retention in the reservoirs;
- inflow of drainage water into the lagoons;
- conflicts between fishers and farmers over the management of the reservoirs and lagoons;
- weak linkages between fishery institutions and irrigation institutions;
- reduction in river flow and floodplain habitat.

This selection was contingent on the values and priorities of stakeholders, and technical specialists working alone would have determined priorities differently. For example, fisheries experts initially prioritized the potential biodiversity and productivity losses resulting from reduced river flow and floodplain habitat, whereas local stakeholders were most concerned with the negative impacts for livelihoods arising from reduced fish production in the pre-existing reservoirs and lagoons. Investigation of the former confirmed that the river floodplain was not an important fishery, while the latter were unanticipated impacts of the scheme's modes of operation and water management rather than its construction.

Stakeholders had less interest in a scientific evaluation of what the impacts of project construction had been but wanted to address problems constraining more productive and sustainable use of water resources. They focused on the competing values of alternative water uses as encapsulated in the following questions:

- Were fisheries of sufficient value to justify water retention in reservoirs and consequent loss of irrigated area and/or crop yield?
- Could negative impacts on the lagoons be mitigated at an acceptable cost?
- Could the livelihood opportunities provided by both irrigated farming and fishing be sustained and enhanced?

Thus, the need to resolve conflicts between fishing and farming interests and to address institutional factors that determined patterns of resource use and the interventions of the relevant government agencies was paramount. Conflicts of interest were identified that initially appeared irreconcilable. However, the stakeholder process through which they were investigated and analysed demonstrated the potential to evolve solutions. It was notable that the needs of fishers gained weight in this process compared with the prior situation. Simply initiating or improving the representation of fishers in negotiations with farmers and other water users was useful to correct past sources of bias and neglect. This showed how stakeholder-oriented valuation can provide the means to discover and compare competing perspectives and to empower those otherwise neglected.

Stakeholder involvement was a prerequisite in this case for a valuation that was genuinely holistic and inclusive. Although aggregate net impacts on potential fishery productivity were positive for the KOISP, stakeholder involvement from different communities and the use of multiple valuation criteria prompted an assessment of impacts that was disaggregated spatially across the catchment and by socio-economic group; for example, assessment for both reservoir and lagoon fishers (Nguyen Khoa, Smith and Lorenzen, 2005a and 2005b). In turn, this led to further identification of opportunities for the mitigation of negative impacts and the enhancement of positive ones.

The results of the study were also action-oriented and practical. Here again, stakeholder involvement was a prerequisite as it was inherent in the process that the valuation moved beyond a point-in-time evaluation of project impacts to the development of options for improved water management. At first, the remedial measures proposed by stakeholders tended to lack creativity with a tendency to focus on engineering measures to divert drainage flows or drain the lagoons that had already proved unsuccessful or would be too costly for implementation. Then, as understanding and consensus grew, there was innovation in recognition of the potential benefits of integrated combinations of measures, addressing interacting effects that might otherwise impede effectiveness, and improving the institutions central to water, land and fisheries management.

The action-orientation of the approach meant that identification of "institutional uptake pathways" was part of the process, and this helped to ensure the relevance of the outcomes. For example, it was identified that there were current opportunities to address the lack of linkages between fisheries and irrigation management by emphasizing this in the national IWRM policy that was under preparation. Similarly, awareness of the socio-economic importance of fisheries was raised among national-level policy-makers. For example, a member of the Water Resource Secretariat requested guidance on how better to address fisheries for the purposes of improving water management policy. Strong interest in continued use of the approach was demonstrated by the reactions of workshop participants and responses to workshop evaluation questionnaires (Nguyen Khoa, Smith and Lorenzen, 2005a).

Representation from diverse stakeholder groups, i.e. communities, researchers and government agencies, was necessary not just from the stand-point of ownership and equity issues, but also because knowledge and perception of impacts differs between groups. There is a risk that stakeholders will introduce a bias or misinformation. However, combining technical expertise with knowledge from stakeholder groups can minimize this and ensure adequate and objective coverage of issues. This combination of expert analysis and local knowledge was a major strength of the approach. Despite this, uncertainty inevitably remains inherent in the prediction or evaluation of complex and variable phenomena that involve interactions between biophysical, economic and social systems. Stakeholder-oriented valuation can provide a useful first stage in the identification and prioritization of key processes and issues, and appropriate use of sensitivity analysis can be helpful where there is uncertainty. Where resources are available, more rigorous valuation studies to quantify the trade-offs between fishing and farming could then be well targeted before decisions are made. However, unless the objective of sustaining fisheries were to be reversed, it would be more important to proceed with an iterative and adaptive approach to system improvements, one well informed by monitoring and selective valuation studies where appropriate.

Outcomes and conclusions

The key results of this project of relevance to the management of the KOISP were:

- the identification of the main processes causing degradation of fisheries;
- an assessment of the number, location and vulnerability status of fishing households affected negatively by the operational conflicts between irrigated farming and fishing;
- an assessment of the severity of these impacts in terms of lost income relative to returns to labour in alternative livelihoods.

It was important to broaden the scope of valuation, and improvements in water management across the Kirindi Oya catchment were identified to have the potential to deliver a range of productive, societal and environmental benefits. For example, fisheries can be restored in reservoirs where savings can be made in the water needs of farming. Similarly, although more research is needed on their ecology to prevent overfishing and protect wildlife, the lagoon fisheries can be restored through improved management of drainage flows and lagoon water levels. Restoration of these fisheries would bring a range of economic and social benefits to local people, particularly to poor households currently marginalized in relation to irrigated farming and other employment opportunities. Stakeholder valuation contributed to the determination of these results and the prioritization of response measures.

Chapter 5
Valuation of aquatic resource use at the Stoeng Treng Ramsar site, Cambodia

INTRODUCTION

Context of the valuation project

Wetlands in Cambodia are vital to the livelihoods of millions of Cambodians, and particularly the food security of many of the rural poor. There are many stakeholders involved in the management of these precious resources. They include government agencies across different sectors and at different levels, private businesses, international and local NGOs, and the local communities whose livelihoods depend on wetland resources. However, in Cambodia, there are a number of barriers to effective wetlands management. These include:

- lack of coordination between different sectoral approaches;
- weak policy frameworks and unsupportive economic environments;
- inadequate information base on which to base wetland policy, planning and management decisions;
- inadequate human and technical resources;
- lack of options for resource use by local communities.

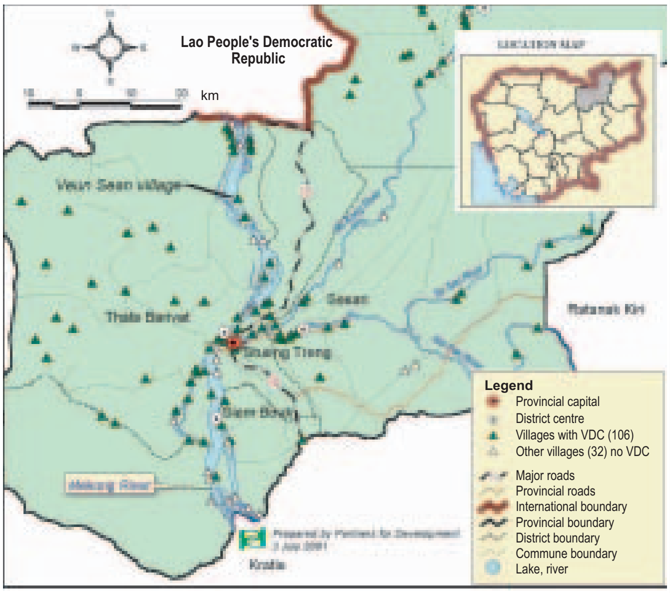
The Mekong Wetlands Biodiversity Conservation and Sustainable Use Programme (MWBP) is a partnership between the four governments of the Lower Mekong (Cambodia, Lao People's Democratic Republic, Thailand and Viet Nam) implemented through the United Nations Development Programme (UNDP), World Conservation Union (IUCN) and the Mekong River Commission (MRC), supported by the Global Environment Facility (GEF). The MWBP aims to overcome the barriers described above by promoting an integrated cooperative approach to wetlands management at regional, national and local levels. To this end, it is working with national and local stakeholders to develop wetland planning and management mechanisms.

A key aspect of the MWBP is the application of valuation tools and techniques to support wetlands management for poverty alleviation outcomes at four demonstration sites. An essential first step is to understand the *in situ* value of water in wetlands to provide ecosystem goods and services to local communities. This chapter describes a participatory valuation study carried out between August 2004 and January 2005 at the Stoeng Treng Ramsar site in Cambodia, one of the four demonstration sites. The study aimed to provide guidance for the use of valuation methodologies to support wetlands management for poverty alleviation outcomes. In particular, it aimed to examine how community-based forms of water resources management could strengthen wetland conservation and sustainable development in Veun Sean, a small village in the Stoeng Treng Ramsar site. More details can be found in the report by Chong (2005).

The Stoeng Treng Ramsar site

The Stoeng Treng Ramsar site covers about 14 600 ha and extends 37 km along the Mekong River, from 5 km north of the town of Stoeng Treng to the Lao border. It is characterized by rocky streams, small islands, sandy inlets, deep pools and seasonally inundated riverine forests. The wetlands contain important habitats for several globally threatened species.

FIGURE 10
Location map of the Stoeng Treng Ramsar site



The village of Veun Sean is located in O'Svay Commune, Thala Borivat District, about 20 km from the Lao border (Figure 10). With 36 households and a population of about 150 people, Veun Sean is the smallest village in the Ramsar site. The village households are situated on the island of Khorn Hang although the location of land-use practices such as cultivation, non-timber forest products (NTFPs) collection and wildlife hunting extends beyond the island to the mainland. Veun Sean is relatively poor in built and human capital – there is only one well, no electricity, no latrines and poor access to health services. Almost three-quarters of the people from Veun Sean cannot read or write.

For the 150 people living in Veun Sean and the 12 000 people living in the Stoeng Treng Ramsar site, wetlands are a precious source of fish, aquatic animals, waterbirds and building materials. For many communities, the wetland is a vital source of water for consumption and washing, and the waterways are an essential means of transportation. The deep pools and flooded forests also provide dry-season refuges and spawning habitats for many important species of fish that migrate throughout the Lower Mekong system, e.g. the critically endangered giant catfish (*Pangasianodon Gigas*).

The resources of the wetland fisheries are particularly important for the largely agrarian, subsistence households in Veun Sean. However, there is evidence of declines in fisheries resources at the Stoeng Treng Ramsar site. Assessments conducted by Partners for Development (PfD) and the Culture and Environment Preservation Association (CEPA) in 2000 and 2002, respectively, explored the trends in and causes of natural resource declines in Veun Sean. The declines in fisheries, forest and wildlife resources since 1975 reflect the general pressures on such resources in the region.

Community wetland and fisheries management: the main stakeholders

In Cambodia, partly in response to declining natural resources, various forms of community-based natural resource management have been established. By 2002, there were 162 community fishery sites and 237 community forestry sites in Cambodia (McKenney and Prom, 2002). Moreover, as Marshke (2003) noted, "a policy environment, albeit disjointed, is being developed to support some forms of community involvement in resource management." The different community-based management approaches in Cambodia tend to have similar characteristics:

- Governments or NGOs provide support to communities to establish physically demarcated management areas and plans.
- Rules and regulations are established that apply to members of the community management association.
- Resource management committees are elected to guide community-based management initiatives.
- Community-based natural resource management requires approval from some government level (e.g. a provincial governor or national line agency).

TABLE 11
Community fisheries management: summary of key actors

Actor	Description
Villagers	Depend on the fisheries resource for food and income. Fisheries provide food security when the staple crop, rice, is threatened. Some are reported to be involved in illegal fishing, or have been forced to sell to commercial fish-buyers at reduced prices.
Community Fisheries Committee	Receives training from the CEPA and is charged with communicating to and encouraging the villagers to maintain the fisheries resource. First in reporting line when a villager sights illegal fishing.
Culture and Environment Preservation Association (CEPA)	Cambodia-based NGO that supports community fisheries management in villages within the site.
Provincial Fisheries Office (PFO)	Has the legal authority to detail fishers accused of conducting illegal activities. Reportedly underresourced. Some provincial fisheries officers reportedly conduct unregulated fee extraction from fishers near Stoeng Treng throughout the year.
Department of Environment (DOE)	Pending enabling legislation, the DOE (and not the PFO) has responsibility over the management of resources, including community fisheries, within the site. In practice, the PFO has greater influence than the DOE.
Ramsar Rangers	Within the site, DOE Ramsar Rangers have the authority to detain individuals accused of conducting illegal activities, including illegal fishing. In practice, the Ramsar Rangers lack training and equipment, and their pay is often delayed.
Provincial governor	As the fisheries law and subdecree have not been passed yet, the support of a provincial governor can influence the extent to which line agencies support community fisheries.
Commune Council	Can report to the police if illegal fishing is sighted. Also involved with planning and prioritization of village-level projects, and the negotiation with line departments and NGOs to support these projects.

The term "community fishery management" was introduced officially into the fisheries policy dialogue in October 2000, when fishery policy reforms commenced under Prime Minister Hun Sen. One of the main stated objectives of government fishery reform is to improve food security and reduce poverty among locally-dependent fishers. The main elements of the reforms included:

- release of 56 percent of fishing lots to "community fisheries";
- elimination of tax on middle-scale fisheries;
- drafting of a community fisheries subdecree, which is intended to provide a framework within which community fisheries can be established.

Private fishing lots have never been officially established in Stoeng Treng province (although illegal licensing has occurred), reflecting the recognized importance of the region as a spawning ground for many fish species. Nevertheless, many of the broader issues and policy impacts that affect community fisheries throughout Cambodia are also relevant to areas in Stoeng Treng. They include a lack of knowledge or clear specification of roles and responsibilities of government officials at various levels, and a lack of political or legal recognition of community fisheries.

The community fisheries subdecree is a key piece of legislation that could potentially support community-based fishery management through defining the role, responsibilities and relationships between villagers, NGOs and government agencies involved with the management of the resource (Table 11).

WATER VALUATION APPROACH

Combining conventional economic valuation with participatory rural appraisal

In the Stoeng Treng Ramsar site, there are a number of constraints that, while not necessarily unique to the area, could in combination restrict the extent to which value assessments can influence wetland management. In particular, power relations determine how resources are used and managed. The Cambodian system is characterized by unofficial fee collection, a lack of trust in government agencies, and social displacement among its people. There is some evidence that planning processes are hampered by a lack of cooperation between government agencies, NGOs and communities. Furthermore, there is a lack of scientific information and human capacity to apply to the management of natural resources.

These legal, physical, institutional and social barriers might limit the short-term influence of information on the value of aquatic resources. However, there exist urgent opportunities for EIAs to contribute to the dialogue between stakeholders and to have real, if longer-term, influence on wetland and fisheries management. Such assessments can help in managing wetland resources by improving understanding of what drives people's resource-use decisions – and why, and to what extent, wetlands are valuable to local communities. However, some economic assessments place emphasis on calculating the quantitative value of a resource. Although information about monetary values can have a powerful influence in promoting resource conservation, a deeper understanding of the nature of wetland values is required for effective planning and management. In particular:

- How are wetlands important in terms of people's livelihoods, food security and health?
- How are wetlands essential in helping communities cope with external shocks and stresses?
- Who benefits most from the wetlands? Who is most vulnerable to the loss of wetland resources, and why?

Conventional techniques for gathering socio-economic data or assessing the value of wetland resources often rely on the household survey. The household survey commonly applied in economic assessments has a number of potential drawbacks. For example, surveys are often lengthy and complicated, causing interviewees to become fatigued, while the concepts and questions used often reflect the perceptions of the researchers rather than the reality of the respondents.

One way to overcome some of these problems is to combine conventional survey techniques with more flexible PRA methods. These methods evolved in response to the need for practical research and planning approaches that could support more decentralized planning and local-level participation in decision-making (IIED, 1997). Participatory techniques vary in the extent to which they are truly participatory. Generally defined, RRA methods focus on applying participatory methods to gain information while minimizing biases. PRAs tend to have greater emphasis on sharing knowledge and processes at the local level, and they tend to be much longer and open-ended processes.

For this reason, the study went beyond quantitative assessment in order to understand the context in which resource-use decisions are made – and the linkages between poverty and the importance of wetland resources. It employed village-level valuation techniques to conduct livelihoods assessment in Veun Sean. In consultation with stakeholders, the constraints and opportunities for using valuation in key planning processes were identified. Reflecting the particular importance of fisheries resources to livelihoods, community fisheries management was identified as a key wetland management process. However, this study was not restricted to the fisheries resource as fisheries form an integrated component both of wetland resources and of village and household livelihoods. Therefore, the study considered the spectrum of processes that affect the use and management of wetlands (including fisheries).

Overview of methods used for participatory water valuation

A participatory approach to valuation was used in order to enable villagers in Veun Sean to define and describe wetland values within the context of their own perceptions, needs and priorities rather than categories imposed by the researchers. The following

TABLE 12
Participatory valuation methods used

Activity	Groups	Outputs
Resource mapping	mixed	Households mapped Resources and infrastructure mapped Resource uses and key activities discussed
Flow diagram river and wetland uses and benefit flows	mixed	Benefits from wetlands Food resources Market linkages Sources of income and expenditure
Semi-structured interviews		Various
Wealth ranking	mixed	Villagers' perceptions of wealth Households categorized
Web diagram social networks stakeholders	gender	External organizations identified Social networks within village Villagers' perceptions of the importance of agencies Stakeholders in wetland resources
Seasonal calendar activities	gender	Key labour activities identified Relative labour efforts identified, across seasons and for different activities
Relative ratings wetland values household problems	mixed	Wetland values ranked Household problems and underlying causes Dependency on wetland resources
Food resources income expenditure	wealth	Drivers of wetland resource use Relative ranking of values
Household surveys		Fish catch, consumption, purchase and sale quantified Fish prices and market linkages identified Household problems and underlying causes identified Perceptions and participation in community fisheries management

methodology was applied in order to analyse the value of wetland resources to the village:

1. Identify different wetland resource values through PRA group activities (resource flow diagram and the relative rating of wetland values).
2. Design and apply a household survey that includes collection of quantitative information about the fisheries resource (which had been identified throughout group activities as an important resource).
3. Estimate the monetary value of the fisheries resource.
4. Compare the relative ratings of other components of the wetland resource to the fisheries resource, to estimate the monetary value of other wetland resources.

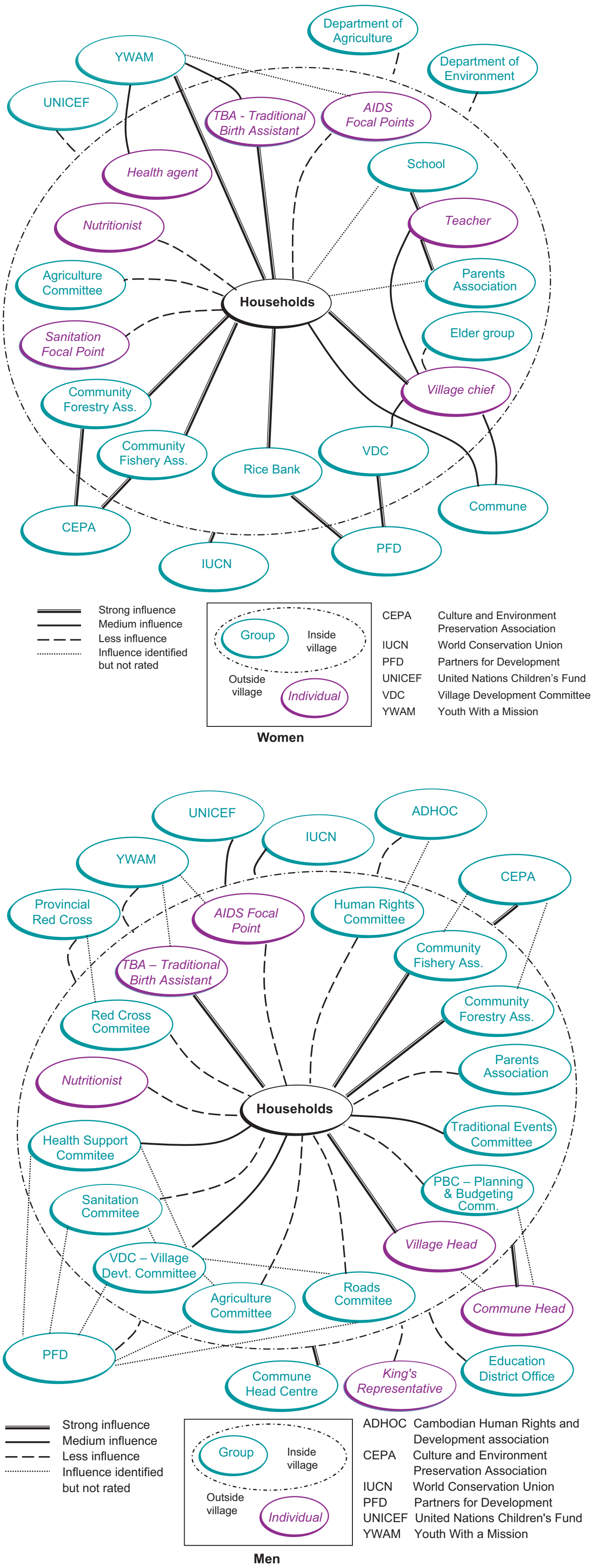
The assessment team, which varied between three and five members, conducted the activities outlined below. The outputs of many of the activities listed in Table 12 do not necessarily relate directly to calculating the monetary value of the wetlands and fisheries resource. Understanding the linkages between households, stakeholders and the resources is vital to the evaluation of why the wetland resources are important to the village and, ultimately, to assess whether there is potential for valuation techniques to be used in planning processes affecting wetlands in the Stoeng Treng Ramsar site.

OVERVIEW OF MAIN OUTCOMES

Resource mapping

The resource mapping activity encouraged participants to draw and discuss their village and the location and use of resources. The resource map is an effective tool for gaining an understanding of the spatial distribution of wetland resources. It is also an interactive activity that can be a good "ice-breaker" between communities and researchers. The resource map of Veun Sean village identified deep pools as important fishing grounds, and areas of cultivation and hunting some distance from the village.

FIGURE 11
Web diagrams for Stoeng Treng



Web diagrams of social networks

The web diagram was applied in order to identify the stakeholders in the wetland resource, and to explore social networks within the village, the relationships between villagers and external organizations, and the extent to which different individuals, institutions and organizations have an influence on their lives.

In this activity, separate groups of men and women were invited to identify institutions, which were illustrated on paper circles. Institutions from within the village were placed inside a large circle, and external institutions were placed outside the circle. Lines were then drawn between different institutions in order to describe the strength of influence between these organizations (Figure 11).

Flow diagram of wetland values

The flow diagram activity invited participants to describe the values derived from the wetland resource, and to discuss why these aspects of wetlands are valuable. The wetland was represented by drawing the Mekong River with flooded forests in the centre of a sheet. An arrow was drawn from the wetland to a fish to illustrate a wetland use. The group then identified and described various benefit flows and market linkages, including: fishing, fish spawning, waterbird hunting, water for cooking and drinking, irrigating cash crops, and transport. The group agreed that fish, a valuable source of nutrition and income, was the "most important" wetland resource.

Seasonal calendar of activities

The purpose of the seasonal calendar was to identify key activities conducted by men and women, and to broadly assess differences in time and effort spent between activities and across seasons. Each group was invited to identify the main activities they conducted. These were then rated

TABLE 13
Seasonal calendar of activities for men's group, Stoeng Treng

Men's group	**Season**		
Activities	**Wet**	**Cold**	**Hot**
Rice-growing	❍❍❍❍❍❍❍❍❍❍	❍❍❍❍❍❍❍❍❍❍	❍❍
Fishing	❍❍❍❍❍	❍❍❍❍❍❍❍	❍❍❍❍❍❍❍❍❍❍
Cropping – bean, corn, others	❍❍❍❍❍❍❍	❍❍❍❍❍❍❍❍❍❍	❍❍❍❍❍
Hunting wildlife from forest – snake, turtle, rabbit and deer	❍❍❍❍❍❍❍	❍❍❍	❍❍❍❍❍❍❍❍❍❍
Cogon grass harvest and weaving	❍	❍❍❍❍❍❍❍❍❍❍	❍❍❍❍❍
Collecting resin (NTFP)	❍	❍❍❍❍❍	❍❍❍❍❍❍❍
Collecting rattan, bamboo, vines for fishing gear	❍❍❍❍❍	❍❍❍	❍❍❍❍❍❍❍❍
Drinking wine – during ceremonies	❍❍❍	❍❍❍❍❍	❍❍❍❍❍❍❍❍❍❍
Collecting traditional medicines	❍❍❍❍❍	❍❍❍❍❍	❍❍❍❍❍
Collecting timber, bamboo and rattan for house construction	❍❍❍	❍❍❍❍❍	❍❍❍❍❍❍❍❍❍❍
Boat-making and repair	❍❍❍❍❍	❍❍❍	❍❍❍❍❍❍❍❍❍❍
Caring for children	❍❍❍❍❍	❍❍❍❍❍	❍
Travelling to market	❍❍❍❍	❍❍❍❍❍	❍❍❍❍❍❍❍❍❍❍
Overall	❍❍❍❍❍❍❍❍❍❍	❍❍❍❍❍❍❍❍❍	❍❍❍❍❍

TABLE 14
Seasonal calendar of activities for women's group, Stoeng Treng

Women's Group	**Season**		
Activities	**Wet**	**Cold**	**Hot**
Upland rice cultivation	❍❍❍❍❍❍❍		
Lowland (paddy) rice cultivation	❍❍❍❍❍❍❍❍❍		
Vegetable planting		❍❍❍❍❍	
Livestock raising	❍❍❍	❍❍❍❍❍	❍❍❍❍❍❍❍❍
Collecting water	❍❍	❍❍❍❍❍❍	❍❍❍❍❍❍❍❍❍❍
Collecting fuelwood	❍❍❍❍❍❍	❍❍❍	❍❍
Cooking and washing	❍❍❍❍❍❍	❍❍❍❍❍❍	❍❍❍❍❍❍
Caring for children	❍❍❍❍❍❍	❍❍❍❍❍❍	❍❍❍❍❍❍
Lowland rice harvest		❍❍❍❍❍❍❍❍	
Upland rice harvest	❍❍❍❍❍❍❍❍❍		
Cogon grass harvest and weaving		❍❍❍❍❍❍❍❍	
Harvesting vegetables			❍❍❍❍❍❍❍❍❍
Planting tobacco		❍❍❍❍❍	
Collecting tobacco			❍❍❍❍❍❍
Overall	❍❍❍❍❍❍❍❍❍❍	❍❍❍❍❍❍❍	❍❍❍❍❍

across seasons – wet, dry cold, and dry hot – using piles of 1–10 beans (Tables 13 and 14). It was evident that the key factor influencing the timing of activities across the seasons is rice-growing, which is driven by seasonal differences in weather. The wet season, when most rice cultivation occurs, is the busiest time of year for both men and women.

Wealth ranking

Wealth ranking was conducted in order to gain an understanding of villagers' perceptions of wealth characteristics and to provide information so that further activities could assess the linkages between wetland resources and poverty. A group of six individuals (three men and three women) were selected with assistance from the village chief. The group discussed the different characteristics of different "wealth groups", and then categorized individual households.

A measure of wealth identified consistently by all members of the group was a household's ability to grow sufficient rice to meet the needs of the family throughout

TABLE 15
Wealth ranking for Stoeng Treng

Rich	Medium	Poor	Very poor
Motorboat	Motorboat	Rowboat	Small cottage
Rice mill	Medium house with tin roof	Small house with grass roof	Small or no paddy fields
Television	Buffalo (2–3)	Buffalo (1)	Small chamkar, some left fallow
Many buffalo	Less paddy fields than rich households	Fewer paddy fields than medium households	Sickness
Many paddy fields	Rice shortage for 6 months	Rice shortage for 9 months	Many children
Large house with tin roof	Pigs (1–2)	Chicken and ducks (2–3)	Rice shortage for 10 months
Always enough food	Chicken and ducks (3–4)	Small chamkar fields, some left fallow	Work as labourer on others' land
Many pigs (5)	Chamkar fields (1–2)	Borrow rice from relatives or rice bank, or buy rice from others	Fish and hunt to earn money to buy rice
Many ducks and chicken	No debt	No knowledge or skills	Chicken and ducks (2–3)
Enough rice to sell	Some skills		No knowledge or skills
No debt			Widowed
Many chamkar fields			Disabled
Knowledge and skills			
4 households	14 households	10 households	8 households

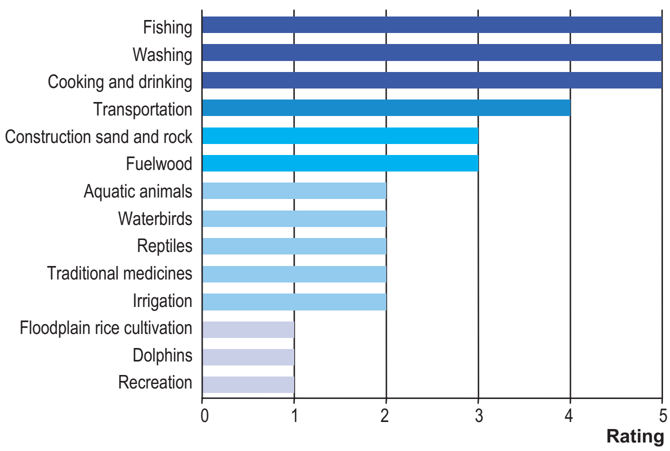
the year (Table 15). Rich families were identified as growing sufficient or excess rice, medium families as facing "rice shortage" for six months, and poor and very poor families for nine or ten months. Rice shortages are widespread and faced by the majority of households. During this activity, the group noted that, in response to rice shortages, poorer households generated income to purchase rice by selling fish and wildlife.

Relative ratings

The rating exercises were linked directly to demonstrating relative values of the wetlands and fisheries resources. The approach undertaken reflected the experiences drawn from previous activities. Ratings were conducted using piles of one to five beans.

Wetland values were first identified in the wetland resource flows diagram. A variety of wetland values were identified. Many of these values represented consumptive use of wetland resources, e.g. fishing, traditional medicines and wildlife. Other values related specifically to consumptive or non-consumptive uses of water, e.g. drinking, washing, irrigation and transportation. The results in Figure 12 show that the group unanimously rated fish as "five", representing the highest level of relative importance.

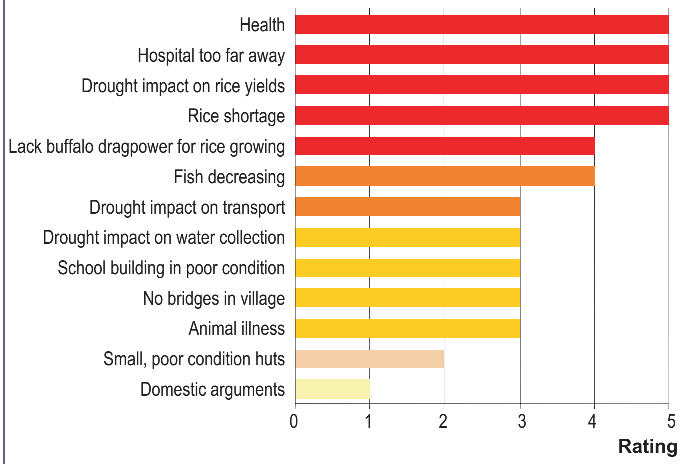
FIGURE 12
Relative ranking of wetland values for Stoeng Treng



The results from ratings of food sources suggest that, in Veun Sean, the types of food consumed are not related strongly to the level of poverty. Independently of the level of wealth, most people noted that rice was a staple and that fresh fish and prahoc (preserved fish) were also very important. However, a key difference is that poorer households suggested that aquatic animals were an important source of food because they were readily available the entire year, whereas wealthier groups could choose not to consume aquatic animals.

Ratings of sources of income revealed that poorer households have fewer options for generating income although it appears that they may be more dependent on generating income to purchase the staple food, rice. Fish (mostly sold to intermediaries) and cash crops are relatively important income sources for all households.

FIGURE 13
Household problems in Stoeng Treng



Problem discussion

The problem discussion activity was a combination of rating and linkage exercises. The aim of the activity was to identify some of the key problems facing households, the underlying causes of these problems, and the ways households respond. The two main types of problems related to health and rice sufficiency (Figure 13). Lack of access to a hospital was described as a major factor contributing to health problems. The impact of recent droughts and the lack of buffalo to prepare land were described as major underlying causes of rice shortage. Declining fish stocks were also identified as a significant problem.

The problem discussion confirms the importance of rice-growing that emerged from the seasonal activity calendars and the wealth ranking. This indicates that the livelihoods of the Veun Sean villagers are built around two main pillars: rice cultivation combined with reliance on wetland goods and services for fisheries, hunting and collection of natural resources.

Household surveys

Eight of 36 Veun Sean households were surveyed individually. The survey was pre-tested twice and the final survey conducted with four households from "poor" and "very poor" wealth categories, and four households from "medium" and "rich" wealth categories. The purpose of the survey was to cross-check the information gained from group activities, to gain further quantitative information about the value of the wetland resource, and to investigate participation in and awareness of community fishing activities. Key types of information included:

- household information – names, children, ages, school attendance, reasons for moving to Veun Sean, observations about household size, condition and building materials;
- fishing – activities, fish catch quantity and location, fish consumption;
- expenditure on rice and other main goods;
- income from selling fish and from other activities;
- community fishery participation and perceptions.

There are many challenges associated with obtaining specific information from a household survey owing to varying interpretations of questions and biases in responses. These were overcome by applying a semi-structured approach to household surveys, and by encouraging flexible questioning and discussions. The survey outcomes confirmed that the fisheries resource is more valuable to poorer households because of its importance as a source of income (Table 16).

Wetland values – how much?

Wetland values were rated by a group of households representing a mix of wealth groups. The monetary values of these values were calculated using the average

TABLE 16
Fish value to households

Value	Average	Poor	Less poor
	CR/household/year		
Fish consumed	500 000	600 000	500 000
Income from fish	1 200 000	2 000 000 (77% total)	600 000 (56% total)
Total	1 700 000	2 600 000	1 100 000

Note: US$1 = CR4 000.

household value of fish and the relative ratings. From other group activities, qualitative observations were made about why different wetland resources are valuable, and whether there are any linkages between poverty levels and wetland resources. Table 17 shows the results.

Summary of the main analytical results of the valuation

The study found that wetlands resources are essential to the livelihoods of the villagers of Veun Sean. Worth an average of US$ 3 000 per household per year (about 13 percent of which is accounted for by fisheries resources), the absolute value of wetland resource use is high in a country with an estimated gross domestic product (GDP) of only US$ 290 (US$1 = CR4 000). On a per-capita basis, the value of wetland resources can thus be estimated to be similar to the level of "recorded" or "formal" GDP. Unlike GDP, the wetland value does not refer to generated income or realized production but refers to the value of wetlands as a natural asset that has an income-generating capacity. It provides an estimation of its value to support local livelihoods, underlining the importance of non-marketed and informally traded natural resources. Quantitative estimates also reveal that, in Veun Sean village, the fisheries resource is more valuable to poorer households than to wealthier households. This is partly because the larger household sizes of poor households mean that they consume more fish per household, and partly because poorer households sell a greater proportion of their fish catch for income.

Fisheries, wildlife and aquatic resources are critical both in terms of nutritive value and household income, particularly in the context of interrelated pressures of poor health, drought and rice shortages. In terms of meeting day-to-day needs as well as

TABLE 17
Wetland values in Stoeng Treng

Ratings	Value (CR/hh/year)	Description of value
Fishing	1 700 000	The fisheries resource is a vital source of food and income. Particularly for poorer households, who do not grow sufficient rice and need to purchase rice each year, food security depends on income earned from fishing.
Washing	1 700 000	As Veun Sean has only one well, the majority of households draw water directly from the Mekong River for washing, cooking and drinking. Few households own water filters and sometimes it is difficult to collect fuelwood to boil drinking-water.
Cooking and drinking	1 700 000	
Transportation	1 360 000	Veun Sean is not serviced by roads connecting to other villages or communes. As fish catch, cash crops, and wildlife are sold and medicines and rice purchased at Veun Kham and Stoeng Treng markets, Veun Sean villagers rely on the river as a transport route.
Construction material	1 020 000	Rocks and sand for construction are extracted from river bed.
Fuelwood	1 020 000	Fuelwood is collected from near the banks of the river.
Aquatic animals	680 000	Wetland wildlife such as small aquatic animals, waterbirds and turtles are a vital source of food and income. Some poorer families, who lack access to land, boats or fishing equipment, are particularly reliant on wetland wildlife for nutrition.
Waterbirds	680 000	
Reptiles	680 000	
Irrigation	680 000	Some vegetable crops are irrigated by fetching water from river.
Traditional medicines	680 000	Traditional medicines are collected from the flooded forests. Most families resort to conventional medicine only when traditional treatments fail, but for many, medicine is a significant expense. Conventional medicines are often ineffective because households lack access to medical care – they diagnose symptoms themselves, resulting in improper use of medicines.
Floodplain rice	340 000	Most rice is not floodplain, but rainfed.
Dolphins	340 000	The group did not describe clearly why dolphins were important.
Recreation	340 000	Swimming.
Total	12 900 000	About US$3 000/household/year.

Note: US$1 = CR4 000.

coping with periods of external stresses and shocks, the conservation and maintenance of wetland resources is vital to all the households of Veun Sean. However, it is equally critical to consider access to these fisheries and other wetland resources. The poorest households have limited access to land, labour, transport to markets, health care, and alternative sources of income. They are particularly dependent on fisheries resources on an "as needs" basis in order to generate income to purchase rice.

In addition to providing day-to-day resources on a routine basis, wetlands are also vital to ensuring that households can cope with external stresses and shocks, such as harvest failures, livestock disease, droughts, floods, and civil and political unrest. Where stresses affect productive activities such as cultivating rice and raising livestock, these can be substituted to a certain extent by collection and capture of wild resources such as fish, wildlife and aquatic animals.

All the households in Veun Sean, but particularly the very poor, are vulnerable to pressures that limit their capacity to cultivate land to grow rice and produce, such as the ongoing stress of limited access to land, or shocks such as drought, livestock death, and human illnesses. For example, rice-growing is a key economic activity, and "rice shortage" (the inability to be self-sufficient in rice production because of lack of access to labour or land) is a major pressure facing most households. For these households, access to wetland resources is vital on a year-to-year basis, and more so when they face other stresses such as poor health and drought.

For many households in Veun Sean, the pressures of poor health, drought and rice shortages appear to reinforce each other. Poor health limits households' capacity to work on the land, resulting in low rice yields, which are further lowered by drought. This emphasizes the importance of owning buffalo to assist in rice-growing. However, during periods of drought, buffalo are more likely to suffer sicknesses and die. Furthermore, when faced with rice shortages, households must spend their income on rice and may face difficulties in purchasing buffalo or health services.

POTENTIAL CONTRIBUTION TO STAKEHOLDER DECISION-MAKING

There is great potential and an emerging capacity to use stakeholder-oriented valuation for wetland conservation and development policy, planning and management in Cambodia. However, it is critical that the decision-makers and local communities participate in the development and execution of such studies in order to ensure that they reflect real-world management issues.

The activities being carried out under the MWBP at the Stoeng Treng Ramsar site provide an important opportunity to mainstream wetland valuation into conservation planning processes at both national and local levels. In Stoeng Treng, a number of strategies and plans to conserve and protect wetland resources are underway. These include large donor-funded projects, government initiatives, and the work of national NGOs and local community-based organizations (CBOs). These processes must consider the biological and ecological importance of wetlands. However, it is also essential that this information be considered in the light of local community dependencies on and access to resources. In this context, participatory valuation methods should continue to be used as a key tool to inform in the planning process – to gain an understanding of the important *in situ* value of water for wetlands to support local communities.

The future sustainability of attempts to conserve the Stoeng Treng Ramsar site depends critically on sufficient financial resources and economic incentives being made available to support wetlands management. Economic assessment tools can help to: (i) indicate the economic impacts, costs and benefits of conservation management regimes; (ii) point to opportunities and needs to capture and redistribute benefits to cover the costs of conservation; (iii) and present a strong case to outside agencies and central government of the need to fund wetland management initiatives.

In Cambodia, community fisheries management activities are being carried out by organizations such as the CEPA as part of the official fisheries policy dialogue. In these activities, some of the assessment techniques could be applied when establishing or monitoring the progress of their community fisheries (e.g. to develop measurable indicators), and to provide local- and national-level advocacy and awareness materials that underline the value of wetlands resources to villagers.

Water valuation could also provide valuable inputs into existing and future five-year development and investment plans that have been developed in the context of commune council development planning. In particular, a broad value assessment can highlight the contribution of wetland conservation to socio-economic development and poverty alleviation goals, and demonstrate the links between wetland status and improved outcomes for other sectors. This link is important because of the dual-livelihood strategy in many wetland communities: combining agricultural activities, such as the cultivation of rice and livestock raising, with the collection and capture of wild resources provided by the Ramsar wetlands.

In the context of Cambodia's international commitments to the Ramsar Convention on Wetlands, economic aspects form an important supplement to initial assessments of biodiversity status, threats and management needs in the planning and management of wetlands. As management plans are developed, valuation can help to identify a wide range of economic and financial tools with which to strengthen conservation implementation.

Part III
Towards a stakeholder-oriented valuation process

The descriptions of the three cases in Part II are used to learn about the responses developed in practice to confront the three challenges for stakeholder-oriented water valuation that were identified in Part I. The differences between the cases somewhat reduce the possibilities for a detailed comparative review of the valuation approaches used, but their independence makes a strong argument for the common elements that nevertheless appear in these different cases. This is not to say that these cases effectively address all the valuation problems identified in Part I, but they serve a purpose in highlighting recent attempts in moving towards a more stakeholder-oriented valuation approach.

Chapter 6 describes the responses to the three challenges for stakeholder-oriented water valuation that emerge from the cases.

Chapter 7 merges these practical responses from the cases with the concepts from literature on IWRM processes to provide an outline of a stakeholder-oriented water valuation process. This should provide a basis to support future use and further development of a stakeholder-oriented approach to water valuation. The chapter ends with the identification of some remaining questions and directions for such future work.

Chapter 6

Responses to the challenges for stakeholder-oriented water valuation

CHALLENGES AND PRACTICAL RESPONSES

At the beginning of this report, an argument was made for a stakeholder-oriented approach to water valuation and three challenges were identified that have to be confronted in realizing such a more stakeholder-oriented approach to water valuation:

- An analytical challenge, to broaden the scope of valuation to include economic, social and environmental values, and to provide insight into stakeholder-specific values as well as relevant trends and dynamics. Transparent and valid assessments of a diverse range of values are required, while still providing insight into the overall picture.
- An adaptive challenge, to adapt to the working conditions for local water resources management in developing countries, requiring the adaptation of valuation to the existing institutional setup and to the available data, knowledge, expertise, time and resources.
- A participatory challenge, to embed water valuation in local stakeholder processes, combining stakeholder judgement, local knowledge and scientific inputs through a stakeholder-driven process.

TABLE 18
Challenges and observed responses

Observed stakeholder-oriented response	Expert-oriented approach[1]
Analytical challenge	
Differentiate within an overarching framework	Aggregate within an overarching framework
Focus on livelihoods as a driving force and integrating element	Focus on water as resources to be valued in integrated water resources management
Link valuation to possible solutions/alternatives	Valuation of water resources in current situation
Validate accuracy and robustness through triangulation and other techniques	Rely on statistical analysis to validate accuracy
Adaptive challenge	
Combine various methods, indicators and data to build a more complete picture	Collect data as complete as possible for input into integrative economic methods
Use an adaptive and learning approach	Authoritative calculations by experts
Ensure links with existing institutions while building social capital	External information input (independent or for client organization)
Participatory challenge	
Use tools and techniques for participatory analysis (with specific attention for stakeholder representation)	Limited participation – passive or by consultation (surveys, willingness to pay)
Mix expert and stakeholder inputs	Expert inputs dominate
Focus on use of participatory valuation to build agreement on actions	Focus on accurate values for given point in time and on theoretic optimum
Use methods accessible to a wide range of stakeholders to facilitate participatory effort	Concerns over validity and accuracy demand use of complex methods

[1] Expert here refers to a valuation expert, whose expertise is the use of economic valuation methods. Stakeholders are also experts, but of a different kind.

This report has described three pilot cases that have been implementing a more stakeholder-oriented approach to water valuation than is used conventionally, and in which stakeholders and experts facing the above challenges have formulated practical responses. Although the characteristics of each case are different, they provide useful lessons for future applications of stakeholder-oriented water valuation. Table 18 compares the responses that emerge from the stakeholder-oriented case studies with the expert-oriented approach that has to date been dominant in water valuation. The responses in Table 18 are categorized under the challenges they address. The three challenges are closely related and they sometimes require integrated rather than separated responses. Nevertheless, most responses put a certain emphasis on one of the three challenges, enabling some degree of categorization. The remainder of this chapter discusses the responses in more detail.

ANALYTICAL CHALLENGE

Differentiating within an overarching framework

It has been argued in Chapter 2 that, although economic, social and environmental values can be aggregated into a full economic value or value function, it may be more appropriate to provide a picture of the diversity of values. The cases confirm this and show that there is no urgent need to bring the different value components all under a common heading.

This does not mean that all efforts towards integration should be given up in favour of a fragmented approach. A more loose integration of values is possible, using an integrating framework to ensure that the main value components are covered as well as some of the important relations between them. For this, existing analytical frameworks can be used, such as the sustainable-livelihoods analysis framework or the IWRM framework used in the Tanzania case. Methodological frameworks can also be used, such as the framework for EIA used as a starting point for the Sri Lanka case. In addition to these frameworks, analytical tools such as objective trees or hierarchies and means–objectives networks (Keeney, 1994a), causal-relations diagrams (Eden, 1989; Bots, van Twist and van Duin, 2000) and basic multicriteria analysis methods, such as score cards or impact tables, provide useful support in structuring values and objectives. Whatever the framework selected, it is essential to ensure that the relevant values and the related objectives of all involved stakeholders are identified.

A looser and more pragmatic type of integration, ensuring that the valuation encompasses the main sectors and disciplines, makes an integrated approach easier to realize in practice, targeting different needs. Aggregating everything into one overall value means missing the opportunity to identify specific measures to meet the specific values of different stakeholders. Rather, insight into disaggregated values is essential because different stakeholders have different perspectives on the value of water. Values can be assessed for stakeholder groups at different locations (as in the Sri Lanka and Tanzania cases), for different sectors or water users, such as fishers, irrigators, livestock-keeping and drinking-water (the Sri Lanka and Tanzania cases), for different wealth classes (all three cases) and for accessibility of water resources (the Sri Lanka case). Other distinctions that may be relevant are gender, cultural groups (immigrants, and indigenous population), age groups, etc.

Focusing on livelihoods as a driving force

Experiences show that the water component is generally not the only factor driving local stakeholders in their water resources management decisions, not even in water-scarce environments. It is important to realize that water resources management is an instrument for realizing broader societal goals, such as poverty reduction and food security, adequate health standards and environmental sustainability. Adequate water resources management is necessary to ensure that these goals are realized, but at the same time, water is just one factor in a larger system.

On the local level, there will be little room to improve water management within existing livelihood patterns where one does not also address factors such as education, land tenure, financial assets, transportation infrastructure, market barriers, etc. For example, in the Tanzania case, there is great potential to improve the productivity of water uses by the poorer households, whose limited access to production capital keeps them trapped in a vicious cycle of low-input – low-output livelihood activities with significant production risks. Important bottlenecks for these households are the limited access to: natural resources, such as irrigable land and water, human capital and labour (especially at peak periods); physical production capital, such as agrochemicals or livestock; and social capital, such as membership of local societies and associations. Merely addressing the water constraints without addressing the others will not be sufficient to enable any structural changes.

A similar example can be drawn from the Cambodia case, where the pressures of poor health, drought and rice shortage appear to reinforce each other for many households in Veun Sean. Poor health limits households' capacity to work on the land, resulting in low rice yields, further lowered by drought. This emphasizes the importance of owning buffalo to assist in rice-growing. However, when faced with rice shortages, households must spend their income on rice and may face difficulties purchasing buffalo or health services. In these cases, the wetlands provide a last resource for livelihoods. However, also in this case, merely ensuring wetland conservation will not break the vicious cycle of poverty for the poor households.

All three cases underscore the importance of the broader livelihood context for local water resources management to ensure the relevance of the valuation process. The use of a sustainable-livelihoods analysis framework, such as described by Ellis (2000) and Nicol (2000), enables a more structured inclusion of livelihood aspects in water valuation. These frameworks help to screen out issues of more and of less relevance and provide the connecting tissue for the expression of a range of water-related values. The focus on livelihoods is not only present in the cases discussed here, but also in one of the few known tools for assessing social values of water, the Water Poverty Index (Sullivan and Meigh, 2003).

Connecting valuation to possible solutions and alternatives

The discussion in Chapter 2 of the water resources management processes shows that valuation should support the analysis of both problems and solutions. Traditionally, valuation has often been used as part of problem analysis, whereas solution analysis has been the domain of impact assessment and cost–benefit analysis. However, the cases indicate that this distinction is not very helpful when supporting local stakeholder processes. This is very clear in the case of Sri Lanka, which actually used EIA as its methodological starting point, but also the Tanzania case included a partial valuation of the expected impacts of possible solutions. Such action orientation is very important to use valuation as a tool to inform decision-making on possible future actions by stakeholders. This implies that water valuation should:

- support a problem analysis and baseline valuation, which can support the identification of potential solutions;
- support a solutions analysis, which takes into account the costs and values associated with the realization of potential solutions, including specifically the transaction costs.

Valuation to support the identification of potential solutions

Sketching an estimate of the current value of water resources is useful for raising awareness and informing stakeholders, but it does not necessarily help in identifying and discussing strategies for improved water resources management. For example, the knowledge that fisheries from the Stoeng Treng wetland in Cambodia constitutes almost 80 percent of the total annual income for the poor households provides a good argument for the protection of the wetland. However, it is not sufficient to identify how such wetland protection should be shaped and how it could be balanced with the need for social and economic development. For this, it needs to be complemented with the insight into the underlying dynamics provided by the PRA outcomes.

This means that it is necessary to extend the water valuation to cover solutions analysis, starting with the identification of possible solutions. An assessment of current values associated with different water uses or in different dimensions can help to identify key areas to focus on. Furthermore, reviewing the objectives and their relations to the different stakeholders may help to identify possibilities for improvement or areas where there may be room for flexibility – areas that have a relatively low score on certain value dimensions and a relatively high score on others. If one has used a certain livelihoods analysis framework, then the mechanisms and elements in this framework can also provide useful starting points for the identification of possible solutions. Possible solutions can be of a physical nature, such as reservoirs, channels and diversion structures, but they may also use economic incentives or market mechanisms for water allocation, as well as institutionalized allocation procedures. A long list of measures can be compiled by collecting the suggestions from stakeholders and experts.

In using water valuation to support the identification and evaluation of possible solutions, determining the proper relative values is more important than estimating absolute values. Priority areas to address are those where value scores are currently relatively low compared with other areas, whereas the prioritization of solutions can be done using ordinal rather than absolute scales, i.e. ranking possible solutions in order of preference.

Valuation to analyse implications of realizing potential solutions, including transaction costs

Once such a long list of potentially useful measures has been established, stakeholders' values drive the evaluation and prioritization of potential solutions. They will want to prioritize those measures that seem most promising to improve the situation with regard to the values that are most important to them. Thus, valuation also has a useful role to play in assigning values to the impacts expected from implementing measures. Therefore, water valuation as a tool to support water management decisions should take into account not only the value of water in different uses but also the costs associated with making the water available to these uses in practice. For example, water may have a high value in a certain water-scarce region of a country, but distributing a certain amount of water to this region may require an expensive distribution system which, in the end, results in a negative outcome of the cost–benefit analysis for this option of transferring water.

ADAPTIVE CHALLENGE

Combining various valuation methods, indicators and data

Indicators are the way by which values can be observed and measured in practice. Which indicators are required depends on the stakeholders' values. Thus, the specific sets of value indicators are likely to differ on a case-by-case basis. Nevertheless, the case experiences suggest that certain indicators are generally likely to be included in these case-specific sets: economic water productivity; food security or nutritional water productivity; and a qualitative indicator that links water resources to the livelihood activities that matter for local households. The latter also suggest the usefulness of indicators that cannot be meaningfully expressed as output for a specific unit of water quantity but that nevertheless can be traced back to the availability of a certain amount of water resources, such as the aforementioned livelihood opportunities, biodiversity, changes in habitats/ecosystems and conflicts over water.

Where several indicators are being used to cover the full range of values that water represents to local stakeholders, local data for all these indicators will not always be available. In these cases, value estimates for a certain location may be based on data on water values from other locations, resulting in an approach that economists refer to as "benefit transfer" or "environmental value transfer" (Agudelo, 2001; FAO, 2004). This has to be done with caution owing to the differences between different locations that are likely to affect the value estimates. However, it can nevertheless provide a powerful tool for valuation. For example, for the Sri Lanka case, data from the Lao People's Democratic Republic were used as the basis for an appropriately adjusted estimate of a balance of gains and losses in fishery-production potential, while data from comparable fisheries elsewhere in Sri Lanka and in Bangladesh were used to assess fish-stock dynamics in relation to reservoir levels.

When the accuracy or availability of basic data are limited, more insight into the accuracy of resulting value estimates can be gained through the use of a triangulation strategy, using data from multiple sources and using multiple methods to obtain different estimates of similar values (Pretty, 1995). Triangulation can help to obtain some insights into the accuracy of value estimates by comparing values resulting from the use of different data sources or different methods. For example, in the Cambodia case, information about the quantitative value of fisheries was verified by using different methods for data collection: responses from a variety of survey questions; group discussions; and participatory activities. In the Tanzania case, values for domestic water were assessed using survey results on stated willingness to pay as well as observed market prices in one specific part of the study area.

The use of different methods is necessary because water valuation is so diverse and complex that it is not feasible to develop one single method that is applicable to all cases. The appropriate methods are different per case, requiring a broad approach to water valuation that can be tailored to the specific needs for each new case. This ensures analytical quality together with flexibility. However, it also places certain requirements on the analysts supporting the stakeholders in their valuation process, as they should have a good knowledge of at least some of the different methods available for valuation. Using interdisciplinary teams is likely to be of help, as different values require different expertise, as do different methods for assessment and data collection. In addition to economic valuation methods (e.g. residual imputation, contingent valuation, averting behaviour, and observations of market-based transactions), especially tools and methods for participatory assessments are promising (see below).

Using an adaptive and learning approach

The adaptive challenge is to deal with gaps in knowledge and information and to use whatever partial information there is to take forward decision-making processes by local stakeholders. It may sound tautological, but addressing the adaptive challenge implies the use of an adaptive approach that has many similarities to the approach known in ecosystems management as adaptive management. Adaptive management "assumes that scientific knowledge is provisional and focuses on management as a learning process or continuous experiment where incorporating the results of previous actions allows managers to remain flexible and adapt to uncertainty" (Van Eeten and Roe, 2002). Originally, adaptive management was used to address the complexity of ecosystem dynamics. Recently, the concept has been expanded to cover the dynamics in social systems, e.g. in the concept of adaptive comanagement (Olsson, Folke and Berkes, 2004).

The notion of learning is central in adaptive management and comanagement, and this conveys the message that current knowledge and understanding of complex water systems is not sufficient to allow for 100-percent certainty. Whatever measure experts think is the best to improve water resources management, they can always be wrong and find that these measures have unintended side-effects. Furthermore, both ecosystems and social systems are dynamic systems, changing continuously. Therefore, what may have been appropriate or acceptable at one point in time, may be problematic at a later stage. This means that: (i) all decisions are based inevitably on knowledge that is less than perfect and necessarily include a certain level of uncertainty; and (ii) decision-makers and experts should realize that they need to revisit their initial decision or analysis and that it may be necessary to adjust – or fine-tune – their activities according to new developments, new insights and new preferences.

The main aim of water valuation is not to find the "true" value or the "right" answer to a problem but rather to help stakeholders reach a point at which they feel confident to take action (Eden, 1989). Building confidence and capacity for people to take informed action means that iteration and overlap of activities can be a helpful strategy for communication and learning, not necessarily a waste of resources for duplicating efforts. In the Tanzania case, some data collection and analysis activities covered similar topics, and during the final stakeholder workshop, a problem analysis was again done even though it had already been part of comprehensive assessment. Nevertheless, this iteration was useful to ensure that everyone had a similar understanding of the main problems and the logic of the process, as well as to further sharpen the picture of stakeholders' values and what drives their water uses.

Adaptive management also means that it might be necessary to revisit the initial choices and adjust the activities as the valuation progresses. In the Sri Lanka case, the stakeholder process was monitored and evaluated continuously in order to allow for learning throughout the process and to be able to adjust it as necessary. Room for flexibility and for re-thinking initial options has to be built into the design of any stakeholder-driven valuation process in order to allow participants to identify knowledge gaps and research needs as the process progresses. This extends into the activity of implementing measures and solutions, where valuation cannot rule out all uncertainty. This suggests the usefulness of combining analysis and reflection with the implementation of pilot projects where possible.

Ensuring links with existing institutions while building social capital

The identification and establishment of links with existing institutions and planning processes is crucial to ensure that, in the end, the outcomes of a valuation process will actually feed into decision-making by local stakeholders and that valuation processes are not taking place in an institutional vacuum. Making a conscious effort to link water valuation processes to existing formalized planning processes is likely to improve their practical usefulness and impact. In the Tanzania case, an effort was made to ensure such links through the involvement of the River Basin Water Office and the District Agriculture Development Office. The latter was responsible for establishing district agricultural development plans, one of the main government planning instruments for channelling the outcomes of the participatory water valuation process. Where such linkages are not possible, this is not necessarily a reason to forget about stakeholder-oriented water valuation. Rather, it should be a reason to reconsider seriously the need and potential usefulness of a water valuation process to improve local water resources management.

Water valuation should not only feed into existing institutional structures and planning processes. It could also help stakeholders to improve their functioning within these structures and processes by offering them a channel to communicate and reflect upon the different values involved in managing local water resources. In this way, it offers a practical instrument for capacity building and for increasing the social capital among participating stakeholders. In the Cambodia case, many internal and external institutions were identified, but it also appeared that households rarely had contact with provincial government agencies and that many working committees within the village, established previously by NGOs, were inactive. The described participatory approach to water valuation could strengthen the commune council development planning process, supporting the local communities to establish five-year development and investment plans.

PARTICIPATORY CHALLENGE

Using available tools and techniques for participatory analysis with specific attention for stakeholder representation

A stakeholder approach to valuation requires stakeholder involvement throughout the process. This involvement can be supported by tools for participatory problem analysis, especially visual modelling and diagramming tools. This gives local stakeholders "a share in the creation and analysis of knowledge, providing a focus for dialogue which can be sequentially modified and extended" (FAO, 1997; for overviews of participatory methods and tools, see also: Pretty, 1995; World Bank, 1996; IAC, 2005). In the Cambodia case, the tools for PRA provided the methodological starting point for the valuation. In this case, use was made of participatory resource mapping, construction of web diagrams, flow diagrams, seasonal calendars of activities, and participatory wealth ranking. In the Sri Lanka and Tanzania cases, focus group discussions and workshops also provided important inputs for the analysis, using participatory tools to discuss priorities and assess values.

In using tools for participatory analysis, the representation of stakeholders deserves specific attention in order prevent a small group of stakeholders from dominating participatory processes. Among the stakeholders that risk being underrepresented are the poor and vulnerable groups, who usually are not part of any of the traditional institutions and who are likely to have difficulties in finding the time and resources needed to attend participatory sessions and meetings. Other stakeholders that risk being underrepresented include private-sector companies or government agencies whose role in water resources management is not reflected in any of the existing water institutions although they have an important influence on, or stake in, water resources management.

Therefore, identifying and selecting organizations and stakeholder representatives is an essential part of a water valuation process. This should be done proactively, i.e. not just advertising the opportunity to participate, but actively seeking out the key interest groups and making sure that they are contacted, briefed and represented adequately (followed by capacity building where necessary). A stakeholder or actor analysis that supports the identification of the main stakeholders and their interests, influence and importance provides useful analytical support for such a proactive approach (Grimble and Chan, 1995; Hermans, 2005). The Sri Lanka case provides an example of this with regard to fisheries interests.

Once a participatory process has been initiated and the participation of a broad basis of stakeholders has been secured, attention needs to be given to the possibilities for stakeholders to actually voice their concerns and ideas during the process. In stakeholder meetings, attention needs to be given to the use of discussion techniques that allow all participants to express their view. If such aspects of empowerment and participation are not addressed consciously, participatory water valuation may turn into just another vehicle for ruling elites to exercise their power. Throughout the process, a continuous monitoring of the process and role of stakeholders is required in order to ensure that stakeholder participation remains balanced and that the process continues to focus on issues that are relevant to stakeholders.

Mixing expert and stakeholder inputs

Water valuation should focus on values that are most important to the stakeholders involved. The stakeholders and not the experts should drive the process. Therefore, local knowledge is needed to identify the main values to be assessed and to support the assessments of them. Local stakeholders have a better knowledge of many aspects of local water management than do external experts. Drawing on local knowledge is essential to eliciting values but also to identifying historic trends, avoiding repetition of past failures and ensuring a match with local conditions and institutions. Local knowledge can be mobilized through the use of focus group discussions, stakeholder workshops and surveys, supported by the use of participatory analysis tools.

This does not mean that stakeholders alone decide what values to include in water valuation. Experts should contribute their specific expertise and bring forward certain information related to water valuation that stakeholders at first might not recognize, such as the importance of certain values that so far have been overlooked, or to inform stakeholders about solutions that are not grounded locally but for example at national level. Experts continue to play a role in a stakeholder approach to valuation, as it needs to draw on a large set of potentially suitable analytical tools to combine stakeholder and scientific knowledge in order to support stakeholder judgement with scientific inputs. They are also likely to be required to offer the facilitation skills needed to support the water resources management process. In addition, where chosen correctly, external experts can act as neutral brokers that do not have vested interests in the project or in potential solutions.

Focusing on use of valuation to build agreement on actionable recommendations

A focus on actionable recommendations is necessary in order to ensure that, when local stakeholders are participating in a valuation process, this does not benefit only the initiator of the study or project who wants to assess water values or develop some long-term policy proposals, but also the local participants. It would not be justifiable to ask local stakeholders to invest precious time and energy in processes that they cannot see the benefits of. Feasibility of the proposed actions is an important consideration, identifying not only actions that would be required ideally, but also focusing on actions that are feasible in the given conditions. Therefore, different measures that target the different needs of stakeholders are likely to be preferable over single comprehensive blueprints or master plans. For example, in the Sri Lanka case, different measures were identified that could lead to improvements without radical changes, while in the Tanzania case, specific attention was given to the identification of a balanced set of actions for addressing both short-term and long-term issues and that local stakeholders could implement.

Once potential actions have been identified and their feasibility and impacts have been assessed qualitatively, stakeholders have to reach an agreement on what actions they will actually implement. Analytical support for this is offered by tools for multicriteria analysis, such as the score cards used in the participatory planning workshop in the Tanzania case, which help to compare the impacts of different solutions over a range of indicators/criteria.

However, rather than analytical tools, process facilitation skills are much more important in this phase of the process. Especially in situations of serious water scarcity and conflicts among users, this evaluation of solutions is closer to negotiations than to an analytical comparison of impacts. All stakeholders look for ways to claim as much value as possible, or at least to avoid negative impacts on interests that are of importance to them. Mapping positive and negative impacts of actions per stakeholder helps to see where compensation is required in order to reach an equitable outcome. Facilitating negotiations is particularly complex as considerations of power and equity come into play. Powerful stakeholders are likely to use their power in the choice for a set of actions, and in dealing with this, truly neutral choices hardly seem possible.

The evaluation and negotiation activities have not been executed in the cases although a start has been made using various techniques. In the Sri Lanka case, specific attention was given to the identification of mitigating measures, to ensure that a larger range of environmental, social and economic benefits would be delivered and that packages of measures could be identified that met the interests of various stakeholders. In the Tanzania case, there was a remarkable consensus on the usefulness of certain measures as well as on the issues to be addressed. This included small-scale charco dams, training and education of water users, and a review of the existing system of water rights. This offered a good basis for further action and implementation. However, hard choices will be inevitable, especially regarding water rights, as not all stakeholders will have had the same "ideal" system in mind for the allocation of a water rights system. Agreement over such hard choices seems unlikely unless compensation measures are put in place.

Using methods accessible to a wide range of stakeholders to facilitate communication and learning

Many of the existing water valuation methods are highly complex and go beyond what a majority of non-specialists could understand. This may be partly in line with the expectations of specialists and non-specialists alike, who may feel that if the method used is too simple, its outcomes cannot be correct. However, even the most advanced methods remain fraught with uncertainties and are likely to result in crude and inexact estimations (Gibbons, 1986). However, the most important decisions are often the most obvious ones (Daily *et al.*, 2000). For these situations, relatively simple methods may be as adequate as very complex ones.

A participatory approach puts additional requirements on analysis methods, beyond analytical accuracy. Where used in a participatory process, facilitating communication and mutual learning are also important for reaching a shared frame of reference and supporting stakeholders to reach a point at which they all feel confident to take action. Especially where it challenges conventional wisdom, water valuation may be highly political and the use of complex "black-box" methods increases the risk that outcomes are not accepted by all the stakeholders or some of them. Simpler methods that are easier to grasp for a large group of stakeholders will contribute more to a better communication and understanding of the different values of water. Furthermore, the expertise and/or data required for complicated methods are often not available, whereas the use of straightforward methods may be more easily repeated by local stakeholders themselves at a later stage, building capacity to conduct water valuations locally.

Previously the emphasis in water valuation has been on complex methods. However, the case experiences show the importance of balancing complex expert inputs with an overall approach to valuation that is fairly easy to grasp and that is accessible to a wide range of stakeholders. For example, in the Tanzania case, relatively simple diagrams and tables were used to facilitate participatory planning during a stakeholder workshop, supported by technical inputs related to the various aspects of water resources management presented by the project team experts. In the Cambodia case, the valuation process was based on the use of various tools for PRA combined with household surveys to strengthen the quantitative aspects.

Chapter 7
Towards a framework for stakeholder-oriented water valuation

REDEFINING WATER VALUATION AS A STAKEHOLDER PROCESS

The practical valuation processes applied in the cases can be merged with the conceptual approaches from literature (Chapter 2) to water resources management as a stakeholder process into the outline of a stakeholder-oriented water valuation process. Such a combination of concepts with experiences from local practice creates a basis to support future use and further development of a stakeholder-oriented approach to water valuation.

Outline of a stakeholder-oriented water valuation process

The responses to the challenges for stakeholder-oriented water valuation observed in the cases are based on an underlying perspective of water valuation as an intrinsic part of a water resources management process. Transposing the experiences from the cases to these IWRM processes enables a generic process for stakeholder-oriented water valuation to be outlined. This process is based on the previous descriptions of the IWRM process by the GWP (2004) and the World Bank (1994), as described in Chapter 2. However, it puts more emphasis on the role of valuation in the IWRM process.

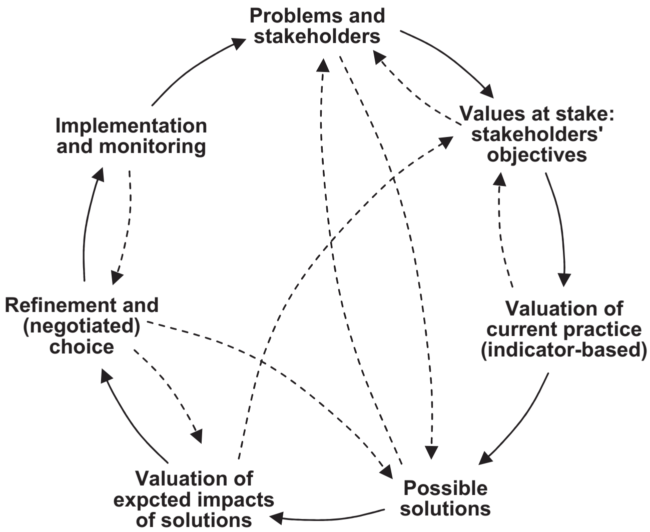
Essentially, the proposed process consists of seven elements that are linked to one another in a logical sequence of activities:

1. identification of the main problems to be addressed and key stakeholders involved;
2. identification of values at stake through a structured overview of stakeholders' objectives;
3. assessment of values associated with these objectives for current practices;
4. identification of possible solutions and the stakeholders that control them (or in part do so);
5. assessment of values associated with expected impacts of solutions;
6. evaluation, refinement and negotiated choice of preferred set of solutions;
7. implementation, monitoring and evaluation by stakeholders.

Just as the descriptions of the IWRM process, the stakeholder-oriented valuation process should not be seen as a blueprint but rather as pointing into useful directions for subsequent activities in a participatory and iterative valuation process. Although a valuation process as outlined here may rarely be found in actual practice, its internal logic makes it a useful tool for practitioners seeking to support stakeholders by adding an analytical and rational component to the essentially political water resources management processes.

Redundancy between activities, repetition of elements and skipping certain elements only to come back to them at a later stage will be the norm rather than the exception. Stakeholders may move from problem to solutions, from solutions to other solutions, and even from one problem to the next. The role of stakeholder-driven water valuation is to support stakeholders in these processes by clarifying the problems and the stakes involved, sharing the different perspectives and positions and, through this process,

FIGURE 14
Stakeholder-oriented water valuation process



identifying some solutions that can form an acceptable basis for action. This results in an iterative process as depicted in Figure 14.

Fitting the cases to the stakeholder-oriented valuation process

None of the cases described in this report followed all the elements of the stakeholder-oriented valuation process as outlined above as they were carried out prior to developing this outline. Nevertheless, important features of this process are present in each of the cases. This is illustrated in Table 19, which shows that, in all the cases, the first three elements of this process can be recognized easily.

The implementation of these elements in the cases resulted in useful responses to deal with the challenges for water valuation (Chapter 6). Implementing these first elements of the process is likely to have an impact, if not directly through the valuation outcomes, then at least through enabling communication and learning among stakeholders and among stakeholders and experts. Through their involvement in the water valuation process, stakeholders engage in dialogue with one another, increasing their understanding for each other's value perspectives and of water-related problems. If this process goes well, as in the cases, it will also contribute to establishing a base of confidence among participating stakeholders that is likely to benefit them in negotiating measures for implementation. Furthermore, it will build capacity among local stakeholders for water valuation and for participation in water resources management, which can help in the resolution of current resource management problems and with other and future problems.

Whether or not these benefits indeed materialize in the subsequent phases of the stakeholder process is difficult to observe. The cases all described fairly recent experiences, whereas policy-making processes have a longer horizon and follow a different time scale. Thus, more time would be needed to assess the role of valuation in these last phases of decision-making and implementation. Moreover, water resources management processes are affected by several factors and events, many of them external and beyond the control of local stakeholders. This makes it difficult to isolate the impact of just one factor. Nevertheless, as the first elements of the stakeholder-oriented valuation process were followed and as the last elements follow more or less logically from the first, one could expect that stakeholder-oriented valuation can offer useful support also for these last elements.

CRITICAL ELEMENTS FOR STAKEHOLDER-ORIENTED VALUATION

Discussion of critical elements for stakeholder-oriented valuation processes

Based on the case experiences that offer empirical evidence to support the main part of the stakeholder-oriented valuation process, a concise overview is given of the elements that are considered essential for a stakeholder-oriented valuation process. This overview of elements offers a checklist to be used throughout the valuation process, to check whether the most critical elements are addressed and the most common pitfalls avoided. Table 20 summarizes the elements, and it provides a brief description of the

TABLE 19
The stakeholder-oriented valuation process in the cases

Elements in the process	Tanzania case	Sri Lanka case	Cambodia case
1. Problems and stakeholders	Increasing water shortages in the subcatchment, especially in the lower zone, affecting livestock and crop production. Downstream problems with wildlife conservation and hydropower generation.	Impacts of irrigation rehabilitation project on fisheries and conflicts over water for farming and fishing.	Pressures on local wetland, putting at risk habitats of several globally threatened species and local livelihoods for villagers.
2. Goals and objectives at stake	Preserve or enhance livelihood opportunities (mainly crops and livestock). Equitable distribution of water resources. Enhance food security. Conservation of existing flora and fauna, maintenance of environmental base-flow for downstream wetlands.	Preserve or enhance local livelihoods and food security, with specific focus on role of fisheries. Biodiversity conservation (secondary here to livelihoods and food security).	Protect habitats, globally threatened species and migrating fish species in larger Mekong system. Poverty alleviation, protect natural resource base for local livelihoods, especially for vulnerable groups. Food security. Traditional values (medicine). Promote public health.
3. Value associated with these objectives for current practices	Values increasing in dry season and when moving downstream; social values “higher” than economic values. Latter ranges from < US$0.05 to almost US$1/m^3 (in 2003). Environmental values threatened downstream.	Value to support fishery production of 2 633 tonnes/year equivalent to US$14 300 (in 1999), but important differences across locations. Value of fisheries as social safety net for poor.	Values for livelihoods, transportation, etc. Value estimate of wetland assets some US$3 000/household/year (in 2004). Values increase for poor households. For very poor, wetlands have high value as key source for nutrition. Values of deep pools as conservation areas and traditional fishing grounds may conflict. Value for diversified livelihood and thus increased resilience.
4. Possible solutions	Small dams for water storage, training of water users, strengthening user platforms, review water rights, “non-water” related measures (marketing associations, harvest storage facilities, etc.).	Improved management of drainage flows, seawater flows and lagoon water levels, water savings for farming, minimum levels to conserve sustainable fish stocks.	.... (protect wetlands, recognizing their biological importance and local-level dependencies on and access to resources for livelihoods).
5. Values associated with expected impacts of solutions	Generally only positive impacts on values expected – indicating also lack of sufficiently detailed insights.	Potential social and economic benefits.	-
6. Evaluation and choice of (set of) solutions	Some preliminary selection based on preferences of stakeholders: training, education, small dams.	-	-
7. Implementation, monitoring and evaluation	-	-	-

Note: Different reference years have been used in the different cases, affecting the monetary values shown.

main analytical output associated with each element and the issues that help to increase the link between these analytical outputs and the stakeholder process.

Table 20 contains the critical elements that should be part of any sound stakeholder-oriented valuation process, be it as a logical sequence or in a more haphazard way. The elements are discussed in more detail below. More details on strategies and specific tools to support this valuation process can be found in the discussion of responses to challenges in Chapter 6.

TABLE 20
Critical elements in stakeholder-oriented valuation processes

Element	Analytical output	Link to stakeholders
1. Problems and stakeholders	Overview of main problems that need to be addressed.	Identify who are affected by problems or solutions, what stakeholders have capacity to contribute to or obstruct problem solving. Identify one/two "lead" stakeholders.
2. Main values at stake	Overview of main objectives involved, structured in overarching framework.	Ensure that the main objectives of all stakeholders are considered. Clarify link between stakeholders and identified objectives.
3. Values associated with current practice	Set of value indicators and a baseline assessment of the existing situation using these indicators.	Provide insight into values per stakeholder (group) to see whose values are catered for, whose values need to be improved, etc.
4. Possible solutions	List of possible actions, as concrete as possible, to support realization of objectives – screened for feasibility and acceptance.	Review the stakeholders to be responsible and/or whose cooperation is necessary for implementation of each action.
5. Expected impacts of solutions on values	Overview of expected impacts of possible solutions (combinations of actions) on main objectives.	Assess impacts on values of importance to different stakeholders. Clarify stakeholder roles in implementation, including financing.
6. Selection of solution	Agreed solution: set of actions and time frame for implementation.	Provide insight into impacts per stakeholder: who benefits, who suffers? Identify compensation and mitigating measures that contribute to a fair balance of costs and benefits among different stakeholders.
7. Implementation, monitoring and evaluation	Implementation of agreed actions and regular monitoring of impacts, covering key indicators.	(This is only possible where implementation has support of critical mass of stakeholders, who should also agree on and contribute to monitoring and evaluation procedures.)

Identification of the main problems and key stakeholders

In water resources management processes, new rounds in a planning cycle may be triggered by external events or decisions, or by new stakeholders that enter the scene. These may create new problems, increase the urgency to address lingering problems and bring new solutions into the process, revitalizing processes that had come to a standstill because there were no solutions to take them forward.

Ideally, one would start by identifying and describing the main problems before identifying solutions to those problems. The problem formulation comes even before the identification or explication of values. This is because, if there is no problem, there is no urgent need to take action and thus no urgent need for valuation. Valuation should be used to address the problems that drive stakeholders into a negotiation or planning process.

Using a problem-based approach makes it easier to identify which stakeholders should be driving the process. These are likely to be the stakeholders suffering from a problem and that have a certain capacity to mobilize additional stakeholders that are also interested in addressing this problem. However, these are not necessarily the stakeholders who can solve the problem. Problems may be caused by the actions of other stakeholders, who should then also be involved in the process. For example, water quality problems may be perceived by government agencies responsible for water management, by downstream communities and by environmental groups, but these are not necessarily the stakeholders who are causing the problems or who have the capacity to solve them.

Although all stakeholders need to be involved, it is helpful to identify one or two stakeholders that should take the lead, motivated by a specific problem that affects them. Otherwise, there is a considerable risk that the process stagnates as no one feels a particular responsibility to take it forward.

Identification of values through structured overview of objectives for key stakeholders

The identification of the complete range of values that are at stake requires a closer look at the problems and the stakeholders involved in the process, reviewing why stakeholders consider something to be a problem. If one defines a problem as a gap between a desired state and the actual state (or expected future state), then a closer look at what is "desired" will aid a more adequate identification and evaluation of the main objectives involved. Without a careful identification and structuring of these objectives, there is a risk of neglecting certain implicit objectives of stakeholders. These implicit objectives may turn out to be important, disrupting the stakeholder process at a later stage when an agreement cannot be reached with stakeholders who realize that certain important objectives are not catered for in the proposed set of measures, or when unintended negative impacts of implemented measures surface.

Assessment of the values associated with identified objectives for current practices – indicators and baseline valuation

An assessment of the values associated with the existing situation, a "baseline valuation", should be done in order to identify the seriousness of problems and to help prioritize them. If one does not know where one stands on the aspects that matter, it will be hard to see in what areas improvements are most needed and whether proposed measures indeed lead to significant improvements. This baseline valuation should cover all the relevant values, using the objectives and their indicators that have been identified by the stakeholders. The identification of objectives and indicators and the baseline valuation are likely to be part of an iterative process. New information may come up during the process that points to the existence of an additional objective. It may not be possible to assess some of the identified indicators with the available data and expertise and additional indicators may be identified once one looks into the data and the details.

The baseline valuation should include not only a "snapshot" of the current situation, but it should also identify the main trends and dynamics. Where water scarcity is a major concern, a water balance (estimate) is an essential part of this baseline valuation, providing an indication of the severity of the water scarcity problems.

Identification of possible solutions and stakeholders that control them

The valuation process should help stakeholders to reach a level of confidence and agreement that enables them to implement a set of measures that can reasonably be expected to improve their situation, i.e. to solve some of their problems. Some promising measures will already be known from past experiences or from other regions, and many stakeholders may have a preference for certain measures throughout the process. A good understanding of the main problems and objectives and the values associated with the current situation helps to identify some additional measures. Initially, one should be creative and identify a wide range of measures, bearing in mind that multivalue mapping enables an integrated approach of multitargeted processes and measures for improvements. Eventually, there should be a first screening, taking into account the financial and legal feasibility of the identified measures.

Furthermore, the measures should also be screened for acceptance by stakeholders. Therefore, the list of potentially promising measures should include an overview of the key stakeholders to be responsible for the implementation of each measure and of stakeholders whose cooperation is essential for successful implementation (for example, because they could obstruct the implementation of a certain measure although they are not responsible for implementing it). This may give rise to a reiteration starting from the first element: the identification of stakeholders to be included in the valuation process.

Assessment of expected impacts of measures on main objectives
Once promising measures have been identified, their impacts need to be assessed and valued. This assessment should include a cost–benefit or cost-effectiveness component, looking into the financial and other costs associated with implementation, versus the contribution to the attainment of important objectives. An accurate assessment of impacts of measures is likely to require substantial analytical effort, especially where the list of possible measures is long and where measures are also likely to influence one another. However, at least a qualitative assessment should be made as otherwise there will be no analytical basis to discuss and negotiate a preferred set of measures to be implemented. The use of tools and techniques for multicriteria analysis can support the presentation and interpretation of these assessments.

Evaluation, refinement (mitigating measures) and choice
Eventually, stakeholders should reach a certain level of agreement on the solution to be implemented. This requires that stakeholders reach an agreement or compromise on a balanced set of measures that they expect to result in an acceptable distribution of costs and benefits among stakeholders. Thus, it is useful to consider the expected benefits and costs associated with each measure per stakeholder, to see how measures may be combined in a package that covers all interests, where compensation may be required in order to reach an equitable outcome, and where mitigating measures are needed. A meaningful discussion on measures requires that they be described in sufficient detail, including, for physical measures, details such as exact locations and sizes. Agreement on measures without such details may be rather easy, but then conflicts are likely to arise when the details have to be filled in for their actual implementation.

The result of this negotiation process should be an agreed set of measures and a time frame for implementation, as well as an overview of the role and responsibilities of stakeholders for their implementation.

Implementation, monitoring and evaluation
Where the valuation process results in a decision that has the consent of all the major stakeholders, there will be a fruitful basis for implementation. However, this will not always be the case and, often, some stakeholders will be more willing than others to implement the agreed set of measures. Even where some stakeholders are not cooperating actively, the others involved may nevertheless decide to move on with the implementation. However, if too many stakeholders stall or obstruct implementation for a considerable period, it will be necessary to go back a few steps in the process and review the reached agreements or even the identified objectives.

Once implementation is underway, the use of adequate monitoring and evaluation procedures, involving local stakeholders, is crucial. There should be a clear monitoring arrangement, specifying indicators and monitoring procedures, as well as a structure for periodic evaluations. Monitoring the impacts of the implemented measures is necessary to see whether the actual impacts are in line with the expectations, whether adjustments or mitigating measures are needed, or whether unforeseen problems arise that need to be addressed. These monitoring arrangements should be based for an important part on the stakeholders' objectives and their indicators that were used for the baseline valuation earlier in the process. This allows stakeholders to see whether the situation is actually improving or not.

Implementing the critical elements for valuation processes in practice

The sketched critical elements may give the impression that stakeholder-oriented valuation is a straightforward process in which all the important stakeholders are happily participating. However, this will not necessarily be the case. Participation of, let alone agreement among, all stakeholders may be nearly impossible to realize in many instances. Therefore, it should again be stressed that the process and the elements outlined here are ideal types. Consciously addressing the presented elements is likely to help improve the role that valuation can play in supporting local stakeholders to manage their water resources, but one should be careful not to let theory obstruct practical progress.

Waiting until all stakeholders agree on all things will make progress virtually impossible. Therefore, it may be wise to "move on" with a process even where not all stakeholders are yet participating or agreeing. One can always come back to initial decisions or elements through iteration in a later phase of the process, and certain stakeholders may decide to join the process later on, when it has gained sufficient momentum. It is difficult to give specific guidelines for the decision either to move on or to continue with efforts to persuade additional stakeholders to come on board. A critical mass of stakeholders needs to be on board in order to allow the process to proceed. However, it is impossible to say at the outset when it would be acceptable to continue even if certain stakeholders are not yet, or are no longer, supporting the process.

CONCLUSIONS AND DIRECTIONS FOR FUTURE WORK

Responding to challenges: the benefits of a stakeholder-oriented approach

Improving the connection between analytical water valuation tools with actual water resources management processes requires valuation practitioners to formulate responses to several challenges, three of which have been central in this report. First, water valuation needs to go beyond an analysis of economic values expressed in monetary units in order to cover the full range of values that are considered important by stakeholders, including social and environmental values. Second, there is an adaptive challenge in that water valuation needs to adapt to the local conditions, coping with limits in available data, expertise and time, as well as uncertainty, knowledge gaps and social and physical environments that are changing continuously. Third, water valuation needs to be participatory, combining subjective stakeholder judgements with scientific inputs, responding to stakeholders' needs and supporting communication, learning and negotiating among stakeholders.

In the three pilot cases presented above, attempts have been made to improve the link between water valuation and the local stakeholder processes. In these cases, several responses were observed that helped to meet the challenges for water valuation. An effort was made to capture the lessons from the cases in the outline of an ideal-type process, based on the identification of critical elements in a stakeholder-oriented valuation approach.

In this approach, efforts are made to bring valuation into line with stakeholders' needs, providing insight into disaggregated value estimates to reflect differences among stakeholders and using valuation to identify and evaluate possible measures for improving water resources management. It features an adaptive and learning approach in which the absence of complete data sets is not taken as an excuse for not starting improvements. It recognizes that the aim of valuation is not to find the "right" answer to the question of what the value of water is, but to help stakeholders to reach a point at which they feel confident to take action. This requires a collaborative effort between experts and stakeholders, where stakeholder ownership of the valuation process is central right from the outset, asking them to bring forward their problems and their felt needs/solutions. This approach has the further advantage of leading the process to the key problems and the underlying values of stakeholders.

Although the cases described cover mainly the first part of the outlined process, the evidence suggests that stakeholder-oriented valuation provides a promising means to take account of the broad range of values related to water resources and their uses, to deal with uncertainty and practical constraints, and that it can become part of an integrated, participatory and adaptive approach to water resources management. Such stakeholder-oriented valuation processes are likely to have benefits in terms of improved outcomes, i.e. better decisions, implementation, etc., and benefits in terms of the establishment of processes and capacity within local civil society to participate in water resources management. The latter benefits the resolution of current as well as future problems.

Remaining challenges and directions for future work

Although the outlined stakeholder process and the described responses will help to address the identified challenges for water valuation, they are neither the definitive answers, nor are they easy to implement. The case material presented here offers a useful basis to build an argument for the stakeholder-oriented valuation approach presented in this final chapter. However, it does not offer the broad basis of experiences needed in order to validate the stakeholder-oriented valuation approach beyond its initial elements. Certain questions remain and new challenges can be identified for stakeholder-oriented water valuation. Discussing some of these helps to be cautious about potential weak spots and to focus further work on stakeholder-oriented water valuation.

Values depend on the specific circumstances in a certain place and at a certain time. This means that all valuation is context specific. Stakeholder-oriented valuation is no exception. Indeed, it may be even more context specific than "classic" water valuation approaches; valuation embedded in a stakeholder process may have little use or meaning outside of that process. This limits the possibilities for comparing values across scales and for trend analyses of values over time to evaluate whether situations have improved.

In future work, these limits may be reduced by including some basic value indicators that are the same across cases and that would make it easier to compare results of different valuation studies and to upscale water valuation results from the local to the regional and national level. For this, more experiences are needed to design a framework that balances predefined indicators with room for flexibility and stakeholder inputs. Such frameworks should probably include multicriteria analysis techniques that can support a participatory analysis based on a range of indicators. With regard to valuation indicators, specific attention is needed for indicators and methods to assess non-monetary social and environmental values.

The stakeholder approach to water valuation has the potential to stimulate agreement among stakeholders throughout their decision-making process – from problem formulation to the identification and implementation of solutions. However, it sets higher requirements for investments from stakeholders in terms of time and effort for participation, which requires a careful focus on the usefulness of the process for local stakeholders. Their investment is worthwhile where the process leads to some degree of consensus on priority actions for water resources management. Where this is not the case, the process may turn out to be quite expensive, if not in terms of expert time, then at least in terms of time required from all the stakeholders involved. This underscores the importance of further developing and using procedures to continuously monitor and evaluate the valuation process itself, to see whether it is still going in the desired direction.

Stakeholder-oriented valuation puts less rigid requirements on available data and economic or technical expertise. However, its dependence on participatory analysis methods puts higher requirements on the facilitation skills of experts and on the analysis skills of stakeholders. Moreover, while expressing values in stakeholder processes helps stakeholders to communicate and discuss the issues of importance to them, it may also elicit conflicts. Conflicts can sometimes play a useful role, clearing the air and enabling stakeholders to move ahead afterwards. However, they may also be counterproductive and inflict lasting damage to relations among stakeholders. Therefore, conflict management remains a key issue for stakeholder-oriented water valuation.

An issue that requires specific attention in stakeholder-oriented valuation processes is the role of local politics and existing power structures. These may pose a threat to realizing an equal representation of stakeholders and interests in the valuation process, but ignoring or bypassing them may reduce the possibilities to actually implement the agreed decisions later on. Empowering poor and vulnerable groups increases the equity and democratic legitimacy of stakeholder processes, but it may also create opposition from traditional elites. These might block stakeholder processes that they fear erode their power base, whereas the underprivileged generally lack the resources to implement agreed decisions successfully on their own. Thus, experts who are facilitating stakeholder-oriented valuation processes have to find a delicate balance between ethical considerations of equal representation and practical considerations of connecting to existing decision-making and power structures.

While stakeholder-oriented valuation helps to improve the transparency and fairness of water resources management processes, it does not offer an easy solution. This report has reviewed the process through which existing valuation methods can support local stakeholders in their water resources management processes, and the focus and scope of this report leaves several important directions open for future work. These include:

- studying the possibilities and implications of upscaling the stakeholder-oriented participatory approaches to the national or international level and replicating valuation processes over time;
- the further improvement of analytical tools to assess social and environmental values and the use of multicriteria decision-making tools to support the analysis of trade-offs between values;
- strengthening and disseminating a new set of tools for the facilitation of participatory processes, conflict management, adaptive management and dealing with existing power structures and inequalities, which are all needed to help water professionals to embed their work in multistakeholder processes.

All in all, more experience with the stakeholder-oriented valuation approach is needed, taking a broader sample than the three pilot cases discussed here and covering a longer period, in order to better evaluate the impacts on policy processes.

References

Agudelo, J.L. 2001. *The economic valuation of water. Principles and methods*. Value of Water Research Report Series No. 5. Delft, The Netherlands, IHE.

Bots, P.W.G., van Twist, M.J.W. & van Duin, J.H.R. 2000. Automatic pattern detection in stakeholder networks. *In* J.F. Nunamaker & R.H. Sprague, eds. *Proc. HICSS-33*. Los Alamitos, IEEE Press.

Burrill, A. 1997. *Assessing the societal value of water in its uses.* Brussels/Luxembourg, Institute for Prospective Technological Studies, Joint Research Centre of the European Commission.

Cap-Net. 2005. *Integrated water resources management plans*. Training manual and operational guide. Cap-Net, GWP and UNDP.

Chong, J. 2005. *Valuing the role of wetlands in livelihoods: constraints and opportunities for community fisheries and wetland management in Stoeng Treng Ramsar site, Cambodia*. IUCN Water, Nature and Economics Technical Paper No. 2. Colombo, IUCN — The World Conservation Union, Ecosystems and Livelihoods Group Asia.

Christen, E.W., Meyer, W.S., Jayawardane, N.S., Shepheard, M. *et al.* 2005. *Triple bottom line reporting to promote sustainability of irrigation in Australia*. Paper for OECD Workshop on Agriculture and Water, 14–18 November 2005, Adelaide, Australia.

Costanza, R., d'Arge, R., de Groot, R., Farber, S. *et al.* 1997. The value of the world's ecosystem services and natural capital. *Nature*, 387: 253–260.

Daily, G.C., Soderqvist, T., Aniyar, S., Arrow, K. *et al.* 2000. The value of nature and the nature of value. *Science*, 289(5478): 395–396.

De Groot, R.S., Wilson, M.A. & Boumans, R.M.J. 2002. A typology for the classification, description and valuation of ecosystem functions, goods and services. *Ecol. Econ*., 41(3): 393–408.

Dyson, M., Bergkamp, G. & Scanlon, J., eds. 2003. *Flow. The essentials of environmental flows*. Gland, Switzerland, and Cambridge, UK, IUCN.

Eden, C. 1989. Using cognitive mapping for strategic options development and analysis (SODA). *In* J. Rosenhead, ed. *Rational analysis for a problematic world: problem structuring methods for complexity, uncertainty and conflict*. Chichester, UK, John Wiley & Sons.

Ellis, F. 2000. *Rural livelihoods and diversity in developing countries*. Oxford, UK, Oxford University Press.

Emerton, L. & Bos, E. 2004. *Value. Counting ecosystems as water infrastructure*. Gland, Switzerland, IUCN.

FAO. 1997. *Improving agricultural extension. A reference manual*, by B.E. Swanson, R.P. Bentz & A.J. Sofranko, eds. Rome.

FAO. 2003. *Unlocking the water potential of agriculture*. Rome.

FAO. 2004. *Economic valuation of water resources in agriculture*, by K. Turner, S. Georgiou, R. Clark, R. Brouwer & J. Burke. FAO Water Report No. 27. Rome.

FAO. 2005. *Water productivity and vulnerable groups in the Mkoji sub-catchment*. Project report. SWMRG Sokoine University of Agriculture and FAO, Rome.

FAO/Netherlands. 2005. *Report of the Conference on Water for Food and Ecosystems*. The Hague, 31 January– 4 February, 2005 (available at http://www.fao.org).

Farber, S.C., Costanza, R. & Wilson, M.A. 2002. Economic and ecological concepts for valuing ecosystem services. *Ecol. Econ*., 41(3): 375–392.

Georgiou, S., Whittington, D., Pearce, D. & Moran, D. 1997. *Economic values and the environment in the developing world*. Cheltenham, UK, UNEP / Edward Elgar.

Gibbons, D.C. 1986. *The economic value of water*. Washington, DC, Resources for the Future.

Global Water Partnership (GWP). 2000. *Integrated water resources management*. GWP Technical Advisory Committee. TAC Background Paper No. 4. Stockholm.

Global Water Partnership (GWP). 2004. *Catalyzing change: a handbook for developing integrated water resources management (IWRM) and water use efficiency strategies*. Stockholm.

Grimble, R. & Chan, M. 1995. Stakeholder analysis for natural resource management in developing countries. Some practical guidelines for making management more participatory and effective. *Nat. Res. For*., 19(2): 113–124.

Groom, B., Koundouri, P. & Swanson, T.M. 2003. The watershed economics management approach: an application to Cyprus. *In* P. Koundouri, P. Pashardes, T.M. Swanson & A. Xepapadeas, eds. *The economics of water management in developing countries*, pp. 181–214. Cheltenham, UK, Edward Elgar.

Hermans, L.M. 2005. *Actor analysis for water resources management – putting the promise into practice*. Delft, The Netherlands, Eburon Publishers.

Hermans, L.M., Van Halsema, G.E. & Mahoo, H.F. Forthcoming. Building a mosaic of values to support local water resources management. Accepted for publication in *Wat. Pol*.

Hoekstra, A.Y., Savenije, H.H.G. & Chapagain, A.K. 2001. An integrated approach towards assessing the value of water: a case study on the Zambezi basin. *Integ. Assess*., 2: 199–208.

IAC. 2005. Participatory planning, monitoring & evaluation website – methodologies & approaches, tools & methods (available at http://www.iac.wur.nl).

International Institute for Environment and Development (IIED). 1997. *Valuing the hidden harvest: methodological approaches for local-level economic analysis of wild resources*. Hidden Harvest Research Series 3.4. London.

International Irrigation Management Institute (IIMI). 1995. *Kirindi Oya Irrigation and Settlement Project: Project Impact Evaluation Study*. Volume II (final report). Colombo.

Keeny, R.L. 1994a. Creativity in decision making with value-focused thinking. *MIT Sloan Man. Rev*., 35(4).

Keeny, R.L. 1994b. Using values in operations research. *Op. Res*., 42(5): 793–813.

Kularatne, M.G. 1999. *Fishermen without fish. The effects of productivity decline in lagoon fisheries on a fishing and farming community and its use of natural resources: a case study of Malala Lagoon, Hambantota, Sri Lanka*. Enschede, The Netherlands, International Institute for Aerospace Survey and Earth Sciences. 118 pp.

Lankford, B.A., van Koppen, B., Franks, T. and Mahoo, H. 2004. Entrenched views or insufficient science? Contested causes and solutions of water allocation; insights from the Great Ruaha River Basin, Tanzania. *Agric. Wat. Man*., 69(2): 135–153.

Lindblom, C.E. 1959. The science of muddling through. *Pub. Admin. Rev*., 19: 79–88.

Marschke, M. 2003. From planning to action: what can resources management committees do "on the ground". *Cam. Dev. Rev.*, 7(3): 7–12.

Matsuno, Y., van der Hoek, W. & Ranawake, M., eds. 1998. *Irrigation water management and the Bundala National Park.* Proc. workshop on water quality of the Bundala Lagoons, IWMI, Colombo, Sri Lanka. IWMI, Colombo.

McKenney, B. & Prom, T. 2002. *Natural resources and rural livelihoods in Cambodia*. Working Paper No. 23. Phnom Penh, Cambodia Development Resource Institute.

Molden, D. 1997. *Accounting for water use and productivity*. SWIM Paper 1. Colombo, IIMI.

Molden, D., Murray-Rust, H., Sakthivadivel, R. & Makin, I. 2003. A water productivity framework for understanding and action. *In* J.W. Kijne, R. Barker & D. Molden, eds. *Water productivity in agriculture*. Wallingford, UK, CAB International.

Moss, J., Wolff, G, Gladden, G. & Guttieriez, E. 2003. *Valuing water for better governance*. White Paper for Third World Water Forum. Business and Industry CEO Panel for Water.

Nakamura, R. 1987. The textbook process and implementation research. *Pol. Stud. Review*., 1: 142–154.

National Research Council (NRC). 1997. *Valuing ground water. Economic concepts and approaches.* Washington, DC, National Academy Press.

National Research Council (NRC). 2004. *Valuing ecosystem services. Toward better environmental decision-making.* Washington, DC, National Academies Press.

Nguyen Khoa, S. & Smith, L.E.D. 2004. Irrigation and fisheries: irreconcilable conflicts or potential synergies? *Irrig. Drain.*, 53(4): 415–427.

Nguyen Khoa, S., Smith, L.E.D. & Lorenzen, K. 2005a. *Adaptive, participatory and integrated assessment of the impacts of irrigation on fisheries: evaluation of the approach in Sri Lanka.* Working Paper No. 89. Colombo, IWMI.

Nguyen Khoa, S., Smith, L.E.D. & Lorenzen, K. 2005b. *Impacts of irrigation on inland fisheries: appraisals in Laos and Sri Lanka.* Comprehensive Assessment Research Report No. 7. Colombo, Comprehensive Assessment Secretariat.

Nicol, A. 2000. *Adopting a sustainable livelihoods approach to water projects: implications for policy and practice.* Working Paper No. 133. London, ODI.

Olsson, P., Folke, C. & Berkes, F. 2004. Adaptive comanagement for building resilience in social-ecological systems. *Env. Man.*, 34(1): 75–90.

Pagiola, S., von Ritter, K. & Bishop, J. 2004. *How much is an ecosystem worth? Assessing the economic value of conservation.* IUCN, The Nature Conservancy, The World Bank.

Pearce, D. 2002. Introduction: valuing the developing world environment. *In* D. Pearce, C. Pearce & C. Palmer, eds. *Valuing the environment in developing countries.* Cheltenham, UK, Edward Elgar.

Pearce, D., Pearce, C. & Palmer, C., eds. 2002. *Valuing the environment in developing countries.* Cheltenham, UK, Edward Elgar.

Pretty, J. 1995. Participatory learning for sustainable agriculture. World Dev., 23(8): 1247 1263.

Renault, D. 2003. Value of virtual water in food: principles and virtues. *In* A.Y. Hoekstra, ed. *Proceedings of the international expert meeting on virtual water trade*, pp. 77–91. Delft, The Netherlands, IHE.

Renault, D. & Wallender, W.W. 2000. Nutritional water productivity and diets: from 'crop per drop' to 'nutrition per drop'. *Agric. Wat. Man.*, 45: 275–296.

Rogers, P., Bhatia, R. & Huber, A. 1998. *Water as a social and economic good: how to put the principle into practice.* TAC Background Paper No. 2. Stockholm, GWP.

Simon, H. 1945. *Administrative behavior. A study of decision-making processes in administrative organization.* Third Edition (1976). New York, USA, The Free Press.

Smith, L.E.D., Nguyen Khoa, S. & Lorenzen, K. 2005. Livelihood functions of inland fisheries: policy implications in developing countries. *Wat. Pol.*, 7: 359–383.

Sullivan, C. & Meigh, J. 2003. Considering the Water Poverty Index in the context of poverty alleviation. *Wat. Pol.*, 5(5–6): 513–528.

Tardieu, H. & Préfol, B. 2002. Full cost or "sustainability cost" pricing in irrigated agriculture. Charging for Water can be effective, but is it sufficient? *Irri. Drain.*, 51: 97–107.

Van Eeten, M.J.G. & Roe, E. 2002. *Ecology, engineering, and management. Reconciling ecosystem rehabilitation and service reliability.* Oxford University Press.

Ward, F.A. & Michelsen, A. 2002. The economic value of water in agriculture: concepts and policy applications. *Wat. Pol.*, 4(5): 423–446.

Wildavsky, A. 1992. *Speaking truth to power. The art and craft of policy analysis.* Third edition. New Brunswick, USA, Transaction Publishers.

World Bank. 1994. *A guide to the formulation of water resources strategy*, by G. LeMoigne, A. Subramanian, M. Xie & S. Giltner, eds. Technical Paper No. 263. Washington, DC.

World Bank. 1996. *The World Bank participation sourcebook.* Washington, DC.

World Bank. 2003. *Environmental flows: concepts and methods. Water Resources and Environment Technical Note C.1*, by C. Brown & J. King. Washington, DC.

WWDR. 2003. *Water for people water for life.* The United Nations World Water Development Report. World Water Assessment Programme. UNESCO Publishing & Berghahn Books.

FAO TECHNICAL PAPERS

WATER REPORTS

1 Prevention of water pollution by agriculture and related activities, 1993 (E S)
2 Irrigation water delivery models, 1994 (E)
3 Water harvesting for improved agricultural production, 1994 (E)
4 Use of remote sensing techniques in irrigation and drainage, 1995 (E)
5 Irrigation management transfer, 1995 (E)
6 Methodology for water policy review and reform, 1995 (E)
7 Irrigation in Africa in figures/L'irrigation en Afrique en chiffres, 1995 (E/F)
8 Irrigation scheduling: from theory to practice, 1996 (E)
9 Irrigation in the Near East Region in figures, 1997 (E)
10 Quality control of wastewater for irrigated crop production, 1997 (E)
11 Seawater intrusion in coastal aquifers – Guidelines for study, monitoring and control, 1997 (E)
12 Modernization of irrigation schemes: past experiences and future options, 1997 (E)
13 Management of agricultural drainage water quality, 1997 (E)
14 Irrigation technology transfer in support of food security, 1997 (E)
15 Irrigation in the countries of the former Soviet Union in figures, 1997 (E) (also published as RAP Publication 1997/22)
16 Télédétection et ressources en eau/Remote sensing and water resources, 1997 (F/E)
17 Institutional and technical options in the development and management of small-scale irrigation, 1998 (E)
18 Irrigation in Asia in figures, 1999 (E)
19 Modern water control and management practices in irrigation – Impact on performance, 1999 (E)
20 El riego en América Latina y el Caribe en cifras/ Irrigation in Latin America and the Caribbean in figures, 2000 (S/E)
21 Water quality management and control of water pollution, 2000 (E)
22 Deficit irrigation practices, 2002 (E)
23 Review of world water resources by country, 2003 (E)
24 Rethinking the approach to groundwater and food security, 2003 (E)
25 Groundwater management: the search for practical approaches, 2003 (E)
26 Capacity development in irrigation and drainage. Issues, challenges and the way ahead, 2004 (E)
27 Economic valuation of water resources: from the sectoral to a functional perspective of natural resources management, 2004 (E)
28. Water charging in irrigated agriculture – An analysis of international experience, 2004 (E)
29. Irrigation in Africa in figures – AQUASTAT survey – 2005, 2005 (E/F)
30. Stakeholder-oriented valuation to support water resources management processes – Confronting concepts with local practice, 2006 (E)

Availability: February 2006

Ar	+	Arabic	Multil –	Multilingual
C	+	Chinese	*	Out of print
E	+	English	**	In preparation
F	+	French		
P	+	Portuguese		
S	+	Spanish		

The FAO Technical Papers are available through the authorized FAO Sales Agents or directly from Sales and Marketing Group, FAO, Viale delle Terme di Caracalla, 00100 Rome, Italy.

Stakeholder-oriented valuation to support water resources management processes

Confronting concepts with local practice

Water resources management is becoming increasingly complex as the water sector has to reconcile rising demand, ever-increasing competition and interdependencies between stakeholders. In this context, agriculture faces the challenges of securing a share of water resources that is sufficient to feed a growing world population and of managing the impacts of its activities on the resource base. It has to meet these challenges in an institutional set-up that is in a state of flux, recognizing the limits of centralized technocratic planning. Today, raising capacity in water resources management entails supporting stakeholders and decision-makers to reach a common understanding on the priorities and necessary arrangements for sharing and allocating water-related goods and services. Valuation is central to this process. Setting priorities and making choices implies valuing certain uses and arrangements above others. Water valuation can help stakeholders to express the values that water-related goods and services represent to them. It also offers a means for conflict resolution and planning, informing stakeholders, supporting communication, and facilitating joint decision-making on priorities and specific actions. This report confronts concepts from the literature on water valuation with practical experiences from three local cases where an effort was made to embed existing valuation tools and methods in ongoing water resources management processes. It uses the lessons from this exploration to provide a first outline for a stakeholder-oriented water valuation process. This is expected to provide a useful starting point to help water professionals and policy-makers improve the use of water valuation as a means to support participatory processes of water resources management.

ISBN 92-5-105477-0 ISSN 1020-1203

9 789251 054772

TC/M/A0385E/1/01.06/1400