



UNDP - GEF - SFA

“Wetland Biodiversity Conservation and Sustainable Use in China”



MAINSTREAMING WETLAND BIODIVERSITY CONSERVATION

Experience and Lessons Learned in Practical Applications of Mainstreaming

Proceedings of the International Workshop

December 4 - 7, 2007

Yueyang, Hunan Province, P.R. China



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Editors' Note: All papers have been edited for content and style. Papers originally written in Chinese were translated by the Project Office, then edited. There are many words, expressions and nuances that are not easily translated from Chinese to English. Therefore, while effort was made to understand and re-interpret awkward translations, some difficult text may remain in the full papers.

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FOREWORD

China has over 24 million hectares of some of the world's most unique natural wetlands, supporting an extremely wide range of globally important biological diversity. The use of these wetlands also supplies rice, protein, medicine, energy and raw materials for local communities. However, there used to be a number of barriers to effective conservation of these global wetland biodiversity, including lack of integration of wetland management and biodiversity conservation into development planning and absence of adequate institutional mechanisms for multi-sectoral wetland management. UNDP/GEF "Wetland Biodiversity Conservation and Sustainable Use in China" Project (China Wetland Project) represents a timely response to these challenges aiming at mainstreaming wetland biodiversity conservation into national, provincial and local government decision making and action.

Though recognized by the UN Convention on Biological Diversity as the principal vehicle through which the objectives of the convention can be achieved, the mainstreaming concept has been relatively poorly understood among many practitioners of wetland conservation. With this in mind, UNDP China, WWF China and Wetland International China Office together with State Forestry Administration jointly organized an international workshop entitled "*Mainstreaming Wetland Biodiversity Conservation – Experience and Lessons Learned in Practical Applications of Mainstreaming*". The workshop which was held on December 1 - 4 of 2007 in Yueyang, China, focused on sharing of experiences between wetland conservation communities in China, their counterparts in other countries and international organizations in the practical application of mainstreaming both in wetland management and in relevant sectoral areas such as water resources management.

As a formal record of the workshop, this proceeding is divided into seven sections containing 24 chapters elaborating the experiences of mainstreaming approaches, methods, mechanisms and practices for wetland conservation from the perspectives of international organizations such as UNDP, Ramsar Convention and WWF, developed and developing countries and the Chinese side at national and local levels. Chapter One provides a consolidated overview of the workshop itself and of the major themes drawn from the papers that comprise the chapters of this volume. These Proceedings are intended to contribute to the building of knowledge to achieve the strategic objective of mainstreaming biodiversity into production landscapes of the GEF, and mainstreaming environment into sustainable development which is integral to the UNDP Strategic Plan for 2008-2011.

Subinay Nandy

Country Director
UNDP China

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PREFACE

In his immortal prose *The Yue Yang Tower*, Fan Zhongyan wrote this sentence: “*To be the first to worry about the affairs of the state and the last to enjoy oneself!*” The sense of responsibility of the whole country reflected in this sentence was taken as a motto of the patriots and contributed to the development of societies, therefore was regarded as a splendid spiritual wealth of China in its civilization history. This prose itself was created in the inspiration by Dongting Lake — the Internationally Important Wetland. In the prose it says: *Dongting Lake holds the mountain ranges in the distance and swallows the water of the Yangtze River. It's so vast and mighty that it seems boundless. Dazzling in the morning sun and fading in the growing evening mist, it offers a myriad scene.* The grand ecological functions and natural scene inspired the thinker.

Wetland is the carrying body of the global water cycle. Water is the soul of wetland, which decides the distribution, structure and function of wetland. At the same time, water is the major product of wetland. It is estimated that at least 1.5-3 billion people in the world directly depend on wetlands for safe drinking water. Among the eight Millennium Development Goals of the United Nations, three are directly connected to wetlands and water.

Reports from FAO and RAMSAR indicate that at least 1 billion people in the world (mostly in developing countries) get most of their animal protein from wetlands. Wetland fishing is an important component of national economies. At least 35 million people in the world directly live on fishery and aquaculture fisheries. More than 70% of aquatic products come from terrestrial and coastal wetlands ecosystems. *The Millennium Ecosystem Assessment Report* estimates that the coastal wetlands alone contribute 34 billion USD of aquatic products every year, and the fishery industry creates an annual international trade volume of 55 billion USD.

In the past three decades, China's fast economic growth, harmony and stabilization of society and food security during the world's food crisis depend to a great extent to the success of hybrid rice and popularization of super rice. There are three elements that contribute to the success of hybrid rice, the thinking of Yuan Longping on hybrid rice and his persistence in research; the swamp with wild rice in Hainan Province and; the emphasis on the study from the Central Government. Among all these, the plant resources protected in the swamp wetlands play a key role.

These facts prove that wetland is the basis of human life. To protect more wetlands is to leave more chances for our own life and more room for the development of our offspring. However, reality goes the other direction. The history of wetland management by human beings in the past century shows that development and exploitation of wetlands brings mostly destruction. Although it has been 37 years since RAMSAR was signed, the trend of destroying wetland globally has not been completely reversed. *The Millennium Ecosystem Assessment Report* points out that among all ecosystems in the world, wetland is regarded as the worst damaged. In the past century, over 50% of the wetlands in North America, Europe, Australia and New Zealand have been converted to other purposes. In the past 20 years, 35% of global mangroves and 20% of the coral reefs have disappeared. In China, the proportion of cultivated and destroyed natural wetlands is similar to those in Europe and America. The most

concentrated areas of wetlands are located in the lower and middle reach of the Yangtze River and the Sanjiang Plain and they are disappearing at rates even higher than 60%.

It is hard to imagine what would happen if the research on hybrid rice had not been successful today. It is even harder to imagine how a society would develop if it lacks water, food, fish and the ecological haven of wetland. But currently the disasters caused by wetland destruction may help us imagine how human beings can face more fierce floods, more serious storm tides and more severe droughts, especially with climate changing. The great flood in 1998 in the Yangtze and Nenjiang Rivers killed more than 4,000 lives and caused a direct economic loss of over 250 billion RMB. Despite of the millions in investments by the Chinese government over the past decade to tackle problems of Taihu and Dianchi lakes, the effects are faint. Blue-green algae blooms frequently alter the drinking water safety, thus affecting millions and even tens of millions of people. After the tsunami in the Indian Ocean in 2004, people were surprised to find little damage upon lives and properties in the coastal areas where mangroves were well preserved. In this sense, if all mangroves had been well protected instead of being developed for shrimps and tourism, maybe the 200,000 people would have survived from the tsunami.

As one of the three major ecosystems in the world, wetland is an important environment for human beings to live in, the place with the richest biodiversity and the most favored natural scenery. Wetland ecosystem has the highest primary productivity and is the basis for material and spiritual civilizations of human beings. The functions of wetland in flood regulation and storage and water purification not only provide us with water resources and supplement groundwater, but also protect us against natural disasters (floods, droughts, storm tides, etc.) all the time. Therefore we can say, from mountains to oceans, wetlands provides us with all types of services and products everywhere. If wetlands are so important, then why are they so seriously destroyed?

The International Workshop on Mainstreaming Wetland Biodiversity Conservation was held from December 1-4, 2007 in Yueyang City, Hunan Province of China. The workshop left us with much material based on which we can discuss the issues mentioned above. More than 130 participants from 11 countries including Australia, Cameroon, Canada, China, Egypt, India, Mexico, Pakistan, South Africa, UK and USA, and renowned international organizations including UNDP, WWF, Wetlands International, the Ramsar Office, etc. participated in the workshop and made scientific and in-depth presentations on wetlands protection and mainstreaming. The ensuing discussions further enhanced our knowledge of wetland management and translated into fruitful results. The internationally influential Dongting Lake Declaration was released during the workshop.

After the concept of Mainstreaming was brought forward in CBD's COP in 2002, the GEF Biodiversity Programme put biodiversity mainstreaming as its prioritized strategic field and emphasized the aim of integrating biodiversity into agriculture, forestry, fishery, tourism and other productive sectors to secure the ecological benefits of countries and even the whole world. China has done a lot in recent years in mainstreaming biodiversity protection. The on-going National Programme on Wetland Conservation receives joint participation and support from relevant government departments, research institutions, protected areas and all walks of life and is now making positive impacts on the mainstreaming of wetland

conservation in China. The National Committee for the Implementation of RAMSAR in China, which is constituted of 16 ministries and was established upon the authorization of the State Council this year, will identify responsibilities and obligations of all levels of governments, relevant institutions and citizens in wetland conservation from a legislative perspective as well as promoting cross-sectoral and cross-boundary cooperation in wetland conservation management. Wetland research, monitoring and awareness-raising activities carried out at various levels and in various forms will further promote scientific decision-making, rationalization of measures, and socialization of participation and management level on mainstreaming wetland conservation.

The efforts made by China in mainstreaming wetland biodiversity need to be further deepened. In this sense, the Yueyang Workshop on Mainstreaming Wetland Biodiversity Conservation is not only an important activity of the project on *Wetland Biodiversity Conservation and Sustainable Use in China*, but also a great driving force for the mainstreaming of wetland biodiversity conservation in China.

In order to fully share the fruits of this International Workshop, the SFA-GEF Wetland Project Office asked experts from the College of Nature Reserve in Beijing Forestry University to consolidate the papers from the workshop and to supplement some key content to this book *Mainstreaming Wetlands Biodiversity Conservation: Experience and Lessons Learned in Practical Applications of Mainstreaming*, so that theories, methods and cases can provide some answers to core issues on wetland conservation management, as well as acting as a reference for readers.

At the time of the publication of this book, on behalf of the State Forestry Administration, I would like to express our appreciation to UNDP which has always been supporting and promoting wetland conservation in China. Also, I would like to congratulate the experts and the project team of the GEF-supported project on *Wetland Biodiversity Conservation and Sustainable Use in China* on their achievements and results. My thanks also go to the 130 participants of the workshop for their valuable case studies and splendid presentations. More importantly, I want to thank the hosts of the workshop, the People's Government of Hunan Province, the People's Government of Yueyang City and the National Nature Reserve of Dongting Lake for their hospitable and considerate support during the workshop. Without all this hard work, it would have been impossible to publish this book. Thank you all.

Yin Hong

Vice Administrator
State Forestry Administration
October 2008, Beijing

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DONGTING LAKE DECLARATION

On the occasion of the

International Workshop on Mainstreaming Wetland Biodiversity Conservation

Dec. 1-4, 2007, Yueyang, China

We, 130 representatives from 11 countries representing both developed and developing countries from four continents, including Australia, Cameroon, Canada, China, Egypt, India, Mexico, Pakistan, South Africa, the United Kingdom, and the United States, as well as from UNDP, Wetlands International and WWF, gathered by Dongting Lake from December 1st to 4th 2007, to discuss and debates the theme of mainstreaming wetland biodiversity conservation. Our consensus on this issue is reflected in this Dongting Lake Declaration.

We agree that:

Mainstreaming wetland conservation is a process, a philosophy and a mechanism by which wetlands policies, planning and implementation converge to form a comprehensive solution to wetlands biodiversity conservation and sustainable use. It requires an ecosystem approach, involving all levels of government, the public and private sectors, and integrating diverse sectoral interests, so as to form a coherent and coordinated wetlands biodiversity program that balances wetlands conservation and sustainable use.

Drawing attention to the fact that:

Experience from all countries in the workshop confirms mainstreaming as an effective mechanism that helps us to address wetland conservation issues. Dongting Lake, formerly the largest freshwater lake in China, is an important example of mainstreaming wetland biodiversity conservation. Dongting Lake once covered an area of six thousands square kilometers, accommodating the vast water inflows and outflows of the Yangtze River and its four tributaries. In the past, Dongting lake and its surrounding basin was managed by sectoral agencies in an uncoordinated manner that has led to damage to the wetlands, decline in biodiversity, and loss of ecosystem functions that are critically important to the health of the lower Yangtze River system. However, through mainstreaming there is now an integrated and coordinated management program for Dongting Lake that involves all sectors and which engages the public. Mainstreaming has also led to greater balance between conservation and sustainable development and has been the key factor in the recovery of Dongting Lake.

We note the efforts and progress made with regard to the Dongting Lake conservation, including the designation of three Ramsar sites, the large-scale return of agricultural land to wetland, wetland restoration and protection programmes, the UNDP supported Wetland Biodiversity Conservation and Sustainable Use Programme, and the WWF supported Partnership for a Living Yangtze Programme. These actions effectively reverse the degradation trend of the Dongting Lake wetland ecosystem.

Therefore:

We confirm that:

The multi-functions and services of wetland ecosystem are the basis of sustainable socio-economic development. Of the three global ecosystems, wetland ecosystems are the link between the terrestrial and marine ecosystems. Wetlands play a critical role in global carbon cycling. They are also the ecosystem with the highest primary productivity and richest biodiversity on Earth and are the inspiration for cultural and spiritual values for millennia. Wetlands play a central economic role in areas such as flood retention and mitigation, groundwater recharge, and water purification and provide effective barriers to natural disasters like floods, droughts and storms.

We note that:

Notwithstanding the benefits of wetlands, they are the most deteriorated and biologically threatened of all global ecosystems. The cause is mainly the unsustainable, irrational and un-coordinated management of wetlands, which normally fails to integrate different purposes and interests in wetland utilization. Despite the Ramsar Convention and the Convention on Biodiversity, degradation of wetland ecosystems continues at the global scale, and will deteriorate further under global climate change. Wetlands, particularly peat lands, are one of the most globally important terrestrial carbon sinks; but if destroyed, they will become the largest single carbon source of global significance.

We endorse the proposal that:

International societies, governments, wetland management institutes and organizations should strengthen their efforts in communication, education and research of wetland ecosystem's functions and services, promote amongst the whole society the key role of wetlands in sustainable socio-economic development, integrate and embody principles of wetland conservation and sustainable management in the formulation and implementation of socio-economic development policies and planning at all levels, reverse as rapidly as possible wetland degradation and restore the functions and services of wetlands, so as to meet the needs of socio-economic development, to cope with global climate change, and to provide essential habitat that supports a healthy and diverse range of living species. .

Specifically, we recommend that:

A. At the International Level:

- Mainstreaming of wetland conservation be urgently integrated into the global processes of environment and development negotiation. This requires two actions: (1) The Ramsar Convention, through its Secretariat should have an official seat in United Nations fora on global issues, and (2) the Convention on Wetlands should extend its cooperation model with the Convention on Biological Diversity to other multi-lateral conventions such as UNFCCC, CCD, CMS, and in particular UNFCCC (United Nations Framework Convention on Climate Change), so as to include the central role that wetlands play in CO₂ emission reduction and global climate change response strategies.

- Recognising the centrality of mainstreaming to wetlands biodiversity conservation, and noting the absence of specific guidance in either the Ramsar Convention or the CBD, we recommend that (1) the UNDP on behalf both of Ramsar and the CBD develop specific guidance on mainstreaming in wetlands and related biodiversity conservation, and (2) the 10th Conference of Parties (COP) of the Convention on Wetlands should consider adopting a resolution on mainstreaming wetland conservation.
- International NGOs should invest more in wetland conservation and facilitate the mainstreaming processes of wetland conservation at global, national, regional and site levels.

B. At the national level

- The past 20 years have demonstrated the fragility of wetland ecosystems, therefore we support the precautionary principle and recommend that all governments make this a guiding principle in wetlands mainstreaming activities.
- That governments adopt mainstreaming as the key component of wetlands management, extending from laws and regulations, to implementation practices.
- We note that the full range of economic and development instruments should be included and coordinated in wetland mainstreaming activities. This includes development policy, legislation, planning, finance and taxation, economic incentives, international trade, capacity building, and research, and technology.
- Successful mainstreaming requires an informed public, therefore we urge all governments to make special efforts to educate the public in wetlands values. We regard effective community participation as an essential element of mainstreaming and we urge all governments to adopt full disclosure and transparency in their stewardship of wetlands and wetlands biodiversity.

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THE WORKSHOP: SYNTHESIS AND PERSPECTIVE

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CHAPTER 1

WORKSHOP SYNTHESIS AND OVERVIEW¹

Abstract

This International Workshop was held under the auspices of the China Office of the United Nations Development Programme (UNDP) and the (China) State Forestry Administration (SFA), that together have been responsible for the “*Wetland Biodiversity Conservation and Sustainable in China*” project of the Global Environment Facility (GEF) over the period 1999-2008. The Workshop, a key deliverable of the Project, was convened with two main purposes in mind – firstly, to demonstrate how China has approached wetlands biodiversity conservation, and secondly to share mainstreaming experiences with wetlands managers in other countries. The Workshop was held in Yueyang, the county town of East Dongting Lake, Hunan Province, and which has had a major program of mainstreaming wetlands issues as part of the national wetlands project. The Workshop also was scheduled to coincide with the annual international Yueyang Bird-Watching Festival held in December of 2007.

The purpose of this chapter is to provide an overview of the entire Workshop including the main points that were presented by the many speakers and the key discussion issues. The conclusions reached at the Workshop are captured in the “**Dongting Lake Declaration**” that appears in this volume as a visible statement of concern to international agencies over the status of wetlands globally, and the central importance of mainstreaming biodiversity conservation across productive sectors and throughout the economy and society.

Mainstreaming has become a significant topic of multilateral interest. This is addressed first by a spokesperson from the Secretariat of the Convention on Wetlands of International Importance (Ramsar Convention), followed by examples of mainstreaming from wetlands projects managed by the UNDP. This is followed by the World Wildlife Fund (WWF) that has extensive experience in wetlands mainstreaming. The third major section of this monograph focuses on the experiences of the current China wetland project of UNDP, SFA and the GEF. This project has involved national, provincial and site level mainstreaming. The fourth section explores mainstreaming from the perspective of international participants who represent both developed and developing countries. The fifth major section brings into focus the mainstreaming activities that have occurred at site (local) levels in China in areas and that are independent of the Project. These papers demonstrate that the issues that form the focus of the national Project have resonance at local levels throughout China. Finally, the sixth major section contains a variety of methods and technologies that are used in China and elsewhere to support mainstreaming.

Keywords: wetlands, biodiversity, conservation, mainstreaming

WORKSHOP SYNTHESIS

Editor's Note: A synthesis of each day's discussion was prepared by this rapporteur and presented at the conclusion of most sessions for further discussion. While there is inevitably an element of subjectivity it is believed that the broadly-based discussion did lead to a consensus opinion that is reflected in the following text.

Main Elements of Mainstreaming

There was no attempt to pre-define the main elements that are important for mainstreaming wetland biodiversity conservation. Table 1 summarizes the consensus on six key elements as they emerged from presentations, subsequent discussions during plenary sessions, and Q&A sessions with individual speakers during the Workshop. It is not surprising that these are very

¹ This chapter was prepared by Edwin Ongley, Water Policy Advisor to the National Project, and who also served as rapporteur for the Workshop.

similar to mainstreaming issues identified in various documents on this subject, however the relative importance of these is determined here by practitioners and not by an arm's length advisory group. The absence of main elements in individual presentations tends to reflect the particular orientation of the presentation and should not necessarily be interpreted as "unimportant" to that speaker.

Political Support: This was identified as the first key element insofar as without political support there is little chance of moving wetlands biodiversity conservation into the national or state/provincial agenda. As noted below, this requires development of "champions" that will lead the politicization of wetlands conservation to the point where it becomes a political reality.

Policy/Legislative and Regulatory Framework: This is the second key element identified at the Workshop. Obviously, a successful wetlands policy must be backed up by well articulated policy objectives, and a legislative and/or regulatory framework that provides the "teeth" to implement the policy. The legitimate role of water for ecological purposes needs to be clearly stated.

Strategic Planning: Comprehensive and integrated planning across sectors is one of the main failures of wetland conservation. This element recognises that without strategic planning wetland conservation and sustainable use cannot be achieved. The principal elements of strategic planning were identified as:

- Understanding of the role of Planning as a key coordinating mechanism
- Clearly identified objectives
- Designation and acceptance of sector roles & responsibilities
- Identification of sector inter-relationships, especially where there are overlapping mandates
- Identifies essential data, how it will be collected and by whom, and how data sharing should occur. This will include cost allocation or sharing, where appropriate.
- Planning provisions should be a complete planning system, including decision approval process, plan amendments, updating or rolling planning, etc..
- Clearly identify mechanisms by which the public are to be involved and if (and how) public supervision should be used.
- Implementation mechanisms are clearly identified with financial and legal responsibilities clearly noted.

Sectors, Partnerships & Coordination: This element specifically addresses the GEF priority "mainstreaming biodiversity conservation across all sectors of the economy..." for the simple reason that wetland managers in most countries (public agencies, community organizations, NGOs, etc.) do not control all the components of a wetland and require the assistance and cooperation of sector agencies to achieve wetland biodiversity conservation and sustainable use. Multi-sector management requires an explicit coordinating mechanisms with clear rules and decision processes, and specified accountabilities.

TABLE 1: MAIN ELEMENTS OF MAINSTREAMING

International Perspective on Mainstreaming

Element	Speaker					TOTAL
	UNDP	RAMSAR	WI China	WWF Int'l	Int'l Overview	
	Sameer	Hails	Chen	Pittock	Ongley	
Threats & Impacts	X	X	X	X		
Political Support	X	X		X	X	4
Policy/Legislative Regulatory Framework	X	X		X	X	4
Strategic Planning	X	X			X	3
Sectors/Partners/ Coordination	X	X	X	X	X	5
Capacity Development/ Research	X			X		2
Awareness/Education				X		1
Enforcement					X	
Econ. Valuation of Wetland						
Key Messages	Meas. Mainstr MDGs	Wetland Health MDGs		Wetland Poverty linkage	Governance	

Notes:

1. "X" indicates that the speaker regarded this factor is important for mainstreaming. In some cases the example provided is a positive influence in mainstreaming; in some cases its absence is identified as a negative factor that inhibits effective mainstreaming.
2. Shaded lines are those most frequently identified as essential for mainstreaming.
3. **Key Messages:** important points identified by the speaker but not adequately highlighted in the listed issues.
4. Absence of "X" often reflects the topic of the presentation which may not touch on many of these issues.

Names of speakers are in bold text.

UNDP : United Nations Development Programme

WI : Wetlands International

WWF : Worldwide Fund for Nature

MDGs : Millennium Development Goals

National Perspective on Mainstreaming : Ex-China

Element	SPEAKER										TOTAL
	Canada UBC	Egypt	Pakistan	S. Africa	Cameroon	USA	India	Aust.	UK WWF	Mexico WWF	
	Yin	Shaltout	Khan	Day	Ajonina	Bondelid	Ramasubr.	Fisher	Oates	Barrios	
Threats & Impacts	X	X			X		X	X		X	
Political Support		X	X	X	X			X		X	6
Policy/Legislative Regulatory Framework		X	X	X	X	X		X		X	7
Strategic Planning	X	X	X	X	X	X	X	X		X	9
Sectors/Partners/ Coordination	X	X	X	X	X	X	X			X	8
Capacity Development/ Research		X	X	X	X	X	X				6
Awareness/Education	X	X	X		X		X	X			6
Enforcement		X	X	X							
Economic Valuation of Wetlands				X					X	X	
Key Messages			Data sharing Financial mainstrea mg.	Water for Environ	Link btw poverty and wetland resources	Techn basis for mainstr data sharing	Importance of local community; local economy & wetlands	Consequence of policy failures; importance of champions	Valuation is a key to resolving X- sectoral differences	Water for Envir	

National Perspective on Mainstreaming : China

Element	SPEAKER												TOTAL
	China SFA	China SEPA	China GEF Project	China St.Oceans Adm	China	China WWF	China Dongting NR	China Guangdong	China Heilongjiang	China Shaanxi	China Qinhu	China Honghu NR	
	Ma	He	Lang	Wang	Cao	Li	Gui	Ke	Cui	Zhang	Liu	Zhang	
Threats & Impacts	X	X		X		X	X	X	X	X	X	X	
Political Support	X					X	X	X	X	X	X	X	8
Policy/Legislative/Regulatory Framewk	X	X	X	X			X	X	X			X	8
Strategic Planning	X	X		X		X	X	X	X	X	X	X	10
Sectors/Partners/Coordination	X	X	X			X	X	X	X	X	X	X	10
Capacity Development/Research	X	X		X			X	X	X				6
Awareness/Education	X	X			X		X	X	X	X	X	X	9
Enforcement				X			X	X				X	
Economic Value of Wetlands							X			X	X		
Key Messages		Link env legislation with wetlds	Need integrating legislation.	Econ. Incentives	Cultural value of wetlds	Networks not single wetlands	Econ value of wetld; flood mitigatn 35%	Need for high level coordination	Inform sharing; Public/priv sector partnership Int'l Coop	Conflict btn agriculture and wetlds; Economic alternatives is win-win	Wetland culture; Sust. tourism; Public / private partnership	Role of publicity & public involv	

Capacity Development/Research: Capacity development and research may not appear as a mainstreaming issue at first glance as this is often narrowly focused on facilities and equipment; here, however it encompasses a broad range of issues that include: management training that cuts across sectors; inter-institutional and inter-sectoral cooperative management models; management tools that include public involvement and/or delegation of wetlands management to civil organizations; economic and business models that capture the principles of cost-recovery, incentives and investment; etc... This element also identifies the research that is required to develop and implement these types of management systems, as well as cross-cutting research in natural and physical sciences that underpin wetlands management. These were not discussed in detail in this Workshop but did form a component of many presentations.

Awareness & Education: This is arguably the most fundamental of the mainstreaming elements insofar as without awareness by the public and by officials, little progress will be achieved in wetland conservation. Education is the key, both upwards to officials, outwards to the general public, and downward to the public and into school curricula. It is also recognized that education is not just about building awareness, but also encompasses a strategic approach that facilitates broad understanding of the sectoral issues and problems, and that synthesises and bridges across social aspirations, economic imperatives, and biodiversity considerations. This element was not fully discussed at the Workshop however many aspects of awareness and education were proposed by various speakers.

Analysis of the main elements

Of the six elements (shaded lines in Table 1) that emerged as those most closely associated with mainstreaming, Chinese speakers found that “Strategic Planning” and “Partnerships/Coordination” were the two most important elements. Given that the Chinese speakers are, for the most part, directly involved in wetlands management, this is not surprising, and highlights the difficulty in China of achieving coordinated and strategic planning, and of securing inter-sectoral partnerships for wetlands purposes. This priority is also at the top of the list for other international speakers who, for the most part, are also practitioners and, for those from developing countries, have many of the same institutional and planning problems as in China. In contrast, international speakers who tended to reflect institutional perspectives, were more balanced in their assessment of mainstreaming priorities. A good example of this difference is in awareness and education which are rated lower by international speakers and much higher by practitioners. All speakers agreed on the need for political support and on the need for a solid policy/legislative and regulatory environment in support of wetlands conservation.

The results suggest that practitioners tend to focus on the day-to-day problems of wetland management in which strategic planning and institutional cooperation often become the main obstacles to wetlands management.

Scale effects on mainstreaming elements

Table 2 attempts to illustrate how the elements of mainstreaming vary in importance, depending on the level of jurisdiction. The table is an interpretation based on the individual presentations but does illustrate how the focus on mainstreaming changes with jurisdictional responsibility. For example, while strategic planning, partnerships and coordination, awareness and valuation all have relevance to national wetland programs, these tend to be abstract and framed as policy rather than as explicit implementation actions. In contrast, at the local level where wetland management is actually implemented, these are daily management issues that spell the difference between success and failure in wetland conservation and are therefore rated as highly important. A notable exception is “policy/legislation and regulatory framework” which appears to be marginally less important at the local level, however this is probably mainly because at higher levels, governments are mainly concerned with policy and not with the mechanics of implementing these policies. In China, the mechanics are largely left to local government to resolve in the way that best suits their local circumstances insofar as Chinese law and regulations tend to focus on general principles and tend not to be especially detailed.

We can conclude from Table 2 that the perception of importance of these main elements of mainstreaming tends to reflect the level of government to which the questions is addressed. It also shows that the criteria for defining mainstreaming elements are different at different levels of government, with higher levels of government mainly concerned with over-arching policy, and local government mainly concerned with the practical issues of implementation of policy.

Table 2: Jurisdictional effects on mainstreaming activities:

Issue	National	Provincial	Local
Threats & Impacts	High	Medium	High
Political Support	High	High	High
Policy/Legislation/Reg. Framework	High	High	Medium
Strategic Planning	High	High	High
Sectors/Partners/Coord.	High	Medium	High
Capacity Development/ Research	High	High	High
Awareness/Education	High	Medium	High
Valuation of Wetlands	High	High	High
Enforcement	High	High	High
Economic Value of Wetlands	High	High	High

Importance: High Medium Low

Additional Mainstreaming Issues

Several other themes were also raised in discussion as essential for wetlands biodiversity conservation. These include:

- ***Wetland Valuation***
 - identifies economic costs / benefits as basis for inter-sectoral discussions
 - sets market values for PES² systems
 - basis for rationalizing conservation with development (wise use)
- ***River Basin Management***
 - allows integration of wetlands into river basin agenda
 - integrates water, environment and economic management at basin scale.
- ***Performance assessment*** and rewards for Officials based on environmental indicators
 - promotes excellence in environmental performance
- ***Methods of accountability*** to ensure that officials consult and implement according to the law.
- ***Eco-tourism:*** It was noted that eco-tourism is often poorly understood in some countries. For example, in China, “sightseeing” tourism is often now advertised as ecotourism but with little or no emphasis on social or bio-ecology. The appeal of “ecotourism” now causes major damage to wetlands due to the emphasis on economic returns to the promoter. Further, the use of the ecotourism concept must be adapted to the particular wetland. For example, wetlands extend from those that are large, robust, and can withstand large influxes of tourists, to those that are highly sensitive and are easily damaged by even small amount of poorly managed tourism. This is significant mainstreaming issue in China where tourism bureaus at local levels often promote high volume wetlands tourism as a means of generating economic growth in their jurisdiction. This leads to the suggestion that there needs to be different tourism strategies for different types of wetlands. In China, for example:

Wetland Parks in large, robust wetland areas can sustain high volume, low-cost tourism which locally has high impact .

versus

Remote Area Wetlands can sustain only low volume, low impact tourism which is carefully planned and managed.

This suggests that a tourism model should not be based solely upon high volume, low cost tourism as is now the case for most Chinese tour groups. Rather, tourism bureaus should impose significantly higher costs in fragile and remote areas so that the number of tourists are limited to a pre-determined number yet the revenue stream is maintained or enhanced.

- ***Retention of benefits in the local economy*** (especially in poor and remote areas): Retention of economic benefits in the local economy is a major issue in many countries where the main profits in ecotourism are often made by tour operators based outside the region. Using the Canadian north as an example, northern jurisdictions

² Payment for Ecological Services

imposed restrictions on “southern” (non-aboriginal) entrepreneurs, requiring them to have active northern business partners for many types of business ventures, involve and train northern residents in business activities, and precluding financial incentives for certain types of business development to those that do not have northern residency status. This has had significant success in that northern aboriginal peoples now have a larger share of the economic benefit and, in some cases, have become very successful business entrepreneurs. Eco-tourism in the Canadian North is mainly organized through local businesses located in the north.

- **Public – Private Sector Partnerships:** China has had significant success in development of wetland parks which use a business model to seek investment in tourism and lifestyle living (summer homes, etc.). Mainstreaming this type of business model can have significant benefits for wetlands including:

- these can work in favour of wetland conservation
- payback period is short if planned well
- provides funding for wetland conservation
- engages government, private sector and public in wetland planning

Chapter 19 presents an excellent case study of public-private sector partnership that reduces poverty while conserving crested ibis habitat.

- **Time Horizons for Mainstreaming:** It was recognized that mainstreaming is a lengthy process. In particular, it needs to accommodate changes in government (western countries). Also, in view of climatic uncertainty, mainstreaming also needs to include within its planning provisions an accommodation for climatic cycles or climate change.
- **Need for Champions** to combat strong vested interests. Examples of strong vested interests include:

Irrigation industry	Agriculture
Hydropower	Major Polluters
Land Developers	

Examples of Champions include:

- Ducks Unlimited (large hunting NGO) in North America
- Ramsar Managers Network (Australia)
- Senior Officials (everywhere)
- Famous People (everywhere)
- Environmental NGOs

- **National and International Partnerships:** This is of particular importance to wetlands managers from developing countries who often lack the skills to mainstream effectively and to present cogent and “winning” arguments that can bring sectoral interests into a win-win situation. Partnerships may be intra-national or inter-national. WWF and WI have been especially effective in developing such partnerships.

SUMMARY OF WORKSHOP PRESENTATIONS

Status and Objectives of Wetland Conservation in China

Wetlands serve many important ecological functions and play an essential role in maintaining national eco-safety; it is therefore important to protect wetlands. In China, some of the major threats and challenges to wetlands conservation are related to wetland degradation and weaknesses in their protection and management. In this paper (Chapter 2), the roles of wetlands in eco-safety and social-economic developments are described. It also describes the major recent achievements regarding wetlands conservation in China through the following actions: the central government has adopted it as a top priority; actively promoting policy and legislation; establishing or strengthening the wetland protection and management institutions; implementing the National Wetland Conservation Strategic Planning; reinforcing the wetland protection system; promoting public education and training activities; and great efforts to implement the Ramsar Convention and conducting international cooperation. The National Strategy for Wetland Conservation in China is outlined.

Perspective on Wetlands in Chinese Cultural History³

This paper, while not about mainstreaming, is placed at the beginning of this volume in recognition of the importance of water in the historical context of wetland management in China. It explores the influence of wetlands in Chinese writing and culture over the many millennia of Chinese history. Water is one of the five elements of ancient Chinese philosophy into which all natural phenomena can be classified. Wetlands were described in ancient writing as mystical and dreamlike places which are vast yet blurred, mysterious and fanciful, and illusory and luxuriant, and are surrounded by cloud and mist as in dreams. We find, for example, that Dongting Lake features prominently in both its influence on classical Chinese poetry and by the present-day Dragon Boat Festival that commemorate Qu Yuan, an ancient poet who drowned himself in Dongting Lake rather than submit to arbitrary authority. Indeed, classical writers regarded water of Dongting Lake as “virtuous” and created allegories that compared the virtues of water with those desirable in society.

Wetlands and water have also had major influence in Chinese gardens and landscaping in which balance and harmony is the objective. This is seen all over China, from the famous “private gardens” of Suzhou City in the south, to the mountain/lake complex of Beijing’s Summer Palace, and northwards to the Emperor’s summer villa in Chengde. Water design in gardens often utilizes, simulates, abstracts, and generalizes the landscape image and structure of wetlands. It is created by man, but it looks like nature. It makes the natural landscape become art, or it reproduces nature using art.

³ The full paper appears as Chapter 3.

PERSPECTIVE OF INTERNATIONAL INSTITUTIONS

Ramsar Convention Secretariat⁴

This group of three papers reflects the experiences in mainstreaming from the perspective of the Ramsar Convention Office, the UNDP, and the World Wide Fund for Nature (WWF). The Ramsar Convention is the oldest of the intergovernmental environmental conventions and the only one that is focused on an ecosystem – wetlands. Mainstreaming under the Convention emphasizes the need for cross-sectoral interactions for effective management of wetlands, especially as wetland managers usually do not have control over such areas as water allocation to individual wetlands. Indeed, water is the common strand through integrated water resources and river basin management to mainstream wetlands and their biodiversity into all sectors. Using examples from the Caribbean, Australia, Republic of Korea and Thailand, this paper places particularly strong emphasis on the need for effective national Ramsar implementing offices that must have strong inter-sectoral linkages to make them effective. Nevertheless, the paper notes that even with an effective inter-sectoral structure, national wetlands programs may not always work well.

It is important to have wetlands objectives codified in laws and regulations and, as in the case of Uganda, to have strong political will to implement the necessary measures for wetland protection. The Convention also notes the need for cross-border as well as broader international cooperation with examples from the “*Trilateral Ramsar Site Floodplains of the Morava-Dyje-Danube Confluence*” involving Ministers from the Federal Ministry of Agriculture, Forestry, Environment and Waters of the Republic of Austria, the Ministry of Environment of the Czech Republic, and the Ministry of Environment of the Slovak Republic. Another example is work of 10 NGOs, working in the Prespa lakes area shared by Albania, Greece, and FYR Macedonia, which culminated in a ministerial agreement in the year 2000 by the Prime Ministers of the three countries. These example demonstrate how bottom-up initiatives can be very successful.

The paper also discusses the immense challenges that face the Parties to the Convention in mainstreaming wetlands. The Ramsar Secretariat has had a long-term working relationship with the Secretariat of the Convention on Biodiversity, and Ramsar now takes responsibility for both Conventions on wetland issues. There is joint work on certain issues, for example, on climate change, with fundamental links to biodiversity issues, and the Ramsar Secretariat is now implementing the 4th Joint Work Plan (2007-2010). Some progress has been made in developing joint guidance (CBD and Ramsar) for Parties, e.g., on impact assessment but a reality is that each Convention has its own constitution, priorities and procedures, making close synergistic action quite challenging.

⁴ The full paper appears as Chapter 4.

United Nations Development Programme⁵

This paper provides background to the concept of mainstreaming and notes that “mainstreaming”, although implicit as far back as the Brundtland report of 1972, was not in general use until 2002 when the Hague Ministerial Declaration of COP-VI⁶ of the CBD⁷ noted that biodiversity will never be really effective until it is integrated (mainstreamed) into other sectors, the national economy, society, and the policy-making framework. Subsequently, the GEF has framed mainstreaming as its second strategy priority. UNDP projects generally focus on one or more of three areas -- (1) focusing on a specific landscape or territorial/jurisdictional area; (2) within a specific sector, including the government and private actors within that sector; and (3) within a specific industry or commodity market. The paper demonstrates UNDP’s approach to mainstreaming using several projects.

- Mekong River Basin Wetland Biodiversity Conservation and Sustainable Use Programme
- Tonle Sap Conservation Project, Cambodia
- Esteros Del Iberá Wetland, Argentina
- Phu My Lepironia Wetland Conservation Project, Viet Nam

These have had the following elements in common:

- Un-coordinated sectoral approaches to wetland planning at national and regional level.
- Weak governance
- Weak policy frameworks and unsupportive economic environments for wetland biodiversity conservation and sustainable use.
- Inadequate information base on which to base wetland policy, planning and management decisions.
- Inadequate human and technical resources available for wetland biodiversity conservation.
- Lack of community empowerment
- Lack of options over use of natural resources by local communities.

In these projects, while the root cause of loss of wetlands is often poverty, population pressure and ignorance of wetland values, one of the key lessons from all four projects is one of governance. Poor governance leads to irrational land use, uncoordinated sectoral decision-making, and an inadequate policy, regulatory and management framework for resolving these conflicts, and that provides a framework within which root causes can be alleviated.

A second lesson and one that is closely related to governance, is the imbalance in power between powerful economic interests of large farmers, industries, developers, etc., and the lack of power of local inhabitants. This leads to disenfranchisement of local inhabitants and can lead to corruption of local officials who make decisions that favour the powerful as has

⁵ The full paper appears as Chapter 5.

⁶ Convention of the Parties

⁷ Convention on Biological Diversity

been documented in the case of the Tonle Sap fishery. The impact of all of these UNDP projects has been, either directly or indirectly, to restore a balance of power between local inhabitants and external economic interests. This has been accomplished by raising awareness of both the public and officials, and engaging officials in areas such as comprehensive planning and enforcement that improves decision-making and produces balanced, win-win situations for both sides.

The third lesson is the linkage between understanding of wetland values and economic improvement. In three of the examples, an improved understanding of biological conservation has led to improved economic conditions of local inhabitants through sustainable harvesting of biological resources and/or ecotourism. This demonstrates that the concept of “sustainable use” is a core concept that improves inhabitant’s lives while also conserving or restoring biological diversity. The theme of sustainable use producing economic benefits for local inhabitants is one that runs through many of the presentations of the Workshop.

World Wide Fund (WWF) for Nature⁸

From 1999-2007, WWF focused on conservation of freshwater ecosystems as one of five global priorities and as part of this work, set itself the target of instigating the designation and better management of over 100 million hectares of wetlands globally. Globally, WWF’s wetlands conservation work has focused on two treaties, the Convention on Biological Diversity and the Ramsar Convention on Wetlands.

WWF’s work falls into several major categories – first is that of support provided by WWF during a country’s accession to the Ramsar Convention and/or following accession by assisting with site designation, mapping, etc.. A second area of work is that of engaging directly with national and/or provincial governments in the development of regulations and national laws. The third is regional initiatives of WWF in the Himalayas, the Andes, Lake Malawi, Lake Chad basin, Niger River basin, and the Danube River Basin. The fourth category is the work of national offices of WWF as in South Africa where, in the 5 years to 2005, the “Working for Wetlands” programme has rehabilitated 175 wetlands nationwide with work to control invasive alien plants and erosion, trap sediment and pollutants, restore water tables and other hydrological functions, and adopt management plans. The paper provides details of many examples of WWF’s work. Chapter 17 of this volume describes the participation of WWF in rehabilitation of Honghu Lake in southern China.

⁸ The full paper appears as Chapter 6.

MAINSTREAMING IN THE CHINA NATIONAL WETLANDS BIODIVERSITY PROJECT

Mainstreaming in the UNDP/GEF/SFA Project “Wetland Biodiversity Conservation and Sustainable Use in China”

Editor’s Note: This paper (Chapter 7) provides an overview of the entire GEF national wetlands biodiversity conservation project.

China is rich in wetland resources with natural wetlands covering 36.20 million hectares and are found from the tropics to the cold-temperate zones, and from coastal zones to the highlands at an elevation of over 4,000 meters. Nevertheless, China has suffered severe wetland devastation and degradation in the past decades. The objective of the GEF project “Wetland Biodiversity Conservation and Sustainable Use in China” has been to mainstream wetland biodiversity conservation as a routine consideration in national, provincial and local government decision-making and actions, and to enhance the capacity for wetland biodiversity conservation. The project was implemented at the national level, at the provincial level by a focus on Heilongjiang Province, which has some of the largest wetland areas in China, and at the local levels by inclusion of four large demonstration sites representing different wetland ecosystems. The demonstration sites were the Sangjiang Plains wetlands of Heilongjiang Province, the Yancheng Coastal Marshes of Jiangsu Province, Dongting Lake of Hunan Province, and the Ruogai Marshes that straddle the upper Yellow River in both Gansu and Sichuan Provinces in western China.

Six project activity areas were pursued at all levels in the project and include:

- The formulation of wetland conservation policies and regulations
- The establishment of inter-agency coordination mechanisms
- The promotion of exchange and sharing of data and information
- Awareness building, publicity and education
- Integrating multi-disciplinary research and advanced wetland management practices
- Capacity development

Wetland policy in China has greatly expanded during the life of the project with national policy clearly enunciated, eight provincial level wetland policy and laws, and a large number of other provincial and local policies and regulations that are much more conducive to wetland conservation. The Project worked with the State Forestry Administration to construct a national wetland regulation that is now under review by different sectors. The legal framework of sectoral laws at the national level (Chapter 8, and next section) was examined for their impact on wetlands using a semi-quantitative consensus evaluation approach developed for this project (Chapter 20) which led to recommendations for revision of sector laws that would make them more sensitive to wetlands issues. A similar approach was adopted for Heilongjiang Province. The project also assisted with the development of new national wetland regulations that are now under review by sectoral departments.

Coordination of sector policies and management objectives at the demonstration sites has been very successful. Hunan Province has officially adopted the principle of inter-sectoral and comprehensive lake management for Dongting Lake and, with Yueyang City, has made

substantial progress in re-aligning agency structures that fit more comfortably within a comprehensive lake management strategy. In Heilongjiang where agriculture has been a major cause of wetland reduction, joint management structures have been established for the Honghu National Nature Reserve. Also in Heilongjiang, a certification and licensing system has been adopted to resolve land ownership and wetland conservation issues. The project itself was managed at all levels by inter-sectoral management committees, chaired by senior officials that had the dual benefit of raising sector awareness as well as co-opting the support of relevant sectors.

Data sharing amongst sectors has been a major emphasis in this project. During the project the Chinese government promulgated new legislation that puts all public data in the public domain; previously, the inability to obtain sectoral data (e.g. water, pollution etc.) was a serious handicap. The data collected during the project is now available to all on the web and through an information management system that is shared with other relevant sectors.

Much attention has been paid to publicity and education both for officials and for the general public. Raising awareness has been an essential part of mainstreaming as, without awareness, mainstreaming is unlikely to occur. The project has created a TV documentary with one of the national broadcasters, has created many pamphlets and circulars, sponsored a photo exhibition, built visitor centres, developed school curricula, organized summer camps, and worked with local governments to plan and implement a wide variety of local events ranging from a round-wetland bicycle race in Jiangsu Province to the International Bird Watching Festival in Yueyang, Hunan Province.

Mainstreaming has also been a focus of research by using inter-disciplinary teams to research, then make recommendations on specific management issues. In some cases alternative management systems have been recommended involving various types of co-management.

Legal and Institutional Mainstreaming in the GEF China National Wetland Project⁹

As in all countries, there is a great range of sectoral law and related regulations that have great potential to impact on wetlands, but which do not include specific reference to wetland biodiversity protection or ecological integrity. Much legislation is focused on resource management (eg Agriculture Law, Soil and Water Conservation Law, Fisheries Law, etc.) but is silent on environmental impacts on wetlands, or produce conflicts with the enforcement of environmental legislation such as the Environmental Impact Assessment Law, the Environmental Protection Law or the Wild Animals Protection Law. As noted elsewhere in this volume, the sector approach to wetland management is a major challenge for mainstreaming.

Therefore, this UNDP/GEF/SFA project has as one of its main Outcomes the enhancement of mainstreaming across government departments at the national, level and to provide guidance

⁹ The full paper appears as Chapter 8.

for similar activities at provincial and local levels. For this Outcome the principal focus was on measures that need to be taken to enhance mainstreaming of wetlands biodiversity conservation at the national level. This has involved two primary activities – (1) assessment of the policies and legislation that are relevant to wetlands management using a set of technical and non-technical assessment criteria, a peer consensus approach, and a semi-quantitative methodology (described in Chapter 20) and (2) assessment of the institutional framework within which wetland management is practiced in China. The consequence of this assessment is a comprehensive set of recommendations on changes in the national legal framework and in institutional arrangements that are both consistent with Chinese legal and institutional practices, and that provide the legal and institutional mechanisms to improve wetland management. The recommendations are directed in two directions. One direction is towards the State Forestry Administration that has been developing a new draft Wetlands Regulation concurrently with this project. For this purpose the project has provided not only recommendations within the main text of this report, but also provides a comprehensive legal text for a “complete” wetlands regulation which contains many proposals that are not now in the SFA draft document. As in most countries, legal drafting in China reflects a compromise between what is possible, especially relative to inter-ministerial consultations, and what is desirable. This project is not handicapped by this practical reality and sets out full recommendations that can be considered in the future as the national government both restructures its environmental agenda and continues with the process of legal reform. The second direction is towards other government sectors that have specific mandates for various aspects of the wetland environment, and for which this component has provided a comprehensive set of recommendations for changes in sector laws and regulations as these come up for revision.

Institutional assessment led to a set of far-ranging recommendations for change in wetlands management systems. These included addressing the lack of comprehensive management and the lack of clear legal authority for wetlands management. Measures to improve inter-sectoral coordination are proposed together with measures to accelerate dispute resolution. Data are a major factor in management, yet there is legal ambiguity in what constitutes public versus “confidential” or “secret” information. Data sharing *per se* is now resolved legally due to new national “access to information” legislation. Planning is a critical part of an institutional assessment and the project has made recommendations on how planning should be codified in law (now adopted by Heilongjiang Province), how the steps in the planning process should be implemented, and the range of issues that need to be addressed in a planning cycle. The project notes that in China there is undue emphasis on “coercive management” (administrative enforcement) and insufficient use of other methods such as administrative delegation, mediation, contracting, etc.; the intent of administrative systems should be to enhance the social contract between government and the people. Within institutional systems, the use of Payment for Ecological Services (PES) systems needs to be further developed as a basis for assessing benefits obtained by one sector or jurisdiction at the expense of another.

Mainstreaming Strategy and Practice in Heilongjiang Wetland Biodiversity Conservation¹⁰

Heilongjiang is the most northeast province in China with a surface area of $47.30 \times 10^4 \text{ km}^2$, representing 4.9% of the national land. It is rich in wetland resources and has the country's largest area in wetlands covering 4.34 million hm^2 , a surface representing 9.18% of the province's area and 12.8% of all natural wetlands in China. In the past, wetland systems were even larger but have been significantly reduced in size over the past several decades by conversion to agriculture. This now causes serious problems for wetlands due to economic priorities for water allocation, pollution from agro-chemicals, and drying out of wetlands from drawdown of groundwater. Currently, about 70% of the wetland area is under legal protection as part of the national or provincial nature reserve system. In 2003, the "Heilongjiang Wetland Protection Regulation" was adopted and was the first local wetland protection regulation in China and was considered a breakthrough for administration departments and in terms of nature reserve enforcement. Mainstreaming began at that time with the formation of the GEF Provincial Wetland Project Leading Group and comprised of heads of sector departments. Heilongjiang is somewhat unique insofar as agriculture over large areas is carried out by an autonomous State-Owned (private sector) industrial group.

At the provincial level, mainstreaming has involved four sub-outputs: (1) analysis of 21 sector laws/regulations to provide the basis for future revision of sector laws using the methodology described in Chapter 20; (2) recommendations to departments on policies and actions, such as wetland-friendly agriculture, that would be beneficial to wetland biodiversity conservation; (3) enhancement of the coordinating capacity to resolve issues of wetland management within government agencies; and (4) establishment of a comprehensive information system to support wetland conservation policies, to raise public awareness, and to engage with sector agencies.

At the project site level in Heilongjiang, mainstreaming focuses on the decision-making and actions of the Jiansanjiang Agricultural Reclamation Bureau (part of the State-owned agricultural enterprise) and the Fuyuan County government in eastern Heilongjiang. The Jiansanjiang Agricultural Reclamation Bureau has taken very positive steps to mitigate the effects of agriculture on wetland issues within its jurisdiction including establishing three wetland nature reserves occupying 18.76% of its territory. There are 6 sub-outputs: (1) improvement of project site wetland protection policy and practice; (2) co-management of the planning of the Nongjiang-Yalujiang River water resources catchment; (3) provision of guidance on ways to reduce agricultural impact on wetland and wetland biodiversity; (4) provide information on key wetland species and their habitats for decision-making by local government and monitoring departments; (5) development of information dissemination systems for the public, government agencies and other related organizations; and (6) a transboundary (China and Russia) joint conservation action plan for the Heilongjiang and Wusulijiang catchment.

¹⁰ The full paper appears as Chapter 9.

INTERNATIONAL EXAMPLES OF MAINSTREAMING WETLANDS BIODIVERSITY CONSERVATION

Editor's Note: There were seven national presentations from outside China. Their contribution to the main themes of mainstreaming are summarized in Table 1 above.

Mexico

Chapter 10 focuses on mainstreaming of wetlands through the vehicle of integrated river basin management and is sponsored by the World Wildlife Fund (WWF) and the Fundación Gonzalo Río Arronte (FGRA). Except in the far south, Mexico is an arid country in which water management is dominated by groundwater extraction, with over-extraction in many aquifers leading to conflict between man and nature. Water allocation is the most critical aspect of wetland conservation in Mexico. Political support with a policy and regulatory framework have been in place for water since the 1990's, nevertheless over-extraction continues. As a consequence, this project was initiated to develop water management models that recognize ecosystems, including wetlands and related aquifers, and to preserve or restore their natural functions and structure in order to assure a balance between conservation and sustainable use. Wetland conservation is managed as a part of an integrated river basin management (IRBM) strategy that allocates water for the environment. The development of sustainable water management in irrigation districts, such as the 2003 program of the Ministry of Agriculture, contributes to the improvement of the water management system nevertheless allocation of water to the environment, as a reserve, should be considered in Mexico.

Key areas of mainstreaming include:

- Use of existing *legislative and institutional arrangements* for water management insofar as these provide a sound basis for dealing with water allocation problems.
- Involvement of *different sectors*, especially the water, agriculture, energy, and environmental sectors.
- *Community involvement* is part of a bottom-up strategy of engagement.
- Use of the *river basin* as the integrating framework makes political and social sense in the Mexican context.
- The use of *environmental flows* has proven to be a very useful technique to create dialogue with other sectors and with the local community. It shows the linkages between water availability and environmental services and provides a basis for agreement on valuation of water and ecosystem components, including wetlands.

Australia

Chapter 11 offers insight into mainstreaming when many wetland nature reserves are located on private land as is the case in Australia, America, Canada and many European countries. In the Australian context, decadal cycles of flood and drought makes wetland management particularly challenging. New South Wales leads Australia with its number of private Ramsar sites, having four of its eleven sites occurring wholly or partly on private or community-managed land. Some of these private Ramsar managers expressed concern that government was not recognizing their commitment to conservation; it became apparent that the Ramsar Managers did not have the same scientific funding or promotional support that government Ramsar managers have, despite both providing the same important environmental services. The Ramsar Managers Network (RMN) was consequently established to ensure processes were in place to support private Ramsar managers.

The main role of the RMN has been to carry out activities such as ecological characterization for each site; a wetlands communication program; and site management actions, e.g., weed and erosion control; recruitment of a wetland officer, updating management plans, *Lippia* control research, establishing photo points for monitoring wetland conditions, and interpretative signs.

Mainstreaming has been an essential activity to achieve their objectives and includes:

- Multi-sectoral composition of the RMN.
- Community involvement in wetlands issues.
- Raising awareness within government and society by television and radio interviews, brochures, website (www.ramsarwetlands.nsw.gov.au), wetland video, school presentations, wetland education kit and recommendations for upgrading posters and trade display products.
- Input into catchment (river basin) management planning to ensure that wetland targets are included in these plans.

Cameroon

Chapter 12 provides a broad overview of coastal mangrove swamps conservation in West Africa in general and in Cameroon in particular. Coastal mangrove swamps harbour diverse populations of plants and animal species of global importance, and cover 3.9 million ha in West and Central Africa. The chapter also describes ten years (1997-2007) of field experiences and lessons learned in management of mangrove forests and coastal wetland in the Douala-Edea Atlantic coastal area. For decades, these mangroves and associated coastal wetlands have been exploited for fuel wood, saw logs, non-timber forest products, and artisanal fishing, as they are zones of reproduction and growth for several species of fish, molluscs and shellfish. Rapid expansion of coastal cities, pollution from industries and domestic sources have caused uncontrolled losses and degradation of the mangrove forests and associated coastal wetlands; more than 50% of the original mangrove forests was lost in the past 50 years. More recently, petroleum and gas exploration and exploitation activities

and shrimp aquaculture along the coast are also increasingly a threat. More than 60 % of the loss in the region is attributed to fish smoking, cooking and urban construction activities.

Mainstreaming is an issue that is well recognized but has been difficult to implement in much of Africa (excepting South Africa). Lessons learned in the Douala-Edea Wetland Reserve area of Cameroon include:

- Co-management experiences have contributed to greater synergies between local government services and local stakeholders.
- Empowerment of local communities has been translated into their support of conservation activities.
- Good national policies and good governance to promote benefit sharing can guarantee success of innovative participatory management initiatives.
- Local, national and regional networks have been developed through exchange visits by various stakeholders willing to share experiences in adaptive management through ‘learning by doing’.
- Linkages between natural resource management and improved livelihoods of local communities can be made through innovative sustainable livelihood and poverty reduction approaches and processes such as: community organisation, provision of grinding mills to improve processing of agricultural products and non-timber forest products, construction of efficient smoking houses to reduce pressure on mangrove forest, and basic monitoring.
- Mainstreaming gender has greatly facilitated and reinforced collaborative management of natural resources in the area.
- Awareness-raising activities with local communities and the administration on conservation and related aspects of resources’ management, have enhanced collaboration in support of program implementation and facilitated the signature of the Ramsar Convention by the Cameroon Government.
- Active presence in the field with local partners and stakeholders builds confidence and trust required for collaborative management processes.

South Africa

Editor’s Note: This paper (Chapter 13) was invited by the Workshop organizers to highlight innovative legislation in South Africa in which the right of the environment (especially the aquatic environment) has been given legal status.

South Africa’s *National Water Act* (NWA) of 1998 was the first in the world to mainstream the conservation of aquatic ecosystems, legally requiring water to be reserved firstly for basic human needs and secondly to secure ecologically sustainable development and use of water resources. The intention of the legislation is to ensure continued water supplies for humans

but the effect is the legislative requirement that rivers and wetlands are to some extent protected, which in turn means conservation of their biota. However, implementation of the law is far from complete, for a number of reasons that vary from political to technical.

In the 1990s, South Africa developed a methodology (the Building Block Methodology) for estimating the ecological water requirements of rivers and estuaries and which has been widely applied in other countries. The implementation of the national law is based upon the determination of the “reserve” that is, that amount of water, of appropriate quality, required to protect aquatic ecosystems in order to secure “ecologically sustainable development and use of the relevant water resource”. The reserve determination process is a demonstration of mainstreaming insofar as the early nineties was an important era in water management in South Africa, in that engineers and scientists, particularly ecologists, learned to trust each other and to work together in a way that even today is not often seen elsewhere in the world. A suite of methods is used to assess aspects of hydrology and hydraulics, water chemistry, river geomorphology, and the biota of the system relative to reference conditions.

Although Reserve estimations have been completed for several large wetland systems, the methods are not as well developed as they are for rivers or estuaries, mostly because South African wetlands have been little studied. South African wetlands are also far more diverse than rivers are and a proposed wetland classification system is presently being evaluated. Furthermore, because of the rapid aging of wetlands, and the fact that human activities can accelerate the process, it is difficult to identify reference wetlands (or even reference conditions for a particular type of wetland) and to decide on the target condition for a managed wetland. It is also quite possible for two adjacent wetlands to be of different age and condition and therefore to require different management approaches. Completion of a coherent suite of methods for estimating the Reserve for wetlands remains a challenge.

Pakistan¹¹

Pakistan lies at the confluence of three zoogeographic regions and demonstrates a rich biodiversity in its ecology and associated fauna. This diversity includes wetlands that occur from the coastal wetlands in the south to the high altitude lakes in the north. The Pakistan Wetlands Programme (PWP) estimates that more than 225 wetlands in Pakistan are of global significance and that all of them are influenced by anthropogenic factors.

The mainstreaming strategy of the PWP for integrating wetlands conservation considerations into the agenda and the mandate of partner organisations, is based on the following elements: (1) the creation of an institutional framework; (2) the establishment of partnership agreements with governmental and non-governmental organizations; (3) the development of GIS, database management and resource-use planning tools; (4) training and capacity building; (5) policy development; and (6) on awareness and communication activities. After two years of

¹¹ The full paper appears as Chapter 14.

mainstreaming experience, the PWP concludes that mainstreaming has enhanced the interest of partner organisations and stakeholders in investing and contributing towards achievement of the objectives of the Pakistan Wetlands Programme through sustainable actions of their own.

India¹²

This paper describes the experience of participatory mangrove management in the Godavari and Krishna mangrove wetlands of Andhra Pradesh, India, and provides good examples of mainstreaming across sectors and to society. Mangroves ecosystems are undergoing wide spread degradation due to variety of human induced stresses and factors such as changes in water quality, soil salinity, diversion of river water, sedimentation and conversion of mangroves to other land-uses practices like agriculture, aquaculture and industrialization. The program of mangrove conservation and management involves multiple stakeholders, i.e., the state forest department, community-based organizations (village-level institutions), and non-governmental organizations. Village level institutions were formed and strengthened by enhancing leadership skills. Participatory rural appraisal (PRA) and other participatory tools were used to identify the status of the resources provided by the mangrove system, their utilization pattern and the issues related to mangrove conservation and management. The degraded mangroves identified through remote sensing imageries were restored using nursery raised mangrove saplings. The causes of degradation were studied and the degraded mangroves were restored by mangrove plantation. An area of about 520 ha of degraded mangroves were restored using scientific understanding of the mangrove ecosystem. An area of 9, 442 ha of mangroves were brought under the joint management of the eight village-level institutions (VLIs) formed by the project. The socio-economic situation of the mangrove-dependent community was addressed through resource-based income-generating activities and alternative livelihoods.

Egypt¹³

Lake Burullus is situated between the two branches of the Nile that form the Nile Delta. It is one of a network of Protected Areas throughout Egypt, designated and managed by the Egyptian Environmental Affairs Agency. It is registered as a Ramsar site and BirdLife International has identified it as an “Important Bird Area”. Recent surveys showed rich biodiversity of plankton, higher plants and fauna, including numbers of rare, endemic and threatened species. Fisheries provide the principal livelihood for the inhabitants. Other resource uses include agriculture, livestock farming, fish farming, reed harvesting, bird hunting, tourism and recreation. The lake and its surroundings are subject to excessive use of the resource, and ecological and administrative constraints are threatening its biodiversity. To

¹² The full paper appears as Chapter 15.

¹³ The full paper appears as Chapter 16.

mitigate the impacts of these constraints on biodiversity, a management plan was developed with the following main objectives: restore ecological and landscape values, maintain and enhance the ecological and landscape values, conserve the resources through sustainable management, improve socio-economic opportunities for local people and develop public awareness for nature conservation. Projects have been developed for each of these objectives.

Mainstreaming has been effected by:

- Eight governmental institutions are included in the management plan. Additionally, a number of non-governmental associations (NGOs) also play a key role in land and resource use in the area.
- An Advisory Committee is comprised of all relevant stakeholders, including representatives of relevant ministries, NGOs, local communities and fishermen's associations. This committee sets policies for the management of the site, supervises the implementation of projects indicated in the management plan, reviews periodically the progress made by the management team in the implementation of projects, and proposes changes in the work plan as the need arises.
- Political support is assured by having the Governor as the chair of the Advisory Committee.
- Awareness and education are being implemented, including the construction of a Visitors Centre.
- Community involvement has been strengthened by directly involving the Association of Fishermen Societies.
- Sectoral involvement has included projects by the Ministries of Agriculture, Environment, Irrigation and Water Resources, Housing and New Communities, etc.. that are directly contributing to the restoration program.

MAINSTREAMING AT PROVINCIAL AND LOCAL LEVELS IN CHINA

These valuable contributions reflect activities outside the national GEF project.

Mainstreaming Wetland Biodiversity Conservation in Honghu Lake, Central China: Practices and Progress¹⁴

Honghu Lake, the seventh largest freshwater lake in China, is a unique inland freshwater lake ecosystem in the middle-lower reaches of the Yangtze River. It is rich in biological diversity. However, over the past 50 years and particularly over the last decade since the early 1990s, it suffered heavy losses in faunal and floral resources due to over-exploitation of enclosed aquaculture and poor cross-sectoral management involving more than 10 organizations. In addition, the water quality of the lake deteriorated to IV-V (very bad quality) from Category I-II (good quality), thus posing a major threat to the ecology of the lake. Fortunately, due to government's increased interest in wetland conservation, wetland biodiversity conservation efforts in China are focused on mainstreaming. Since 2003, with the support of the State Forestry Administration (SFA), WWF and local government and sectors, the Honghu Lake Nature Reserve has initiated the effort on mainstreaming wetland biodiversity conservation.

Mainstreaming has involved the following activities:

- *Institutional Change:* The original organizations, *i.e.*, the Honghu Fishery Administration of Jingzhou City, the Honghu Municipal Nature Reserve Administration and the Jianli County Nature Reserve Administration, were abolished. A new organization named the Honghu Lake Nature Reserve Administration was created to assume the functions of wetland conservation, fishery, tourism and water transport management.
- *Legislative Initiatives:* A specific regulation for comprehensive management of Honghu Lake Nature Reserve has been submitted for government approval.
- *Land Ownership:* Land ownership for the Nature Reserve was delimited.¹⁵
- *Enforcement:* The authority for enforcing nature reserve management, wildlife conservation, fishery, tourism, water transport and boats checking, was transferred to the Nature Reserve Administration, thereby providing a legal basis for effective and efficient resources protection of Honghu Lake.
- *Integrated Planning:* A government-led plan supported by relevant sectors: This involved a comprehensive set of objectives and measures for improving ecological conditions in Honghu Lake. This was supported by government funding.

¹⁴ The full paper appears as Chapter 17

¹⁵ Editor's Note: In China, control of the land or lake bottom by a particular sector carries specific rights to exploit the land. Bringing land ownership under the control of the Nature Reserve allows integrated management of the land and overlying water resources.

- *Building Awareness*: This was a core activity.
- *Improving Income*: This has been an essential element for fishermen whom have adopted new techniques, higher value fish, etc.. Eco-tourism is also increasing revenue for local communities.

Mainstreaming has proven to have been very effective for Honghu Lake, with reversal of biodiversity loss, expansion of the number of fish species, re-appearance of endangered species, and rapid rise in the bird population. At the same time, unsustainable aquaculture has been replaced by a wild fisheries and with high intensity but spatially limited fish ponds, which together have resulted in an increase in fishermen's incomes.

Mainstreaming Wetlands Biodiversity Conservation in Guangdong Province¹⁶

Wetlands are plentiful and diverse in Guangdong Province with rich biodiversity. Their total area represents 1,807,000 ha, which accounts for 10% of the total area of the province. Nevertheless, irrational reclamation and land-use change have reduced wetlands functions and the area of wetlands. Waterfowl habitat is shrinking and wetlands functions are deteriorating, and the ecological status of wetlands is severely threatened. To counter these trends the province has recently taken a number of measures to stabilize and recover mangrove and coastal wetlands. Mainstreaming wetland biodiversity conservation in Guangdong Province is a recent activity and is not fully implemented at this time. Successes thus far includes:

- *Legislation and Policy*: Political support for wetlands conservation is notable in Guangdong. The Provincial Party Committee and the Provincial government have issued the "Directive on Expediting the Construction of Forestry and Ecological Development of the Province". The Directive covers the development of ecological security system, the protection of the mangrove resources, and acceleration of the restoration of coastal mangroves. The "Guangdong Province Wetlands Conservation Regulation" entered into force on September 1st 2006.
- *Inter-sectoral coordination*: A liaison meeting mechanism has been established to begin the process of a more integrated sectoral approach to wetland management.

There is abundant recognition in Guangdong of the steps needed to conserve what is left of provincial wetlands, and there is also recognition of the need and of the mechanisms to actively promote inter-sectoral management if the political and legislative changes are to bring success to wetlands biodiversity conservation.

¹⁶ The full paper appears as Chapter 18

Demonstrating and Expanding Green Agriculture in the Crested Ibis Nature Reserve, Shaanxi Province, China¹⁷

The Crested Ibis (*Nipponia nippon*), a globally endangered species listed under the first-grade national key protection in China, was re-discovered in the wild in China in 1961. It only occurs in China in Yangxian County, Shaanxi Province, and its surrounding areas. The story of the crested ibis is an interesting one, as it involves government, an international NGO (WWF), the private sector, and local communities working together to achieve a suitable result both for the birds and for farmers, and is a good example of mainstreaming. This story is also an example of the contradictions in biodiversity conservation and rural poverty, and how creative involvement of the private sector can increase economic and environmental benefits. Because these birds live close to farms and feed in paddy fields as well as in flood plains and banks of reservoirs, they are endangered by habitat destruction, agricultural pesticides and proximity to man. Farm income fell when pesticides were prohibited (both to reduce killing the ibis food supply and to prevent bio-accumulation in the birds), however alternative livelihoods (e.g., planting mushroom; building hydrologic stations, bridges and culverts; and installing food processing facilities) were introduced. Some farmers became guardians of the birds, watching their movements and preventing their disturbance. Nevertheless, rapid expansion of the crested ibis population since 2000 has outstripped the conservation efforts. In this nature reserve, crested ibis habitat occupies the whole area, as do farmlands, which therefore requires a co-management model. However, most local communities leaders regarded community co-management as a poverty reduction effort and focused solely on the economic benefits rather than on the ecological benefits and responsibilities for nature conservation. This reactive attitude prevented the majority of local people from actively participating in nature conservation, and failed to achieve a win-win situation for the nature reserve and the local communities.

To resolve this dilemma the “Crested Ibis-branded Green Rice” project was initiated as a comprehensive experiment involving both government and a private sector partner. The major components of the project are: to develop the production of branded green rice within the nature reserve on the basis of the local socio-economic baseline survey; and to integrate the production with processing and marketing services to maximize the economic and ecological benefits. Thus far Green Rice has been successful in providing improved economic returns to farmers and to the private sector with farmers outside the experimental area requesting to be admitted to the experiment. Recently a second project involving organic food production, now popular in China, has been implemented that will provide additional incentive to local farmers together with habitat protection.

¹⁷ The full paper appears as Chapter 19.

SUPPORTING MEASURES FOR MAINSTREAMING

Editor's Note: The following five presentations provide background on a variety of measures ranging from technical, to policy, best management practices, and adaptive management of wetlands for climate change.

MEASURING MAINSTREAMING: Development and Application of Wetlands Biodiversity Conservation Criteria in China¹⁸

The concept of mainstreaming is quite new and is in use in biodiversity projects worldwide. There is, however, no specific guidance on methodology for measuring mainstreaming, nor for assessment of sectoral compliance with biodiversity conservation. Measurement of mainstreaming was an objective of the national “Wetlands Biodiversity Conservation and Sustainable Use” project in China. Using a panel of policy, legal and biodiversity experts, a set of “wetland biodiversity conservation criteria” (the “criteria”) was developed as a basis for evaluating sensitivity of sector laws/regulations and practices to the principles of biodiversity. The methodology was used at the national level, at the provincial level in Heilongjiang Province, and more limitedly at local levels at the five demonstration sites. The criteria were not specifically applied to the national policy framework as this is now quite mature in China at the national level, however the project has noted a number of issues that could improve the policy environment.

Two types of criteria were developed – one being seven technical criteria that describe the biophysical impact on biodiversity of laws and regulations, and the other being nine non-technical criteria that describe a variety of operational, policy and institutional characteristics that impact on biodiversity. The criteria are used to evaluate laws and regulations by a peer expert group that, through consensus, provides a narrative comment on the impact of relevant articles on wetland biodiversity conservation. A summary is then created which is the basis for discussions with sector agencies on future revisions to sector laws and regulations that will make them more sensitive to biodiversity issues. The third step is a quantification process in which the peer group allocates a score to each law based on their judgement of the aggregate impact of the law or regulation on biodiversity conservation. The score values identify which laws have the most impact on biodiversity and are most in need of revision.

¹⁸ The full paper appears as Chapter 20. This paper was not presented at the Workshop due to limitations of the available time; it appears here as one of the products of the national GEF wetlands project that bears directly on mainstreaming.

The American Experience in Inter-Sectoral Data-Sharing: STORET¹⁹

Data exchange amongst sectors is a frequently-cited problem in wetland management in many countries. In the United States, STORET is the United States Environmental Protection Agency (USEPA) central repository for storing and retrieving water quality data, and has been in use since 1965. Its existence and ongoing maintenance falls primarily under the *United States Freedom of Information Act* and the *Clean Water Act*, and serves as the platform to enable the free and consistent exchange of water quality data between Agencies. STORET has been a leader in linking its data to USEPA standardized river-coding systems, referred to as “Reach Files”, as well as to the latest national-standard system called the National Hydrography Dataset (NHD). This data linkage provides powerful capabilities to map and analyze the upstream/downstream relationships between STORET monitoring stations as well as other data linked to the river coding system, such as stream flow monitoring stations, point source dischargers and water quality supply intakes. The entire collection of data in the system is referred to as the “STORET Data Warehouse” and is available on the Web at <http://www.epa.gov/STORET>. It serves as a central clearinghouse for water quality and water characteristic data. Users interact with the Warehouse using standard Web browsers. Users can access and download information by using a simple set of menus. The data can then be loaded into a wide variety of applications including spreadsheets, databases, models and Geographic Information Systems. STORET data can also be accessed and viewed with a Web browser using USEPA mapping tools. Important characteristics of STORET are: it is free; it is up-to-date and maintained; it is national in scope; it is used by all major government agencies; and training and support is available.

Mainstreaming Wetland Economic Evaluation: A Case Study from Potteric Carr National Nature Reserve, England²⁰

This paper sets out the case for using a cost based approach of economic evaluation, for use in influencing decision makers to protect wetlands and their biodiversity. Biodiversity is often recognised as important by decision makers in government or business. But it can often be overlooked or given a lower weight than for other requirements such as agriculture development or new buildings. This is partly because decision-making involves weighing costs and benefits. It is difficult to include biodiversity in this because its value is not well quantified or understood. Valuing wetland biodiversity requires an understanding of the range of ecosystem services which wetlands provide. The report 'Revealing the value of Nature' by the UK government agency English Nature (2002), now Natural England, demonstrates that, in addition to the scientific and moral arguments, the conservation of biodiversity can also provide significant economic and social benefits in terms of goods, services and cultural connections, which contribute to human well-being. When we can demonstrate the total value

¹⁹ The full paper appears as Chapter 21.

²⁰ The full paper appears as Chapter 22.

of all of the benefits that wetlands provide, then we have a chance of influencing decision makers to protect them. This paper sets out a cost based approach to demonstrating those total values, so as to illustrate to decision makers that they can exceed the single value of many proposed developments. The object is to mainstream this tool in order to persuade decision makers to require developers to undertake a full economic evaluation of a proposed development affecting a wetland. This would challenge developers to prove that their proposals represent a net gain to society. In this way, conservationists can be on the offensive rather than the defensive in the face of development threats to wetlands.

International Examples of Legislation, Policies and Practices Supporting Mainstreaming of Wetlands (Biodiversity) Conservation²¹

This paper describes a survey of “best practices” on 12 issues that were requested by managers of the “Wetlands Biodiversity Conservation and Sustainable Use in China” project of the UDNP/GEF and State Forestry Administration. The 12 issues were:

- Wetland conservation and management policy and law;
- Wetland land use, tenure and ownership;
- The assessment of impacts on wetlands and the ecological services they provide, including consideration of the relative risks of the impacts;
- The concept of “no net loss” as a way of compensating for destruction of wetlands and the problems in ensuring quality of wetland area;
- The concept of maintaining “ecological flows” in wetlands;
- Wetland degradation and recovery are assessed and managed;
- Requirements and procedures for dynamic wetland monitoring;
- Different categories of protection for wetland areas;
- Measures of compensation for ecological services provided by wetland sites;
- Wise use of wetland resources – criteria and safeguards;
- Administrative mechanisms to implement wetland conservation policies, including horizontal inter-agency coordination and communication between different ministries and commissions and vertical coordination and communication between central and local government;
- Wetland conservation planning and “master plans”.

For practical reasons the focus was on wetlands rather than more narrowly on wetlands biodiversity conservation. The survey was carried out in 2006 using a comprehensive web-based survey.

The survey revealed that few countries have specific legislation concerning wetlands conservation at the national level. Most have national wetland policies but have opted to include wetland conservation in other legislative instruments. Policies on wetland use and

²¹ The full paper appears as Chapter 23.

tenure in western countries often rely on subsidies, incentives and tax measures to encourage landowners to maintain wetlands. “No net loss” can refer to *no net loss of area and/or no net loss of function* depending on what is specified in the related policy. Usually, “no net loss” is interpreted to mean wetlands should be conserved wherever possible, and that area of wetlands converted to other uses must be offset through restoration and creation of wetlands. We could find no countries having policy or legislation on ecological compensation apart from those compensation schemes to ensure “no net loss”. Institutional arrangements and cross-sectoral collaboration is mainly a matter of practice and not of legislation.

Western governments have, in general, made a transition from “command and control” to “coordination and facilitation” over the past 25 years. All western governments have provisions for public access to information so that public scrutiny of officials’ actions is highly developed. As a consequence, cross-sectoral collaboration is, generally, the norm and not the exception and few governments now would make major policy announcements without extensive inter-sectoral and public consultation.

The full set of results and a comprehensive bibliography are available from the Project office.

Mainstreaming Wetland Adaptation to Climate Change into Rural Sustainable Development Plans²²

The necessity of mainstreaming climate adaptation strategies or policies into natural resource management plans has been recognized by the United Nations Framework Conventions on Climate Change (UNFCCC). The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) suggests a growing demand for research to provide information for a deeper and more useful understanding of adaptation options to climate change, and indicates a lack of effective methods to meet this increasing demand of policy makers.

It is important to note that adaptation to climate change has not yet become a topic of high policy priority in most regional development planning. Only recently, several climate policy researchers and development practitioners have proposed for mainstreaming climate adaptation into development planning and sector decision making at both policy design and implementation stages. Mainstreaming is aimed to ensure the long-term regional sustainability by reducing the risks of economic sectors to both climate variation and change.

In this respect, a participatory integrated assessment (PIA) framework is presented in this paper to provide an effective means to mainstream wetland adaptation to climate change in rural sustainable development strategies, and thus to reduce climate vulnerability and to enhance rural community livelihood. The PIA approach includes relevant sectors (e.g., agriculture, water, wildlife, fishery, and ecosystem health) and integrates multi-stakeholder participation, environmental science, economic analysis, and multi-criteria decision making policy evaluation.

²² This paper appears as Chapter 24.

For illustration purpose, two case studies that promote the integration of climate change adaptation into wetland biodiversity conservation and water system sustainable development (SD) actions with multi-stakeholders participation are introduced. The two case studies are for two watersheds in Canada and China respectively. The study regions suffer from climate variations and may experience severe impacts of climate change on wetland ecosystem health, water resources, climate risks, and food security, in the future.

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CHAPTER 2

STATUS AND OBJECTIVES OF WETLAND CONSERVATION IN CHINA

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Abstract

Wetlands serve many important ecological functions and play an essential role in maintaining national eco-safety; it is therefore important to protect wetlands. In China, some of the major threats and challenges to wetlands conservation are related to wetland degradation and weaknesses in their protection and management. In this paper, the roles of wetlands in eco-safety and social-economic developments are described. It also describes the major recent achievements regarding wetlands conservation in China through the following actions: the central government has adopted it as a top priority; actively promoting policy and legislation; establishing or strengthening the wetland protection and management institutions; implementing the National Wetland Conservation Strategic Planning; reinforcing the wetland protection system; promoting public education and training activities; and great efforts to implement the Ramsar Convention and conducting international cooperation. The National Strategy for Wetland Conservation in China is outlined.

Keywords: Wetland conservation, China, National Strategy

Introduction

Wetlands, together with forests and oceans, are known as the three major ecosystems in the world. Wetlands have many important ecological functions, such as water conservation and purification, flood control, climate regulation and biodiversity maintenance; and they are often nicknamed the “Kidneys of the Earth”. Healthy wetland ecosystems not only provide various physical and cultural products to human beings, but also play an essential role in maintaining national eco-safety and in addressing global climate change issues. It is, therefore of great importance to protect wetlands in order to maintain ecological balance, to improve ecological conditions, to promote harmonious co-existence between human beings and nature, and to build a society based on ecological principles.

Current Status of Wetlands in China

According to the first national wetland resources survey of 1996-2003 (excluding Hong Kong, Macao and Taiwan), wetlands cover a total area of 38.48 million hectares, i.e., 36.20 million hectares (3.77% of the total land area) of natural wetlands and 2.28 million hectares of reservoirs and ponds. High-altitude wetlands represent 9.25 and 7.47 million hectares at altitudes above 3,000 and 4,000 meters respectively. Of the natural wetlands, there are 13.70 million hectares (38%) of palustrine wetlands; 5.94 million hectares (16%) of coastal and marine wetlands; 8.21 million hectares (23%) of riverine wetlands; and 8.35 million hectares (23%) of lacustrine wetlands.

Wetlands in China support a wide array of wildlife: 2,276 species of higher plants and 724 species of wild animals. The wild animals include 271 species of water birds, 300 species of amphibians, 122 species of reptiles, 31 species of mammals and over 1,000 fish species.

The wetlands in China are characterized by:

- A high diversity of wetland types: All the 40 categories of wetlands designated by the Ramsar Convention can be found in China; it is one of the countries with the richest wetland types in the world;
- A large surface area: Wetland area in China ranks the first in Asia and the fourth in the world;
- A wide distribution: Wetlands can be found across the whole country, from the cold temperate to the tropical climates, or from coastal to inland areas, from the plains to the plateaux;
- Regional differentiation: Geographically, most rivers occur in the eastern parts, while a majority of marshes are found in north-eastern parts, and most of the lakes are distributed along the middle and lower reaches of the Yangtze River and the Qinghai-Tibetan Plateau;
- Rich biodiversity: China boasts diverse wetland habitats, which are home to many endemic species. As a result, China has become a hotspot of wetland and biodiversity conservation in the world.

In China, the major threats and challenges to wetlands are: population density, poor quality (degradation), and weakness in protection and management. In addition to natural factors such as climate change, reduced rainfall and desertification that have impacts on wetlands, there are also human-induced factors, which include the following:

- Unreasonable conversion and over-exploitation of wetlands, leading to the reduction of natural wetland areas and the degradation of their functions;
- Over-exploitation of water resources and biological resources in the wetland areas, resulting in loss in biodiversity;
- Severe pollution and water quality deterioration;
- Heavy loss of water and soil in the upper reaches of major rivers, causing high levels of siltation in rivers and lakes; and
- Poor awareness on wetland conservation of officials and the general public, in some local areas; incomplete systems of wetland protection and management; and insufficient funds, which slow down efforts for wetlands protection and management.
- The trend of decreasing wetland areas and reduced functions has not yet been contained effectively.

Roles of Wetlands in Eco-safety and Socio-economic Development

Wetlands serve as water storage reservoir and water purifier, playing a critical role in ensuring regional water security. They can effectively regulate hydrology, store rainfall and surface runoff, and recharge ground water. In China, about 2.7 trillion tons of water resources are retained in wetlands, accounting for 96% of the freshwater resources available for use in the country. Many rivers in Asia, such as Yangtze, Yellow, Lancang (Mekong), Ganges, and Indus rivers, originate from the high-altitude wetlands located in the Himalayas, and provide water sources for 1.5 billion people living in the Continent. In China, the Sanjiangyuan Wetlands provide 25%, 49% and 15% of the water volume of the Yangtze, Yellow and Lancang rivers respectively. The Lancang River plays a crucial role in maintaining the eco-safety of the five countries in its lower reaches. Wetlands are also efficient at removing pollution and purifying water. A number of experiments in Beijing have demonstrated that

water with poor quality (Category V) can be improved to Category III or better after it passes through wetland areas. Wetlands also play a vital role in absorbing and storing carbon. According to the IPCC, an estimated 2.48 trillion tons of carbon is stored in global terrestrial ecosystems, with 500 billion tons sequestered in peat land, which covers an area of less than 4% of the land surface. In China, 4.7 billion tons of carbon are stored in marshy wetlands, of which 1.9 billion tons are stored in the Ruoergai Marshes, contributing significantly to controlling the CO₂ emissions. Wetlands also play a significant role in regulating regional climate. For example, scientific studies indicate that the temperature around Bosten Lake in Xinjiang Uygur Autonomous Region, in North-western China, is 2-4 degrees centigrade lower than that of the surrounding desert areas.

Wetlands are often referred to as the “biological supermarket” and the “Gene Bank of Species”. Natural wetlands boast many species of aquatic animals and plants. They also provide staging, migrating, wintering and breeding sites for many rare and endangered animals, especially water birds. China is rich in wetland biodiversity, supporting many rare, endangered and endemic species, such as the Chinese alligator, the Yangtze River dolphin and the crested ibis. Natural wetlands preserve the genetic properties of many species, and have great potential to stimulate socio-economic development. For example, the ancient Hemudu Civilization produced rice of high yield using wild rice gene, thus making history in rice production.

Wetlands provide the material base for human socio-economic development. The physical products and the services offered by wetlands, such as animals (mainly fish), plants, shipping, medicine, and energy, play a crucial role in advancing social development in China. It is estimated that about 300 million Chinese people directly or indirectly obtain products from wetlands; and the total economic value is of RMB 2.7 trillion Yuan.

Wetlands also represent the cradle of human civilization. Several millennia ago, our ancestors still lived a nomadic life near marshes and grasslands. They created diverse and brilliant human civilizations. The ancient Egyptian, Babylon and Chinese civilizations have their roots from the Nile, Euphrates and Tigris, and Yellow Rivers respectively. The aesthetic, educational, cultural and spiritual values provided by wetlands have produced many unique religious cultures, local customs and folk music. From the ethnic groups’ perspectives, many lakes are considered as Saint Lakes and they have an important significance in religious activities. For instance, the Tibetan Buddhists worship Nam Co Lake and Lake Manasarovar as their holy lakes. In China, all the four most famous ancient towers (Yellow Crane Tower, Yueyang Tower, Pavilion of Prince Teng, and Stork Tower) are located in and around wetland areas. Many literary masterpieces on these topics have been passed down.

Mainstreaming: Major achievements in wetland conservation in China

Chinese government places top priority on wetland conservation efforts

In 2005, Chinese President Hu Jintao wrote that “it is critical to enhance the protection of wetland and wildlife resources”. In 2002, the former Chinese President, Jiang Zemin highlighted the importance of “strictly controlling the exploitation of wetland resources, taking rescue measures to establish a series of wetland nature reserves in appropriate areas, and well protecting established wetland nature reserves”. In 2007, during an episode of poisonous algal bloom in Taihu Lake, east China, Premier Wen Jiabao had a field visit to the site, requesting the local government to actively promote ecological control projects and to

implement wetland conservation and restoration projects in the lake. Over the recent years, the delegates of NPC and CPPCC have submitted over 100 suggestions and proposals for enhancing wetland protection and management. In 2007, Zhang Meiyong and Li Meng, respectively Vice Chairwoman and Vice Chairman of CPPCC, inspected works in wetland protection and management nationwide. Wetland conservation has now become a focus for the government and the general public. Public awareness of wetland conservation has increased as a result of the involvement of officials, and of public education campaigns.

Policy and legislation on wetland conservation greatly promoted

After the catastrophic flood of the Yangtze River in 1998, the State Council of China released a guideline on integrating flood control measures (e.g., removing polders for flood diversion and returning cropland to lakes) with wetland restoration, thus marking a new stage for wetland conservation efforts in China. With the implementation of this policy in some provinces (e.g., Hunan, Hubei, Jiangxi and Anhui), the ecological function of flood regulation have been enhanced in the major lakes and rivers in the region, e.g., Poyang Lake, Dongting Lakes and the Yangtze River. In 2004, the General Office of the State Council issued the “Circular on Enhancing the Wetland Protection and Management”, demanding that great efforts be made to strictly control the exploitation and conversion of natural wetlands, and take rescue measures to protect the wetlands. Over the recent years, the State Forestry Administration (SFA) in coordination with other agencies, has conducted research and pilot projects on some forward-looking policies such as eco-compensation and ecological water replenishment, and some favourable outcomes have been accomplished. For example, since 2001, the Heilongjiang Provincial Government has replenished a total of 700 million cubic meters of water for the Zhalong Wetland for 6 consecutive years, thus restoring and enhancing the ecological functions of the wetland area, and resulting in an increased number of water birds. From a legal perspective, some laws that refer to wetland conservation, have been promulgated and implemented, e.g., the *Law on the Administration of the Use of Sea Areas*, the *Environmental Impact Assessment (EIA) Law*, the *Water Law* and the *Law on Water Pollution Control*. In particular, the EIA Law integrates projects on wetland conservation into the scope of EIA approval. In 1998, legislation on wetland conservation at the national level was launched with the objective of developing a special regulation on national wetland conservation. Up to 2001, SFA has completed assessment on the policies and legislation in China. At this time it has drafted the National Regulation on Wetland Conservation that will be finalized after incorporating the inputs from relevant agencies, then submitted for approval of the Legal Affairs Office of the State Council. At the same time, legislation efforts at the local level are also progressing, with seven provinces and autonomous regions (i.e., Heilongjiang, Gansu, Hunan, Shaanxi, Guangdong, Inner Mongolia and Liaoning) having promulgated regulations on wetland conservation.

Wetland protection and management institutions established or strengthened

In 2008, the State Council, through its ‘three definings’ (defining major functions, internal organization and staffing), authorized SFA to be responsible for organizing, coordinating, guiding and supervising national wetland conservation and management, and implementing relevant international conventions. Earlier in August 2005, the central government approved the establishment of the Wetland Management Center (WMC) of SFA (the Ramsar Convention Implementing Office of China). The China National Commission for Implementation of the Ramsar Convention, consisting of SFA as the leading agency and 15 other agencies, was set up in August 2007, with the approval of the State Council. It will

strengthen the institutional capacity for implementing international conventions and will contribute to promoting wetland conservation efforts in China. Wetland conservation institutions at provincial level have also been enhanced; 14 provinces, municipalities or autonomous regions (e.g., Tianjin, Jilin, Liaoning, Jiangxi, Guangdong, Chongqing and Qinghai) and the Daxing Anling Forestry Corporation have established specific wetland conservation organizations. The capacity for administration of wetlands of national and international importance and national wetland parks has also been improved through the implementation of national wetland programs and other projects. Through the capacity building efforts of the Wetland Management Centre and its guidance to local organizations, a network of institutions working on wetland protection and management at various levels is being developed, providing a solid foundation for enhancement of efforts across the country.

National wetland conservation strategic planning implemented

Initially, special planning on wetland conservation has been initiated in 2000. SFA together with 16 other agencies under the State Council prepared the China National Wetland Conservation Action Plan. The Plan defines major actions for jointly enhancing wetland conservation efforts. At the same time, wetland conservation was listed as one of the major components for wildlife conservation and nature reserve development in the six key national forestry programmes launched by the central government. In 2002, the document “Strategic Research on Wetland Conservation” was completed as an integral part of the Strategic Research of Sustainable Forestry in China. In 2003, the National Wetland Conservation Programme (2002-2030) was approved by the State Council. The Programme specifies the objectives, overall layout and prioritizes projects on wetland conservation for the country. In 2004, SFA convened a national conference on wetland protection and management. One year later, the National Wetland Conservation Programme Implementation Plan (2005-2010), prepared by SFA and other 9 agencies, was approved by the State Council. Implementation of some demonstration projects for wetland conservation, restoration, sustainable use and capacity building was launched in 2006. Since then, more than 200 wetland-related projects have been approved by SFA and relevant agencies, with a total funding of 800 million Yuan from the central government; nearly 100 projects having been or are being implemented.

Wetland protection and restoration is an integral part of the special programmes of the forestry sectors (e.g., natural forests conservation; returning farmland to forest; coastal protective forest; and the Sanjiangyuan Nature Reserve (NR) Ecological Conservation and Development in Qinghai). Prior to the World Wetlands Day 2005, the Chinese government approved the Master Plan for the Sanjiangyuan NR Ecological Conservation and Development; 7.5 billion Yuan are earmarked for wetland protection and restoration projects in the region.

Wetland conservation is also highlighted in wetland-related plans prepared by other agencies under the State Council. For example, coastal wetland conservation was listed as a priority area in the National Marine Function Zoning prepared by the marine sector in 2002. Also, in the National Integrated Water Conservation Plan being developed by the water resources sector, ecological water demand for wetland areas has been assessed and wetland conservation is included in integrated river basin management. Wetland protection and restoration measures are also taken as an important mean for water quality improvement in some major rivers and lakes in China, such as Huaihe, Haihe, Liaohe rivers, Taihu, Chaohu and Dianchi lakes.

Finally, local governments developed long-term programs and implementation plans on wetland conservation; objectives, missions and measures for wetland protection and restoration are defined; some key projects have been implemented at the local scale. Through implementation of special programs at national, regional, local and site levels, a number of representative natural wetlands have been put under effective protection; some degraded wetlands have been restored, and demonstration models for sustainable use of wetlands have been developed.

Reinforced wetland protection system

Over recent years, as China steps up its effort in establishing wetland nature reserves, many natural wetland areas have been rescued. For instance, a network of up to 54 wetland nature reserves has been developed in Heilongjiang Province, representing an area of 3.65 million hectares, i.e., over 80% of the natural wetland areas of the province. Up to now, more than 550 wetland nature reserves have been established nationwide. A number of wetland parks and protected zones have also been built to strengthen wetland protection and management. Wetland parks have gradually become a major way of conserving and wisely using wetland areas. So far, 18 national wetland parks have been established, covering a total area of 270,000 hectares. Measures such as strengthening management and demonstration activities have promoted scientific studies, monitoring, public education and eco-tourism in these wetland parks. Therefore, a network of wetland nature reserves, wetland parks and wetland-protected zones is now available in China. As many as 17 million hectares of natural wetlands, or 47% of the total natural wetlands in China, are under effective protection.

Public education and training activities

Over recent years, the Chinese government has declared wetland education, public awareness and training as basic activities for wetland conservation efforts. For example each year on World Wetlands Day (WWD) and Week of Loving Birds, various levels of governments conduct campaigns to raise public awareness on wetland conservation. Various media (e.g., Radio, TV, photo exhibitions and seminars) are used to disseminate knowledge on wetlands and explanation of services and functions of wetlands.

Special activities are also implemented to publicize wetland conservation. For example, SFA, the Chinese Ministry of Water Resources, WWF and the Secretariat of the Ramsar Convention have organized “Wetland Ambassador Action” across the country to increase public awareness on wetland conservation. In addition, SFA worked with China Agricultural Film Studio to produce the film “Protecting the Wetland Ecological Barrier” which won the prize of Best Documentary of the China Movie Awards.

SFA has strengthened the provision of information on wetlands by developing infrastructure and other communication tools. The education center on wetland conservation has been built in Nanchang, central China, and the first China Wetland Museum is being established in Xixi Wetland, Hangzhou. In addition, SFA is providing guidance to wetland-related scientific journals, (e.g., Wetland Newsletter, Wetland Science & Management) and has built a website on wetland conservation nationwide (<http://www.wetland.gov.cn/>).

Training activities have also been enhanced. Professional training on topics such as wetland conservation, nature reserve management and biodiversity conservation tools, are part of training courses for managers.

As a result of these many activities public awareness and participation in wetland conservation has been greatly increased.

Implementing the Ramsar Convention and conducting international cooperation

Great efforts have been made on implementing the Ramsar Convention and conducting international cooperation. On January 3, 1992, China ratified the Ramsar Convention on Wetlands. Since joining the Convention, China has been actively involved in activities to implement its obligations with corresponding significant achievements.

China has participated in the COP meetings. In May 2005, China was elected as a member country of the Standing Committee, the Financial Group, and Management Group of the Ramsar Convention. China has actively promoted and implemented the relevant decisions and initiatives of the Ramsar Convention. These activities include: the active participation in the UN Millennium Ecosystem Assessment; assisting the Ramsar Convention to adopt the Decision of Enhancing Regional Cooperation and successfully holding the Asia regional meeting in Beijing in 2005; taking a leading role in promoting the “Decision on Enhancing High-Altitude Wetlands Conservation”; organizing the International Conferences on High-Altitude Wetlands Conservation in Urumqi, Sanya and Kunming in 2002, 2004 and 2007 respectively, and jointly promoting the Regional Initiative of Conservation of High-Altitude Wetlands in the Himalaya with the surrounding countries.

China has actively promoted the wetland areas of international importance and enhanced supervision on these sites. Up to now, 36 sites in China are listed as Ramsar sites. Over recent years, it has conducted protection, restoration and management of Ramsar sites (e.g., ecological water replenishment and pollution control) by integrating with the national wetland conservation programme. Pilot projects on monitoring wetland ecological characters were launched in five Ramsar sites, e.g., Dongzhaigang Mangrove in Hainan and Dalai Lake in Inner Mongolia, and the “Technical Protocol for Monitoring Ramsar Sites” has been developed. In addition, information on Ramsar sites is updated and surveys on these sites are organized regularly to understand their current status and find solutions to problems. Training workshops are also held to improve the professional skills of the managers of Ramsar sites. Furthermore, some sites, e.g., Chongming East Tidal Flat in Shanghai and Mai Po Marshes in Hong Kong, have developed their own management plans to enhance wetland protection and management.

China has also enhanced international collaboration. It has integrated wetland conservation into the inter-governmental scientific cooperation programs on nature conservation with other countries (e.g., USA, Australia, Russia, the Netherlands and the UK) by leveraging the cooperative mechanisms of the Ramsar Convention. It is also actively engaged in the wetland conservation of the Mekong River basin. Similarly, it has worked closely with some international organizations (e.g., WWF, WI, IUCN, ICF and TNC) on wetland and biodiversity conservation. Over recent years, the Chinese government has been awarded a total of nearly 500 million Yuan for international cooperative projects on wetland conservation, which significantly promoted wetland protection and management efforts in China. As a result, the great achievements of the Chinese government on wetland conservation have been widely acclaimed by the international community through prizes and awards, e.g., the Gift to the Earth, the Global Recognition for Wetland Conservation and Wise Use, the Wetland Science Prize, the Award for Conservation Leadership, among others.

National Strategy for Wetland Conservation in China

Immediate objective

The immediate objective is to secure, by 2010, the effective protection of 50% of natural wetlands and 70% of wetlands of national and international importance; preliminarily establish a natural wetland conservation network-based system by enhancing wetland nature reserve construction and management; initially halt the shrinking and degradation of the natural wetlands through restoration demonstration projects; and improve significantly the capacities in terms of wetland resources monitoring, governance, research, public education and wise use.

Long-term objective

The long-term objective is to designate, by 2030, 713 national wetland nature reserves and 80 Ramsar sites to secure the effective protection of over 90% of natural wetlands; complete the wetland restoration projects of 1.40 million hectares, and establish 53 national demonstration sites on wetland conservation and wise use; develop a relatively sound system of wetland protection, management and wise use in term of legal, policy, monitoring and scientific research aspects; and establish a complete system of wetland sites protection and management to establish China as a leader in this domain.

Strategic focus

The strategic focus is to enhance the protection of natural wetland, further promote the ecological restoration of degraded wetlands, facilitate the wise use of wetland resources, implement the national wetland conservation programme, increase the capacity of sustainable development to balance the wetland conservation and wise use.

Strategic measures

The strategic measures are to:

- Integrate wetland conservation into land use planning, achieving a 'Zero Net Loss' of natural wetlands. Land use planning should meet the needs of national ecological security; land used for ecological protection will be delimited to regulate its special use; governments buy or enforce the right of land use to acquire its complete control over the use of natural wetlands; and a licensing system for converting the natural wetlands will be established.
- Combine wetland conservation and integrated water resources and river basin management. In particular, the environmental impact must be considered in implementing and assessing water control and diversion projects. Efforts should be made to reduce the negative impact of water development projects on wetland ecosystem health and its biodiversity, while a comprehensive management system of integrating wetland conservation and river basin management, as well as the national safeguarding mechanism on wetland environmental flow will be made available.
- Adopt effective economic regulatory mechanism in policy making. In the strategy of wetland sustainable management, particular focus should be made on economic means, including incentive and punitive, market-based and contractual means. An appropriate eco-compensation system should also be established to promote the integration of the rights and interests of wetland resources;

- Resettle the people living in and around the wetland sites for wetland conservation purpose, and accelerate the development of alternative industries. This can not only fundamentally address the ecological degradation in some wetland areas, but also speed up the development of small towns and improve the quality of life of the local population. Efforts will be made to encourage participatory management, guide the multi-hierarchical use and promote the efficient management of natural resources; and,
- Build wetland protection and management structures under the goal of sustainable development. A legal framework will be formulated to grant the legal status of special protection to the natural wetlands. Ecological risk assessment mechanism will be put in place. Public awareness on wetland conservation will be further increased. Some basic activities such as wetland scientific research and monitoring should be enhanced to provide theoretical and technical support on wetland conservation and wise use, and ultimately to contribute more to the global sustainable development.

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CHAPTER 3

PERSPECTIVE ON WETLANDS IN CHINESE CULTURAL HISTORY

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Abstract

Wetlands contain abundant and inexhaustible beauty. Over the last two thousand years, the aesthetics of wetland landscapes were a significant source of inspiration for various important poems, myths and legends, graceful musical pieces, and other artistic works. Wetland is a source for art creativity; it impacts our life and belief. Wetland influences the heart, blood, character and the work of Chinese writers. Water is the representation of wisdom. In China and for more than two thousand years, wetlands induced a fondness for fisherman in literati. Wetlands also produced the important literati and scholar-bureaucrat spirit, e.g., the patriotism and the noble character and moral represented by Qu Yuan, taking the whole country as one's own responsibility represented by Fan Zhongyan. Wetlands influence landscape architecture: in the structure of gardens, water is the key feature and the soul. Wetland produces much intangible and tangible cultural heritage and landscape, linking them into a heritage system network. Understanding and discovering more about the cultural heritage of the wetland will assist in building up a better awareness of wetland values and in improving nature conservation. In return, wetland nature conservation will help the successful development of a cultural heritage.

Keywords: wetland, culture, landscape, heritage

Introduction

Lake of Cloud and Dream was an ancient large lake. Since the West Jin Dynasty, Dongting Lake was often referred to as the Lake of Cloud and Dream. The term “Cloud and Dream” is used to describe wetlands; which are vast, blurred, mysterious, fanciful and illusory, luxuriant, and surrounded by cloud and fog, just as in dreams. It is the space, where the nimbuses of the universe gather.

“Cloud and Dream” of wetland endows human beings with countless treasures: habitats for animal and plants; plentiful natural products; ecological security; the cradle of civilization and of human spirit, graceful landscapes, and a source of artistic inspiration and culture.

Wetlands are not only a rare natural heritage but also a source of cultural heritage. It is the space that produces tangible and intangible heritage. In order to protect the natural ecology, the endangered species and the graceful landscape, we should start by exploring and re-understanding the cultural heritage of wetlands and by strengthening the understanding of the significance of natural heritage with respect to the cultural heritage. Then, from the protection of the natural heritage, we can promote the protection of the cultural heritage. Accordingly, wetlands that are oasis and paradise for humans, can be protected, utilized, and developed from a nature perspective and a culture perspective.

Landscape Aesthetics of Wetlands

There are many kinds of plants growing in wetlands, thus providing a precious resources warehouse of species and a graceful plant landscape. There are floating plants (e.g., candock,

semen euryale, duckweed, water-fringe, water chestnut), emerging plants (e.g., lotus, calamus, cattail, willow, reed, sedge), embankment trees (e.g., mangrove, metasequoia, pond cypress, deciduous cypress, yew, bamboo, willow, ficus microcarpa) and many kinds of submerged plants and bushes, etc. Whether it is spring, summer, autumn, or winter, those plants show unique forms, colors, and beauty. Wetland plants combined with the physiognomy of continent, island, beach and water systems, encompass and twists, abounding with spacious and misted beauty.

Wetlands are important migrating and breeding ground for birds. Vast wetland beaches provide good food areas, especially in the migratory season, for many birds such as cormorant, egret, tern, swan goose, swan, sheldrake, greenhead duck, ash crane, white crane, etc. These rare birds settle, wander, jump, hover in wetland; it presents a busy, auspicious and joyous vision. So many species live in wetlands cheerfully and harmoniously showing the beauty of life.

The wetland landscapes, which consist mainly of plants and birds, form an integrating and unisonous ecology system of harmonious, active or quiet ecological beauty. Meteorological and celestial phenomena often enhance the unique beauty of wetlands. Clouds, glow, wind, thunder, morning or evening, sunshine or raindrop can bring striking colors and baffling configurations. The complex wetlands water system bears rich water arrangements, in the form of spring, brook, fall, pool, pond, lake, river, etc. The water flow can be quiet, active, gentle or rapid; and it generates a variety of forms, textures, and sounds. Numerous factors (e.g., physiognomy, plant, animal, weather, climate, etc.), therefore, create various and abundant wetland landscapes of luxuriant beauty.

From ancient to present time, people have devoted much passion for wetlands and appreciated their beauty. This was translated in many artistic forms, e.g., poetry, songs, music, myths and legends, folklore, etc.

The first poetry anthology in China, “The Book of Odes” dates back to more than two thousand years, and it contains many poems on wetlands. In those poems, Guanju is regarded as the inchoation and deputation of love poems, in which birds fly around an island and grasses flow in the water, expressing a nice and touching emotion. In another poem, “Jianjia” (reed) builds a dimly discernible boundless image in which island and waterway entangle and twist, aquatic plants are indistinct, and the scenery is cool. That poem had an important influence on later poem writing.

By the side of mysterious and beautiful Dongting Lake and Yuan-Xiang River, Qu Yuan wrote many poems with marvelous imagination and structure; therefore, people place the “Poetry of Chu” in the same league as “The Book of Odes”. Chu compares the fragrant flowers, grasses and trees to man of honor, and builds a fine fragrant and pure world, which was sought and coveted by people, pursuing a high-minded personality.

The “Ode to Luo River Goddess”, written by Cao Zhi, describes in splendid sentences a Goddess of Luo River. It vividly expresses the mysterious beauty of the floating, light, transcendent goddess aside the river, which is different in approach but analogous to a fantastic water bird. In the Tang Dynasty, the landscape was described as much as one liked. Many passionate poems were devoted to specific landscape. At that time, Dongting Lake was

in an immense lake, and it attracted uncountable eyes. Meng Haoran, Li Bai, Du Fu, and others wrote many outstanding poems describing the beauty of Dongting Lake.

The “Song of the Lotus”, written by Zhou Dunyi in the Song Dynasty, is famous around the world, and has only about 150 words. In it, the lotus is compared to an honest and noble-minded character, which was interpreted and followed by people afterward. This piece, with the theme of lotus, became an outstanding way to express one’s ideal with the help of matter, in this case, a plant.

Wetlands produce melodious music. “Mountain” and “Flowing Water”, the two famous Chinese Qin compositions spread, together with the story of bosom friend, from mouth to mouth. “Water and Cloud of Xiao-Xiang Rivers”, a famous Qin composition from the Song Dynasty, expresses the torment of the writer about his home country through the description of a supernatural landscape.

Wetlands also inspired myths and legends. For instance, for Dongting Lake, there was the stories of the “Xiang Goddess” and “Liuyi Sending Message”. They express the people’s imagination about the spirit of wetland and glorify the landscape and human love.

Wetlands inspired not only the important art works, but also affects the folkloric traditions deeply. Before the Qin dynasty, there was a famous festival in spring, which was called Shangsi. On the first Si Day in March of the lunar calendar, people put on new clothes, run to the waterside to celebrate the sacrifice of getting rid of bad luck, to play and to bathe, which is called Chunxi. This tradition is one kind of activity to salute the nature, to welcome spring, and appreciate spring outing. In many poems and books, this tradition was described dramatically.

Wetlands are considered mysterious and full of spiritualism. In China, from antiquity to present time, wetlands are places where gods gather; where people cherish awe; where their soul can relax. It produces natural worship. For instance, in Tibet, there are nine great holy lakes.

Literati and scholar-bureaucrat spirit brought up by wetland

Laotzi said that perfection was like water and that water was apt to everything and did not contend; water was on the place where everyone hated, so water was nearly Tao. Water, nearly Tao, contains much philosophy, character and genius. We can say that water in wetland bring up the important scholar-bureaucrat spirit in China.

The wise like water.

Confucius said in the Analects that the water is wise and the mountain kind; the wise are active, and the kind quiet; the wise are happy, and the kind have longevity. Water became the representation or the symbol of the wise.

Water has so much virtue and wisdom, so literati continuously think about the character of the water and trace the character of the water. Water in wetlands edifies the exquisite temper of the people living by wetland, their flexible manner of dealing with things, pure and clear

character, seemingly soft but actually determined spirit, gracious aesthetic sentiment, aloof and free attitude towards life. It endows people with inexhaustible spiritual fortune.

Literati's fondness for fisherman

Yuan River is among the four rivers of Dongting Lake. As a branch of Yuan River, "Canglang" was small, but existed in the heart of the literati more than two thousand years ago; it was the bailment of recluse. This is due to a fisherman's ballad, the Canglang Ballad: Canglang water is clean, so I can wash my tassel of hat; Canglang water is muddy, so I can wash my feet. Confucius taught his students to cultivate one's morality by making correct choices. Qu Yuan preferred going to Davy Jones's locker than to drift with the tide. The fisherman meant that when water is clean, one should realize one's will; when the water is muddy, one should renounce the world, which meant to take a sober, flexible, free and relaxed attitude towards life. These three viewpoints raised continuous thinking and questioning in the literati for the past two thousand years. There are many thought-provoking poems about fishermen, and many paintings portray fishermen.

Patriotism and noble character inspired by Qu Yuan

Qu Yuan is an exceptionally good representative of romanticism in Chinese literary history. It is also the first great patriotic poet, and a great mind. As an outstanding politician and patriot, Qu Yuan worried about the country and the people, insisted on truth, and on "rather die than submit". His towering personality which can win honor with sun and moon, impelled and fed countless Chinese over thousands of years, especially when the country and the nationality was in jeopardy.

The spirit of Qu Yuan who drowned in the river for his country, is as glorious as sun and moon and is the origin of an important festival. To rescue Qu Yuan, people put their boats in the water; to prevent fish from eating his body, people threw zongzi into the river to feed the fish. The tradition of the Dragon Boat Festival now takes place to commemorate Qu Yuan. Later it was developed as a celebration and dragon boat contest on Duanwu. A kind of tough, active and joyful power arose out of this solemn and stirring contest.

The spirit of taking the whole world as one's own responsibility inspired by Fan Zhongya – to be concerned about the state affairs before others, and to enjoy comfort after others

The first lake, Dongting Lake, brought up the first scholar, Fan Zhongyan, then came the first piece of writing, Record of Yueyang Pavilion, a piece that was widely read, had a very high reputation and a deep influence. In it, Fan Zhongyan paints Dongting Lake with magnificent words. Towards the end, one can find his main thought expressed as "be concerned about the state affairs before others, and enjoy comfort after others"; and it became one of the famous locutions in history. Fan Zhongyan was guided by this principle for all his life, recalling to his heart the country and its people. This spirit of taking the whole world as one's own responsibility, i.e., to worry before and be happy after, represents the lightning fortune of the history of Chinese civilization. Persons with noble feelings all take him as their model and follow his principle. As a result, great achievements constantly happen in the history of

Chinese civilization, stimulating progress in the society and through time.

Impact of Wetlands on Landscape Architecture

In Chinese traditional gardens, space is flowing to and fro forever. This kind of flowing space is often achieved by using water.

Gardens are like paintings, mountains and water are the bones and the most important characters. Water is an indispensable and crucial element with the spirit; it makes gardens seem alive and close to Tao.

In Suzhou City classical private gardens which are famous in China, water is the soul. Whether the garden is small or large, water is always found under many different forms, e.g., pond, lake, spring, pool, river, brook, etc., which replicates natural water occupying diverse spaces and expressing a yearning for water. For instance, Wangshi Garden (fisherman garden) is representative of the fisherman complex.

Yuan Ming Yuan is called “the garden of thousands gardens”. It is not only magnificent, but also delicate. Mountain and water are interwoven with each other; water elements and mist bring about a mysterious atmosphere; changes are innumerable, but the garden as a whole is harmonious.

The whole structure of mountain and water at the Summer Palace resembles that of Xihu Lake.

The design of the Emperor’s Summer Villa of Chengde features a watercourse from mountain stream, to falls, to pool, to river, to lake and sea. The water moves constantly back and forth, creating different spaces. The local physiognomy and the skillful art technique enhance the natural beauty.

Landscape architecture in Beijing is closely related to wetlands. Dating from the Jin Dynasty, city construction in Beijing used water and dredged watercourses. After cleaning up the water, gardens were built. Many historic gardens with high value gather by the lakes in the historic center or in the northwest suburb; they all have an important and invaluable contribution to ecology and culture.

Water design in gardens often utilizes, simulates, abstracts, and generalizes the landscape image and structure of wetlands. It is created by man, but it looks like nature. It makes the natural landscape become art, or it reproduces nature using art. Wetlands represent not only a base and model for landscape architecture but also an important mental and aesthetic image of them.

Wetlands Heritage System

Wetlands produce much tangible and intangible heritage and landscapes that are connected to a heritage system and network. In China, large and small cities or regions choose some specific landscapes and monuments, and classify them as “Ten Scenes” or “Eight Scenes”. This heritage scene system comes from Xiao-Xiang (two big rivers, Hunan province) Eight Scenes; it is comprised not only of important natural but also of cultural landscapes that are declared a heritage system and network produced and linked by wetlands.

“Xiao-Xiang Eight Scenes” influences landscape series in other climes, and in which “Xihu Lake Ten Scenes” is the pinnacle. “Xihu Lake Ten Scenes” has a more profound influence on the landscape series of many cities and gardens, such as Beijing Eight Scenes, Yuan Ming Yuan Forty Scenes, etc.

The landscape series produced and linked by wetlands covers a wide array of elements, including the four seasons, cloudy or sunny weather, sunrise and sunset, mountain and water, temple and bridge, celebrity footprints, poems, legends, etc. The combinations of temporal, spatial, historical and cultural conditions provide infinite scenes, which are summed up as “ten scenes” or “eight scenes”. The scene series come from interpreting the landscape, history and humanity, in order to create a landscape and heritage system representing a natural and cultural visualization of the city or region and expressing its life and culture.

Conclusion

There are abundant renewable resources and graceful landscapes in wetlands, and they offer a guarantee of ecological security. Human history is closely linked with wetlands. They represent a natural heritage of outstanding value, plenty of works of art, local culture, human spirit, and many tangible cultural attributes; civilizations and people can develop and identify with the environment. Wetlands link and produce a heritage system and network, containing natural and cultural as well as tangible and intangible aspects.

Wetlands, the place of cloud and dream, make us rich and more flourishing. To conserve their natural configuration and ecology, is undoubtedly as important as conserving the natural heritage; if they are lost, we will also lose an oasis. As to the cultural heritage, it is also indispensable and, if lost, we lose the source and cradle of our culture.

With respect to culture, it would help to have a deeper understanding of the importance of wetlands. Exploring, understanding and developing a wetlands culture would definitely boost wetlands nature conservation. In exchange, progress made in nature conservation would also be of great assistance for the success and innovation in cultural heritage. This type of interaction would facilitate continuity and progress in nature, ecology, society, and culture.

Wetlands, the place of cloud and dream where nimbi of the universe gather, always represent our homestead in history and heaven in our dreams. Their beauty, mystery and abundance, we should respect and appreciate forever. Let us protect both the cultural and natural heritage of wetlands; let culture and nature promote each other; and let wetlands, our heaven, continue to be glorious.

MULTILATERAL VIEWS ON MAINSTREAMING

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CHAPTER 4

MAINSTREAMING WETLAND BIODIVERSITY – A CONVENTION PERSPECTIVE

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Abstract

This paper focuses on the Ramsar Convention perspective on the mainstreaming of wetland biodiversity. The Ramsar Convention is the oldest of the intergovernmental environmental conventions and the only one that is focused on an ecosystem – wetlands. Mainstreaming under the Convention emphasizes the need for cross-sectoral interactions for effective management of wetlands, but also the need for cross-border as well as broader international cooperation. The paper also discusses the immense challenges that face the Parties to the Convention in mainstreaming wetlands; the importance of well-constructed National Ramsar Wetland Committee; appropriate policies, strategies, legislation; and effective approaches to managing wetlands at the national level; the mainstreaming challenges and solutions at the international level, highlighting Ramsar's working with other multilateral environmental agreements (MEAs); and finally touches upon the use of wetland communication as a mainstreaming tool.

Keyword: Ramsar, mainstreaming wetland biodiversity

Introduction

This paper is focusing on a global Convention perspective on the mainstreaming of wetland biodiversity, that of the Ramsar Convention, the oldest of the intergovernmental environmental conventions and the only one that is focused on an ecosystem – wetlands. Rivers, lakes, marshes, peatlands, coral reefs, mangroves etc., are all considered as wetlands under the terms of the Ramsar Convention. The 157 Contracting Parties to the Convention are committed to the wise use of wetlands within their national boundaries, to designation of internationally important wetlands as Ramsar Sites, and to cooperating internationally to achieve wetland wise use. There are currently 1,708 diverse wetlands designated as Ramsar Sites covering 152,992,776 hectares, arguably the largest single network of protected areas in the world.

What is the relationship between wetland conservation under Ramsar and biodiversity conservation? Of the nine criteria for designating Ramsar Sites, eight are directly associated with biological diversity, variously relating to species and communities, waterbirds, fish, as well as other taxa. Thus, while our treaty focus is on conserving wetland ecosystems, we are equally directly concerned with the conservation of the biological diversity supported by wetlands, which in turn supports the ecosystem services upon which we all depend at some level.

Ramsar and Biodiversity Mainstreaming

Within the Convention we work at international, national and local levels, reflecting the reality that wetlands and their biodiversity cross national boundaries, and that an individual wetland is an integral part of a hydrological basin: what happens in one part of a river system can have fundamental repercussions on other wetlands downstream. Thus mainstreaming under the Convention emphasises the need for cross-sectoral interactions for effective management of wetlands but also the need for cross-border as well as broader international cooperation.

In many of our Convention's Resolutions, guidelines and other official documents, the need to work cross-sectorally to be effective is identified. This is particularly so in certain areas of work – such as in river basin management, or coastal zone management – but generally is true for most areas of work on wetlands. In this paper, the aim is to look not at what Parties are required to do but rather to briefly consider the cross-sectoral challenges they face and then focus on practical examples of what they are actually doing on the ground that does result in improved wetland health through mainstreaming wetlands. It will also look at the role of the Convention Secretariat in mainstreaming wetlands.

National and Local Mainstreaming

The water challenge

What is the challenge?

Agriculture, fisheries (including aquaculture), tourism, forestry, industry all have a need for water and thus have an impact upon wetland health. Agriculture in particular, especially irrigated agriculture, is placing ever increasing demands on water, already taking approximately 70% of available water, with demands predicted to increase further.

A fundamental aspect of wetlands is that they need a certain amount of water to maintain their values and continue to provide the many ecosystem services that directly benefit human populations.

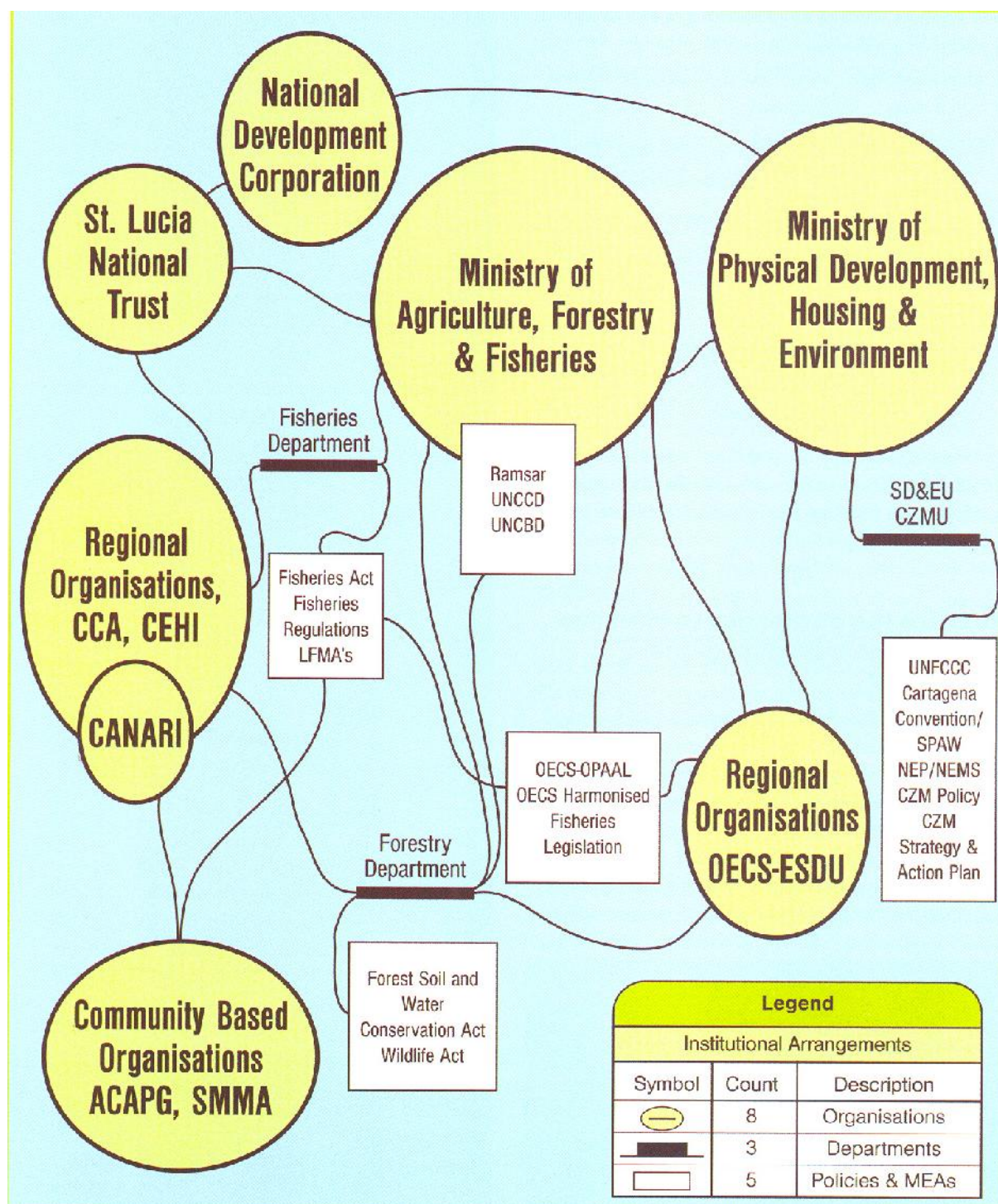
While managers in the wetland sector can control many aspects of wetland ecology, including biodiversity, they rarely have control over the allocation of water to individual wetlands and wetland systems – this rests in the hands of the water sector which must deal with the many demands for water from other sectors. Indeed, water is the common strand through integrated water resources and river basin management to mainstream wetlands and their biodiversity into all sectors. This is the water challenge for Ramsar Parties.

Responding to the water challenge

Before giving some examples of effective response to the challenge, it is useful to consider what the challenge looks like from the point of view of a national Ramsar implementing agency, which we call our Administrative Authority (AA). A workshop in the Caribbean looked at the policies and institutions for wetland management in Saint Lucia and produced a diagram of the institutional arrangements (Figure 1)

The Ramsar AA sits within the Department of Forestry in the Ministry of Agriculture, Forestry & Fisheries. A preliminary analysis of the diagram immediately shows the challenges facing this Ramsar AA – the multiple ministries, departments, MEAs, regional government agencies and national agencies as well as regional and national NGOs that are wetland stakeholders, people and institutions whose behaviour can have positive and/or negative effects on wetland wise use within Saint Lucia.

Figure 1: Institutional arrangements diagram developed by CANARI from the national consultation in Saint Lucia held under the *CANARI policies and institutions for wetlands management: Training for wetland managers from the insular Caribbean Ramsar Wetlands For the Future* project. Available for download as a PDF file at <http://www.canari.org/policybrief9.pdf>



The Ministry of Physical Development, Housing and Environment has responsibility for implementing UNCCD and also for integrated coastal zone management, including policy and planning. Both of these areas of work are highly relevant to the management of wetlands. The diagram also identifies many other regional, national and local institutions whose actions and

policies can have an impact on wetlands, for example: CEHI, the Caribbean Environmental Health Institute, a regional government-sponsored institute dealing with human health issues; OECS-ESDU, the Organisation of Eastern Caribbean States Environment and Sustainable Development Unit, a regional intergovernmental body concerned with the provision of natural resource and environmental management services to the Member States; the National Development Corporation, a government agency charged with the promotion of economic development goals; ACAPG, a group of charcoal producers operating in mangroves in St Lucia, etc. The policies and actions of all of these groups and others in the diagram can have an impact on wetland wise use and could be considered wetland stakeholders. Yet for a small AA, the challenges of being able to work effectively with all of these are enormous. This situation is mirrored but on a greater scale for larger countries.

National Ramsar/wetland committees

At national level, the designated Ramsar AA, as exemplified above, usually operates within one sectoral department, often within a Ministry of Environment. Typically, they have no clear authority over other sectors such as agriculture and fisheries, and often very limited authority over coastal wetlands. Recognising this weakness, Ramsar Parties are encouraged by the Convention to develop a strong, cross-sectoral National Ramsar/Wetlands Committee (NRC) to provide the opportunity for the input and commitment of key sectors, agencies and key NGOs on national wetland management. Where there is broad representation, activity, and adequate funding, such Committees have considerable success in ensuring effective wetland management.

Founded 19 years ago, the Austrian National Ramsar Committee (NRC) is the oldest such Committee in the Convention. Members representing the Ministry of Agriculture, Forestry, Environment and Water Management (which includes the Ramsar Administrative Authority), Nature Conservation, Water Management, Flood Protection, as well as the Ramsar Administrative Authorities (AAs) of nine State Governments, representatives from the Austrian Chamber of Agriculture and Forestry, and from Austrian Federal Forests, as well as good NGO representation (WWF, BirdLife, Naturschutzbund) make up the Committee. The structure of the committee responds to the federal constitution of the country where regional authorities have considerable autonomy. Through regular biannual meetings, the diverse members are able to share important information from their respective institutions thus dealing quickly with any potential problems arising from policies and procedures in their sectors than can impact wetlands, and jointly plan wetland interventions as necessary.

In Thailand the NRC was set up in 1993, and still enjoys high level representation including the Deputy Permanent Secretary of the Ministry of Natural Resources and Environment as Chair, the Secretary General of the Office of Environmental Policy and Planning (wherein sits Ramsar's AA) as Deputy Chair, with other members including senior representatives from the Department of Fisheries, Royal Irrigation Department, Harbour Department, Department of Local Administration, Royal Forest Department, as well as representatives from two national NGOs. This committee, which meets every three months, has set up a Technical Working Group made up of wetland experts from universities, NGOs as well as relevant public agencies to provide the NRC with the necessary technical information to assist the Committee in its key role of coordinating action on wetland management, and supporting, supervising and monitoring implementation of the Ramsar Convention. The Working Group acts as a preliminary reviewing panel for wetland site management plans (including sites that are not Ramsar Sites). Overall, the structures operating in Thailand have contributed to the country's recognition within the region as a successful implementer of the Convention

The Republic of Korea became a Contracting Party to Ramsar in 1997. As part of its implementation of the Convention, Korea enacted a Wetlands Conservation Act in 1999, which dealt with some of the challenges facing the AA (located within the Ministry of Environment–MOE). A particular challenge for the AA is that majority of the country's wetlands are coastal rather than inland and thus partly under the purview of the Ministry of Maritime Affairs and Fisheries (MOMAF). In 2007, a useful Amendment to the Act included a provision that established the legal basis for a National Ramsar/Wetland Committee and identified to some extent the membership, as well as its primary functions. The Act identifies the Vice-Minister of MOE as Chair and two senior wetland conservation officers within the MOE and the MOMAF as Vice-Chairs. Other committee members appointed by the Minister of MOE should include other senior central government persons and senior local government officials – but the amendment stops short of actually identifying a fixed number of positions and ministries so time will tell if the committee enjoys the broad sectoral membership it requires. This Committee should meet before the end of 2007 and is being assisted through the support of the UNDP/GEF Wetlands Project.

Despite the success stories from well-constructed committees with strong legislation behind them, there are examples of perfectly constituted committees that still are apparently unable to deliver an effective wetland programme. Funding is often an issue but an important ingredient is the capacity – and drive – of the Chair and other members to really use the NRC as a mechanism to deliver an effective wetland management approach and programme at the national level.

Indeed there is no magical formula for the Ramsar AAs in managing wetlands, just a number of good models that Parties may refer to. For example, at the time of writing, China has shown that it is possible to implement the Convention without having a cross-sectoral National Wetland/Ramsar Committee in place: China did not have such a committee in place when it began an inter-ministerial process in late 1994 to develop a China National Wetland Action Plan. A Steering group was appointed that was cross-sectoral, including 17 other ministries/agencies, and five years later the Action Plan was completed and implemented. Yet the country still sees the need for a NRC and there are plans to have such a committee in operation before the end of 2007.

National policies and strategies

There are many successful approaches that Parties have used to mainstream wetlands and their biodiversity within their countries. Here are just a few examples of some such approaches.

In 1999 the Swedish parliament agreed on 15 environmental objectives (a 16th was later added) that defined the state of the Swedish environment which environmental policy should aim to achieve. This provided a coherent broad framework for environmental programmes and initiatives at national, regional and local level. Their objectives were broad-ranging, including, for example, clean air, non-toxic environment, reduced climate impact, flourishing lakes and streams, thriving wetlands, sustainable forests, good quality groundwater, varied agriculture etc. The National Strategy for Thriving Wetlands, adopted in 2007, was one of the products following from the identification of the objectives. This strategy was the result of a government directive to the four key authorities, the Environmental Protection Agency (Ramsar's AA), the Forest Agency, the Board of Agriculture, and the National Heritage Board. Through a broad consultative process taking two years, this strategy clearly defined the roles and responsibilities for the four authorities as well as the County Administrative Boards, the national rail traffic authority and road administration, the Board of Fisheries, the municipalities, non-profit organizations, and owners and users of land and drainage

companies, thus truly involving all authorities and agencies whose activities are likely to have an impact on wetlands.

Amongst other things, it commits the various sectors to avoiding any kind of damage to wetlands through the construction on forest roads and from off-road vehicles; no damage to mires (a kind of peatland) through extraction that are already listed in the national Mires Protection Plan, control of the impacts of recreation, hunting and fishing in wetlands, no reduction in the current total area of wetlands etc.

Other strategies and action plans important for “Ramsar” wetlands cover lakes and streams and the marine environment have been developed and are being implemented through the collaborative efforts of all the relevant sectoral authorities. Overall the identification of the objectives and the high level commitment and broad sectoral involvement in developing and implementing strategies to achieve the objectives is seen by the Swedish Ramsar AA as “a very promising working method for mainstreaming and achieving cross-sectoral commitment to conservation and sustainable use of biological diversity” and they have already reported on positive outcomes of implementation.

In Uganda, the strength behind their well-regarded wetlands programme, was a Presidential and Cabinet Declaration in 1986 to halt drainage of wetlands and cultivation in wetlands. An inter-ministerial committee oversaw the process of formulating a National Wetland Policy with 17 ministries involved. This committee later evolved into a Wetlands Advisory Group that currently reviews the wetland policy as well as conflicting policies, and the preparation of a Wetlands Bill, and has overseen the incorporation of wetland issues in the constitution and in a number of relevant laws (such as the *National Environment Act*, *Local Government Act*, etc.). While there have been a significant number of successes that has resulted in a strong wetland programme, there are still challenges to be confronted with a number of conflicting policies as well as the limited technical capacity in the key implementing agency, the Wetlands Management Department.

Mainstreaming management

Based on its rich biodiversity and socioeconomic importance, Chilika Lake was designated as a Ramsar site in 1981. Chilika soon began encountering problems of siltation, choking of the inlet as well as the outlet channel connecting the sea, decrease in the salinity gradient, weed infestation, depletion of the fishery resources, and water logging in the peripheral agricultural lands – a suite of problems affecting the lagoon’s biodiversity and significantly impacting the livelihoods of the 200,000 people living around the lagoon. These problems were serious enough for the Government of India to place it on Ramsar’s Montreux Record in 1993, a list of sites where the ecological character has significantly and detrimentally changed.

Recognising the threat to the lake and its people, the state Government of Orissa created the Chilika Development Authority (CDA) in 1992, with the Chief Minister as its Chairman. In addition to having Secretaries of the key departments such as tourism, fisheries, forest, environment, water resources, etc. as members, local Members of Parliament were also included. The CDA commands both political and financial support for its work on restoration and conservation of the lagoon resources. Their restoration model of Chilika involved two key approaches: to restore the complex lagoon ecosystem through technical solutions to restore natural flows of water and salinity levels; and to ensure the effective participation of local communities as key stakeholders in the future management of the lagoon’s natural resources. The latter recognised that overharvesting and conflicting interests had to be resolved in future management strategies. As a result of their successful efforts, Chilika Lake was removed from

the Montreux Record in November 2002, and there have been many positive reports of effective management of fisheries etc., by local community groups.

In addition to these effective approaches by the CDA, it has to be said that the appointment of a charismatic person as Chief Executive Officer undoubtedly contributed to the success of the project. In recognition of the work of the CDA, it was one of three Ramsar Wetland Conservation Award winners in 2002. But of course nothing is perfect and success is not forever; there are still issues to be resolved and there are new issues arising through the multiple users of the wetland that need to be addressed.

Transboundary wetland management

That so many rivers and lakes cross national boundaries, merely compounds the challenges of managing wetlands and water. Yet there have been some successful partnerships both from within and without the Convention, which could equally be considered as part of the next section on international mainstreaming as this section.

Ramsar has defined a transboundary Ramsar Site, as one where “...*an ecologically coherent wetland extends across national borders and the Ramsar site authorities on both or all sides of the border have formally agreed to collaborate in its management, and have notified the Secretariat of this intent*”. Agreements between national authorities can play a positive, catalytic, and decisive role in planning and providing technical and financial support for projects and activities across borders.

One such example is the “*Trilateral Ramsar Site Floodplains of the Morava-Dyje-Danube Confluence*” crossing the borders of Austria, Czech Republic and Slovak Republic. This ecosystem is one of the most valuable wetlands in Europe from a biological, economic and cultural viewpoint, an area where traditional land use has maintained a mosaic of meadows, river meanders and oxbow lakes, old hardwood floodplains, forests and reed beds that supports a rich biodiversity.

A trilateral agreement was reached through a bottom-up approach from four NGOs, Daphne (Slovak Republic), Distelverein (Austria), Veronica (Czech Republic), and WWF International’s Danube-Carpathian Programme, who began working cooperatively, developing and implementing activities within their respective countries to restore degraded habitats, encouraging sustainable use of natural resources (largely through the use of traditional and extensive farming practices), and working in close partnership with local populations.

This cooperation extended beyond on-the-ground project work: they also worked with their own governments resulting in the signature of a joint declaration in 2001 by the Ministers from the Federal Ministry of Agriculture, Forestry, Environment and Waters of the Republic of Austria, the Ministry of Environment of the Czech Republic, and the Ministry of Environment of the Slovak Republic, to implement the Ramsar Convention in the transboundary, trilateral area of the “Morava - Dyje Floodplains” and to establish the trilateral platform. Through the Memorandum, the three countries hold annual meetings to coordinate their efforts to manage the sites as a single ecosystem, bringing together representatives from the Ministries, water management institutions, the National Ramsar Committees and NGOs. While they have yet to define a management plan for the whole area, acknowledging the significant challenge this would be across three borders, they have never-the-less worked on various successful projects to restore the natural floodplain, especially important for the three countries because of the serious flooding events along the artificially straightened river in recent years. Overall it provides a model of transboundary cooperation and promotion of wise use practices.

A similar bottom-up approach in developing cooperation is evidenced through the activities of the Society for the Protection of Prespa, an umbrella organisation including 10 NGOs, working in the Prespa lakes area shared by Albania, Greece, and FYR Macedonia, which culminated in a ministerial agreement in the year 2000 by the Prime Ministers of the three countries. The resulting Prespa Park includes 2 Ramsar Sites and covers an area of 2,519 km². A Prespa Park Coordination Committee composed of representatives of the three Ministries of Environment, local government, and NGOs, has carried out a number of collaborative activities and has produced a Strategic Action Plan that was drawn up with broad stakeholder involvement. With the support of an on-going UNDP-GEF project, this action plan is currently being implemented.

International Mainstreaming

What does mainstreaming mean for Convention secretariats?

Multilateral Environmental Agreements, such as Ramsar, CBD, CMS, UNFCCC, and UNCCD, influence environmental actions at national and international levels and can have a major impact on funding of interventions in ecosystem management at all levels. And of course there are many global and regional agreements and organizations – such as WHO, FAO and the European Union just to name a few – that also have major impacts on ecosystems, including wetlands. A major challenge for all of these global/regional entities is to “join up” their thinking and ensure that countries are not faced with conflicting, or at least potentially conflicting guidance, advice, and priorities. Do we succeed? Yes, we do to some extent. Here are a few examples.

The Ramsar Secretariat has had a long-term working relationship with the CBD Secretariat, and Ramsar now takes responsibility for both Conventions on wetland issues. There is joint work on certain issues, for example, on climate change, with fundamental links to biodiversity issues, and we are now implementing the 4th Joint Work Plan (2007-2010). Some progress has been made in developing joint guidance for Parties, e.g., on impact assessment. But a reality is that each Convention has its own constitution, priorities and procedures, making close synergistic action quite challenging.

At a project level, the secretariats of Ramsar and AEWA (African-Eurasian Waterbird Agreement) have joined in partnership with two NGOs, Birdlife International and Wetlands International, in the Wings Over Wetlands (WOW) UNEP-GEF Flyways project. Focused on the conservation of migratory bird species, this project is identifying key stopover wetland sites in the AEWA agreement area covering 119 countries, and coordinating site conservation efforts at the flyway scale. The project includes 11 demonstration sites in 12 countries (one transboundary) that focus on a range of critical issues including community mobilization, management planning, ecotourism, field research, wetland restoration, control of invasive species, transboundary management, education and awareness raising, and alternative livelihoods, to identify elements of best practice to be disseminated throughout the project area. The WOW project brings together international agreements, governments, scientists, and wetland management practitioners in the conservation and wise use of wetlands.

Ramsar’s 10th Conference of the Parties (COP10) in 2008, hosted by the Republic of Korea, will have as its theme – Healthy Wetlands, Healthy People – and this will also be the theme for World Wetlands Day 2008. This focus on wetlands and human health, a relatively new area of work for the Convention, will guide Parties in directly linking wetland and water management with human health issues, such as poor sanitation and its effects on wetlands and human health through diarrheal infections, as well as the relationship between water, wetlands

management and other water-borne diseases. To give some scale to wetland-related human health issues, today 2.6 billion people, including almost one billion children, live without basic sanitation. The net result is 1.5 million preventable deaths each year as a result of poor sanitation and polluted waterways. As we move forward to COP10, Ramsar is engaging with WHO and several other key players on these issues, and a draft Resolution will be presented at COP10 addressing the subject of wetlands and human health from the broadest perspective. This has taken the Convention to a new area of work, bringing us face-to-face with the world of development rather than our own ‘cosy corner’ of environment, but also making sure that the development sector is made more aware of the impact of human activities on wetland health.

Communication - a Tool for Mainstreaming at All Levels

Effective communication is essential in all areas of wetland conservation and wise use and it is recognized as a crosscutting area in the Convention’s work. The Convention’s CEPA (communication, education and public awareness) Programme notes the key role of communication and awareness in implementing the Convention at all levels from decision-makers in governments to local community users of wetland resources.

Communicating key information to all wetland actors who directly and indirectly influence wetland policy, legislation and on-the-ground action for conserving wetlands and their biodiversity, are the recently published Millennium Assessment (MA) reports. The main findings of the MA on managing the world’s ecosystems assists wetland actors in understanding that policy and decision-makers can only effectively manage ecosystems through governance structures that span sectors. Ramsar’s involvement in the MA process has resulted in the especially useful wetland synthesis report “*Ecosystems and Human Well-being: Wetlands and Water*”. This 68-page, well-illustrated document makes the link between scientific knowledge and decision-making, and between wetlands and water, identifying the key drivers of change to wetlands as well as the response options. The report notes that the degradation and loss of wetlands is more rapid than that of other ecosystems, and the status of freshwater and coastal wetland species is deteriorating faster than those of other ecosystems. The report usefully distinguishes between indirect and direct drivers as follows:

- Indirect drivers: population growth and increasing economic development
- Direct drivers: infrastructure development, land conversion, water withdrawal, pollution, overharvesting and overexploitation, introduction of alien invasive species.

This rather neatly illustrates the challenge to those charged with implementing the Convention – without cross-sectoral collaboration most of these drivers cannot be dealt with by the wetlands community. The synthesis report provides the overview needed for the wetland community to take a more holistic view of the environment and its management, accepting that today’s water and wetland problems can only be adequately addressed through the broadest cross-sectoral and ecosystem-based approaches, and most usefully at basin-scale. Providing the understanding and information needed to mainstream wetland issues and solutions, it helps the Ramsar constituency address the question “when there simply is not enough water, how do we make the best water and wetland decisions?” and accept that decision-makers in the coming decades will need to consider trade-offs among current uses of wetland resources as the only realistic approach to ensure sustainable development; trade-offs between, for example, water quality and agricultural production, or water use and aquatic biodiversity.

The Convention's CEPA Programme emphasises the need to ensure that wetland issues are effectively communicated through the Secretariat's annual global World Wetlands Day (WWD) campaign. As a broad communication tool for mainstreaming wetlands, this campaign day has grown immensely since its launch in 1997 to become "the" day for celebrating wetlands, their diversity and their value to people, and it is the only time that unites the Ramsar extended family.

Each year the Secretariat identifies a suitable theme for national and local action helping to focus mainstreaming efforts from all wetland actors. The success of this is evidenced in the reports from wetland actors at the national and local levels (see our Web site under World Wetlands Day). Some themes are particularly successful in triggering cross-sectoral interaction. In 2007, for example, WWD ran with the slogan "*Will there be fish for tomorrow?*" stimulating fruitful interactions between the national Ramsar authorities and the national fisheries sectors in many countries. While it is hard to assess the real impact of this in the long-term, some of our Parties have noted that this had the positive effect of re-establishing or reinforcing working links across sectors within their countries. In addition, the development of the Ramsar Secretariat materials also resulted in a joint publication between FAO and the Secretariat on effective fisheries management, which forced us to assess each other's viewpoints and agree on texts (a particularly difficult area was aquaculture in tropical coastal wetlands and the need to bringing together somewhat divergent opinions). The leaflet was distributed to all Parties and many national and local NGOs, reinforcing a working relationship where there is much need for more effective collaboration.

As mentioned earlier, "*Healthy Wetlands, Healthy People*" is the theme for World Wetlands Day 2008. This focus on wetlands and human health will again encourage those preparing national and local activities for the celebration to work with their counterparts in other sectors, in this case those sectors concerned with health and sanitation, a challenging area for the wetlands world.

Conclusion

The Ramsar Convention, in common with other multilateral environmental agreements, must work at international, national and local levels to effectively mainstream wetlands and their biodiversity. The challenges for all 157 Parties to the Convention in mainstreaming wetlands are immense. A brief look at the situation for the tiny island of Saint Lucia in the Caribbean emphasises the need for the Ramsar implementing authorities to be able to work effectively with other sectors within their country, with regional structures that impact wetlands, and also with the authorities implementing other environmental agreements. This paper has looked very briefly at the importance of well-constructed National Wetland Committees, the importance of appropriate policies, strategies and legislation, and effective approaches to managing wetlands at the national level. It has also looked at the mainstreaming challenges and solutions at the international level, highlighting Ramsar's working with other MEAs such as the CBD and AEWA, and finally has touched upon the use of wetland communication as a mainstreaming tool.

CHAPTER 5

STATUS OF MAINSTREAMING BIODIVERSITY: EXPERIENCE OF THE UNITED NATIONS DEVELOPMENT PROGRAMME

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Abstract

The concept of “mainstreaming” of the environment has its roots in the 1972 United Nations *Declaration on Environment and Development*, which first bound governments to a set of environmental principles. The principle of mainstreaming is found in Article 6 of the 1992 Convention on Biological Diversity and was explicitly used in the 2002 Hague Ministerial Declaration from COP VI, which stated that biodiversity conservation could only be successful when it is mainstreamed across all production sectors. It is now recognised that mainstreaming provides the basis for resolving conflicts between sector interests and environmental interests (including wetlands biodiversity conservation). The UNDP enunciated its own policy of mainstreaming of the environment in 2004. In recent years, UNDP projects on biodiversity have included a specific focus on mainstreaming across sectors in order to achieve an outcome that balances biodiversity conservation, economic development, and social equity. Mainstreaming activities in several of these projects is described.

Keywords: mainstreaming, biodiversity, wetlands, UNDP

Introduction

Mainstreaming – the Concept

The concept of “mainstreaming” of the environment has its roots in the 1972 United Nations *Declaration on Environment and Development*, which first bound governments to a set of environmental principles. Mainstreaming also builds on other man-nature concepts, especially the concept of *sustainable development*. The term “sustainable development” was first used by IUCN in 1980 in their *World Conservation Strategy*, and came into general usage following the 1987 report of the Brundtland Commission (*World Commission on Environment and Development*). Sustainable development was a major focus of the second United Nations Conference on Environment and Development held in 1992 in Rio de Janeiro. However, the term “mainstreaming” was not used in the Rio declaration. The World Bank referred to “mainstreaming the environment” in its 1995 review of Bank activities (World Bank, 1995).

Mainstreaming, although not unique to biodiversity¹, is especially linked to the Convention on Biological Diversity (CBD). The principle of mainstreaming is found in Article 6 of the Convention on Biological Diversity (CBD) signed in 1992 at the Rio conference which states that countries should “*Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies.*” The term “mainstreaming” appears to have entered the common lexicon of environmental discussion in 2002 when the Hague Ministerial Declaration from COP VI in 2002 stated:

*“The most important lesson of the last ten years is that the objectives of the Convention will be impossible to meet until consideration of **biodiversity** is fully integrated into other sectors.*

¹ Mainstreaming is also used in other similar ways, such as mainstreaming the environment and mainstreaming gender. The meaning is, however, exactly the same as when used for biodiversity.

*The need to **mainstream** the conservation and sustainable use of biological resources across all sectors of the national economy, the society and the policy-making framework is a complex challenge at the heart of the Convention.”*

In following years, the term “mainstreaming” has been adopted by all agencies, governments, organizations, and programmes. It is used also for other similar purposes as, for example, “mainstreaming gender” which has the same context as “mainstreaming biodiversity”. In 2003, as follow-up to the Hague Ministerial Declaration, the Global Environment Facility (GEF), which is responsible for managing the financing of the CBD, introduced mainstreaming of biodiversity into its biodiversity programme as the second **Strategic Priority**:

“Mainstreaming biodiversity in production landscapes and sectors—to integrate biodiversity conservation into agriculture, forestry, fisheries, tourism, and other production sectors in order to secure national and global environmental benefits.”

The position of the GEF on mainstreaming biodiversity in production landscapes was more fully developed at a 2004 conference held in South Africa and led to:

- Definition of the Objective of mainstreaming of biodiversity conservation: *“to internalize the goals of biodiversity conservation and the sustainable use of biological resources into economic sectors and development models, policies and programmes, and therefore into all human behaviour.”*

This implies that biodiversity conservation can only be successful when it is explicitly included in policies, plans and activities of other sectors of the economy and in society as a whole.

- The enunciation of 10 guiding principles for mainstreaming biodiversity conservation (Box 1).

The South Africa conference resulted in a substantial publication on mainstreaming of biodiversity in production landscapes in 2005 (Petersen and Huntley, 2005). Although that publication deals with biodiversity in a comprehensive way, the main points raised are equally applicable to mainstreaming of wetlands biodiversity conservation.

Environmental issues, including biodiversity, are particularly difficult to resolve because they inevitably involve many interests that cut across sector boundaries. As an example, production of food is mainly the prerogative of the agriculture sector, however conservation and wise management of wetlands inevitably involves sector interests of water, agriculture, forestry, tourism, roads/railways, etc. Often these interests are in conflict, not only with wetlands conservation but also between the sectors. Traditionally in many countries, sector decision-making is done in isolation so that the result often has negative consequences for other sectors and, especially, for wetlands and biodiversity. The solution to this conundrum is in “mainstreaming” and it is this that provides the means to resolving conflicts between sector interests, biodiversity conservation, and development.

Box 1. Principles for Effective Mainstreaming of Biodiversity

Effective mainstreaming requires:

1. Awareness and political will from the highest levels, providing support for implementation
2. Strong leadership, dialogue, and cooperation at all levels
3. Mutual supportiveness and respect between biodiversity and development priorities
4. A strong focus on economic sectors, supported by cross-sectoral approaches, securing sector-based biodiversity conservation
5. Analysis and understanding of the changing motivations and opportunities of each sector, including the effects of globalization
6. Identification and prioritization of entry points and the development of sector-specific tools and interventions (such as international codes of conduct or standards)
7. Awareness within sectors of the relevance of biodiversity conservation and the capacity needed for implementation
8. A coherent set of economic and regulatory tools and incentives that promote and reward integration and added value, while discouraging inappropriate behaviors
9. Sustained behavioral change within individuals, institutions, and society, and in both public and private domains
10. Measurable behavioral outcomes and biodiversity impacts.

Mainstreaming in the UNDP

In 2004, also as follow-up to the Hague Ministerial Declaration, the UNDP enunciated its own policy of mainstreaming of the environment (UNDP, 2004). As one of the three original implementing agencies of GEF programmes, the UNDP has been centrally involved in operationalizing the mainstreaming concept both in its own programmes and in its GEF projects worldwide. The UNDP, together with the other UN and multi-lateral agencies regards mainstreaming of the environment in general, and of biodiversity in particular, as a key measure to achieve the Millennium Development Goals (MDGs) that were adopted by the world community in 2000. This applies, in particular, to three MDGs:

Goal 1: Eradication of hunger and poverty

Goal 3: Gender equality and empowerment of women

Goal 7: Environmental sustainability (e.g. safe water, biodiversity)

According to Petersen and Huntley (2005) three distinct types of mainstreaming projects are emerging in UNDP-GEF projects: (1) focusing on a specific landscape or territorial/jurisdictional area; (2) within a specific sector, including the government and private actors within that sector; and (3) within a specific industry or commodity market.

Examples of Mainstreaming in UNDP Projects

Mainstreaming of wetlands biodiversity conservation by the UNDP is demonstrated in the following four examples:

Mekong River Basin Wetland Biodiversity Conservation and Sustainable Use Programme²

The Mekong River, one of the great river systems of the world, possesses immense biodiversity of truly exceptional international significance including many unique ecosystems and a wide array of globally- threatened species such as Irrawaddy Dolphin, Giant Ibis, Siamese Crocodile, and Giant Catfish. The diversity of the river fauna itself is surpassed only by that of the Amazon and the Congo, with between 500 and 1,300 species of fish present. This biodiversity forms the main natural resource for a population of 55 million people living in the Lower Mekong Basin - about one third



Figure 1. A Mekong wetland. (MWBP, 2006; with permission)

of the total population of Cambodia, Lao PDR, Thailand and Vietnam combined. Despite the rapid economic advances of these countries, population growth and poverty levels remains high. Wetland degradation associated with increasing development pressures is heavy, e.g. only 1.3% of the once biodiversity-rich Mekong Delta now remains in a semi- natural condition, and planned development of river infrastructure threatens large-scale changes to the hydrological regime. Widespread hunting, inflated by a massive illicit wildlife trade, has brought many species to the brink of imminent extinction. There is a range of threats to wetland biodiversity in the Mekong River. These can be categorized as habitat destruction and degradation; loss of ecosystem integrity; and depletion of species abundance and diversity.

Mainstreaming issues

The principal mainstreaming issues are found in the root-cause analysis, which identified the following root causes for wetlands biodiversity degradation and loss in the Mekong River basin (situation as of 2001):

- (i) ***Uncoordinated sectoral approaches to wetland planning at national and regional level.*** At a national level ministries are not yet fully coordinated with regards to wetland conservation with interests from the energy, irrigation and water supply sectors often conflicting with those from forestry and environment.

Mainstreaming Activity: Strengthen the institutional framework for regional and national wetland conservation so that wetland conservation and management institutions are more effective in producing coordinated policies supporting sustainable use of wetlands.

- (ii) ***Weak policy frameworks and unsupportive economic environments for wetland biodiversity conservation and sustainable use.*** No wetland policies exist in any of the countries and existing policies do not support wetland conservation or even advocate drainage and conversion into other uses. No attempt has yet been made to adopt a regional policy on wetland conservation and management for the Mekong.

² The material in this section is taken from the GEF Project Brief for the Mekong Wetlands Project (UNDP, 2001a)

Mainstreaming Activity: Strengthen the policy framework and influence the macroeconomic environment to be more supportive of wetland biodiversity conservation and sustainable use. This includes:

- cross-sectoral review of environment and development sectoral policies, strategies and plans, and macroeconomic policies,
- supporting the establishment and updating of National Wetland Action Plans to ensure protection of global biodiversity in each of the four countries,
- developing a set of regional guiding principles to promote an integrated approach to catchment management for which legal standing would be sought,
- national seminars to seek changes in policy to favour wetland biodiversity resulting from increased understanding of wetland issues by senior decision-makers.

- (iii) ***Inadequate information base on which to base wetland policy, planning and management decisions.*** Little information is available about functions and values of wetlands, especially in local language, and few people at decision-making levels are fully cognizant of the ecological and hydrological processes that make wetlands so important for mankind.

Mainstreaming activity: Create a broader and more policy-relevant information base to support policy makers, planners, and managers, and to improve information flow regionally to all levels of policy through the enhanced Ramsar Administrative Authorities, the Mekong River Commission Secretariat, and regional networks. Particular attention is directed to:

- gather and disseminate information on the economic value of wetlands functions and products in the region.
- undertake strategic environment assessment of cumulative trans-boundary effects of proposed hydropower dams upon the biodiversity of the Lower Mekong Basin.
- develop biodiversity overlays and use them to integrate wetland considerations into development planning.
- produce wetland biodiversity assessment and training tools .
- publish a Regional Red Data Book of threatened plants and animals.
- undertake a regional initiative to address the impacts of invasive fish species.
- disseminate lessons learned and program results throughout the region.

- (iv) ***Inadequate human and technical resources available for wetland biodiversity conservation.*** There are no wetlands departments in any of the countries and few dedicated wetland staff, either at national level or on the ground. Often managers of wetlands are foresters or fisheries officers by training and they may not have the full grasp of management demands of wetlands.

Mainstreaming activity: Improve human and technical capacity to better conserve and sustainably manage wetlands in the Lower Mekong Basin through provision of training at national and community levels. Measures are also taken to combat illegal wildlife trade in wetland species throughout the region

- (v) ***Lack of options over use of natural resources by local communities.*** Local people are often using wetland products unsustainably due to a lack of access and ownership over the resources and a lack of opportunities to develop sustainable management practices.

Mainstreaming activity: The program redresses the lack of options experienced by local communities over use of natural resources in order to support sustainable management of important wetlands. The program provides opportunities to develop sustainable management practices by improving access and ownership over wetland resources and, through education and awareness programmes, by including local people in the management of wetland sites. Specific activities include;

- Develop pilot projects at the village level within the demonstration site to prepare and implement an integrated natural resource management plan.
- Develop financial mechanisms sustainable at local level for conservation and development, for example, establishment of village conservation funds, and a saving and micro-credit program.
- Undertake a market analysis and development of wetland products used unsustainably to reduce wastage and add value, thus enhancing local economic benefits.
- Develop alternative livelihoods to reduce pressure on unsustainable commercial use of biodiversity products.
- Replicate in adjacent areas the successful activities derived from the pilot projects.

Summary: The UNDP/GEF Mekong wetlands program addresses all the major areas of mainstreaming – coordinated sector policies and management practices at national and regional levels; improved data and information; linkage of wetlands to economic development (especially hydro dams); community involvement in wetland site management; and training and raising of awareness by officials and the public.

Tonle Sap Conservation Project, Cambodia³

Tonle Sap, also known as the Great Lake of Cambodia, is the largest freshwater wetland in Southeast Asia. The ‘flooded forests’ of Tonle Sap are the largest remaining examples of this habitat type remaining in South East Asia. These flooded forests consist of a diverse array of habitats, including shrublands, stunted swamp forests, gallery forests, submerged and floating aquatic vegetation, and reed beds. About 200 plant species have been recorded, and the flora as a whole is distinct from other wetlands associated



Figure 2. Flooded forest, Tonle Sap Lake, Cambodia.
(photo: E. Ongley©)

³ The material for this section is drawn from the GEF Project Brief and Project Appraisal Document (2002). The author has reformatted some of this information to make it consistent with the objectives of this chapter.

with the Mekong River, especially with regard to woody species. Many plant species are endemic to the Mekong River basin. The fisheries resources in particular are of central importance to the protein intake of Cambodians and to the local economy.

The principal threats to this vast wetland are:

- (i) ***Over-exploitation of forest resources around the Tonle Sap:*** is leading to widespread loss and degradation of the flooded forests for cheap, locally available fuel wood and charcoal, the need for construction materials for houses and fishing gear, and the lack of cheap and easily accessed alternatives.
- (ii) ***Encroachment and land clearance:*** The root causes are believed to be weak policies and laws on land use rights and tenure, perception of low values and open rights over 'common' resources (tragedy of the commons), particularly amongst the poorer villages and transient migrants, and a lack of examples and incentives for managing resources sustainably.
- (iii) ***Over-exploitation of fish resources:*** This is driven by intensive fishing pressure throughout the system, a weak regulatory framework for natural resource management within the Tonle Sap (and within the fisheries sector in particular), a lack of examples and incentives for establishing and managing fisheries resources sustainably, and poor enforcement of the Fisheries Law and policies.
- (iv) ***Over-exploitation of wildlife resources:*** in the Tonle Sap is having a direct negative impact on many wildlife species, especially the rare birds, reptiles and mammals. This has led to population declines, especially of rare birds, reptiles and mammals and has contributed to the loss of biodiversity in the Tonle Sap Biosphere Reserve. A root causes include widespread regional poverty and a lack of food security; economic incentives and high demands in foreign markets for some wildlife species; the lack of a formally approved Wildlife Protection Law, lack of ratification of international conventions (notably the Convention on International Trade in Endangered Species or CITES), low levels of enforcement, and low levels of literacy and awareness regarding the need for biodiversity conservation.

Mainstreaming issues

This project is somewhat unique insofar as it part of a much larger environmental management program for Tonle Sap Lake basin. Because this project addresses only biodiversity conservation within the larger Tonle Sap Environmental Management program it does not have a direct focus on inter-sectoral issues which is the subject of other parts of the Tonle Sap program; rather, it focuses on building the tools and capacity for biodiversity conservation within the framework of improved inter-sectoral policies and operations and legal reform.

The overall project recognizes that mainstreaming in Tonle Sap basin rests upon improvement of ***governance***. Governance is one root cause of the above four threats. In the fisheries sector, resource-use conflicts have been well documented and are typically between subsistence (family-scale fishers) and large-scale users (fishing lots). These conflicts are widespread, often violent and importantly there is little institutional capacity to resolve these conflicts peacefully or transparently. The relationship between Government authorities and communities is generally poor, exacerbated by a history of poor service delivery by the authorities and endemic corruption. The Government of Cambodia recognizes this problem therefore this project is being implemented against a backdrop of governance reform in Cambodia.

Mainstreaming activities:

The project has focused on:

- integration of project activities where possible within the large number of ongoing projects and reform processes;
- an attempt to integrate biodiversity conservation strategies within the reform process for inland fisheries, in particular the fishing lots encompassing the three core areas of the TSBR; and
- an emphasis on employing a stakeholder approach, which recognizes and accommodates the limitations imposed by the history of conflict between local authorities, local communities and fishing lot owners.
- enhancing the capacity for management of biodiversity in the core of the Tonle Sap Biosphere Reserve (TSBR), including developing systems for monitoring and management of biodiversity, and promoting awareness, education, and outreach on biodiversity conservation in the TSBR.

These core components of the project are all mainstreaming issues, including community resource management, improved governance, and appropriate policies at national and local levels to safeguard the lake and its biodiversity.

Esteros Del Iberá Wetland, Argentina⁴

The Esteros del Iberá is a large, intact and globally important wetlands ecosystem spanning 1.2 million hectares within Corrientes Province, Argentina. While it is a relatively untouched and healthy ecosystem and is a designated protected area, Iberá does not benefit from any comprehensive management or protection strategy in the face of various threats including hydropower, plantation forestry, industrial agriculture, and other development activities along its borders. In general, the root causes to these threats include poor stewardship, unclear land ownership, funding constraints, and economic under-development.

Mainstreaming issues

- (i) ***Conflicting sector interests compromise wetlands:*** cattle, rice farming and tree plantations all threaten these wetlands, especially through disease and use of pesticides and herbicides. Also, there is no legal framework that protects the wetland from changing water levels from the Yacryreta dam complex.

Mainstreaming activity: Create a widely based stakeholder involvement in conservation, including local populations, local politicians and decision-makers, farmers and other resources users, and tourism operators.

- (ii) ***Irrational development and lack of unified management:*** No plans or decrees on land use have ever been issued for this wetland and, as a consequence, private landowners raise cattle and plant crops on land that is supposed to be under protection.

Mainstreaming activity: Implement policy and regulatory reform for this wetland area, including achieving conditions for a RAMSAR designation. Clarify existing ownership and use rights, and the development of regulatory changes and financial incentives for cattle ranching, forestry, and agricultural sectors to create improved conditions for

⁴ The material for this project is taken from the Project Appraisal Document (UNDP, 2001b)

achieving the conservation objectives. Additionally, a regional management strategy is to be managed by a multi-stakeholder Conservation and Management Committee.

(iii) *Poor community involvement in ecological protection with few economic benefits*

Mainstreaming activity: Community involvement has resulted in much improved interest in conservation and the link between conservation and improved livelihoods, has been clearly established. Now, ecotourism is being actively promoted both to improve livelihoods and as a means of conserving biodiversity in these wetlands. Greater control is now exerted over access to the wetlands.

(iv) *Insufficient revenue and disaggregated land holdings in core areas:* There is extremely limited funding for Argentina's National Park System, therefore protected area management is mainly the result of local activities and suffers from lack of sufficient and sustainable revenue.

Mainstreaming activity: Financial strategy for meeting recurrent costs of the wetland management program and the purchase of privately held land that will be integrated into a complete wetlands ecosystem under an organized conservation regime.

Phu My Lepironia Wetland Conservation Project, Viet Nam⁵

This small project of the World Bank's International Finance Corporation, and the International Crane Foundation (ICF)⁶, is an example of the larger role that UNDP plays in promoting sustainable environmental management amongst partner agencies and organizations. This project is part of the Equator Initiative of UNDP and other partner organizations. Located in the Mekong Delta of Viet Nam, this project arose because of unsustainable land use practices that were devastating the Lepironia grasses that are used by local communities to make traditional handicrafts. Phu My Lepironia grassland is important to the culture and the livelihood of local Khmer communities. The wetland was being converted into paddy fields and shrimp ponds. Additionally, *Minosa pigra* – a highly invasive weed, endangered the wetland. By mainstreaming the project both at government and at



Photos: Tran Triet, 2007; with permission of the International Crane Federation and T. Triet

community levels, there is now a win-win situation in which the wetlands have been preserved and local communities have increased their income from the increased supply of

⁵ This material is taken from a number of sources, including the DM (2003) Project Completion Report, and from Tran Triet, 2007.

⁶ This project was nominated in 2006 for the Equator Prize, and was awarded the UN Habitat/Dubai award in 2006 for its outstanding successes. The project also received the World Bank's Development Marketplace Award in 2003.

Lepironia grass. The invasive weed is being eradicated. Furthermore, the Sarus crane has returned after the first year of the conservation effort.

Mainstreaming issues

- (i) ***Land conversion and encroachment:*** from wetlands to intensive agriculture and aquaculture

Mainstreaming activity: By cooperating closely with local community and authorities land encroachment was prevented and the occupied lands were returned to the project. The canal digging (for water supply to shrimp farms) was spotted early in the project. The steering committee worked with the provincial authority and the involved shrimp company. Finally, a win-win solution was reached: the canal was relocated to the boundary of the project area. Kien Giang province agreed to maintain the Phu My wetland in its natural condition and the protected area was established.

- (ii) ***Illegal Cutting of Lepironia Grass***

Mainstreaming activity: A new regulation was issued by Phu My commune to ban “cut” method (indiscriminate cutting of grass) and to limit access only for villagers of the project area. Illegal exploitation has been reduced.

- (iii) ***Loss of income by local residents:*** from loss of Lepironia grass

Mainstreaming activity: The project introduced local villagers with new fine handicraft products that can be made from Lepironia, and provided skill training so that they can make these new products. These new products consume less raw materials and thereby reduce pressure on the resource. The project also improved marketing so that the villagers can sell their products to higher-profit markets such as tourist destinations.

- (iv) ***Lack of community empowerment***

Mainstreaming activity: Local villagers have been actively involved in project implementation and now play central roles in project area management.

Lessons Learned in UNDP Mainstreaming Projects

While the root cause of loss of wetlands is often, poverty, population pressure and ignorance of wetland values; one of the key lessons from all four projects is one of governance. Poor governance leads to irrational land use, uncoordinated sectoral decision-making, and an inadequate policy, regulatory and management framework for resolving these conflicts, and that provides a framework within which root causes can be alleviated.

A second lesson and one that is closely related to governance, is the imbalance in power between powerful economic interests of large farmers, industries, developers, etc., and the lack of power of local inhabitants. This leads to disenfranchisement of local inhabitants and can lead to corruption of local officials who make decisions that favour the powerful as has been documented in the case of the Tonle Sap fishery. The impact of all of these UNDP projects has been, either directly or indirectly, to restore a balance of power between local inhabitants and external economic interests. This has been accomplished by raising awareness of both sides and of officials, and engaging officials in areas such as comprehensive planning

and enforcement that improves decision-making and produces balanced, win-win situations for both sides.

The third lesson is the linkage between understanding of wetland values and economic improvement. In three of the examples, an improved understanding of biological conservation has led to improved economic conditions of local inhabitants through sustainable harvesting of biological resources and/or ecotourism. This demonstrates that the concept of “sustainable use” is a core concept that improves inhabitant’s lives while also conserving or restoring biological diversity.

References

- DM**, 2003. Project Completion Report.
(http://siteresources.worldbank.org/DEVMARKETPLACE/Resources/205097-1090596582429/DM_Project_1386_completion_report.pdf) accessed June 22, 2008
- MWBP**, 2006. Status of the Crocodile (*Crocodylus siamensis*) in Song Hinh District, Phu Yen Province, Viet Nam. Mekong Wetlands Biodiversity Conservation and Sustainable Use Programme. Vientiane, Lao PDR.
- Petersen, C. and B. Huntley**, 2005. Mainstreaming Biodiversity in Production Landscapes. Working Paper #20, Global Environment Facility, Washington, D.C.
- Tran Triet**, 2007. Towards Sustainable Rural Development Combining Biodiversity Conservation with Poverty Alleviation – A Case Study in Phu My Village, Kien Giang Province, Vietnam. Presentation at IIRS-IARU International Symposium “The Evolution of Sustainable Science – Energy, Resources and Environment”, University of Tokyo, 1-2 Feb. 2007.
(www2.ir3s.u-tokyo.ac.jp/ir3ssympo2007/7.Tran%20Triet%20presentation%20-%20IR3S%20Tokyo%20University) Accessed June 22, 2008.
- UNDP**, 2001a. Project Brief: Mekong River Basin Wetland Biodiversity Conservation and Sustainable Use Programme.
(http://www.gefweb.org/Documents/Council_Documents/GEF_C18/Regional_Mekong_Wetlands.pdf#) Accessed June 22, 2008.
- UNDP**, 2001b. Project Appraisal Document. “*Management and Conservation of Wetland Biodiversity in the Esteros del Iberá*”. UNDP-GEF, New York.
- UNDP**, 2004. UNDP Environmental Mainstreaming Strategy. United Nations Development Program, New York, NY. 21p.
- World Bank**, 1995. Mainstreaming the Environment. The World Bank, Washington, D.C. 301p.

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CHAPTER 6

MAINSTREAMING EXPERIENCES IN WWF PROGRAMMES

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Abstract

The World Wildlife Fund (WWF), from 1999-2007, set itself the target of instigating the designation and better management of over 100 million hectares of wetlands globally. During this period, 84 million hectares in 291 wetlands have been reserved in 46 countries following WWF interventions, mostly under the Ramsar Convention on Wetlands. WWF investment of CHF 900,000 in six regions has leveraged at least 33 times more funding for designation and management of these wetlands. This paper outlines the methods WWF used to promote adoption of national wetlands strategies, designations of wetland conservation sites and their better management.

The paper discusses the advantages of using the Ramsar Convention and other multi-lateral agreements as a framework for accelerating adoption of wetlands conservation methods. The use of livelihood and flood management benefits to mainstream wetlands conservation is demonstrated. The role of national laws and strategies is discussed.

Examples from Algeria, Australia, Tunisia, South Africa, and also the Danube and the Niger River basins are presented. The paper concludes by outlining some of the lessons learnt by WWF for promoting mainstreaming of wetlands conservation at the national scale.

Keywords: WWF, Ramsar, CBD, mainstreaming wetland conservation, Algeria, Tunisia, Australia, South Africa, Danube, Niger River

Introduction

Freshwater wetlands are the most threatened biome globally (Loh and Wackemagel, 2004; Pittock *et al.*, 2006), and this paper argues that their precipitous decline can only be arrested through mainstreaming conservation at a large scale. For these reasons the World Wildlife Fund prioritized wetlands conservation from 1999 to 2007. In this paper we outline the methods and lessons from WWF's work to mainstream wetlands conservation.

WWF, the global conservation organization, works in over 100 countries globally and has a mission (WWF, 2007a): *"To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by:*

- *conserving the world's biological diversity;*
- *ensuring that the use of renewable natural resources is sustainable;*
- *promoting the reduction of pollution and wasteful consumption."*

From 1999-2007, WWF focused on conservation of freshwater ecosystems as one of five global priorities, and as part of this work, set itself the target of instigating the designation and better management of over 100 million hectares of wetlands globally. An earlier paper (Pittock *et al.*, 2006) details WWF's broader freshwater conservation work encompassing work on ecoregion identification, prioritization and conservation planning, conventions and

regional agreements, and work on freshwater protected areas, water use efficiency and river basin management up to 2004.

This paper reviews WWF's wetlands protected areas designation and key restoration work from 1999-2007 and draws from it lessons for mainstreaming wetlands biodiversity conservation.

Conventions and Regional Agreements

Mainstreaming wetland conservation through intergovernmental agreements and treaties is essential for promoting better methods and standards for the conservation of wetlands by each country, and in particular in the 263 river basins shared by more than one country. While there are a great number of river basin specific agreements (UNEP, 2002), unfortunately at this time these mostly concern national borders and water infrastructure development and thus make little or no contribution to conserving wetlands.

Globally WWF's wetlands conservation work has focused on two treaties, the Convention on Biological Diversity and the Ramsar Convention on Wetlands.

Convention on Biological Diversity (CBD)

The CBD has been slow in building momentum for conservation of freshwater habitats, despite advocacy by WWF and others, with the adoption of key freshwater measures only in its February 2004 Conference. The governments adopted a Plan of Work on Protected Areas (CBD, 2004a) with targets for the designation of representative reserve systems, including for inland waters habitats, by 2009. Subsequently a target promoted by WWF was incorporated for the conservation in protected areas of 275 M ha of inland waters habitats by 2010. A Plan of Work for Inland Waters (CBD, 2004b) with a wide set of goals and activities was adopted in 2004, incorporating a provision calling on the Parties to facilitate minimum water allocations to maintain function and integrity of freshwater ecosystems.

The collaboration with the Ramsar Convention (Ramsar, 2002a), amounting to endorsement of Ramsar as the CBD's wetlands implementing agency, is a promising step in efficiency, coordination and combining resources for wetlands biodiversity conservation. This CBD link provides a mandate for national governments to seek Global Environment Facility (GEF) international waters funding for projects that use the Ramsar Convention to conserve wetlands. An earlier paper by Pittock *et al.* (2006) details the role of the CBD further.

The Ramsar Convention on Wetlands (Ramsar)

Contracting Parties (nations) to the Convention on Wetlands (Ramsar, 1971) have committed themselves to: "wise use" of all wetlands on their territory (including rivers), conservation of "wetlands of international importance" (Ramsar sites), and international cooperation. As such, the Convention is arguably the most global of all treaties that focus on freshwater management.

The Convention is now the world's largest protected area system, covering 1,702 sites, i.e., just over 1% of the world's registered protected areas and 1.53 million km² or about 8% of the world's 18.8 million km² area of parks (Chape *et al.*, 2003) on its Register of Wetlands of International Importance.

An earlier paper by Pittock *et al.* (2006) argues that most Contracting Parties consider their Ramsar Convention obligations seriously and as a result enhance wetlands conservation on their territories to some degree. The Convention has many benefits for wetlands conservation since it creates moral pressure for member governments to establish and manage wetland protected areas; sets standards and provides guidance and facilitates collaboration on best practice; has a triennial global reporting and monitoring system; and encourages participation of non-government organisations, local and Indigenous peoples.

WWF has been promoting accessions to the Convention to enhance wetlands conservation with the goal of universal membership. There are now 157 Contracting Parties. Out of 38 new Contracting Parties recorded since 1999, Fiji is the 10th one brought to the Ramsar Convention as a result of WWF's assistance, following Cuba, Palau, Marshall Islands, Mozambique, Samoa, Seychelles, Sudan, Central Africa Republic and Cameroon. This represents over 25% of all new accessions since 1999.

WWF small grants to many developing country governments have included support for these governments to accede to the Convention, undertake national wetland inventories, prepare national wetlands strategies and/or designate wetlands for conservation. Examples of these wetlands conservation benefits are detailed below.

Ramsar Convention and National Wetlands Conservation

The Contracting Parties to the Ramsar Convention each commit to undertaking an inventory of their wetlands, to preparing a strategic framework for the Ramsar list and to developing a national wetlands strategy and to mainstreaming wetlands conservation into national laws and programs. The role of the Convention in promoting inventory, designation, national laws and strategies in mainstreaming wetlands conservation, together with non-government participation in their implementation, is demonstrated with examples from Algeria, Tunisia and Australia.

Algeria

Using national measures under the Ramsar Convention, Algeria has built a network for wetlands conservation in a remarkably short time. Algeria joined the Ramsar Convention in 1983 but designated only 3 sites before 2000. WWF grants (CHF 160,000 since 2000, made possible through the MAVA foundation) to Algeria's Direction Générale des Forêts assisted with wetland atlas, designation, management and education projects. This culminated in the designation in December 2004 of 16 new sites as part of a national system of wetland reserves of 42 sites covering 2,959,615 hectares (Ramsar, 2007a). Algeria is now preparing a national wetlands strategy.

A number of the designated Ramsar sites are oases that are important for traditional agricultural systems and for growing crops such as dates. Ramsar designation has resulted in investment to conserve oases. In 2001, the value of exported dates totaled USD \$18 million for Algeria (WWF, 2002).

Tunisia

Tunisia joined the Ramsar Convention in 1981. A WWF grant (CHF 40,000 in 2003, made possible through the MAVA foundation) to Tunisia's Direction Générale des Forêts has resulted in a wetlands inventory and the designation in November 2007 of 19 new sites to form a national system of wetland reserves of 20 sites covering 726,541 hectares (Ramsar, 2007b). Michael Smart who assisted the government authorities with these designations reported that (Ramsar, 2007b): "...there is a very wide spread of sites all over the territory of

the country, and the regional authorities have been much involved in site selection and the preparation of documentation ... There is also a very wide variety of wetland types ...”

Australia

In Australia, WWF successfully advocated for the adoption of a new national environmental law, the Environment Protection and Biodiversity Conservation Act 1999 (Australian Government, 1999) to implement the country's Ramsar obligations. For the first time, Ramsar sites are designated as a “matter of national environmental significance” and developments that may have a significant impact on the wetlands values of the Ramsar sites require environmental impacts assessment and approval by the Federal Minister for the Environment. In addition, the higher profile afforded these wetlands has increased the pressure on the state (provincial) and national governments to proactively conserve wetlands that otherwise would not receive as much political attention. This is an ongoing debate in Australia. Ramsar sites have not yet been successfully protected from major threats in many cases, such in the Gwydir and Macquarie Marshes Ramsar sites where there was loss of environmental flows. The law has empowered wetland managers in their representations to governments for better conservation measures. It has also enabled people and non-government organizations to take legal action against developers, state (provincial) and the national governments to ensure that wetland conservation law is enforced when governments have not acted promptly, as in the case of clearing vegetation in the Gwydir wetlands.

Ramsar Convention and Regional Initiatives

One of the “three pillars” of the Ramsar Convention is international cooperation. This has partly been operationalised by the establishment of regional wetland conservation initiatives. An earlier paper by Pittock *et al.* (2006) details the nature and benefits of Ramsar regional initiatives and provides a number of case studies.

WWF has strongly supported the establishment and implementation of regional wetlands conservation initiatives centered on river basins, regional seas or mountain areas. These initiatives either build on existing regional treaties or may be the catalyst for new agreements. Data is provided below on the successes in enhancing both the wetland areas designated for conservation and the increase in resources for management of these wetlands in five regional initiatives instigated by WWF in the Himalayas, the Andes, Lake Malawi, Lake Chad basin and the Niger River basin.

According to WWF, regional initiatives can accelerate wetlands conservation by building on common geographic interests and institutions for their management, by sharing knowledge on best practices, by accessing greater technical and financial support from the international community, and by providing a mechanism where peer pressure acts to encourage better wetlands conservation in the region's least active countries.

In our view, these benefits may also be achieved in initiatives involving provincial / state governments within a country.

WWF and Regional Initiatives

In six ecoregion initiatives, from 2001 to 2007, WWF has spent over CHF 900,000 in small grants (excluding WWF staff costs) to instigate designation of over 40 M ha of new freshwater protected areas (at 2.2 CHF centimes/ha), mostly as Ramsar sites. This funding has

leveraged CHF 30 million, nearly 33 times more funds than invested by WWF, and mainly for reserve management (Table 1).

Table 1. Leverage achieved for freshwater protected areas in six freshwater ecoregions

Freshwater ecoregion / program	New fresh water protected areas (ha)	WWF project grants (CHF)	Leveraged funds secured (CHF)	Leveraged funds proposed / in prep (CHF)	Other sources of funds
Himalayan Wetlands Regional Initiative	5,333,232	220,500	388,600	-	Ramsar, governments, corporate
Andean Wetlands Regional Initiative	547,888	80,000	370,000	15,000,000	Ramsar, governments, corporate, GEF
Algeria	3,453,925	80,000	725,000	-	Government, UNDP, MAVIA
Lake Malawi	3,805,700	60,000	2,030,000	-	Ramsar, SDC
Lake Chad - ChadWet	12,500,122	213,333	23,634,000	-	Ramsar, GEF, UNDP, Nigerian Gov.
Niger River – NigerWet	15,164,480	253,333	2,539,000	4,000,000	Ramsar, GEF, UNDP, SDC
TOTAL	40,805,347	907,166	29,686,600	19,000,000	

(Source: J. Pittock and D. Landenbergue. Unpublished WWF internal assessment. February 2007)

A further CHF 19 million in expected funding would see WWF's investment having leveraged nearly 54 times more funding. In these six ecoregions WWF adopted the following strategies:

- Consistently engaging governments and other stakeholders over many years.
- Providing small grants of up to CHF 40,000 each to local WWF offices or governments to promote freshwater protected area designation and management.
- Partnering or helping to establish regional organizations, e.g., for river basins.
- Rewarding with publicity each government as it has enhanced its wetland protected areas, creating a constructive rivalry between neighboring countries.
- Securing endorsement of these ecoregional initiatives by international institutions, such as the Ramsar Convention.
- Linking these regional initiatives to international aid and corporate donors, such as the GEF, to secure resources for follow up management.

In most instances the leveraged funds have been directed to the regional institutions or national governments, for building their capacities for ongoing management of these wetland-protected areas. The successes of these regional initiatives to date are inspiring the formation of similar programs in ecoregions in the Congo and La Plata basins.

The Niger River Basin Case Study

One example of this work concerns the Niger River basin. WWF undertook to mainstream wetlands conservation in this basin through the following steps:

- Starting in 1999, WWF worked to establish partnerships and agreement on priority wetlands and conservation actions. By 2001, a partnership was formalised between the inter-governmental Niger Basin Authority, Wetlands International, the Nigerian Conservation Foundation (NCF) and WWF. An ecoregion vision map was also produced of prioritised wetlands and watersheds for conservation based on biodiversity and hydrological characteristics (WI, 2002).
- WWF and NCF staff worked with national governments and facilitated the designation of over 15 M ha of Ramsar sites covering key wetlands in the basin, mostly coinciding with the identified conservation landscapes identified in the ecoregion vision. The basin's Inner Niger delta was designated the world's third largest Ramsar site (4.1 M ha) in February 2004 as a result of WWF support. Public ceremonies at inter-governmental meetings recognising the progress of one basin state were very important for encouraging other basin governments to step up their wetlands conservation efforts.
- To follow up on the management of these sites and progress management of the whole basin, WWF then: i) facilitated a partnership between the Niger Basin Authority and the Ramsar Convention (Ramsar, 2002b) by providing a framework for ongoing political and technical support; ii) assisted the basin governments in securing initial GEF funding of CHF 2.5 million for implementation of pilot wetland management projects, most of them located in existing or planned Ramsar sites; iii) attended the regular basin meetings of the Councils of Ministers and Summits of Heads of States, and the Niger Basin Authority member governments to promote freshwater ecosystem conservation, leading to increase support of the French and other European governments for wetlands management; iv) supported development of management plans, demonstration field projects and national wetlands policies in several basin states; v) contributed to workshops for basin site managers and parliamentarians; and vi) together with the Ramsar Secretariat and Wetlands International, supported the development of "NigerWet", a basin-wide network for wetlands conservation, that was endorsed as a Ramsar sub-regional initiative at CoP9 in November 2005.
- As a consequence of the progress in the Niger River basin, other African governments are looking a replicating this approach. For example, in 2005 the Council of Ministers of the Congo River Basin Commission established a "CongoWet" initiative.

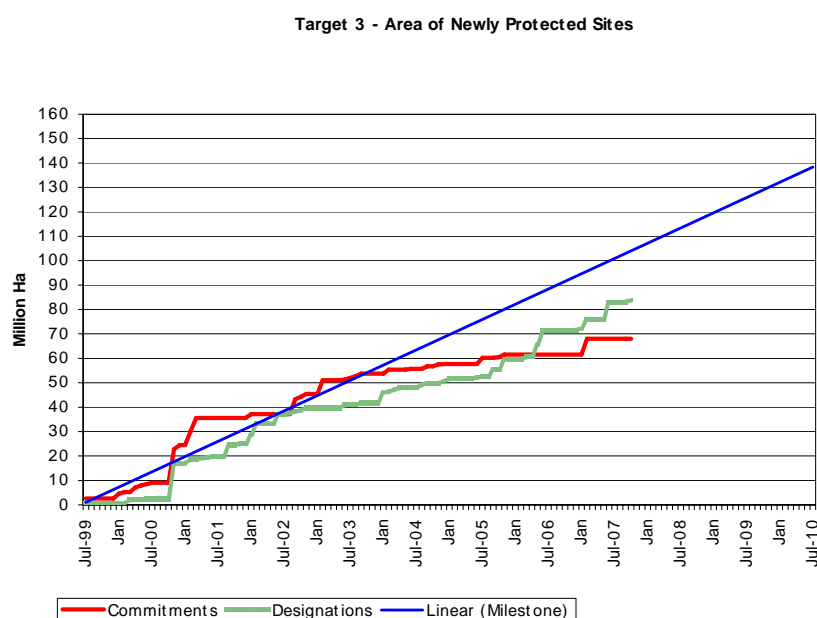
WWF spent CHF 253,000 over 7 years, and did not employ many staff but it has facilitated sound ecoregion conservation in the Niger River basin with top-level political support from the national governments. Not every designated site coincides with the Niger basin ecoregion vision or is well managed, but most new reserves are priority habitats and are better conserved as a result of the designation. Partnerships established between donors such as the GEF, national government agencies, and institutions like the Niger Basin Authority may now provide for long-term conservation of this ecoregion.

This method of achieving greater wetlands conservation through protected area designation has required the following attributes: dedicated national government agency staff; local WWF staff partnering with a WWF International staff member to facilitate international support; flexible small grant funds; consistent engagement over many years; and publicity for governments who take the right decisions.

Results of WWF Investments in Wetland Protected Area Designations

WWF set itself the milestone of achieving 100 million hectares in new freshwater protected areas between July 1999 and June 2007. A total of 84 million hectares of new reserves were established (Figure 1). Small grants of up to CHF 40,000 to developing country conservation agencies have been a critical factor in this success. WWF supported 46 countries, most with small grants for a total of CHF 2.007 million (1.204 million directly from WWF and an additional CHF 0.803 million from partners). Thus far, this has resulted in the designation of 291 more wetlands reserves at a cost (in grant funds) of CHF 0.24 per hectare (D. Landenbergue, unpublished WWF data, June 2007). Most of these wetlands were designated under the Ramsar Convention. At this time, the work instigated by WWF has contributed about three quarter of the global area expansion of Ramsar sites.

Figure 1. Designation of freshwater protected areas initiated by WWF from 1999 to 2007
(Source: D. Landenbergue, unpublished WWF data, June 2007)



Public recognition of government, which has taken good decisions, particularly at inter-governmental events, has been another key factor in generating support for new wetland protected areas. Presentation of certificates, media coverage and other means of recognizing good wetlands governance have reinforced action by the governments it concerned and encouraged neighboring states to undertake similar conservation actions.

Mainstreaming Wetlands Conservation by Highlighting Other Benefits

WWF has also used livelihood and flood management benefits to mainstream wetlands conservation into powerful industry and economic programmes of governments. In the cases

of South Africa, wetlands conservation work has helped disadvantaged citizens enhance their livelihoods through skills development, increased income, building self esteem and facilitating greater access to government services. In the case of the Danube, floodplain restoration can make a significant contribution to reducing flood risk.

South Africa Working for Wetlands

Pittock (in press) details the benefits of South Africa's Working for Wetlands programme, which is summarized here. The South African Government reports that by 2025, the nation will be one of 14 African countries classified as subject to water scarcity (i.e., less than 1000 m³ per person per year). There has been a remarkable extension of water services to poor communities since the end of apartheid, yet as of 2004, 12% of South Africans still lack access to adequate water supplies and 35% lack access to acceptable sanitation services. In South Africa, the National Spatial Biodiversity Assessment of 2004 found that 44% of freshwater ecosystems associated with main rivers in South Africa are critically endangered, compared with only 5% of terrestrial ecosystems. WWF has supported the "Working for Wetlands" programme, which undertakes wetlands restoration all over South Africa, gaining support by emphasizing the societal benefits from more reliable water supplies and poverty reduction through employment.

Working for Wetlands employs the most disadvantaged people in South Africa for a period of between six months to two years to restore degraded wetlands for nature conservation and better water management. It provides workers with training and life skills. Its objectives are to reduce poverty and improve water and wetland management. The Programme prioritises employment of single parents, youth (20% target; 18% in FY05), women (60%; 54%) and people with disabilities (2%; 4%).

The Programme was established through funding from the South African Government's National Poverty Alleviation Fund, which has increased to R75 million in 2007. Working for Wetlands is a consortium of three government agencies and the non-government Mondi Wetlands Project, which provides strategic, technical, and training support, valued at an additional R0.6 million per year. The Mondi Wetlands Project is a partnership of WWF, the Wildlife and Environment Society of South Africa and the Mondi Business Paper Company. Last year the mining industry also contributed about R7 million towards projects involving their operations. Farmers and forestry companies contribute a further 3 to 5% of programme costs for wetlands restoration involving their lands, as well as committing to ongoing management responsibilities.

The Programme selects wetlands that are a priority for conservation and water supplies, and where on-ground works can enhance the health of the wetlands. The project sites are all in areas identified by the South African Government as "poverty nodes". The projects have focused in particular on construction of structures to halt erosion and restore the hydrology of wetlands sites. Works commonly also include blocking drains originally dug to dry out the wetlands, removal of invasive alien plants and propagation and planting of indigenous species. At specific sites, other interventions have included such measures as construction of a boardwalk for visitor access and breaching road embankment to restore water flows.

In the 5 years to 2005 the Working for Wetlands programme has rehabilitated 175 wetlands nationwide with work to control invasive alien plants and erosion, trap sediment and pollutants, restore water tables and other hydrological functions, and adopt management plans. For example, in FY07 at 83 wetlands the program completed the following: 12,905 m³ of gabion (rock basket) erosion control structures, 6,591 m³ of concrete structures, 16,599 m³

of earthen structures, 43,206 m³ of earthworks, revegetated 183,048 m², cleared 1,052 ha of invasive plants, and propagated 112,711 indigenous plants. The program has raised public awareness of wetland conservation, helped maintain cultural values and enhanced local water supplies.

A large number of previously disadvantaged South Africans have benefited from the program. Between 2000 and 2005, Working for Wetlands has employed 8 000 disadvantaged South Africans at a cost of R 195 million. A huge multiplier effect is likely since in the one project site with research data, at Lake Fundudzi, the 36 people employed provided benefits to more than 180 people.

A 2005 socio-economic assessment of the Working for Wetlands programme commissioned by WWF identified the poverty reduction benefits as:

- Increased and more reliable income;
- Improved education and confidence of participants who are saying that the programme has made them better people;
- Reduced vulnerability to shocks and seasonality, particularly for food security;
- Investments in housing and children's education.

The Danube River

The Danube River is the most international in the world, with 19 countries and 30% of Europe in the basin, covering an area of more than 800,000km². There are 80 M people living in the basin and 20 M people depend on the Danube River for drinking water. Ecologically there are 50 protected areas of international importance, 11 Ramsar sites, 2 UNESCO biosphere reserves and world heritage sites, 103 fish species, and the 500,000 ha delta is the world's largest reed bed and home to 320 bird species of European importance (WWF, 2007b).

WWF has promoted the conservation of the Danube wetlands through interlinked and mutually supportive work at the site, national, basin and European scales. At the site level, WWF has demonstrated how restoration of flood plain wetlands can improve nature conservation, water quality and flood safety while also supporting people's livelihoods. Nationally, WWF has helped governments establish programmes to restore and designate wetlands, in part to fulfill their national obligations under the EU Water Framework, Habitat and Birds Directives. WWF helped establish the inter-governmental treaty for the basin and its International Commission for the Protection of the Danube River to instigate and coordinate better river management. At the European scale, WWF has played a central role in advocating for the establishment of the EU Directives that have set standards for river management that all European Union member states and aspiring members have to meet.

In 2000, WWF brought together Heads of State of four countries who agreed to establish the Lower Danube Green Corridor, to create a network of functioning wetlands along the river that includes 775,000 ha of existing protected areas, 160,000 ha of proposed new protected areas and 225,000 ha of proposed wetland restoration areas (WWF, 2007b).

Large floods have become an almost annual event along the Danube River. Poor catchment and river management, and climate change are the likely causes for the increase in flood damage. In the mid 2005 floods in Romania, 69 persons were killed and 13,000 persons evacuated, while there was € 1.5 billion in damages. In Bulgaria, 14 persons were killed,

14,000 persons were left homeless and there were € 520 million in damages that were inflicted by this flood (WWF, 2006).

Regrettably, government efforts to implement their commitments have been slow. Although 70% of the planned protected areas have been designated by early 2007, only 14% of the promised wetlands were restored. WWF reports that if restored these wetlands could have prevented flood tragedies in recent years. WWF has now mapped 43 floodplains with high potential for flood risk mitigation in the Danube basin and is campaigning for governments to restore these wetlands (Bratrich *et al.*, 2006). A total of 10,500 km² of flood plain remain in the basin and an additional 7,000km² area of former floodplains could be restored. The Danube River basin has lost 15,000 to 20,000 km² of floodplains since the 19th century, with less than 19 per cent of the former flood plains remaining (Bratrich *et al.*, 2006; WWF, 2006). The lower Danube government's commitment to restore more than 222,000ha of former floodplains would provide roughly the storage capacity that would safely manage the 2006 flood that inundated 200,000ha. The flood has enhanced the commitment of these governments to wetlands restoration.

The examples from South Africa and the Danube show that a key means of mainstreaming wetlands conservation is to link it to achievement of objectives of greater priority for national governments than biodiversity conservation, which were in these two cases, poverty reduction and flood safety.

Conclusions

The paper concludes by outlining some of the lessons learnt from promoting mainstreaming of wetlands conservation at the national scale. These include:

- Building interpersonal relationships over many years;
- Providing small grants to encourage government agency action;
- Publicising successes and thanking governments - using successes in one country to inspire neighbors to emulate this success;
- Having solutions ready to implement following environmental disasters;
- Linking and drawing strength from work at the local, national, regional and global scales;
- Establishing national wetlands laws, plans and committees as a framework for wetlands conservation;
- Using the framework of the Ramsar Convention on Wetlands;
- Demonstrating livelihood, flood management, and other benefits from wetlands conservation;
- Involving the public in the establishment and management and enforcement of wetlands conservation systems.

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This paper summarises the work of a large number of WWF staff globally and WWF's partners. Mr. Denis Landenbergue in particular has instigated and overseen many of the activities described in this paper, ably assisted by Amalia Romeo. The support of the MAVA Foundation for Nature Protection and the Swiss Government in funding important parts of WWF's wetlands conservation work is greatly appreciated.

References

- Australian Government.** 1999. Environment Protection & Biodiversity Conservation Act 1999. Australian Government, Canberra. Accessed on 30 November 2007 at <http://www.environment.gov.au/epbc/index.html>
- Bratrich C., S. Moroz and U. Schwarz.** 2006. 2006 Floods in the Danube River Basin. WWF Workin Paper. Accessed on 1 December 2007 at: http://assets.panda.org/downloads/2006_floods_in_the_danube_river_basin_wwf_working_paper.pdf
- CBD.** 2004a. Convention on Biological Diversity, Decision VII/28 Protected areas, Articles 8(a) to (e). Accessed on 29 December 2004 at <http://www.biodiv.org/decisions/default.aspx?m=COP-07&id=7765&lg=0>
- CBD.** 2004b. Convention on Biological Diversity, Decision VII/4 Biological diversity of inland waters. Accessed on 29 December 2004 at <http://www.biodiv.org/decisions/default.aspx?dec=VII/4>
- Chape S, S. Blyth, L. Fish and P. Fox** (compilers). 2003. 2003 United Nations List of Protected Areas. IUCN, Gland, Switzerland UNEP - WCMC, Cambridge. Accessed on 30 December 2004 at <http://www.unep.org/PDF/Un-list-protected-areas.pdf>
- Loh J. and M. Wackemagel** (eds). 2004. Living Planet Report 2004. WWF, Gland. Accessed on 30 December 2004 at <http://www.panda.org/downloads/general/lpr2004.pdf>
- Pittock, J., B. Lehner and L. Lifeng.** 2006. Chapter 8: River basin management to conserve wetlands and water resources. p: 169-196. In: R. Bobbink, B. Beltman, J.T.A Verhoeven and D.F. Whigham (eds). Wetlands: functioning, biodiversity conservation and restoration. Springer-Verlag, Berlin and Heidelberg.
- Pittock, J.** (In press). Working for Wetlands, South Africa. Case studies: local sustainable development in Africa. United Nations Department of Economic and Social Affairs, New York.
- Ramsar.** 1971. Convention text and amendments. Accessed on 21 July 2003 at http://www.ramsar.org/index_very_key_docs.htm
- Ramsar.** 2002a. Joint work plan between Ramsar and the Convention on biological diversity. Accessed on 21 July 2003 at http://www.ramsar.org/key_cbd_jwp3_e.htm
- Ramsar.** 2002b. Memorandum of Cooperation between The Bureau of the Convention on Wetlands (Ramsar, 1971) and The Niger Basin Authority (NBA). Ramsar Convention, Gland. Accessed on 23 November 2007 at http://www.ramsar.org/moc/key_nigerba_moc2002.htm

- Ramsar.** 2007a. Algeria reaches 42 Wetlands of International Importance. Algeria names an additional 16 Ramsar sites. Ramsar Convention on Wetlands, Gland. Accessed on 21 November 2007 at www.ramsar.org/wn/w.n.algeria_16.htm
- Ramsar.** 2007b. Varied new Ramsar sites in Tunisia. Tunisia names 19 new Ramsar sites. Ramsar Convention on Wetlands, Gland. Accessed on 21 November 2007 at www.ramsar.org/wn/w.n.tunisia_19.htm
- UNEP.** 2002. Atlas of International Freshwater Agreements. United Nations Environment Programme, Nairobi.
- WI.** 2002. Special issue on the Niger Basin Initiative (a partnership of Wetlands International, World Wildlife Fund, and Nigerian Conservation Foundation). In: Fadama, Newsletter of the Wetlands International (WI) Africa Office, No. 5, Dakar-Yoff, Senegal.
- WWF.** 2002. Saharan fruit-growing, foggara style. WWF, Gland. Feature story of 20 November 2002. Accessed on 21 November 2007 at: www.panda.org/news_facts/newsroom/features/index
- WWF.** 2006. Danube floods the result of mismanagement. Media release and report, 25 April 2006. Accessed on 21 November 2007 at: http://www.panda.org/news_facts/newsroom/index.cfm?uNewsID=67080
- WWF.** 2007a. WWF – who we are and how we came about. WWF, Gland. Accessed on 21 November 2007 at: http://www.panda.org/about_wwf/who_we_are/index.cfm
- WWF.** 2007b. Restoring the Danube. WWF, Gland. Feature story of 23 February 2007. Accessed on 21 November 2007 at: http://www.panda.org/about_wwf/where_we_work/europe/what_we_do/danube_carpathian/news/index.cfm?uNewsID=94740

MAINSTREAMING IN THE CHINA NATIONAL WETLANDS BIODIVERSITY PROJECT

**“Wetlands Biodiversity Conservation and Sustainable
Use in China”**

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CHAPTER 7

MAINSTREAMING IN THE UNDP/GEF/SFA PROJECT “WETLAND BIODIVERSITY CONSERVATION AND SUSTAINABLE USE IN CHINA”

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Abstract

China is rich in wetland resources, yet has suffered severe wetland devastation and degradation in the past decades. The objective of the GEF project “Wetland Biodiversity Conservation and Sustainable Use in China” is to establish wetland biodiversity conservation as a routine consideration in national, provincial and local government decision-making and actions, and to enhance the capacity for wetland biodiversity conservation. The project was implemented at the national, and at provincial and local levels by inclusion of four large demonstration sites representing different wetland ecosystems, and at the provincial level by a focus on Heilongjiang Province, which has some of the largest wetland areas in China. Through various interventions such as policy making, promotion and training, the project promotes the development of mainstreaming wetland biodiversity conservation. The project outcomes include: 1) promotion of policy and law, thereby providing an appropriate framework for wetlands biodiversity conservation, 2) establishment of a coordination mechanism for government sectors thereby strengthening the cooperation mechanisms for wetland biodiversity conservation and sustainable use, 3) by a variety of interventions that advance communication and sharing of wetland data and information, 4) by promotion and education to enhance the awareness by government officials and by the public, 5) by research and demonstration project using targeted cases of wetland management, and 6) by training and provision of equipment that facilitates these other measures. At its conclusion, the project has significantly accelerated the course of mainstreaming wetland biodiversity conservation, and government and the public have greatly improved awareness of wetland conservation in China. In some areas, plans to return farmland into wetland have been implemented, and plans for water compensation and inter-sectoral coordination and management have been developed or are in advanced state of preparation.

Keywords: wetland, biodiversity, conservation, sustainable use, mainstreaming, China

Background and Context

China is rich in wetland resources, with its natural wetlands covering 36.20 million hectares. Those wetlands can be seen from the tropical zone to the cold-temperate zone, and from the coastal zone to the highlands at an elevation of over 4,000 meters. China’s vast territory and its diverse natural geographical conditions support an extremely wide range of wetland biological diversity. There are over 2200 species of wild flora and 1700 species of fauna in the country, many of which are known to be rare, endangered or endemic. Amongst 57 endangered species of waterfowls in Asia, 31 are found in China. Meanwhile, 10.8% of its amphibians and 15.5% of its fish species are endemic. Of 947 wetland sites of international importance (as defined under Ramsar Convention criteria) in Asia, China has 192, covering an area of 16 million hectares, over 20% of Asia’s total area of the international important wetland sites.

However, since the opening of China the values and functions of the wetland ecosystem have been under-appreciated and government policies promoting economic and agricultural growth have resulted in drainage and conversion of wetlands for agriculture, and has led to major

losses in wetland attributes. Coastal mudflats have been converted to aquaculture, which has segmented the landscape of coastal wetlands and damaged their bio-community structure and distribution patterns. Over-grazing in highland wetlands has led to rapid degradation of wetland functions. Those activities, whether intentional or unintentional, have caused shrinkage of wetlands, degraded wetland quality and resulted in a heavy loss of wetland biodiversity, which is now seen to impair local socio-economic development. The government has promulgated many laws and regulations on use and management of water resources, but there are many ambiguities in terms of wetland conservation, and wetland biodiversity is not usually specifically addressed in these sector laws. Lack of understanding of wetland values and functions by governmental sectors, by enterprises and by the public has prevented the establishment of an efficient and coordinated operational system. The consequence has been severe fragmentation of wetland management functions, which has resulted in serious damage by human activities. The government of China has now realized the important significance of conserving wetlands and has issued new directions with the intent of slowing, then reversing unwise or irrational land use practices in wetlands.

In such a context, UNDP and the State Forestry Administration launched, in 1999, the project “Wetland Biodiversity Conservation and Sustainable Use in China” with funding from the Global Environment Facility (GEF). At the local level, the project involved four demonstration sites - Sanjiang Plain of Heilongjiang Province, Yancheng coastal marshes of Jiangsu Province, Dongting Lake of Hunan Province, and Ruoergai Marshes that lie around the Yellow River in both Sichuan and Gansu Provinces. Under the project, a wide range of demonstration activities was undertaken at national, provincial and site levels. The project aimed to integrate wetland conservation into government decision-making and actions at national, provincial and local levels, and to improve wetland management capacity through a variety of interventions at each level of government. To ensure coordination amongst various sectors, a Project Steering Committee was formed with members from the SFA, UNDP, Environment Protection and Natural Resources Conservation Committee of the National People’s Congress, Ministry of Finance, Ministry of Water Resources, Ministry of agriculture, Ministry of Environment Protection, the Chinese Academy of Sciences, the State Oceanic Administration.

Strategic Approach of the Project

The objective was to ensure that relevant governmental sectors at all levels, enterprises, social organizations and individuals give full consideration to wetland biodiversity conservation in their decision making, planning and daily actions and to adopt practical and effective measures to achieve this objective. Conceptually, mainstreaming wetland conservation is a process as well as a philosophy, by which wetland policies, planning and implementation converge to form a comprehensive solution to wetlands biodiversity conservation and sustainable use. It requires an ecosystem approach involving all levels of government, the public and private sectors, and integrating diverse sectoral interests and coordinating development targets of relevant sectors for wetlands biodiversity conservation and sustainable use. Mainstreaming commences with the organization structure of the project that ensures participation by these various societal groups. The six major components of the project were:

- The formulation of wetland conservation policies and regulations
- The establishment of inter-agency coordination mechanisms
- The promotion of exchange and sharing of data and information
- Awareness building, publicity and education
- Integrating multi-disciplinary research and advanced wetland management practices
- Management of capacity building

Policy and law in support of wetlands biodiversity conservation

At the national level, the project formed a peer evaluation group consisting of recruited experts and specialists on wetland laws and policies; that group analyzed and assessed 18 laws and regulations closely related to wetlands. The objective was to analyze sector laws and major regulations as a basis for (1) determining their impacts on wetland conservation, and (2) for recommending to sector agencies revisions of their laws and regulations that would make these more cognizant of wetland issues. An outcome of this work has been advice to SFA on content of a draft wetland regulation, and an example of a “complete” draft law on wetland conservation. The group’s “Assessment Report and Proposal on Wetland Conservation Policies and Regulations” has been submitted to relevant ministries and commissions as a reference for revision or improvement of their relevant laws and regulations. The work on mainstreaming at the national level is more fully developed in Chapter 7 “Legal and Institutional Mainstreaming in the GEF China National Wetland Project”. Also, the work of this group into new methods for measuring mainstreaming appears in Chapter 19 “Measuring Mainstreaming: Development and Application of Wetlands Biodiversity Conservation Criteria in China”.

China’s experience in wetlands regulations is not fully developed. Two overseas study tours improved greatly the understanding of relevant agencies on wetland legislation and promoted the national wetland legislation process. At the same time, the project has been actively involved in the formulation of the national China Wetland Conservation Regulations and has contributed supportive materials in 12 key areas, which are more fully described in the Chapter 22 “International Examples of Legislation, Policies and Practices Supporting Mainstreaming of Wetlands (Biodiversity) Conservation”. These provide greater perspective in areas such as “wise use”, ecological flows, categories of protection, compensation, tenure and ownership issues, etc. Most of these have mainstreaming consequences therefore it was important to consider them as the national regulations were being drafted and as a basis for further discussions with other sector agencies.

Heilongjiang is the demonstration area used for provincial level mainstreaming. In Heilongjiang, policy and law experts have completed an analysis of provincial laws and regulations in a manner similar to the national examination. In their work, however, investigations, interviews and field study were used to focus the assessment on the actual consequences of sector management on the wetlands in that province. The Heilongjiang team of experts put forward, to the provincial government, suggestions to improve the wetland nature reserve management system, to establish a wetland ecological benefit compensation

fund, and to strengthen law enforcement and wetland certification.

At the local level, as in the Yancheng site in Jiangsu Province, the “wetland sustainable use strategy” developed by the project has been approved by the local government, and a book entitled “Conservation Law and Policy Assessment, Land Use Analysis and Evaluation of Ecologically Economic Values of Yancheng Wetlands” has been published. Proposals concerning the formulation and enforcement of coastal wetland conservation laws and policies have also been developed. In all of these, mainstreaming has been essential to ensure that sector managers are both cognizant and supportive of the proposed wetland measures. At the Dongting Lake site in Hunan Province, consultants assessed land use policy and management practices on wetlands conservation; it was found that sector management of fisheries, reeds and poplar plantations, had very negative impacts on wetlands. In East Dongting Lake the local government has made great progress in integrating sector responsibilities into a more comprehensive wetland/lake management strategy.

On sector issues, the project has had a significant influence, which can be measured in term of the number of policies and regulations that have been implemented over the life of the project. The provinces of Heilongjiang, Gansu and Hunan have taken the lead in promulgation of wetland conservation regulations at the provincial level in the country. Three important documents were promulgated by the Hunan provincial government: “Circular on Improvement of Wetland Conservation Management in Dongting Lake”, “Circular on Establishment of the Dongting Lake Wetland Conservation Committee”, and “Summary of the meeting on Management Right Readjustment of the Core Zone of the Dongting Lake Nature Reserve”.

Inter-agency coordination mechanisms

For project implementation and coordination at the national level the Project Steering Committee (PSC) that involves all relevant sectors has acted as an inter-agency body for dealing with and solving important issues through its regular consultative meetings. This has ensured that all sectors are in agreement with the principles and practices that have been proposed by the project.

In Heilongjiang province, a project leading group was set up consisting of all relevant sector departments, chaired by a vice governor: also, a project liaison group headed by a director-general of the provincial forestry department was also formed to work on day-to-day issues with sector counterparts. Similar inter-sectoral coordination arrangements were used at the Sanjiang Plain Site of Heilongjiang with a project leading group and liaison group established at the site level with directors of the Jiansanjiang Sub-bureau and Fuyuan County as their leaders. A joint mechanism for Nongjiang/Yalu river basin water resources management was developed. Facilitated by the project, an agreement on joint transboundary conservation actions was reached between Sanjiang National Nature Reserve and two nature reserves on the Russian side of the Heilongjiang (Amur) River. Additionally, the Honghe Reserve has also signed a transboundary agreement with two Russian national nature reserves. Those transboundary agreements are aimed at adopting joint and cooperative actions in monitoring of wild animals in winter, and migratory birds and banded birds in spring.

In Hunan Province, a special Dongting Lake Fund under the China Green Fund and its

management committee were established. Led by the Hunan provincial Development and Reform Commission, an integrated inter-sectoral and inter-regional management plan is under preparation for the whole watershed area of Dongting Lake. The People's Congresses and the People's Political Consultative Congress of Hunan Province and of Yueyang Municipality gave their opinions in 2006 and 2007 respectively concerning overall management of Dongting Lake wetland biodiversity conservation and sustainable use. In Gansu Province, a liaison group was set up, which consists of members from Provincial Development and Reform Commission, provincial departments of finance, water resources, agriculture and animal husbandry, forestry, land resources, bureau of environment protection, and meteorology. Meetings for consultation and coordination purposes are held on a regular basis. At the county level, an inter-agency coordination mechanism has been established under the the people's government of Maqu County in Gansu Province consisting of its Municipal Development and Reform Commission, and Bureaus of finance, taxes, hydraulic electricity, animals and forestry, meteorology, land resources and environment protection as well as grassland stations. Each has assigned individual liaison members for the project and has developed their respective responsibilities and liaison meeting schemes.

The development of the inter-agency coordination mechanism has achieved significant results in improving wetland conservation and wise use. For instance, in Heilongjiang Province, a wetland certification and licensing system for development and use systems were established in July of 2007 with active involvement and coordination of multiple sectors. In July of 2007, under the leadership of a vice director of Yueyang County of Hunan province, the county fishery bureau and reed industry company and some other relevant agencies worked closely with the East Dongting Lake Nature Reserve to deal with such issues as management of the Nature Reserve core zone, a fishing ban, water level control, and alternative livelihoods for fishermen. With their coordinated efforts, the long-existing conflict between protection and use of wetlands has been resolved. In the annual work meeting held by the people's government of Maqu County of Gansu Province on April 16, 2008, conservation of Ruorgai Marshes was identified as one of 11 priorities of the county for 2008 through the active involvement and joint efforts of forestry, water resources, agriculture, and environment protection sectors.

Information and data exchange and sharing

The project has developed a national wetland information system. Using data from the first national wetland survey as the basis, the system includes such content and functions as geographic distribution and classification of wetlands (e.g., classified basic attributes, administrative division or watersheds, etc.), enquiry and statistics about basic data (e.g., area of wetlands). Additionally, the system has ports for rapid data transfer, exchange and sharing between national and local levels.

At the provincial level, Heilongjiang has developed the wetland database for the province. A coastal wetland biodiversity (wild fauna and flora) survey, especially a survey of key wetland species like Saunder's gull and Chinese water deer has been completed for the Yancheng Coastal Marshes site. The survey outcomes have been aggregated into a thematic report, which will be published soon. Hunan has finished its Dongting Lake wetland biodiversity

monitoring system. Gansu has concluded its Ruoergai wetland landscape diversity survey, taking over a thousand photographs, which will be published as an album.

Wetland data and information systems/databases will be accessible by the public and other agencies, free of charge, and will provide a platform for the public to learn more about wetlands and their conservation and management. Meanwhile, the availability of the information systems/databases will be helpful in improving work efficiency in relevant sectors of wetland conservation, management and decision making.

Publicity and education to improve awareness

Diverse publicity and education activities for wetland conservation have been carried out at the national level. These include:

International meetings/conferences have been held to draw the attention of government agencies, enterprises and the public; they are aimed at improving awareness about wetland conservation and wise use. In conference organization, we have involved senior government officials in order to create “ownership” of the conference objectives. For example, this volume reports on the “International Workshop on Mainstreaming Wetland Biodiversity Conservation” held December 2007, and was attended by high-ranking officials from national, provincial, and city levels.

Publicity and education: The project’s national office assisted the SFA’s Office of Wetland Conservation and Management to carry out the following publicity and education activities:

- 2008 World Wetland Day;
- A national wetlands photo exhibition entitled “Healthy Wetlands, Healthy People” held in Beijing in February, 2008;
- A telefilm entitled “Healthy Wetlands, Healthy People” made and broadcasted by CCTV through its 4 channels on many occasions;
- Brochures and leaflets created and disseminated extensively;
- The public and relevant agencies are kept informed of the project in particular and of wetlands issues in general, through a variety approaches, including bilingual newsletters, brochures and telefilm;
- The project website (www.wetland-gef-CPR98.org) serves as an important means of informing the public of the project progress and disseminating knowledge on wetlands nationally and internationally.

At the provincial level, wetland conservation publicity and education are important components of project activities. In Heilongjiang Province, primary and middle school students use the project’s educational material. In Jiangsu Province, education/visitor centers were built in Yancheng Red-crown Crane Nature Reserve and in Dafeng David Deer Nature Reserve; publicity materials introducing on coastal wetlands were printed and distributed. Activities, such as bicycle racing around the wetland site and a wetland knowledge contest for school students, were also organized. In Hunan Province, the project organized and conducted various activities, for example a “Bird Loving Week” and an “International Bird Watching

Festival” in Yueyang City to improve public awareness about Dongting Lake conservation. In the Ruoergai wetland site in Maqu County, the Gansu project office organized summer camp activities for primary and middle school students.

Those publicity and education activities organized by the project have received favorable responses from society. For instance, the international workshop held in Yueyang was reported by many media agencies including Xinhua News Agency, People’s Daily, CCTV, China Green Time and local media. The photo exhibition popularizing wetland information lasted 28 days; it was visited by 45,000 person-times and was highly acclaimed by the public. The telefilm “Healthy Wetlands, Healthy People was broadcasted by CCTV on 40 occasions. The bicycle race around the wetland site in Yancheng was organized with funds provided from many local enterprises. The wetland knowledge contest in Yancheng, Jiangsu Province and the summer camp in Maqu County, Gansu Province were warmly welcomed and actively participated by primary and middle school students.

Interdisciplinary research and demonstrating advanced wetland management practices

Integration of multi-disciplinary research is an element of mainstreaming that ensures that technical experts from different sectors have a common understanding of core problems and issues in wetlands management. To effectively deal with specific wetland conservation and management issues in areas such as biodiversity monitoring, policy-making and legislation, water resources restoration, agricultural production and grassland management, the project formed interdisciplinary scientific research teams to carry out research on wetland conservation and restoration. For instance, development of the wetland biodiversity monitoring system for Dongting Lake has not only involved computer science and information systems specialists, but also experts in networking, zoology and botany. The team for wetland policy and regulations is composed of specialists and experts in the fields of policy, law and land use. The team for Sanjiang wetland water resources management has not only involved experts in hydrology but also in ecology and computer science. In Maqu county of Gansu Province, comprehensive considerations have been given to Ruoergai grassland management, including herding practices, wetland restoration, co-management of communities and transboundary coordination (between Sichuan and Gansu provinces).

These interdisciplinary research activities have promoted and demonstrated a number of advanced cases of wetland management. An example is the research on Honghe National Nature Reserve (NNR) water resources restoration and management. The results were accepted by the National Development and Reform Commission (NDRC) in 2005 and set for implementation in 2006; they could be used as a technical guideline for water compensation in Honghe NNR and as a good example for other nature reserves to follow in water resources restoration and management. Through corridor construction, the project has brokered an agreement on co-management between Jiansanjiang Sub-bureau of Heilongjiang Provincial Agricultural Reclamation Administration and Fuyuan County government. Under this agreement some areas in Nongjiang and Yalu River basin which are not under protection but have significant wetland value have now been incorporated into the local wetland conservation and management plan, thus resolving the long-existing problem of land ownership and wetland conservation and management. The Dongting Lake biodiversity

monitoring system has been accepted by the four nature reserves around the lakes and is likely to be used in the rest of Hunan Province.

Strengthening capacity

Great importance has been attached to capacity building in relevant sectors in management and infrastructure since the start of the project. To improve management capability, needs-based training plans were developed and training activities implemented. The project has held 41 major domestic training workshops with a total of 1356 persons. Short-term training courses were provided on a demand basis for 43 persons and there have been 11 persons who have taken domestic training courses as part of their academic degree program. Additionally, the project has also organized 5 domestic study groups and 4 overseas study groups. Three persons took short-training courses overseas and 9 persons participated in seminars held both at home and abroad. Training was carried out with a combination of domestic and foreign experts.

With the overseas study tours, a number of international cooperative activities were initiated, including cooperation between SFA's Office of Wetland Conservation and Management and the British Wetland and Waterfowl Conservation Fund, and the planned Sino-British Wetland Conservation Cooperative Mechanism. Additionally, exchange visits of personnel and technical exchange of information have also been conducted. A technical cooperative plan is underway between SFA's Office of Wetland Conservation and Management and the Dutch Government in wetland management, restoration, survey and monitoring, and improvement of water quality. Efforts have also been made to seek international support and assistance in monitoring of international important wetland sites, wetland rehabilitation, pilot site development and technical extension.

The training activities organized by the project, has also improved the awareness of the public and of government officials on wetland conservation. For instance, the mayor of Dafeng City of Jiangsu Province, after finishing the training course, worked with relevant sectors to provide funds for the Dafeng Nature Reserve and the incorporation of 75000 ha. of mudflat into the nature reserve for protection. After taking the training courses, the director of Maqu County of Gansu Province has gained new understanding and ideas on how to improve wetland conservation and sustainable use. At Dongting Lake site, Hunan Province, GIS training courses are organized and provided to enforcement personnel from various sectors (e.g., water resources, environment protection, fishery and forestry) in order to develop a joint enforcement scheme between the Dongting Lake Nature Reserve Administration and relevant sectors.

Experiences and Lessons

Over nearly 10 years of implementation, the project has used mainstreaming as an effective approach to building bridges across sectors. The main achievements can be summarized as:

- a) Using a mainstreaming approach to wetland conservation and sustainable use, there has been a change from traditional ideas about wetland protection to a more comprehensive approach of considering all elements related to wetlands such as water, land, biodiversity,

and human activities. Part of the success has been in harmonizing nature protection and local economic development and the interests of relevant sectors and beneficiaries;

- b) Cooperation and coordination amongst government agencies at different levels and sectors has become an important guarantee for promoting wetland conservation and sustainable use;
- c) Mainstreaming of large-scale, interdisciplinary involvement and introduction of new ideas and technologies has been important in inter-sectoral cooperation;
- d) Project achievements and impacts are used as indicators for appraisal of officials' performance;
- e) Measures taken for mainstreaming are adjusted so that they are suitable for local conditions and emphasis is placed on practical results.

Although much effort has been made by the project in promoting mainstreaming of wetland biodiversity conservation and that many important results have been achieved, mainstreaming still remains a new philosophy to many people in China. Our successes still need to be replicated in other parts of China. Nevertheless, the project has taken the first big step and we believe that with leadership and guidance of the relevant government sectors and with the re-discovery of environmental values by the Chinese public, the Chinese nation will move forward to achieve a more sustainable balance between wetland biodiversity conservation and sustainable use.

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CHAPTER 8

LEGAL AND INSTITUTIONAL MAINSTREAMING IN THE GEF CHINA NATIONAL WETLAND PROJECT

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Abstract

The “Wetland Biodiversity Conservation and Sustainable Use in China” project of UNDP, GEF and the State Forestry Administration (SFA) has, as one of its principal outcomes, the improvement of wetlands conservation and sustainable use through the process of mainstreaming across sectors. This process has involved several component activities at the national level: (1) the development of a set of criteria against which mainstreaming wetlands biodiversity could be measured; (2) evaluation of the legal and regulatory framework of all relevant sector departments; and (3) evaluation of the administrative framework for wetland management. At the provincial level, Heilongjiang was selected as the demonstration province for mainstreaming at the provincial level using the same framework as at the national level. Additionally, each of the five demonstration sites, representing widely divergent types of wetland environments, also had a major focus on mainstreaming actions to enhance wetlands management and protection at the local level. This paper mainly focuses on the national level. Readers are referred to Chapter 8 that deals specifically with Heilongjiang, and to Chapter 19 that describes wetlands biodiversity assessment criteria developed in his project for assessing mainstreaming.

Keywords: China, biodiversity, wetlands, mainstreaming, laws, institutions

Introduction

This Chapter highlights some of the key observations, conclusions and recommendations for mainstreaming at the national level that were developed in the “Wetlands Biodiversity Conservation and Sustainable Use in China” project of the GEF, UNDP and the State Forestry Administration. The reader is referred to the full report of this activity for the full text of recommendations of the Peer Evaluation Team (PCO, 2007).

The context¹

The wetlands of China are components of hydrological systems that, when well managed, provide water in periods of shortage, flood control in periods of heavy rain or snowmelt, food for millions of people, and breeding and feeding habitat for many wild species. China’s great size and huge range in latitude and longitude are accompanied by a diverse geology, a long coastline, a large river network and about 2,300 lakes bigger than 100 ha in area. These provide diverse habitats for animal and plant species, including a high proportion (15% of the fish, for example, and 11% of the amphibians) that are endemic to China, and large numbers of migratory waterfowl and shorebirds that rely on wetlands for breeding, wintering or stopovers and would not survive without them. Of the world’s total of 166 species of ducks, 46, or 28% occur in China, and on a single census in April 2004 the counts of Swan Geese (*Anser cygnoides*) and Lesser White Fronted Geese (*Anser albifrons*) exceeded current estimates of their global and regional populations respectively. Ninety five percent of the world’s population of Siberian Cranes (*Grus leucogeranus*) winter in the Yangtze Valley.

¹ This is taken from UNDP (2005).

China is particularly rich in wetlands yet is suffering water shortages in many areas. For several decades the values of wetlands and the biodiversity they support have been under-appreciated, and government policies have promoted drainage and conversion of wetlands for agriculture. Overuse of water, and siltation as a result of logging in the upper reaches of major rivers have added to the problems, and future agricultural production is now threatened in several areas. Coastal mudflats and mangroves have been converted to aquaculture or agriculture, biological resources have been overused, and dams, river diversions and embankments, and introductions of alien species, have adversely affected aquatic species and ecosystems, leading to the near extinction of several species and reduced ranges for many others.

The government of China now recognizes many past errors, and programmes are in place or planned to fill in drains, to re-hydrate wetlands and to allow farmland to be returned to seasonally flooded polder or lake. Specific legislation on water resources, wildlife protection, pollution control, river basin management and environmental impact assessment provides a framework for regulation. However, there are ambiguities, wetland biodiversity is not always addressed specifically and the legislation is not always enforced. Many wetlands have been declared as nature reserves but reserve management authorities often lack jurisdiction inside the reserves and have little or no influence over threats that arise from development and other activities in the surrounding areas. The establishment of protected areas is a vital step in conservation but alone it has not halted species' declines or neutralized the threats. Wetlands in particular require an integrated approach to management in the wider landscape, involving all stakeholders with influences on or interests in the water, yet different agencies are undertaking uncoordinated and often contradictory programmes.

National Policy Framework for Wetlands Biodiversity Conservation

The policy framework developed slowly following the 1992 entry of China to the Ramsar Convention. Although a number of measures that have linkages to wetlands were enacted in the period to 2000 there were no specific national policies dedicated to wetlands conservation. Since that time the national government has taken a number of significant initiatives including:

- 2000 China National Wetland Conservation Action Plan, jointly enacted by State Forestry Administration and other 17 ministries, commissions and administrations, serves as a guideline for various authorities and levels of governments to implement wetland conservation and wise use in the country.
- 2003 China National Wetlands Conservation Program (2004-2010) issued in 2003 by an inter-ministerial Steering Group.
- 2004 National Wetlands Policy outlined in Circular 50 of 2004 of the State Council which lays out the overall national policy for wetlands management.
- 2005 Implementation Plan 2005-2010 of the National Wetland Conservation Programme approved by national government.
- 2007 State Forestry Administration drafts national Wetlands Regulations; in 2008 these are under discussion with other ministries.
- 2002-2030 The National Programme for Wetland Protection Engineering and the implementation component over the period 2005 – 2010.

Additionally, there have been numerous speeches and pronouncements on the urgency of wetlands conservation by government leaders, including former President Jiang Zemin, and

former premier Zhu Rongji, since 2000. Since the National People's Congress of 2006, the increased emphasis on environmental protection has greatly improved momentum in wetlands conservation across China. In the meantime, some provinces with extensive wetlands have pushed ahead by developing their own wetlands policies such as Heilongjiang Province which promulgated China's first provincial wetland law in 2003.

Legal and institutional situation

While the State Forestry Administration (SFA) and their subordinate Forestry Departments at provincial levels have the overall mandate to manage wetlands, national biodiversity conservation is under the authority of the Ministry of Environmental Protection (MEP). Wetlands management is greatly complicated by the sector approach to resource management in the Chinese institutional system. Fisheries bureaus manage wetlands fish; water bureaus manage wetlands water; navigation bureaus manage navigable waterways in wetlands; environment bureaus manage water quality, reeds bureaus own wetland areas and promote the growing of reeds (usually for paper pulp); agriculture bureaus control farming around wetlands; tourism bureaus manage tourism in wetlands; etc., etc.. Each of these sectors has specific interests that are (with some exceptions such as tourism) supported by national and provincial sector legislation and supporting regulations. Some sectors financially support themselves through issuing of licences and permits for wetlands activities such as commercial fishing, reed growing, forestry plantations, etc.; these are usually not coordinated with the conservation requirements of national wetland policy. Furthermore, there are inconsistencies between sector laws that create profound difficulties in integrated management of wetlands. The many wetlands that are not designated nature reserves present particular problems for provincial and local governments in terms of institutional jurisdiction. The consequence is that many are not protected or are extremely vulnerable to encroachment and land use change.

Mainstreaming

As in all countries, there is a great range of sector law and related regulations that have great potential to impact on wetlands, but which do not include specific reference to wetland biodiversity protection or ecological integrity. Much legislation is focused on resource management (eg Agriculture Law, Soil and Water Conservation Law, Fisheries Law, etc.) but is silent on environmental impacts on wetlands, or produce conflicts with the enforcement of environmental legislation such as the Environmental Impact Assessment Law, the Environmental Protection Law or the Wild Animals Protection Law. As noted above, the sector approach to wetland management is a major challenge for mainstreaming.

The continuing challenge of integrating biodiversity conservation within all sectors of national economies was stated at the 2002 Conference of the Parties (COP) of the Convention on Biodiversity (CBD):

*"The most important lesson of the last ten years is that the objectives of the Convention [on Biodiversity] will be impossible to meet until consideration of biodiversity is fully integrated into other sectors. The need to **mainstream** the conservation and sustainable use of biological resources across all sectors of the national economy, society, and the policy-making framework is a complex challenge at the heart of the Convention."* (COP VI, CBD, 2002)

The concept of "mainstreaming biodiversity" is implicit in the Convention on Biodiversity (CBD) and, since 2003, is explicitly stated as Strategic Priority #2 of the GEF Biodiversity Programme: "Mainstreaming biodiversity in production landscapes and sectors—to integrate

biodiversity conservation into agriculture, forestry, fisheries, tourism, and other production sectors in order to secure national and global environmental benefits.” Nevertheless, the concept and practice of “mainstreaming” has been poorly understood. In 2002, at the World Summit on Sustainable Development (WSSD), world leaders agreed that continuing loss of biodiversity required renewed attention.

Therefore, this UNDP/GEF/SFA project “Wetland Biodiversity Conservation and Sustainable Use in China” (UNDP, 2005) has as one of its main objectives (Outcome A) the enhancement of mainstreaming across government departments at the national, level and to provide guidance for similar activities at provincial and local levels. For this Outcome the principal focus was on measures that need to be taken to enhance mainstreaming of wetlands biodiversity conservation at the national level. This has involved two primary activities – (1) assessment of the policies and legislation that are relevant to wetlands management, and (2) assessment of the institutional framework within which wetland management is practiced in China. The consequence of this assessment is a comprehensive set of recommendations on changes in the national legal framework and in institutional arrangements that are both consistent with Chinese legal and institutional practices, and that provide the legal and institutional mechanisms to improve wetland management. The recommendations are directed in two directions. One direction is towards the State Forestry Administration that has been developing a new draft Wetlands Regulation concurrently with this project. For this purpose the project has provided not only recommendations within the main text of this report, but also provides a comprehensive legal text for a “complete” wetlands regulation which contains many proposals that are not now in the SFA draft document. As in most countries, legal drafting in China reflects a compromise between what is possible, especially relative to inter-ministerial consultations, and what is desirable. This project is not handicapped by this practical reality and sets out full recommendations that can be considered in the future as the national government both restructures its environmental agenda and continues with the process of legal reform. The second direction is towards other government sectors that have specific mandates for various aspects of the wetland environment, and for which this component has provided a comprehensive set of recommendations for changes in sector laws and regulations as these come up for revision.

Methodology

Team organization

Outcome A was implemented by a Peer Evaluation Team (PET) consisting of: a senior Chinese environmental law expert who was mainly responsible for developing the legal framework assessment; a senior Chinese institutional specialist who focused on the institutional issues; a national specialist in wetlands ecology; the international water policy advisor to the project, the Chief Technical Advisor for the project, and a second national environmental law expert who served as Team Leader and was a member of the SFA wetlands regulations drafting team. The international advisor developed the assessment criteria described in the chapter “Measuring Mainstreaming”.

Implementation Steps

The implementation steps are shown in Figure 1. The assessment criteria were used, as described below, to assess the text of laws and regulations that were relevant to wetlands biodiversity conservation. The result of this process was a set of recommendations on the legal framework to be used in discussions with sector ministries and administrative organs on

ways and means to enhance the sensitivity of sector laws for wetlands purposes. The institutional analysis, while paying attention to the assessment criteria, used a more independent approach in which the main characteristics of the wetlands and related (sector) administrative systems were analyzed, with recommendations made on administrative reform. and included an inter-agency consultation step prior to writing the summary report. The inter-agency consultations were mainly focused on discussion of the principal observations of the assessment with sector counterparts and obtaining their opinions. This Chapter summarizes the Summary Report for Outcome A noted in Figure 1 (PCO, 2007). The same process was used at the provincial level for Heilongjiang province (Outcome B of the project) but is not reported here.

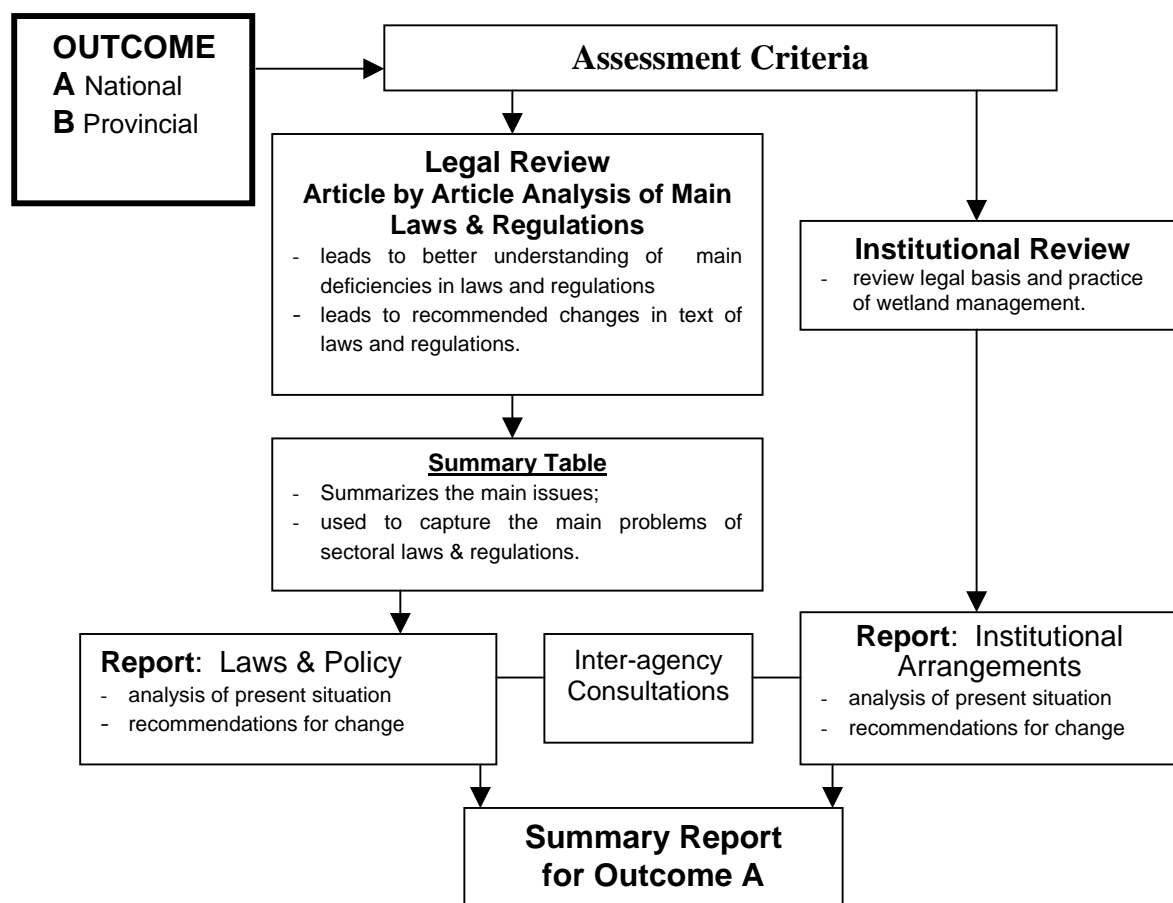


Figure 1: Flow path of methodology used to implement the mainstreaming objective of Output A

Assessment Criteria

The assessment criteria and their use are fully described in the chapter “Measuring Mainstreaming”. In summary, two sets of draft criteria were initially developed (Table 1). One set of 9 criteria focused on legal and regulatory review (referred to as “non-technical” criteria). The other set of 7 criteria were developed by a team of wetland specialists and are of a technical nature that describe typical technical issues in wetlands management (e.g. water diversion, alien species, etc.). These criteria were used in the legal and institutional analysis at national and provincial levels, and also in the five demonstration sites at local levels.

Table 1: Technical and non-technical criteria used in the assessment

CRITERIA	EXPLANATION
Non-Technical Criteria	
1. Policy Environment	There are two types of policy – those that are written down, and those that are de facto (unwritten) policies (what agencies do in support of their mandate)
2. Technical Clarity	Lack of clarity is a common problem both for the sectoral ministries and for others, in understanding how the legal provisions should be implemented. Laws often lack definitions of terms so that, e.g. “water resources” is interpreted differently by different ministries. Technical clarity should be applied to definitions, procedures, methods, etc., that are identified in the text of the law or regulation.
3. Mandate, Authority & Institutional Obligations	There are mandate clashes between sectoral agencies relative to wetlands conservation. What institutional obligations are required under the law?
4. Planning Provisions	Planning is usually very unspecific in most laws.
5. Operational Practices	This mainly focuses on the institutional arrangements and management practices (e.g. permitting, monitoring and data sharing) that could affect wetlands
6. Enforcement	What enforcement mechanisms are specified in sectoral laws and regulations that may apply to wetlands issues. Partly, this is to determine if wetlands regulations can use enforcement mechanisms in other laws, or alternatively, if enforcement mechanisms in sectoral laws will conflict with enforcement of wetlands regulations.
7. Rights and Obligations & Public Participation	This refers rights and obligations that sectoral laws and regulations convey to individuals, working units, etc.. for wetlands issues.
8. Penalties & Rewards	Are penalties for violations that damage wetlands adequately represented in the law? Are there penalties for violations of the law by public officials?
9. Economic Provisions	What economic provisions are contained in laws that may impact positively or negatively on wetlands?
Technical Criteria	
1. Hydrological Impacts	dams, diversions, river training, flood control, etc.
2. Drainage Impacts	Drainage for construction; Drainage for agriculture; Drainage for grazing lands; Embankments; Polders; Dredging – flows Dredging – water quality; Ground water overdraft; Tree planting; Weather control; Transportation infrastructure
3. Pollution Impacts – Point Sources (Industry, municipal)	Industrial chemical pollution; Industrial thermal pollution Urban waste (sewage); Urban landfills
4. Pollution Impacts – Non-Point Sources (agriculture, urban, roads, mine sites construction sites, , etc.)	Agric. runoff – eutrophication; pesticides/herbicides, sediment Urban runoff – heavy metals, sediment Construction – sediment Mining – mine drainage, acid runoff, sediment
5. Land Conversion	Agricultural encroachment; Use as a landfill; Filling for construction; Peat mining; Plantations; Aquaculture; Grazing
6. Use of Wetlands Products	Hunting, Peat Mining, Fish farming, Over-harvesting Grazing, Tourism, Reed cultivation, etc.
7. Ecosystem Engineering	Pika and rodent poisoning; Exotic species introduction; Removal of surrounding forests; Conversion of surrounding vegetation; Overstocking of fish; Special measures for small populations; Restoration; Create wetlands

Observation: It would seem intuitive that one should be able to assess laws and regulations using strict technical criteria for wetland impacts. However, in practice, it was found that laws and regulations are written in a sufficiently general way that makes it difficult or impossible to assess their impacts relative to the highly detailed technical criteria. For example, while the Water Law clearly has impacts on several technical criteria, the law is not specific about the nature of the relationship between it and wetlands technical criteria. In fact, it is more a matter of how the law is implemented than what the law actually says. Therefore, analysis using the technical criteria often has little practical value. As a result, the analysis in Outcomes A (and B) used mainly the non-technical criteria. The technical criteria are, however, of value in assessing mainstreaming at the local level which is the level where implementation can be directly assessed as noted in the Chapter “Measuring Mainstreaming”.

For the legal assessment the PET used a consensus-based approach in which each article of each law was reviewed against the criteria using the format shown in Table 2. The result was a series of comments for each applicable criterion. Following completion of the detailed assessment for each law, the PET created a summary table (Table 3) for each law which contained the team’s views of what was believed to be the most important issues with that law. The summary table provided guidance for discussions with sector ministries on improvement of sector laws.

Table 2: Article by Article analysis table.

ARTICLE BY ARTICLE ANALYSIS TABLE									
Law/Regulation on									
Article	Technical Criteria							Non-Technical Criteria	Comment
	1	2	3	4	5	6	7	1 to 7	
1									
2									
etc									

Table 3: Summary Table

SUMMARY TABLE		
Law/Regulation on		
	KEY GUIDANCE COMMENTS	
Overview		
Non-Technical Criteria	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	

Mainstreaming assessment

Problems in policy and legal analysis

Determining mainstreaming effectiveness of national policies in China is complicated by a variety of factors that are more fully described in the chapter “Measuring Mainstreaming”. The following is a summary:

- Policies that may have significant impacts on wetlands are often sufficiently vague that they do not indicate how they may affect something as specific as wetlands biodiversity conservation. Examples include the policy on economic development (which, at least until recently, clearly had higher significance at the local level than the government’s policy on the environment). Another example is the new policy on the “sustainable socialist countryside” which, although not contained in any law, sets out broad directives to improve the life of farmers and to stabilize the rural sector. That policy, articulated at the 11th PPC in 2006, creates a conundrum insofar as environmental policy (including wetland policy), water policy, agricultural policy and rural development policy, all have elements that are mutually inconsistent. Such a policy cannot, therefore, be effectively evaluated at this time against a set of wetland biodiversity criteria.
- Policy, like law, cannot be easily evaluated against wetlands biodiversity conservation criteria based solely on the text insofar as the effect of the policy on wetlands will depend entirely on how the policy is actually implemented.

- (c) There is a large gap between law and implementation, and an even larger gap between policy and implementation. While a policy may, in the abstract, improve wetland biodiversity conservation, only by noting the implementation of the policy can it be determined if the policy is actually improving the situation. Similarly, policies that may harm wetlands biodiversity conservation may, or may not, actually do harm.

Summary: For these reasons, the PET decided not to review policies per se, but rather to focus on the legal framework as it is this that describes the specific mandates of each ministry.

Legal Framework for Wetlands Biodiversity Conservation

China has not yet formulated comprehensive national legislation specific to wetland conservation and wise use, however many laws and regulations are relevant to wetland conservation. The legal framework addressed by the Team is shown in Table 4.

Table 4: Components of the legal framework considered in this assessment.

Constitution	Constitution of The People's Republic of China of 1982 and subsequent amendments
Administrative Laws	<ol style="list-style-type: none"> 1. Criminal Law of The People's Republic of China 2. Civil Law of The People's Republic of China 3. Administrative Law (civil service) 4. Administrative Law on Permitting 5. Law on Compensation
Sectoral Laws & Regulations	Forest Law (1983), Water Pollution Prevention and Control Law(1984) [subsequently revised in 2008] Land Administration Law (1986), Wildlife Protection Law (1988), Water Law (1988 & 2002), Environmental Protection Law (1989), Water and Soil Conservation Law (1991), Marine Environment Protection Law (1999), Law on the Administration of the Use of Sea Areas (2001) Agriculture Law (2003) Fishery Law (2004) Grassland Law (1985) Highway Law (1997) Law on Rural and Township Enterprises (1996)
Other	Additionally, there are 21 administrative rules and regulations that have relevance to wetland conservation. There are many other implementation measures, detailed rules and local legislations enacted by local governments at various levels to meet respective needs within their own jurisdictions however these were beyond the scope of this assessment.

Legal and institutional assessment

Main Issues

There is considerable overlap between institutional and legal issues insofar as many of the institutional issues arise from deficiencies or peculiarities of the legal framework. The main legal deficiencies together with institutional issues for which recommendations are provided by PCO (2007), include the following:

Sectoral Management: The current institutional arrangements for wetlands management is management by sector (soil, water, fish, land, etc.) with coordination of the sectors by the forestry department. While this has certain benefits such as bringing specific expertise to bear on particular wetlands components, each agency approaches wetlands from its particular sectoral perspective. Often sectoral management produces conflicts between sectors and cannot accommodate integrated ecosystem management requirements of wetlands. Recently, tourism is becoming a significant danger to wetland conservation. Sectoral issues include particular problems related to the economic focus of local-level Development and Reform Commissions that, probably through lack of knowledge, promote economic schemes that place wetlands in significant danger. Tourism deserves special comment insofar as ecotourism in China is now being heavily promoted by local governments and is mainly “sight” tourism. The tourism concept in China is to maximize the number of visitors in order to keep the cost low. This is particularly evident in so-called Wetland Parks and is increasingly apparent in very fragile wetland ecosystems. Mainstreaming the concept of ecological preservation into tourism bureaus is a significant challenge and will require greater control over wetland resources by the wetland management authority.

Comprehensive Management Authority: Comprehensive management of all Chinese nature reserves is assigned, under the Nature Reserve Law, to the Ministry of Environmental Protection (MEP – formerly the State Environmental Protection Administration - SEPA). However, in practice, MEP lacks the ability and personnel to effect this mandate. Therefore, in practice, wetland and forest nature reserves are, de facto, managed by the State Forestry Administration but which does not have a clear legal mandate for this responsibility. This is a legal problem but also reflects the difficulty of redistributing institutional powers amongst state agencies.

Coordination: Circular 50 of the State Council clearly gives SFA the responsibility for coordinating sector activity for all wetlands. There is, however, no law that yet gives SFA the legal responsibility for coordination. It is assumed that the draft Wetland Regulation will provide for this. However, in the Chinese context, coordination is difficult and carries no legal power of supervision to ensure that other sectoral agencies fulfill their responsibility. In such situations, problems are transferred to higher level authorities for administrative settlement which may, or may not, occur.

Data and Information: Data sharing between different agencies is difficult in the current Chinese situation. Data are often regarded as an economic commodity to be bought and sold between and even within ministries. Nowhere in law or in wetland plans, is essential wetland data defined. In the future, and probably as part of the planning process, essential wetland data collected by various sectoral agencies, needs to be identified and mechanisms put in place for data sharing and data transfer. A related issue is the requirement for modern data collection and data management techniques to be applied to wetlands. For example, there is yet no comprehensive national wetlands information system and such systems are not

available for individual wetland management authorities. Data includes not only descriptive information on wetlands but also management information such as permitting, fee collections, etc.. The status of essential data needs to be clarified in law.

Public and Stakeholder Participation: Current laws such as the Environment Impact Assessment Law contain specific provisions for public and stakeholder participation. Most older laws do not have such provisions. Nevertheless, even the more recent laws are quite deficient insofar as there are no details provided on public rights or conditions of access to information², the agency's obligations and methods to include public and stakeholder input; obligation to respond to public and stakeholder opinions, etc.. Recent statements by the national government to increase transparency of governance requires strengthening of all laws in this regard. In this regard, it is paradoxical that public supervision³ of government agencies is required in many laws, yet the public are not given the information to carry out this role.

Planning: Planning is the Achilles heel of most sectoral laws and which profoundly affects, amongst other things, wetlands management. Planning, per se, is not a legal issue, however the absence of detailed provisions for planning in sectoral laws and the absence of procedural regulations cause many of the problems now existing in sectoral programs relating to wetlands biodiversity conservation. In most laws, cross-sectoral planning is summarily dealt with through the legal provision of "unified management" in which one department has primary jurisdiction but has an obligation to consult with other relevant departments. In fact, consultation is highly arbitrary and is up to the primary department to decide how, when, or if, it will consult. Planning regulations that are consequent to a sectoral law tend to reflect the perspective (and powers) of the department having the primary jurisdiction. The consequence is that each sector develops its own plans which may have little resemblance to each other and can create serious conflicts.

The main planning issues that were evaluated in law and practice and for which recommendations are provided include the following:

(i) Planning Process

- Type of plan and how different plans need to be integrated
- Either as joint plan with other agencies, or the coordination process is identified in detail.
- Type of public involvement, and obligations of officials to consult during plan development and during periodic plan review.
- Approval process (which agencies have to approve the plan and plan revisions)
- Plan review and update process defined (e.g. rolling 5-year plans).

(ii) Plan Content

- Planning objectives with priorities allocated.
- Implementation activities according to planning priorities
- Extra-ordinary provisions (e.g. wetlands is designated for flood retention)
- Specific requirements such as water quality class and minimum water flows
- Emergency situations (re wetlands) and roles of various sectors.
- Implementation schedule (work plan)
- Data and Monitoring Plan:

² Since completion of this component, the national government has promulgated the Law on Open Government (Access to Information), which should have the effect of eliminating this problem once it is fully implemented.

³ Public supervision means, generally, the obligation of the public to inform officials if there are violations of the law and, by extension, if public officials are violating the letter or spirit of the law.

- types of data required, monitoring program specified
- institutional responsibilities for data identified
- data sharing procedures identified
- data quality assurance procedures identified
- Monitoring and Evaluation (M&E) procedures identified including plan performance indicators.

(iii) Plan Administration

- Leading Group identified and responsibilities defined.
- Institutional responsibilities for day-to-day plan management defined.
- Responsibilities of partner agencies clearly identified
- Procedures for complaints identified, and rights of complainants stipulated together with obligations of official to respond.
- Procedures for plan variance approvals.
- Accountability for Plan implementation (penalties for [a] public violations of the plan, [b] officials who ignore or violate the plan; and methods to ensure accountability.

(iv) Plan Reporting and Information

- Reporting mechanisms identified (reporting to officials, to public)
- Policy on public access to data, information and reports clearly stated and mechanisms developed to respond to requests for information.

Transjurisdictional Administration: Transjurisdictional wetlands are a particular institutional problem. Where wetlands lie between jurisdictions within one province, the transjurisdictional problems require the higher level of government to take effective supervision actions to resolve the issue. Where problem exists between two provinces the law lacks suitable mechanisms to resolve such issues expeditiously. Several provinces have recognized the many problems of transjurisdictional water quality and quantity and have been taking legal and administrative actions to deal with this problem. This needs to be done at a national level and specifically for those many areas where wetlands management is seriously compromised by transjurisdictional issues.

Professional Management Cadre: The assessment notes particular weaknesses in the technical and administrative capacity for modern wetland management.

Undue Emphasis on Coercive Management Measures: There is an undue emphasis in wetland management on coercive management (management using administrative enforcement mechanisms such as permitting, enforcement, inspection, punishment, requisition, confiscation, arbitration, etc.) and not enough use of non-coercive methods such as administrative delegation, guidance, mediation and contracting. It is concluded that a better balance between these will enhance the social contract between the government and the people.

Dispute Settlement: Disputes are common however the mechanisms for dispute settlement are only vaguely worded in most laws. The process for resolution of disputes between agencies is administrative settlement. For disputes involving citizens or working groups the process is either administrative settlement or court actions. Citizens are not permitted to initiate court actions against administrative agencies which leads to imbalance of power and lack of redress when government agencies do not carry out their responsibilities. While the categories of settlement processes are clear, the details are not and cause much difficulty in reaching judgements on disputed issues. Rights of plaintiffs are not defined, nor are obligations of the authorities.

Penalties: In law and in practice, penalties for wetlands violations are far too light. This means that it is cheaper to break the law and pay a fine, rather than to comply with the law. Penalties in many laws need to be seriously raised so as to become effective deterrents.

Economic and Development Focus of Laws: Many laws such as the Water Law, Land Management Law, and others, are focused on exploitation of natural resources for economic and development purposes. In the Land Management Law, wetlands tend to be classified as “unused” land with the encouragement to convert such land to productive purposes. All laws lack a ecosystem approach in which the environment (including wetlands) has equal rights with other types of resource use. China currently has no biodiversity conservation law, and habitat and ecological integrity is absent from other laws.

Ecological Compensation: Payment for Ecological Services (PES systems) is now being promoted as an economic tool for wetlands maintenance wherein those that benefit from the services provided by wetlands (e.g. flood control and water supply downstream) pay for these benefits. In China, wetlands tend to be in upstream areas which are poor, yet traditionally they bear the brunt of the costs for maintaining wetlands. In law and in practice, there is an urgent need to bring PES principles into play. More broadly, current laws place no value on wetlands. PES systems require a formalized valuation process which must be defined in the law with appropriate administrative mechanisms.

Conclusions

Outcome A of this GEF project was focused on measuring and improving mainstreaming of wetlands biodiversity conservation at national levels. Methodologies were developed for analysis of mainstreaming that included wetlands biodiversity “criteria”, and an investigative procedure that was used also at provincial and local levels. A systematic evaluation of the legal framework using an Article by Article analysis of all relevant national laws and typical regulations against the “criteria” allowed the project to discuss with sector ministries how their laws and regulations could be improved by including wording that was “wetlands friendly” or re-wording Articles that would have negative impacts on wetlands.

The institutional analysis, using the criteria as a frame of reference, investigated the wetland and nature reserve management system. The current system is not very functional insofar as wetlands are managed on a sector basis. One problem is that the coordination function for wetlands management that has been assigned to the forestry sector by the State Council is not accompanied by any special power through which forestry bureaus can decisively coordinate. As a consequence wetland management tends to be fragmented amongst sectors, with incompatible plans, and incompatible objectives. In some cases, sector management has led to the situation where one of the objectives of some sector bureaus is to increase their own budget through selling of permits and licences for economic activities in wetlands. Some jurisdictions, such as Yueyang Municipality on East Dongting Lake (one of the demonstration sites in this project) have recognised this incompatibility and are making significant changes in administrative organization to prevent this problem. Indeed, Yueyang Municipality is a good example of how mainstreaming has taken root within local government. At a higher level, Hunan provincial government has shown sensitivity to the need for mainstreaming and has also recommended changes in administrative structure for Dongting Lake as a whole.

At the national level it will take much more time before sector policies and laws are fully compatible with biodiversity principles, partly because of the time cycle in revising laws (usually a decade or more), and partly because national laws are generally drafted in such a way that issues so specific as wetlands biodiversity conservation are unlikely to be included.

However, it is anticipated that the recognition of mainstreaming principles at the national level will cascade downwards to provincial and local levels where the laws are administered. In this regard, several of the project demonstration sites have had noticeable success in mainstreaming wetlands biodiversity into productive sectors.

References

- PCO** (2007). *Mainstreaming Wetlands Biodiversity Conservation in China*. Final Report of Outcome A. Project Coordination Office (PCO) of “Wetlands Biodiversity Conservation and Sustainable Use in China” project. State Forestry Administration and the UNDP, China. (unpublished).
- State Council** (2004). Circular of the State Council’ General Office on Strengthening the Management of Wetland Conservation, Circular No. 50, June 2, 2004.
- UNDP** (2005). *Wetlands Biodiversity Conservation and Sustainable Use in China*, Project CPR/98/G32 of UNDP and the State Forestry Administration. Project Revision Document CPR/98/G32, 2005.

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CHAPTER 9

MAINSTREAMING HEILONGJIANG WETLAND BIODIVERSITY CONSERVATION STRATEGY AND PRACTICE

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Abstract

Heilongjiang is a province rich in wetland resources. Natural wetlands cover an area of 4,340,000 hm² or 9.18% of the total provincial land. In the past, the Heilongjiang Government has invested much effort on wetland conservation and protection, however, wetland coverage is shrinking and the wetlands are degrading. This paper presents the current status of Heilongjiang wetlands conservation and an analysis of current issues regarding wetland biodiversity conservation. Based on the guidance and experiences gathered from UNDP/GEF Project on Wetland Biodiversity Conservation and Sustainable Use in China, this paper presents a summary of the successes and experiences from the wetland biodiversity conservation mainstreaming efforts in Heilongjiang. Mainstreaming is a new concept and it provides theoretical and practical foundation for wetland biodiversity conservation.

Keywords: wetland biodiversity, conservation, mainstreaming, Heilongjiang

Introduction

Considered as the “kidneys of the earth”, wetlands are important life support systems rich in biodiversity. Wetlands act as natural reservoir and play important functions such as flood mitigation, runoff alleviation, water storage, pollution reduction, climate regulation, and provision of habitats for wild animals and plants. Heilongjiang is rich in wetland resources and it is the Province with the largest marsh distribution and diversity. However, the wetland resources is degrading and facing a decline in biodiversity due to economic and industrial development. Thus, there is an urgent need to strengthen wetland biodiversity conservation; to promote the concept of mainstreaming wetland biodiversity conservation; and to reinforce the importance of wetland conservation to governments, relevant agencies and stakeholders.

Heilongjiang Wetland Biodiversity Conservation - Status and Problems

Heilongjiang wetland situation

Heilongjiang is the furthest northeast province in China with a surface area of 47.30×10^4 km², representing 4.9% of the national land. The north and east part of the province faces Russia across the Heilongjiang (Amur) river.

Heilongjiang is rich in wetland resources and it is the Province with the largest marsh distribution and diversity. Currently, the wetlands cover 4.34 million hm², a surface representing 9.18% of the province's land and 12.8% of all natural wetlands in China. Wetlands in Heilongjiang occupy large areas of land, are of diversified type and niche importance, and with a rich wild fauna. River wetlands represent 460,000 hm²; freshwater lake wetlands 4,300,005 hm²; marsh and swamps 3,320,000 hm²; and pond 130,000 hm².

Wetland biodiversity conservation in Heilongjiang Province

When China entered the Ramsar Convention in 1992, the Heilongjiang government has made much effort on wetland protection. In order to effectively protect wetland resources and to improve wetland ecology, the provincial government issued the “Decision on Strengthening Wetland Protection” in December 1998. This was done after much research and study, and it clearly recognized the importance of wetlands and stipulated wetland protection goal management.

On June 20th 2003, the Heilongjiang Wetland Protection Regulation was adopted at the provincial congress and then promulgated on August 1st; it was the first local wetland protection regulation in China and was considered a breakthrough for administration departments and in terms of nature reserve enforcement. In January 2000, a Provincial GEF Wetland Project leading group was formed with the governor as team leader, and relevant departments, e.g., provincial planning department, financial department, forestry department, environment protection department, land department, water resource department, etc., as team members. The leading team office is located within the provincial forestry bureau. Wetland protection leading groups were also set up in cities and counties with abundant wetland resources.

After the promulgation of the Regulation, a series of wetland nature reserves were created, actually protecting most of the wetland in Heilongjiang Province. Currently the wetland nature reserves (over 3,360,000 hm²) represent 70% of the natural wetland that have been adopted for protection.

Problems facing Heilongjiang wetland biodiversity protection

Conflicts between wetland protection and industrial/agricultural productions

Wetlands have been extensively exploited due to the demands of an increasing population, human development and production. It has caused high pressure on wetland ecosystem. In agriculture, the construction of draw off valves has led to serious wetland surface water loss, water-leaking ditches have lowered wetland water level causing water shortage, diminishing biodiversity and loss of wetland ecosystem function.

Incomplete wetland protection administration and inadequate managing system

Municipal or county governments administer some of the existing wetland nature reserve, while some others are lead by department. The national nature reserves should have their own administration and be supervised by the provincial or municipal forestry department. Most provincial wetland nature reserves do not have specialized administrations. Some have an administration agency, but without managing staff. The jurisdiction for natural wetlands is complex; most do not have ownership of the land resources as the land in nature reserves belongs to local collective or to enterprises. There are also no specialized national laws and regulations on wetland protection; therefore, the lack of a legal base has caused problems.

Lack of basic equipment, scientific research and monitoring systems

Scientific research and monitoring is essential to wetland resources protection. Since wetland research is a relatively new topic, the research theories and protection management are still in the initial stages. There is a lack of basic equipment for scientific research and monitoring.

More awareness of the importance of wetland biodiversity conservation is required

Currently, the value and importance of wetland conservation is not recognized. Public education on wetland protection and sustainable use lags behind economic development and resource use.

Mainstreaming Wetland Biodiversity Conservation – Principles, Goals and outputs

General principles and goals

- Wetland biodiversity conservation mainstreaming should be done in accordance with principles of priority, extendibility and sustainability.
- Priority means primarily protect wetland of importance, primarily protect rare and important species and birds.
- Extendibility means that, during the process of mainstreaming, not only the government and relevant department agencies should be aware of the importance of wetland biodiversity and take it into consideration in their actions; the same also apply to all relevant stakeholders involved, including local people, especially those living around wetlands, and also schools, research institutes, non-governmental organizations.
- Sustainability means that, in order to extend mainstreaming protection, there should be relevant laws and regulations and appropriate management evolving through time to ensure that biodiversity conservation can be maintained in the face of changing circumstances. The main goal of wetland biodiversity mainstreaming is to integrate wetlands biodiversity conservation into national, provincial, and local government's decision-making and daily practice, as well as integrate biodiversity protection into relevant sectoral or cross-sectoral plans, programmes and policies.

Mainstreaming wetland biodiversity conservation in Heilongjiang - Outputs

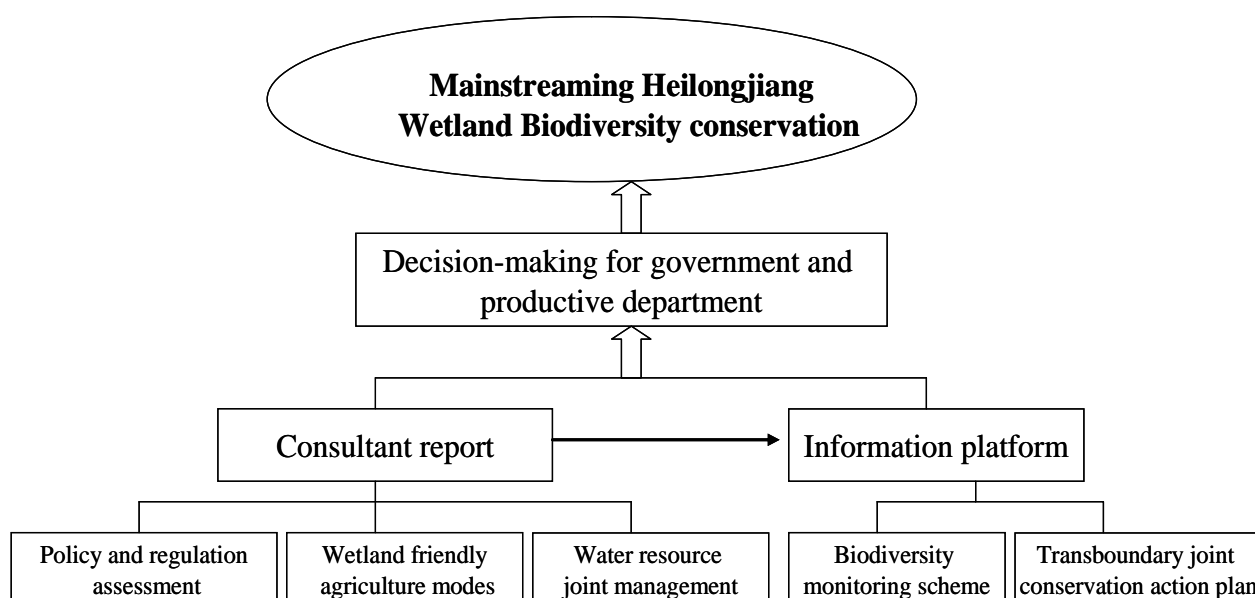
Mainstreaming wetland biodiversity is to integrate wetland biodiversity conservation into agriculture, forestry, fishery, tourism as well as other production sectors, in order to secure local, national and global environmental benefits.

Heilongjiang is one of the provinces involved in the UNDP/GEF wetland project “China Wetland Biodiversity Conservation and Sustainable Use”. Considering the problems regarding biodiversity conservation in Heilongjiang and the goals and framework of the project, the Province has done an effective job in mainstreaming wetland biodiversity conservation. The project decided on a promoting approach considering both the provincial and project site levels.

At the provincial level, the main output is to establish wetland biodiversity conservation as a routine consideration in the decision-making and actions of provincial government and agencies. There are three sub-outputs: recommendations to departments on policies and actions that would be beneficial to wetland biodiversity conservation; enhancement of the coordinating capacity to resolve issues of wetland management within government agencies; and establishment of a comprehensive information system to support wetland conservation policies and to raise public awareness.

At the project site level, the main output is to establish wetland biodiversity conservation as a routine consideration into the decision-making and actions of the Jiansanjiang Agricultural Reclamation Bureau and the Fuyuan County government. There are 6 sub-outputs: improvement of project site wetland protection policy and practice; co-management of the planning of the Nongjiang-Yalujiang River water resources catchment; provision of guidance on ways to reduce agricultural impact on wetland and wetland biodiversity; provide information on key wetland species and their habitats for decision making by local government and monitoring departments; development of information dissemination approaches for the public, government agencies and other related organizations; and transboundary (China and Russia) joint conservation action plan for the Heilongjiang and Wusulijiang catchment. (Figure 1)

Figure 1. Mainstreaming Heilongjiang wetland biodiversity conservation



Mainstreaming Heilongjiang Wetland Biodiversity Conservation - Results

Assessment of laws and regulations and recommendations concerning biodiversity conservation

Although Heilongjiang Province had initially established some wetland protection systems, the current laws and regulations did not seem to be adequate for wetland biodiversity conservation. An analysis and review of current laws and regulations concerning wetland was required, in order to provide recommendations on revisions that would be beneficial the wetland biodiversity conservation.

After survey and discussion, policy analysis experts choose 21 laws and regulations which are closed related to wetland issues. They reviewed and analyzed the laws and regulations with the objectives of establishing both conflicts contained in legal text relative to wetlands “wise use” principles, and practices that are allowed under these laws that are potentially deleterious to wetlands. A secondary objective was to provide insight on changes to these laws and

regulations that could be considered by the relevant departments at the time these laws and regulations are updated. The laws and regulations are:

- Regulations of Wetland Conservation of Heilongjiang Province;
- Regulations of Heilongjiang Province on Administration of Mineral Resources;
- Measures of Heilongjiang Province for the Implementation of the Water Law of the People's Republic of China;
- Regulations of Heilongjiang Province for the Implementation of the Flood Control Law of the People's Republic of China;
- Measures of Heilongjiang Province for the Implementation of the Law of the People's Republic of China on Water and Soil Conservation;
- Regulations of Heilongjiang Province on Administration of Water Conservancy Projects;
- Regulations of Heilongjiang Province on Protection of Wildlife;
- Regulations of Heilongjiang Province on Protection of Wild Medical Materials;
- Regulations of Heilongjiang Province on Forests Administration;
- Regulations of Heilongjiang Province on Grasslands;
- Regulations of Heilongjiang Province on Environmental Protection;
- Regulations of Heilongjiang Province on Administration of Scenic and Historic Zones;
- Regulations of Heilongjiang Province on Petrol Exploration Protection;
- Measures of Heilongjiang Province on Regulations of Heilongjiang Province on State-operated Farms;
- Regulations of Heilongjiang Province on Administration of Agriculture Comprehensive Development;
- Regulations of Heilongjiang Province on Highway;
- Measures of Heilongjiang Province on Administration of Nature Reserves government regulations;
- Regulations of Heilongjiang Province on Administration of Tourism;
- Measures Heilongjiang Province for Agricultural Environment Protection;
- Regulations of Heilongjiang Province on Management of Navigational Courses.

Based on the review and analysis, the project team has provided to the provincial government recommendations on e.g., streamlining wetland nature reserve management, establishing a wetland ecological compensation fund, strengthening wetland enforcement, etc. The provincial government has replied in an official letter detailing the countermeasures taken. This review and analysis has not only provided a foundation for the completion and supplement of Heilongjiang laws and regulations, but it has also promoted wetland biodiversity conservation at the local government level.

Establishing a comprehensive information system to support wetland conservation policies and to raise public awareness.

The project team improved the data collection, analysis and application approaches and established a data analysis, management and information system on a shared basis. Thus, users inside and outside the government can conveniently gain common wetland information on Heilongjiang province. Meanwhile, government agencies involved in wetland biodiversity conservation, through better-shared information, can consider wetland biodiversity conservation in their decision-making and actions.

Heilongjiang wetland information system is a comprehensive internet-based information system on main wetland information within Heilongjiang Province. It consists of three components: the Heilongjiang wetland website, the Heilongjiang wetland geographical information system (GIS) and the wetland plants retrieval system.

The Heilongjiang wetland website is based on Microsoft.NET and Visual c#. The safety and stability of c# as well the compatibility of .NET provides the website with better flexibility and customization capacities, also the module design is easier to manage and transfer. The Heilongjiang wetland geographical information system is based on the second version of an ESRI GIS platform. The data base of the system is a three layered web GIS information system, composed of the Heilongjiang wetland information data base and the wetland geographical information database with a scale of 1: 250000, SQLServer2000 as the database platform. The interactive query and retrieval of geographical and wetland information is direct and easily operable, therefore users can get to know about wetland information in Heilongjiang Province by simply using the internet browser. The Wetland plants retrieval system is an index retrieval system based on C language; descriptions and images to illustrate the distribution, styles and status of main wetland plants in Heilongjiang Province can be obtained.

The Heilongjiang wetland information system, which is the first specialized wetland system at provincial level, will serve as an information platform for wetland conservation, research and policymaking.

Recommendation on wetland friendly agricultural mode

Wetland protection and agricultural production have been in conflict for a long time. Some of the key contentious issues are: land reclamation, water resources exploitation, overusing of wetland bio-resources, and pollution drainage, etc. A wetland friendly-type agriculture guarantees not only high profits for farmers, but also more protection for wetland ecosystem due to its unique production modes and the inner environment requirement (reduced use of agri-chemicals and fertilizers).

Several wetland friendly-type agricultural modes have been recommended to solve the problems of Sanjiang Plain wetland and agricultural reclamation, which are rice-reed-fish mode, rice-fish-crab mode, wetland bio-engineering mode for water quality purification and water resources holding; wetland ecotourism mode, etc. These modes are to be used as models and put into practices.

Wetland friendly-type agriculture can raise farmers' income and improve protection of wetlands, which can assist necessary biodiversity conservation with nature reserve as a core.

Planning on co-management of trans-catchment water resources

A quantitative evaluation of the water resources and usages in the Nongjiang-Yalujiang River catchment was done through analysis and research on the general geography, wetland

resources and issues. Elements studied include: water resources quantities of surface water, ground water, and total water resources; as well as river valley water usage, water projects, currently-used water quantity, currently-needed water quantity, currently-supplied water quantity, water supply balance evaluation, etc. Then, plans have been made for co-management of cross-river valley water resources. It will provide the practical basis for the future water resources co-management committee to distribute water resources.

Raising awareness and information dissemination

Raising public awareness

The GEF wetland project gave training to the technicians of the two nature reserves and relevant officials and personnel around the nature reserve. Public education activities on wetland biodiversity conservation and sustainable use were successfully held on Wetland Day, International Volunteers Day, Bird-Loving Week, and World Environment Day. They were warmly embraced and attended by relevant departments and students in primary, middle schools and universities. A Wetland Youth Club was established, with more than 30000 brochures and awards distributed. The activities were well covered by newspapers (e.g., Xinhua Daily, China Daily, People's Daily), websites (e.g., Wetland International, China Volunteers and China Rainbow), and the television stations of the province and local project zone. They played a positive role in promoting wetland conservation among wetland users.

Active involvement of enterprises

The Heilongjiang Provincial General Administration for Agricultural Reclamation is the largest and most mechanized state-owned farm group. In March 1998, approved by the State Council, Heilongjiang Agriculture Company Limited has been formed, as well as the Beidahuang Group. Heilongjiang total reclamation area is 5,430,000 hm², of which 2,060,000 hm² is tillable. The grain productivity has reached 9 trillion kg, with a yearly marketable grain supply of 7.5 trillion kg; the commercial rate has reached up to 85%, which is 40% higher than the national level. One of the project sites, i.e., Jiansanjiang Reclamation Sub-bureau, being an enterprise, has done quite a lot for wetland biodiversity conservation during the course of the project:

- *Creating of a wetland protection management goal system:* The Jiansanjiang Reclamation Sub-bureau, after checking-out former evaluation and carrying out the relevant wetland protection policies of the provincial government, has adjusted their environmental protection management goals, to include an evaluation index of wetland protection and the return of farmland to wetland. The Environment Protection Bureau has added wetland protection into the evaluation of leaders' achievement: goals are established in the beginning of the year, supervision during the year, and an evaluation at year-end.
- *Strengthening nature reserve management:* The Jiansanjiang Reclamation Bureau has supported the Honghe national wetland nature reserve with basic equipment and though specific projects. They have carried general resources investigation and planning, strengthened animal and plant protection and scientific research (e.g., artificial attraction and population resumption of the Siberian white stork). In early 1999, No. 15 document of the sub-bureau approved a protection belt be set around the nature reserve, within which any sort of construction and development be forbidden. At the same time, in order to strengthen wild animal protection, the bureau has ordered the seizing of guns and has asked other relevant agencies (e.g., environment protection, public security and forestry) to punish illegal behaviours such as random

tree cutting and wild animal killing. The bureau also created three nature reserves: the Naolihe River nature reserve, the Qindeli Sturgeon nature reserve and Wusulijiang nature reserve. Currently, the Jiansanjiang Sub-bureau has a total area of 21,230,000 hm² in nature reserve, representing 18.76% of the land.

- *Strengthening the Construction of eco-agricultural demonstration area:* The Jiansanjiang Reclamation Sub-bureau was concerned with bio-agriculture development, and had done experimental site work. In 1999, the sub-bureau formed a leading team and an office of Green Food Development, which was the green food base of rice, wheat and soybeans. In 2003, the National bio-demonstration area gained approval of the state.
- *Strong control of pollution in and around wetland:* Rice husk is a recently aroused “Yellow Pollution”. In order to control husk pollution, the bureau has strengthened husk enterprises management and has promoted new techniques on comprehensive use of husk. Farms subject to the sub-bureau strengthened the pollution control of agricultural chemical bottles and plastic covers. Every year, the farms and the production teams sign duty contracts on clear stipulations of chemical bottles and plastic covers and the dosage of agricultural chemicals and fertilizers around the wetland nature reserves. In July and August, the bureau organized for the agricultural and environmental protection agencies to examine the fields and publicize the results.

All the above have, to a great extent, reduced the pollution from farm production to wetland and the surrounding environment.

China-Russia transboundary conservation activities

As economy and trade are increasing between China and Russia, it is also desirable to have more extensive cooperation and communications with Russia across the Heilongjiang and Wusuli rivers. Wetland biodiversity conservation issues in the Sanjiang Plain would be addressed more comprehensively.

A joint protection agreement was signed between the Sanjiang National Nature Reserve, Heilongjiang and the Bolshehekstirskiy and Bostak nature reserves, Jews Autonomous State. The Heilongjiang office has also successfully facilitated another agreement among Honghe National Nature Reserve, Heilongjiang and Xinganski National Nature Reserve. Under the agreements, both countries have obligations to do research on winter animals; to carry monitoring of spring birds migration and banding of birds; to engage in business cooperation regarding cross-border bio-tourism; visits and communication activities on a yearly basis and co-publishing journals.

The Sino-Russian conservation activities mainly focuses on the joint protection of rare and endangered wild animals such as the Siberian Tiger, Eastern White Stork, Red-crowned Crane, White-napped Cranes and salmon; cooperation and communications on scientific research and bio-tourism; and for their mutual benefit, the joint creation of a North-eastern Asian Nature Bio-protection Network in the area and the set up of a protection system for rare and endangered wild fauna and flora.

After signing the agreements, there was exchange visit on both sides, with extensive exchange of information on the monitoring of spring birds migration, birds banding, wetland fire control, nature reserve management. For both countries, this has facilitated the task of wetland biodiversity conservation; and it is significant contribution to wetland biodiversity conservation in the Heilongjiang and Wusulijiang river basins.

Lessons Learned on Mainstreaming Wetland Biodiversity Conservation

Laws, regulations and policy making must take into account the principles of mainstreaming in order to improve the system of laws and regulations for effective conservation of wetland biodiversity and sustainable use of wetland resources.

Capacity development is an integral part of mainstreaming. One element is the need to strengthen the capacity in wetland protection and reasonable use of wetland of the government, of non-government organizations, of local committees, etc. and to strengthen communication and coordination amongst the relevant agencies responsible for wetlands; a second element is the requirement for new models of comprehensive management, such as coordination and co-management in which local residents and committees would be encouraged to get involved in wetland protection.

Mainstreaming requires extensive information sharing amongst sector departments and the public. A timely and accurate information platform is required for providing information to government and other relevant agencies for decision-making, to the public (e.g., media, people) and to the research institutes.

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INTERNATIONAL EXAMPLES OF MAINSTREAMING WETLANDS BIODIVERSITY CONSERVATION

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CHAPTER 10

MAINSTREAMING WETLAND BIODIVERSITY CONSERVATION THROUGH AN INTEGRATED RIVER BASIN MANAGEMENT PROGRAM IN MEXICO

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Abstract

Water management in Mexico has been implemented since the early 90's, when the *National Water Law* (NWL) was approved. After almost 20 years, remarkable progress have been achieved in the development of instruments, such as the concession entitlements for water use and the Public Water Rights Registry (REPDa); however, the water management system has not been able to cope with the challenges of improving water overextraction; unsustainable use of water is growing due to overexploited aquifers and decreasing flows in rivers, which result in social and economic conflicts in some regions, and have an important impact on biodiversity conservation. In 2003, the Ministry of Agriculture (SAGARPA) started a program called Water Rights Adjustment Program and Irrigation Districts Resizing to promote sustainability in irrigation districts. Currently, the program is considered a viable mechanism to recover water rights and decrease water overextraction; however, there are a lot of uncertainties about expanding the program to the whole country. The allocation of water to the environment would strengthen the program achievements.

World Wildlife Fund (WWF) and the Fundación Gonzalo Río Arronte (FGRA), concerned about the water and biodiversity crises in Mexico, jointly initiated a project to develop water management models that recognize ecosystems, including wetlands and related aquifers, and to preserve or restore their natural functions and structure, in order to ensure water needs and environmental services required for development. From the three basins where the project is being implemented, two of them include a RAMSAR site. In both basins, wetland conservation is managed as a part of an integrated river basin management (IRBM) strategy that allocates water for the environment. Water management must be used to implement environmental flow; however, there are several adjustments to the implementation of water management instruments that have to be made. The development of sustainable water managements programs, such as the one developed by the Ministry of Agriculture, contributes to the improvement of the water management system, and provides a solution to water overextraction. In this particular case, allocation of water to the environment, as a reserve, is a feasible solution. In the case of the Rio Conchos, the proposal for environmental flow downstream of the main irrigation district (DR 005, Delicias) where the water rights adjustment program has invested US\$23 million to recover 110 Hm³ (3.5 m³/s), it is below this number for most of the time, and about the same for the peak annual flow.

Keywords: Mainstreaming wetland biodiversity, water management in Mexico, IRBM, WWF

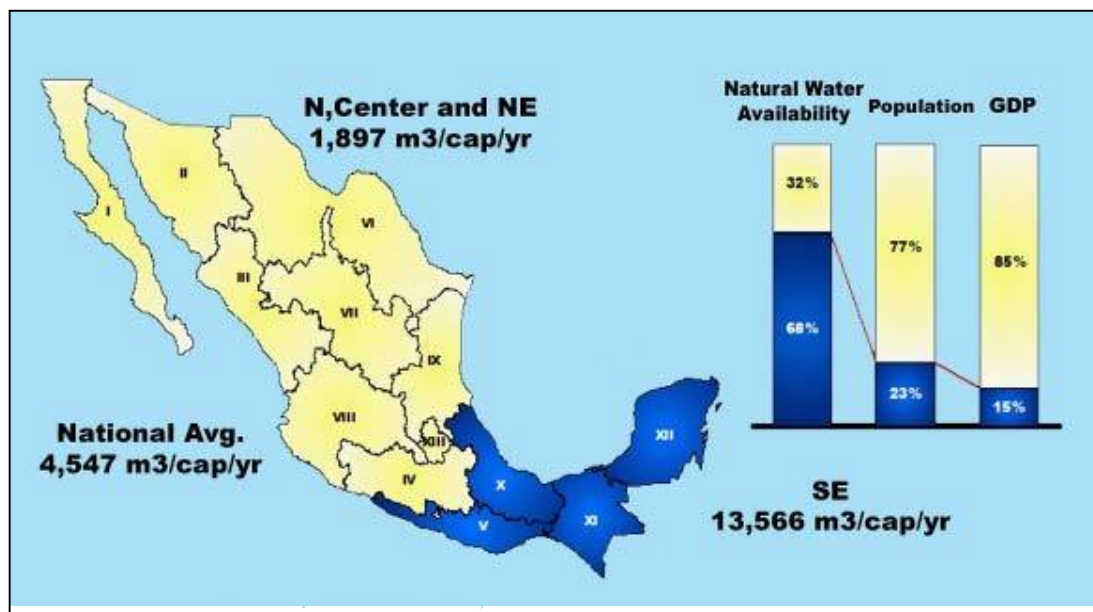
Water Management in Mexico: Current Challenges

At the beginning of the XXI Century, Mexico with a surface area of 2 million km² has a population of 104,000 million people, a GDP of US\$840 billion and a Gross National Income (GNI) per capita of US\$7,870. It is considered an upper middle-income economy. In 2000, however, 24.2% of the population was having an income below the national poverty line (World Bank, 2008).

Mexico has an annual natural water-availability of 4,547m³/cap-yr; that is considered a medium natural water-availability level for the country. However, statistics say little about the water reality, as there are very important differences in natural water-availability from region to region. The lowest quantities are found: in the Valley of Mexico –around 182 m³/cap-yr– due to the huge people concentration in Mexico City and the surrounding metropolitan area (nearly 20 million inhabitants); and in the Rio Bravo Basin, in the northern

border, with 1,324 m³/cap-yr. These two regions are considered at extremely low and very low levels of natural water-availability. A better picture of the country's reality is shown in Figure 1, which shows that only 32 % of the country's natural water-availability is located in the central and north part, where 77% of the population is living and 85% of the Gross Domestic Product is generated (CNA, 2005).

Figure 1. Water availability and development in Mexico (CNA, 2005)



Water in Mexico is considered a public good. Therefore, the federal government manages the water, and there is little intervention from the provinces/states and local governments. The latter are responsible for urban water services, and the former, normally supports local governments, and other water users to provide good water services and to carry out good water practices.

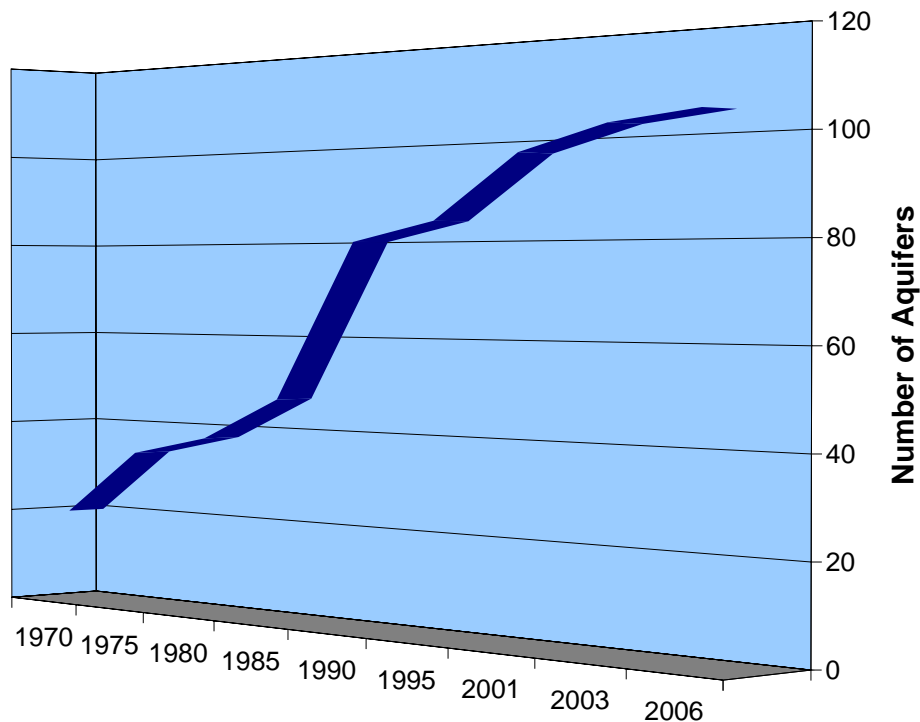
Water management in Mexico has been implemented since the early 90's, when the *National Water Law* (NWL) was promulgated. Since then, a lot of efforts have been made to develop the main water management instruments contained in the NWL and related regulations (Asad and Garduño, 2005), which are, by type of instruments:

- Regulatory: concession entitlements for water use and registration in the Public Water Rights Registry (REPDA), regulations, well-drilling prohibitions, and reserves.
- Order and control: inspection and measurement, sanctions.
- Economic: users' obligation to pay for use, water rights market;
- Participatory: users associations, river basin councils, and Groundwater Technical Committees (COTAS).

After almost 20 years of implementation, remarkable progress has been achieved in some instruments, such as the REPDA, which has reached full coverage of current water-right permits. In 1992, the total number of registered entitlements was around 2,000; by 2003, the register included 325,000 from a total estimated number of 355,000 water users. This figure represents a volume of 72 km³ of water extractions for consumptive use (Asad and Garduño,

2005). However, the impact on improving water management toward sustainability is not as remarkable as the achievements by themselves. The water management system has not been able to cope with the challenges of improving water over-extraction; unsustainable use of water is growing due to overexploited aquifers and decreasing flows in rivers and coastal lagoons. In addition, little progress has been made to control water pollution. It has been estimated that groundwater is depleted at a rate of 8 km³/year and the number of overexploited aquifers has increased from 20 to 104 in the last 36 years (Figure 2).

Figure 2. Number of over-exploited aquifers in Mexico by year (CNA, 2008)



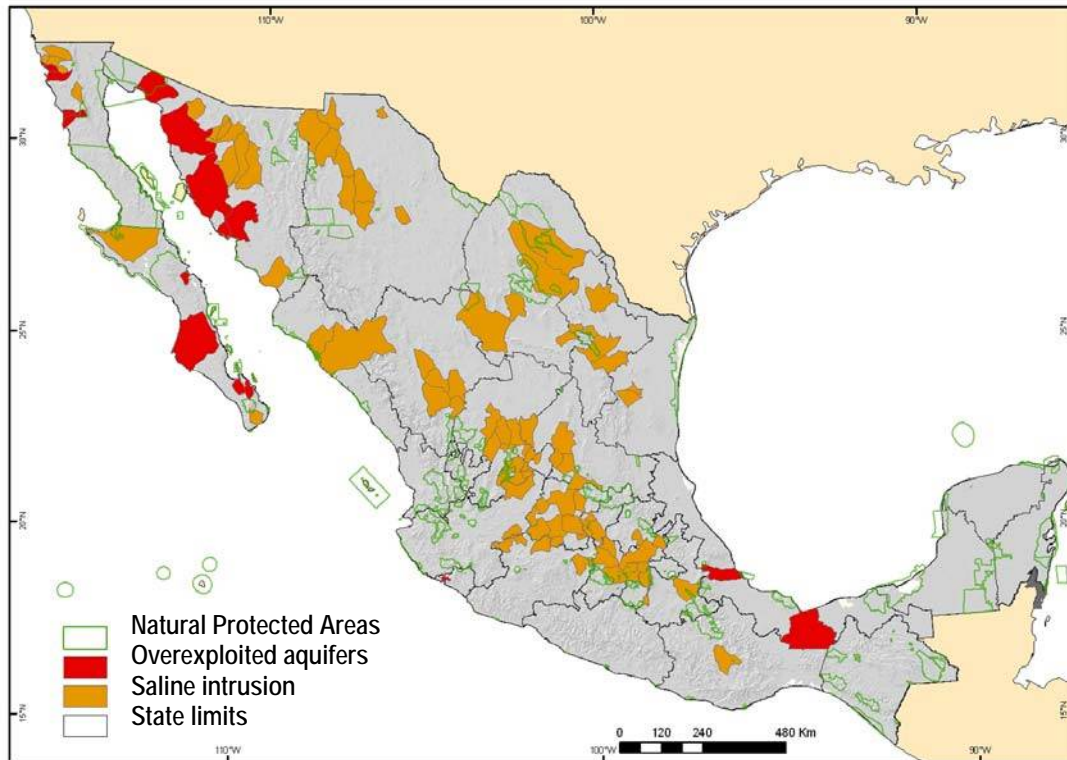
The situation of aquifer over-extraction has important effects on biodiversity, since water availability in the environment is reduced. Figure 3 shows the Natural Protected Areas (NPA) of Mexico and the location of the overexploited aquifers and those with saline water intrusion. As it can be seen, in the central and north and northwestern part of the country, the NPA are surrounded or directly affected by groundwater overextraction.

There are several causes behind the growing tendency of water over-extraction: some are related to knowledge on the hydrological conditions of basins and aquifers; others relate to water-user behavior and the implementation of the water rights permit system. In the first case, it has been clear there are limitations in using poor information to implement a reliable water management system. With limited knowledge of water availability, management was based on best guess, in many basins and aquifers. In the other case, users, when pressed to register, tend to increase their water volumes needs, and provide false information on their application forms; and it is impossible to cross check this information.

At that time, the National Water Commission (NWC), in charge of the implementation of the water management system, knew about these constraints, however the decision to complete the REPDA was taken, considering that once all the users were known, adjustments could be

made. It was then decided to issue the new water permits for only 10 years (Asad and Garduño, 2005).

Figure 3. Location of Natural Protected Areas and over-exploited aquifers in Mexico



There are other causes behind the over-extraction and they are related to other factors, such as: low water cost, energy subsidies in the agricultural sector, illegal extraction that are important at regional level, and the incipency of the water governance structures.

As mentioned above, the over-extraction problems are related with the implementation of a reliable water management system. However, there are fundamental reasons for this situation: total allocation of available water; and total extraction without considering sustainable water-extraction and recognition of ecological flow. Although the NWL mentions the environmental principles and recognizes the environment as a water user, it is clear that it has not been the best way to proceed. The environment should not be considered as a user because: primarily, the concept of sustainable water extraction guarantees a functioning water cycle, and therefore development; and secondly, the water management system is not reliable enough to ensure an environmental allocation when contending with other water uses. This environmental water volume is owned by future generations and it must be used to ensure the ecosystem services that the hydrological cycle provides. Therefore, it should be non-allocable water that must be subtracted from available water balances, whatever the institutional capabilities and the level of knowledge about the hydrological cycle are.

The next water management challenge in Mexico is to resolve the issue of over allocation that is starting to cause social and economical problems in some regions, and the fact that it is one of the main threats to biodiversity. The NWC must determine the water availability in aquifers and basins, and exclude from the available volume the amount of water to guarantee

a sustainable extraction, and then, integrate policies and programs from all sectors and levels of governments to recover water rights, and to reduce current economic and social impacts. The water administration system must be at the core of the strategy, supported. It has to work for the society and not against it.

Water Rights Adjustment Program

In 2003, the Ministry of Agriculture (SAGARPA) of the Government of Mexico started a program called Water Rights Adjustment Program and Irrigation Districts Resizing to promote sustainability in irrigation districts with water scarcity problems due to droughts, aquifer depletion and saline intrusion. The objectives of the program were: to recover water rights to benefit aquifers and basin balances, and to attain mid and long term sustainability of water sources for irrigation (SAGARPA, 2007).

The program provided a compensation of US\$0.25-US\$0.5 per cubic meter to water irrigation users that are willing to give up their water rights. The volume recovered in the process, then becomes part of an environmental reserve. After three years, the program had been applied to only 8 irrigation districts due to budget limitations. The volume of water recovered was 188 Hm³ and the sum paid to users was US\$41 million (SAGARPA, 2007). The potential of this program of water rights recovery had been estimated at 3,500 Hm³ for groundwater and at 1,500 Hm³ for surface water, with an investment cost of around US\$940 millions (Asad and Garduño, 2005); the potential water volume represents, in terms of groundwater, around 45% of the estimated annual overextraction.

Currently, the program is a viable mechanism to deal with water overallocation. However, there are a lot of uncertainties about expanding the program to the whole country. Most of them mainly related with the final status of the water rights, and also with the real physical water recovery. Application of the program to the whole country would require the integration of several laws, e.g., the water law and other regulations, and some government programs. A feasibility analysis on the expansion of the program recommends allocating water for the environment as an option to ensure that water rights are not transferred to other users (Asad and Garduño, 2005).

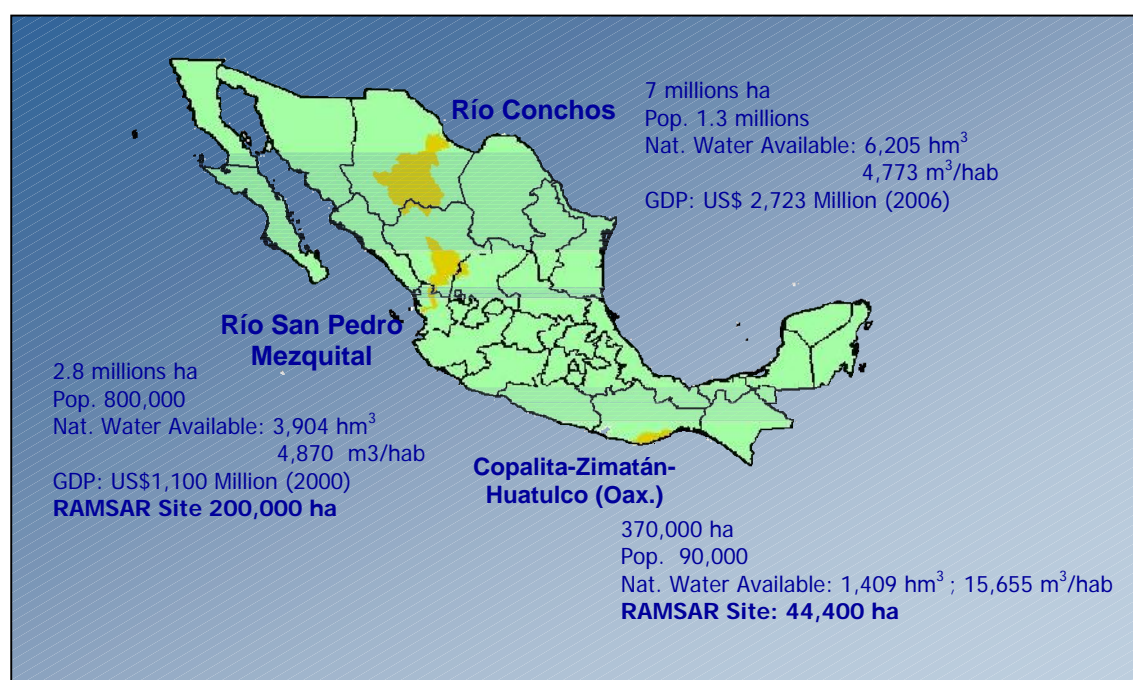
The success of the water administration system in implementing this agricultural program has demonstrated its reliability and tested its performance as a management tool. Furthermore, if ecological needs are taken into consideration for water allocation, the program will be an example of an integrated solution toward water management sustainability. As stated by Asad and Garduño (2005), *“The fact that a ministry of agriculture would lead a program with the objective of promoting the sustainability of productive systems as well as of river basins and aquifers is unusual at international level and represents a most valuable political willingness and a positive initiative with considerable potential to produce a favorable impact in the field”*.

WWF Integrated River Basin Management Program

The World Wildlife Fund (WWF) and the Fundación Gonzalo Río Arronte (FGRA) developed the project “Integrated Watershed Management: development of new models in Mexico” to address their common concerns about the water and biodiversity crises in Mexico. The first stage of this project started in 2004 with a time frame of 7 years. Three basins were selected based on WWF Mexico Program Office 15-years experience, and the integration of

current eco-regional and thematic programs and priorities (Figure 4). The selected basins were: i) the Conchos River in the Chihuahua Desert in the north part of Mexico, it is the main tributary of the Rio Bravo/Grande at the border of Mexico and USA; ii) the San Pedro Mezquital River, also in the Pacific coast in the states of Durango and Nayarit, the river is the main freshwater source to the “Marismas Nacionales” (Text box, 1), the most extensive block of mangrove ecosystem on the Pacific Coast of Mexico and a RAMSAR site included in the Conservation Plan of the Gulf of California WWF Program; and iii) the Copalita-Zimatán-Huatulco basin in the Pacific coast Dry Forest, located in the State of Oaxaca in the south part of Mexico, where the main water user is the tourist zone of Huatulco, which is part of the RAMSAR site “Basins and Reefs of the Huatulco Coast” (Text box, 2)

Figure 4. Location and main characteristics of WWF-FGRA Project river basin



Text box 1. Ramsar site no. 732, Marismas Nacionales. 22/06/95; Sinaloa, Nayarit; 200,000 ha; 22°08'N 105°32'W. Large network of brackish coastal lagoons, mangroves, swamps, and salt marshes fed by several rivers. The site includes estuaries, the most extensive mangroves of the Mexican Pacific (20% of all the mangroves in the country), timber-grade forests, and pastures. At least 60 species of nationally or internationally endangered vertebrates occur here, including 51 endemic ones, 36 of which are endemic birds. The *Orbygnia* palm forests on sand bars constitute a threatened community. Numerous creeks have been transformed into large prawn farms, and pressure continues. This could become an economically important activity in the area. Other human activities include traditional fishing and cattle ranching; limited numbers of pigs, fowl and bees are also kept. Fruit and seeds are exploited by industry and leaves are gathered for handicrafts and roof thatch. Most recent RIS information: 2001.

Text box 2. Ramsar site no. 1321, Cuencas y corales de la zona costera de Huatulco. 27/11/03; Oaxaca; 44,400 ha; 15°47'N 096°12'W. National Park, Community Reserves. The site features coral reefs, uncommon in the Pacific littoral of Mexico, associated with shallow inlets in a coast dominated by cliffs. Mangrove forests are found at the outlet of some rivers and associated with several coastal lagoons. Several freshwater currents cross inland dry forests of priority importance for conservation. A wealth of fauna and flora inhabits the site, including several endangered and endemic species, including the amphibians *Bufo marmoreus* and *Hyla sartori*, the Sinaloa Wren *Thryothorus sinaloa*, the Golden-cheeked Woodpecker *Melanerpes chrysogenys* and the West Mexican Chacalaca *Ortalis poliocephala*, as well as numerous marine mammals that transit the coastline, such as the Pygmy and False Killer Whales (*Feresa attenuata* and *Pseudorca crassidens*) and the Long-finned Pilot Whale *Globicephala macrorhynchus*. Shellfishing, agriculture and tourism are the main activities in the area. Tourism development is considered to be the main threat due to large concentrations of people seasonally and the effect of new infrastructures. Forest clearing, hurricanes and hunting are also of concern. A management plan is in place for the Huatulco National Park and research activities are coordinated with several universities. The Ramsar Wetlands for the Future Initiative supported information gathering for designation of the site. Most recent RIS information: 2003.

Program objectives and development

The main goal of the project is to develop a water management model that recognize ecosystems and preserve or restore their natural functions and structure, including wetlands and related aquifers, to ensure water needs and environmental services for development. The objectives of the project are:

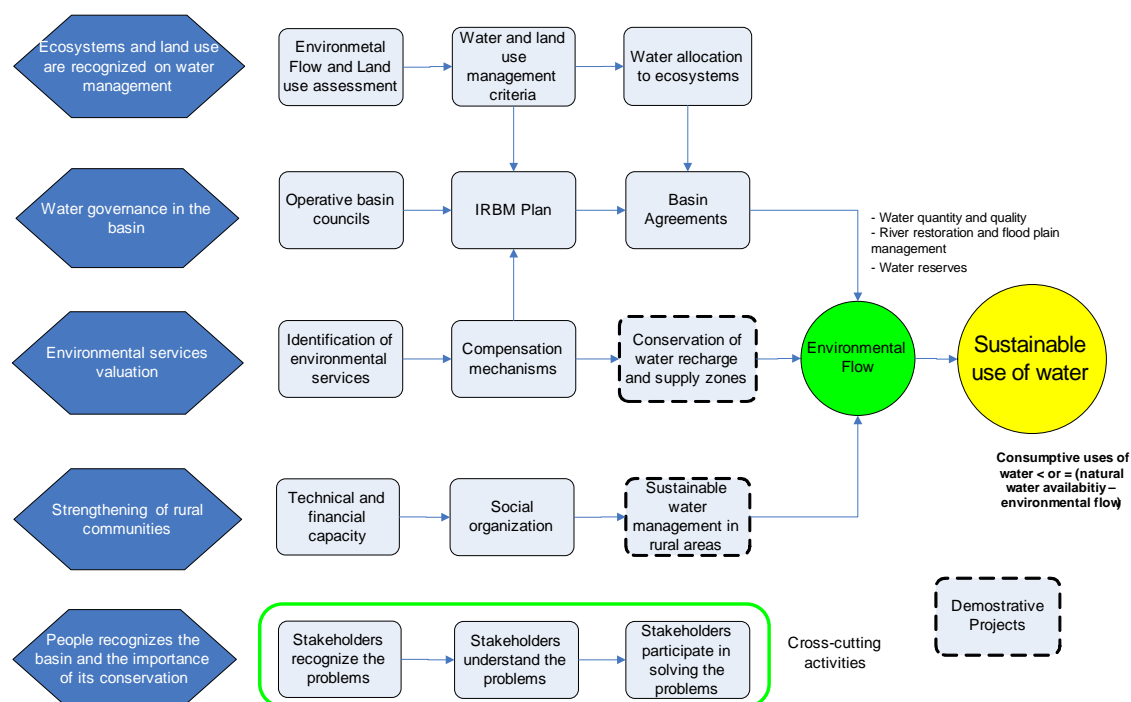
- Promote and support institutional and social processes to generate the foundation of a sustainable management of the basins in the mid and long term.
- Develop a proposal to consider the freshwater and estuarine ecosystem functions and structure as the support for water administration and land-use planning in the basin, integrating ecosystem management criteria.
- Promote and support water governance processes in the basins focusing to implement environmental flow and land use management agreements.
- Demonstrate the feasibility of conservation to ensure water availability and other environmental services.
- Institutions, stakeholders and civil society recognize themselves as a part of the basin, and understand the importance of ecosystem conservation as a provider of water and environmental services, and take an active role on problem resolution.

The main activities of the program focus on coordinating three levels of government, the private sector, NGOs, academic institutions, and local communities to support integrated river basin management (IRBM) in target basins; and developing small-scale projects to demonstrate that biodiversity and water management can be a development principle rather than a conflicting issue.

The program planning framework includes five strategic actions to address key threats to freshwater ecosystem conservation: 1) ecosystems functions and land use are recognized in the water administration system; 2) support water governance consolidation in the basin; 3) valuation of environmental services and products through demonstrative projects; 4) strengthen the rural and indigenous communities to improve sustainable use of ecosystems and their participation in basin governance bodies; 5) raise awareness of stakeholders about basin conservation. Figure 5 shows the integration of these strategies in an IRBM model aimed at implementing an environmental flow.

The program itself has been designed considering several mainstreaming elements. The central one is to set freshwater ecosystem management as the main water management goal; whatever interpretation of a sustainable water use or rational use of water is, it must not be valid if freshwater ecosystems are destroyed. Therefore, environmental flow has been established as the main strategy with different implications and activities at local, basin and national levels (Figure 6).

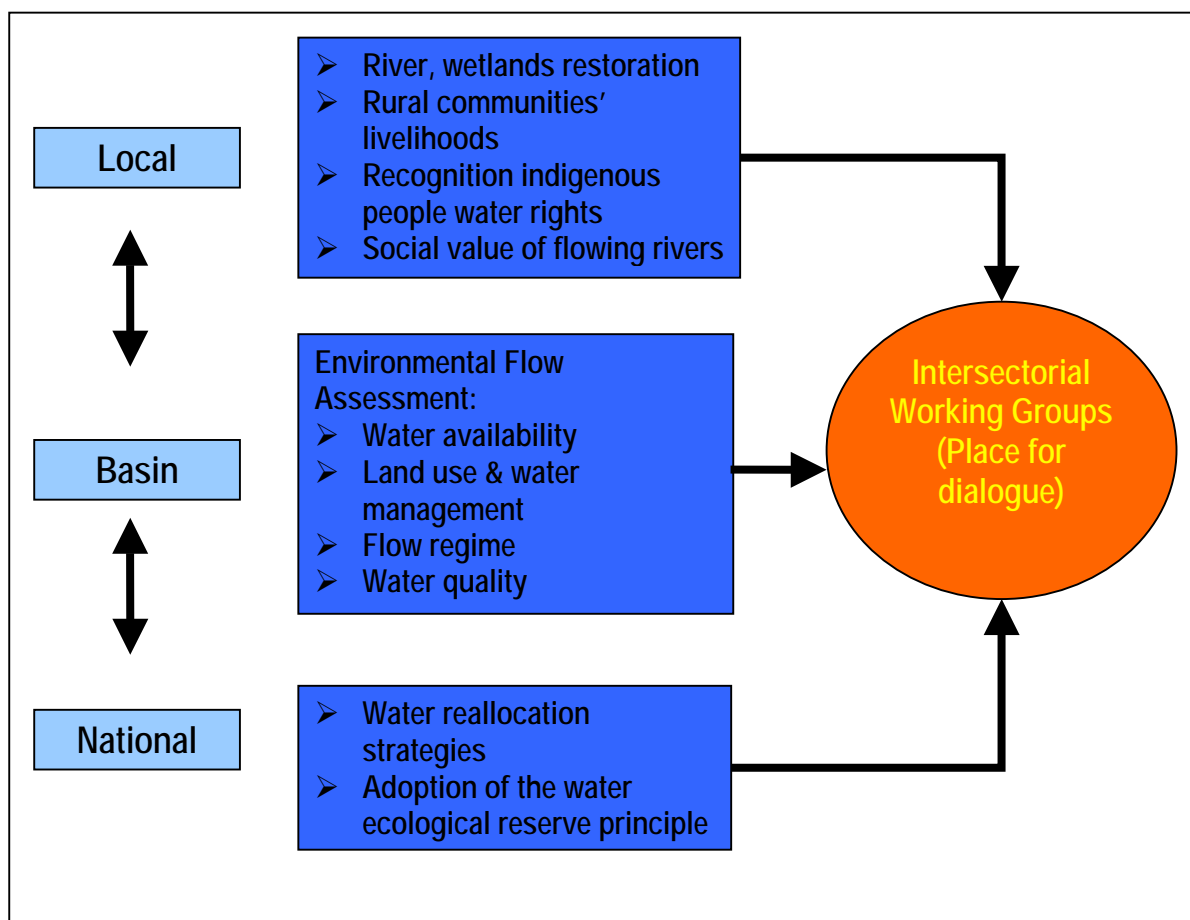
Figure 5. WWF-FGRA Integrated River Basin Management Model



At the local scale, activities focus on linking biodiversity conservation in forest and wetlands areas with improving rural communities' livelihood. There are two activities at this level that mainstream environmental flow: the recognition of water rights for domestic and productive activities of indigenous and rural communities smaller than 2,500 inhabitants; and the assessment of the social values related with a flowing and healthy river. At the regional scale, we are aiming to introduce ecosystem management principles within the water management and administration system; three issues are addressed: better recognition of land use, ecological flow regimes, and better understanding of the benefits of water quality management. At the national level, the activities consist in supporting working groups to define national standards to determine environmental flows as a sustainable water availability limit and the development of strategies for reallocation of water rights.

It is to be noted, that the creation of intersectoral working groups – similar to river basin entities or authorities – has been instrumental in making the different members understand the importance of ensuring environmental flows; and perhaps most importantly, in developing of an understanding of each other views and positions on water basin management realities.

Figure 6. Integration of activities to implement environmental flows, from the local to the national levels



Mainstreaming wetland biodiversity

Currently, three years into the program, several lessons have been learned, and some results show that the strategies are somehow in the right track.

The environmental flow concept is an adequate management tool, rather than just an instrument or methodology. It provides rational solutions for some of the most important water management problems: water allocation, sand and gravel extraction from riverbeds, water quality management, land use, etc. As a conservation strategy, it has different meanings for different actors at different levels, but there is a common understanding about the importance of water in the environment. It has also become a good communication tool.

Water management must be used to implement environmental flow; however, as explained in the first part of this document, several adjustments had to be made for the implementation of the water management instruments. The development of sustainable water managements programs in other sectors, such as the one developed by the Ministry of Agriculture, is an important contribution to the improvement of the water management system, and provided a solution to problem of water over-extraction. In this case, allocation of water to the environment is a feasible solution to keep water as a reserve. In the case of the Rio Conchos, the proposal for environmental flow downstream of the main irrigation district (DR 005, Delicias) where the water rights adjustment program has invested US\$23 million to recover

110 Hm³ (3.5 m³/s), is below this number for most of the time, and about the same for the peak annual flow.

As it can be seen, the whole program throughout its four strategies is an attempt to mainstream ecosystem management criteria, using the water administration system, and within the different government levels, stakeholders and rural communities, and using environmental flow as the management instrument. From the three basins where the project is being implemented, two of them: Copalita and San Pedro include a RAMSAR site. In both basins, wetland conservation is being approached as a part of the IRBM strategy; and it is directly related with environmental flows. Implementation has to soundly approach the integration of surface and groundwater management.

Currently, several lessons have been learned through the implementation of an IRBM process:

- The capacity to work at different levels from local to national is showing good results in articulating social and institutional processes around wetland conservation in these basins. There are different realities at different levels that play an important role on wetland conservation. This role is proving that mainstreaming wetland conservation should be accomplished by both top-down and bottom-up strategies, and not by one of them alone.
- The basin scope provides a good geographical framework to mainstream wetland conservation into the water management sector, through the environmental flow concept.
- It is also important to recognize that recent natural disasters produced by hurricanes have created a lot of awareness about basin and wetland conservation, at local, regional, and federal level. Thus, opportunities are also a mainstreaming force.
- Approaching the agriculture and energy sector has produced good results on mainstreaming biodiversity, rather than working solely with government environmental agencies.
- A clear and rational proposal, in the case of environmental flow allocation, has been very helpful to communicate that biodiversity conservation is feasible, as a starting point; later on, benefits need to be proven and shown to people.

Final Remarks

Biodiversity conservation has different meanings and implication for different actors; therefore, it is important to develop a common understanding.

Currently, one of the main obstacles to the implementation of conservation policies with other sectors is the existing legal framework. Implementation is difficult, as it involves different policies, programs and priorities, which most of the time, are unknown. It is important to ensure conservation strategies effectiveness by testing their implementation before expanding them at regional or national level.

References

Asad, M. and H. Garduño. 2005. Water Resources Management in Mexico: The Role of the Water Rights Adjustment Program (WRAP) in Water Sustainability and Rural Development. Sustainable Development Working Paper, No. 24, World Bank.

- CNA.** 2008. Estadísticas del Agua en México 2007 [Water Statistics in Mexico 2007]. 1st Edition, 256 pp.
- CNA.** 2005. Estadísticas del Agua en México 2004 [Water Statistics in Mexico 2004]
- SAGARPA.** 2007. Programa de Adecuación de Derechos de Uso del Agua y Redimensionamiento de Distritos de Riego (PADUA) 2003-2006. [Water Rights Adjustment Program and Irrigation Districts Resizing].
<http://www.sagarpa.gob.mx/agricultura/pages/sust/agua.htm#padua>
- World Bank.** 2008. Mexico Data. <http://devdata.worldbank.org>

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CHAPTER 11

MAINSTREAMING WETLAND BIODIVERSITY CONSERVATION ON PRIVATE LANDS IN AUSTRALIA

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Abstract

This paper discusses the Ramsar Managers Network (RMN), a group of 4 private landholders and government representatives involved in the management of Ramsar wetlands in New South Wales. The RMN has made a number of significant achievements over the last three years. It has become an effective force for wetlands conservation in NSW and has reestablished a profile for Ramsar within the state while providing a structure for direct communication between private land managers and Government. The success encountered to date has demonstrated the power of landholder/agency partnerships. The benefits to two of the sites are clear, e.g., recruitment of wetland officer, weed control, funding and networking opportunities; however, for the two other sites where the key issue is the lack of water, no change in water availability has occurred. The case of the Macquarie Marshes is discussed. The marshes covers an area of 200,000 hectares, contains 3 Ramsar sites, and supports a vast variety of wetland vegetation and is one of Australia's largest site for colonial nesting water-birds. Unfortunately, up to 60% of the Macquarie Marshes are in bad shape because of inadequate water supply. While measures (e.g., buying back licensed entitlements for the environment) are being put in place in order to address the problem, it may not happen in time to save many areas of the Marsh.

Keywords: NSW Ramsar Managers Network, Macquarie Marshes

Introduction

The New South Wales Ramsar Managers Network (RMN) is a group of private landholders and government representatives involved in the management of Ramsar wetlands in New South Wales. Established in 2003 by the New South Wales Minister for the Environment, the RMN aims to support private/community Ramsar managers and provide a link to information and resources within Government. The group seeks to raise the awareness of the value of wetlands and the Ramsar Convention in New South Wales, and assist private Ramsar managers to maintain the ecological character of their wetlands. Ramsar wetlands are those that have been listed under the Ramsar Convention as wetlands of international importance.

Background

In the past, Ramsar nominations in New South Wales were primarily focused on NSW Department of Environment and Climate Change (DECC – previously the NSW National Parks and Wildlife Service) estate, but today Ramsar sites cover a range of tenure e.g. private land, National Park, Nature Reserve, Crown land and State Forests. New South Wales leads Australia with its number of private Ramsar sites, having four of its eleven sites occurring wholly or partly on private or community-managed land including Gwydir wetlands, Macquarie Marshes (Wilgara Wetland component), Fivebough and Tuckerbil wetland and Hunter Estuary (Shortland wetland component). Some of these private Ramsar managers expressed concern that government was not recognizing their commitment to conservation; it became apparent that they did not have the same scientific funding or promotional support that government Ramsar managers have, despite both providing the same important

environmental services. The RMN was consequently established to ensure processes were in place to support private Ramsar managers.

New South Wales Ramsar Managers Network

The New South Wales (NSW) Ramsar Managers Network (RMN) has fifteen members and comprises representatives from the four private Ramsar sites in NSW; DECC; Department of Environment and Heritage (DEH); Department of Natural Resources (DNR); Forests NSW (FNSW); and WWF Australia. The RMN is coordinated by DECC.

Goals

The goals of the RMN are to:

- Identify needs/issues of private Ramsar Managers;
- Assist in developing solutions;
- Provide link to relevant resources and Government/Catchment Management Authorities;
- Provide a network and structure to raise issues as they arise; and
- Raise awareness on Ramsar sites.

The main issues for private Ramsar managers in NSW that the network has sought to address during the last three years are: adequate and appropriately managed share of water, increased support and access to funding for identified management actions; and increased support for the control of weeds.

Activities

Significant funding (approximately \$500,000) from the Australian Government through the Natural Heritage Trust (NHT) has allowed the network to initiate and implement a number of activities such as ecological character descriptions for each site; a wetlands communication program; and site management actions, e.g., weed and erosion control, recruitment of wetland officer (Fivebough and Tuckerbil Swamps), updating management plans, *Lippia* control research, establishing photo points for monitoring wetland conditions, and interpretative signs.

The NSW Ramsar Wetlands Communication Program (RWCP) is a two-year program initiated by RMN and coordinated by Hunter Wetlands Centre Australia. It seeks to raise awareness of the value of wetlands and the Ramsar Convention within government and the broader community. RWCP has done a number of activities, e.g., television and radio interviews, brochures, website (www.ramsarwetlands.nsw.gov.au), wetland video, school presentations, wetland education kit and recommendations for upgrading posters and trade display products. Baseline data on the existing awareness of wetlands and Ramsar among Government and community was conducted at the start of the program and is currently being compared to awareness levels at the completion of the program in order to evaluate the effectiveness of the program.

Presentations on Ramsar and RMN activities were given to the four Catchment Management Authorities that have a private Ramsar wetland in their area. RMN has also provided input to the development of wetland targets for each of the relevant Catchment Action Plans to ensure that processes are in place for future management of private Ramsar sites.

The RMN meets every six months with key stakeholders to discuss Ramsar and wetland management issues. The RMN also meets with representatives of State and Commonwealth Governments to discuss Ramsar issues on private land.

Challenges and Achievements

The challenges facing the RMN members are numerous: a few are presented in Table 1, along with attempted solutions used and an evaluation of their successes.

The RMN has made a number of significant achievements over the last three years. It has become an effective force for wetlands conservation in NSW with more than \$132 million committed to NSW wetlands since the RMN established. This includes funding from NSW Riverbank (\$105 million), the NSW Wetland Recovery Package (\$26 million) and Natural Heritage Trust project funding

RMN has also been effective in reestablishing a profile for Ramsar within the state and providing a structure for direct communication between private land managers and Government. The success encountered to date has demonstrated the power of landholder/agency partnerships.

Table 1. Challenges for the Ramsar Managers Network

Challenge	Attempted Solution	Has it been successful?
High turnover of government staff.	Additional observers from the same department are invited to regular meetings.	Successful to some extent; but remains frustrating for both landholders and other members. "Loss of institutional memory" is a key factor in water crisis conflicts and new members are less aware of the urgency for action (Scholz and Stiftel, 2005).
Ownership of RMN by private Ramsar managers.	DECC facilitates but does not initiate. Private Ramsar managers decide on agenda, frequency, action of meeting.	Successful to some extent; but difficulties have occurred recently consolidation as a group.
Managers wanting to see results immediately.	Hold regular meetings and email updates on progress.	Successful for two of the sites; but the remaining two sites have not received any water despite the processes now being in place and some managers remain frustrated.
Mixed group with widely different backgrounds.	Remind ourselves of common larger goal, i.e., conservation of wetlands	Successful to some extent; but the group is very reactive to individual member actions.

Discussion

Community participation in ecosystem management is rare and usually involves agencies merely practicing “tokenism” where the community is asked for comment after the agency has already made a decision (Duane, 1997). In contrast, the private Ramsar managers of RMN decide on actions and direction for the group, meeting agendas, invitees and venues etc. A participatory approach to resource management is, however extremely resource intensive.

The success of the network depends on the scale under which it is examined. For two of the sites the benefits have been clear, e.g., recruitment of wetland officer, weed control, funding and networking opportunities. However, for the two sites where lack of water is the key issue, no change in availability has occurred. The scale of change required for the latter two sites, however, far exceeds any short-term goals and will involve major institutional shifts in the way in which water is managed. For water to be returned to these wetlands, long-term commitment to both private and community Ramsar wetlands, is needed from Government, as well as rain and effective regulation of water management.

Despite the challenges, RMN has played a significant role in the conservation of wetlands in NSW and demonstrates the power of landholder/agency partnerships.

A more binding agreement to Ramsar, when parties sign on, would be very beneficial and stop governments from taking these environmental covenants so lightly. Also more international scrutiny and some type of audit process could also make a big difference to the long-term health and sustainability of wetlands.

Macquarie Marshes Case Study

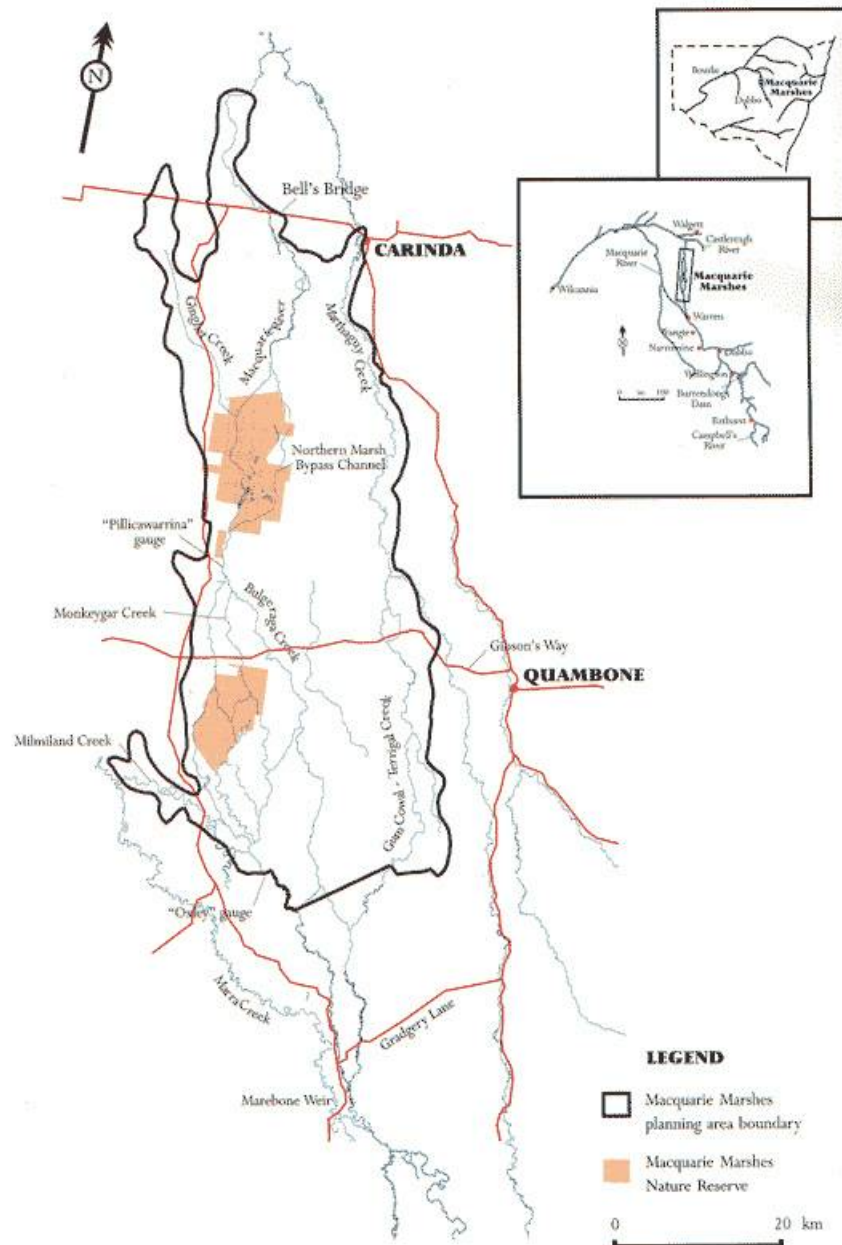
As a case study to the RMN, I have chosen the Macquarie Marshes area in central New South Wales Australia (NSW) as my subject. I have lived in this area for my entire life and have been able to see vast changes in the area over time.

The Macquarie River is a large regulated river in the Murray-Darling Basin, with a catchment of about 75 000 km² (Figure 1). The river rises on the western side of the Great Dividing Range and flows about 500 km northwest and north before joining the Barwon-Darling River in northern NSW. Most of the tributaries of the river are upstream of Burrendong Dam, the river’s largest water storage. As the Macquarie flows onto the Darling Riverine Plain, downstream of Narromine, it develops distributary streams and forms extensive floodplain wetlands. These streams flow north and northwest to join the Bogan and Barwon-Darling Rivers. The main Macquarie River channel continues north, forming the Macquarie Marshes about 50 kilometres north of Warren. The Marshes extend for about 120 km to near Carinda before the river reforms and flows to the Barwon-Darling River, between Walgett and Brewarrina.

The Marsh covers an area of approximately 200,000 hectares, and is 100 kilometers long by 20 to 30 kilometers wide. This area supports a vast variety of wetland vegetation, including water couch and common reed grasslands, and river redgum forest and woodland. The Marsh consists of approximately 80% privately managed and 20% government managed land.

The Macquarie Marshes is one of Australia’s largest colonial nesting waterbird sites. There are twelve waterbird nesting colonies in the marsh and ten of these are on privately managed land.

Figure 1. The Macquarie Marshes (Source: © Macquarie Marshes Management Committee)

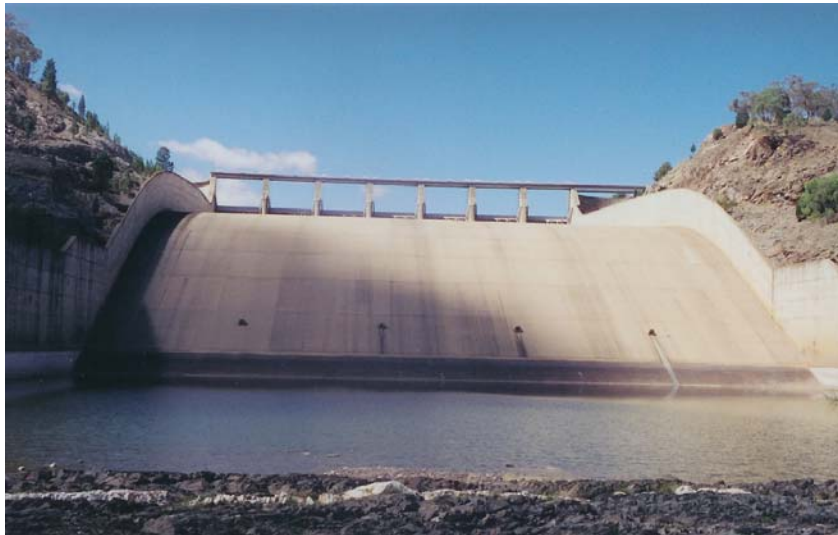


In 1965, Burrendong Dam was completed at Wellington in the middle section of the river. The dam was constructed to support irrigation development and for flood mitigation for the towns and cities downstream who had suffered heavy flooding in the 1950's and 60's. While subtle changes occurred after the Dam went in, it wasn't until broad area flood irrigation for cotton production expanded along the river that the real impact to the environment and downstream landholders really became apparent.

Burrendong Dam has a capacity of some 1,189,000 megalitres of water conservation storage and 489,000 ML of flood mitigation storage (Photo 1). The total water allocated to extractive use (irrigation, stock, domestic and industry) is about 740,000 megalitres. 160,000 ML is allocated as an environmental flow. This is from a water source that was originally estimated to be able to sustainably yield 475,000 megalitres in an average year. Thus the river as with most in the Murray Darling Basin is grossly over allocated.

The 160,000 megalitres of environmental entitlement is allocated as what is known as 'general security' this means that the entire 160 000 megalitres are only available when Burrendong Dam is full. If the Dam is only part full then the allocation might be 10% or 30% of the 160 000 depending on the Dam level at the time. A water corporation, under the NSW Government, sets the allocation percentages.

Photo 1. Burrendong Dam Spillway



When town and stock and domestic supply is added this leaves very little for the Macquarie Marshes. In addition, the outlet valve is set at the bottom of the Dam and only has the capacity to release 7,500 megalitres per day, and only when the Dam is reasonably full. This capacity reduces as the Dam level drops due to decreased head pressure. This not only inhibits the amount that can be released at any one time but it also means that the water is coming from the bottom of the dam where it is very cold and it affects fish migration and breeding habits.

Three areas of the Marsh are listed Ramsar sites, two areas are government conservation reserve and on private landholding, but as this system is so intrinsically linked no single area can be managed in isolation.

The Macquarie Marshes are an iconic area and have had a great number of experimental works and scientific studies carried out on them over many of years (Photos 2 and 3). Much of this work has never been reviewed and has not been made available to other managers responsible for the health of the system. However in saying that, and it is an important issue, it is also important to say that other scientific work, that has been peer reviewed and

published has helped greatly to identify the over allocation of river systems and help in the arguments for programs such as the NSW Wetland Recovery Program and RiverBank.

Photo 2. Healthy Macquarie Marshes



Photo 3. Ibis Colony on private land of Macquarie Marshes



There are now measures being put in place in order to address these problems. With up to 60% of the Macquarie Marshes already a wasteland (Photo 4), we hope it is not “too little too late”. Some of these measures include buying back licensed entitlements for the environment but this is a long-term process and may not happen in time to save many areas of the Marsh.

Photo 4. The Macquarie Marshes as it looks today!



I would hope that the work coming out of the Mainstreaming Wetland Conference will shed some light on ways to stop the destruction of wetlands not only where we live but world-wide and bring back some balance into the landscape.

Here are a few personal observations:

- For every scientific study, there are scientific disagreements or debate. While, this is simply the nature of science, groups, especially those whose main interest is in maintaining the status quo, often misuse the debate. It is, however, vitally important that all people involved in wetland management have access to important information, and that they are kept well informed.
- As governments fund most of the scientific research done in wetlands, it is important that all research results are made available in a form useful to managers.

- The linkages between research, policy and management must be clear to managers.
- Governments have very short terms of office that encompass three to five years. They often make decisions for the term of their government that are not relevant at the broad landscape scale or long-term social time scales necessary for sustainable management.
- The results of scientific studies should be made user-friendly.
- There needs to be a depository where all wetland studies for an area are catalogued and easily accessed.
- On ground information and solutions proposed by non-scientific people are not always valued or taken into accounts. It is critical that the long-term experience of managers who know the systems in ways other than scientific ways (i.e., local knowledge), is incorporated into management.
- Political and social changes are inevitable and important part of management and development of new solutions. It is important to take advantage of opportunities for change, while at the same time maintaining a core of experience and knowledge to help provide continuity of knowledge, and the transfer of experience.
- There must be mechanisms by which non-government stakeholders can participate effectively in management of natural systems such as the Macquarie Marshes, and on larger scales – the Macquarie River and the Murray-Darling Basin. They need to be supported to be effective. In many cases, as I have been suggesting above, governments must provide most of that support.

Wetlands have no time left for posturing, arguing and, more studies. Actions are now the only solutions to this looming disaster. Blame is no longer an excuse or a threat to reverse the state of affairs. While we can never go back to the past, there has to be balance brought back into the allocation of water resources. If we continue down the path at the rate we are going both industry and the environment will lose.

Acknowledgments

I thank the NSW Ramsar Managers Network and key stakeholders who are continuing to work hard to restore private Ramsar wetlands in New South Wales.

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References

- Duane, T.P.** 1997. Community participation in ecosystem management. *Ecology Law Quarterly*, **24**: 771 – 797.
- Scholz J.T. and B. Stifel.** 2005. Adaptive governance and water conflict - new institutions for collaborative planning. *Resources for the Future*. Washington, USA.

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CHAPTER 12

MAINSTREAMING COASTAL WETLAND BIODIVERSITY CONSERVATION IN AFRICAN MANGROVES, CAMEROON

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Abstract

The African coastal mangrove forests cover over 3.9 million ha and are largely situated on the Atlantic coast of West and Central Africa. They harbour diverse populations of plants and animal species of global conservation importance. For decades, these mangroves and associated coastal wetlands have been exploited for fuel wood, saw logs, non-timber forest products and artisanal fishing. Rapid expansion of coastal cities, pollution from industries and domestic sources have caused uncontrolled losses and degradation. More than 50% of the original mangrove forests were lost in the past 50 years. Maintaining a balance between the needs of the local coastal communities and the ecological potential of the remaining mangrove and coastal wetlands ecosystems has been a challenging cause for concern for governments in the region.

Much effort has been made to save these mangrove forests and coastal wetlands from further destruction. Recently developed wetlands policies are being translated into various projects, i.e., national action programmes with sectoral legal instruments; poverty reduction efforts; national and regional wetland mainstreaming projects on community sensitisation and capacity building; local, national and regional institutional development on sustained livelihood and poverty alleviation. Good progress has also been made in the field on poverty reduction by working with local communities in wetland areas. This has been achieved by improving livelihood conditions of local communities and by creating opportunities and mechanisms for value added and rates of return based on secured access and good governance.

This paper also describes ten years (1997-2007) of field experiences and lessons learnt in management of mangrove forests and coastal wetland in the Douala-Edea Atlantic coastal area. The project has carried out: wetlands inventories and assessments of biodiversity and threats on the Cameroon coast; established wetlands monitoring systems with clear biological and socioeconomic indicators; built gender sensitive local co-management institutions for poverty alleviation; sustained livelihood demonstration projects for improved wetlands resource extraction and conservation; community-based mangrove regeneration schemes; establishment and/or strengthening of national and regional networks. The ongoing national wetlands policy development in Cameroon has the potential to spill over the west/central African region. Highlights of mainstreaming strategies, processes and lessons learnt are presented.

Keywords: Mainstreaming wetland biodiversity, coastal mangrove, Cameroon, poverty reduction efforts

Introduction

Location, Extent, Distribution and Biodiversity Potential

The African coastal mangrove forests are largely situated within the Atlantic coasts of West and Central Africa. They are covering 3.2 million ha (ITTO, 1993), accounting for 82.1% of the 3.9 million ha of mangrove forests on the continent. About 2.1 million ha (53.8%) of mangrove forest ecosystems are located in West Africa, 1.1 million ha (28.2%) are in Central Africa, while the rest are within the East African Indian Ocean coasts in Tanzania, Kenya and Somalia. In the Atlantic coastal section of Africa, mangroves stretch from Mauritania in the

north western section to Senegal in the Saloum Delta, Lower Casamance through Guinea Bissau, South Guinea, to the Gulf of Guinea flanking the coastlines of West and Central Africa from Liberia to Angola. The Niger delta in Nigeria supports up to 10,000km² of mangrove stands in this area and plays a critical role in supporting the region's rich wildlife. Climatic conditions are predominantly humid and tropical but changes to more temperate conditions towards Angola.

In Africa, there is some degree of variation in phytogeographical distribution of mangroves species across the continent. West and Central Africa have three families with five species including: Avicenniaceae (*Avicennia germinans* – referred to as white mangroves); Combretaceae (*Laguncularia racemosa*); and Rhizophoraceae (*Rhizophora harrisonii*, *R. mangle*, *R. racemosa* - red mangroves).

The geophysical characteristics of the wetlands are very variable especially in the Cameroon coastal region comprising tropical forest; rocky and sandy beaches; mudflats; estuaries and coastal lagoons and lakes. The varied wetland types harbour diverse populations of plants and animal species of global conservation importance especially elephants, gorillas, chimpanzees, buffaloes, monkeys, antelopes, West African manatees, crocodiles, fishes, fresh water sea turtles and many resident and migratory water bird species. The extensive beaches also provide nesting habitats for marine turtles. The area also supports a diverse fish fauna, with high levels of endemism, and populations of West African manatee and Atlantic humpbacked dolphins. The warm coastal waters are internationally known to serve as breeding sites for humpbacked whale. The endangered pennant's red colobus monkeys are restricted to isolated forest patches in Korup national park in Cameroon and Bioko near to the coast. Cameroon coastal wetlands harbour significant populations of resident and migratory birds (Mbog, 2005; Ajonina *et al.*, 2002; 2003; 2004).

Threats

For decades, these mangroves and associated coastal wetlands have been exploited for fuel wood, saw logs, non-timber forest products, and artisanal fishing since they are zones of reproduction and growth for several species of fish, molluscs and shellfish. The rapid expansion of coastal cities, pollution from industries and domestic sources have caused uncontrolled losses and degradation of the mangrove forests and associated coastal wetlands; more than 50% of the original mangrove forests was lost in the past 50 years (RCM/CMN, 2007 a; b). Petroleum and gas exploration and exploitation activities along the coast are also increasingly threatening these wetlands. More than 60 % of the loss in the region is attributed to fish smoking, cooking and urban construction activities. Fish smoking and fish processing activities are largely responsible for more than 40% degradation and loss of mangroves in the region using traditional low energy efficient smoke ovens/houses with attendant health and environmental impacts (Ajonina and Eyabi, 2002). There are potential threats from shrimp aquaculture coming from SE Asia to SE Africa, especially Tanzania, through Nigeria and across to West Africa. Current mangrove forest degradation activities seriously threaten this ecosystem and reduce its resilience to mitigate climate change effects. Frequent impacts of invasive species, sea surges, inundations and natural disasters and other climate change impacts recorded in recent years in the coastal areas are evidence of the increased vulnerability of this system to human pressures, as more than 30% of the people are living within the coastal areas.

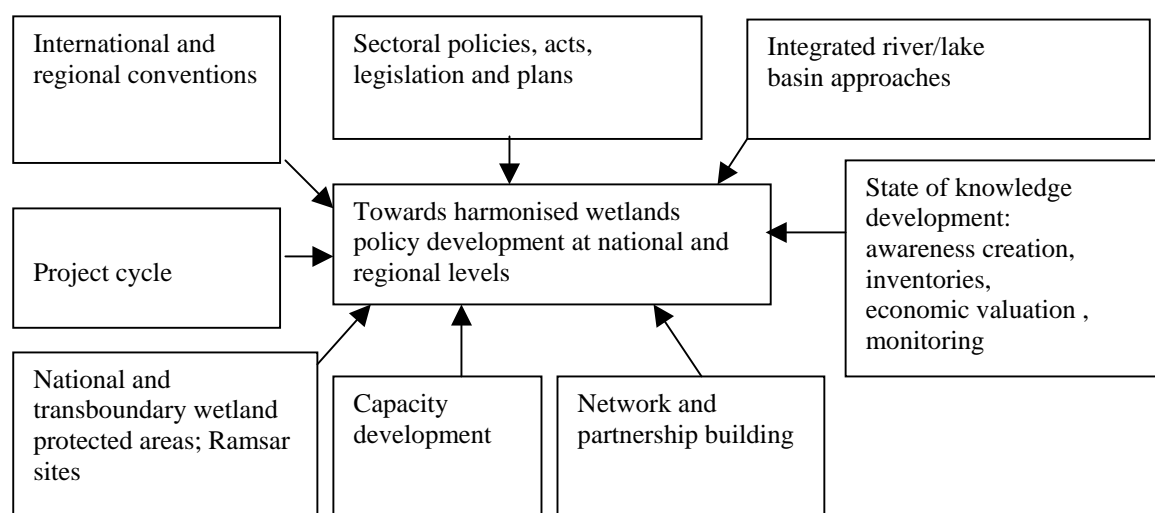
The need to mainstream wetland conservation issues in all national and sectoral planning processes has been expressed by various actors and stakeholders. This paper traces the evolving mainstreaming patterns and shows how poverty reduction concerns have been

addressed as part of the conservation and wise use of wetlands in general with particular references to coastal wetlands. Lessons learnt from a national NGO –Cameroon Wildlife Conservation (CWCS)– experience in running a multi-donor project in the Douala-Edea coastal landscape in Cameroon are highlighted. The paper also draws heavily from recent papers done for the African Development Bank (Tata and Ajonina, 2007a, b; Tata, 2007).

Overview of Evolving Wetlands Conservation, Mainstreaming and Poverty Reduction Efforts in Africa

Maintaining a balance between the needs of the local coastal communities and the ecological potential of the remaining mangrove and coastal wetlands ecosystems has been a challenging national and regional cause for concern for governments in Africa especially as wetland issues transcend national boundaries. Figure 1 presents key conservation and mainstreaming elements that are discussed. Linkages to poverty reduction and wetlands policy development will also be discussed. Broad wetlands issues are discussed with reference to mangrove and coastal systems that are intricately linked to other inland wetlands systems.

Figure 1. Key conservation and mainstreaming elements in African wetlands



Impact of international and regional conventions on wetlands conservation

Given the economic value and ecological functions of wetlands, the numerous threats on wetlands and the need for socio economic development, concerns have been expressed at national, sub-regional, regional and international levels on the need for measures to ensure sustainable conservation and wise use of wetland resources. At the international level, numerous relevant conventions have already been put in place. Along with other regions of the world, most African countries have expressed their concerns over wetlands and water resources. There are several African regional agreements dealing with shared watercourse systems, the protection and sustainable utilisation of water resources, the development of lake basin, and important basin initiatives are being developed. In the environmental action plan of the New Partnership for African Development (NEPED), one of the initiatives deals with the conservation of Africa's wetlands.

Status of mainstreaming within sectoral policies, plans, programmes and projects

Wetlands issues are generally not explicitly stated in many sectoral policies, acts and legislation, which are mostly focused on water management issues and not specifically wetlands. Responsibilities for wetlands issues tend to be dispersed in several ministries and departments, e.g., agriculture, fisheries, forestry, etc., within a country. Sectoral policies, programmes and projects usually have inadequate provisions for linkages and coordination. They also do not incorporate clearly defined collaborative framework within projects; a situation that can result in conflicts, duplication of efforts and waste of resources and funds during the implementation stages. At the project level, wetlands issues are generally not taken into considerations, unless the project is one of the following: integrated river/lake basin, wetland specific, integrated coastal zone management, or national and transboundary basin initiatives. Sector-oriented projects, mostly for general rural development, may directly or indirectly contribute to wetland degradation – a situation that can be effectively addressed by the incorporation of Integrated Wetlands Management (IWM) approaches and Environmental Impact Assessments (EIAs) into the project cycle. In addition, IWM processes ought to be adapted according to the type and requirements of each project, the specific characteristics of the wetlands and the country's general environmental situation.

Integrated river/lake basin and transboundary approaches

In Africa, there over 83 transboundary freshwater river and lake basins, most of which run to the sea. Of this total, 11 are in North Africa, 29 in West Africa, 8 in Central Africa, 20 in East Africa and 15 in Southern Africa. Many integrated river/lake basin initiatives have provided opportunities to mainstream wetland conservation issues, e.g., the Integrated Coastal Zone Management (ICZM) project in the Gulf of Guinea and in national and transboundary basin initiatives on the River Sanaga/Nyong basin in Cameroon and in the Congo basin. There are several African regional agreements dealing with shared watercourses, the protection and sustainable utilisation of water resources, and the development of lake basins. Programme area 6 of NEPAD's environmental action plan is on transboundary conservation and management of river/lake basins. Some of the countries participating in this initiative have created basin commissions and conventions, which are forums for discussions, elaboration and implementation of projects of common interest within a basin, e.g., the Lake Chad Basin and Niger Commissions and the Convention of the Sustainable Management of Lake Tanganyika (Iza, 2004). There is a growing recognition of the benefits derived from taking a river/lake basin approach because it is the only way to identify the most critical needs of each basin. It provides a good framework for building partnerships and strengthening teamwork between national institutions and between countries sharing common challenges and common wetlands resources. The basin approach is prompting many African sub-regions, national or sub-regional organisations, to shift from immediate and short-term planning to a much longer-term vision. Apart from problems arising because some countries tend to put their national interests above other riparian countries' interest, managing for long-term sustainable use at the basin-level scale is the most challenging undertaking for Africa because it is costly, complex and lengthy.

National and transboundary wetland protected areas and Ramsar sites

African countries have set up commendable initiatives in creating wetlands protected areas and Ramsar sites. In 2005, there were 131 Ramsar sites in 39 of the 52 countries in Africa; covering a total of 34 478 728 hectares and representing various wetland types with 39 marine and coastal wetlands and 7 mangrove Ramsar sites (Ramsar Convention, 2005). The creation of coastal wetland/marine protected areas (MPAs) is now part of a global priority to rescue

coastal resources under extremely severe threats (WSSD, 2002). Senegal is leading with 5 new MPAs created. Other countries have expanded existing coastal parks, e.g., in the Douala-Edea and Campo Ma'an parks in Cameroon. These initiatives are seen as a mechanism for enhancing ownership in local communities, for providing a clear fishing zoning strategy, and for providing benefits on fisheries and coastal communities. Enormous opportunities for sustainable transboundary wetlands management do exist: e.g., the establishment of transboundary protected areas could be an important mechanism for resolving sectoral and cross-border conflicts and for promoting sub-regional peace and stability. African countries only need to develop the necessary policies and have the political will for their implementation.

African wetland inventories and economic valuation

A significant number of national wetland inventories have been done in Africa in the past few years. However, because of inadequate capacity of the personnel and lack of funds, the data collected has been fairly limited; the emphasis was mainly on identifying wetlands of for conservation purposes rather than for the importance of their functions, services or direct uses. Given the increasing recognition of the importance of sound management of wetland ecosystems, a more systematic and comprehensive approach to wetland inventory is required. Many basin initiatives have undertaken national and regional wetland inventories and evaluations, e.g., Chadwet, NigerWet, MedWet .

Building networks and partnerships

There is an increasing number of partnerships/networks at various levels: community-based, non-governmental, governmental, MDBs and international/bilateral that are involved in promoting integrated wetland management and sustainable environmental management. Effective collaboration and coordination of activities between partners is essential in order to minimise the possibilities of unnecessary and costly duplication and overlapping of interventions. The main actors in the area of wetlands in Africa can be classified into the following broad categories (Tata and Ajonina, 2007a):

- Organizations that finance projects but are not directly involved in implementation, e.g., ADB, World Bank, IUCN, UNEP, EU, Ramsar Secretariat;
- Organizations that require joint-financing and get involved in project implementation in the field, e.g., WWF and Wetlands International;
- Organizations that provide funds and are sometimes involved in implementation, e.g., GTZ, DFID;
- Special projects, e.g., Gulf of Guinea Large Marine Ecosystems Management, which includes important components dealing with coastal wetlands;
- Various Regional and National NGOs that receive external and internal funding for implementing projects at the local level.
- National governments, some of which are still lagging behind in wetlands management issues within their countries;
- Riparian local communities that live within and around wetland areas and whose activities impact on wetland resources.

Development of national wetland policies and of legal and institutional framework

Although the governments in the region have elaborated far reaching biodiversity conservation policies, there is still no adequate provision for wetlands. Wetlands issues tend to be treated in a rather scanty and scattered manner in various sectoral policies (Tata and Ajonina, 2007a, b). For example Senegal, a Ramsar member, has a Nature Conservation Policy, with provisions for activities that protect wetlands, and the policy is being implemented by the Ministry of Environment and Nature Protection (Terpstra, 2003). In the Ministry, wetlands fall under the Department of National Parks. The Senegalese Nature Conservation Policy evolved out of three plans and strategies for natural resources conservation: the National Environmental Action Plan; the Senegal Forestry Action Plan; and the National Strategy for Biodiversity Conservation (Ibrahima Mamadou Mat Dia, 2003). Cameroon, which became member of Ramsar only in 2006, has just started the process of developing a wetlands policy. In Cameroon, wetland issues started being discussed under the topic “floodplains” only in 1990. Currently, wetlands issues are still mentioned incoherently as floodplains in the National Environmental Management Programme, the Framework Law on Environmental Management and the National Biodiversity Strategy being developed. On an encouraging note, Uganda is among the African countries that have developed a National Wetlands Policy, and this was achieved through a participatory process that was coordinated by an Inter-Ministerial Wetlands Committee within an inter-sectoral approach (Davis, 1993).

There is an inherent evolution towards wetlands policy development into which mangrove and wetland conservation issues are mainstreamed. These processes are gradually being coordinated and harmonized to develop wetland policies based on various sectoral policies, action plans, legal and institutional mechanisms to define conservation priorities at national, regional and international levels. For example, the African Development Bank (ADB) and partners have developed mechanisms to assist African countries with the development of National Policies, Legislation and Institutional Frameworks. These should be strengthened and harmonized at sub-regional levels to address trans-boundary wetlands, in order to achieve more effective integrated wetland management. The starting point, especially in Uganda and Kenya, has been to review the country environmental management plans, sustainable development strategies, poverty reduction papers to ensure that wetland issues are adequately addressed and with appropriate legal and institutional backing mechanisms. Special consideration is being given to the management of transboundary wetlands, fight against invasive species, sustained livelihoods and poverty alleviations as well as creation of marine and transboundary protected areas to resolve conflicts.

Wetland conservation and poverty reduction efforts

Good progress has been made in the field on poverty reduction by working with local communities in wetland areas; this is essential for maintaining the efforts to mainstream mangrove and wetland biodiversity conservation. Linkages between poverty and wetlands are complex because of the definition, nature and extent of poverty and more importantly the causes of poverty.

Conventionally, poverty was defined by income per household and macro-economic indicators. Within this narrow definition of poverty, the value of nature and the role natural resources and ecosystem services play is difficult to evaluate. Today, poverty is better understood broadly under many dimension, in terms of: access to and the quality of physical and social infrastructure (roads, housing, water and sanitation); the social support structures and social progress (distribution of benefits from resource exploitation, social relations and

networks including gender equality and children rights, empowerment, cultural identity); capacity development (knowledge, skills, education and health); rights or legal position (land tenure including demarcation and elimination of overlapping land rights, laws and policies – specifically those which govern community rights and access to natural and other resources, benefit sharing) and financial conditions (income, access to credits, cash flow).

Nature and natural resources are the foundation of economies in Africa. Ecosystem products (food, fodder, timber, fish, etc) and services (regulation of climate and clean air, water flow, coastal protection, etc.) support these dimensions. When the ecological systems fail and natural resources are depleted, quality of life decreases and poverty (as defined above) is exacerbated. Nature conservation and environmental interventions are therefore unsustainable if poverty is not addressed. Consequently poverty reduction efforts have been hinged around addressing sustainable resource use. This has been achieved through contributions to improved livelihood conditions of local communities (increased income levels, employment, enterprise development, ecotourism development) by creating opportunities and mechanisms for added value and rates of return based on secured access and good governance; rational methods of resource extraction, processing, storage and use; wetland restoration; and the emerging concept of marine protected areas (MPAs).

Up scaling and Mainstreaming from Douala-Edea - Ten Years of Community Based Experience

Overview of status and conservation of wetlands in Cameroon

Cameroon is a Central African country of 475 442 km², with a population of 15.7 millions in 2003. It is open to the Atlantic coast in the West with a coastline of 590 km, and is bordered in the west by Nigeria, by Chad in the north, by the Central African Republic in the east and by the Equatorial Guinea, Gabon and Congo republics in the south. Cameroon has over 200 000km² of tropical rainforest, one of the largest in the Congo Basin.

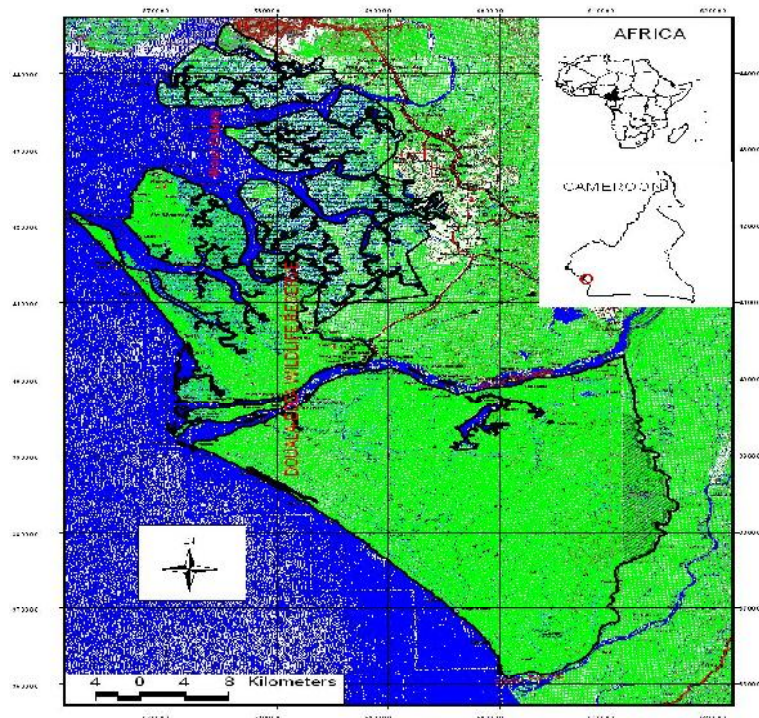
Cameroon is a unitary state with an administrative structure consisting of Provinces, Divisions, Sub-Divisions and Districts. Cameroon is signatory to a number of international conventions and regional agreements, including the Ramsar Convention (signed in 2006). There are two Ramsar Sites, the Waza- Lagone Floodplain and Barombi Lake. There is a network consisting of more than 50 protected areas with more than ten National Parks. Five national parks are located along the Atlantic coast. The Ministry of Forestry and Wildlife /Department of Wildlife and Protected Areas is responsible for the management of all protected areas. Other ministries are also involved in wetlands issues; they include: the Ministry of Environment and Nature Protection, who handles Ramsar wetlands; the Ministry of Tourism; the Ministry of Agriculture and Rural Development; and Ministry of Fisheries and Animal Husbandry. Cameroon has developed a National Biodiversity Strategy and Action Plan, in support of the implementation of the Convention of biodiversity that defines the general orientation on environmental management in Cameroon, including wetlands. Other legislation that have relevance to wetlands management are: the Forestry, Wildlife and Fisheries Law (1994); the National Environmental Management Plan (1996); and the *Community Based Natural Resources Management Act* of 1992 provides the framework for community participation in natural resources through the formation of viable tax-free common initiative groups. Of particular relevance are procedures for attributing community forests. Environmentally related laws are enforced by a paramilitary forestry service. Cameroon has initiated the process for developing a national wetlands policy spearheaded by the Group of Parliamentarians for Environment and the Cameroon Mangrove Network consisting of NGOs and CBOs.

Mainstreaming Douala-Edea coastal wetlands and mangrove biodiversity conservation

Main characteristics of Douala-Edea coastal wetlands

Douala – Edea coastal Atlantic area (Figure 2) covers over 500 000 ha and is located at the confluence of the four largest Cameroon rivers: Wouri, Dibamba, Sanaga and Nyong. It is a unique coastal and marine wetland with mangroves, lakes, lagoons and tropical lowland Congolian rainforest with marshes and swamps. These freshwater and marine ecosystems are identified by WWF Eco-region 200 as priority conservation areas and are protected under the Douala-Edea (160 000 ha) and the Lake Ossa Wildlife Reserve (4 000 ha) gazetted in 1932 by the French colonial administration. They are biologically rich in aquatic resources notably sea turtles, dolphins, crocodiles and the West African manatee, presently on IUCN list of highly threatened species. It harbours over 200 terrestrial and water bird species, 120 fish species, large mammalian flagship species, e.g., forest elephants, primates (chimpanzees and monkey species, especially black Columbus) and antelopes (sitatunga, blue duiker, etc).

Figure 2. The Douala-Edea coastal Atlantic area, Cameroon, Africa



There are several village communities and fishing camps located within the periphery and inside the two reserves with a population of more than 10 000 people, of which some were there before the creation of the reserves. Fishing activities, mainly by foreign nationals from the neighbouring countries, seriously threaten the mangrove vegetation as 120 000 m³ of mangrove wood are cut annually for smoking fish; mangrove is preferred over other wood species because of its desired burning characteristics under wet conditions. More wood is also cut around the reserves in order to meet the needs for urban fuel-wood and construction. The biodiversity of the reserves is also increasingly threatened by poaching, farming, encroachments from private and multinational oil palm and rubber plantations and from exploitation of extractive industries, mainly logging, petroleum and gas exploration.

Mainstreaming efforts, approaches and achievements

The Cameroon Wildlife Conservation Society (CWCS) is a national conservation NGO working on biodiversity conservation and protected area management. Since April 1997, it has been running a conservation and development programme and assisting the government of Cameroon towards developing a community-based conservation management plan that conserves biodiversity and promotes socioeconomic development within the Douala-Edea wetland reserve area. The programme benefits from a wide range of support from donors: the Netherlands Committee of IUCN; Oxfam-Novib; Wetlands International-Africa Programme; Mangrove Action Project; Netherlands Development Organisation (SNV); Canadian Gender and Development Funds; GEF-UNDP Small Grants Programme; and the Nature and Poverty Netherlands; programme achievements are numerous (CWCS, 1997 – 2006) and include the following:

- *Establishment of a field office base:* Development of a strong project field base in Mouanko with over 20 permanent staff (9 women): comprised of technical (forestry, research and monitoring, socio-economic and community development, GIS and data management) and support (administrative) staff, and more than 10 volunteer support staff from villages. Major assets include two vehicles, an outboard engine (40 hp) and a boat, scientific equipments, a GIS laboratory, and a resource centre with over 1500 books.
- *Research, monitoring and data base development:* Conducted wetlands inventories (Ajonina *et al.*, 2004); biodiversity assessments (Ajonina *et al.*, 2002; 2003) and threats (Ajonina and Usongo, 2001; Ajonina *et al.*, 2005) of Cameroon coasts; established wetlands monitoring systems with clear biological and socioeconomic indicators (Dongmo, 2005) including the monitoring use of non-timber forest products and bush meat; conducted monthly waterfowl census (Ajonina *et al.*, 2007) and wetland monitoring; conducted mangrove impact assessments on forest regeneration dynamics, development of mangrove wood for energy saving smoke ovens, and houses and community based mangrove regeneration studies; and shared data base with partner institutions.
- *Awareness creation:* Raised community awareness during the celebration of environmental days, e.g., World Wetlands Day and National Days, through seminars; round table discussions and public debates; distribution of hundreds of flyers, T-shirts and posters. Created and supported over ten primary and secondary school environmental clubs; and established of 5 school gardens and orchards.
- *Partnership building and good governance:* Within the framework of the conservation programme, signed a collaborative agreement elaborated and implemented jointly by CWCS and the Ministry of Forestry and Wildlife, under the provisions of the *Community Based Natural Resources Management Act* of 1992. Created a gender sensitive local co-management institution consisting of a network of 32 community-based organisations (CBOs) constituted of women groups involved in fishing, farming and natural resources exploitation; 20 of the CBOs are fully legalised by the government. Signed collaborative with technical government services (agriculture and fisheries) for joint implementation and support of biodiversity conservation and natural resources management projects. Facilitated the establishment of consultative platforms to stimulate stakeholders' dialogue with foreign fishing representatives on responsible fisheries; and with private sector representatives, especially from the oil palm plantation and extractive industries (logging and petroleum) to promote sustainable exploitation of resources by conducting joint

impact assessments and by urging them to invest proceeds in wetlands conservation and social infrastructures by signing agreements with communities.

- *Capacity development:* Capacity building of local communities and technical government services (forestry, agriculture and fisheries) for joint implementation and support of biodiversity conservation and natural resources management projects. Facilitated capacity building in environmentally sensitive micro-projects in agro-forestry, energy saving smoke houses, post harvest processing of agricultural and non-timber forest products (NTFPs), regeneration and controlled extraction of mangrove forests. Provided support in national capacity building to over 15 national students and volunteer projects. Provided capacity building to other national and regional NGOs (in the Congo delta region and Nigeria) consisting of site and exchange visits to share CWCS experiences and lessons learnt on participatory management of natural resources.
- *Poverty reduction initiatives based on pilot demonstration models:* Set up sustained livelihood demonstrating projects on improving wetlands resource extraction and conservation, through modern processing techniques: built 50 community and individual smoking houses (Ajonina and Eyabi, 2002) to improve fish processing methods and to reduce mangrove exploitation; in agro-forestry, established 20 ha of selective alley-cropping, fruit and NTFP tree improvement orchards; implanted 2 grinding mills to improve processing of agricultural and NTFPs and facilitating the development of artisanal industries based on NTFPs.
- *Land use planning and gazettement:* Within the framework of the gazettement program, ongoing development of a participatory land use plan for the zone with three core conservation areas (national park of pristine tropical rainforest, mangrove reserve and manatee lake sanctuary) and the community-use zones.
- *Mangrove restoration:* Undertook community-based mangrove regeneration schemes (managed by village mangrove forest committees) by planting over 2500 plants covering 5 ha.
- *Ecotourism development:* Promoted the ecotourism potential of the area. The area presents high ecotourism potential because of the variety of habitat types (mangroves, sand banks, mudflats), a rich fauna and its proximity to the Cameroon economic capital of Douala (30 – 60 km), just 300 km from Yaounde, the national capital. It is of particular interest to bird watchers from September to April for the presence of palaearctic water birds. Cultural values are enhanced by the presence of the vestiges of colonial administration, e.g., the first catholic and protestant missions in Cameroon, miradors, and mangrove railway exploitation routes.
- *Networking:* Developed good working relationships at local, national and regional levels: At local level, built a local enabling institutional framework, with local technical services and administrative authorities, to facilitate and support dialogue amongst stakeholders. At the national level, created and facilitated a national mangrove conservation network (RCM/CMN, 2007 a; b) of 37 NGOs and CBOs active in mangrove and coastal area management issues. At the regional level, contributed to the creation of Central and West African Mangrove Action Network (African Mangrove Network) comprising 10 national NGOs from Cameroon, Nigeria, Cote d'Ivoire, Republic of Benin, Senegal and Togo who participated in the initial workshop organised in Cameroon (RAM/AMN, 2007). CWCS participation in these networks has significantly contributed in fostering information exchange and sharing

conservation experiences. CWCS has also developed partnerships with international NGOs, e.g., with WWF Central Africa Programme for the implementation of mangrove projects; SNV for smokehouse projects; Mangrove Action Project in America; Wetlands International for inventorying Cameroon coastal wetlands and waterfowl monitoring; and IUCN, UNEP and UNDP for development of joint coastal mangrove and wetlands management programme.

- *Policy influence:* Collaborated with the government and relevant stakeholders on the development of a clear-cut gazettement process, which the completion is expected by 2009. This will assist in resolving the ambiguous access to natural resources and the land and biodiversity conservation issues by designing three core protected areas and by demarking and defining the user zones and the land ownership schemes. The collaboration of Cameroon Mangrove Network with the caucus of parliamentarians for environment has set up the current process for sustainable national wetlands policy.

Lessons learned from mainstreaming coastal wetlands conservation and poverty alleviation

- Co-management experiences have contributed to greater synergies between local government services and local stakeholders.
- Empowerment of local communities has been translated into their support of conservation activities.
- Good national policies and good governance to promote benefit sharing can guarantee success of innovative participatory management initiatives.
- Local, national and regional networks have been developed through exchange visits by various stakeholders willing to share experiences in adaptive management through 'learning by doing'.
- Linkages between natural resource management and improved livelihoods of local communities can be made through innovative sustainable livelihood and poverty reduction approaches and processes such as: community organisation, provision of grinding mills to improve processing of agricultural products and non-timber forest products (NTFPs), construction of efficient smoking houses to reduce pressure on mangrove forest, support of GICs, gender support combined with basic monitoring.
- Mainstreaming gender in our programmes have greatly facilitated and reinforced collaborative management of natural resources in the area
- CWCS awareness-raising activities with local communities and the administration on conservation and related aspects of resources' management, have enhanced collaboration in support of program implementation and facilitated the signature of the Ramsar Convention by the Cameroon Government.
- Active presence in the field with local partners and stakeholders builds confidence and trust required for collaborative management processes.

Next steps and challenges

In order to achieve the objectives of the programme, the challenges of CWCS are numerous, e.g., sustaining current initiatives and maintaining donor support; finalizing the gazettement process; continuing partnership development and establishing of consultative platforms; negotiating and signing collaborating agreements with relevant stakeholders; maintaining the existing networks and creating others; and applying CWCS's experience within the Douala-Edea coastal wetlands to other rich but threatened wetland ecosystems in the country and sub-

region. CWCS will also promote the development of national policies that favor benefit-sharing mechanisms, and the strengthening of the ongoing national wetlands policy.

Conclusion

The importance of wetlands in Africa in terms of the environmental and ecological services, their socio-economic value to human populations and as well as for wildlife conservation, has been highlighted. African wetlands are threatened, degraded and sometimes destructed as a consequence of both natural and anthropogenic causes. This dismal situation has been recognised by the donor and development agencies and most governments, but measures to address the situation so far have been inadequate. There is constant evolution towards filling policy gaps by developing national wetlands policies by countries of the region, where wetlands conservation and poverty reduction issues are mainstreamed. It has also been demonstrated that site programmes largely employing the Ecosystem Approach can contribute in strengthening mainstreaming at national and regional levels.

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References

- Ajonina, G., W. Ganzevles and B. Trolliet. 2003. Rapport national du Cameroun. In: Dodman T. and C.H. Diaguna (eds). *African waterbird census/les dénombrements d’oiseaux d’eau en Afrique 1999, 2000 et 2001*. Wetlands International Global Series, No 16, Wageningen, The Netherlands.
- Ajonina, G.N. and G.D. Eyabi. 2002. Saving Cameroon’s Mangroves through improved fish smoke-houses: CWCS community-based approach in Douala-Edea Mangroves. Mangrove Action Project Los Angeles. <http://www.manroveactionproject.org>
- Ajonina, G.N. and L. Usongo. 2001. Preliminary quantitative impact assessment of wood extraction on the mangroves of Douala-Edea Forest Reserve, Cameroon. *Tropical Biodiversity*, 7 (2-3): 137 – 149
- Ajonina, G.N., I. Ayissi and L. Usongo. 2002. Provisional checklist and migratory status of waterbirds in the Douala-Edea Reserve, Cameroon. *Nature et Faune: Biodiversity files*. FAO. Rome.
- Ajonina, G., I. Ayissi and R. Mbakwa. 2007. Sanaga river waterfowl monitoring 1999-2006. In: J.J. Van de Waarde. J.J. (ed). *Waterbird census of coastal Cameroon and Sanaga river January-March 2007*. WIWO report 83. Beek-Ubbergen.

- Ajonina, G.N., I. Ayissi and L. Usongo.** 2004. Inventory of Coastal Wetlands of Cameroon Inventaire des Zones Humides Côtières du Cameroun. Wetlands International Report 68 p.
- Ajonina, P.U., G.N. Ajonina, E. Jin, F. Mekongo, I. Ayissi and L. Usongo.** 2005. Gender roles and economics of exploitation, processing and marketing of bivalves and impacts on forest resources in the Douala-Edea Wildlife Reserve, Cameroon. International Journal of Sustainable Development and World Ecology, **12**: 161–172.
- CWCS.** 1997-2006. Rapports d'activités/Activity Reports 1997-2006. Cameroon Wildlife Conservation Society.
- Davis, T.J. (ed).** 1993. Towards the Wise Use of Wetlands. Ramsar Convention Bureau. Gland, Switzerland.
- Dongmo, Z.N.** 2005. Système de suivi écologique et socioéconomique dans la Réserve de Faune de Douala-Edea et sa zone périphérique : axes d'intervention. Cameroon Wildlife Conservation Society, 41 p.
- Ibrahima Mamadou Mat Dia.** 2003. Élaboration et mise en oeuvre d'un plan de gestion intégrée – La Réserve de biosphère du delta du Saloum, Sénégal. UICN, Gland, Suisse et Cambridge, Royaume-Uni.
- ITTO.** 1993. Conservation and sustainable utilisation of mangrove forests, p: 193–209 In: Latin America and Africa regions, part II technical report of the project PD114190 (F) International Timber Organization Yokohama, Japan.
- Iza, A. (ed).** 2004. International Water Governance: Conservation of Freshwater Ecosystems. Vol. 1. International Agreements – Compilation and Analysis. IUCN, Gland, Switzerland and Cambridge, U.K. 324 p.
- Mbog, M.** 2005. Workshop paper prepared for the start-up workshop of the Cameroonian Network for the conservation of mangrove ecosystems (RCM). Edea, Cameroon.
- RAM/AMN.** 2007. Newsletter of African Mangrove Network. www.mangrove-africa.net
- Ramsar Convention.** 2005. Ramsar Sites: Directory and overview.
- RCM/CMN.** 2007a. Rapport d'activités / Activity report: 2005-2006. Réseau Camerounais pour la Conservation des Écosystèmes de Mangrove / Cameroon Mangrove Conservation Network. Mouanko, Cameroun. 48 p.
- RCM/CMN.** 2007b. Matanda News. Vol. 1, No.1. Newsletter of Cameroon Mangrove Network.
- Tata F.T.** 2007. Handbook on Wetlands assessment, planning, management and monitoring in Africa. African Development Bank Publication (in review). 64 p.
- Tata F.T. and G.N. Ajonina.** 2007a. Wetlands assessment, planning, management and monitoring in Africa. Desk Study. African Development Bank Publication (in review). 123 p.
- Tata F.T. and G.N. Ajonina.** 2007b. Wetlands assessment, planning, management and monitoring in Africa. Selected Case Studies. African Development Bank Publication (in review). 97 p.
- Terpstra, P. (ed).** 2003. Wetland Management Planning: Five Years of Case Studies from West Africa. Wetlands International West Africa, Dakar, Senegal. 358 p.
- WSSD.** 2002. World Summit on Sustainable Development. WSSD Report. Johannesburg.

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CHAPTER 13

MAINSTREAMING CONSERVATION OF WETLAND BIODIVERSITY IN SOUTH AFRICA

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Abstract

This paper briefly outlines the history of inland waters management in South Africa, then describes the significant aspects of the South African *National Water Act* (NWA). This Act was the first in the world to mainstream the conservation of aquatic ecosystem and the protection of its biota. The implementation of the NWA is described, in broad terms, as it applies to rivers, estuaries and wetlands. Although, the Act was promulgated nearly ten years ago, its implementation is far from complete, for a number of reasons that range from political to technical. In conclusion, some of the challenges faced by managers of local aquatic ecosystems are discussed.

Keywords: South Africa, National Water Act, mainstreaming wetland biodiversity

Introduction

South Africa's *National Water Act* (NWA) of 1998 was the first in the world to mainstream the conservation of aquatic ecosystems, requiring water to be reserved firstly for basic human needs and secondly to secure ecologically sustainable development and use of water resources.

One of the principles on which the Act is based, states that: *"The quantity, quality and reliability of water required to maintain the ecological functions on which humans depend shall be reserved so that human use of water does not, individually or cumulatively, compromise the long-term sustainability of aquatic and associated ecosystems."* (South Africa, 1996). In this regard, the "Reserve" is defined as *"...that quantity and quality of water required i) to satisfy basic human needs [currently 25 litres per person per day] of people who are supplied ... from the relevant water resource and ii) to protect aquatic ecosystems in order to secure ecologically sustainable development and use of the relevant water resource"*.

The intention of the legislation is to ensure continued water supplies for humans but the effect is the legislative requirement that rivers and wetlands are to some extent protected, which in turn means conservation of their biota. Indeed, the degree of 'protection' of South Africa's aquatic ecosystems can be measured largely by the degree to which the integrity of their biodiversity has been conserved.

This paper outlines the history of aquatic conservation in South Africa, then describe the significant aspects of the South African *National Water Act* that give effect to aquatic biodiversity conservation, and how, in broad terms, they are implemented. In conclusion, some of the challenges still being faced by managers of local aquatic ecosystems are discussed.

Wetland Systems Discussed in this Paper

In this paper, the Ramsar definition of wetlands is used; it includes shallow marine systems as

well as rivers and lakes, and wetlands in the narrow sense. Different Acts, however, control marine and inland waters. The most significant Act with regard to protection of marine resources is the *Marine Living Resources Act*, which is enforced by the Marine & Coastal Management branch of the Department of Environmental Affairs and Tourism (DEAT), by the South African National Parks and by Provincial Nature Conservation bodies. Coastal marine biodiversity is “adequately protected” in South Africa (G.M. Branch, University of Cape Town, personal communication) and is not discussed further in this paper.

Historical Aspects of South Africa’s Management of Inland Waters

A number of lessons can be learnt from a brief look at the way in which in the management of South Africa’s inland waters developed over the last four decades.

The earliest reference to the idea of providing water specifically for “managing the environment” is seen as long ago as 1970 in the deliberations of the Commission of Enquiry into Water Matters (Department of Water Affairs, 1986). A vague suggestion was made that a small percentage (probably 1-2%) of mean annual runoff should be allocated for the maintenance of floodplains and estuaries, with a small fraction also being set aside for drinking water for wildlife. The greatest concern seems to have been for the rivers of the Kruger National Park, which lie downstream of large irrigated farmlands and which often run dry in summer.

The matter was expanded upon in Roberts (1981), a visionary internal technical report by an engineer from the then Department of Water Affairs (DWA, now the Department of Water Affairs and Forestry - DWAF). At this stage, no attempt was made to decide how much water to allocate to a particular river, or how this should be done. Nevertheless, a seed had been planted - a seed that germinated about ten years later. In 1990, the very first attempts were made to release water for “environmental” purposes (Walmsley, 1989): a total of $182 \times 10^6 \text{ m}^3 \text{ y}^{-1}$, of which $110 \times 10^6 \text{ m}^3 \text{ y}^{-1}$ was set aside for the rivers of the Kruger National Park and *ca* $55 \times 10^6 \text{ m}^3 \text{ y}^{-1}$ was provided to allow inundation of the Pongola River floodplain. The Pongolo River, in the northeast of South Africa, had been dammed in order to store water for irrigation of commercial farms in a very extensive floodplain. Of course the dam prevented the natural annual inundation of the floodplain, which was used by local subsistence farmers. The amount of $55 \times 10^6 \text{ m}^3 \text{ y}^{-1}$ went some way towards inundating the floodplain and associated pans but was considered by ecologists to be totally inadequate (Heeg and Breen, 1982). The amounts of water presently released from the dam have since been increased to levels that locals consider to be adequate.

In the 1990s, South Africa developed a methodology (the Building Block Methodology (King *et. al.*, 2000) for estimating the water requirements of rivers and estuaries in a series of some twenty “Instream Flow Requirements” (IFR) workshops, dealing with a different river or series of adjacent rivers. The expertise in hydrology, geomorphology, water chemistry and biology that was developed in these workshops was later used to form the basis of the methods that are presently being used to give effect to the NWA. The early nineties was an important era in water management in South Africa, in that engineers and scientists, particularly ecologists, learned to trust each other and to work together in a way that even today is not often seen elsewhere in the world. Had these personal relationships not existed, I doubt that the 1998 NWA would have been the highly innovative legislation that it is.

A democratic government was elected in South Africa in 1994, heralding an era of new legislation and leading to the publication (South Africa, 1996) of a series of principles on

which proposed new water management legislation would be based. The resulting new *National Water Act* (Act 38 of 1998) was the first in the world to provide legal protection for “water resources” (rivers, wetlands, estuaries and ground water). Absolute water rights exist only for a) basic human needs (presently 25 litres per person per day) and b) for aquatic ecosystems: the law requires that a suitable quantity and quality of water be allocated for the sustainable maintenance of aquatic ecosystems. (Other clauses provide for issues such as management of water resources by catchment - i.e., drainage basin - but these are not directly relevant here.)

Giving Effect to the *National Water Act*

The quantification of the “reserve” (that amount of water, of appropriate quality, required to protect aquatic ecosystems in order to secure “ecologically sustainable development and use of the relevant water resource”) is no simple matter and the methods that are presently used have taken many years to develop. Details can be viewed on the DWAF website at www.dwaf.gov.za/rdm.

In brief, the following aspects need to be taken into account when quantifying the Reserve for a river.

Firstly, the Management Class of “the resource” (the section of river under consideration) needs to be ascertained. Classes range from A (near-pristine) to F (badly degraded). The intention is that some rivers that are presently in a near-pristine condition (Class A and perhaps B) should be kept that way (and thus contribute significantly to biodiversity conservation) while others (classes C and D) are “hard-working” rivers in which biodiversity issues are less important. Rivers in classes E and F must be rehabilitated to at least a Class D. Obviously it will take more water, and of higher quality, to maintain a river as Class A or B than C or D. A very detailed handbook of methods for ascertaining the class of a river has recently been produced by DWAF and is available on their website.

Depending on the Management Class, and on whether the river is of particular significance in some respect, a decision is then made as to whether the “Reserve-determination” process should be “Rapid”, “Intermediate” or “Comprehensive”. A Rapid process is, as the name suggests, a short, desktop study. It is inexpensive to undertake but the confidence that can be placed in the results is low. A Comprehensive process can take many months and requires the collection of a great deal of information. Confidence in the results will, obviously, be as high as one can achieve within the limits of the process.

A suite of methods is then used to assess aspects of the hydrology and hydraulics, the water chemistry, the geomorphology, and the biota of the system relative to reference conditions (see the River Health Programme below). Note is taken of special features such as scientific and cultural value and conservation value. Together these are used as input for estimating the quantities and quality of water that will be needed for maintaining habitat (depth and area), supporting the biota (including riparian vegetation) and sustaining people, especially subsistence farmers and villagers, dwelling close to the river. Usually a series of different scenarios is presented and examined. Local stakeholders are involved at various stages of the proceedings. While functional, a major drawback of the present process is that few of the methods for assessing the biophysical environment have been validated and a standardized system is not yet in place. The lack of rigorous testing of methods leaves the entire process open to legal challenge.

Ultimately “the Reserve” is calculated. For water quantity, the appropriate discharge at

particular points in the river is specified, usually month by month, to take into account seasonal differences in the hydrograph. Flood releases - for example, a higher-than-‘normal’ discharge for a certain number of days every other year, to simulate 1:2-year flood events - are also recommended. Water quality ranges are also recommended for the major chemical constituents and physical attributes of the system.

Finally, calculations are made of the amount of water already allocated to users and new licenses are granted if there is any “spare” water (i.e., over and above the amount already allocated, plus the Reserve) in the system.

When the water allocations are in place, a monitoring process should be (but seldom is) put in place to provide feedback on the effects of the recommendations on the ecosystem and its biota. It should be emphasised that we do not have nearly enough information on the functioning or the biodiversity of our systems to place much confidence in our recommendations. For this reason it is crucial that detailed monitoring is carried out to provide this information. It is equally important that a feedback system is in place so that results of the monitoring programme can be used to amend the values originally recommended. Note that the River Health Programme surveys (see below) do not always coincide with sites for Reserve determination, so the two are not necessarily complementary.

Implementation of the National Water Act

Rivers

‘Reserve determinations’ have already been completed for numerous rivers and licences are being granted - or refused - for allocation of water from those rivers. Details will be available in an audit report presently being completed by Dana Grobler as part of a GEF-funded project designed to facilitate implementation of biodiversity-related aspects of the NWA in the Cape Floristic realm (Grobler, 2007). The process of completing reserve determinations and granting licences is slow, for reasons listed below, but progress has been made.

The Berg River Project

A new dam has very recently (mid-2007) has been constructed on the upper Berg River in the South-west of South Africa. This is the only large dam to be built in South Africa in the last few years, and off take towers have been designed to allow flood releases far in excess of those required for operational purposes but necessary for channel-scouring flood releases. Indeed, the cost of construction has been increased by several million US dollars by provision of off take towers large enough to simulate 1-in-2-year floods. What is more, the water required for a single flood of this magnitude is presently worth about US\$2 million. In addition, the river below the dam has been closely monitored since the pre-construction phase, which should provide very useful information on the effects of construction and of reduced discharges on the river below the dam. Such actions show that the provisions of the *National Water Act* are being taken seriously.

The River Health Programme (RHP)

Monitoring aquatic ecosystem ‘health’ is a requirement in terms of the NWA and results are also fed into the *National Environmental Management Act* (NEMA) of 1998. The River Health Programme assesses the biological and habitat integrity of rivers by evaluating the state of water quality, the physical habitat, riparian vegetation, and invertebrate and fish assemblages. Information from the RHP assists in identifying rivers in unacceptably poor condition, as well as, for instance, the effectiveness of the Reserve. Implementation of the

RHP is now countrywide but coverage is still patchy. While the programme has huge strengths, it is unlikely that any river will be assessed more often than once in five years. No equivalent programme has yet been implemented for wetlands. The website for the River Health Programme is presently www.csir.co.za/rhp.

Estuaries

Some of the first “IFR” work attempted to quantify water requirements of estuaries in various parts of the country. “Reserve determination” methods are now well developed for estuaries and management plans are presently being developed for six estuaries in the CFR as part of the GEF-funded CAPE programme.

Wetlands

Although Reserve estimations have been completed for several large wetland systems, the methods are not as well developed as they are for rivers or estuaries, mostly because South African wetlands have been little studied. South African wetlands are also far more diverse than rivers are and a proposed wetland classification system is presently being evaluated on the ground. Furthermore, because of the rapid aging of wetlands, and the fact that human activities can accelerate the process, it is difficult to identify reference wetlands (or even reference conditions for a particular type of wetland) and to decide on the target condition for a managed wetland. It is also quite possible for two adjacent wetlands to be of different age and condition and therefore to require different management approaches. Completion of a coherent suite of methods for estimating the Reserve for wetlands remains a challenge.

In my lab, we are currently developing a series of metrics and indices for rapid assessment of various aspects of wetlands. These include IBIs (indices of biotic integrity) using invertebrates, plants and diatoms; indices of sustainability of use of wetlands resources and of dependency of subsistence users; and indices of landscape-level impacts such as the effects of cumulative loss of functional wetlands.

Details can be found at <http://web.uct.ac.za/depts/zoology/fru/wetlands/whirp.ppt>.

Challenges to Aquatic Biodiversity Conservation in South Africa

Challenges related to further implementation of the National Water Act

In theory, the South Africa legislation should result in well-protected ecosystems and a concomitant protection of biodiversity and in some cases this is happening - see the comments above on the Berg River Dam. In many respects, though, and although the NWA was promulgated nearly ten years ago, implementation is far from complete, for a number of reasons that vary from political to technical. Some of these reasons are outlined below:

- The political will to implement the legislation is no more than half-hearted. The populist government is attempting to deal with conflicting requirements of population pressure, economics, aridity and climate change, other priorities such as the HIV epidemic, poverty relief and subsistence issues. Few politicians see beyond these existing pressures to the issue of long-term environmental sustainability and the concomitant conservation of biodiversity. The financial implications of implementing the Reserve are, understandably, also an impediment in a country with so many other calls on the treasury. This attitude extends to some senior civil servants in the relevant departments. Consequences include a lack of urgency in implementing aspects of the

NWA and also a reluctance to police the use of water and to prosecute offenders.

- South Africa has suffered from ‘brain drain’ for decades, resulting in a lack of technologically trained personnel in all fields; the water sector is no exception. In addition, the vast majority of the population has had inadequate schooling at both secondary and tertiary level. This means that the skills even of supposedly qualified technicians and engineers are often inadequate to meet the challenges of developing and implementing new technologies. As a consequence, management happens very slowly and there are not enough people to develop and implement the methods needed for estimating the Reserve.
- The Act requires that a certain system-specific amount and quality of water is ‘reserved’ to provide for sustainability of each river, wetland and groundwater systems in the country. As mentioned above, rigorously tested methods are not yet available for estimating the amount of water required by a single river, let alone by different kinds of rivers and wetlands, across different ecoregions and climatic zones, and subject to different anthropogenic influences. In short, the methods required are many and complex, and have still not been entirely developed or validated.
- Whatever their shortcomings, methods are available for estimating the Reserve with respect to perennial rivers, as well as wetlands, estuaries and aquifers but we are seriously lacking even in an approach to estimating water needs of non-perennial rivers.
- The Act as it stands is most useful for protecting biodiversity in aquatic ecosystems that are close to the natural state. Part of the Act requires that each separate ‘resource’ (ecosystem) be categorized with regard to the extent of impairment - i.e., the degree of departure from some natural condition. It is much harder (and needs far more stringent requirements) to maintain a system in a ‘close to pristine’ condition than merely in ‘some functional state’ but managers must take account of the biodiversity in near-pristine systems, while this may not be required of merely ‘functioning’ rivers. This becomes significant particularly for conservation of lower rivers, almost all of which have already been significantly impacted by human activities.

Wider issues

- While the national legislation is quite clear in its intention, the relationships between and lines of responsibility of institutions at the three levels of government (national, provincial and local) are tangled. Until clear lines of responsibility and authority are drawn, conservation of aquatic biodiversity will not take centre-stage.
- Although the Department of Environmental Affairs and Tourism has the mandate to manage aquatic ecosystems in the same way that it manages other ecosystems, at present, and by default, the Department of Water Affairs and Forestry has more or less taken responsibility for all aspects of management of aquatic ecosystems, including (tacitly) biodiversity conservation. The relationship between DWAF and DEAT is uneasy and South Africa has no equivalent of an Environmental Protection Agency (in the sense of an environmental ombudsman).
- Throughout the world, formal conservation is still based almost exclusively on terrestrial goals and targets, conservationists assuming that these are adequate surrogates for conservation of rivers and wetlands. This is clearly not the case but approaches to conservation of aquatic ecosystems *per se* are still underdeveloped.

Conclusions

Despite the difficulties mentioned above, the groundwork has been done and aspects of the *National Water Act* are being used in cases where water is already over-allocated, or to force polluters to purify their effluents on site. Other positive developments are under way. For instance, the term 'IWRM' (integrated water resource management) is being used more and more and is becoming part of the water manager's worldview, not only in South Africa but also in other southern African countries such as Zimbabwe, Botswana, Tanzania and Namibia. Catchment management is more than a catchphrase and South Africa is implementing another part of the NWA, which requires that water resources are managed at the catchment level.

At provincial level, 'CAPE' (Cape Action for People and the Environment) is a large GEF-funded programme aimed at assisting in the conservation of biodiversity in the Cape Floristic Region (CFR), the smallest of the world's six floral kingdoms. Area for area, the aquatic invertebrates of the CFR are more diverse even than the terrestrial plants (Wishart and Day, 2002), making it an aquatic biodiversity Hotspot (WWF, 2005). Our Freshwater Research Unit is involved in a CAPE-funded project aimed at steering the mainstreaming of biodiversity in the CFR's fresh waters.

References

- Department of Water Affairs.** 1986. Management of the water resources of the Republic of South Africa. CP Book Printers for Government Printer, Pretoria.
- Grobler, D.F.** 2007. Draft Ecological Reserve Determination and implementation audit for the Cape Floristic Region. Report to the South African Department of Water Affairs and Forestry, Pretoria.
- Heeg, J. and C.M. Breen.** 1982. Man and the Pongolo floodplain. South African National Scientific Programmes. Report 56. Council for Scientific and Industrial Research, Pretoria. 117 p.
- King, J.M., R.E. Tharme and M.S. de Villiers (eds).** 2000. Environmental flow assessments for rivers: manual for the building-block methodology. Water Research Commission Report TT 131/00, 339 p.
- Roberts, C.P.R.** 1981. Environmental considerations of water projects. Department of Water Affairs Technical Report 114. Government Printer, Pretoria.
- South Africa.** 1996. Fundamental principles and objectives for a new water law for South Africa. Government Printer, Pretoria.
- Walmsley, R. D.** 1989. Water for environmental management: an overview. Fourth South African National Hydrological Symposium, Pretoria, p: 432–447.
- Wishart, M.J. and J.A. Day.** 2002. Endemism in the freshwater fauna of the south-western Cape, South Africa. *Verhandlungen, internationale Vereinigung für theoretische und angewandte Limnologie*, **28**: 1752–1756.
- World Wildlife Fund.** 2005. Freshwater ecoregions of Africa and Madagascar. Island Press, Washington, D.C.

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CHAPTER 14

MAINSTREAMING WETLANDS CONSERVATION IN PAKISTAN

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Abstract

The Pakistan Wetlands Programme (PWP) is an initiative of the Federal Ministry of Environment, and is being funded by a consortium of donors including the Global Environment Facility (GEF), the Royal Netherlands Embassy (RNE), the United Nations Development Programme (UNDP), the Pakistan Poverty Alleviation Fund (PPAF), and the World Wide Fund for Nature (WWF) Network. The mainstreaming strategy of the PWP for integrating wetlands conservation considerations into the agenda and the mandate of partner organisations, is based on the following elements: the creation of an institutional framework; the establishment of partnership agreements; the development of GIS, database management and resource-use planning tools; training and capacity building; policy development; on awareness and communication activities. After two years of mainstreaming experience, the PWP concludes that mainstreaming has enhanced the interest of partner organisations and stakeholders in investing and contributing towards achievement of the objectives of the Pakistan Wetlands Programme through sustainable actions of their own.

Keywords: Pakistan Wetlands Programme, mainstreaming wetland conservation

Introduction

Pakistan

Pakistan, located in South Asia between the 23.6° N to 37.0° N at 13.4° latitude, has a tremendous cultural, geographic, and ecological diversity. The country, with a 1000 kilometre crow fly stretch, rises from sea level in the south to the world's second highest peak, K2, in the north with an elevation of 8611m. At the confluence of three zoogeographic regions, the country demonstrates a rich biodiversity in its ecology and associated fauna. This diversity includes wetlands that occur from the coastal wetlands in the south to the high altitude lakes in the north. The Pakistan Wetlands Programme estimates that more than 225 wetlands in Pakistan are of global significance; and that all of them are influenced by anthropogenic factors. Many of these wetlands are under tremendous pressure that has threatened their ecological characteristics and functions. The Pakistan Wetlands Programme, an initiative of the Federal Ministry of Environment, is mandated to conserve the globally significant wetlands of Pakistan and to address poverty alleviation in its local communities.

Pakistan Wetlands Programme

The Pakistan Wetlands Programme (PWP), with an estimated cost of 11,792 million US dollars, is an initiative of the Federal Ministry of Environment, and is being funded by a consortium of donors including the Global Environment Facility (GEF), the Royal Netherlands Embassy (RNE), the United Nations Development Programme (UNDP), the Pakistan Poverty Alleviation Fund (PPAF), and the World Wide Fund for Nature (WWF) Network. The UNDP Pakistan is the implementing partner for the GEF. The Federal Ministry of Environment is the implementing partner for the UNDP and the World Wide Fund for Nature Pakistan is the implementing agency on behalf of Pakistan's Federal Ministry of Environment. The goal of the PWP is to conserve Pakistan's wetlands of global significance

while also alleviating poverty. This programme will achieve its goal through the following two objectives:

- Create and maintain an enabling environment for effective and sustainable conservation of natural wetlands at federal, provincial/territorial and local levels.
- Implement sustainable wetlands conservation at four representative sites that will serve as replicable models for subsequent nationwide wetlands conservation initiatives.

To achieve the first objective, there is a provision for developing a national-level Wetlands Conservation Strategy. This strategy will consist of a national level policy framework integrating community-based conservation and will promote mainstreaming of wetlands conservation in development planning process and in cross-sectoral initiatives. Implementation of this approach will be modelled through establishment of Interim Wetlands Management Committees to achieve the second objective of the programme.

The case of freshwater turtles – an example of mainstreaming

Reports of mass killings of freshwater turtles by fishermen along the Indus River prompted the Pakistan Wetlands Programme (PWP) to commission a research investigation on the subject. Study findings revealed an on-going well-organized trade in freshwater turtle parts, which involved mass killing of three species of soft-shelled turtles. After the killing, the turtle parts are exported to China and other far-eastern countries. A review of wildlife laws confirmed that no laws are covering freshwater turtles. WWF Pakistan initiated efforts to inform the wide range of stakeholders involved and to promote conservation actions to save the freshwater turtles of Pakistan from vanishing.

The PWP motivated the Ministry of Environment to writing to Provincial Wildlife Departments demanding a strict and immediate action on this topic. Two of the Provincial Wildlife Departments responded; they amended their laws and launched a crack down on poachers of freshwater turtles. The Customs Department also got sensitized and was able to confiscate, at Karachi Airport, a consignment of about 300 kilograms of turtle parts mislabelled as dried fish skin. The Pakistan Wetlands Programme has started negotiations with local communities and line departments to incite them in playing a role in the conservation of freshwater turtles in Pakistan.

Strategy for Mainstreaming Wetlands Conservation

The strategy of the Pakistan Wetlands Programme (PWP) for integrating wetlands conservation considerations into the agenda of partner organisations and for generating an interest for other organisations to include it in their mandate is based on the following:

Creation of an institutional framework

Programme Steering Committee: At the national level, the PWP has established a Programme Steering Committee that meets periodically to review progress of the programme and approve work plans. This Committee provides over all policy guidelines to the programme for ensuring smooth and effective functioning. Membership on the committee includes key government organizations at the national level and key non-governmental organisations.

Interim Wetlands Management committees: At the regional level, the PWP has established Interim Wetland Management committees (IWMCs). The IWMCs steer functions of the regional wetlands complexes, review its progress and provides inputs into the annual work

planning progress. Membership of the IWMCs includes representatives from provincial line departments, and governmental and non-governmental development organisations.

Partnership agreements

The Pakistan Wetlands Programme (PWP) has based its outreach in the regions on establishing partnerships with custodian departments and educational institutions. The PWP has signed partnership agreements with NWFP Wildlife Department and Quid-e-Azam University. The partnership with the NWFP Wildlife Department mandates the allocation of human resources and provision of support for the conservation wetlands in the Department. The Quaid-e-Azam University will include a course on wetlands management in their curriculum under the partnership agreement with the PWP.

At local level, the PWP has signed a partnership agreement with Chiantar Welfare Organisation, a local community based non-governmental organisation. Collaboration between the PWP and the Organisation has enabled the PWP to meet the challenge of conserving high alpine wetlands in a remote and isolated region such as Yar Khun Valley, which remains inaccessible for around half of the year.

The PWP is also considering signing such partnership agreements with governmental and non-governmental organisations in other provinces and regions of the country, e.g., with the Northern Areas Forests and Wildlife Department, the Balochistan Forest Department, the Sindh Wildlife Department and the Azad Kashmir Wildlife and Parks Department.

Data base development and resource-use planning

The PWP has established a GIS laboratory at the National Council for Conservation of Wildlife (NCCW). This will serve as a national repository for spatial data on wetlands. The GIS laboratory has enabled the NCCW to work as a focal point for wetlands database management. The PWP plans to build and strengthen the capacity of the provincial and regional partners in data collection, and for GIS mapping and its use in wetlands resource-use planning.

Policy development

The PWP has the mandate to develop a National Wetlands Conservation Strategy. To benefit from the expertise of organisations having experience in the similar work, the PWP assigned the task to IUCN Pakistan. The IUCN previously developed National Conservation Strategy for Pakistan, as well as several provincial conservation strategies. This partnership was not only aimed at benefiting from the expertise of IUCN Pakistan, but has achieved to draw attention of the organisation to wetlands conservation and bringing them closer for collaboration and partnership on many other conservation issues.

Training and capacity building

One focus of the PWP is to build capacity in several organisations including governmental, non-governmental and military organisations. There are many significant wetlands that are under the control of Pakistan Military. To draw their attention to conservation of wetlands and associated biodiversity, the PWP is working on the following:

- Creation of a course on wetlands in the training modules of key military training institutes

- Creation of wetlands protected areas under joint management of custodian civil departments and control military organisation
- Holding short courses and seminars on wetlands conservation issues for military officials

Awareness raising and communication

The PWP conducts awareness-raising events on partnership development while informing key partners on the benefit of conserving wetlands in Pakistan. These events had tremendous successes in the past two years of the programme. The PWP has also celebrated international days, such as the World Wetlands Day, Environment Day, and Earth Day. The Capital Development Authority (CDA) in Islamabad has not only requested a partnership with the Pakistan Wetlands Programme but has provided funds for World Wetlands Day 2008 celebrations. In addition, CDA plans to establish a wetlands conservation programme for the wetlands located in the capital territory.

Components of the PWP's Mainstreaming Strategy

The Pakistan Wetlands Programme (PWP) mainstreaming of the Wetlands Conservation Strategy is aimed at the following three components:

- Institutional mainstreaming: This is achieved through the Programme Steering Committee (PSC), Interim Wetlands Management Committees (IWMCs), and partnership agreements at provincial and local levels.
- Financial/budget mainstreaming: This is achieved through collaborative work under partnership agreements. The partnerships with the Capital Development Authority (CDA), the NWFP Wildlife Department, and the Pakistan Forest Institute serve the purpose of this type of mainstreaming.
- Policy/legal mainstreaming: The case of freshwater turtles reflects this type of mainstreaming, where research conducted by the PWP has resulted in amendments in the laws of two provinces, i.e., North West Frontier Province and Punjab to declare freshwater turtles as protected animals.

Conclusion

Mainstreaming of Pakistan Wetlands Programme

In light of the two years of mainstreaming experience, the Pakistan Wetlands Programme summarise it as: *“Mainstreaming is enhancing interest of partner organisations and stakeholders to invest and contribute towards achievement of the objectives of Pakistan Wetlands Programme through sustainable actions on their own.”*

Next steps and the way forward

The Pakistan Wetlands Programme aims at creating the National Wetlands Conservation Council, and transforming the Interim Wetlands Management committees to Provincial Wetlands Management committees by the fifth year of the programme. The programme also aims at establishing replicable models of wetlands management planning and at establishing wetlands conservancies by the year fifth of the programme for replication in other areas. In addition, the programme looks forward to developing and implementing the Wetland Conservation Strategy and developing a national policy on wetlands.

CHAPTER 15

JOINT MANGROVE MANAGEMENT IN ANDHRA PRADESH, INDIA

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Abstract

Participatory management of natural resources in the developing countries gained greater importance in recent years. The M. S. Swaminathan Research Foundation (MSSRF) which is similar to Joint Forest Management of India implemented community participation in mangrove conservation and management program in Godavari and Krishna mangroves of Andhra Pradesh. The program involved multiple stakeholders, i.e., the state forest department, community-based organizations (village-level institutions), and the non-governmental organizations MSSRF, in the management and conservation of mangroves. Village level institutions were formed and strengthened by enhancing leadership skills. Participatory rural appraisal (PRA) and other participatory tools were used to identify the status of the resources, their utilization pattern and the issues related to mangrove conservation and management. The degraded mangroves identified through remote sensing imageries were restored using nursery raised mangrove saplings. The causes of degradation were studied and the degraded mangroves were restored by mangrove plantation. Apart from restoration of degraded mangroves, the socio-economic situation of the mangrove-dependent community was addressed through resource-based income-generating activities and alternatives for mangroves. An area of about 520 ha of degraded mangroves was restored using scientific understanding of the mangrove ecosystem. An area of 9,442 ha of mangroves were brought under the joint management of the eight village-level institutions (VLIs) formed by the project. This paper describes the experience of participatory mangrove management in the Godavari and Krishna mangrove wetlands of Andhra Pradesh, India.

Key words: mangroves, Godavari, Krishna, village-level institutions, forest department, conservation and management, socio-economic development, joint mangrove management

Introduction

Mangroves consist of inter-tidal flora and fauna found in the tropical and subtropical regions of the world. Mangrove forests mostly occur along the estuarine areas, where there is a constant mix of sea and river water. Mangroves play both protective and productive roles for the coastal community. Mangroves in the mudflats along the coastline reduce the impact of cyclones and tidal waves entering the mainland. The mangrove wetlands serve as spawning and nursery grounds for many economically important finfish and shellfish (FAO, 1994). They prevent soil erosion and stabilize the coastline and also help in land building process by trapping sediments and suspended solids. Mangrove forests harbour many endangered fauna including salt-water crocodile, tiger and many resident and migratory birds. Mangrove wetlands play an important role in enhancing the fishery production of the adjacent neritic waters by exporting organic and inorganic nutrients (Alongi *et al.*, 1992). The mangrove plants are able to survive in the saline water environment through unique adaptations such as stilt roots, viviparous seeds, salt glands, salt-excluding mechanism, leathery leaves with thick cuticle and pneumatophores (Ramasubramanian *et al.*, 2003).

In India, out of 487,100 ha of mangrove wetlands nearly 56.7% (275,800 ha) of mangroves are located along the east coast, 23.5% (114,700 ha) along the west coast, and the remaining 19.8% (96,600 ha) is found in the Andaman and Nicobar islands. The extent and species

diversity of mangrove wetlands in the east coast of India are more than the west coast due to the large number of east flowing rivers characterized by the presence of larger brackish water-bodies and a complex network of tidal creeks and canals (Selvam, 2003).

Mangroves ecosystems are undergoing wide spread degradation due to variety of human induced stresses and factors such as changes in water quality, soil salinity, diversion of river water, sedimentation and conversion of mangroves to other land-uses practices like agriculture, aquaculture and industrialization (Uma Maheswara Rao and Narasimha Rao, 1988; Ravishankar *et al.*, 2004). Apart from these factors, mangroves are also degraded due geo-morphological (topographic changes) and hydrological changes. Indiscriminate use of mangrove resources and clear felling of mangrove forests for catering the fire wood requirement earlier were also responsible for the present degraded status. Collection of fish, prawns, crabs and mollusks is the major fishing activity apart from the collection of prawn juveniles for aquaculture (Primavera, 1993).

The multiple benefits conferred by mangrove forests are varied. However, the benefits provided by mangroves are largely ignored and unsustainable exploitation is continued for short-term human benefits. To address these issues, a project on mangrove conservation and management is implemented by the M.S. Swaminathan Research Foundation along the coasts of Tamil Nadu, Andhra Pradesh and Orissa with the support of the India Canada Environment Facility in New Delhi. The project activities are implemented through the village-level institutions jointly with the forest department similar to Joint Forest management. The activities include developing alternatives for mangroves, alternative income-generation activities, restoration of degraded mangroves and conservation and management of mangroves through participatory process.

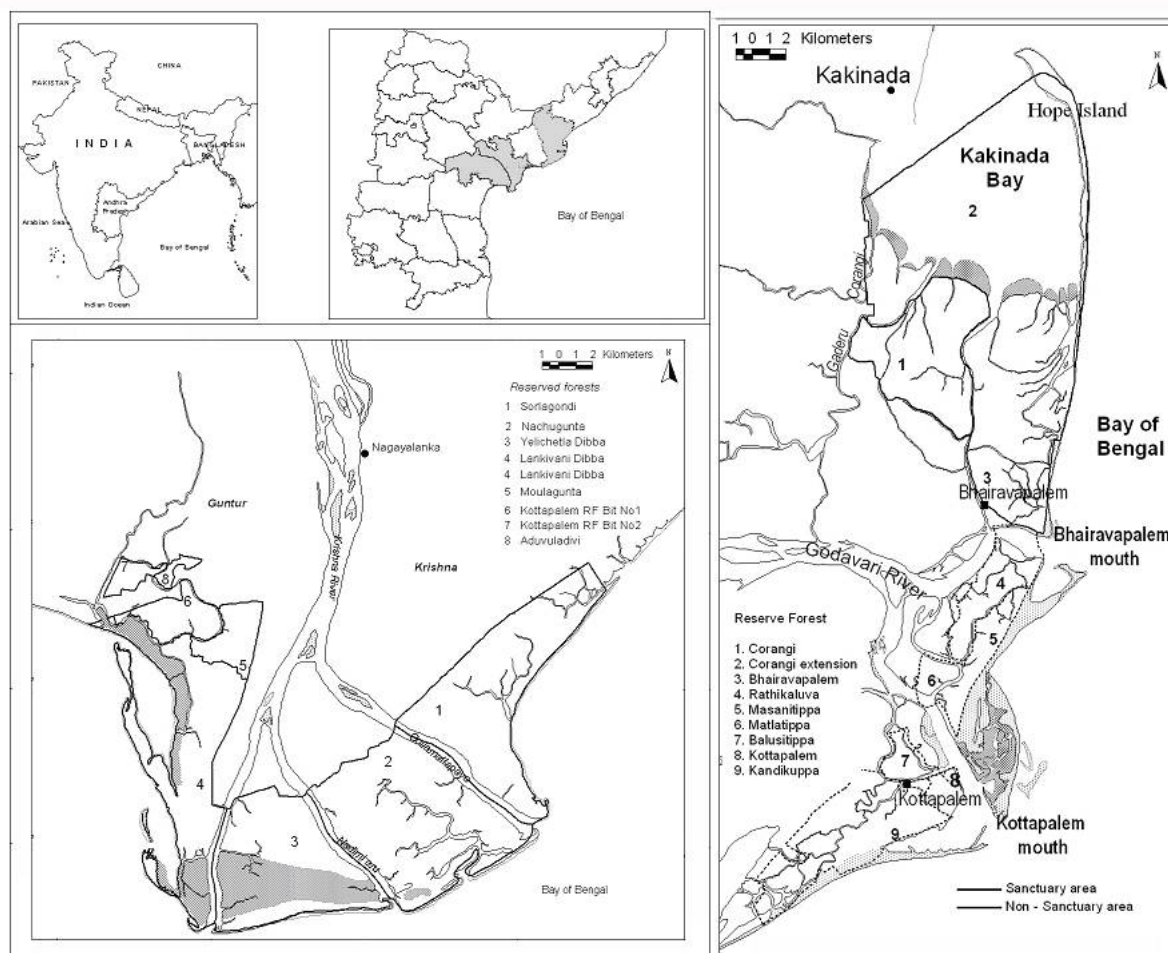
Study Area

The Godavari and Krishna wetlands in Andhra Pradesh are located in the deltaic regions between 16° 30' - 17° N and 82° 23' E in the East Godavari district and between 15° 42' - 15° 55' N and 80° 42' - 81° 01'E in Krishna and Guntur Districts respectively (Figure 1). The total area of the two wetlands is 58,263.1 ha of which 33,263.32 ha are in Godavari delta and 24,999.47 ha are in the Krishna delta (Rajesh Mittal, 1993). The Godavari and Krishna Rivers bring copious fresh water into the mangroves during the southwest monsoon and a smaller quantity during the northeast monsoon.

In the Godavari mangrove wetland, the Coringa wild life sanctuary, occupies the northern side of the delta. Two distributaries, namely Corangi and Gaderu branching-off from the northern side of the river Gautami-Godavari, supply freshwater to the Coringa mangroves. Apart from these two distributaries, a number of small creeks and canals are interconnected and form a network of canals supplying tidal water into the mangroves. The River Godavari branches into Vasishta and Gautami near Dowleswaram, which is considered as the head of the delta. Freshwater flows into the mangrove wetlands of the Godavari during nearly six months of the year and the peak flow normally occurs during July to September, coinciding with the southwest monsoon season. During this period the river Godavari brings flood water and the entire mangrove wetland is submerged under freshwater. The salinity levels at many places are between 0 and 5 parts per thousand (Ganapathi and Rama Sarma, 1964). The salinity levels starts increasing from October to February and it reaches its maximum level during summer (March to May) when there is no freshwater discharge into the mangrove wetland. It has been recorded that the river Godavari has changed its course towards the south in recent years and as a result, the amount of freshwater reaching the Coringa mangroves is reduced,

affecting the growth and distribution of less saline-tolerant mangrove species (Uma Maheswara Rao, and Narasimha Rao, 1988). The drainage basin of the river Godavari occupies an area of $3.1 \times 10^5 \text{ km}^2$ and the mean annual discharge is 1.05×10^{14} liters (Alongi *et al.*, 1992).

Figure1 Study Area



The extent of the Coringa wildlife sanctuary is about 23,570 ha. It has three Reserve Forests namely Corangi, Corangi Extension and Bhairavapalem. Most of the mangrove area in the sanctuary is not directly connected with the Bay of Bengal, but through Kakinada Bay located in the northern part of the Godavari estuary. It has a long sand spit of about 18 km in the eastern side, which separates the Bay from the Bay of Bengal. This sand spit is protecting the mangroves from high-energy waves. This bay is shallow, about 2 m in depth and, during low tide, large mud flat areas in the southern side are exposed. By measuring the growth of the sand spit with a map drafted in 1789, it is estimated that, in the past, the mangrove was at about 6 km inside the present shoreline (Selvam *et al.*, 2003). This is an indication of an expansion of the mangrove into the sea, a characteristic feature of the river-dominated mangrove wetland (Thom, 1984). Apart from the sanctuary, mangroves are also distributed in six other reserve forests in the southern side of the Nilarevu Godavari River. They are Rathikalava, Masanitippa, Matlatippa, Balusutippa, Kothapalem and Kandikuppa Reserve forests. The climate in this region is sub-humid and mean annual rainfall varies between 1200

and 1300 mm. The dry season extends for about six months, from December to May. The mean sea level in Godavari mangrove wetland is about 0.87 m and the maximum high tide water level is 1.54 m and minimum low tide water level is 0.20 m (Upadhyay, 1988).

The Krishna delta is the seaward-extended land mass created by alluvial deposit of the river Krishna. The Krishna wildlife sanctuary is a part of Krishna mangrove wetland – the total area of this sanctuary is 19,481 ha (Sorlagondi Reserve Forest (RF), Nachugunta RF, Yelichetladibba RF, Kottapalem RF, Molagunta RF, Adavuladivi RF and Lankivanidibba RF). Geomorphologically, the Krishna delta comprises bays, tidal creeks, extensive tidal mudflats, spits and sand bars (Space Application Centre, 1992). Two distributaries, namely Gollamattapaya and Nadimeru and the main Krishna River flows southward and joins the sea near a point called False Divi Point (Varadarajulu *et al.*, 1985). Mangroves are abundant in three islands located between the Gollamattapaya and Nadimeru distributaries and the River Krishna. The total area of the drainage basin of the river Krishna is about of $2.6 \times 10^5 \text{ km}^2$ and the mean annual discharge is 6.0×10^{13} liters (Sarin *et al.*, 1985).

As in the case of river Godavari mangroves, the mangrove wetland of the Krishna delta also receives freshwater for about six months but the quantum is low when compared to the Godavari. This reduced inflow is due to construction of many dams across the Krishna River upstream. The salinity level in the Krishna mangroves is always high, since evaporation in the Krishna River is 15 % more than that in the Godavari (Sarin *et al.*, 1985). The mean tidal amplitude in the Krishna mangroves is only 90 cm. The maximum water level during the high tide is 1.10 m and the minimum water level during the low tide is 0.20 m.

Methodology

Joint mangrove management (JMM) is a participatory process involving different stakeholders (i.e., the Forest Department, NGO's and the primary stakeholders, the local community) in the management of the mangroves. Awareness campaigns, on the causes for the degradation of mangrove forest and the need for its restoration, were done in the demonstration villages using folk media, audio-visuals and through wall paintings. Entry point activities were carried out to develop a rapport with the community. The community is mobilized by organizing a village-level institution. These village-level institutions have equal representation of both men and women in the general body as well as in the executive body. One adult male and one adult female from each household are representing the general body that elects 15 members as an executive body. The forest department has formed the village-level institutions in all adjoining villages. This project was implemented in five villages namely Matlapalem, Dindu, Bhairavalanka, Gadimogga and Kobbarichettupeta in Godavari Mangroves in East Godavari and in three villages namely Dheenadayalapuram, Zinkapalem and Nali in Krishna mangroves. Participatory rural appraisal (PRA) was conducted in all the villages to identify the availability of mangrove resources and to determine their status and utilization pattern. The causes of mangrove degradation, the selection of species and the dimensions of the canal were discussed with the community. The issues identified in the PRA were prioritized and then village microplans were prepared with budget estimates for implementing the project activities. The microplan budget was deposited in a joint account. The chairperson of the village-level institution and representatives of the Forest department and the NGO – MSSRF, were the 3 members responsible for operating the bank account. The money was drawn based on the resolutions and with the signatures of all three members. The funds deposited in the joint account were used only for project activities. The expenditure for project activities was discussed at the executive committee and at the general body meetings. The degraded areas were identified with the help of bio-physical surveys, satellite imageries

and through community interactions. Community members, both men and women, were trained in mangrove nursery, canal alignment, canal digging and planting of mangrove saplings.

Results

Mangroves and resource utilization pattern

In the Godavari delta, a population of about 79,400 (10,261 households) living in 39 villages uses the mangrove resources. Similarly in Krishna, a population of about 31,605 (6,360 households) living in 28 villages utilizes the mangrove resources. These villages not only depend on mangrove for their livelihood but also use the mangrove resources for fodder, fencing materials, timber for house construction and fuel wood. Mangroves play an important role in coastal fisheries production. The mangrove areas are rich in crustacean, mollusk and finfish resources. The marine fisheries production in the East Godavari district was 19,796 tons and 23,530 tons during 1998-99 and 1999-2000 respectively (Source: Commissioner of Fisheries, Andhra Pradesh), accounting for 36% of the total production of Andhra Pradesh.

Kakinada Bay is rich in bivalve resources such as *Anadara granosa*, *Placenta placenta* and *Meretrix meretrix* and gastropods such as *Telescopium* and *Cerethidium* species. Shells collected from the area are used for making lime and in ornaments. About 100 families depend on this resource. Prawns and crabs constitute a higher percentage of the fish catch near mangroves (about 25% more) than in non-mangrove areas, where the percentage is between 9 and 15 %. In the Krishna and Godavari mangroves, there are about 35 mangrove species in which 17 are exclusive to mangrove. *Avicennia marina* and *Excoecaria agallocha* are the dominant species. An endangered mangrove species, *Scyphiphora hydrophyllacea* is present in the Godavari mangroves. *Porteresia coarctata* is used as fodder and *Myriostachya wightiana* is used as thatching material. The leaves and twigs of *Avicennia marina* and *A. officinalis* are used as a fodder. The farming community living near the mangroves uses the mangrove forest for grazing their feral cattle. They are semi-domesticated buffaloes, which graze in the forest for most of the year. The farmers go to the forest to fetch milk while at the same time, bring freshwater from their villages for the animals. The bark of *Ceriops decandra* is used for coloring the fishing nets. The mangroves adjoining the private and revenue lands were converted for aquaculture in the late 1980s. In the past, some mangroves were used for food and medicine. It is not done anymore.

Restoration of degraded mangroves

The restoration of degraded mangroves was carried out through the village level institutions. These demonstration villages have mangrove management area based on their traditional right. An area of 520 ha of degraded mangrove was restored using the canal method in the Godavari and Krishna mangroves. The canals were designed in a trapezoidal shape with an angle of 45 degrees to facilitate free flow of tidal water. The tidal water enters through the canals during the high tide and recedes during the low tide. Of the 520 ha, 165 ha was restored in the Godavari mangroves (Table 1), the rest in the Krishna mangroves. Initially in some of the fishermen villages, villagers did not know how to do mangrove restoration work. Training was given to them with the participation of villagers from *Chollangipeta* who had experience in restoration work. Similarly training for nursery activities was provided to the community and community nurseries were established. The saplings were procured from these nurseries and used for planting in the restored area. The involvement of community at all levels from planning to implementation stage has helped the community to own the project

and judiciously utilize the money. Although the forest department had also implemented a similar project, the necessary capacity building of the community had been lacking. Since the mangrove restoration work required intensive labour, the community members had numerous employment opportunities.

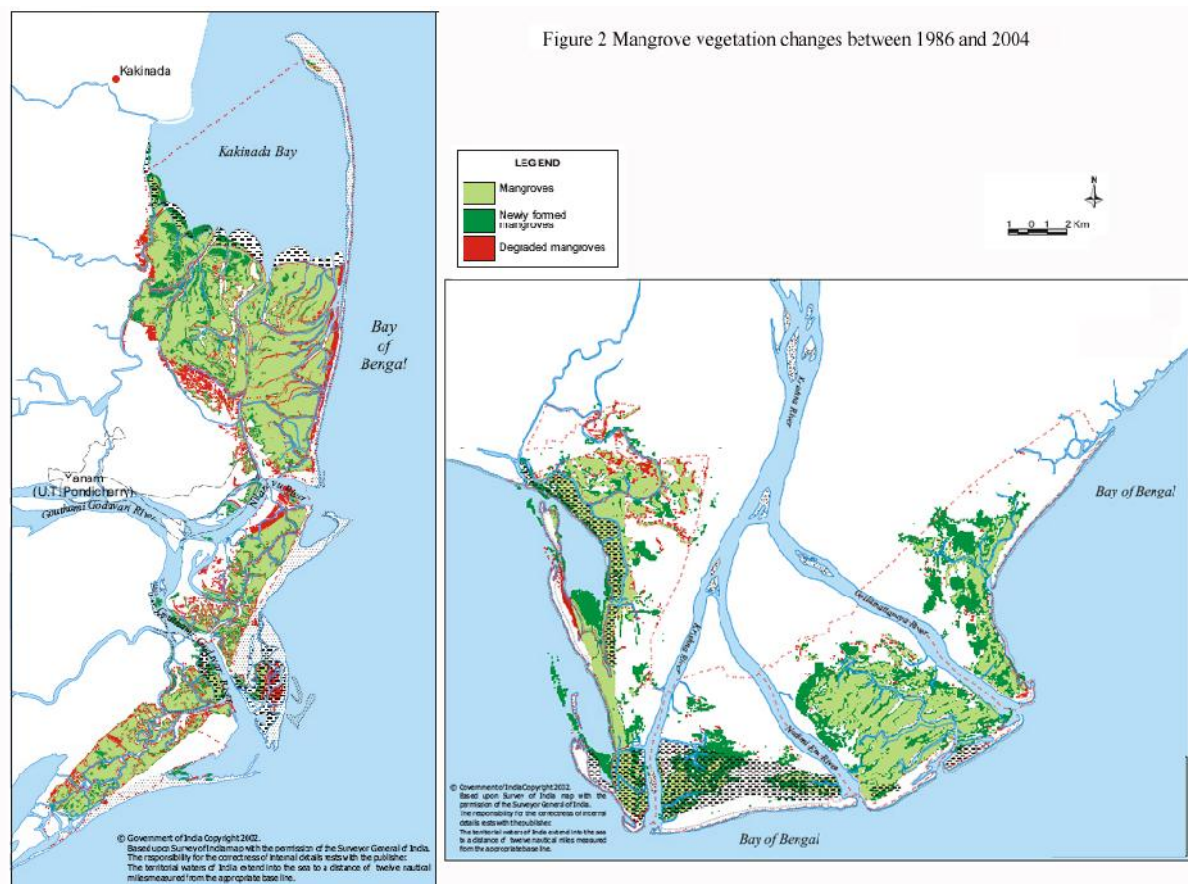
Table 1. Mangrove restoration in the demonstration villages

Name of village	Area restored (ha)	Area under MMU (ha)	No. of saplings planted (area planted in ha and % survival)	Year of planting
Godavari				
Matlapalem	5	502	4000 (5 ha and 80%)	1999
Dindu	25	900	4000 as causality replacement	2000 2001
Kobbarichettupeta	35	3925	28 000 (35 ha and 75%)	2000
Gadimoga	25	900	20 000 (25 ha and 70%)	2002
Bhairavalanka	75	615	4 000 (5ha and 80%) 28 000 (35 ha and (75%) 28 000 (35 ha and 60%)	1999 2000 2001
Krishna				
Deenadayalpuram	236	2000	11 200 (14 ha and 90%) 70 400 (88 ha and 80%) 11 200 (14 ha and 70%) 96 000 (120 ha and 60%)	1999 2001 2001 2002
Zinkapalem	114	600	91 200 (114 ha and 60%)	2002
Nali	5	-	4 000 (5 ha and 70%)	2002
Total	520	9442	368 000 (72%)	

Restoration of mangroves was carried out only in reserve forest areas in order to ensure better protection. The mangrove restoration increased healthy mangrove areas, but also prevented further degradation in adjoining degraded patches. Canals in the restored areas increased the water surface areas, which in turn increased the fishery resources. The mangroves are slow growing, especially in the restored areas. An assessment, using 2004 satellite data, revealed that vegetation is now covering the degraded area. Due to participatory mangrove conservation, natural regeneration is taking place as shown Figure 2. In addition to mangroves being planted, numerous mangrove saplings are being re-established naturally, crab population increased in the degraded area.

Mangrove alternatives to reduce pressure on the vegetation

Community wood lots were developed wherever possible to reduce the dependency on mangroves for firewood, fencing, house construction and fishing poles. In Bhairavalanka, the forest department has raised a *Casuarina* plantation of 15 ha. Awareness was created to use *Prosopis*, coconut and other agricultural refuses as alternatives to firewood, house construction material and fencing. Smokeless stoves, kerosene stoves and gas stoves were provided to reduce the mangrove dependency. The community contributed to the programme by distributing gas and kerosene stoves, while the government provided kerosene in all the villages through a public distribution system. The government has also provided a few gas connections to the women self-help group members. After the 1996 cyclone and the December 2004 tsunami, the housing board with the assistance of local NGOs built concrete houses in the coastal area. Timber requirement for house construction has now been reduced to a large extent.



Socio-economic development activities

Women Self-Help Groups (SHGs) were formed and the habit of saving and inter-lending among them were inculcated. Interest free loans were provided to the SHGs for developing small-scale micro-enterprises such as fish, groceries and milk retailing. The recovery rate on this credit was 100%. In the past, they were getting loan from money-lenders at huge interest rate. Although the government was providing loans through the self-help groups they had to pay interest. They also had to spend time to go to the District Rural Development Agency in order to get loans. But now, the project provides hassle free loan at their doorstep without much paper work and repayment (monthly installments) collected by project staff in their own village. The project staff provides the training and the bank linkages. Money recovery is flexible. If members are not able to pay for a month, they are allowed to pay the amount the next month. This situation is more advantageous; women can appreciate the importance of this credit for their livelihood.

Discussion

Role of Different Stakeholders on Mangrove Management

The mangrove forests of Krishna and Godavari are protected areas and the forest department is the key stakeholder in the management of the resource and in the protection of the

mangroves. The forestry project implemented from 1996, with the support of the World Bank, focused on joint forestry management. The role of the forest department was to mobilize the community and form groups with equal representation of men and women. The forest department staff was the ex-officio member of the committee. The members carried out the activities and the forest department handled the budget. In the community forest-management-scheme implemented, the budget is kept in the village committee account and the activities carried out by the villagers.

The NGOs particularly MSSRF started implementing the project by enhancing the skills of the community. Need-based training was provided to the community. The funds for the village microplan were deposited in the village account and project activities were carried out. Usually, NGOs were used for mobilizing the community and for preparing the PRA and the microplan. The community members are the primary stakeholders using the mangrove resources. The role of the community in this project is to plan and implement the activities related to mangrove conservation. Although the community is mobilized it still needs further training and capacity building for mobilizing the resources and managing them.

The mangrove dependent community was involved in raising mangrove plantation, it helped them earn wages for more than three months every year, for three years. Due to this involvement, they are now able to work for the government programmes. As the women and men were involved in the restoration and management of the mangroves, the community now feels that they should manage these resources in a much better way in coordination with the Forest Department. In the past, the forest department managed the forest alone and the villagers felt that the forest department was not people friendly. Since the project was implemented and involved the local community, the forest department and the NGO, the villagers are having a better relationship with the forest department. In the past, collection of dry fuel wood from the forest was not allowed. But after the establishment of the joint management system, people are now allowed to collect the dry wood that is plentiful.

Since the community is well organized they are able to leverage support for development schemes from the government agencies. The participation of the community in the project activities has made the people realize the importance of mangroves for the wellbeing of the coastal community.

How did the Joint Mangrove Management project worked?

The Joint Mangrove Management (JMM) project implemented over the past seven years has made substantial impact among the local community. The villagers are using mangrove resources, for example dried wood, for their needs. They are also using other alternatives for fuel. However, they could not mobilize financial support either from the government or from other agencies to manage the restored areas. More over, mangroves could provide indirect benefits in the form of fisheries to the local community. Some of the alternate employment opportunities such as coir-rope making and tailoring developed for women are not profitable when compared to fish retailing. The market linkages for these activities are too weak. The women are more experienced at fish selling than at coir-rope making and tailoring and hence they could not sustain these alternative activities. The mangrove conservation efforts are working well in the villages where the community has implemented the project activities. The villagers are aware of spending huge amount on forest development, something unknown to them in the past when the forestry department was implementing. The regular monthly meetings with the project staff helped the community to share their ideas and issues with government agencies.

To sustain the mangrove conservation activities, micro-credit for the development of micro-enterprises was provided to the women self-help groups and it is still continuing even after the end of the project. However, some of the income-generating activities performed during the project were pursued because of meager profits. The training given on canal construction made the people realize the potential and value of hard work. The participatory approach made the people could appreciate their potential and the need for conservation of mangrove ecosystem on which their livelihood depends.

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References

- Alongi, D.M., K.G. Boto and A.I. Robertson.** 1992. p. 251–292. In: D. M. Alongi and A.I. Robertson (Eds), *Tropical Mangrove Ecosystem*. American Geophysical Union, Washington, DC, USA.
- FAO.** 1994. Mangrove forest management guidelines. FAO Forestry Paper 117. Rome.
- Ganapathi, P. N. and D.V. Rama Sarma.** 1965. Mixing and Circulation in Gautami-Godavari Estuary *Curr. Sci.*, **34**: 631–632.
- Primavera, J.-H.** 1993. A critical review of shrimp pond culture in Philippines. *Alum. Rev. Fish. Sci.*, **1**: 151–201.
- Rajesh Mittal.** 1993. Management plan for Coringa Wildlife Sanctuary. Rajahmundry, Andhra Pradesh Forest Department, India.
- Ramasubramanian, R., T. Ravishankar and D. Sridhar.** 2003. Mangroves of Andhra Pradesh - Identification and Conservation Manual. M. S. Swaminathan Research Foundation, Chennai. 67 p.
- Ravishankar, T., L. Gnanapazham, R. Ramasubramanian, D. Sridhar and M. Navamuniyamal.** 2004. Atlas of Mangrove Wetlands of India Part 2: Andhra Pradesh. M. S. Swaminathan Research Foundation, Chennai. 136 p.
- Sarin, M. M., K.S. Rao, S.K. Bhattacharya, R. Ramesh and B.L.K. Somayajulu.** 1985. Geochemical studies of river estuarine systems of Krishna and Godavari, Mahasagar, **18**: 129–143.
- Selvam, V.** 2003. Environmental classification of mangrove wetlands of India, *Current Science*, **84**: 757–765.
- Selvam, V., K. Ravichandran, L.Gnanappazham and M. Navamuniyammal.** 2003. Assessment of community-based restoration of Pichavaram mangrove wetland using remote sensing data. *Current science*, **85**: 794–798.
- Space Application Centre.** 1992. In: *Coastal Environment*. Indian Space Research Organization, Ahmedabad, India.

- Thom, B. G.** 1984. p: 3–17. In: S.C. Snedaker and J.G. Snedaker (eds.) *Mangrove Ecosystem: Research Methods*, UNESCO, Paris. France.
- Uma Maheswara Rao, M. and G.M. Narasimha Rao.** 1988. Mangrove populations of the Godavari delta complex. *Indian J. Mar. Sci.*, **17**: 326–329.
- Upadhyay, S.** 1988. Physico-chemical characteristics of the. Mahanadi estuarine ecosystem, eastcoast of India. *Indian J. Mar. Sci.*, **17**: 19–23
- Varadarajulu, R., M. Harikrishna, P. Chitti Babu, and P. Chakaravarthy.** 1985. Geomorphology of the coastal zone around Krishna River confluence, Mahasagar, **18**: 265–272.

Chapter 16

Towards Mainstreaming Lake Burullus Biodiversity, Egypt

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Abstract

Lake Burullus is situated in a middle locus between the two branches of the Nile that form the Delta. It is one of a network of Protected Areas throughout Egypt, designated and managed by the Egyptian Environmental Affairs Agency. It is registered as a Ramsar site and BirdLife International has identified it as an Important Bird Area (IBA). Recent surveys showed rich biodiversity of planktons, higher plants and fauna; including numbers of rare, endemic and threatened species. Fisheries provide the principal life-support system for the inhabitants. Other resource uses include agriculture, livestock farming, fish farming, reed harvesting, bird hunting, tourism and recreation. The lake and its surroundings are subject to excessive use of the resources and ecological and administrative constraints that are threatening its biodiversity. To mitigate the impacts of these constraints on biodiversity, a management plan was developed with the following main objectives: restore ecological and landscape values, maintain and enhance the ecological and landscape values, conserve the resources through sustainable management, improve socio-economic opportunities for local people and develop public awareness for nature conservation. Projects have been developed for each of these objectives. Eight governmental institutions are involved in the management plan. A number of non-governmental associations (NGOs) also play a key role in land and resource use in the area.

An Advisory Committee was formed to overview the implementation of the management plan. This committee is chaired by the Governor of Kafr El Sheikh and is comprised of all relevant stakeholders, including representatives of relevant ministries, NGOs, local communities and fisherman associations. This committee sets policies for the management of the site, supervises the implementation of projects indicated in the management plan, reviews periodically the progress made by the management team in the implementation of projects, and proposes changes in the work plan as the need arises. To assist the Advisory Committee, an Executive Committee headed by the Manager of the Protectorate, is responsible for the implementation of the directives of the Advisory Committee, for carrying out the day-to-day tasks of patrolling, and for reporting to the Advisory Committee on all new developments in and around the site. In conclusion, the role of the Advisory Committee should be re-formulated from being merely consultative to the more effective function of decision-making.

Keywords: Lake Burullus, Egypt, wetland biodiversity, biodiversity mainstreaming

Introduction

The term "mainstreaming" is used in a variety of ways, but within broad environment-development circles "mainstreaming biodiversity" has come to have a particular meaning. Consensus on a precise definition of the concept has proven elusive, but participants at the September 2004 Global Environment facility (GEF) workshop on biodiversity held in Cape Town, South Africa, agreed that the objective of mainstreaming biodiversity is to internalize the goals of biodiversity conservation and the sustainable use of biological resources into economic sectors and development models, policies and programs, and therefore all human behavior (Petersen and Huntley, 2005). Although mainstreaming initiatives may be generated by conservation agencies, increasingly often they originate within economic sectors, and typically involve a broad range of actors, with partnerships between non-governmental organizations (NGOs), government, industry, small, medium, and micro enterprises, and communities.

The ecosystem approach is highly compatible with mainstreaming biodiversity because of its emphasis on social and economic concerns, and on integrated and holistic decision-making. A tension may sometimes exist, however, between the principles of the ecosystem approach that conservation of ecosystem structure and functioning should be a priority target, and the need for real world compromises and trade-offs in some mainstreaming interventions (Petersen and Huntley, 2005).

Situations where mainstreaming of biodiversity has occurred might be characterized by the incorporation of biodiversity considerations into policies governing sectoral activities: by simultaneously achieving gains in biodiversity and gains in economic sectors (the "win-win" scenario); by sectoral activity being recognized as based on, or dependent on, the sustainable use of biodiversity; and situations where sectoral activities result in overall gains for biodiversity exceeding biodiversity losses (Sandwith, 2002). Policymakers have to consider the long-term costs of conserving biodiversity in certain contexts, and develop scenarios and plans in which the additional costs can be internalized. Successful outcomes will take many forms and will always necessitate compromises and trade-offs.

Biodiversity conservation, sustainable use and equitable sharing call for social change. Education and public awareness are long-term investments towards this change. At the same time, biodiversity issues need to be communicated effectively to ensure the participation of major stakeholders from different sectors in the short, medium and long term. To stimulate the development of biodiversity agendas across sectors, those who are primarily responsible for biodiversity (e.g., Ministry of Environment) have to reach out and involve other ministries and sectors in society (Hesselink and van Boven, 2002).

Assessments of impacts of human activities in Lake Burullus (shallow, brackish, Mediterranean coastal lagoon with an area of 410 km²), and the vast territories that form its catchment area in north Egypt, provide decision makers with bases for sound decisions and fair judgments. The wealth of information about this Lake makes a rich source for environmental education at all levels (Shaltout and Khalil, 2005). The available data on its biodiversity is a useful tool in the hands of rangers and technicians working in the survey and monitoring programs in Lake Burullus. The present paper introduces the Egyptian efforts towards mainstreaming biodiversity of Lake Burullus in North Egypt. Such efforts have been done through the "Project for the Conservation of Wetland and Coastal Ecosystems in the Mediterranean Region" (MedWetCoast Project) sponsored by UNDP and GEF and implemented by the Egyptian Environmental Affairs Agency (EEAA), through its Nature Conservation Sector (NCS) and National Biodiversity Unit (NBU).

Site Characteristics

Lake Burullus is situated in a middle locus between the two branches of the Nile that form the Delta, it is the centerpiece of five lakes: Bardawil in Sinai, Manzala in the eastern Delta, Burullus, Idku in the west and Mariut further west (Figure 1). The chain of five lakes is located on about 500 km coastal front which is crossed by flyways of migratory birds in their seasonal journeys between the Euro-Asian Palearctics and the African Tropics. All 5 lakes are wetlands of international importance. It is one of a network of Protected Areas throughout Egypt, designated and managed by the Egyptian Environmental Affairs Agency (EEAA). It is registered as a Ramsar site and BirdLife International has identified it as an Important Bird Area (IBA). It is a shallow, brackish, Mediterranean coastal lagoon with an area of 410 km², a maximum length of 47 km and a maximum width of 14 km (Table 1). Its depth varies between 40 and 200 cm. Recent surveys carried out in this Lake provide information on its

ecological features, geomorphology, hydrology, water, bottom sediments, and climatology. They also describe the various taxonomic groups of living organisms and their habitat types, and provide the socio-economic set-up in the area and the intimate relationships between the society and the biological and ecological features (Shaltout and Khalil, 2005). Surveys showed rich biodiversity of planktons, higher plants and fauna including birds (it is a wintering area of international importance for water birds). Biodiversity includes numbers of rare, endemic and threatened species. This work provides bases for ecologically sound management of the Lake that ensures balance between needs of conservation of biodiversity and sustainable use of the life-support systems of natural resources of the Lake.

Figure 1. Location of the five northern lakes of Egypt.

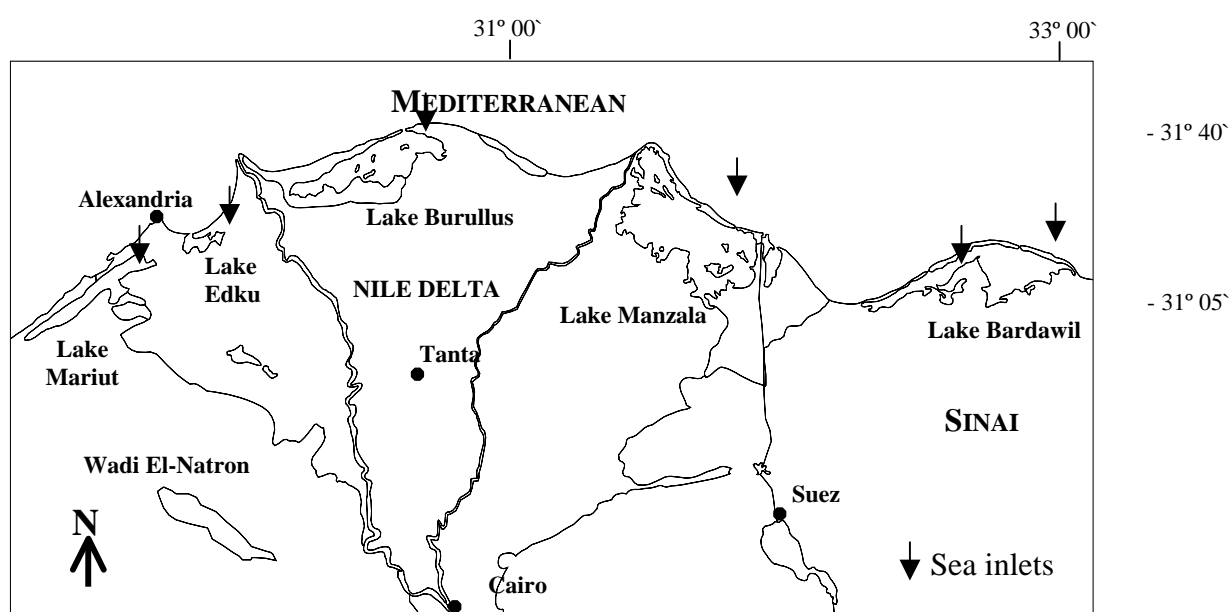


Table 1. Morphometry of Lake Burullus (El-Bayomi, 1999).

Character	1984	1996	Reduction (%)
Area (km ²)	502.7	410.0	18.4
Circumference (km)	160.0	143.0	10.6
Maximum length (km)	56.0	47.0	16.1
Maximum width (km)	15.0	14.0	6.7
Length/width ratio	3.7	3.3	10.8

Fisheries provide the principal life-support system for the local inhabitants with a production of approximately 51 000 ton year⁻¹ and 17000 licensed fishermen depend on these resources for their living. Other resource uses include agriculture, livestock farming, fish farming (about 15 5000 ton year⁻¹), reed harvesting, bird hunting, tourism and recreation.

Biodiversity

Based on the ecosystem approach, the biodiversity in Lake Burullus is classified into three major trophic groups: producers, consumers and saprotrophs. The producers are classified into vascular

plants, phytoplankton and epiphytic algae (Table 2). The consumers are classified into three trophic levels: primary consumers (herbivores), secondary consumers (primary carnivores) and tertiary consumers (secondary carnivores). Zooplankton and zoobenthos are mainly primary consumers, but the other animal groups (terrestrial invertebrates, fish, reptiles, amphibians, birds and mammals) have members that belong to the three levels of consumers (Shaltout and Khalil, 2005). The saprotrophs are mainly the bacteria and fungi.

Table 2. Biodiversity of Lake Burullus, Egypt.

Biotic Group	All species	Endemic species	Rare species	Endangered species
Vascular plants	197	3	33	-
Phytoplankton & epiphytic algae	276	-	-	-
Zooplankton	90	-	-	-
Macrobenthos	48	-	17	-
Arachnida	23	-	-	-
Insecta	94	-	-	-
Fishes	25	-	-	-
Herpetofauna	23	1	4	2
Birds	112	6	5	2
Mammals	18	1	1	-

Producers

Some 197 species of vascular plants have been recorded from Burullus Wetland (100 annuals and 97 perennials) including 11 hydrophytes (the most common is *Potamogeton pectinatus*) and one fern (*Azolla filiculoides*). The most common species is the common reed *Phragmites australis* (Shaltout and Al-Sodany, 2000). Phytoplankton includes 226 algal species, i.e., 125 Bacillariophytes (Diatoms), 56 Chlorophytes, 39 Cyanophytes, 2 Euglenophytes, 2 Dinophytes, one Cryptophyte and one Rhodophyte. The common submerging *Potamogeton pectinatus* is a host for some 45 epiphytic algal species, most of them are limnetic forms and can survive in both planktonic and attached situations (Samman *et al.*, 1988)

Consumers

The zooplankton community in Lake Burullus includes 90 species: 26 species of Copepoda, 7 of Cladocera, 26 of Rotifera and 10 of Protozoa; they constitute collectively about 85% of the total zooplankton (Aboel Ezz, 1995). The study of terrestrial invertebrates in Burullus Wetland is still at a preliminary stage. Specimens of 23 species representing 4 orders of spiders, scorpions and their allies have been collected (El-Hennawy, 2000). In addition, 94 insect species were recorded so far in this region, however it is believed that this number will be increased following thorough future investigations (Metwally, 2000).

Twenty five fish species are known from Lake Burullus, 15 of which live in fresh or brackish water, 4 species are of purely marine origin which invade the lake for some time, while 6 species are obligatory migrants who spend their adult life in the brackish water of the lake and migrate to the sea for spawning (Khalil and El-Dawy, 2002). On the other hand, there are 23 species of reptiles and amphibians (Herpetofauna). The recently described Nile Valley Toad *Bufo kassasii* is endemic to Egypt with localized distribution in the Nile Valley, but it is found in dense populations in suitable freshwater swamps along the southern margins of Lake

Burullus (Anonymous, 2002). In addition, some 15 mammalian species have been recorded, only one (the Flower's shrew, *Crocidura floweri*) is rare and endemic to Egypt. According to the status categories set out by IUCN, two species (*Canis aureus* and *Felis chaus nilotica*) are considered vulnerable (Basuony, 2000).

One hundred and twelve species of birds were recorded in Burullus wetland. Burullus is home to six bird subspecies endemic to Egypt, none is considered threatened: Little Green Bee-eater (*Merops orientalis Cleopatra*), Laughing Dove (*Streptopelia senegalensis aegyptiaca*), Senegal Coucal (*Centropus senegalensis aegyptius*), Egyptian Swallow (*Hirunda rustica savignii*), Crested Lark (*Galerida cristata nigricans*) and Egyptian Yellow Wagtail (*Motacilla flava pygmaea*). According to Goodman *et al.* (1989), five rare species and subspecies occur: Montagu's Harrier (*Circus pygargus*), Cuckoo (*Cuculus canorus canorus*), Bar-tailed Godwit (*Limosa lapponica lapponica*), Pied Avocet (*Recurvirostra avosetta*) and Jack Snipe (*Limnocryptes minimus*). Two of the bird species occurring in this wetland are globally threatened: Lesser Kestrel (*Falco naumanni naumanni*) and Ferruginous Duck (*Aythya nyroca*).

Saprotrophs

Aquatic bacteria and fungi are distributed throughout the rivers, ponds and lakes, but they are especially abundant in the mud-water interface along the bottom where bodies of plants and animals accumulate (Odum, 1971). The available data on both biotic groups in Lake Burullus are limited; only 3 papers were recently published in 2002 and 2004. The first paper deals with the zoosporic fungi recovered from 3 northern lakes (Edku, Burullus and Manzala) and lake Qaron (Mahmoud and Abou Zeid, 2002). The second one was published by El-Hissy *et al.*, (2004) on the diversity of zoosporic fungi recovered from the surface water of four lakes including Burullus and Manzala in the north, Qaron in the Mid and Nasser in the south. The third deals with the distribution of some actinomycetes groups in Lake Burullus (Abou-Elela *et al.*, 2004). No doubt that this gap of information should be filled taking into account the important biological role of the saprotrophic organisms in the dynamics of aquatic ecosystems.

Constraints

To deal with constraints placed upon biological diversity, the causes of negative pressures on the ecosystem and their services have to be addressed. Because of its complex dependency on other processes, the conservation of biological diversity has to be mainstreamed, or incorporated into the work of all sectors, rather than being treated as a separate agenda. Lake Burullus and its surroundings are subjected to many ecological constraints that threaten its biodiversity and to excessive use of the resources through, e.g., land reclamation, fish farming, over-fishing, over-hunting, and overwhelming flow of drainage water. Likely, future constraints relate to impact of new development projects such as the international highway that runs along the sand bar, the fishing port to the west of the sea inlet and future sea-side resorts. To this may be added the likely impacts of future climate change including sea-level rise. Also, conflicting legislation, insufficient penal codes, under-staffed law enforcement, illiteracy of local inhabitants, over-population and local traditions are among the constraints which can have severe impacts on biodiversity.

Management Plan

Wetlands are dynamic areas, open to influence from natural and human factors. In order to maintain their biological diversity and productivity and to allow wise use of their resources by human beings, some kind of overall agreement is needed between the various owners, occupiers and interested parties. The management planning process provides this overall agreement. The guidelines recommended by the Ramsar Convention Bureau (2000) for wetlands management plan consists of a Preamble followed by the following sections: Description, Evaluation & Objectives, and Action Plan (Figure 2).

Figure 2. Structure of the management plan

- PREAMBLE
- 1. DESCRIPTION
- 2. EVALUATION and OBJECTIVES (what to do)
 - 2.1 Evaluation
 - 2.2 Long-term objectives
 - 2.3 Factors influencing achievement of long-term objectives
 - 2.4 Operational objectives
- 3. ACTION PLAN / PRESCRIPTIONS (how to do it)
 - 3.1 Work plan
 - 3.2 Projects
 - 3.3 Work programs
 - 3.4 Annual review
 - 3.5 Major review

The Preamble is a concise policy statement that reflects in broad terms the policies of supranational, national or local authorities, or other organizations (e.g., non-governmental conservation bodies or private owners) concerned with the production and implementation of the management plan. The Preamble should also recall the broad Ramsar obligations: maintaining the ecological character of listed sites, making wise use of all wetlands, and establishing nature reserves in wetlands, whether or not they are included in the Ramsar List. Review of the plan may lead to revision of the site description and objectives (particularly the operational objectives).

To mitigate the impacts of the constraints on the biodiversity of Lake Burullus, a multidisciplinary team of experts prepared a management plan (Kassas *et al.*, 2002) following the Ramsar Convention Bureau (2000) guidelines. This plan comprises 5 major programs that respond to five long-term objectives, which are described in the following sub-section.

Restoring ecological and landscape values

Many studies have demonstrated that the condition of Lake Burullus has been deteriorating alarmingly in recent years. The major over-riding factor is the use of the lake as a discharge area for agricultural drainage water. This has had a severe effect on water balance, water quality, water condition, biodiversity and income generation for people reliant on the lake. In order to restore these deteriorated conditions, the following operational objectives are suggested: restore salinity level; establish a network for monitoring water quantity and quality; treat water for reuse; and monitor climate change.

Maintaining and enhancing the ecological values

This objective relies heavily on the first one. Unless a return is made to a system, which replicates the previous natural hydrological system, maintenance of current values cannot be achieved and management measures would, at best, slow down the rate of deterioration already occurring. The following operational activities are suggested: propose a zoning scheme; take *in situ* measures of species conservation; initiate *ex situ* conservation measures; establish a system of data management; monitor species diversity; and initiate a research program.

Conserving resources through sustainable management

Restoring and conserving ecological and landscape values can only be achieved by application of the principle of sustainable resource management. To do this, the following operational objectives are suggested: improve law enforcement; revise legislative and institutional aspects; sustainable use of fish resources; and sustainable use of reed growth.

Improving socio-economic opportunities for local people

Local stakeholders should understand the principle of sustainable use of resources as a means of maintaining the necessary levels of resources for future years. However, in most cases they are not in a strong enough financial position to reduce or set aside activities generating their income in favor of a long-term approach. Sustainable resource management must therefore be accompanied by alternative income generation opportunities and in particular those which diversify the money-earning process. In view of this, the following operational objectives are suggested: initiate capacity-building schemes; develop eco-tourism; and raise fund.

Developing public awareness for nature conservation

The environmental and cultural values of Burullus are a resource, which is currently largely unexploited. Greater interest and knowledge can translate into using that resource, for instance for educational, interpretation and eco-tourism purposes. Opportunities related to eco-tourism, diversify income generation without putting further strain on the resources. The following operational objectives are suggested: raise the level of public awareness; and initiate publicity programs.

Additional projects are essential prerequisites if the main objectives are to be achieved, they can be converted to an objective: provide the administration and the facilities necessary to implement the management measures supporting the main objectives.

The implementation of these programs and their component projects is an integral part of the management of the Protectorate. Some of these projects are priority activities that are basic requirements for the operation of the Protected Area. Others are complementary actions that ensure the sustainability of the endeavor. Some of these may be implemented in a second phase of operation. First priority projects are mainly the direct responsibility of the Protected Area management team. Others may require co-operation and shared responsibility between management and competent governmental and non-governmental stakeholders. The execution of the work plan has started in September 2003, with aims to achieving the five main long-term objectives by 2010 through field actions (programs and projects), and the establishment of effective institutional arrangements.

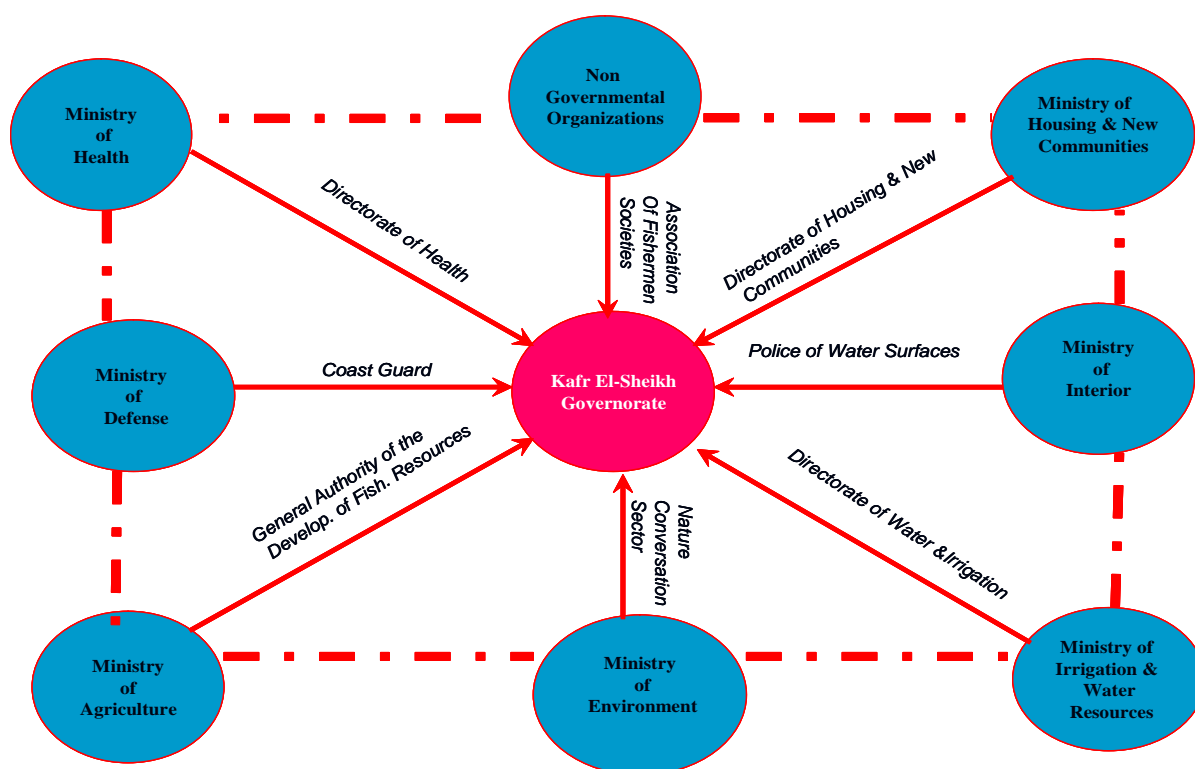
Mainstreaming Activities

Institutions involved in the management plan

Eight governmental institutions and a number of non-governmental organizations in Kafr El-Sheikh Governorate are involved in the management of the Burullus Protected Area (Figure 3 and text below):

- *Ministry of State for the Environment:* The Nature Conservation Sector (NCS) of the Egyptian Environmental Affairs Agency (EEAA), has the ultimate legal responsibility for the management of the Burullus Protected Area and its resources.
- *Kafr El-Sheikh Governorate:* It is the single most influential stakeholder at the local level. It has its own Environment Office, Local Administration Councils and Investment Council. The latter institution plays an important role in the approval and allocation of land for development projects.
- *Ministry of Agriculture:* The local branch of the General Authority for the Development of Fisheries Resources (GADFR) is responsible for the management of the Lake's fisheries. It issues permits for the establishment of fish farms in the vicinity of the Protectorate. The Ministry of Agriculture determines the distribution and area of rice cultivation in the Nile Delta and fines farmers violating the instructions by exceeding the limits of areas allowed for this crop. This Ministry controls to a large extent the amount of drainage water flowing into Lake Burullus.
- *Ministry of Irrigation and Water Resources:* This Ministry is responsible for water resource management and the maintenance of all watercourses in the country. It is also concerned with the volume of water in the Lake as it dams the likely seawater intrusion into the Delta.
- *Ministry of Defense:* Coast Guard, which comes under the jurisdiction of the Ministry of Defense, is responsible for security and controls all illegal smuggling activities along the coast (which forms the northern border of the Lake).
- *Ministry of Interior:* The police of water surface enforce fisheries and environmental regulations, such as restrictions concerning hunting, fishing and quail netting within the Lake. Currently, there are two police stations on the shores of the Lake and a third one is under construction.
- *Ministry of Housing and New Communities:* This Ministry has constructed an international coastal highway between Sallum (on the border with Libya) and Rafah (on the border with the Palestinian Authority). Part of the highway is a bridge over the Bughaz and the rest cuts through the entire sand bar lengthways. This highway is rapidly attracting new populations and settlements to the area. The impact of the increased human activities on both sides of the highway, have not been properly assessed.
- *Ministry of Health:* The Directorate of Public Health in Kafr El-Sheikh Governorate is responsible for health issues affecting inhabitants of the Burullus Protected Area.
- *Non-governmental organizations (NGOs) in the Kafr El-Sheikh Governorate:* NGOs also play a key role in land and resource use in the area. Four of these are mainly concerned with local community development and another seven are fishermen's societies. A recent addition to the list of local pressure groups is the Charity Association for Environmental Protection. Fishermen working in the Mediterranean Sea, outside Lake Burullus, are organized in three NGOs.

Figure 3. Institutions involved in the management of Lake Burullus



Advisory Committee

The management plan gives the responsibility of implementation to local-government and to local non-governmental societies. To apply this, an Advisory Committee composed of all relevant stakeholders was appointed and it includes representatives of relevant ministries, NGOs, local communities and fishermen associations. The Governor of Kafr El Sheikh chairs this Committee that has been given a legal status, including structure and functions, through a Governorate decree (Table 3).

Table 3. Membership of the Advisory Committee

Member	Position
Governor of Kafr El-Sheikh Governorate	Chairman
Secretary-General of Kafr El-Sheikh Governorate	Vice Chairman
Manager of Lake Burullus Protected Area	Secretary
Manager of MedWetCoast Project	Member
Director of Lake Burullus	Member
Undersecretary of Ministry of Health	Member
Undersecretary of Ministry of Housing and New Communities	Member
Local Representative of Coast Guard	Member
Local Representative of Police of Water Surfaces	Member
Chief of Association of Fishermen Societies (NGOs)	Member

This Committee ensures the participation and the involvement of concerned stakeholder groups in the decision-making process. Bi-monthly meetings deal with the following tasks: set policies for the management of the site within the framework of the management plan; supervision of the implementation of projects indicated in the management plan; review

periodically the progress made by the management team in the implementation of projects; and proposing changes in the work plan as the need arises.

Executive Committee

An Executive Committee headed by the Manager of the Protectorate is assisting the Advisory Committee (Table 4). The executive committee undertakes the following functions: implementation of the directives of the Advisory Committee; carrying out the day-to-day tasks of patrolling; and reporting to the Advisory Committee on all new developments in and around the site. These duties are additional to the official obligations and duties of the Manager, the team of rangers and other supporting staff.

Table 4. Membership of the Executive Committee

Concerned Institution	Representative
Burullus Protected Area	Manager and 2 Rangers
General Authority of the Develop. of Fish. Resources	Director of the Lake
Police of Water Surfaces	An Officer and 2 Guardians
The Four Administrative Districts Surrounding the Lake	4 Representatives
The Seven Fishermen Societies (NGOs)	7 Representatives

Outcomes

The coordination between the institutions involved in the management of Lake Burullus, through the Advisory and Executive Committees, had led to many activities designed to enhance biodiversity and productivity of the lake; here are some examples:

- The Ministry of Housing and New Communities, through its Agency of North Coast Construction, has deepened the sea inlet to increase the flow of seawater into the lake.
- The Ministry of Agriculture, through the General Authority of Development of Fisheries Resources, has made some radial channels (grooves at the lake bottom) in front of the sea inlet in order to distribute the seawater into the different sectors of the lake.
- The Ministry of Irrigation and Water Resources has made floating barriers, near the mouths of the 7 drains that pour their water into the lake, in order to minimize the invasion of the free floating plant, water hyacinth (*Eichhorina crassipes*), into the lake's water body.
- The MedWetCoast Project has started to control the heavy growth of the common reed (*Phragmites australis*), using the partial cutting technique, in the narrow straits between the lake's islets. The Association of Fishermen Societies, a NGO, did the work.
- To increase the ability of the Police of Water Surfaces to enforce the fishing law and to reduce the illegal activities that affect the lake's biodiversity, the MedWetCoast Project provided 2 motorboats.
- Many awareness programs and training courses were done with the cooperation of all the institutions involved in the management plan. The target audiences of the activities were students, fishermen, managing team, religious leaders (i.e., Imams), journalists and others.
- Construction of a Visitors Center and Accommodation Building. The center includes a seminar room, small Lab, library, museum and herbarium. Equipment includes one car, three motorboats, computer, laptop, printer, overhead and slide projectors, data

show, GPS, digital camera, some binoculars, land and mobile phones. Informative signposts were set up in all sites. This was done after the cooperation between the Governorate, EEAA and MedWetCoast.

- Additional staff supported the management team, which currently consist of a manager, 6 rangers, 7 technical assistants, 5 keepers, an environmental lawyer and a driver. The manager is delegated from Kafr El-Sheikh Governorate and submits a monthly report to the director of Nature Conservation Sector (EEAA). Unfortunately, most of the team members are on temporary contracts with EEAA.
- Small grants were offered by the GEF to the 7 fishermen societies for replacing their illegal fishing gears by legal ones.
- Biannual newsletters were issued under the title "MedWetCoast Egypt"; several posters and brochures were produced to raise public awareness.
- A book was published. It provides the description of the biotic and abiotic components of the lake's ecosystem, the socioeconomic aspects and the details of the management plan (Shaltout and Khalil, 2005).

Evaluation and Recommendations

Unfortunately, by the end of the MedWetCoast Project in February 2007, many activities, which were underway, stopped either due to lack of financial support (e.g., zoning and monitoring of water level) or due to conflicts between the different institutions (e.g., control of the common reed growth).

Consequently, the role of the Advisory Committee should be re-formulated and re-structured from being merely consultative to the more effective function of decision-making (i.e., Management or Steering Committee).

Unless the institutional structures in a country are reinforced to mainstream biodiversity, they remain vulnerable to alternative development options, thus the biodiversity value may get eroded over time (GEF 2002).

In addition, it is important for the Global Environment Facility (GEF) and its implementing Agencies to build tools to monitor and evaluate the effectiveness of mainstreaming interventions and their eventual impact on biodiversity. Indicators can be designed at differing levels to track the outputs, outcomes, and impacts of projects and the interrelationships between these. The Cape Town workshop suggests a wide range of potential indicators for consideration by the GEF and its stakeholders (Petersen and Huntley, 2005).

Acknowledgements

This work had been carried out through the "Project for the Conservation of Wetland and Coastal Ecosystems in the Mediterranean Region" (MedWetCoast) sponsored by UNDP and GEF and implemented by the Egyptian Environmental Affairs Agency (EEAA), through its National Biodiversity Unit (NBU), which made its compilation possible and deserves special acclaim. I wish to thank to Mr. Fayed El-Shamley, Manager of the Burullus Protected Area, for providing unpublished reports and information that were useful for completing this article.

References

- Aboel Ezz, S.M.** 1995. Zooplankton of Lake Burullus (Egypt)). Bull. Inst. Ocean. Fish., **21**(1): 233-261.
- Abou-Elela, G., N. Ghanem and M. Okbah.** 2004. Distribution of some actinomycetes groups in Burullus Lake. Bull. Fac. Sci., Assiut Univ.
- Anonymous.** 2002. Site diagnosis for Burullus Protected Area: Concise Report. EEAA, MedWetCoast, Cairo, Egypt.
- Basuony, M.I.** 2000. Ecological survey of Burullus Nature Protectorate: mammals. EEAA, MedWetCoast, Cairo, Egypt.
- El-Bayomi, G.M.** 1999. Lake Burullus: a geomorphological study. Ph.D. Thesis, Fac. Arts, Helwan , Cairo, Egypt.
- El-Hennawy, H.K.** 2000. El-Burullus Protectorate: Arachnida (Spiders & Scorpions). EEAA, MedWetCoast, Cairo, Egypt.
- El-Hissy, F., E. Ali and A. Abdel-Raheem.** 2004. Diversity of zoosporic fungi recovered from the surface water of four Egyptian lakes. Ecohydrology and Hydrobiology, **4**(1): 77-84.
- GEF.** 2002. Summary negotiations on the third replenishment of the GEF trust fund. GEF Council Document (GEF/C.20/4). Washington, DC, USA.
- Goodman, S. M., P.L. Meininger, S.M. Baha El-Din, J.J. Hobbs and W.C. Mullie.** 1989. The Birds of Egypt. Oxford University Press, Oxford, UK.
- Hesselink, F. and G. van Boven.** 2002. Mainstreaming Biodiversity - Article 13 CBD and CEPA as a policy tool. Google Search.
- Kassas, M. et al.** 2002. Management plan for Burullus Protected Area. MedWetCoast, Global Environment Facility and Egyptian Environment Affairs Agency, Cairo, Egypt.
- Khalil, M.T. and F.A. El-Dawy.** 2002. Ecological survey of Burullus Nature Protectorate: fishes and fisheries. EEAA, MedWetCoast, Cairo, Egypt.
- Metwally, S.M.** 2000. Burullus Lake: surveying of invertebrates. EEAA, MedWetCoast, Cairo, Egypt.
- Odum, E.** 1971. Fundamentals of ecology. W.B. Saunders Company, Philadelphia, USA.
- Petersen, C. and B. Huntley.** 2005. Mainstreaming biodiversity in landscapes. Working Paper 20: Global Environment Facility, Washington, DC, USA.
- Ramsar Convention Bureau,** 2000. Ramsar handbooks for the wise use of wetlands. Ramsar Convention Bureau, Gland, Switzerland.
- Samaan, A.A., E.Y. El-Ayouty and Z.M. El-Sherif.** 1988. Epiphytes growing on *Potamogeton pectinatus* L. in Lake Burullus (Egypt). Bull. Inst. Ocean. Fish., **14**: 133-139.
- Shaltout, K.H. and Y.M. Al-Sodany.** 2000. Phytoecology of Lake Burullus Site. EEAA, MedWetCoast, Cairo, Egypt.
- Shaltout, K. H. and M.T. Khalil.** 2005. Lake Burullus (Burullus Protected Area). Publication of the National Biodiversity Unit (NBU), No 13. Egyptian Environment Affairs Agency (EEAA), Cairo, Egypt.

MAINSTREAMING AT PROVINCIAL AND LOCAL LEVELS IN CHINA

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CHAPTER 17

MAINSTREAMING WETLAND BIODIVERSITY CONSERVATION IN HONGHU LAKE, CENTRAL CHINA: PRACTICES AND PROGRESS

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Abstract

Mainstreaming wetland biodiversity conservation refers the integration of wetland biodiversity conservation and sustainable use into the agenda of various government sectors and the establishment of extensive partnerships among government sectors, NGOs, business and communities in order to ensure environmental benefits at local, national or global scales, while ultimately balancing socio-economic development with environmental protection. Honghu Lake, the seventh largest freshwater lake in China, is a unique inland freshwater lake ecosystem in the middle-lower reaches of the Yangtze River. It is rich in biological diversity. However, over the past 50 years and particularly over the last decade since the early 1990s, it suffered heavy losses in faunal and floral resources due to over-exploitation of enclosed aquaculture and cross-sectoral management. In addition, the water quality of the lake deteriorated to IV-V from Category I-II previously, thus posing a major threat to the ecology of the lake. Fortunately, due to government's increased interest in wetland conservation, wetland biodiversity conservation efforts in China are focused on mainstreaming. Honghu Lake has taken the lead in mainstreaming wetland biodiversity conservation in China. Since 2003, with the support of the State Forestry Administration (SFA), WWF and local government and sectors, the Honghu Lake Nature Reserve has initiated the effort on mainstreaming wetland biodiversity conservation. The progress achieved to date can provide a reference for future wetland biodiversity conservation in Honghu Lake and in the country at large.

Keywords: biodiversity, mainstreaming, wetland, Honghu Lake

Background

Overview of Honghu Lake Nature Reserve

Honghu Lake is located in the southwest part of Honghu City, Jingzhou Prefecture, Hubei Province, Central China. It is a low-lying area situated between the Yangtze River and the Dongjing River, a tributary of Hanshui River, belonging to the subsiding area of the 2nd Subsiding Belt of the New China System in eastern China, an inland fault basin formed in the Yanshanian Orogeny. The lake first appeared in the Spring and Autumn of the Warring States Period about 2500 years ago (Yu Xiubo *et al.*, 2007). It is now the largest lake in Hubei Province, the Province of Thousand Lakes, and the seventh largest freshwater lake in China.

Honghu Lake Nature Reserve is a provincial-level nature reserve, the main elements are the lake and its wetland ecosystems; and the major conservation target is focused on biodiversity. It covers a total area of 41,412 hectares, spanning over Honghu City and Jianli County across the dyke. Geographically, it is situated between E 113°12'—113°26' and N 29°49'—29°58', with the center as E 113°19' and N 29°50'.

Honghu Lake is an inland freshwater lake that plays a key function role in flood control, aquaculture, water transportation, water supply, climate regulation, scientific research, tourism and recreation.

Honghu Lake Nature Reserve is also well-known for its beautiful landscape and rich biological resources. It houses 472 species and 21 subspecies of wetland vascular plants, including ten that are listed as key national protection species, *e.g.*, *Nelumbo nucifera*, *Trapa incise*, and *Ceratoptenis pteroides*. In addition, as many as 698 species of animals can be found in the area, including 213 species of vertebrates, 62 species of fish, 138 species of birds, 6 species of amphibians, 12 species of reptiles, 13 species of mammals, as well as 379 species of zooplankton and 98 species of zoobenthos. Among these, there are 24 key national protection species of vertebrates. Of them, 7 species of wild animals are listed under the Grade I national key protection species, *i.e.*, *Ciconia boyciana*, *Cnigra nigra*, *Mergus squamatus*, *Otis tarda dybowskii*, *Apuile h. heliaca*, *Haliaeetus albicilla*, and *Muntiacur crinifrons*. While the other 17 species are listed under Grade II national key protection species, *e.g.*, *Anser albifrons*, *Cygnus Cygnus*, *C. columbianus*, *Aix galericulata*, *Buteo hemilasius*, *Buteo b. burmanicus*, *Falco vespertinus amurensis*, *Tyto capensis chinensis*, *Myxocyprinus asiaticus*, *Anguilla japonica*, *Hoplobatrachus rugulosus*, and *Hydroptes inermis*.

In addition, there are 131 species of terrestrial wild animals included in the List of Terrestrial Wild Animals of Beneficial Use, Important Economic Value or Significant Scientific Research Value under national protection. Of the birds living in the area, 69 species are listed under the China-Japan Agreement on the Protection of Migratory Birds and their Habitats, and 16 species are listed under a China-Australia Agreement (County Annals of Honghu, 1987). Honghu Lake has a diverse array of biological species, and represents a unique wetland ecosystem in the middle-lower reaches of the Yangtze River. It is also known as a natural gene bank of significant ecological and cultural values.

Major challenges facing Honghu Lake

Reduced wetland areas and functions

Due to historical reasons, Honghu Lake has been transformed on a large scale, the water surface area, now, has diminished to 34,820 hm² from 76,000 hm² in 1950. This has also resulted in a decline in wild plants and animals, as well as weakened functions in pollution control and flood regulation.

Exacerbated eutrophication due to non-point source pollution

Non-point source pollution in Honghu Lake comes from various sources, *e.g.*, upper reaches, agriculture in the surrounding areas, enclosed aquaculture in the lake area, and domestic sources in the lake area. Of these sources, it is the large-scaled enclosed aquaculture that poses the largest and most direct threat to the lake. It leads to the depletion of water grasses, the weakening of water purification functions, and the deterioration of water quality. Monitoring results from 2003 show that the contents of DO, COD, TN and TP have all exceeded the standards; in some areas of the lake, the water quality fell below Category V (Wen Zhanqiang, Wen Feng *et al.*, 2002).

Sectoral fragmentation leading to mismanagement of the lake

In the past, Honghu Lake was managed by more than ten organizations: the Honghu Fishery Administration, the Honghu Nature Reserve Administration, the bureaus in charge of forestry, aquaculture, environmental protection, water resources and public security, the local

governments, and the farms of towns and villages. This had complicated the management of Honghu Lake and posed a great challenge to its ecological conservation.

Major factors and their roles in mainstreaming wetland biodiversity conservation

Policy support at the national level

China is rich in wetland resources with a total area of $6594 \times 10^4 \text{ hm}^2$; it is the country with the largest in Asia and the fourth in the world (Environmental Protection Bureau of Honghu City, 2003). China ratified the Ramsar Convention on Wetlands in 1992, and as of February, 2008, thirty-six (36) of its wetland nature reserves have been listed as Ramsar sites. In 2000, 16 ministries and commissions under the State Council the China jointly promulgated the National Wetland Conservation Action Plan, with SFA as the lead agency. In 2004, the General Office of the State Council issued the Notice of Enhancing Wetland Conservation and Management, stating that the governments at various levels should be responsible for wetland conservation, and designating the forestry sector to coordinate and organize the national and local wetland conservation efforts. In the same year, SFA designated five demonstration sites in China for wetland conservation and restoration, e.g. Honghu Lake in Hubei Province, Hengshui Lake in Hebei Province, South Dongting Lake in Hunan Province, Chongming Dongtan in Shanghai Municipality, and Lashihai Lake in Yunnan Province. In 2006, the State Council approved the National Wetland Conservation Programme Implementation Plan (2005-2010), with a total investment of 9 billion Yuan RMB. In 2007, the State Council approved the establishment of the National Commission on the Implementation of the Ramsar Convention. It consists of 16 ministries and commissions, with an Implementation Office based in SFA. As a result, the strong policy support at the national level provided the prerequisite context for mainstreaming wetland biodiversity conservation in Honghu Lake.

Key science-based policy-making at the local levels required for mainstreaming

In China, the governments at provincial, municipal, county and township levels are mainly responsible for implementing the policies made by the central government. The concepts and approaches of the policy-makers at the local levels, therefore, are key to promoting the practices of mainstreaming wetland biodiversity conservation.

In 2003, the Action Plan was launched across China. One of the demonstration projects was implemented in Honghu Lake by SFA and WWF initiated its WWF-HSBC Yangtze Programme, establishing a partnership with the Hubei Provincial Forestry Bureau and the local government of Honghu City to conduct demonstration activities on biodiversity conservation in Honghu Lake. The implementation of activities such as wetland network development, public awareness, capacity building, consultants' assistance, and community support, has brought new conservation concepts to the local policy-makers, thus furthering the practice of mainstreaming wetland biodiversity conservation in Honghu Lake.

In November 2004, a workshop on the ecological development of Honghu Lake was organized by the Hubei Provincial Government in Honghu City in order to develop policies and measures for improving the natural conditions of the lake. The ultimate aim was to 'develop Honghu Lake into a beautiful and ecologically sound wetland nature reserve in five years'.

Over the past few years, the following key progresses have been made:

- *Established the Honghu Lake Nature Reserve Administration:* The original organizations, *i.e.*, the Honghu Fishery Administration of Jingzhou City, the Honghu Municipal Nature Reserve Administration and the Jianli County Nature Reserve Administration, were abolished. A new organization named the Honghu Lake Nature Reserve Administration was created to assume the functions of wetland conservation, fishery, tourism and water transport management. It reports to the administrative management of the municipal government of Jingzhou, where Honghu Lake is located, but it is also under the technical guidance of Hubei Province on sectors of such as forestry and aquaculture.
- *Defined the land tenureship:* The land tenure for Honghu Lake Nature Reserve was delimited, with the dykes as boundary lines; it covers a total area of 41,412 hm².
- *Earmarked staff funding for the administration:* The number of the staff for the nature reserve administration is established at 85. Staff funding for the administration is included in the financial budget of Hubei Provincial Government. An annual budget of 1.8 million yuan RMB for staff funding will be allocated.
- *Designated the authority of centralized administrative punishment to the nature reserve administration:* In 2005, the Government of Hubei Province delegated to the nature reserve administration, the authority for enforcing 'nature reserve management, wildlife conservation, fishery, tourism, water transport and boats checking', providing the legal instrument for effective and efficient resources protection of Honghu Lake.
- *Developed a government-led mainstreaming practice supported by relevant sectors:* In 2005, the Government of Hubei Province issued a No.1 Official Document, outlining the guiding principles, objectives and measures for improving the ecological conditions of Honghu Lake. A total funding of 70 million Yuan RMB was then earmarked for wetland biodiversity conservation and restoration of Honghu Lake.

Significant assistance from technical experts

With the support of WWF, experts in different fields were invited to conduct survey in Honghu Lake. Policy-makers from the provincial and local governments and sectors also participated in seminars and workshops with the technical experts to reach an agreement on mainstreaming wetland biodiversity conservation in Honghu Lake.

In addition, senior experts on Honghu Lake were recruited by the nature reserve administration to act as technical advisors and to provide scientific information and recommendations to policy-makers at various levels of governments and sectors. This has also greatly promoted the mainstreaming process.

Important role of public awareness in the mainstreaming process

Since its establishment, the Honghu Lake Nature Reserve Administration has committed itself to serving the interests of the local communities and local government. Their goals are to promote the sustainable socio-economic development of the local communities and to improve their living standards and their wellbeing. In the past, when the lake was damaged,

fishermen suffered economic losses in aquaculture that resulted in a decline of their living standards; they even lacked clean drinking water. Under such context, the local people began to voluntarily call upon the local government to conserve Honghu Lake.

In the mean time, the nature reserve also leveraged the media to promote its mainstreaming efforts. The problems that Honghu Lake was once confronted with attracted the attention of the media at national and local levels. For example, after a reporters' visit to Honghu Lake organized by WWF in 2004, more than 20 media in China covered the visit and issued reports on the lake. This has placed great pressure on public opinions and local government and sectors, and facilitated the inclusion of wetland conservation of Honghu Lake into the agenda of local government and sectors.

Specific Measures for Mainstreaming Wetland Biodiversity Conservation in Honghu Lake

The Honghu Nature Reserve Administration has worked closely with various relevant stakeholders, such as the Government of Honghu Municipality and the Government of Jianli County, various sectors at higher level (*e.g.*, forestry, agriculture, tourism, environmental protection, public security, finance, and education), scientific institutions, local communities, NGOs and business to mainstream wetland biodiversity conservation efforts. As a result, the following specific measures have been adopted:

Removing the nets of enclosed aquaculture and resettling the fishermen

Statistics indicated that by end of 2004, the enclosed aquaculture within Honghu Lake Nature Reserve had spanned an area of 24,867 hm², accounting for 71% of the area of the Nature Reserve. It can be clearly seen that over-aquaculture was mainly responsible for the ecological deterioration of the lake, as it has largely gone beyond the carrying capacity of the natural resources of the lake. Therefore, removing the nets of enclosed aquaculture is a top priority and prerequisite to enhance wetland conservation in the lake. The Hubei Provincial Government had planned to remove all these nets within three years, but it only took two years to complete this work, thanks to the close collaboration of the nature reserve and local government. A total of 70 million Yuan RMB was earmarked by the provincial government to remove the nets and resettle the fishermen in Honghu Lake.

Protecting the wetland resources according to law

To further enhance conservation and restoration of Honghu Lake, the nature reserve administration has delegated the stations to be responsible for routine patrolling and for enforcing administrative punishment. It also worked closely with the local government and sectors (*e.g.*, forestry, public security, business and commerce administration) to crack down on illegal activities in wildlife conservation. Over the past three years, it has removed and captured more than 1500 fishing nets, 150 electric fishing boats and over 200 iron rabbles¹. In addition, it has punished five cases of water bird poaching and helped release more than 100

¹ Iron rabble is a tool used to harvest water grass. Illegal collection of water grass is a major threat to the health of many lakes in China.

wild animals. Over the previous two years, it has put in over 8 million fries into the lake, and enhanced management on the use of water grass. All these activities have effectively protected and restored the wildlife resources in the lake.

Strengthening scientific research and monitoring

With the support of the Forestry Bureau of Hubei Province and WWF, the Honghu Lake Nature Reserve Administration worked closely with relevant universities and research institutions conducting scientific research and sharing results; it also carried routine monitoring of birds, fish and aquatic plants to develop a basic understanding of the dynamics of the natural resources in the lake and to provide a scientific basis for its daily management. As a national monitoring station (site) of wild animal epidemic diseases under the SFA, the nature reserve administration also cooperated with the local livestock sector to implement monitoring and exchange of information on the prevention and control of epidemic diseases such as bird flu.

Increasing public awareness of the local communities on wetland conservation

With the support of WWF, the nature reserve administration has installed more than 20 large posters and signboards in densely populated areas surrounding the nature reserve. It has also developed a website on Honghu Wetland (www.wetlands.net.cn), built boats for increasing public awareness in the demonstration sites, as well as built a bird-watching area and 1250 meters of bird-watching sidewalks. Over the past four years, more than 60 national and international media have covered Honghu Lake.

In addition, the nature reserve administration has worked closely with the Honghu Municipal Education Bureau and the Friends of Nature, an NGO, to raise awareness of the students of primary and middle schools in Honghu City on the issues of wetland conservation at Honghu Lake. Under the financial support of WWF, the three organizations jointly produced the local book 'I Love My Mother Lake'. Its purpose is to help students have a better understanding of wetland and Honghu Lake, to involve them in protecting Honghu Lake, to cultivate a good habit of protecting the environment, and to influence their parents and the society in general. The ultimate goals are to raise the public awareness on loving the homeland, the nature and the planet, and to promote a harmonious development between human being and nature. This book was selected as a textbook for the primary and middle schools in Honghu City in 2006, and listed as a compulsory textbook by Hubei Provincial Department of Education in 2007. This is the first local book on environmental protection that has been selected as a formal textbook in China, and it suggests that good results have been achieved in educating children on Honghu Lake protection.

Enhancing local community co-development

The nature reserve administration worked with WWF to help Yangchai Lake fishery, one of the key communities, build an electric sluice gate for eco-aquaculture. In other communities, based on the premises of placing top priority on conservation, of considering the wise use of the natural resources and the interests of fishermen, the nature reserve administration worked with the local people to conduct eco-tourism, raise top-quality aquatic products and to change

the unsustainable production practices of these communities. For instance, in Donggangzi of Jianli County, where Honghu Lake is located, an eco-tourism area was built, with a good result in 2007. In order to take full advantage of the rich aquatic resources in Honghu Lake, the nature reserve administration has adopted measures such as putting in fences; specifying a period when fishing is banned; and allowing fishermen to conduct seasonal fishing outside the banned period. These measures, not only protected and restored the fish resources, but it increased the economic incomes of fishermen. In addition, the nature reserve administration also worked with WWF to conduct training workshops on aquaculture technologies for the local fishermen, encouraging the local communities to raise top-quality aquatic products, and laying a solid foundation for the development of alternative industries for the future.

Facilitating national and international exchange and collaboration

By leveraging the platform of WWF, the nature reserve administration has organized national and international study tours to the nature reserves, as well as more than ten symposia, training workshops and other exchange activities. For instance, the Institute of Geodesy and Geophysics, the Chinese Academy of Sciences and the Central South University of Forestry and Technology have used the nature reserve as the base for their research and teaching. These extensive exchange activities have greatly enhanced the capacity of the managers and staff of the nature reserve.

Organizing staff training and improving management skills

Over the past few years, the nature reserve administration, under the financial support of WWF, has organized trainings for the managers at different levels, involving more than 150 people times and improving the management skills of the nature reserve staff.

Conducting integrated planning on wetland biodiversity conservation in Honghu Lake

To fulfill the objectives and mission put forward by the provincial government, the Integrated Plan for Ecological Development of Honghu Lake was prepared by the Provincial Commission of Development and Reform, together with other provincial sectors (*e.g.*, forestry, agriculture, water resources, environmental protection, tourism, health, and transportation). The objectives of the plan are to fully take advantage of various functions of Honghu Lake according to its actual conditions; and to conserve and wisely use the wetland biodiversity by taking into consideration the interests of all relevant stakeholders. At present, the Hubei Provincial Government has incorporated the ecological development of Honghu Lake into the provincial economic development plan, placing a top priority on biodiversity conservation of Honghu Lake for the sustainable development of all relevant industries.

Implementing demonstration projects

In 2003, the SFA approved the first stage of Honghu Lake Conservation and Restoration Demonstration Project, with a total investment of 11.77 million Yuan RMB, including 5.88 million Yuan RMB from the central government. Over three years of natural restoration and man-made interventions, the coverage of water grass in the demonstration site was increased to 90%; the water quality was improved to Category II-III (from Category IV); and with the

growing numbers of wild fish, the water bird population increased to 20,000-40,000 individuals (from only 2,000). In 2006, the second stage of the demonstration project was launched by SFA, with a total investment of 15.30 million Yuan RMB, including an allocation of 6.12 million Yuan RMB from the central government and a co-funding of 9.18 million Yuan RMB from the local government. The demonstration areas have been expanded to 100,000 mu (6,667 hectares). Through efforts such as conservation and restoration, infrastructural development and capacity building, the ecological conditions of Honghu Lake has been improved, while the management skills of the nature reserve administration has been greatly enhanced.

Advancing a legislative process for Honghu Lake Nature Reserve

At present, more than ten national laws and regulations are closely related to wetland conservation in China, *e.g.*, the Regulation on Nature Reserve, the Wildlife Protection Law, the Fishery Law, the Law on Water Pollution Control and the Water Law. However, in the current wetland conservation efforts, the implementation of these laws and regulations is often confronted with difficulty in enforcement, too decentralized powers and poor management. The Honghu Lake Nature Reserve is the largest freshwater lake in Hubei province, representing a unique wetland ecosystem in the province. As a result, the experts from the provincial Commission of Legislation under the Provincial Congress and the Office of Legislation under the Provincial Government, have visited Honghu Lake many times to conduct surveys, to lay the foundation for a legislation. So far, the Rule of the Management of Honghu Lake Nature Reserve has been developed and submitted to relevant authorities for review and approval. The Honghu Lake Nature Reserve Administration has also been actively involved in the legislation on wetland conservation at the national level.

Mainstreaming Wetland Biodiversity Conservation in Honghu Lake - Achievements

The opinion of the local people has been fundamentally changed

Human being play a decisive role in mainstreaming wetland biodiversity conservation in Honghu Lake. Experiences have proved it is very difficult to change one's stereotyped ideas. However, through many years of hard work, such as public awareness, training, study tour, demonstration and collaborative activities, the Honghu Lake Nature Reserve Administration has succeeded in exerting a great impact on the local government, sectors and communities. In particular, the fishermen living in and around the nature reserve have fundamentally changed their traditional ideas, which is reflected as follows:

- *Realizing that they 'cannot eat up the food of the future generations'*: This means that the local people have come to realize the adverse consequences of 'killing the goose that lays the golden eggs', which could lead to depletion of resources, and deprive the future generations of living sources, making it impossible to achieve sustainable use of natural resources.
- *Recognizing that it is necessary to love and protect the birds that are the friends of human being*: It is a difficult process for people to change from poaching practice to

the voluntary protection of water birds. Most of the local people have now a better understanding of the interactions between the migratory pattern of birds and the human living environment. They regard the birds as their friends and take initiative to protect them.

- *Realizing that they have benefited from the establishment of the nature reserve:* At the early stage when the Honghu Lake Nature Reserve was founded, many local people did not have a good understanding of the purpose of the nature reserve, assuming that the nature reserve would compete with them for using the lake resources, or would deprived them of their rights to use wetland resources. This caused some disputes and contradictions between the nature reserve administration and the local communities. Through many years of hard work, the environment of the nature reserve has been greatly improved, there is more natural resources, and the local people have benefited from the conservation efforts. As a result, the local people have shifted their old ideas, and expressed their commitment to supporting biodiversity conservation efforts in the lake.

Wetland biodiversity restored and changes in local environmental conditions

Thanks to the mainstreaming practice, Honghu Lake has restored its vigor and vitality. This can be clearly seen with blue sky, cleaner water, more birds, including the return of whistling swan, and fish, etc. According to monitoring results, fish species in Honghu Lake has increased to 62 from 57 and fish size has shifted from small to larger individuals; the coverage of water grass has been expanded to more than 90% from 60% of the area; the area of the wild lotus has been extended to over 50,000 mu (3,333 hectares) from less than 10,000 mu (667 hectares); the bird species have been increased to 138 from 133 and the total bird population has risen sharply to 100,000 from about only 2000 bird; and the water quality of the lake has also been improved to Category II and III (from Category IV and V).

Production and living practices of local fishermen significantly improved

Firstly, the old enclosed aquaculture-dominated practice has been changed into natural fishing and organic fishery-dominated practice. Before 2004, the enclosed aquaculture had reached an area of 24,867 hm² in the lake. After removing the enclosure, the aquaculture area for the relocated fishermen has been controlled within 10%, or less than 4,000 hm². Large spans of water bodies in the lake are used for natural breeding of fish and aquatic plants. The fishermen can only have limited fishing with permits in the non-banned areas during the non-banned period. The statistic indicated that the average economic income of fishermen's household for natural fishing was increased by 3 to 4 times over previous years, with a much lower risk of investment for the fishermen.

Secondly, the fishery practice has been transferred from extensive aquaculture in the big lake into intensive aquaculture in the small ponds in order to achieve high production and high efficiency. After implementing wetland conservation measures, the local government allocated 1.33 hm² water surface to conduct aquaculture to each household of fishermen whose enclosure had been removed. Most of the fishermen moved their aquaculture in the small ponds around the lake, changing from extensive (more investment and less income) to intensive (less investment and more income) aquaculture practice. The aquatic products

harvested also changed from common fish species and crabs to special and top quality fish species, such as eel, Mandarin fish, and lobster.

Lastly, the mono-aquaculture practice has shifted to a diversified development model integrating aquaculture, processing and eco-tourism. In previous years, the lake fishermen were mainly involved in the aquaculture industry with large investment, high risk and low income. Following the mainstreaming process, the local government and the nature reserve administration worked closely with the local fisherman to encourage them to develop a more diversified economy: the local government provided, free of charge, the technical training to encourage them to be involved in the industrial and service sectors; an industrial system that integrates aquaculture, processing and marketing was established, good examples of aquatic products companies are the Deyan and Minhong companies; and lastly, eco-tourism has become a major industry in Honghu Lake, for instance, the Lantian Ecological Park of Honghu Lake has been developed into an AAAA scenic spot in China, while Honghu City is working hard to become a famous tourism city.

Conclusions and Discussion

Over the past few years, the Honghu Lake Nature Reserve Administration has worked closely with the local government and sectors, as well as the national and international NGOs, scientific institutions, business, media, and local communities to mainstream the biodiversity conservation efforts in the lake. Initial progress has been achieved and rich experiences gathered. The government has played a leading instrumental role in this process, taking effective measures and injecting funding to restore the vitality of the lake. The outstanding achievements are attributed to a number of factors: the policy of the central government on wetland conservation; the due attention of the leaders at various levels; the great support from WWF and other national and international NGOs; the work and participation of relevant experts; the extensive coverage and support from the media and the society; and the involvement of local communities. The great success achieved in conserving and restoring the wetland biodiversity in Honghu Lake is also the result of close collaboration and co-management among the various relevant stakeholders. Therefore, cooperation and co-management should be a major component in mainstreaming wetland biodiversity conservation in the future.

In the course of developing a sound system for the wetland conservation legislation and with legal reform in China, the wetland sites will be increasingly managed according to law. The local governments where Honghu Lake Nature Reserve is located should pay due attention to the wetland biodiversity conservation efforts, restructure their economies and develop alternative industries according to the interests of the people first and placing top priority on conservation and wise use of the biodiversity resources, from the perspective of sustainable socio-economic development in the region. Specific recommendations are proposed below:

- Wise use of the natural resources and developing the industrialization of aquaculture to integrate aquaculture, processing and marketing. Special efforts are required to develop special aquaculture to add value to aquatic products;

- Building cost-effective eco-agriculture. Use diversified eco-agricultural models, such as the symbiosis of fish and lotus, of rice and crabs, and of fish and eels, should be expanded at a larger scale. An intensive economy that combines the production bases, households and companies should be encouraged to promote the development of green food production;
- Developing eco-tourism by leveraging the natural resources and geographic location of Honghu Lake. The area of Honghu Lake is not only well-known as the Hometown of Fish, but a famous revolutionary base area. It has a great potential in tourism because of its rich natural and cultural values. The eco-tourism and revolutionary tourism ('red tourism') are expected to further promote the development of service sectors, providing some employment opportunities for the local communities (State Forestry Administration *et al.*, 2000). As for the nature reserve itself, innovative measures are also required to explore new management models to enhance monitoring and management of the five wetland elements, *i.e.*, people, water, grass, fish and birds. In addition, following the nature conservation principles, the nature reserve should also work with the aquaculture, farming, tourism and processing industries in order to generate more income for the nature reserve and to mitigate conflicts between the nature reserve and local communities for the harmonious development of the nature reserve and the regional economy (Wen Feng, 2005).

References

- Yu Xiubo *et al.*** 2007. Brief on Ecosystem Research and Management. Volume 9.
- County Annals of Honghu.** 1987. Wuhan University Press: 62-63.
- Wen Zhanqiang, Wen Feng, *et al.*** 2002. Management Plan of Honghu Lake Nature Reserve (2003-2007).
- Environmental Protection Bureau of Honghu City.** 2003. Bulletin on the Environmental Conditions of Honghu City.
- State Forestry Administration, *et al.*** 2000. China National Wetland Conservation Action Plan. China Forestry Press.
- Wen Feng.** 2005. Conserving Honghu Lake to achieve the sustainable development of regional economy. Hubei Forestry Economics **4**: 40-41.

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CHAPTER 18

MAINSTREAMING WETLANDS BIODIVERSITY CONSERVATION IN GUANGDONG PROVINCE

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Abstract

Wetlands are one of the important environmental settings for human being. It is also one of the three main ecological systems. Healthy wetlands provide the foundation for ecological security, biodiversity conservation and construction of harmonized society. The article introduces the practice of mainstreaming wetlands conservation in Guangdong province. It also analyzes the bottleneck of wetlands biodiversity conservation in Guangdong. It further discussed the approach of mainstreaming wetlands conservation in Guangdong province under the tenets of harmonizing human being and the nature and sustainable development.

Keywords: Guangdong, mainstreaming wetlands biodiversity

Wetlands Biodiversity in Guangdong Province

Wetlands are plentiful and diverse in Guangdong Province. Their total area represents 1,807,000 ha, which accounts for 10% of the total area of the whole province. According to the five main wetlands categories and 20 types, the 12 types of coastal and offshore wetlands can all be found in Guangdong. Characterized by long and meandering coastline and decorated with lots of bays and covered by extensive river system, the mangroves are widely distributed in large patches. Aquaculture is widely practiced in the province.

Guangdong Province is rich in wetlands biodiversity. The diversity of wetlands ecological systems is responsible for the multitude of species found in the Province: there are 155 species of waterfowls (11 orders and 23 families), representing 48.3% of the total waterfowl population in China. There are 45 species of *Charadriiformes*, 27 species of *Anseriformes*, 21 species of *Ciconiiformes*, and 13 species of *Lariformes*. It also includes rare and endangered bird species, e.g., *Ciconia boyciana* and Black Stork that are in the first level of national protected species and 13 species and one sub-species that are on the second level of national protected species. There are also species that are recognized by IUCN as endangered species, i.e., *Egretta eulophotes*, *Gorsachius magnificus*, *Platalea leucorodia*, Black Stork, *Haliaeetus leucogaster*, *Pandion haliaetus*, Nordmann's Greenshank, two sub-species of the spotted bill pelican (*Pelecanus onocrotalus*) and the Baikal Teal. There are 59 species of provincial protected birds (3 orders and 13 families), 60 species of reptiles (3 orders and 9 families), 43 species of amphibians (8 orders and 17 families), 32 species of mammals (54 orders and 122 families), 211 species of marine fish, 184 species of freshwater fish, 151 species of brackish-water fish, 260 species of zooplankton, 181 species of benthic fauna (among which there are 22 species of Crustacean and 65 species of mollusc). In the coastal wetlands, there are more than 70 species of corals, and other invertebrates such as molluscs, arthropods, echinoderms. In addition, there are 451 species of wetlands plants (141 orders and 294 genera) distributed in the province, among which there are 381 species of angiosperms (93 families and 246 genera), and 117 species of hydrophilous fascicular plants. (Chen Junqing *et al.*, 2005)

Mainstreaming Wetlands Biodiversity Conservation in Guangdong

Legislation and policies

The Provincial Party Committee, the Provincial People's Congress, Provincial government and the Provincial People's Political Consultative Conference are providing legislative and policy support to mainstream wetlands biodiversity conservation.

The Provincial Party Committee and the Provincial government have issued the "Directive on Expediting the Construction of Forestry and Ecological Development of the Province". The Directive covers the development of ecological security system, the protection of the mangrove resources, and acceleration of the restoration of coastal mangroves. Strengthening the environmental protection of wetlands, oceans and the earth and the conservation of biodiversity has been clearly stated by Zhang Jiangde, the Provincial Party Committee secretary, in his report at the Tenth Provincial Party Delegation Meeting held in May 2007. Wetlands conservation has been covered in the Provincial Government Work Report. At the provincial liaison meeting, mechanisms regarding conservation and management of wetlands have been discussed and wetlands conservation and management are listed as part of the Eleventh Five-Year Plan forestry resource conservation and development target responsibility and for evaluation of government officials at all levels. To further strengthen the leadership and supervision in terms of wetlands conservation, the performance review of government officials is to be carried out on a yearly basis and the results are to be circulated. The provincial government has forwarded to the State Department a circular regarding the "Strengthening of Wetlands Conservation and Management". The Provincial People's Congress Standing Committee has passed the "Guangdong Province Wetlands Conservation Regulation" on June 1st 2006. The regulation was put in force on September 1st 2006. After a joint survey of the Provincial and Guangzhou city People's Political Consultative Conference, a survey report on "Guangzhou City Wetlands Conservation and Construction" was submitted to the Provincial Party Committee and the Provincial government.

Coordination of the wetlands management system

The second of the GEF strategic priorities in biodiversity is mainstreaming biodiversity, in another word, mainstreaming biodiversity conservation in production landscapes and in sectors (e.g., agriculture, forestry, fishery, tourism and other production sectors) to guarantee benefits to individual nations and the global environment. This goal is in accordance with the Guangdong Province wetlands management system mandated by the provincial "Wetlands Conservation Regulation", which states that the wetlands conservation and management system of the province should be carried out by individual sectors with an overall coordination; a liaison meeting mechanism has been established to provide the platform for exploring the mainstreaming of wetlands biodiversity conservation.

Scientific and management plans

Scientific and management plans provide the scope and the long-term goals for wetlands biodiversity conservation. The province's forestry department compiled the "Guangdong Province Mangrove Protection and Management Plan (2006-2015)" and the "Guangdong Province Coastal Wetlands Conservation and Restoration Plan (2006-2015)", and implemented one of the core projects of the "Tenth Five-Year Forestry Plan", i.e., a mangrove wetland ecosystem protection and construction project, which was based on the province wetlands and mangrove survey. Now the "Guangdong Province Wetlands Conservation Project Plan (2006-2030)" is being compiled (Guangdong Provincial Forestry Bureau, in review).

Establishment of wetlands protection system

The creation of wetland protection systems is required to provide a solid foundation for effective conservation of wetlands biodiversity. Nature reserves and wetlands parks are important components of a wetlands protection system. After several years' effort, 94 wetlands nature reserves were established in Guangdong Province, totaling an area of 0.7824 hectare. Under the auspices of the nature reserves, diverse wetlands types (e.g., mangrove, coastal beaches, reservoir, pond, swamp, coral reef) and habitats for, e.g., Black-faced Spoonbill, Purple Swamphen, Dalmatian Pelican, Humpbacked Dolphin, *Shinisaurus crocodilurus*, and other rare and endangered species have been protected. The Zhan Jiang Mangrove and the Hui Dong Port Chelonian National Nature Reserve have been listed as wetlands of international importance under the Ramsar Convention. Two provincial wetlands parks, i.e., the Mao Ming Da Zhou Island and the Zhan Jiang Hu Guang Mangrove, have also been established. The Zhao Qin Xing Lake Wetlands Park has been approved as a pilot wetlands park; and the Zhao Qin Lily-trotter protection site and Xin Hui Bird Resort have been built.

Innovative technologies

Innovative technologies provide the continuous momentum and support to wetlands biodiversity conservation. This year, experiments on mangrove pollution ecology, species introduction and afforestation have been carried out. Fast-growing tree species such as *Sonneratia apetala* and *S. caseolaris* were successfully introduced. A total of 4066.7 hectares of mangrove was restored. Much research has been carried out on the geographical location of rare and endangered waterfowls, their population levels, protection strategies, migration routes and behaviour pattern. For example, in August of this year, seven Pacific reef egrets were found, in Nan Ao Migratory Birds Provincial Nature Reserve. In addition, marking rings were installed on the legs of Bridled Terns to study their migration patterns. Research on Purple Swamphen's breeding was carried out in Haifeng Wetlands. Research on artificially-breed chelonian set free in Hui Dong Chelonian, a Ramsar site, was carried out to provide scientific information on wetlands biodiversity protection.

Challenges in Wetlands Biodiversity Conservation in Guangdong

Irrational reclamation and land-use change

Irrational reclamation and land-use change have reduced wetlands functions and the quantity of wetlands. Wetlands are a limited natural resource. However, for a long time, wetlands have been considered as unused land. Consequently, a lot of wetlands were developed in a very rude manner. Waterfowl habitat is shrinking and the wetlands functions are deteriorating. The ecological status of wetlands is severely threatened. Before the 1980s', there were 86,000 ha of mangrove and coastal wetlands that could be reforested. Due to continuous reclamation, the area of mangrove and coastal wetlands that could be reforested is shrinking to 37,000 ha. In Wuchuan city, the size of the Wetlands of *Vetiveria zizanioides* was 5,000 ha in the 1950s', however, now only 150 ha remain; this shrinkage was caused by the nearby brick making factories', which were digging for clay. Such activities greatly threatened the existence of specific types of wetlands.

Environmental pollution and excessive use of wetlands

Environmental pollution and excessive use of wetlands are reducing the biodiversity of wetlands. In recent years, rapid economic growth, industry and municipal sewage are increasingly discharged into wetlands; that and extensive use of pesticide and fertilizer has led to unhealthy wetlands ecosystems in the Zhujiang estuary. From the 1960's to now, the population level of the Chinese Beluga of the Zhujiang estuary was reduced from more than 1,000 to less than 500. In addition, the fishing intensity is increasing. The excessive fishing activities have resulted in the gradual disappearance of fish species of economic value. The harvesting level is continuously declining. The ecology of offshore wetlands is destroyed, its biodiversity threatened. There has been a great reduction in the population of over 70 species of coral, more than 30 species of valuable fish and other rare species (e.g., finless porpoise, Asia giant soft-shell turtle, dugong, king crab) and several snake species, due to excess exploitation; some of these species are extinct or are on the verge of extinction.

Institutional set up and mainstreaming wetlands biodiversity conservation

Mainstreaming wetlands biodiversity conservation is very difficult in the current institutional set up. The conservation and management of wetlands concerns government agencies specialized in forestry, oceanography, fishery, land, agriculture, water and environment protection, etc. Although, the state and provincial governments have put the forestry agency in charge of overall coordination of wetlands conservation, there are problems arising from contradictory management measures and different management objectives taken by other government agencies. Therefore, mainstreaming wetlands biodiversity conservation, in practice, is very difficult. The enforcement regarding cracking down on damaging of wetlands is far from satisfactory. In many cities and townships, wetland inventories were not done, and consequently no plan for wetlands conservation. To make the matter worse, staff shortage and poor training of existing staff in charge of wetlands management and law enforcement has resulted in ineffective wetlands management.

Insufficient investment

Insufficient investment impedes wetlands conservation, restoration and development. Currently, despite the increasing concern on wetlands conservation, the wetlands conservation and construction has no stable funding source. Consequently, lot of wetlands ecological conservation and restoration project could not be implemented.

Mainstreaming Wetlands Biodiversity Conservation in Guangdong

Guangdong will be guided by several development principles, including the "Three Represents" that were first enunciated by President Zhang Zemin and that guide the modern development of China (the Party represents the development trend of China's advanced productive forces, the orientation of China's advanced culture, and the fundamental interests of the overwhelming majority of the Chinese people), (ii) the concept of scientific development to which the State Council Circular on Wetlands Conservation Management applies, and (iii) to harmonize man and nature for sustainable development. We will base our actions on the foundation of the construction of ecological country and to build an ecological province to protect wetlands ecological system and improve its ecological function, to strengthen wetlands protection and management, and to build a harmonized society by protection, restoration and rational exploitation of wetlands based on the principle of sustainable development.

Regional linkages and concerted protection

In China, mangroves are found mainly in Zhejiang, Fujian, Guangdong, Guangxi and Hainan provinces. The largest surface area of mangroves is located in Guangdong and Guangxi has the second largest area. Fujian was the first province to carry out research on mangrove. The mangroves in the three provinces have different characteristics due to different latitudes and climate; the three provinces have connected coastlines adjacent to Hongkong and Macau. It is therefore important to strengthen cooperation and communication on mangrove and migratory bird protection among Guangdong, Guangxi, Fujian, Hongkong and Macau. This could be achieved by establishing a mechanism for negotiation and information sharing; by establishing a concerted Guangdong and Fujian mangrove protection circle, a Guangdong, Hongkong, Macau Zhu Jiang estuary mangrove wetlands protection circle; a Guangdong, Guangxi, Hainan North coastal mangrove wetlands protection circle; and a regional wetland ecological security system.

Awareness raising and dissemination of information

We plan to raise awareness on the importance of wetlands for national ecological security and for their indispensable role in the every day life of the general population. This will be done by developing wetlands training material and carrying out World Wetlands Day events. Special attention will be given to disseminating wetlands conservation knowledge among the general population in order to generate public support on wetlands conservation. Simultaneously, it is also important to raise awareness on wetlands conservation among the various levels of relevant government agencies and citizens. This is necessary in order to change attitudes such as, e.g., “dealing with the damage afterwards” or “allowing the damage and dealing with it simultaneously”; to develop a scientific vision; and adequately treat the relationships among wetlands, economic development, partial and overall interests, long-term and short-term interests. For saving wetlands resources, it is important to strengthen wetlands conservation and to build the social awareness for the wetlands to be protected by all citizens.

Improving coordination and staffing

The forestry departments at various levels should take full charge of their responsibilities for the overall coordination and organization of wetlands management through the strengthening of the coordination with other agencies (e.g., finance, land, agriculture, water, environmental protection, oceanography, and legislative) in order to respect the law. It is important to improve the management liaison meeting system to provide concrete coordination regarding the exploitation, integrated management, and comprehensive protection of natural wetlands. The local government should carry out the provincial Party Committee and the Provincial government’s “Decision on Expediting the Construction of a Forestry Ecological Province” by defining the coordination role of various levels of the administration departments that are in charge of forestry. This should also include research on the wetlands management institutions, to improve wetlands conservation management with appropriate staffing and funding, and to establish wetlands conservation and wise use management and coordination mechanisms including small but efficient wetlands management and law enforcement teams.

Wetlands protection, restoration and networking

We will continue our work of strengthening the infrastructure and capacity building in the existing 94 wetlands nature reserves and 3 wetlands parks. We will also make an effort to recover mangrove in the coastal areas that are suitable for afforestation; to carry out investigations in important bird habitats and build bird marking stations; to establish or

restore nature reserves, wetlands parks, protected sub-regions or stations in typical or important rivers, lakes, marshland or coastal wetlands, etc. We are planning to gradually build a wetlands protection network that will cover all wetlands types, with appropriate geographical distribution, good protection and management, and effective conservation outcome. In addition, we are planning to build long-term wetlands monitoring systems at fixed location and time interval with appropriate scientific methods.

Scientific planning and management

It is important to define the land tenure and to issue certificate based on the wetlands inventory and to clearly identify the wetland location and type. We plan to use different conservation, management, recovery and exploitation measures according to wetlands types. We are planning to compile a “Wetlands Conservation Project Plan of Guangdong Province” with the best science available and compile a corresponding implementation plan. We would like to initiate its implementation right after the provincial government’s approval and its ratification by listing in the country economic and social development plan. We would like to conserve, recover and demonstrate “wise use” of wetlands through pilot projects involving wetlands conservation, recovery, sustainable use, and to prioritize community development and capacity enhancement projects. It is important to conduct wetland resource surveys and to compile local wetlands conservation plans for the conservation and wise use of the wetlands resources of the whole province.

Scientific research and science-based decision-making

The government should establish grants or a funding mechanism for wetlands related research by providing continuous support to academic and research institutions; establishing a southern China Wetlands Research Center and Regional Research base to foster wetlands related sciences and the enhancement of the research level, which will gradually improve the science-based decision-making regarding wetlands management.

Government investments and widening other sources of funding

Wetlands conservation is an important public undertaking. Wetlands conservation and management is one of the important functions of the government. Recently, funding for wetland conservation and wise-use has felt short of the real needs, becoming a severely limiting factor for wetlands conservation and wise-use. Therefore, it is important for governments to play a leading role by bringing wetlands conservation into National Economy and Social Development and Annual plans, and by budgeting funds for the timely implementation of various wetland conservation projects. In addition, we should gradually develop some conservation and wise-use economic policy system by establishing wetlands conservation association and other relevant civil society and associations to raise public funds. Consequently, we would promote the socialization of wetlands conservation and wise-use by widening the sources of funding from different sectors, both domestically and internationally.

References

- Chen Junqing, Chen Guizhu and He Weitian.** 2005. Yue Ao Wetlands. p. 51–110.
- Guangdong Provincial Forestry Bureau. (in review).** Wetlands Conservation Project Plan of Guangdong Province (2006-2030). p. 4–13.

CHAPTER 19

DEMONSTRATING AND EXPANDING GREEN AGRICULTURE IN THE CRESTED IBIS NATURE RESERVE, SHAANXI PROVINCE, CHINA

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Abstract

The Crested Ibis (*Nipponia nippon*) is a globally endangered species listed under the first-grade national key protection in China. It now only occurs in Yangxian County, Shaanxi Province, and its surrounding areas in China. When the Crested Ibis was re-discovered in the wild in China in 1961, the administration of the National Crested Ibis Nature Reserve has been working closely with WWF and other conservation organizations and sectors to introduce business mechanism and green agriculture projects by focusing on the dynamic changes of its population to contain the damage of chemical-based agriculture to the habitats of the Crested Ibis. A conservation model has been developed with the participation of various stakeholders such as the nature reserve, the company and the farmers, and some initial outputs have been achieved. The paper assesses the findings of this project, summarizes the major issues facing the protection of the Crested Ibis habitats and the next steps for community-based projects. Recommendations for scientific protection and management of this rare species are proposed.

Keywords: crested ibis, habitat, agriculture, mainstreaming

Background

The Crested Ibis (*Nipponia nippon*), also called Vermilion Heron or Red Ibis, is a rare wader and a globally critically endangered bird. Historically, it was widely distributed in China, Japan, the Korean Peninsula and eastern Russia (Shi Dongchou and Chao Yonghan, 2001). However, since the 1950s, due to the chemical agricultural development and wetland destruction, the living areas of the Crested Ibis and their population declined sharply, and the species was on the verge of extinction. It was identified as a Bird of Global Protection in 1960 at the 12th International Workshop on Bird Protection. Since then, the crested ibis disappeared from the Korean Peninsula and Russia. In 1981, to save the bird from extinction, the Japanese government captured the five remaining crested ibises and kept them in captivity. The Crested Ibis was declared extinct in Japan with the death of the last female bird, named Ah-jin, on October 10, 2003 (Yang Chaolun, 2004). It was once regarded as being extinct in China where it had disappeared from the wild for two decades, i.e., in the 1960s and 1970s. To understand the actual conditions of this species, beginning in 1978, a team under the Chinese Academy of Sciences initiated surveys in the provinces (i.e., Hebei, Shanxi, Anhui, Shaanxi and Gansu) that were once home to the Crested Ibis.

In May 1981, the scientists identified a small population of 7 individuals in Yangxian County, Shaanxi Province at the southern foot of the Qinling Mountain (Liu Yinzeng, 1981). This new finding caused a big stir in the domestic and international science communities, and aroused a great interest from international wildlife protection organizations. China became the only country in the world with wild population of the species. Specific institutions for the protection of Crested Ibis were established under the guidance of governments at various levels and with the support of domestic and foreign organizations and individuals.

In 1986, a station for the protection of Crested Ibis was created; it was upgraded to a national nature reserve in 2005. The wildlife protection, management and research professionals have worked closely with local people to save this endangered species, and significant progress has been made. Initially, a protection and management team was formed and a series of measures were adopted to ensure the normal reproduction of Crested Ibis under natural conditions, as a result their numbers significantly increased and their habitat gradually expanded. Now, their habitat represents a total area of 4000 km² located in seven counties and districts (Yangxian, Chenggu, Hanzhong, Mianxian, Xixiang and Foping) in Shaanxi Province (Cao Yonghan and Lu Xirong, 1994). This prevents it from being listed as a critically endangered species.

Protection of the Crested Ibis cannot be made possible without the valuable support and contributions of the local government and communities. The crested ibis preferred habitats are big trees or forest edges near the farmer's houses and they feed on loaches or crickets in paddy fields, in the flood plains or along the banks of reservoirs. They often move according to seasonal changes and food abundance. However, their habitat areas feature frequent human activities and vulnerable environmental conditions. In the earlier stage, there was a limited number of Crested Ibis and their living areas, especially their breeding sites, were confined to only a few villages. The local government then passed rules in order to ban the use of pesticides and chemical fertilizers, as well as deforestation and mining activities in major areas where crested ibis were found. While some results have been achieved regarding the protection of this rare species, the local economic development was slowed.

To make up for the economic losses of the local farmers, the local government reduced or exempted the local farmers from some agricultural taxation. The protection station staff worked closely with the local communities to develop alternative livelihoods (e.g., planting mushroom; building hydrologic stations, bridges and culverts; and installing food processing facilities). Campaigns were also launched to raise awareness of the local people. As a result, the local farmers were actively involved in conservation efforts by preventing the nests of Crested Ibis from being disturbed, by reporting the activities of the Crested Ibis, and by not applying pesticides in the bird feeding sites. Local farmers therefore contributed to population growth of this rare species in ensuring a safer habitat for them.

Over the recent years, as the population size of the Crested Ibis has increased, their habitats expanded across Yangxian County and surrounding areas. Unfortunately, the rules of the local government are not adequate to meet the changing situation. On the other hand, the fast growth of agricultural and industrial production, the intensive farming practice, the extensive use of irrigation, as well as the abnormal climate and conflicts of various interests have led to heavy loss and deterioration of wetlands ecosystems. In particular, the aquatic biodiversity of paddy fields, one type of man-made wetlands, was greatly reduced because of heavy use of pesticides and chemical fertilizers, which area direct threat to the life and health of the crested ibis.

Research Methodologies

The Crested Ibis branded green food project was launched in 2004. To assess the project progress, to disseminate the experiences learned, and to establish future targets, a survey was conducted using questionnaires, face-to-face interviews and site visits.

Questionnaires

Before investigating, the team discussed and reached an agreement on the methods to use and on the planning of the survey. The survey addressed the following major topics: the economic incomes of the local farmers, the community environment, the supporting facilities and the needs for the community economic development. To assess project implementation and to solicit comments on future development, questionnaires were prepared on the project itself and on the community development in and around the Crested Ibis Nature Reserve.

Face-to-face interviews and site visits

Both face-to-face interviews and site visits were conducted during the survey. Half-structured interviews were done with local residents, government agencies, nature reserve managers and other stakeholders. A half-structured interview is one in which the topics are determined in advance; during the interview, the interviewer asks open questions that are closely related to the research projects, i.e., there is no pre-set order and formulation of the questions.

Assessment of Conflicts between Species Protection and Local Economic Development

Although the population size of Crested Ibis is rapidly growing, there are only several hundred individuals. It is below the minimal population size and distribution areas required for survival. They are still vulnerable to extinction caused by the impact of natural disasters and human disturbances. Apart from natural causes, human activities are becoming a major factor affecting the protection of endangered species. The Crested Ibis habitats are adjacent to local communities, and consequently they are directly and heavily impacted by human activities. The local communities depend heavily on land resources. While the Crested Ibis protection efforts were carried out, the traditional living and production practices were restricted and the alternative livelihood practices had not yet been developed. This situation led to illegal use of natural resources by the local communities. It became a major threat to local ecological conditions and biological resources.

Chemicals used in agricultural production are a threat to the life and reproduction of the Crested Ibis

Pesticides and chemical fertilizers contribute substantially to agricultural production and their negative effects on ecosystems are often ignored. Large use of pesticides and chemical fertilizers can have an impact on aquatic resources in wetlands. In the past, the survey indicated that there was 0.7 to 1.3 kg of loaches /m² in paddy fields, the Crested Ibis feeding ground during the breeding period. Now, this figure has dropped by 50% in mountainous areas and 80% in plain areas. The reduced density cannot meet the needs of crested ibis during reproduction. The birds have to go further to fetch food for their young and spend less time feeding them. The nestlings become weaker and there is a higher mortality rate. To understand the impact of chemical fertilizers on loaches, the nature reserve administration conducted a simulation experiment: 20 kg of loaches were raised in a paddy field where chemical fertilizers were applied. At the end of the experiment, the weight of the remaining loaches decreased by 6.6 kg, a reduction of 33%.

Pesticides can accumulate in Crested Ibis *via* the food chain and may represent a direct threat to them. Since 1990, the Shaanxi Institute of Environmental Monitoring has monitored twice the environmental quality of the Crested Ibis habitat. Their results show that the DDT content of loaches harvested in the wandering areas is much higher than the DDT content of those

harvested in the nesting areas (i.e., 68.4 to 130.5 mg/kg vs 12.4 to 15.0 mg/kg). The DDT contamination of the Crested Ibis food is more severe in the wandering areas than in the nesting areas. This contamination may result in weak health, slow growth and low survival rate of young birds. The Crested Ibis has also the habit of clustering with other waders such as egrets; the comparatively low food quantity in the wandering areas forces many Crested Ibis to look for food in a larger area during their wandering seasons. This situation has increased the uncertainties and difficulties in the conservation and management of Crested Ibis (Zhang Yueming, 2001).

Conservation measures constrain the economic development of local communities

Most local farmers in the area still use traditional farming practices that depend heavily on natural resources. To protect the Crested Ibis, the nature reserve administration has banned some human activities and enforced many rules at breeding sites. For example, quarrying activities generated direct incomes for local people and its ban constrained their local socio-economic development and had negative effects on the stability and safety of the Crested Ibis population. Conventional conservation practices cannot directly benefit the local people, and they have hindered the local people in their acquisition of wealth and weakened the conservation efforts.

Poor economic status hinders the protection of ecological conditions

Yangxian County is situated in the Qinling and Dabashan mountain ranges; it suffers from poor transportation, lack of information and backward economic development. It is dominated by an agricultural economy, without any large-scale industrial projects. The designated Crested Ibis Nature Reserve encompasses 19 villages and townships within the county. Ninety-five percent of the local people depend mostly on agriculture and have a poor economic status. From 2004-2005, the statistics of Yangxian county indicates that the total annual revenues of the whole county was 40 million Yuan RMB. The annual per-capita income of the local farmers was only 1,400-1,900 Yuan RMB, that is much lower than the national per-capita income of 2,622 Yuan RMB, for that year.

To maximize the economic benefits of crops per-unit level, the local farmers are increasingly seeking higher production. They do this by selecting varieties with higher yields but with less desirable flavour, and by using pesticides and chemical fertilizers to increase production and improve outer appearance of crop. This practice increases the production costs, causes contamination of the agricultural products and the local environment, and poses direct risk to the human health. As a consequence, the trust of the consumers on the edible products is lowered. A vicious cycle of high production, high cost, low sales, low price and high pollution is created, complicating the efforts for the protection of Crested Ibis for the nature reserve administration.

Increasing number of young farmers move to urban areas and severe wetland degradation at breeding sites

Working in urban areas is one of the major strategies used by local farmers to escape from poverty. The survey shows that in Yangxian County more than 40,000 people, i.e., 10% of the local population go to the coastal areas to find work. In the mountainous areas, a higher proportion of young people is working in urban areas. The best breeding sites for Crested Ibis are also located in the mountainous zones where there are large areas of winter paddy fields, i.e., paddy fields with water in all four seasons. These areas support rich resources of loaches and other aquatic life and undisturbed sites, which are favourable for breeding. The paddy

fields of the mountainous areas are often distributed in the valleys and need careful maintenance and management to prevent flooding, mudflows and proliferation of water grass. However, as many young farmers move away, large areas of paddy fields are converted to dryland or are subject to desertification because of droughts and the lack of manpower. This situation often leads to the deterioration of the Crested Ibis habitat and is harmful to their breeding. A similar situation occurred in Japan, in the 1950s when many people living in the mountainous areas resettled to the plains and the paddy fields were left uncultivated. The crested ibis had therefore no food to feed and breed, and eventually it disappeared from Japan. China needs to learn from this lesson to prevent it from happening again.

Past community co-management practices are outdated and unsuitable for the conservation needs of the growing population of Crested Ibis

It is of critical importance for the nature reserve to coordinate between the regional and overall interest, and the interest within the region. Over the last two decades, the nature reserve administration has implemented a wide range of activities on community co-management, e.g., the construction of public facilities for the underdeveloped communities; improvements in the living and production conditions of the local people; and enhancement of the relationship between the nature reserve administration and the local communities. But this co-management program did not take fully into account the integration of the conservation of crested ibis with the sustainable development of local communities. With the rapid growth and expansion of the wild population of crested ibis since 2000, the old practice of community co-management was found outdated. In addition, the nature reserve receives from the government a limited budget and eco-compensation funds for the local communities, have not yet been made available. As the financial support of the government for conservation cannot address the needs of the growing population of crested ibis, and as the conservation program does not directly benefit the local people, deterioration of the local environment has increased. Most local communities leaders simply see the community co-management as a poverty reduction effort; and they focus solely on the economic benefits rather than on the ecological benefits and responsibilities for nature conservation. This reactive attitude has prevented the majority of local people from actively participating in nature conservation, and failed to achieve a win-win situation for the nature reserve and the local communities, which is inconsistent with the basic objective of community co-management.

Project Framework Proposal: Mitigating Conflicts Between the Nature Reserve and the Local Communities

The principle of nature reserve and community co-management is guided by regional economics. It highlights the harmonious relationship between man and nature in a certain region by integrating natural resources protection and regional economic development. Under the current socio-economic context, we cannot deny the fact that there does exist some conflicts between the ecological and economic benefits of nature reserve. But in essence, the functioning of ecological benefits of the nature reserve is consistent and complementary with maintaining the prosperity of local communities in the surrounding areas. The key is how to integrate the advantageous resources of the two parties to maximize the ecological and economic benefits.

The Crested Ibis Nature Reserve has been a fully open protected area before and after its establishment. The open protection means that all the birds living areas are accessible to local people, and most of the local people are involved in the protection of the Crested Ibis. In order to establish a biosphere nature reserve, the nature reserve must have a core zone, a

buffer zone and an experimental zone, with different functions and degrees of protection for each zone. However, in practice, the designated core zone is also a living and production area for the local people, and where there are intense human activities. It is, therefore, impossible to enforce the Regulation on the Management of Nature Reserves in this area, and the conservation efforts can only be achieved through co-management practice. The root cause of the problem is the overlap of the feeding site with the croplands of local farmers. The Crested Ibis habitat, i.e., farmland and mountain forests, is owned by local communities, that are socially managed by the local government. The nature reserve can only play a bridging role between the protection of Crested Ibis and the local communities' interest, i.e., promoting a healthy development of the Crested Ibis population on the basis of community co-management.

To restore Crested Ibis population and to stop the deterioration of their habitat, it is crucial to coordinate the interests of local economic development and the protection of this species. Theoretically, the best way to contain the deterioration of its habitat is to fully ban the use of pesticides and chemical fertilizers. However, it is impractical and impossible to ban the use of pesticides and chemical fertilizers in larger area. Under the guiding principle of 'putting people first', it is very important to effectively integrate Crested Ibis conservation with local community development, i.e., generating benefits to local people from conservation efforts. To achieve this goal, a cost-effective green (organic) agricultural model is needed to ensure an increase of income for local people. Production in the paddy fields will likely to be reduced if pesticides and chemical fertilizers are not used. But with the help of modern agricultural technology, green organic food and agricultural products with an added value can be produced to generate large economic benefits to the local farmers.

In 2003, based on the guideline "Banning the use of pesticides and chemical fertilizers in the paddy fields that are crested ibis feeding sites", a two-year project entitled the "Crested Ibis Branded Green Rice" was conducted in the nature reserve in the Qinling Mountains. The project funded by WWF-China, focused on the development of highly efficient, green agriculture to protect feeding sites. In 2006, in response to the call of Academician Zhu Xianmo and three other academicians from Shaanxi Province under the Chinese Academy of Sciences and the Chinese Academy of Engineering, the Government of Yangxian County worked closely with the nature reserve administration to build an organic food production and processing base. The project's activities are expected to exert a far-reaching impact on the conservation of the Crested Ibis.

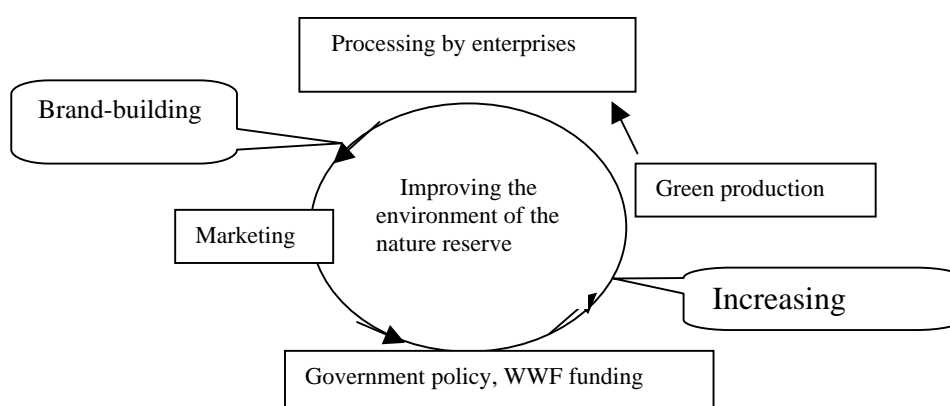
Major Components and Expected Objectives of the Green Rice Project

The Crested Ibis-branded green rice project is a comprehensive experimental activity. The major components of the project are: to develop the production of branded green rice within the nature reserve on the basis of the local socio-economic baseline survey; and to integrate the production with processing and marketing services to maximize the economic and ecological benefits. The project is also expected to promote a diversified production to the local farmers in the project area. Programs such as building irrigation systems, returning cropland to forests and raising loaches are also implemented.

The expected objectives of the project are to upgrade the habitat conditions of the Crested Ibis; significantly increase their population size; improve the income of the project partners; and ultimately form a business pattern integrating marketing and production to ensure the sustainable development of the conservation efforts and that of the local communities. It aims to restructure the industrial practices and to involve the local people in conservation efforts in

order to improve the living conditions of the Crested Ibis; and develop a co-management model with the participation of companies, farmers' households and the nature reserve; and disseminate information on lessons learned to other similar nature reserves. The project partners consist of the local farmers, the local government, the agricultural technical sector, the food processing companies and donors. As to their functions, the nature reserve serves as the platform for the project. The local agricultural and forestry bureaus provide both technical and financial support to the project; while the food processing enterprises are responsible for purchasing, processing and selling the quality rice in the experimental paddy fields within the project area. This is done to gradually raise purchasing prices on the basis of brand building, and to guide the local communities in the production of quality products. (Figure 1)

Figure 1. Critical pathways of the project



Project Outcomes

Successful implementation of project components with WWF

From 2003 to 2005, the nature reserve fully implemented project components funded by WWF and the State Forestry Administration. The Crested Ibis-branded green rice was granted the Certificate of Green Food by the Ministry of Agriculture, and therefore marking an initial success of this project.

Winning results for all stakeholders in the project

The survey indicates that in 2003, the average production of ordinary rice in the non-project area was 350-600 kg per mu (1/15 hectare), with a unit price of 1.2 Yuan RMB/kg; while the average production for the green rice in the project area was 350-500kg per mu, with a unit price of 1.6 Yuan RMB/kg, i.e., an increase of 33%. Together with the subsidies, the local farmers in the project area could raise their incomes by 200 Yuan RMB per mu. In 2004, as the purchasing price of the green rice increased by another 30%, the local farmers in the project area continued to reap the benefits.

Additional income was also generated from the diversification of farming activities. The local people within the project area were actively engaged in the project, and the farmers outside the project area also wanted to be involved in it. As for the diversified activities, a total sum

of 130,000 Yuan RMB of micro-credit was granted to 62 households in the project area: 28 households planted 573 hm² of medicinal plants and 34 households raised livestock (43 pigs, 30 cattle, 200 sheep and goats). In 2005, the loans were paid back and the sum made available to more households.

As a participating enterprise, the Shuangya Food and Oil Company earned 60,000 Yuan RMB the very first year of the project. Over the years of development, the company has been growing up from a private workshop-based processing plant into a leading business in Hanzhong city, Shaanxi Province. It became the special supplier of rice for local institutions of higher education and the owner of the Crested Ibis Branded Rice products, with a great potential market and increased economic benefits from its products.

For the nature reserve, the project has improved the Crested Ibis habitat, which resulted into a steady growth of the breeding population of wild birds. Between 2003 and 2006, there was an increase of 520 new nestlings in 2006, up 285% from 2003.

Influencing decision-making at local government level; initiating the organic food production and community co-management for Crested Ibis conservation

When CCTV covered the project, the Hanzhong Municipal Government highly praised the efforts of the Yangxian county government and the nature reserve. The main leaders of the Hanzhong Municipal Government visited the nature reserve and expressed their commitment to providing support to the project. “The Development Plan for Building a Green Production and Livestock-Raising Base in Yangxian County”, the first plan of its kind, was developed and printed for distribution by the County government, and implementation across the whole county.

In 2006, a proposal to build the second organic food production (with high technology and added value) based in Yangxian County, next to Yangling, Shaanxi Province, was submitted to the provincial government by four academicians, on the basis of the favourable natural conditions and its good foundation in green agricultural development. The provincial government approved the proposal; and the Provincial Development and Planning Commission was asked to coordinate the feasibility study and planning efforts. After one year of hard work, the planning and certification process for the organic food production based in the Crested Ibis Nature Reserve was completed in Yangxian County. An area of 220,000 mu of croplands, in 297 villages from 22 townships in the county, has been transformed into the production of organic food. It is comprised of 100,000 mu of organic rice; 100,000 mu of vegetable (potato and sweet potato); and 20,000 mu of pear and peach orchards. In addition, 10,000 chickens and 10,000 pigs are raised and 1,000 mu are used for aquaculture. It is expected that by 2010, the annual sales of organic food could reach 2.514 billion Yuan RMB, with an annual taxation of 170 million Yuan RMB (Yangxin County Government, 2006). By that time, the income of local farmers will have increased and the whole society will be paying greater attention to the Crested Ibis and its habitat.

Project Assessment

Innovative non-traditional conservation and business approaches

The project innovated in introducing non-traditional conservation practices and business mechanisms into the conservation efforts, enriching the conservation approach and adding to the community co-management practices. By fully leveraging the current policies and management systems within the nature reserve, the project encouraged local people to wisely use and reduce their dependency on the natural resources. Benefiting from the use of natural

resources is a goal pursued by stakeholders and establishing a business mechanism is an effective way to attain this objective. As a result, integration of a business mechanism with the conservation efforts is not only necessary but also practical. It can provide a good example for other conservation work in China and to other similar international projects.

Participatory management approach

The project fully applied a participatory approach in order to lay a solid foundation for: industrializing the green rice production in the nature reserve; and also forming a new management model involving the company, the farmers' households and the nature reserve in the conservation efforts. Participatory management is a new and modern management approach. It changes the unilateral way of thinking, and advocates for win-win solutions and complementary and harmonious development. It also pays great attention to the role of traditional culture and organizational structures, while providing a balance amongst established rules, institutional arrangements and innovative mechanisms (Du Shouhu, 2004). The project adopted an all-win approach as its objective throughout its implementation.

Within the framework of the project, the farmers were only requested to produce the rice according to the technical standard of green rice production, without necessarily having to take care of raising seedlings and marketing the rice. The Shuangya Food and Oil Company of Yangxian County was responsible for fully purchasing the green rice produced by the farmers, and marketing them under the name of Crested Ibis Brand Green Rice. The nature reserve assisted the company with the green food certification for the rice produced in the nature reserve; the reserve also helped the farmers with the production of green rice by providing personnel, material, financial and technical support. During project implementation, the farmers generated more income by producing green rice, the company earned profits and the nature reserve increased the quality and sizes of the human-made wetlands, therefore achieving the objectives of the project.

Demonstrating best practices

The project was well organized and played a significant role in demonstrating best practices. The entire project was conducted on a scientific basis. It focused on the root causes of the major issues in the nature reserve to integrate Crested Ibis conservation with local economic development; to leverage national and international expertise on conservation and other sectors; and to work closely with the various stakeholders. The project adopted an incremental approach, well-organized institutions and efficient operational mechanisms. An effective management body, the community co-management committee, was created and was responsible for decision making on project implementation (e.g., the selection of varieties, the distribution of micro credit loans, using democratic, equalitarian and transparent principles). Over the years, the project has grown from the production of green rice to that of other organic food. The growing size of this eco-agricultural project provides a practical basis for dissemination of the project results as an example of best practice for the future.

Positive impacts at home and abroad

The project implementation has had a positive impact both at home and abroad. Since its inception, CCTV and local media have continuously covered the project. During a visit to the USA, Dr. Ding Changqing (a research professor at the Institute of Zoology, Chinese Academy of Sciences) presented the project to a university audience; the presentation was well received and the university expressed their interest in working with the project. After a project field visit, a Japanese delegation invited representatives from the local farmers to Japan in order to

provide field guidance. They intend to include this project as part of a Sino-Japanese collaboration program in the future.

Challenges and Options

The protection of Crested Ibis habitat has improved since the national natural forest conservation programme has, to a large extent, controlled the large-scale deforestation activities. Despite the achievements in eco-agriculture in the nature reserve, the Crested Ibis conservation still remains a challenge for a number of reasons. Here are some examples:

The dominance of traditional agriculture

Traditional agriculture still dominates and there is still a long way to go ensure the conservation of Crested Ibis. The success of the green agricultural project could not have been made possible without the financial support of the project and corporate cooperation. However, the awareness about the concept of the project among the local people remains poor. Also because of deficient monitoring methods and instruments, some farmers are still using chemical fertilizers. This is contrary to procedures for green rice production and therefore, has negative impacts. In addition, the organic-food sector in China is still restricted by many factors, e.g., lack of supporting regulations, insufficient funding and poor monitoring methods and instruments. In this regard, the EU countries have already implemented organic food action plans with subsidies. For example, in 2000 the Netherlands government launched an organic food action plan, in which there were subsidies of 227 to 500 Euros per hectare for organic food producers. In Norway, the subsidy reaches 731 Euros per hectare (SEPA, 2003). However, this type of incentive is not available in China, and the protection of Crested Ibis habitat has to be achieved through various approaches.

Difficulties in establishing and selling a new green brand

Introducing new brands is difficult, since established brands often take a lion's share in the green agricultural products market. As the project's green product was released in the market, despite rising prices and revenues, it is still far from being satisfactory. The major reasons are as follows: the poor brand awareness in the broader areas; the great gap between this product and other established brands both in appearance and flavour; poor transportation of the product; and the lack of marketing information. The news about a professor who just sold a bag of rice in a day has caused a big stir in the society, and has greatly dampened the enthusiasm of the local farmers and enterprises. In addition, as it is the first project of its kind in Yangxian County, the project partners still rely on the project implementation and depend heavily on the nature reserve. A permanent mechanism needs to be established to ensure the sustainability of business development and conservation efforts.

Difficulties in promoting the green and organic rice production

As the project area is economically underdeveloped and local farmers relatively conservative, it is difficult to further promote the green and organic rice production. Constrained by geographical, cultural and economic factors, the stakeholders of the project, in general, have a poor understanding of the project requirement. It leads to fragmented practices and unsatisfactory results. Because of the complexity of rural areas and poor living conditions, the largest barrier to the project implementation is the conservative attitude of the local farmers. It is time-consuming and great efforts are needed to persuade them. The production levels vary greatly and problems often arise in the production of the green rice despite all the training efforts provided (e.g., distribution of information leaflets, workshops, demonstration sites and

technical support). In addition, the poor brand awareness and the variable quality of the product have had negative impacts on the pricing and sales of the product. This directly affected the project.

To address these problems, there is a need to develop policies at the national scale to promote green organic food production. The concept of organic agricultural production first emerged in the developed nations in the 1970s. China only started experimenting in the 1990s, and implementation plan are, yet, to be developed. The lack of policies and legislation on subsidies for organic food production has hindered the development of the organic food sector and the implementation of food safety measures in China. As the benefits generated by nature reserves are shared by the whole society, the costs for the establishment of nature reserves should not be borne solely by local communities. The government should therefore increase their investments on community co-management of nature reserves. As for the Crested Ibis Nature Reserve, there should be greater efforts made to provide information on the technical and practical advantages of the project and to work more on community management to enhance the production of green and organic rice in the local areas. Greater communication efforts are needed to disseminate the best practices arising from the project to other areas. For example, in Caoba, a village in the project area, the purchase and application of secure and harmless pesticides helped the partners to work together in an industrialized chain.

Finally, in order to fully achieve the expected objectives of the project, the following actions are required: the development of a sound information and monitoring system on green agricultural production areas; and the developments of mechanisms for purchasing, processing and marketing. This would help to transform the traditional agricultural practices based on individual households into a modern agriculture regulated by market mechanisms.

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References

- Cao Yonghan and Lu Xirong.** 1994. Wildlife (4).
- Du Shouhu.** 2004. Forestry and the Society. **12** (1): 1–7.
- Liu Yinzeng.** 1981. The Re-discovery of Crested Ibis in Qinling Mountain. *Acta Zoologica Sinica*, 27(3): 273.
- SEPA.** 2003. Research Report on the Ecological and Organic Agricultural Development in China. State Environmental Protection Administration of China. Beijing.
- Shaanxi Institute of Environmental Monitoring.** 1994. Survey on the Environment of the Living Area for Crested Ibis. Shaanxi Institute of Environmental Monitoring.
- Shi Dongchou and Chao Yonghan.** 2001. Crested Ibis in China. China Forestry Press, Beijing.
- Yang Chaolun.** 2004. Ecological Economy.

Yangxian County Government. 2006. Notice Delimiting the Areas of Organic Food Production Base and Enhancing the Environmental Protection of Organic Food Production Base. Official Document of Yangxian County Government, 46.

Zhang Yueming. 2001. Causes for the Death of Crested Ibis and its Response Options. Proceedings of International Workshop on Crested Ibis Conservation, China Forestry Press.

SUPPORTING MEASURES FOR MAINSTREAMING

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Chapter 20

Measuring Mainstreaming: Development and Application of Wetlands Biodiversity Conservation Criteria in China

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Abstract

A major focus of the GEF's "Wetland Biodiversity Conservation and Sustainable Use in China" project was on mainstreaming wetlands issues across sectors, the society and across the policy-making framework. This is in direct response to GEF Biodiversity Strategic Objective #2 (Mainstreaming). While the concept of mainstreaming is now well known from an academic perspective, there is little guidance on the practical methods on how to accomplish this. Therefore, this project developed a set of criteria to be used to evaluate mainstreaming, and then applied these criteria to an evaluation of the national legal and regulatory frameworks, and to wetland management at the local (site) level. The criteria were not specifically applied to the national policy framework as this is now quite mature in China at the national level, however the project has noted a number of issues that could improve the policy environment. The evaluations resulted in specific recommendations for change of legal/regulatory texts in various sectors, and also made recommendations for improvement of the institutional and management regime for wetlands. This paper outlines the methodology and some of the key conclusions and recommendations.

Keywords: wetlands, biodiversity, mainstreaming, regulations, policy, laws

Introduction

A major focus of this national project "Wetland Biodiversity Conservation and Sustainable Use in China" project has been on mainstreaming biodiversity conservation and sustainable use at national, provincial and local levels. The concept of mainstreaming is relatively new and is in use in biodiversity projects worldwide. While there is guidance on implementing mainstreaming (Petersen & Huntley, 2005; UNEP, 2007), there is no specific guidance on methodology for measuring mainstreaming, nor for assessment of sectoral compliance with biodiversity conservation. Therefore, a set of "wetland biodiversity conservation criteria" (the "criteria") was developed as a way of measuring compliance of sector laws/regulations and practices to the principles of biodiversity. The methodology was used at the national level, at the provincial level in Heilongjiang Province, and more limitedly at local levels at the five demonstration sites. This paper reports on our experience at the national and local levels. The methodology reflects a Chinese context and may require modification for other countries.

Developing the Criteria

Background

In the development of the GEF Project document certain assumptions were made concerning the types of criteria that could be used to evaluate governance relative to biodiversity conservation. For example, it had been proposed to count the number of policies, legislation, and regulations across sectors at national, provincial and local levels that were consistent with biodiversity conservation. While such a comprehensive evaluation might provide some useful output, it would be a gargantuan task involving thousands of documents, a large team that fully understood the documentation from the many relevant sectoral areas, and access to all documentation at all levels of government and from all sectors of government. From a practical perspective, this type of comprehensive analysis is neither feasible, nor cost-effective, nor especially meaningful for the reasons outlined below. It also would not offer much insight on how to address shortcoming in sectoral compliance to wetlands biodiversity conservation criteria.

It was agreed, therefore, that the measure of “mainstreaming” should reflect the (a) actual impact on wetlands biodiversity conservation by sectoral agencies where this was known, and (b) text contained in law and regulations that was favourable or detrimental to wetlands. Therefore, an alternative approach was designed that achieves much of the same purpose but in a more efficient way, and that provides a semi-quantitative assessment of real progress in mainstreaming.

“Criteria” and Policy Evaluation

There was considerable discussion within the project on how, or if, policy could be evaluated by the wetlands biodiversity conservation criteria. The main issues of discussion are presented below.

Policy versus law and implementation

Unlike western countries where policies of governments have almost the effect of law insofar as a policy binds the agencies of the government to follow that policy, the situation in China is different. In China, policies provide broad direction but often have only vague legal or binding power on government departments. Policies tend to indicate a broad direction that the government wishes to follow, may specify a lead agency (e.g., the 2004 policy [Circular 54] on wetlands), and sets the stage for the development of specific rules, regulations or laws that have legal and binding powers. With the exception of policies that are specific to wetlands management (such as Circular 54 of 2004) it is not possible to determine if other policies may have an actual beneficial impact on wetlands or not until such time as the policy is captured in specific regulations or in actions of sector ministries. There is no doubt that ministries do pay attention to national policies that lie outside their own specific mandate, however under the Chinese Constitution, implementation is mainly controlled by lower levels of government where local priorities determine how and when (and sometimes “if”) specific policies will be implemented.

In this context, there are policies that are important for wetlands and but which are not clearly captured in law and are sufficiently vague that they do not indicate how they may

affect something as specific as wetlands biodiversity conservation. Examples include the policy on economic development (which, at least until recently, clearly had higher significance at the local level than the government's policy on the environment). Since the 11th Peoples Congress of 2006, this policy has been softened to achieve an improved balance between economic growth and environmental sustainability. Another example is the new policy on the "sustainable socialist countryside" which, although not contained in any single law, sets out broad directives to improve the life of the rural population and to stabilize the rural sector. That policy, articulated at the 11th PPC in 2006, creates a conundrum insofar as environmental policy (including wetland policy), water policy, agricultural policy and rural development policy, have elements that are mutually inconsistent. Therefore, how these policies will be implemented, let alone affect wetlands biodiversity, cannot be evaluated until there are concrete actions laid out in the regulations, or specific cases that can be evaluated. On the positive side, in the past several years there are many examples where local levels of government have taken the initiative in wetlands conservation where there is no specific national legal requirement to do so.

Lack of Specificity in policy text

Usually policies cannot be easily evaluated against wetlands biodiversity conservation criteria based solely on the text insofar as the text is usually rather vaguely worded so that its effect on wetlands will depend entirely on how the policy is actually implemented.

Policy within laws

For the most part, detailed sectoral policy is contained within those laws that give "power" to each ministry. Hence, for example, the Water Law and Flood Control Law (both of which have substantial implications for wetlands) contain the essential policy provisions that are empowered by virtue of the existence of these laws and which the Ministry of Water Resources is legally bound to follow. In theory, all other ministries are bound to follow the same policy provisions of the Water Law, however there is often lack of clarity or overlaps in mandate and authority in some areas of the law which can lead to conflict between ministries over policy implementation. Furthermore, sectoral policy implications for wetlands are not easily evaluated until the implementation details are known. At the national level, sectoral policies are further spelled out in detailed regulations, however these too are frequently difficult to evaluate until they are given effect by provincial level regulations which provide the framework for local level implementation. Having said this, the actual implementation may not be precisely what the national regulations might seem to imply due to the fact that local government (prefectural and below) tend to implement these according to local requirements.

Gap between policy and implementation

It is well known that in China there is a large gap between law and implementation, and an even larger gap between policy and implementation. While a policy may, in the abstract, improve wetland biodiversity conservation, only by noting the implementation of the policy can it be determined if the policy is actually improving the situation. Similarly, policies that have potential to harm wetlands biodiversity conservation may, or may not, actually do

harm. Without an implementing law or measurable implementing actions, the policy cannot be evaluated for its actual impact on biodiversity conservation.

Summary

It was decided that policy clarity should be included as one of the evaluation criteria for the evaluation of the legal framework. The policy environment was not evaluated independently for the reasons noted above and also because the wetlands and biodiversity policy environment in China is quite mature.

“Criteria” and Legislation

Evaluation of laws and regulations against a set of wetlands biodiversity conservation criteria can be quite misleading, for the following reasons:

Vagueness of text

The written text of Chinese national and provincial laws cannot be reliably evaluated against wetlands biodiversity “criteria” as the text is often rather general and, without detailed information on how the text is actually applied at the local level. For example, both the Agriculture Law and the Water Law specifically forbid draining of lakes, yet this has been a significant factor in wetlands disappearance over many years. In the 1996 Water Pollution Prevention and Control Law (WPPC Law), there is the provision for total (pollution) load control which could be interpreted as “beneficial” for wetlands, but which has never been implemented in most of the country. If one were rating these several laws according to wetlands biodiversity conservation criteria, the articles referring to total load control or drainage of lakes would be rated highly, but in the real world, they have not been applied or not enforced.

Selective application of the law

Specific provisions of the law may be ignored (or not implemented) not only by other ministries but also by the ministry, which is governed by that law.

Imprecise deadlines

A further problem is that Chinese laws do not contain deadlines or timelines for implementing the provisions of the law therefore some provisions are significantly delayed or not implemented at all. Therefore, an evaluation of the text can be quite misleading in terms of actual impact on wetlands.

Due to budget and time limitations it was not possible to examine the universe of sectoral regulations that might have implications for wetlands biodiversity¹. Therefore, to evaluate mainstreaming of the national legal and policy framework, the project decided to focus only on those national laws that can have substantial impact wetlands biodiversity conservation on the grounds that, in China the laws: (1) reflect the policies of the government and are reflected in the text of the law; (2) provide the legal basis for compliance to the policy; (3) for the most part, indicate what the sectoral ministries actually do; and (4) define the

¹ Ferris and Zhang (2003) estimated that there are “several thousand” documents having some degree of legal status solely within the environmental sector.

administrative authority of the sector ministry (albeit, often in vague terms). A small number of regulations were also been examined however these were limited to areas where there are regulations, but not laws, or where regulations have a particular consequence for wetlands.

The “Criteria”

The criteria that were developed for evaluating the laws and related key regulations are designed to reflect the level of generality that is typical of these laws and implementing rules. There is, for example, no point in using a criterion such as “aquatic habitat” insofar as few, if any, laws and implementing rules will contain sufficient detail to determine if aquatic habitat will be negatively affected. On the other hand, at this level of generality, it can be determined if the law or regulation has the *potential* to impact on hydrology, drainage, land use, or other aspects of environmental quality (e.g., water quality), and from which it can be inferred if aquatic habitat may be affected. At the *site level*, a much finer level of detail can be used insofar as decisions of local governments can often have very direct and measurable impacts on habitat and indeed on sub-components of habitat. This suggests that the criteria should be capable of moving from a more generic evaluation at the national level to a more specific evaluation of actions and decisions at the site level. In this project we provided detailed guidance notes for transition from general application at the national level to detailed application of the criteria at the site level.

We have developed two types of criteria – one is **technical criteria**, and the other **non-technical criteria**. These are noted in Table 1 together with a brief explanation of how these are used. More detailed discussion is provided below. The application of these criteria is specific to their implication for wetlands biodiversity conservation and is not meant for generic evaluation of sector laws and regulations for other purposes. Implementation procedures are usually specified to some extent in sectoral laws, therefore we have included planning, operations (carrying out the work), and enforcement as non-technical criteria.

Technical Criteria

The seven technical criteria noted in Table 1 were developed by biodiversity specialists and identify the main types of threats that can impact on wetlands biodiversity and related wetlands systems. Each criterion can be evaluated by knowledge of the role played by the different sectors that have primary responsibility for actions that can cause these threats. We found, however, that the technical criteria could not be used for national or provincial level assessment insofar as, in China, laws and regulations are not written in highly technical terms, therefore, it was not possible to equate a law with a specific technical impact. The potential for impact was noted in some laws, for example, the Water Law clearly could have hydrological impacts on wetlands, however the nature of the impact (good or bad) can not be determined from the law or regulation itself. Nevertheless, the technical criteria provided a useful frame of reference for evaluating the non-technical criteria. We found that the technical criteria were especially useful at the site level insofar as evaluators could directly assess the consequence of actions of sectoral agencies on the technical criteria.

Non-Technical Criteria

The non-technical criteria refer to characteristics of a law – is it clear; is it complete; are the provisions adequate for wetlands protections; are there overlaps or redundancies in respect of other sector laws, and how do these impact on wetlands biodiversity management and conservation. The nine non-technical criteria are as follows:

Policy

Part of legal evaluation is to ensure that there is an appropriate policy framework that guides the application of the law. There are two types of policies:

- *Formal written policies* are those issued by senior levels of government such as the State Council or by other senior state or provincial level bodies (e.g., NDRC) that state the government's objectives for an initiative, how the initiative shall be carried out, and which are the responsible agencies. There are also written policies of ministries that lay out their overall agenda for some particular activity that is mandated by the law(s) governing that ministry. Provincial governments also make formal written policies that announce their intention to implement some type of initiative. In some cases, the policy statement is enough to catalyze actions by ministry officials to begin implementation. In other cases the policy statement begins a process of legal drafting of a new law or regulations.
- *Informal and Unwritten Policies:* Ministries often have unwritten policies that are reflected in how a ministry conducts its affairs. An example is river training (river engineering) by MWR² that is carried out under the Water Law and the Flood Control Law, but which is carried out, usually, with little or no regard for affected wetlands. The unwritten policy is that flood control takes precedence over wetlands protection. In agriculture, food security takes precedence over wetlands protection, therefore the practice of draining wetlands is accepted even though it is a contravention of the Law on Agriculture.

Technical Clarity

A problem in the Chinese legal system is often a lack of detail in legal text. This lack of clarity can be a major problem both for the sector ministries and for others, in understanding how the provision should be implemented. During our review, clarity (or lack of it) was often of major consequence for wetlands biodiversity conservation. Technical clarity is applied to definitions, procedures, methods, etc., that are identified in the text of the law or regulation. Only those terms that have an impact on wetlands are considered in the evaluation. Terms that apply to specific criteria such as an imprecise use of the term “planning” is evaluated as part of the “planning” criterion and not under “technical clarity”. Similarly, imprecise definitions of “damage” are evaluated under the criterion “penalties”. Note that technical clarity in this project was omitted as a criterion when evaluating sector mainstreaming at the site level insofar as site-level government usually implements but does not create text for laws or regulations.

² Ministry of Water Resources

Table 1. Criteria used for evaluating the legal/regulatory framework for wetlands biodiversity conservation.

NON-TECHNICAL CRITERIA		TECHNICAL CRITERIA	
Criterion	Explanation	Criterion	Forcing Functions
1. Policy Environment	Does the law contain a clear statement on the policies that guide the law?	1. Hydrology	River diversions Dams Irrigation projects Other consumptive uses Reservoirs -Upstream reservoirs -Flood control -Hydropower -Irrigation
2. Technical Clarity³	Is the wording of the text clear and unambiguous?	2. Drainage	Drainage for: construction, agriculture; grazing lands Embankments and Polders Dredging – flows; water quality Ground water overdraft Tree planting Weather control Transportation infrastructure
3. Mandate, Authority & Institutional Obligations	Does the law convey an appropriate mandate or authority for the sector and provide for specific obligations of the institutions concerned?	3. Point Source Pollution	Industrial chemical pollution Industrial thermal pollution Urban waste (sewage) Urban landfills
4. Planning Provisions	Are the planning provisions of the law clearly defined – how, when, who, etc.?	4. Non-point Source Pollution	Agric. Runoff: eutrophication; pesticides/ herbicides; sediment Urban runoff : heavy metals; sediment Construction: sediment Mining: mine drainage, acid runoff; sediment Solid and/or toxic waste disposal
5. Operational Practices	Are the operational practices identified in the law so that we can see how these may affect wetlands biodiversity?	5. Land Conversion	Agricultural encroachment Use as a landfill Filling for construction Peat mining Plantations Aquaculture
6. Enforcement	Is the law specific about enforcement? Are there conflicts with other sectors regarding enforcement?	6. Use of wetlands – products, tourism	Reed cultivation Hunting and egg collection Fishing (including amphibians and shellfish) Unsound grazing practices Mass tourism
7. Rights, Obligations & Public Participation	Does the law convey any specific rights to the public or to third parties, or create obligations on the ministry to consult with the public?	7. Ecosystem Engineering	Pika and rodent poisoning Exotic species intro. Removal of surrounding forests Conversion of surrounding vegetation Overstocking of fish Special measures for small populations Restoration Create wetlands
8. Penalties & Rewards	Are penalties and/or rewards suitable for wetlands offences?		
9. Economic Provisions	Are the economic provisions (e.g. subsidies, etc.) that have impacts on wetlands?		

Mandate, Authority and Institutional Obligations

A review of sectoral legislation is intended to reveal where there are mandate clashes between sectoral agencies relative to wetlands conservation. It is necessary to identify the specific authorities provided under various laws to sectoral agencies that may conflict with wetlands planning and management. As part of the review, it is important to determine

³ Technical Clarity is an important issue when assessment national and provincial laws. It is omitted as a criterion when evaluating sector activities at the local level insofar as site-level government does not create text of laws.

exactly what obligations are contained in the law that require actions by sectoral departments that could impact on wetlands. Sectoral mandates that could be used to assist in wetlands conservation are also noted.

Planning

Many laws and regulations are not specific about how planning should occur, who shall be consulted, and how these consultations should be carried out, or how the plans should be reviewed and approved (Box A), etc.. The English translation of the Chinese requirement for external consultation and supervision is “unified management”. In practice this means that one sectoral department is fully responsible for the specified action and may involve other departments fully or minimally according the discretion of the responsible department. Therefore, the process of planning, consultation, etc., is usually not specified and is, therefore, quite arbitrary. This is of particular consequence for wetlands issues.

Box A: Elements of good planning that are considered in evaluating the planning provisions in laws and regulations (Criterion #4)

- Are the planning objectives and priorities clearly specified?
- How are other agencies included in planning process, and is their inclusion a formal or informal process?
- Are there overlaps or conflicts with planning priorities of other agencies?
- Are there mechanisms to resolve conflicts between agencies involved in planning?
- Is the planning process transparent – (clear to everyone)?
- Are there appropriate supervision mechanisms specified in the law or regulations for the disbursement of government funds, especially where there is more than one sectoral department involved?
- Is there a requirement to include the public and other stakeholders in the planning process? Note that other aspects of public participation are dealt with in Criterion #9.
- Is there a prescribed method for public and stakeholders to formally object to a plan, and how are these objections to be dealt with?
- Is there a monitoring component defined for data gathering, including data sharing?
- Is the plan evaluated for feasibility of implementation at the local level?
- What is the review process before the plan is finalized – who reviews and who approves?
- Are there milestones clearly defined and a performance monitoring process for evaluating plan implementation?
- Are there mechanisms to amend the plan during implementation?
- Are accountabilities established for officials who must implement the plan?
- Is there a mechanism for informing, for example, MWR of the essential wetlands requirements that need to be included in the water resources plan and for routine administrative issues? Are there similar mechanisms for the pollution management plan, for agriculture, etc.?
- Is the requirement for an EIA clearly identified?
- Is there any requirement for Integrated Environmental Management within the plan?

Operational Practices

This mainly focuses on the institutional arrangements and management practices noted in Box B that could affect wetlands, and that are (a) prescribed in the law or regulations or (b) are *de facto* arrangements and practices used by agencies to implement their activities at the local level. At the national and provincial levels one assesses only what the laws and regulations actually say about institutional arrangements and management practices. The important point is whether the institutional linkages and inter-institutional responsibilities

that are required for wetlands biodiversity protection are clearly defined in the law. Using this procedure at the local level involves assessing how the institutional arrangements actually work in the field. Commonly, what actually happens, and what is supposed to happen according to the law, are quite different and needs to be taken into account, especially at the local level where decisions and actions of local government can be directly evaluated.

Box B: Typical activities that are considered in evaluating operational provisions in laws and regulations (Criterion #5)

- Permitting – is a full system of permitting or permissions established and implemented?
- Are Approval systems adequately described?
- Fee collection systems – are full cost recovery; receiver of funds; allocation of funds, etc., specified?
- Monitoring – objectives of monitoring, monitoring methods and standards specified?
- What mechanisms are stipulated to resolve inter-sectoral conflict over wetlands management practices?
- Are Data and information systems and other “tools” specified, with suitable authorities for implementation and data sharing amongst sector agencies?
- What exclusions or exceptions to other wetlands regulations are permitted – formal and informal?
- Do technical tools used by different agencies, e.g. water function zone (MWR) and water environment function zone (SEPA), create problems for integrated wetlands management?
- Are ecological compensation mechanisms allowed between upstream and downstream, and how are these to be implemented?
- What form, if any, is Integrated Environmental Management (IEM) specified?
- Are there transjurisdictional issues that create problems for coordinated wetlands management (e.g. two or more jurisdictions with different approaches to a common wetland)?

Enforcement

Here we evaluate what enforcement mechanisms (Box C) are specified in sectoral laws and regulations that may apply to wetlands issues. Partly, this is to determine if wetlands regulations can use enforcement mechanisms in other laws, or alternatively, if enforcement mechanisms in sectoral laws will conflict with enforcement of wetlands regulations. At the local level it can be determined if enforcement is, in fact, carried out. Note that “Penalties” are considered separately as Criterion #8.

Box C: Characteristics in laws or regulations in regards to enforcement (certain of these will only be useful at the local level).

- What is the record of fines and other punishments for violation of relevant laws and regulations that impact on wetlands?
- Is the existing system of penalties suitable for effective wetlands management?
- Are fines and other punishments sufficiently large to change the behaviour of violators?
- Are there conflicts between agency over actions, which are punishable by one agency, but supported or condoned by others (e.g., draining wetlands)?
- What mechanisms exist to ensure social justice in the imposition of penalties (poor people who cannot pay)?
- Are court judgements made and, if so, are they enforced in wetlands management court actions?
- Are there conflicts between sectoral agencies in dealing with complaints or court actions involving wetlands issues?
- Are the regulations clear so that judges do not have to guess what the regulations actually means or are there conflicts between sectoral laws and regulations that could apply to wetlands?
- Are transjurisdictional disputes a problem for wetlands management and cause enforcement problems (e.g., upstream jurisdiction pollutes a wetland but refuses to do anything about it.)

Rights, Obligations and Public Participation

This criterion refers to institutional obligations that are defined in the law. These include the rights and obligations that sectoral laws and regulations convey to individuals, working units, etc., for wetlands issues. Issues to be considered are noted in Box D.

Box D: Characteristics in laws or regulations in regards to rights, obligations and public participation.

- Are there any specific rights or entitlements granted to persons, working groups, or other entities, in wetlands?
- What obligations are placed on those holding Rights?
- How do Water Rights and Permitting for water extraction impact on wetlands planning and management?
- What occupancy rights are conveyed formally or informally by sectoral agencies to groups such as farmers, and are there any obligations placed on these people as part of that Right?
- Are there commercial rights allocated formally or informally by sectoral agencies for such things as tourism, fish farming, harvesting, etc. in wetlands; and what obligations or restrictions are placed on those holding these Rights?
- Are there specific rights granted or claimed by other government agencies (an example would be State-owned farms) that could have a negative effect on wetlands conservations?
- What Rights are provided for public participation, Right to Know, Rights of objection, etc.?
- Others ??

In all cases it is also necessary to determine:

- which sectoral agencies grant these rights and are these in conflict with other rights granted by other agencies under other laws ?
- what is the potential conflict between sectoral laws & regulations that authorise granting of rights, and wetlands regulations administered by the State Forestry Administration?

Penalties

Penalties are usually outlined, sometimes in considerable detail, in laws and regulations. Questions to be considered in the assessment include:

- What penalties are provided for in sectoral law that could be applied to wetlands violations?
- Do penalties include penalties for officials that violate the law by actions such as failing to enforce the law or for not implementing fully a plan that includes wetlands components?
- Are penalties that can be imposed by various sectors in conflict with penalties that could be imposed by wetlands regulations?

Box E: Characteristics in laws or regulations in regards to economic criteria.

- Are there economic or non-economic incentives (e.g., subsidies), or authorities to give such incentives, identified in legislation or in practice, and/or are they used by sectoral agencies to promote certain activities that impact on wetlands conservation?
- Are wetland valuation or Payment for Ecosystem Services (PES Systems) explicitly or implicitly considered in sectoral laws, regulations or practice?
- Does sectoral legislation and/or practice identify costs and responsibility for relocation, restoration, hydraulic and other engineering requirements for wetlands maintenance or restoration as a consequence of sectoral activities?
- Are economic incentives developed and applied in a manner that is consistent with good wetlands management?

Economic Issues

Box E identifies typical economic issues that may have impact on wetland biodiversity conservation.

Application of the Criteria

Table 2 outlines the overall structure of the criteria used in the assessment of mainstreaming. It was found that, at the national and, usually, at the provincial level, the laws and regulations are too general to allow any realistic assessment of the impact of legal text relative on the technical criteria. Therefore, primarily the non-technical criteria were used at the national and provincial levels; however, the technical criteria were kept in mind as a frame of reference in the assessment process. At the local level, the assessment is mainly on sectoral actions in response to local regulations. In this case, the technical criteria also provide a frame of reference for the evaluation of sector actions and decisions that can be shown to have consequences for the non-technical criteria.

The assessment process consisted of a peer review by an ***expert panel*** comprising two environmental lawyers, a senior policy specialist, an institutional specialist, at least one field biologist/ecologist with long experience in wetlands issues, and an international facilitator/policy specialist. One of the lawyers acted as referee and adjudicated differences of views with the objective of arriving at a consensus. The results of the assessment is based upon a consensus of the expert panel.

In the mainstreaming component of this project, there are two major outputs – the first is to evaluate and document the extent of mainstreaming of wetlands biodiversity conservation by the different sectors, and the second is to provide recommendations on changes in sectoral laws that will improve mainstream of wetland biodiversity issues within those laws.

Measurement of “Mainstreaming” at National and Provincial levels

There are three main steps in the application of the criteria.

Step 1. Article by Article review of each law or regulation against the non-technical criteria

This is done using a spreadsheet in which the articles appear in rows and the criteria in columns as illustrated in Table 2 below. The final column is for comments that cannot be accommodated in the other columns.

Narrative comments reflecting the panel consensus are inserted into each cell for the non-technical criteria, describing the problem with the article relative to wetlands biodiversity conservation. Unless the evaluators have specific knowledge, they should not attempt to guess at the possible impact of Articles on any of the technical criteria, and should leave these empty as these provide only a frame of reference for the evaluators. While it is tempting to discuss other problems with the article, evaluators should focus only on those aspects that are relevant to wetlands issues. Generally, many cells will be empty as, for example, if the article has no relevance to the criteria. For laws/regulations that have very

little impact on wetlands biodiversity conservation, evaluators may eliminate Step 1 and move directly to Step 2.

Table 2. Article by Article analysis table.

ARTICLE BY ARTICLE ANALYSIS TABLE																	
Law/Regulation on																	
Article	Technical Criteria							Non-Technical Criteria									Comment
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	
1																	
2																	
etc																	

Step 2. Summary Table

The second step (Table 3) is to create a summary *for the law as a whole* based on the article-by-article table for each law or regulation. The Summary Table condenses the information from the article-by-article table, so that only the most essential information is retained. This is achieved by weighing the relative merits or demerits of individual Articles to arrive at an overall assessment of the law as a whole for each non-technical criteria. The purpose of this Table is to provide a more generic set of guidance to senior levels of sector ministries and departments on the principal deficiencies of their laws or regulations and as a basis to quantify mainstreaming (Step 3).

Table 3. Summary Table

SUMMARY TABLE		
Law/regulation on		
		KEY GUIDANCE COMMENTS
Overview		
Non-Technical Criteria	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	

In this table the first row of comments is the “overview” in which the evaluators can capture the main issues with the law or regulation. This should not reproduce the detailed comments

made for each of the criterion, but should be a general statement about the impact of the law on wetlands biodiversity conservation. In many laws and regulations, some of the rows will be empty as, for example, when the law or regulation has no relevance to one or more of the criterion.

Step 3. Quantify “Mainstreaming”

This is carried out by the peer review group, and using the Summary Table from Step 2. The objective is to calculate a “Mainstreaming Index” that expresses the degree of beneficial, or harmful impact of a complete sector law or regulation on wetland biodiversity conservation. In Steps 1 and 2, the analysis focuses on a narrative description of the problems as a basis for substantive discussions with sectoral departments on textual changes. Step 3 produces the “Mainstreaming Index” for the law or regulation according to the following procedure.

Each of the non-technical criterion (for the law as a whole) is assigned a score, which is determined through consensus of the Expert Panel. This is based on the views of the panel members in consideration of the relative merits or demerit of individual Articles that were discussed in order to arrive at the Summary Table. Each criterion is evaluated on a scale ranging from –5 to +5, where –5 is the worst case for negative impacts on wetlands biodiversity conservation, and +5 for the most significant benefits for wetlands biodiversity conservation. A zero score is assigned according to the following three possibilities:

- (i) There are both good and bad aspects to a criterion. If these are judged to be equivalent, then a zero value may be assigned. Normally, harmful characteristics have more weight than beneficial characteristics because harmful effects are not easily reversed.
- (ii) The criterion is completely neutral, having neither positive nor negative effects, in which case a zero value is assigned.
- (iii) The evaluators do not know what the impact of the criterion might be on wetlands.

The individual scores are summed to give a total for each law as shown in Table 4, then normalized to a percentage value by dividing the Total by 45 (the maximum possible number of points [5 points x 9 criterion]). This normalized value is the *Mainstreaming Index* (MI).

Interpretation of Table 4

The completed table show a comparative assessment of the complete regulatory framework in which each of the laws can be seen in the context of its overall impact on wetlands biodiversity conservation. A law, which is fully supportive of wetlands biodiversity would, in theory, have the value of “+5” in all cells, and a Mainstreaming Index of +100%. A law which is extremely harmful for wetlands would, in theory, have a –5 in each cell and a Mainstreaming Index of -100%. In practice, most sector laws have criterion that either don’t apply to wetlands (Score = 0) or which cannot be assessed. Therefore, the MI of most sector laws will be relatively low which indicates that the law has, in general, only a small

influence on wetlands. A law could have both +5 and –5 as cell values, but could have a zero Mainstreaming Index if the number of + and – values cancel each other. This means that, on balance, the law is neither helpful nor harmful to wetlands. The individual values within Table 4 provide the supporting evidence showing where the main deficiencies lie in each law or regulation and therefore where the priority should be in subsequent discussions with sectoral agencies.

Table 4. Examples of rated criteria for national and provincial laws/regulations relative to impacts on wetlands biodiversity conservation.

Criterion	Law #1	Law #2	Law #3	Law #4	Etc.
Policy Environment	0	0	2		
Technical Clarity	-3	0	-1		
Mandate, Authority & Institutional Obligations	1	0	3		
Planning Provisions	-4	-2	3		
Operational Practices	-2	0	3		
Enforcement	0	0	2		
Rights and Obligations & Public Participation	-5	0	2		
Penalties & Rewards	2	0	0		
Economic Provisions	0	0	1		
Total (sum of column values)	- 11	-2	+ 15		
Mainstreaming Index (+/- %) (score / 45 x 100 = %)	- 24.4 %	- 4.4 %	+ 33.3 %		

“Total” is the total number of actual points in the column.

“Mainstreaming Index” is the total divided by 45 (total possible points) x 100 to give a % value expressed as + or - .

In the examples shown in Table 4, Law #1 has a negative impact on wetlands biodiversity conservation in which the two criteria of planning and rights and obligations are particularly bad; the MI is –24.4%. Law #2 is almost neutral in its impact (MI is –4.4%). Law #3 is judged as having a generally beneficial impact on wetlands biodiversity conservation with an MI of +33.3%. The Mainstreaming Index provides the ability to track regulatory performance over time as laws and regulations are amended.

Measurement of “Mainstreaming” at the Local or Site Level

The mainstreaming assessment procedure used at the site level is different than for national or provincial levels. The reason is that, at the local/site level, the specific threats to wetlands are quite visible and the role of sectoral agencies is generally well known. Therefore, the procedure is to focus on those decisions and actions of sectoral agencies, and of local government that create the observed threats in the project sites. First, the threats are defined; secondly, the causes that produce the threat are identified. The causes are mainly associated with the ways that sectoral agencies carry out their responsibilities or from decisions of

local governments. A third step is the quantification of agency performance in regards to wetlands biodiversity conservation so that a priority is established that targets specific sectoral agencies for improvement.

Each technical criteria is evaluated for sectoral roles as shown below. Subsequently, there is a site assessment against the non-technical criteria. This is to establish how considerations such as planning, operations, etc., are actually conducted at the local level and whether these are beneficial, neutral, or harmful to the wetland. These steps are noted in Section 3.2.

Step 1. Threat Assessment

Threats to wetlands biodiversity conservation arise from the impacts or conditions that are contained in the Technical Criteria. The threat assessment for each project site is carried out according to the example in Table 5 and in the context of the technical criteria (Table 1). The specific threats are used to focus the research on the decisions and actions of governments and on those sectoral departments that contribute to those threats.

Table 5. Threat Assessment -- Ruoergai Marshes Example

Main Threats	Other related Threats	Diagnosis	Root Causes	Policies/Issues	Target Sectoral Agencies
Wetland degradation and desertification	expansion of rodent population	Wetland degradation Enlargement of desertified areas	Trend to warmer and drier on Tibetan Plateau Anthropogenic impacts - population growth - economic develop Digging of canals Overgrazing Diversion of Yellow River have left sand beds Higher temperatures and less rainfall	Low awareness of wetlands ecosystem services Different stakeholders have different interests Irrational pasture allocation and grazing models Irrational pasture allocation system and grazing models Conflict between historical policies and current protection demands. (e.g. poisoning of rats)	Agriculture & animal husbandry bureau Planning & Devel Bureau Forestry Natural Res. Mgt. Bureau Local Gov't.
Irrational tourism and road construction	Water quality deterioration from road construction	Tourism carried out in core and buffer area Wetlands damaged by road construction	Economic priority over conservation. Punishment policies are inefficient re wetland conservation	Local gov't ignores laws and regulations for protected areas. Difficulty in punishing actions that damage wetlands.	Tourism Bureau Forestry Protected Area Mgt Bureau Local Gov't.
Over-harvesting		Over-harvesting of fish	Economics over-ride good management Overlapping of sector management functions	Water and hydropower sectors issue permits for fishing under authority of the provincial gov't. Fisheries resources under management of nature reserves	Water & hydropower Bureau (is a single bureau) N.R. Mgt Bureau

Notes:

This is not a complete threat assessment for Ruoergai Marshes; it is used only to provide an example of the methodology. Pasture allocation plan to individual households was done as if it was farmland; rationale for allocation decisions not supported by adequate knowledge.

Grazing may be considered by some to be responding to concerns of food security.

Laws are not the issue; poor implementation is the main issue and driven, in part, by economic priorities.

Local government leaders (e.g., mayor, etc.) also have important roles that can be included in this assessment, insofar as they set the overall agenda for sectoral agencies under their jurisdiction. The threat assessment must be a joint activity of wetlands specialists and policy/law/regulatory specialists who have local knowledge. There are many ways of carrying out a threat assessment, however, the method illustrated here was suitable for our purposes.

Step 2. *Evaluation of sectoral decision-making in wetlands management*

In this second step (Table 6) the evaluation team/panel, using expert knowledge, assesses in narrative form the sectoral contribution to each of the threats noted in Table 5. Each threat is associated with one or more of the technical criteria that is associated with the threat. For example, in Table 6, the first threat for Ruorgai Marches is mainly associated with technical criterion of “Hydrological Impacts” and probably with “Land Conversion” and “Use of Wetlands”. The threat of “wetland degradation” is created by decisions and actions of agencies according to their policies, mandates, planning, operations, etc., that led to the decision to carry out works that led to hydrological impacts. Therefore, the root cause of the decision to carry out those works lies in these policies etc. (the non-technical criteria) that apply to that sector agency. Each of the relevant technical criteria (e.g., hydrological impacts) is evaluated by assessing the degree to which sector policies, etc. (the non-technical criteria) have contributed positively or negatively to that technical criteria. In practice, often only one or two of the non-technical criteria are mainly responsible for the decisions or actions that cause benefit or harm relative to the threat. A consensus opinion is summarized in narrative form in Table 6 as a basis for the next step.⁴

The purpose of Steps 1 and 2 is to focus the analysis on high priority threats, on the factors that cause each threat, and to develop a narrative profile for those sector agencies that play the major role (good or bad) in each threat. The narrative profile focuses on policies, planning etc. (the non-technical criteria) that play the key role in contributing to the threat. An additional benefit of Step 2 (Table 6) is the ability to present to sector agencies, in a simple table, how their policies, decisions and actions have cumulative effects on wetland conservation biodiversity. This allows a focused discussion that leads directly to recommendations on how local sector agencies (and local government) can improve their actions, decisions and operations in regards to wetlands biodiversity conservation.

Step 3. *Quantifying “Mainstreaming” at the site (local) level*⁵

The purpose of this step is to provide a quantitative basis for prioritizing the role of sectoral agencies in their performance in wetlands biodiversity conservation. Interventions with

⁴ Note that there are only 8 non-technical criteria for local site assessment because “technical clarity” is not applicable at the site level as site-level local government follows rules but generally does not make the rules.

⁵ After much discussion within the project, this step was omitted, mainly due to fears by some participants that local agencies would react badly to the possibility of receiving a poor assessment. This step is presented here to provide the complete procedure that may be useful to others.

sectoral agencies can be planned according to the priority attached to individual agencies. The worst performing agency would normally be the first priority for intervention. Step 3 uses a ranking methodology similar to that described above where consensus rank values are assigned by an Expert Panel for each sectoral agency identified in the threat assessment of Table 6. The detailed methodology is noted in Tables 7-9.

Table 6. Assessment of sectoral contribution to wetlands threats.

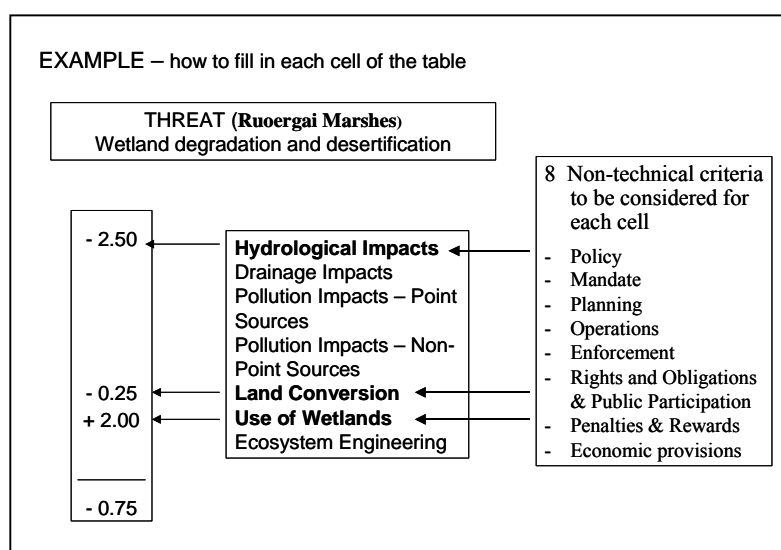
<div> <div>From the 8 non-technical criteria, select those that are key to understanding how the sector influences the threat, either beneficially or negatively .</div> <div> Policy Mandate Planning Operations Enforcement Rights and Obligations & Public Participation Penalties & Rewards Economic provisions </div> </div>						
Project Site: Ruoergai Marshes						
Main Threats	Technical Criteria to be considered for each threat	Tourism Bureau	Forestry	Protected Area M.B.	Roads Dept	Local Gov.
Wetland degradation and desertification	Hydrological Impacts Drainage Impacts Pollution Impacts – Point Sources Pollution Impacts – Non-Point Sources Land Conversion Use of Wetlands	Narrative assessment of the types of actions and decisions involving non-technical criteria (Table 1) such as policy, planning, operations etc. that result in an impact which is associated with each technical criteria	Narrative assessment	Narrative assessment	Narrative assessment	Narrative assessment
Irrational tourism and road construction	Ecosystem Engineering	As above	Narrative assessment	Narrative assessment	Narrative assessment	Narrative assessment
Over-harvesting		As above	As above	As above	As above	As above

The objective is to derive a numerical value that allows a direct evaluation of the cumulative performance of sectoral agencies in regards to their impacts, good or bad, on wetlands biodiversity conservation. This numerical evaluation allows the project to prioritise and focus on those agencies whose decisions and actions are most harmful to wetlands. The numerical evaluation also provides a baseline against which to assess improvements in agency performance in the future.

Based on the narrative assessment of Table 6 each sector agency (and local government if relevant) is ranked according to how the expert panel views the role of that agency for each major threat. The Panel assigns a rank value from –5 (very deleterious to wetlands) to +5

(very beneficial to wetlands) as shown in Tables 7 and 8. In Table 9 the rank values are cumulated for each column to give a final score for each agency.

Table 7. In this example the threat has been associated with three technical criteria (bold type). Of the 8 non-technical criteria, usually only one or two play a key role for each identified threat. A rank value between -5 to +5 is assigned, based on how these non-technical criteria influence decisions of the sectoral agency in respect to that threat. In this example, the agency's role is judged to be moderately harmful for "wetlands hydrology" and is assigned a rank of -2.50. After completing this for the three technical criteria, the total value is -0.75. This is inserted in Table 9.



In cases where the evaluation of the sectoral agency for each threat is fairly simple, the panel may be able to assess all the relevant non-technical criteria for all the relevant technical criteria as a whole, as shown in Table 7, and assign a value. In more complicated situations the Expert Panel may wish to evaluate each non-technical criterion separately, then average them. This would be done as in the example in Table 8 with the final values inserted into Tables 7 and 9.

Table 8. This is the working table, used to evaluate the non-technical criteria that give rise to each threat. A value of zero (0) is assigned if the agency has no impact; this includes the situation where the agency has no role in a threat.

Use this approach if there are many non-technical criteria to be evaluated

Threat is: Wetlands degradation and desertification Agency #A

Criterion	Hydrol. Impacts	Land Conversion	Use of Wetlands		
Policy Environment	-2	0	2		
Mandate, Authority & Institutional Obligations	-2	0	3		
Planning Provisions	-4	-2	3		
Operational Practices	-4	0	3		
Enforcement	-4	0	2		
Rights and Obligations & Public Participation	-2	0	2		
Penalties & Rewards	-2	0	0		
Economic Provisions	0	0	1		
Total (sum of column values)	-20	-2	+16		
Column Mean (Total / 8)	-2.50	-0.25	+2.0		

Table 9. Use of assessment criteria for local government and sectoral agencies.

- Policy
- Mandate
- Planning
- Operations
- Enforcement
- Rights and Obligations & Public Participation
- Penalties & Rewards
- Economic provisions

From the 8 non-technical criteria, select those that are key to understanding how the sector influences the threat, either beneficially or negatively .

Project Site: Ruorgai Marshes						
Main Threats	Technical Criteria to be considered for each threat	Sector Agency A	Sector Agency B	Sector Agency C	Sector Agency D	Etc.
Wetland degradation and desertification	Hydrological Impacts	(one value for these combined assessment criteria)	(one value for these combined assessment criteria)	(one value for these combined assessment criteria)	(one value for these combined assessment criteria)	
	Land Conversion					
	Use of Wetlands					
Irrational tourism and road construction		(one value for these combined assessment criteria)	(one value for these combined assessment criteria)	(one value for these combined assessment criteria)	(one value for these combined assessment criteria)	
Over-harvesting		(One value)	(One value)	(One Value)	(One value)	
	TOTAL	Σ above	Σ above	Σ above	Σ above	Σ above
Project Site: Ruorgai Marshes (ranking assigned)						
Main Threats	Technical Criteria to be considered for each threat	Sector Agency A	Sector Agency B	Sector Agency C	Sector Agency D	Local Gov't.
Wetland degradation and desertification	Hydrological Impacts	- 2.50	+ 2.5	- 3.4	0	+ 2
	Land Conversion					
	Use of Wetlands					
Irrational tourism and road construction		- 0.25	0	-2.2	- 5	- 3
Over-harvesting		+2.00	- 2.5	- 2	0	0
	Total	- 0.75	0	- 7.7	- 5	- 1
Mainstreaming Index (Total / max. possible points * x 100)		- 5.0 %	0 %	- 51.3 %	- 33.3 %	- 6.6 %

Maximum possible points per sector agency in this example is 15 (max value in each cell is 5 x 3 cells)

Mainstreaming Index (MI): is calculated as the sum of the cell values (Total) for each agency (see Table 9) divided by the maximum possible number of points. In the example of Table 9, the maximum possible number of points is 15 for each agency (three threats is $5 + 5 + 5 = 15$ possible points; (the + and – values are excluded in calculating the total possible number of points).

Interpretation of Table 9

In the example shown in Table 9, the Expert Panel has determined that the role of sector agency A, through its policies and actions is moderately harmful (-2.5) for the threat of wetlands degradation and desertification; only slightly harmful (-0.25) in its role in irrational tourism, and has a moderately beneficial impact (+2) on over-harvesting. The overall (average) impact of sector agency A on wetlands biodiversity conservation is only slightly negative (MI = -5.0%). This is in contrast with sector agency C, which has an MI of -51.3% indicating that its policies and programs are quite harmful to wetlands interests.

The advantage of Table 9 is that it permits a direct assessment of mainstreaming and a comparative evaluation of each sector. It also indicates in which areas, and for which types of threats each sector agency can make improvements. For example, Table 9 indicates that sector agency C clearly does not play a constructive role in any of the threats and needs to review and change its policies/programmes/operations if wetlands biodiversity conservation is to be improved in that sector.

Difficulties with Methodology Implementation

The methodology, although relative straight forward, is subject to biases, peer pressure, incomplete information, etc. The main problems encountered in this project include:

- *Subjectivity of the evaluation process:* It has not been possible to develop a set of evaluation instructions that accommodate the range of problems surrounding subjective evaluation. For example, technical clarity for some text in one law may be excellent, while the text elsewhere in the same law is deficient. How, then, to write guidance to assign an unambiguous and objective value to “technical clarity”? The alternative, used here, is to leave this to the expert judgement of the panel members and using guidance by an expert with experience in the evaluation process.
- *Lack of continuity between review periods:* The quantitative process establishes the baseline for mainstreaming, and permits period re-evaluation of the status of laws etc, relative to mainstreaming. However, another panel may have different views than the previous panel and may assign values that are inconsistent with the values previously assigned. The approach adopted here is to urge a conservative approach to assigning values. In our work we used a well-known law as a benchmark (see below) so that different panels had a standard benchmark as an example.
- *Dominant panel members:* It is well known that some individuals can exert excessive influence on the consensus opinion. This should be avoided to the extent possible and requires expert facilitation.

- *Different understandings of the implementation of laws:* Although the national-level analysis focuses on the text of the law/regulations, panel members also tend to assign values based upon their knowledge of how the law is implemented. There can be substantial differences in the degree of familiarity of the panel members with the actual implementation of a law. For example, the policy environment for water regulations may focus on economic importance of water, which is negative for wetlands. Some evaluators may know of cases where this policy has had very negative consequences and assign a –5. Other evaluators with less field experience may assign a lesser value of –2. The consensus process requires that the panel come to a common understanding of appropriate consensus value based mainly on what the text of the law say, and not how it is implemented unless there is good justification. At the site level, knowledge of implementation is usually very good, therefore “how” the law is implemented is more important than what the law actually says.
- *Inconsistency in evaluation of different laws:* This is best dealt with by first assigning provisional values for the criteria, using perhaps three or four laws, then re-evaluating the provisional values to achieve a balanced response based upon the three or four laws. We used a well-known law as a benchmark to achieve consistency with other laws.
- *Benchmark:* It is useful to first evaluate the key law or regulation concerning the subject at hand. For Heilongjiang, the benchmark regulation would be the Wetlands Regulations, which should, for example, have a very high ranking for “policy environment”. The benchmark regulation should be the one that the panel members are most familiar with.
- *Conflict of Interest:* Members of the expert panel may come from the agency responsible for certain laws and may defend these laws by assigning higher values than acceptable to other panel members. This can only be resolved through discussion. In principle, members having specific responsibility for a law should not participate in the discussion of that law or, at the least, not contribute to assigning of a rank.
- *Focus on wetlands:* A common problem is that panel members attempt to define problems in laws and regulations in a broader context, identifying many types of deficiencies in the law/regulation that are not related to wetlands issues. The panel must evaluate the law/regulation relative **only** to its impact on wetlands.
- *Outdated laws:* In some cases provincial-level regulations are outdated due to revision of a national law that takes precedence. Where the analysis is focusing on provincial laws, a decision must be taken on whether the evaluation will focus on the outdated provincial law or on the application of the national law at the provincial level. In Heilongjiang, the water regulation is out of date, however the decision was to focus mainly on the outdated provincial regulation where it is relevant, but to consider the national water law where it is clearly the basis for specific aspects of provincial water management.
- *Use of the value of “0”:* Use of 0 can mean any of the following:
 - no relevance of the criteria for wetlands issues
 - + and – values average out to 0.

- Evaluators don't know or have no opinion.
- *Perception that agencies will be unhappy with their ranking:* The ranking of agencies and local government may be contentious. As it is important to determine which agencies are especially detrimental to wetlands, this analysis can be done using 1,2,3 etc. instead of agency names. Only the persons doing the analysis would know which agencies are associated with which numbers. This is a real concern as the intention is to provide positive advice on the nature of change that would benefit wetlands conservation. For many agencies, a good mainstreaming index is a zero (0) insofar as their law has no negative impacts on wetlands. Generally, one would look mainly at laws/regulations that have a negative mainstreaming index as those that require specific attention. The allocation of ratings for individual criteria provide evidence of which criterion need attention.

Conclusions

A major outcome of the GEF “China National Wetlands Biodiversity Conservation and Sustainable Use” project, implemented by the UNDP and the State Forestry Administration of China, was to assess and improve mainstreaming of wetlands biodiversity conservation across production sectors and within society as a whole. While the mainstreaming concept is now well known there is little guidance on how to measure mainstreaming. The methodology developed in this project was applied at the national, provincial and, to a lesser extent, at the local level. It proved relatively easy to apply at the national level but with greater difficulty at provincial and lower levels mainly due to lack of sufficient mentoring. There was a lack of familiarity with the peer consensus approach in China, and concern that local agencies would not cooperate if they were shown to be performing badly. Nevertheless, at the national level and provincial levels, the outcome was useful in presenting meaningful arguments to sector agencies about how they could improve their policy, legislative and administrative approach to wetlands biodiversity conservation. Further constraints included insufficient time to adequately train domestic experts in full use of the procedure. Also, the transition from the unfocused and impractical assumptions about measuring mainstreaming that were contained in the original program document, to a more rigorous assessment methodology, took considerable time and clearly indicates that program documents should be much more precise and realistic when defining outcomes and analytical processes.

References

- Ferris R.J. Jr. and H. Zhang. 2003. Reaching Out To The Rule Of Law: China's Continuing Efforts To Develop An Effective Environmental Law Regime. William & Mary Bill of Rights Journal, **11**: 569-602.
- Petersen, C., and Huntley, B., 2005. Mainstreaming Biodiversity in Production Landscapes. Working Paper #20. Global Environment Facility, Washington, NY.
- UNEP, 2007. Mainstreaming Biodiversity into Sectoral and Cross-Sectoral Strategies, Plans and Programmes. Module B-3. United Nations Environment Programme, Nairobi.

CHAPTER 21

THE U.S. EXPERIENCE IN INTER-SECTORAL DATA-SHARING: THE AMERICAN EXAMPLE OF STORET

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Abstract

STORET is the United States Environmental Protection Agency (USEPA) central repository for storing and retrieving water quality data, which has been in use since 1965. Its existence and ongoing maintenance falls primarily under the *United States Freedom of Information Act* and the *Clean Water Act*, but under Memorandums of Understanding with other Federal Agencies, who are requiring the enhancement of its systems to enable the free and consistent exchange of data between Agencies. A description of STORET, its use and advantages, and planned future developments are presented. The use of a system such as STORET provides assistance when mainstreaming water and biodiversity conservation management.

Keywords: STORET, USEPA, data-sharing, mainstreaming

Introduction

STORET (STore and REtrieval) is the United States Environmental Protection Agency (USEPA) central repository for storing and retrieving water quality data. STORET contains data from a wide variety of sources. These sources include data from State agencies, other Federal agencies, Native American Tribes, and other entities such as watershed organizations and data from special studies. The STORET system has been in operation since the mid 1960's, making it the largest single collection of water quality data in the world. The system contains ambient water quality data for freshwater, marine and biological monitoring. STORET is maintained and supported by USEPA, available at no charge to users. The success of STORET in building its widespread-base of data providers and users is due in large part to a consistent focus on outreach and support to the water quality community. Also, all STORET data is readily available via simple Web interfaces.

STORET contains virtually any existing data that is related to water quality. The data includes water quality measurements such as dissolved oxygen, pH and toxic compounds as well as biological data. Biological data can include indices based on bioassessment methods as well as data on individual biota. Information on sampling sites, such as stream bank condition, is also included. STORET also includes data on wells, point source emissions and streamflow. Metadata is now an essential component of STORET, providing users with a reliable means to screen the data based on documented data quality, detection limits, analysis methods, etc.

Enabling Legislation for STORET

There are two primary legislative mandates for the existence and maintenance of the STORET system. The first is the *United States Freedom of Information Act* (FOIA). The second is the *Clean Water Act* (CWA). In addition, there are Memorandums of Understanding (MOUs) that provide further impetus for STORET development.

The FOIA is a landmark legislative mandate for disclosure of information and documents controlled by the U.S. Government. The FOIA was originally promulgated in 1966, and amended in 2002. Under the FOIA, individuals and private enterprises can submit written requests for information to Federal Agencies. The Agency receiving the FOIA request must respond by either providing all or part of the information requested or by denying the request and providing the legal reason for such denial. There are exceptions for providing information, such as for data related to national defense or security, corporate proprietary information and data related to and which would identify individuals. Examples of this in the USEPA include locations and characteristics of drinking water intakes (under national security provisions) and certain data related to emissions from individual industrial sources that could enable competitors to acquire proprietary information about the industrial processes being undertaken at the given facility.

One of the effects of the FOIA has been the need for Federal Agencies to allocate time and resources to respond to FOIA requests. This can divert significant manpower from other work. Therefore it is in the best interests of an agency to take steps to minimize FOIA requests. STORET is a prime example of a system that has been able to reduce FOIA requests by making its data readily available on the Web. A number of programs within the USEPA have developed such interfaces for data such as that relating to impaired waters and fish consumption advisories. FOIA requests to the USEPA have dropped from 14,252 in 2001 to 12,201 in 2005, a 15% reduction. Most of this reduction is attributed to the USEPA making its data, e.g., STORET, accessible via the Web at <http://www.epa.gov/foia/docs/2006report.pdf>.

The *Clean Water Act* (CWA), enacted in 1972 and amended in 1976, is a primary legislative mandate under which the USEPA Office of Water operates. There are several sections of the CWA that make STORET an important component for implementation of the CWA. For instance, Section 303 requires the identification of waters that do not meet State water quality standards. Section 303(d) requires the development and implementation of a plan of action, such as improved point source emission controls, to meet water quality standards. STORET data is invaluable in assisting in identifying impaired waters and in developing the plans for meeting water quality standards. In most cases, the implementation of Section 303(d) has been delegated to the individual States and to Native American Tribes on their land. The States and Tribes are required to submit reports to the USEPA on their status and progress under Section 303(d) every two years. A summary report is then prepared by USEPA and submitted to the U.S. Congress. Other sections of the CWA are addressed by STORET, for example, assistance in the development of mandated municipal and industrial point source controls.

Currently, Memorandums of Understanding (MOUs) with other Federal Agencies, especially the United States Geological Survey (USGS), are requiring STORET to enhance its systems to enable the free and consistent exchange of data between Agencies.

Why STORET Is Important

From its very beginning, STORET has proven to be an invaluable tool for both data providers and data users. For data providers it provides a single platform and data format for storing and maintaining their water quality data. Once data is entered into STORET it is maintained in a secure location. STORET provides a mechanism for maintaining the integrity of an agency's monitoring data during the inevitable staff turnover that takes place over time. Also, users such as State agencies often employ STORET data as a basis for their standard biennial reports on the status of their water quality.

A broad and diverse user community regularly uses the data in STORET for local, regional and national-scale analyses. State agencies can retrieve and analyze their own data and enhance it with data collected by other agencies, such as data from the National Park Service. Water quality modellers often use STORET as the fundamental basis for calibrating and validating their models. Because of the long history of data in STORET, it is regularly used to examine trends and “snapshots” in water quality conditions.

A very important aspect of STORET data is its nation-wide scope. States and Tribes can thus use the data for adjacent States to assist them in examining water quality beyond their borders. For example, States’ plans to meet water quality standards may be impacted by conditions in a neighbouring State and STORET can help in diagnosing such situations.

STORET has been a leader in linking its data to USEPA standardized river-coding systems, referred to as “Reach Files”, as well as to the latest national-standard system called the National Hydrography Dataset (NHD). This data linkage provides powerful capabilities to map and analyze the upstream/downstream relationships between STORET monitoring stations as well as other data linked to the river coding system, such as stream flow monitoring stations, point source dischargers and water quality supply intakes.

In China, a similar river coding system linkage is being implemented in the GEF Haihe River Basin Integrated Water Resources and Water Quality Management Project. As part of this project, a river coding system named the “HAINHD” has been developed. Existing databases, such as the State Environmental Protection Administration’s Water Environment Function Zones (WEFZs) and the Ministry of Water Resource’s Water Function Zones (WFZs) are being integrated in a logical manner that will permit the two agencies to freely exchange and integrate their data within an analytical framework. Other data, such as flow monitoring and water quality data is also being integrated in this way.

The Keys to the Success of STORET

Six principles of the STORET system are primarily responsible for its continued and long-term success, they are:

- A consistent focus on service: As with all successful data processing systems, STORET is a service to the water quality community. STORET in itself cannot be useful unless it meets the real needs of this community.
- Continual outreach to the water quality community: It is not enough to provide a location and tools for holding water quality data. It is essential to reach out to data providers and users to offer training and support.
- Training and support to data providers and users is essential: Unless the user community knows how to use the system and to use it to their full advantage, users will tend to “go their own way”. Training and support functions include training sessions with individual users, State, regional and national groups, as well as telephone and email support. Documentation, such as tutorials, examples, and brochures are continually updated and provided.
- Remaining current with the evolving and increasingly powerful evolution in computer and Internet capabilities, has become more important over the last several years. The advent of personal computers and now the Internet have changed the way almost everyone “does business” in data processing. Especially since 1990, STORET has been an evolving system designed to best serve the user community.

- Integrating STORET with other data systems is very important to the user community. Water quality data is most useful when it can be hydrologically linked to other water data such as flow gages, point sources, water intakes, etc. STORET has been a leader in data integration, starting with the first USEPA river coding system, named “Reach File Version 1”. STORET is continually working to integrate its data with other related data systems.
- STORET has always been a free (no-cost) service to the water quality community, States, Universities, and USEPA contractors. The newer Web systems have enlarged the capabilities to provide anyone, including individuals, with free access. Providing free access to data generators and users has been essential because many organizations have limited budgets. STORET provides a valuable resource that is affordable: nothing is more affordable than free.

The History of STORET

The history of STORET parallels the history of data processing platforms and standards. The first version of STORET was on a computer mainframe system and it was used from 1965 to 1998. This version is now referred to as the “Legacy” system. There are over 200 million water quality records contained in the Legacy STORET system. It went through continual applications enhancements and had a very stable support team that ensured its success. Perhaps the biggest disadvantage of the Legacy system is its lack of information about the qualities of the data in the system.

Subsequent versions of STORET have placed great emphasis on collecting information related to data sources and data quality. This type of information is called “metadata”, which means “data about the data”. The collection of metadata is now an accepted practice in most information systems, and in the case of STORET it has greatly improved the usability of the data.

The subsequent version of STORET, referred as “Modernized STORET”, took advantage of the changes in data processing technologies, using relational database management systems, and the growing use of Servers and Personal Computers. The Modernized STORET system provided common system architecture for both data providers and for the central system maintained at USEPA. This version of STORET used an ORACLE-based data management system. Unfortunately, this system has proved cumbersome and difficult for many users. Therefore, support for Modernized STORET will be discontinued in 2008 and replaced with the newer approach described below.

The new enhanced version of STORET is currently in rapid development and already in use. This enhanced version takes advantage of yet newer, more powerful Internet standards for data transfer and applications. Data transfer to the central STORET is done using industry-standard processes called Extended Markup Language (XML). Using XML, data providers are free to maintain data in their own systems, and transfer the data to USEPA as XML text files.

The new STORET is also taking advantage of a powerful industry-standard method for retrieving data, called “Web Services”. A Web Service provides dynamic data retrieval capabilities that can be built into each user’s application. This STORET capability is currently being built and enhanced in close cooperation with the United States Geological Survey (USGS). It is expected that this new STORET configuration will enlarge the number of data

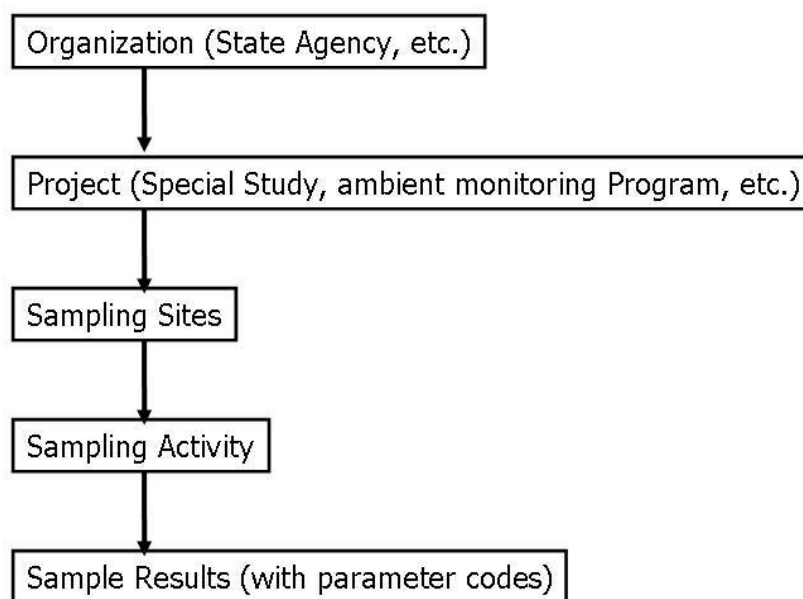
providers and lead to more enhanced, dynamic application of the data in STORET. This new version of STORET is presented in greater detail in the section on the future of STORET.

How STORET Data Is Organized

STORET data has a relatively simple five-level hierarchical data structure. This data organization is illustrated in Figure 1. The basic organizational structure has been used from the beginning of the STORET system and has therefore been proven over time to be a robust way to organize water quality data.

Figure 1. STORET data organization

The Hierarchical Organization of STORET Data



The following information describing each hierarchy of data in STORET can be found at <http://www.epa.gov/STORET/descript.html>.

Organizations

In STORET, organizations are the primary owners of data and they control access to it. Organizations retain ownership of their metadata (descriptions of their data), project descriptions, and lists of organizations and people with whom they work. Organizations control a broad set of lists of their preferences or usual practices for monitoring activities. These lists may include protocols for data entry (e.g., substances tracked by monitoring activities, habitat evaluation criteria, etc.), equipment used in the field, methods used in their

labs, bibliographic references, as well as others. In STORET, organizations control their own data through the use of an organization-specific identification code provided by EPA, and with passwords administered locally. The identification code ties together an organization's projects, stations, and sampling data.

Projects

STORET allows an organization to maintain descriptions, in summary form, of the projects and surveys it conducts. The descriptions contain essential information concerning purpose, procedures, standards and methods, and quality goals. The descriptions also include information on individuals who manage and participate in the projects. Project descriptions permit linking of data quality objectives and other quality control plan items to a broad spectrum of data. In this way, the needs of users for data quality descriptors can be met with a minimum of data entry effort.

Sampling stations (sites)

All data concerning fieldwork is keyed to the specific location at which the field work is conducted, linking water quality measurements to the place they represent. Each STORET site has a point of reference, whose latitude and longitude are fully defined. In addition, each site may include an area boundary, a field of actual monitoring locations, and the descriptions of any permanent sampling grid found there. For facilities, additional data may be entered for individual “end-of-pipe” locations; for wells, a field of individual wells may be described.

Interpretation of Table 4

The completed table show a comparative assessment of the complete regulatory framework in which each of the laws can be seen in the context of its overall impact on wetlands biodiversity conservation. A law, which is fully supportive of wetlands biodiversity would, in theory, have the value of “+5” in all cells, and a Mainstreaming Index of +100%. A law which is extremely harmful for wetlands would, in theory, have a -5 in each cell and a Mainstreaming Index of -100%. In practice, most sector laws have criterion that either don't apply to wetlands (Score = 0) or which cannot be assessed. Therefore, the MI of most sector laws will be relatively low which indicates that the law has, in general, only a small influence on wetlands. A law could have both +5 and -5 as cell values, but could have a zero Mainstreaming Index if the number of + and - values cancel each other. This means that, on balance, the law is neither helpful nor harmful to wetlands. The individual values within Table 4 provide the supporting evidence showing where the main deficiencies lie in each law or regulation.

Samples and station visits

Samples are described according to their medium and the intent for which they were collected. STORET accepts descriptions of the sample collection process, which address the complete spectrum of water monitoring and sampling of the biological community. How a sample is collected is documented in STORET by links between a sample and lists of methods and equipment. Lists are available as part of the system, or client organizations may supply their own lists.

Results

Each result is linked to a field monitoring activity. If the activity was the collection of a water sample, the results are qualified by all the methods used to collect, handle, store, and process that sample. The results may be further qualified by the identity of the lab performing the

analytical work, and the equipment and methods used in this process. STORET captures information about participating laboratories and their qualifications. It also captures identifying information for the substances or properties being measured with qualifiers that enable valid data comparisons to be made. Statistical information concerning confidence intervals may be supplied, and for results, which are not quantified, detection status and quantitation status may be stored. Results which are counts or percentages may be qualified by the range of some size or weight variable they represent.

Using STORET Data

The entire collection of data in the system is referred to as the “STORET Data Warehouse” and is available on the Web at www.epa.gov/STORET. It serves as a central clearinghouse for water quality and water characteristic data. Users interact with the Warehouse using standard Web browsers. Once a user is in the Warehouse, data can be accessed and downloaded by using a simple set of menus. The data can then be loaded into a wide variety of applications including spreadsheets, databases, models and Geographic Information Systems. STORET data can also be accessed and viewed with a Web browser using USEPA mapping tools.

Figures 2 and 3 show example Web interface screens that highlight how easy it is to inventory and retrieve data from the online STORET system. In this example, a few clicks of the mouse will provide a summary of all of the data in a watershed. The United States is divided into approximately 2,100 watersheds, each identified by a unique 8-digit number. This example illustrates how easy it is to get a summary of all of the Modernized STORET data in watershed 02080103 – the “Rapidan/Upper Rappahannock” watershed. Figure 2 shows the main STORET page. Using a few mouse clicks, a summary of all of the data in watershed 02080103 is displayed. Note that most of the data comes from the United States National Park Service, with additional data from a volunteer organization and a EPA National Aquatic Resource Survey. From this point in Figure 3, any or all of the data can be retrieved and downloaded into applications such as Excel. On the main STORET screen, there are several ways to get assistance. These include online tutorials, example retrievals, brochures, email support and phone support.

Figure 2. The STORET Interface

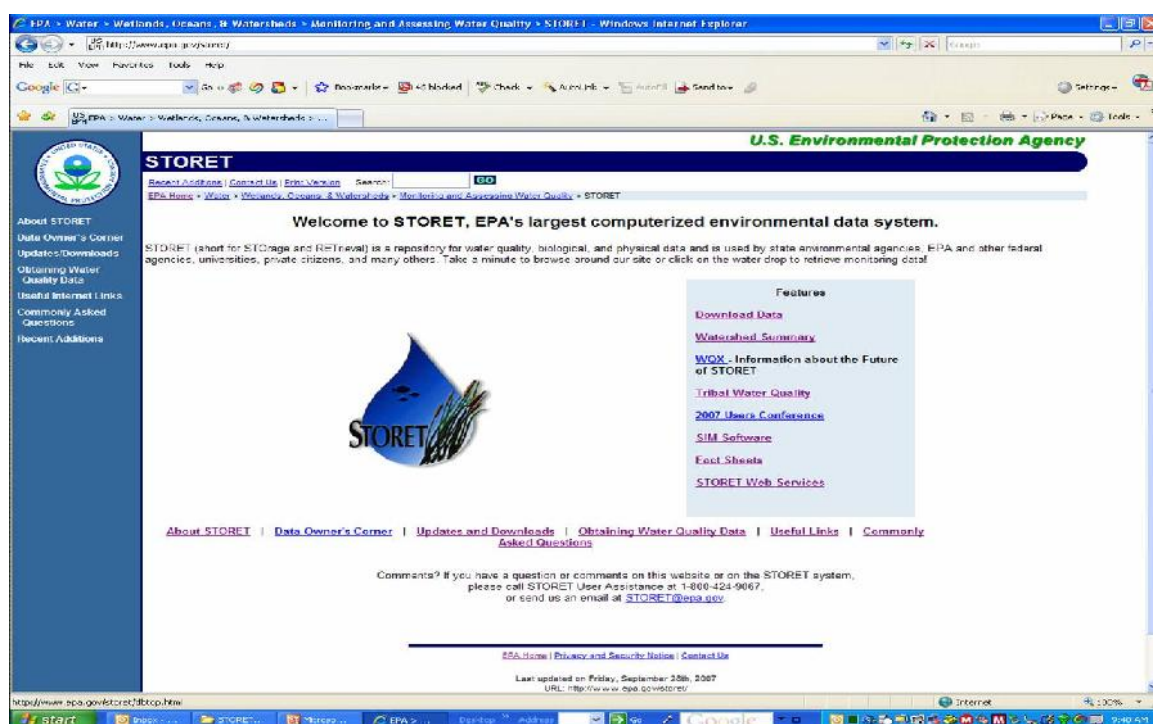
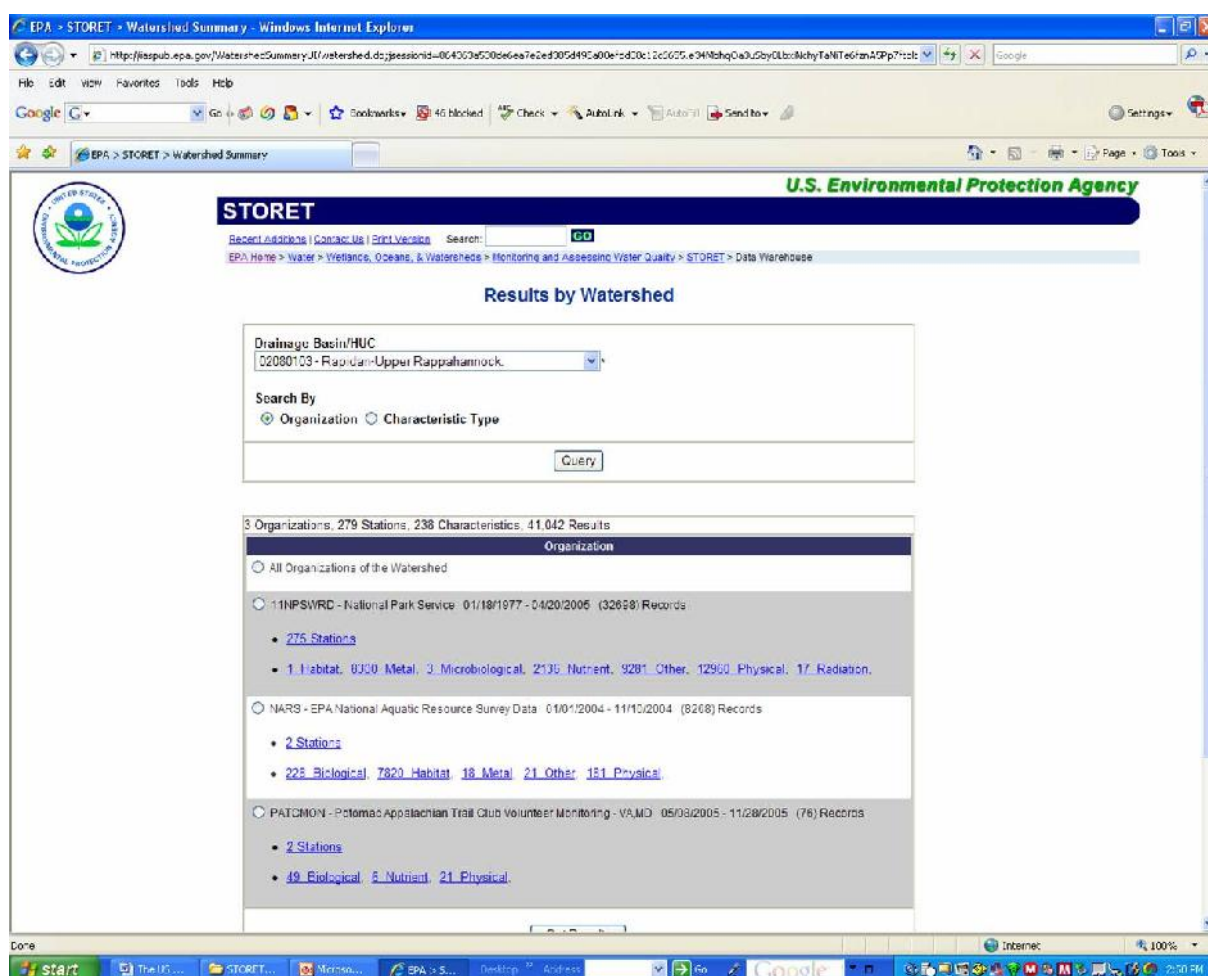


Figure 3. A summary of STORET data in a watershed



The Future of STORET

The major “next steps” in STORET development will be:

- To replace the Modernized STORET with a complete conversion to the XML/Web Services architecture;
- To enhance the capabilities for storing and using biological monitoring data;
- To increase the amount of high-quality data from volunteer monitoring organizations and;
- To enhance coordination with other agencies, especially USGS.

The first “next step” will greatly simplify subsequent steps by providing easier methods for data exchange and use. The change in system architecture will simplify data transfer by volunteer monitoring groups. The data coordination needed with USGS and others would be difficult, if not impossible, without the conversion to the XML/Web Services approach. The following is a simplified discussion of this approach.

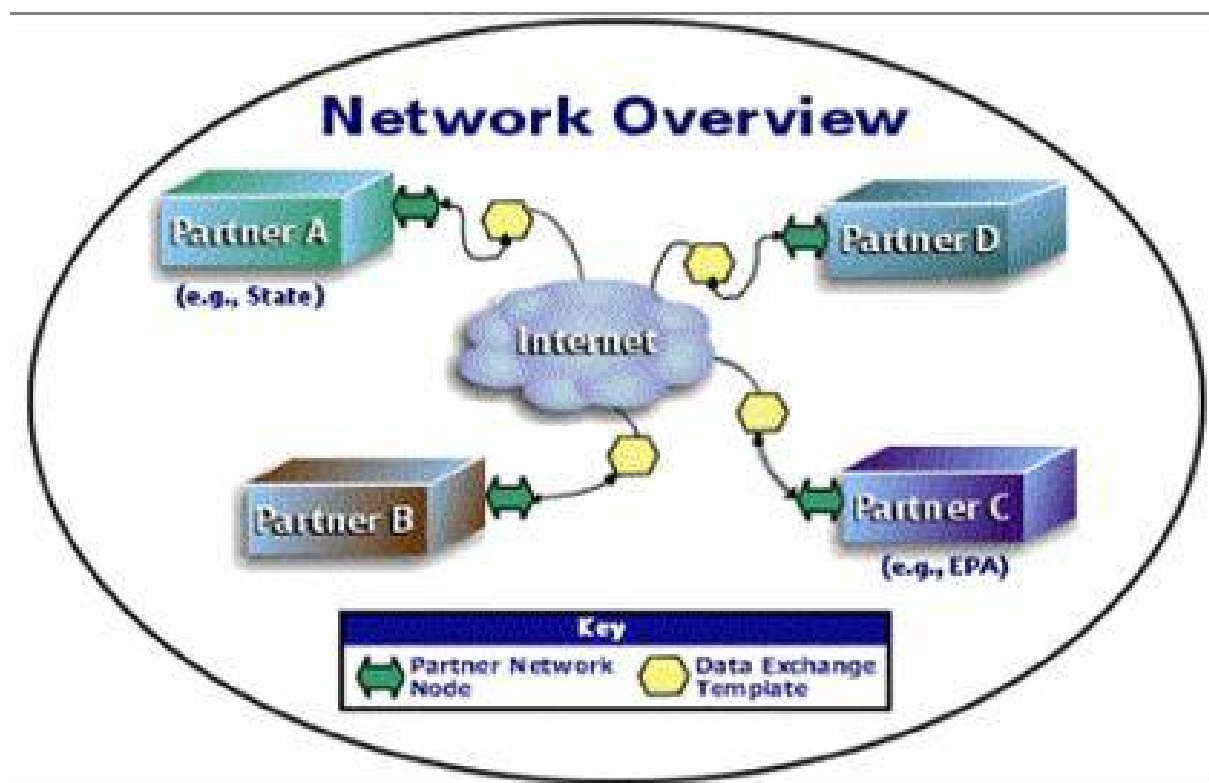
XML schemas have become an industry standard for sending data across the Web. For example, software applications such as Microsoft Word could save this paper as an XML file, which could then be sent to another application, such as a Web page or a Geographic Information System.

Web Services have become very common in data exchange across the Internet. A simple example is a commonly available Web service called “Weather Bug”. A program or Web interface can call this service, provide basic location information to Weather Bug, and Weather Bug will then return the current weather conditions and forecast for that area.

The XML/Web Services approach is being developed with a “Water Quality Exchange” (WQX) network, illustrated in Figure 4. To reiterate, if the XML/Web Services capabilities do not exist, integration and coordination with USGS cannot be feasible. The figure illustrates the manner in which many different organizations can dynamically share their data. For instance, a State can maintain a node, USGS could maintain a separate node, and a volunteer organization could maintain a node. By using a common XML data structure, data sharing across the Internet between these organizations can be done seamlessly. At the same time, EPA can maintain its central repository for data as needed.

The steps described above, in particular the conversion to the XML/Web Services, are essential in meeting the goals of a Memorandum of Understanding (MOU) adopted between USEPA and USGS. The objective of the MOU is to provide a common interface for data exchange between the two agencies. The XML/Web Services currently being developed and planned within the WQX are essential to accomplishing the goals of this MOU.

Figure 4. The water quality exchange network



The Relevance of the STORET System to China

Perhaps the most important lessons learned during the long development of STORET are as follows:

- Consistently provide strong user support and outreach.
- Always work to simplify the use of the system for both data providers and users.
- Maintain system stability while staying current with the evolving power of modern data processing.
- Ensure that data quality descriptors are key elements in the database.

The example of STORET can be a valuable tool for China. The principles and methods developed by STORET over 42 years are readily adaptable to the Chinese situation. The Chinese system will most likely be quite different from the USEPA STORET but the guiding principles may remain the same. In particular, the “Keys to Success” and Data Organization can serve as a proven roadmap for the development of an integrated Chinese water quality system.

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Chapter 22

Mainstreaming Wetland Economic Evaluation: A Case Study from Potteric Carr National Nature Reserve, England

Robert Oates

WWF – United Kingdom

Abstract

This paper sets out the case for using a cost based approach of economic evaluation, for use in influencing decision makers to protect wetlands and their biodiversity. Biodiversity is often recognised as important by decision makers in government or business. But it can often be overlooked or given a lower weight than for other requirements such as agriculture development or new buildings. This is partly because decision-making involves weighing costs and benefits. It is difficult to include biodiversity in this because its value is not well quantified or understood. Valuing wetland biodiversity requires an understanding of the range of ecosystem services which wetlands provide. The report 'Revealing the value of Nature' by the UK government agency English Nature (2002), now Natural England, demonstrates that, in addition to the scientific and moral arguments, the conservation of biodiversity can also provide significant economic and social benefits in terms of goods, services and cultural connections, which contribute to human well-being. When we can demonstrate the total value of all of the benefits that wetlands provide, then we have a chance of influencing decision makers to protect them. This paper sets out a cost based approach to demonstrating those total values, so as to illustrate to decision makers that they can exceed the single value of many proposed developments. The object is to mainstream this tool in order to persuade decision makers to require developers to undertake a full economic evaluation of a proposed development affecting a wetland. This would challenge developers to prove that their proposals represent a net gain to society. In this way, conservationists can be on the offensive rather than the defensive in the face of development threats to wetlands.

Keywords: Economic valuation, Mainstreaming wetlands, WWF-UK, Potteric Carr National Nature Reserve

Introduction

The Millennium Ecosystem Assessment (WRI, 2005) states that more than 50% of specific types of wetlands and their biodiversity in parts of North America, Europe, Australia, and New Zealand were destroyed during the twentieth century, and many others in many parts of the world degraded. The degradation and loss of wetlands is more rapid than that of other ecosystems. Similarly, the status of both freshwater and coastal wetland species is deteriorating faster than those of other ecosystems. The primary indirect drivers of degradation and loss of inland and coastal wetlands have been population growth and increasing economic development. That economic development is frequently driven by valuation techniques, which ignore or play down the wide range of functions and benefits that wetlands can provide. Economists have struggled to come up with a method of wetland economic evaluation that is scientifically robust but also simple and easy to use by conservationist working in wetland protection. This economic need has been recognised in international documents such as the Millennium Ecosystem Assessment and those of the Ramsar Convention.

Why Value Wetlands

Governments and NGOs have done much good work around the world to protect wetlands. But wetland habitats and species are still in decline. Economic development is still taking more land and water resources. The needs of people must come first, especially in developing countries. But people also need a healthy environment for long-term sustainability. Wetlands are an essential part of a healthy environment. But they often lose the argument when other uses are proposed for the land. When decision makers in government or industry plan developments, the natural values of wetlands are often seen as lower priority than new agricultural land, homes, factories or other developments. Because all of those things can be given monetary values, such as value of agricultural production, price of houses or output from factories. But wetlands are often seen as having only biodiversity or low priority values such as fishing or recreation. So the value of wetlands has not been fully mainstreamed into decision-making processes. We need to develop a cheap and easy-to-use methodology to calculate the total economic value of wetlands, so as to achieve that mainstreaming.

The research report 'England's Ecosystem Services' by English Nature (EN), refers to ecosystem services being usefully grouped according to four broad categories (Table 1) as defined in the Millennium Ecosystem Assessment (WRI, 2005).

Table 1. Ecosystem service categories and examples of services they provide

Supporting services	Provisioning services	Regulating services	Cultural services
<ul style="list-style-type: none"> - Primary production, - Provision of habitat, - Nutrient cycling, - Soil formation and retention, - Production of atmospheric oxygen, - Water cycling. 	<ul style="list-style-type: none"> - Food, fibre and fuel, - Genetic resources, - Biochemical, - Fresh-water. 	<ul style="list-style-type: none"> - Invasion resistance, - Herbivory, - Pollination, - Seed dispersal, - Climate regulation, - Pest regulation, - Disease regulation, - Natural hazard protection, - Erosion regulation, - Water purification. 	<ul style="list-style-type: none"> - Spiritual and religious values, - Knowledge, Education and inspiration, - Recreation and aesthetic values, - Sense of place.

The EN paper (EN, 2002) emphasises that ecosystem services contribute to economic welfare (or generate benefits) in two ways: through contributions to the generation of income and wellbeing, and through the avoidance of damages, which inflict costs on society. The latter is characteristic of certain ecosystem services that provide insurance, regulation and resilience functions, such as floodwater storage. Both types of benefits should be accounted for in any policy-making decision.

Valuing wetlands and their services or functions is difficult thing to do. However, it is necessary in order to illustrate their importance. As there are competing uses for land, such as for farming, housing or industry, society needs to be able to choose which is the best use for each particular area of land. Classical economics is used to put a value on each new house constructed or the agricultural output from each new hectare of land. But it is difficult to put a value on wildlife. It is often then calculated as of zero economic value. Therefore, it often loses out to development pressures. The arguments for the intrinsic, scientific or cultural

value of wildlife have enabled the designation of certain areas as protected zones for wildlife. And tourism has been seen as a direct economic driver to protect some natural habitats and species. But overall, there are insufficient protected areas around the world, and they are no habitat corridors to enable wildlife to migrate along traditional routes or to avoid threats.

How to Value Wetlands

In the paper 'Valuing the Benefits of Biodiversity', the UK department of the Environment, Food and Rural Affairs (DEFRA) describes how valuing biodiversity requires an understanding of the range of benefits it provides. The paper sets out how biodiversity provides these benefits and the evidence to support this, including some UK case studies. The paper set out a Total Economic Value (TEV) approach to value the natural environment. It breaks down why people value the environment by looking at whether the benefits they gain are direct, indirect or from 'non-use'.

The DEFRA paper (DEFRA, 2007) shows how wetlands are a good example of the natural environment providing both direct and indirect use benefits to society. By hosting a variety of birds and wildlife, wetlands can attract large numbers of visitors. These are people who are directly enjoying the natural environment. However, wetlands also provide other services of benefit to society, including water purification and flood control. Without these, society would have to pay higher costs to treat water or build flood defences. These are considered indirect benefits because people do not consume these services directly, but rather they impact on services people do consume.

This paper describes a basic cost based approach to valuing both direct and indirect uses. The term basic is used, as the author is not an economist. He is a conservation manager who is looking for a practical, non-technical way to value wetlands that can be used in planning processes to persuade decision makers to recognise their importance and so to protect them and the functions they provide for people and wildlife.

The DEFRA paper emphasises that care must be taken with the TEV approach of separating out all the benefits. It says that simply adding them all up to give a total figure is inadvisable. The reasons being that the figures presented may come from a variety of different sources for different parts of the environment using different valuation techniques, and so are not comparable. Another problem with the adding-them-up approach is potential double counting. This is the case in pure economics studies terms. However, what this paper attempts to do is to set out a simple cost based method of calculating the multiple benefits of wetlands, so as to illustrate to decision makers that even on a crude measure those values can exceed the single value of many proposed developments. The English Nature paper makes it clear that we remain in the early stages of understanding both the science and economics of ecosystem services. However, that should not stop us using a relatively simple and cheap cost based process if it provides evidence that helps to protect wetlands today.

A cost based approach

A basic cost based approach to main streaming wetland economic valuation into decision-making processes uses the following steps:

- Identify all of the functions that a wetland provides – ecosystem services;
- Identify a value for each function of the wetland – benefit to society;
- Calculate the total value for all of the functions – in monetary terms;

- Compare the total value to the value to be gained from other potential land uses such as agriculture, construction or waste disposal;
- Prepare case studies to demonstrate the total value of wetland functions;
- Show uses of the wetland values method to decision makers in government, industry and communities;
- Lobby those decision makers to use the wetland economic valuation method in assessing the total cost benefits to society of a proposed development affecting a wetland;
- Mainstream wetland biodiversity into economic development by integrating it into national and local planning processes.

The detail of how to undertake each of these steps is described in the following sections.

Identify all wetland functions

Wetlands are multifunctional, offering a broad range of service and goods that benefit people and wildlife. These wetland functions are described in detail in the various publications of the Ramsar Convention on Wetlands. For any particular wetland they can include the following:

- Reserve of natural resources
- Harvesting of natural resources, such as plants and fish
- Recreation for local people
- Tourist attraction for visitors
- Floodwater storage
- Water supply in dry season
- Natural sewage treatment
- Filtration of pollution from industry or agriculture
- Education of children and adults
- Training people in skills for employment
- Scientific research

For a wetland threatened by development or a lack of investment in its protection, it is important to identify the full range of functions that it performs. As well as scientific studies and research, participatory techniques with stakeholders can help to quickly identify and value the functions of a wetland.

Identify a value for each function

For each function we can then identify a benefit or value that it performs. Or to put it another way, if that wetland were lost to development, what would need to be created to provide that ecosystem benefit or value to people. Table 2 illustrates some typical ways of providing ecosystem benefits by artificial means.

In many wetlands around the world there are other benefits that can be evaluated, such as the harvesting of plants for food, fuel, construction or medicine.

Calculate the value of each function

To value these functions, economic evaluation techniques often ask how much it would cost to institute man-made technologies to replace the natural services provided by a given ecosystem. An example from an English Nature report (EFTEC *et al.*, 2006) looks at the role

of salt marshes in flood defence. By absorbing and dissipating the power of waves, salt marshes prevent erosion of the coastline. This means that flood defence banks of a lower engineering specification and cost can provide the required level of flood risk protection. The study estimates that where salt marshes are feasible, this could amount to a cost saving of £4600 per metre.

The DEFRA paper shows some of the key services for the principal habitats in the UK, and suggests some suitable valuation techniques.

Table 2. Providing ecosystem benefits by artificial means

ECOSYTEM BENEFIT	ARTIFICIAL MEANS
Protect natural resources	Create nature reserve
Harvesting of fish	Build fish ponds
Recreation for local people	Build town park
Tourist attraction	Build wetland park
Flood water storage	Build flood defences
Water supply	Build water storage reservoir
Groundwater recharge for springs	Dig wells
Sewage treatment	Build waste water treatment plant
Filtration of pollution	Build pollution treatment plant
Outdoor education	Build field studies centre
Developing practical skills for employment	Build training centre

The Potteric Carr case study

One example of the use of the simple cost based approach is the evaluation of the functions and benefits of the Potteric Carr wetland National Nature Reserve in the North of England. Potteric Carr covers 200 hectares and is owned and managed by the Yorkshire Wildlife Trust, a local NGO. The trust has built up the reserve over thirty years of land acquisition and skilful management, much of it done by volunteers. This is a typical scenario in the UK, where people work within an NGO to protect biodiversity by creating nature reserves. But in doing so, they also create ecosystem functions of other sorts, which largely go unrecognised and unvalued by others.

Potteric Carr is used here to illustrate two simple cost based methods of illustrating the total value of the ecosystem goods and services provided by a wetland. Table 3 illustrates the total value to society of the 200 hectares of Potteric Carr, if all of its benefits had to be replaced.

If we divide the £55 millions total value of the functions at Potteric Carr by 200 then we arrive at a total value per hectare of £275,000. We can compare this with the value of top grade land for agriculture, which is only £7,000 per hectare. Or land for construction, which is currently averaging around £50,000 per ha (excluding the cost of land in inner cities such as London, which is currently among the highest in the world). Even the highest value land in the UK countryside, which is for mineral extraction, is currently valued at around £250,000 per hectare. So the total value of Potteric Carr is actually the highest use value to society as a whole. In addition, it is more cost effective to provide all of these benefits on one site rather than through sectoral provision of separate facilities such as a town park, water storage reservoir, nature reserve etc. Also, a multi-functional wetland use less land than provision on

separate sites, which frees up other land for functions such as agriculture or houses. Many wetlands in the UK and around the world have similar multifunctional benefits, which can be used to illustrate to decision makers that their value is not only in providing biodiversity.

Table 3. Total value of functions at Potteric Carr

FUNCTION	REPLACEMENT COST £ STERLING
Nature reserve	3,000,000
City park	1,000,000
Flood water storage	30,000,000
Water supply	10,000,000
Sewage treatment	5,000,000
Pollution treatment	5,000,000
Outdoor education	500,000
Skills training	500,000
TOTAL	55,000,000

Note: Amounts are estimates based on average figures from a range of sources.

However, it is important that conservation organisations take the initiative in finding and presenting the information in this way. The many different functions performed by wetlands are often provided by a number of different sectoral public and private organisations. Often the only official provider that sees the whole picture of the total benefits is a government nature conservation department, and they are usually a weak voice in making the case for protecting wetlands. Also, many organisations benefiting from wetland services do not see or value them, such as sewage treatment companies. At Potteric Carr for example, the nature reserve water supply is partly drawn from a drain which receives waste water discharged from 10,00 homes in the town of Doncaster. The wastewater has received primary treatment but is still highly enriched with phosphates, nitrates and other substances. However, once the wastewater has percolated through the wetlands of the nature reserve it meets the EU Bathing Water Standard; in other words it is clean enough to swim in. But that pollution reduction function is not recognised by the homeowners or the water company and the nature reserve managers receive no payment from them for the service provided.

Another simple cost based method of demonstrating the value of a wetland such as Potteric Carr is to show the annual replacement value of its 200 hectares. This method illustrates what would be the annual cost to public and private organisations if they had to provide the functions of Potteric Carr on other sites. This method is illustrated in Table 4.

This method gives a total annual value to society of £1,100,00 to the multiple functions provided by the Potteric Carr wetland. This annual value can then be compared to the cost of alternatives. For example, if it was proposed to use a wetland as a municipal waste dumping site, then the total annual value can be compared to the cost of using an alternative dumping sites. The big problem for conservationists is that decision-makers in government and industry still look at wetlands and at best see only their nature reserve value. In the case of a wetland such as Potteric Carr, decision makers would typically look only at the income generated by the main use of the site as a nature reserve. That income currently is only around £25,000 from the entrance fees paid by visitors, plus purchases in the shop and cafe. This narrow traditional evaluation fails to see or to take account of the total or annual value of all of the functions provided by Potteric Carr.

Table 4. Annual value of functions at Potteric Carr

FUNCTION	PROVIDER	ANNUAL COST £,000s Sterling
Nature reserve maintenance	NGO	150
City park maintenance	City council	250
Flood defence infrastructure	Government agency	300
Water supply	Water company	100
Sewage treatment	Water company	100
Pollution treatment	Private companies	100
Outdoor education	Education authority	50
Skills training	Training agency	50
TOTAL		1,100,000

The need for case studies

There are few cases studies showing the economic evaluation of wetlands. And fewer that provide a simple approach that conservationists can use quickly and easily to persuade decision makers that a range of services to society may be lost through development for a single benefit. The Potteric Carr case study is one of the few in the UK showing a simple cost based approach that be used in other wetlands. But it still needs further work by trained economists. Fortunately, in the UK, DEFRA is funding a project to develop a robust wetland functional valuation methodology. The results of that study should be published in 2008. But more such work is needed around the world to develop wetland economic evaluation and to mainstream it. Without this, wetlands will still lose out to development pressures and will not receive the protection and funding required for maintaining them. In the meantime, the basic cost based method at least gives some figures to challenge developers to produce better ones.

Uses of the wetland values method

The cost based approach to wetland valuation can produce basic figures that are useful in a number of ways, such as:

- To help protect existing wetlands and lobby for resources to maintain them;
- To challenge proposals to develop wetlands for other uses;
- To help restore wetlands in areas where they have been damaged or destroyed.

Lobby decision makers

In the UK, wetland valuation methods are already being used to lobby decision makers in processes such as:

- Developing the River Basin Management Plans to be produced by government under the European Union (EU) Water Framework Directive legislation;
- The government Regional Development Plans;
- The national Biodiversity Action Plan.

Mainstream the method

To mainstream wetland economic evaluation we need to perform all of the steps described above. In this way we will build up a series of case studies and examples where economic

evaluation has helped to protect and restore wetlands. The examples can then be used within countries and internationally to prevent the loss and degradation of the world's wetlands and the vital functions they perform.

It would assist mainstreaming if we could achieve a system where all of the organisations or companies that benefit from the functions of a wetland contributed to maintaining or creating it. One way of doing so could be new legislation that requires all benefiting organisations or companies to contribute to a fund held by the local government. The local government would then pay an expert organisation such as an NGO or government agency to maintain or create a wetland to perform the multiple functions. In this way, we would provide the functions to citizens in a cost effective manner and create a large number of new wetlands for biodiversity.

Conclusion

Wetlands are still being lost around the world to development and other pressures, often because we cannot demonstrate their economic value to society. Economists have developed various methodologies to evaluate the benefits of ecosystem services provided by wetlands. But there is a need for a robust economic methodology that can be easily and cheaply used by conservationists to help protect wetlands, especially those threatened by development processes. Such processes often move very quickly and leave little time for extensive data gathering and analysis, which few conservation organisations can afford. However, the basic cost based method as illustrated in the Potteric Carr case study provides at least figures to make decision makers aware of the range and depth of the multiple values to society that a wetland can provide. It provides a means of challenging developers to come up with better figures.

We will still have a large task to persuade decision makers to mainstream wetland economic evaluation. But even the basic cost based method shows that it can be more cost effective for society to provide multiple functions through wetlands rather than through sectoral provision. The science of wetland management is now good enough to provide functions such as natural flood management and pollution abatement safely and effectively, while at the same time creating a habitat rich in wildlife for people to enjoy. So we should mainstream economic evaluation to protect and provide more such wetlands. But we should not rely on economic arguments alone, wetlands should still be protected for their intrinsic value even if they have only a few economic functions.

References

- DEFRA.** 2007. Valuing the benefits of biodiversity. Economics & Funding SIG, Department for Environment, Food and Rural Affairs, U.K.
- EFTEC,** Just Ecology and R.K. Turner. 2006. England's ecosystem services, a preliminary assessment of three habitat types: broad-leaved woodland, the inter-tidal zone and fresh-water wetland. English Nature Research Reports, N° 701.
- EN.** 2002. Revealing the value of nature. English Nature.
- WRI.** 2005. Millennium Ecosystem Assessment: Ecosystems and Human Well-being: Wetlands and Water, Synthesis. World Resources Institute, Washington, DC.

CHAPTER 23

INTERNATIONAL EXAMPLES OF LEGISLATION, POLICIES AND PRACTICES SUPPORTING MAINSTREAMING OF WETLANDS (BIODIVERSITY) CONSERVATION

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Abstract

An Internet survey of legislation, policies and practices that support mainstreaming of wetland conservation around the world was carried out in 2006 in support of the “Wetlands Biodiversity Conservation and Sustainable Use in China” project of the UDNP/GEF and State Forestry Administration. For practical reasons the focus was on wetlands rather than more narrowly on wetlands biodiversity conservation.

The survey revealed that few countries have specific legislation concerning wetlands conservation at the national level. Most have national wetland policies but have opted to include wetland conservation in other legislative instruments. Policies on wetland use and tenure in western countries often rely on subsidies, incentives and tax measures to encourage landowners to maintain wetlands. “No net loss” can refer to *no net loss of area and/or no net loss of function* depending on what is specified in the related policy. Usually, “no net loss” is interpreted to mean wetlands should be conserved wherever possible, and that area of wetlands converted to other uses must be offset through restoration and creation of wetlands. We could find no countries having policy or legislation on ecological compensation apart from those compensation schemes to ensure “no net loss”. Institutional arrangements and cross-sectoral collaboration is mainly a matter of practice and not of legislation.

Western governments have, in general, made a transition from “command and control” to “coordination and facilitation” over the past 25 years. All western governments have provisions for public access to information so that public scrutiny of officials’ actions is highly developed. As a consequence, cross-sectoral collaboration is, generally, the norm and not the exception and few governments now would make major policy announcements without extensive inter-sectoral and public consultation.

Keywords: mainstreaming wetland conservation, wetlands policies and legislation, wetlands practices

Introduction

The UNDP/GEF/SFA project “Wetlands Biodiversity Conservation and Sustainable Use in China” has a major focus on mainstreaming of wetlands biodiversity conservation across all sectors. Mainstreaming involves policy, legal, institutional and practical management procedures. As a basis from which to pursue “best practices”, project managers requested a review of international practices based on the following 12 issues:

- Wetland conservation and management policy and law;
- Wetland land use, tenure and ownership;
- The assessment of impacts on wetlands and the ecological services they provide, including consideration of the relative risks of the impacts;
- The concept of “no net loss” as a way of compensating for destruction of wetlands and the problems in ensuring quality of wetland area;
- The concept of maintaining “ecological flows” in wetlands;
- Wetland degradation and recovery are assessed and managed;

- Requirements and procedures for dynamic wetland monitoring;
- Different categories of protection for wetland areas;
- Measures of compensation for ecological services provided by wetland sites;
- Wise use of wetland resources – criteria and safeguards;
- Administrative mechanisms to implement wetland conservation policies, including horizontal inter-agency coordination and communication between different ministries and commissions and vertical coordination and communication between central and local government;
- Wetland conservation planning and “master plans”.

Methodology

This review used searches on the Internet on the above 12 topics. It was time-limited to 10 days of work and is, therefore, limited in term of depth of analysis. Information was gathered mainly on North American, European, Australia, New Zealand and South African experience, i.e., where the information was readily available, and from the Ramsar website. The principal focus was on law and policy with some attention directed to implementation practices.

The final report (Ongley, 2006) is in the form of a table that attempts to capture the main points and certain “practices” where these are relevant to the understanding of law and policy. For each of the 12 topics, wherever possible, the information was summarized in the Table under the following 4 headings:

- Policy: what are the policy guidelines?
- Legislation: what laws support the policy?
- Practice: how countries/states/provinces implement the legislation or, if there is no legislation, how is the policy implemented?
- Comment: background or other relevant information.

The Table is supported by an extensive bibliography that is contained in a companion CDROM that contains the full documentation of the texts that were consulted. Most of the supporting documentation has been examined. Some very long documentation (some are in excess of 500 pages) was screened using the table of contents and relevant parts were read in detail. The material presented here and in the report Table and CDROM is current up to August 2006.

Findings

The largest experience in wetlands management has undoubtedly been in the United States, especially at the State level. There is a large body of opinion and practical information available from the many State and NGO websites that deal with wetlands issues in America. Canada and Australia have also produced considerable documentation. The least amount of useful information from developed countries that is available on the Internet is from the European Union and its member countries. The Ramsar Convention website is highly informative, and provides numerous guidelines, e.g., on reviewing laws and institutions, wetland restoration, water allocation, etc.

Wetland conservation and management policy and law

At the National level, the development of policies and legislative mechanisms relevant to wetland conservation is stimulated by their adherence to international conventions, e.g., mostly the Ramsar Convention (1971) but also the Convention on Biological Diversity (1992), the Bonn Convention on the Conservation of Migratory Species of Wild Animal (1979) and even the Framework Convention on Climate Change, which promote the conservation, wise use and/or restoration and rehabilitation of wetlands. In Europe and North America, multilateral agreements also provide frameworks for the conservation of wetlands. Since 1986, the North American Waterfowl Management Plan (involving the USA, Canada and Mexico) focusing on wetland-dependant species is instrumental in the protection, conservation and restoration of many wetland habitats in the 3 countries. This tri-lateral plan is an excellent example of mainstreaming; it is coordinated through a multi-agency and a NGO Council and is mainly implemented through various financial grants and incentives that create partnerships involving NGOs, land owners, and various levels of government. In Europe, the EU Water Framework Directive (2000) and the Council Directive on the Conservation of Natural Habitats and of Wild Flora and Fauna (1992) are also establishing a framework for the protection of ecosystems, including wetlands.

Although by 2005, 40% of the contracting parties to the Ramsar Convention had adopted national wetlands policy or action plans (Ramsar, 2007), very few countries have national legislation specifically on wetlands conservation. Generally, it seems that most countries have opted to include wetland conservation in other legislative instruments (e.g., in broader legislative instruments such as biodiversity legislation). However, in many cases, policies and specific legislation do exist at sub-national levels (state or provincial levels); some specific examples are given below.

South Africa has a *Wetland Conservation Act* (1995) providing a framework for the application of the Ramsar Convention; this Act is very short and provides little policy and technical guidance. However, its *National Water Act (NWA)* (1998) provides a series of directed measures for the protection of water resources, one of which is related to wetland ecosystems. Of central importance to wetlands is the fact that the under the *NWA*, the ecological requirements for water have more or less equal weight with the water amount required to meet basic human needs. This establishes a legal “right” to water for environmental purposes and is to be honoured in water resources planning and management. There is, however, little detail on the web in this regard and it is not known how much real progress has been made. The *National Environmental Management: Biodiversity Act* (2003) contains provisions for the protection of threatened ecosystems and species on the basis of their national and international conservation status.

In the USA, wetlands policy was first defined by (Presidential) Executive Order in 1977, then followed in 1993 by the *Federal Wetlands Policy*, however there is no single legislative instrument covering wetlands at the national level. The *Clean Water Act* (1977) has provision for conservation of wetlands (especially Section 404) and the earlier policy of draining of wetlands for agricultural purposes was reversed in the so-called “Swampbuster” provisions of the 1985 Food Security Act (and in later regulations). The *North American Wetland Conservation Act* is a non-regulatory act that is specifically designed to implement the *North American Waterfowl Management Plan* (Canada, USA, Mexico). This Act provides matching grants to public organizations or individuals who have developed partnerships to carry out conservation projects, i.e., the securement, restoration, enhancement and/or management of wetland ecosystems (used by migratory waterfowl) in the three countries. Many USA states, however, have their own wetland legislation, e.g., the New Jersey (NJ) *Freshwater Wetlands*

Protection Act protects transition areas or buffers around wetlands; this law requires the NJ Department of Environmental Protection to regulate virtually all activities proposed in wetlands. An excellent account of the policy and regulatory change in the USA is provided in USDA (undated).

In the European Union, the Water Framework Directive provides guidance for wetlands, but this is to support water quality/quantity management and not specifically for wetlands conservation. France adopted in 1995, a National Wetland Action Plan to ensure the conservation of wetlands, to stop their degradation and to encourage restoration: a wetland inventory was done; a National Wetland Observatory was created to monitor wetland's situation, to contribute to public policies and information regarding wetlands; and a network of Centers established to encourage and support local initiatives for the sustainable management of wetlands.

In Australia, the Wetlands Policy of the Commonwealth Government of Australia (1997) seeks to ensure that the activities of the Government of Australia promote the conservation, the ecological sustainable use and, where possible, the enhancement of wetland functions (Table 1). The Ramsar Convention promoting the wise use principles and its guidelines inspired the development of the Australian wetlands policy. In addition, Australia has also an *Environment Protection and Biodiversity Act* (1999) promoting the conservation of biodiversity by strong protection measures for, amongst other things, Ramsar wetlands and Australian reserves and conservation zones.

In Canada, wetland conservation is a shared responsibility amongst the federal, provincial and territorial governments. The Federal government has a particular role to play as it is estimated that 29% of all of Canada's wetlands are located on Federal lands or waters. The Federal Policy on Wetland Conservation was developed in 1991 and its Implementation Guide for Land Managers was issued in 1996 (Table 1). Wetland conservation issues are also considered into decision-making processes under the *Canadian Environmental Assessment Act* when it applies to land under Federal jurisdiction. All of the Provinces have put in place non-regulatory wetland management programs and many of the Provinces have developed specific wetlands policies. Current Provincial wetland policies complement the federal policy strategies. In many provinces, wetlands are given some protection under more general environmental and conservation legislation. For example, in Ontario, some wetland protection is included as a policy statement under Ontario's *Planning Act*; its section on the wise use and management of the resources states that development and site alteration shall not be permitted in significant wetlands in certain ecoregions, significant coastal wetlands and significant wetlands in the Canadian Shield north of certain ecoregions. Another example is in Prince Edward Island (PEI) where wetland protection measures are found under the *P.E.I. Environmental Protection Act*, the *PEI Wildlife Conservation Act*, the *PEI Natural Areas Protection Act* and the *Planning Act*.

In China the State Council issued policy directions in 2004 for wetlands conservation. There is currently no national legislation on wetlands however regulations are now being drafted. A number of Chinese provinces have their own policies and regulations on wetlands conservation.

Table 1. Examples of national wetlands policies - Table of contents of Canadian and Australian policies

Canada - Federal Policy on Wetland Conservation (1991)	Wetlands Policy of the Commonwealth Government of Australia (1997)
<p><u>Policy Background</u> The Wetland Resource The importance of wetlands Ecological functions Threats to wetland The Federal response Socio-economic functions Estimated value of wetland functions Loss and degradation in Canada</p> <p><u>The Federal Policy on Wetland Conservation</u> Objective Goals Guiding Principles Strategies <ul style="list-style-type: none"> • Developing public awareness • Managing wetlands on Federal lands and waters in other Federal programs • Promoting wetland conservation in Federal protected areas • Enhancing cooperation • Conserving wetlands of significance to Canadians • Ensuring a sound scientific basis for Policy • Promoting international actions Glossary of terms in the Policy</p> <p>Implementation Guide for Federal Land Managers (1996)</p>	<p>1. Introduction What are wetlands Why a Commonwealth Wetlands Policy is needed Purpose of the Policy Actions through partnership and cooperation</p> <p>1. Policy The importance of wetlands resource Threats to our wetlands Goal Objectives Guiding principles</p> <p>3. Strategies <ul style="list-style-type: none"> • Managing wetlands on Commonwealth lands and waters • Implementing Commonwealth policies and legislation and delivering Commonwealth programs • Involving the Australian people in wetlands management • Working in partnership with State/Territory and local governments • Ensuring a sound scientific basis for the policy and management • International actions </p> <p>4. Implementation of the Policy</p> <p>5. Glossary</p> <p>6. Further readings</p> <p>Appendices</p>

Wetland land use, tenure and ownership

In many western countries, wetlands are often owned privately rather than by national, state/provincial or local governments. Private rights are mitigated by local zoning, planning bylaws, etc. that reflect public policy and restrict actions that might otherwise be taken by landowners. In North America, policies on wetland use and tenure also rely on mainstreaming measures such as subsidies, incentives and tax measures to encourage landowners to maintain or restore wetlands. In the USA, for example, the Wetlands Reserve Program created under the *US Food, Agriculture, Conservation and Trade Act*, is a voluntary program to restore and protect wetlands on private property; it is an opportunity for landowner to receive a financial incentive to enhance wetlands in exchange for retiring marginal agricultural land through either a permanent easement, a 30-year easement or a restoration cost-share agreement of a minimum 10-year duration. In North America, governments also have programs that pay farmers for harvest that is eaten by migrating waterfowl, and that provide extensive public-private sector partnerships to restore and maintain wetlands for migrating waterfowl. In France, the protection of wetlands does not necessarily preclude the use of wetlands for

agricultural and harvesting practices when products are harvested in ways to ensure sustainability and protection of the wetlands.

The assessment of impacts on wetlands and the ecological services they provide, including consideration of the relative risks of the impacts

It was difficult, through our Internet searches, to find policies and legislation specifically on the assessment of impacts on wetlands and the ecological services they provide. In many countries, the assessment of impacts on wetlands is done when there are major changes occurring (e.g., construction, large water withdrawal, etc.). Most countries have requirements for environmental impact assessment that include, but are not specific to, wetlands. An impact assessment for wetlands is often required by environmental assessment or environmental protection legislation at the National/State/Provinces levels, e.g., the *Canadian Environmental Assessment Act* applies to wetlands under Federal jurisdiction; the Australian *Environment Protection and Biodiversity Conservation Act* covers wetlands that are listed as Ramsar wetlands of international importance.

In Europe, the EU policy is to use ecological assessment as the basis for water quality management throughout all watercourses. The EU Water Framework Directive requires Member States to address all water problems that affect all water-dependant ecology; wetlands are an important component of the Directive. EU Member States are currently developing impact assessment protocols, as technical protocols are not provided under this Directive. EU guidance is that wetland management is dependant upon an initial ecological assessment as a basis to determine impact.

The Ramsar Convention, under Resolution VIII.9 (2002), provides guidelines for incorporating wetland biodiversity related issues in environmental impact assessment legislation and process (Table 2). It applies equally to the conservation and wise use of wetlands.

Table 2. Ramsar Convention - Resolution VIII.9 (2002): Table of contents of the guidelines

Guidelines for incorporating wetland biodiversity related issues in environmental impact assessment legislation and process	
Definitions	
1.	Purpose and approaches
2.	Biodiversity issues at different stages of EIA
	Screening
	Scoping
	Impact analysis and assessment
	Consideration of mitigation measures
	Reporting: the environmental impact statement
	Review
	Decision-making
	Monitoring and environmental auditing
3.	Incorporation of biodiversity considerations
4.	Ways and means
	Capacity building
	Legislative authority
	Participation
	Incentives
	Cooperation

The concept of “no net loss” as a way of compensating for destruction of wetlands and the problems in ensuring quality of wetland area

In general, “no net loss” can refer to “no net loss of area” and/or “no net loss of function” depending on what is specified in the related policy.

In the USA in particular, this concept has been widely mainstreamed through all relevant government departments and the public. The concept of “no net loss” was adopted as a policy goal, and is interpreted to mean wetlands should be conserved wherever possible, and that area of wetlands converted to other uses must be offset through restoration and creation of wetlands, thus maintaining or increasing the wetland resource base. Legislative and voluntary measures were used to curb the conversion of wetlands into agricultural lands.

As for legislative measures, the conflicts that had existed between Federal farm policies and wetland protection were resolved by eliminating direct and indirect incentives through what are known as the “Swampbuster” provisions of the 1985 *Food and Security Act* (now under the 1996 *Federal Agriculture Improvement and Reform Act*, and changes that were made to the *Tax Reform Act* in order to eliminate preferential tax treatment for land clearing that disadvantaged wetlands. The *Clean Water Act* now directs USA Federal agencies to minimize destruction, loss or degradation of wetlands and to enhance the beneficial values of wetlands in all actions involving Federal lands, activities or projects in which there are Federal investments; section 404 of the *Act* direct the Army Corps of Engineers and the US Environmental Protection Agency to regulate discharge of dredge and fill material in the waters of the USA, which are defined as including wetlands, even those that are isolated from navigable water bodies.

In parallel with the above legislative changes, non-regulatory measures were pursued. The Wetlands Reserve Program is a voluntary program to restore and protect wetlands on private property; other programs contributing to wetland restoration are Partners for Wildlife and joint venture projects between public and private organizations under the North American Waterfowl Management Plan.

As a result of the above actions, net rates of wetland conversion have decreased over time: agriculture’s share of conversions in America decreased from 80% to 20%, while urban development rose. In 1995, it was estimated that 141,000 acres of USA wetlands were converted to other uses, while at least 187,000 acres of wetlands were restored through voluntary programs.

In Canada, “no net loss” is a policy but without legislation. Elsewhere, there is little information available on how this principle is applied.

The concept of maintaining “ecological flows” in wetlands

Wetlands represent a major ecological user of water. According to our survey, at the national level only the new South African *National Water Law* contains explicit provisions for ecological use of water; it captures a fundamental shift in South Africa’s policy on water as it establishes two equal and legal “rights” for water – one for basic human need and another one for ecological use of water.

The state of New South Wales (Australia) introduced in 1998 a comprehensive water reform. Three of the major reform initiatives make reference to “environmental flow” and wetlands:

- *River Flow Objective*: Which will, among other things, ensure healthier wetlands.

- *Environmental Flow Rules*: Application of environmental flow rules in the water sharing plans will protect and provide water for the environment; done through River Management Committee.
- *Integrated Monitoring of Environmental Flow*: to provide an understanding of the response of major rivers and associated wetlands.

Also in New South Wales, a Water Sharing Plan is a legal document under the *Water Management Act*. It establishes rules for sharing water between the environmental needs of the river or aquifer and water users (e.g., town supply, domestic rural supply, stock watering, industry and irrigation). It provides water for the environment by protecting a proportion of the water available for fundamental ecosystem health and/or specific environmental rules.

Lastly, Resolution VIII.1 (2002) of the Ramsar Convention provides guidelines for the allocation and management of water for maintaining the ecological functions of wetlands, which can be adapted to national conditions and circumstances (Table 3).

Table 3. Ramsar Convention - Resolution VIII.1 (2002): Table of contents of the guidelines

Guidelines for the allocation and management of water for maintaining the ecological functions of Wetlands
<div>Introduction</div> <div>Basic principles</div> <ul style="list-style-type: none"> • Sustainability as a goal • Clarity of process • Equity in participation and decision-making factors • Credibility of science • Transparency in implementation • Flexibility of management • Accountability for decisions <div>Guidelines for operationalising the principles</div> <ul style="list-style-type: none"> • Decision-making (<i>includes policy and legislation and guidelines for valuation of wetland ecosystems</i>) • Process for determining water allocations (<i>includes guidelines for environmental flow assessment downstream of dams</i>) • Scientific tools and methods (<i>includes guidelines for determining water allocated to a particular wetland ecosystems</i>) • Implementation

Wetland degradation and recovery are assessed and managed

In general, in the published literature, we talk about restoration instead of recovery. Restoring a wetland means returning a wetland that has been disturbed or altered by human activities to a previously existing condition. Restoration may include “re-establishment”, that is, restoration of a wetland on a site where a wetland existed before. Restoration may also include “rehabilitation”, i.e., the return of a currently degraded site to its previous conditions. Wetland restoration is not always effective. Efforts to restore often fail to accomplish their objectives. Some types of wetlands (e.g., vernal pools, fens, and bogs) are very difficult or

impossible to restore (Gardner, 2003) due to the inability to restore the physical conditions that give rise to these types of wetlands.

In the EU, USA and Canada, there are non-regulatory financial incentives to restore wetlands. They usually come in the form of programs in which the landowners are compensated to restore wetlands. The funds originate from supra-national, national and local levels and may also be supported by non-governmental organisations (NGOs), and the private sector. Often the programs require matching funds, for example half from the program funds and the rest from other sources, including the value of in-kind support, i.e., provision of equipment, staff or material. Compliance monitoring is an important aspect of ensuring that actions are taken in accordance with the agreed upon plan and performance standards. Monitoring and inspecting authority may be delegated to other federal or state/provincial agencies or to external or independent contractors.

Permit-based regulatory systems that require governmental permission before one may fill, damage or alter a wetland can encourage wetland restoration projects. These programs have jurisdictional limitations based on activity (done in wetland) and/or type of wetland. Most permit systems, requires the applicant to mitigate wetland impacts, which may include restoration measures. The permit holder may be requested to do the restoration or mitigation prior to when the permitted activity starts, or concurrent with it. EU Habitats Directive suggests that a site should not be irreversibly affected before the compensation is in place. In the USA, under the *Clean Water Act*, a longer time period is allowed for the completion of the compensatory project. In the EU, Canada and USA, compensatory mitigation is a tool of last resort, i.e., regulatory agency must first consider if avoiding the wetland is possible and weather unavoidable impacts can be minimized, if negative impacts remain, then the agency evaluates the appropriate amount of compensatory measures.

Requirements and procedures for dynamic wetland monitoring

Internet searches did not find any policies or legislation that define requirements or procedures for dynamic wetland monitoring. Dynamic monitoring is usually developed according to the particular needs of the conservation study or the species under investigation; it is widely practiced in biological studies, including wetland biodiversity conservation. For example, in the Peace-Athabasca Delta of northern Canada, dynamic monitoring was developed to determine the biological requirements for seasonal water levels in that wetland. It led to flow control provisions under the “Mackenzie River Basin Transboundary Waters Master Agreement” amongst the national, three provincial and two territorial governments. That Agreement has an aquatic ecological objective but does not specifically identify wetlands.

The Ramsar Convention, in Resolution IX.1 on “Wise Use” (2005), Annex E provides an integrated framework for wetland inventory, assessment and monitoring. It outlines 10 types of assessment and provides some guidance. It also defines inventory, assessment and monitoring:

- *Wetland inventory*: the collection and/or collation of core information for wetland management, including the provision of an information base for specific assessment and monitoring activities.
- *Wetland assessment*: the identification of the status of, and threats to, wetlands as a basis for the collection of more specific information through monitoring activities.
- *Wetland monitoring*: the collection of specific information for management purposes in response to hypotheses derived from assessment activities, and the use of these

monitoring results for implementing management; the collection of time series information that is not hypothesis-driven from wetland assessment is termed surveillance rather than monitoring.

Different categories of protection for wetland areas

There are many definitions of wetlands and related classification systems. Most are scientifically based, i.e., rely on some combination of soil, plant and water characteristics. It also appears that the type and level of protection measures varies greatly, usually according to the importance of the wetland and in the context of environmental, social and economic factors.

In 1993, the USA Federal Wetlands Policy recognized that not all the wetlands have the same values and thus should not be regulated uniformly. It also recognizes that wetlands issues are often most effectively dealt with at State and local levels. Some States are now responsible for Section 404 permit program of the *Clean Water Act*. Efforts are made to reduce duplication between State and Federal programs. Within their *Wetlands Protection Act* Regulations, for emitting permits for specified activities in wetlands, the State of New Jersey classifies its freshwater wetlands into 3 categories according to their resource value:

- *Exceptional resource value*: wetlands discharging into trout production waters or their tributaries, or are a present habitat for threatened or endangered species, or are documented habitats for threatened or endangered species, and which remains suitable for breeding, resting or feeding by these species.
- *Ordinary resource value*: small isolated wetland, drainage ditch, and swale and detention facilities.
- *Intermediate resource value*: any wetlands that do not fall into the above two categories.

In Australia, The Ramsar Wetland sites are offered special protection under the *Environmental Protection and Biodiversity Act* and are classified as of national environmental significance. In China, wetlands are divided into wetlands designated as of “international importance”, “national importance” and of “local importance”. Only the wetlands that are designated are protected in China.

Measures of compensation for ecological services provided by wetland sites

We could find no countries having specific policy or legislation on ecological compensation apart from those compensation schemes to ensure “no net loss” of wetland area or functions. In the Chinese context, ecological compensation includes “payment for ecological services” (so-called PES systems) however we could find no reference to this in current provisions of any country. The Canadian government provides guidance on the economic valuation of wetlands however this is not contained in specific policy.

The Ramsar Convention Secretariat published the book *Economic Valuation of Wetlands: a Guide for Policy Makers and Planners* by Barbier *et al.* (1996). This book provides guidance to policy makers and planners on the potential for economic valuation of wetlands and how such study should be conducted; details of the various techniques and examples of valuation studies (in different types of wetlands, using different methods and covering diverse geographical areas); guidance on planning and managing a study and how to put the result into a wider decision-making framework.

Wise use of wetland resources – criteria and safeguards

“Wise Use” policies are not very specific and refer generally to achieving benefits both for ecology and for society. It is determined through the planning process for wetlands management. There are no fixed rules as it is a very subjective issue and which is determined by an analysis of pressures on the wetland, relative to societal objectives for the wetland. Cost of wetland restoration or maintenance plays an important part in determining the final outcome.

The Ramsar Convention Resolution IX.1 on Wise Use (2005) provides a conceptual framework for the wise use of wetlands and the maintenance of their ecological character (Annex A). Under this framework, “wise use” equates the maintenance of ecosystem benefits/services to ensure long-term maintenance of biodiversity as well as the well being of the human population and poverty alleviation. The concept and its use in national wetland policies are elaborated in the Ramsar handbook on national wetland policies (Ramsar, 2007).

Administrative mechanisms to implement wetland conservation policies, including, horizontal inter-agency coordination and communication between different ministries and commissions; and vertical coordination and communication between central and local government

This issue is mainly a matter of practice and governance policies, and not usually of legislation. Western governments have, in general, made a transition from “command and control” to “coordination and facilitation” over the past 25 years. All western governments have provisions for public access to information so that public scrutiny of officials’ actions is highly developed. As a consequence, cross-sectoral collaboration is, generally, the norm and not the exception and few governments now would make major wetlands policy announcements without extensive inter-sectoral and public consultation.

For example, in Canada, the Mackenzie River Basin Agreement (MRBA) of 1997 is not legislation but has equivalent weight in specifying actions by the parties to the Agreement. Wetlands are a key issue in water management in this remote, northern river basin and had been the cause of much friction between two provinces and one territory arising from conflicts over water development (hydropower), conservation (especially for aboriginal peoples), navigation, etc. The MRBA implicitly includes wetlands that are important in this river basin; it details the joint federal-provincial roles, and sets up a joint management Board with specific powers. Conflict resolution is identified, and the principle of equitable and sustainable use of water is the basis of the agreement. The Board is empowered to harmonize monitoring and assessment practices. In Canada, like in China, provinces have jurisdiction over water management, therefore this Agreement provides for the vertical and horizontal coordination mechanisms, for resolution of disputes, etc. It also protects aboriginal (i.e., minority) traditional rights for hunting and fishing in the basin, including in wetlands. Aboriginal peoples are members of the Board. The Federal Government is a member of the Board and could, under other legislation, act unilaterally because this river is transjurisdictional, however it does not exercise this right, preferring to allow the Parties to reach a common agreement on issues. Compensation is not an issue in this basin or in the Agreement. The MRBA provides a framework for mainstreaming decision-making between and within jurisdictions, and between government and local stakeholders.

In Australia, as in most Federal states, the situation is similar; it is the States/Territories that have the day-to-day legislative responsibility for the management of the land and water resources. Thus, when Australia developed a national approach to wetland policy/legislation, it needed to ensure that all State and Territory jurisdictions, as well as the National

government were involved. One strategy of the National policy involves “working in partnership with State/Territory and local governments” to assist them with their development of wetland policies or strategies for their jurisdictions. The process to encourage the other jurisdictions to develop their own policies or strategies, was achieved partly through political and financial incentives. Another example of mainstreaming is the Council of Environment Ministers (National and State/Territorial governments) that meets regularly to discuss and agree on collaborative actions (same as in Canada). The National government has also established a major biodiversity conservation and natural resource-management funding programme. This programme can fund or accelerate the development of provincial/territory policies; it can also disperse funds for on-the-ground projects at community level or for other activities (e.g., for suitable wetland projects) by the State/Territorial jurisdictions.

Mainstreaming is promoted by dialogue amongst stakeholders. In Trinidad and Tobago, a National Wetland Committee facilitated national discussion of their proposed National Wetland Policy over several years. Representatives from several sectors (government, academia, non-governmental organizations, industry) were invited by the Government to act as an advisory body in the planning of written material and consultations on a national policy (Pritchard, 1997).

In the USA, in the State of Illinois, a mainstreaming mechanism for the cooperative management of activities related to wetlands has been included in the state’s wetland legislation. The *Interagency Wetland Policy Act* (1989) recognizes the environmental, economic and social values of the State’s remaining wetlands and directs that State agencies shall preserve, enhance, and create wetlands where possible and avoid adverse impacts to wetlands due to State supported activities (Table 4). In order to coordinate the work of all the state departments or agencies, an Interagency Wetlands Committee, chaired by the Director of Natural Resources or his representative, is established. The Directors of 5 other agencies, or their representatives, serve as members of the Committee.

Table 4. Table of contents of the State of Illinois *Interagency Wetland Policy Act* (1989)

Sections	Contents
General Provisions	Short title, legislative declaration, application, state goal, goal implementation and definitions.
Agency Coordination	Interagency wetlands committee (chaired the by the Department of Natural Resources and includes representatives from 5 other Departments/Agencies); agency action plan must be prepared by all departments or agencies sitting on the committee.
State Wetland Mitigation Policy	State wetland mitigation policy, ownership and management, wetland compensative account, impact evaluation, value, compensation ratio.
Administration	The Department (here: the Illinois Department of Natural Resources) shall administer this Act and shall formulate rules and regulations necessary for its implementation.

In the State of California, mainstreaming is ensured by the California Resources Agency (composed of 18 State departments, boards, conservancies and commissions) and the California Environment Protection Agency that are designated as co-lead in the implementation of the State Wetland Conservation Policy.

Mainstreaming has probably been most evident in the USA in terms of the depth and breadth of policy, legislative tools, and broad consultative mechanisms. At the national level in the USA, the principal agency responsible for wetlands is the US Corps of Engineers however other agencies such as the US-EPA (pollution of wetlands), Agriculture, etc., have substantial direct or indirect responsibilities for wetlands. Over the past decades, the command and control function of, in particular, the Corps of Engineers has evolved into an effective and often informal cooperative form of decision-making involving all stakeholders through consultative and transparent processes. In part, these processes have been accelerated by the ability (and willingness) of stakeholders (including the public) to pursue judicial actions (including injunctions) against agencies that, in the plaintiff's view, are acting contrary to the stakeholder's interests. Access to the courts is a feature that is common to most western countries however this is not the usual route for stakeholder dissatisfaction outside the USA; elsewhere, public complaints to the appropriate ministry together with highly transparent decision-making processes usually result in broadly acceptable administrative actions concerning wetlands.

Wetland conservation planning and “master plans”

Wetlands policies of various countries may refer to planning, but are not specific about planning processes and procedures. Many countries, including China, have river basin or river catchment authorities having the responsibility to develop river basin plans (so-called Master Plans). However these are not specific in regards to wetlands per se.

Generally, in Canada, Australia, USA, etc., planning is larger than just for wetlands. In other words, regional planning that includes wetlands must take into account national and lower level wetlands policies in developing the plan. Planning is specifically carried out using national and state/provincial planning legislation, including environmental impact assessment, and local planning ordinances. These address planning in general and not wetlands specifically.

There are, of course, exceptions such as specific plans for very large and important wetlands such as the Florida Everglades of the USA. In Australia, the *Environment Protection and Biodiversity Conservation Act* (1999) requires management plans for wetlands that are listed as Ramsar sites. Mainstreaming is achieved through a multi-disciplinary scientific committee that provides technical input that must be considered by the Minister for approval.

References

- Barbier, E.B, M.C. Acreman and D Knowler.** 1996. Economic valuation of wetlands: a guide for policy makers and planners. Ramsar Convention Bureau, Gland, Switzerland.
- Gardner, R.C.** 2003. Rehabilitating nature: a comparative review of legal mechanisms that encourage wetland restoration efforts. *Catholic University Law Review*, Vol. 52, No 3: 573-620. Washington, D.C.
- Ongley, E.D.** 2006. International experience in wetlands conservation policy, legislation and practice. Report prepared for UNOPS Project No. CPR/98/032 – Wetlands Biodiversity Conservation and Sustainable Use in China. August 2006. (with CD Rom containing full text of consulted documentation)
- Pritchard.** 1997. As cited in Ramsar, 2007.

Ramsar. 2007. National Wetland Policies: Developing and implementing National Wetland Policies. Ramsar handbooks for the wise use of wetlands, 3rd edition, vol. 2. Ramsar Convention Secretariat, Gland, Switzerland.

USDA. undated. Wetlands and Agriculture: Private Interests and Public Benefits, Economic Research Service, US Department of Agriculture / AER-76

CHAPTER 24

MAINSTREAMING WETLAND ADAPTATION TO CLIMATE CHANGE INTO RURAL SUSTAINABLE DEVELOPMENT PLANS

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Abstract

The necessity of mainstreaming climate adaptation strategies or policies into natural resource management plans has been recognized by the United Nations Framework Conventions on Climate Change (UNFCCC). The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) suggests a growing demand for research to provide information for a deeper and more useful understanding of adaptation options to climate change, and indicates a lack of effective methods to meet this increasing demand of policy makers.

It is important to note that adaptation to climate change has not yet become a topic of high policy priority in most regional development planning. Only recently, several climate policy researchers and development practitioners have proposed for mainstreaming climate adaptation into development planning and sector decision making at both policy design and implementation stages. Mainstreaming is aimed to ensure the long-term regional sustainability by reducing the risks of economic sectors to both climate variation and change.

In this respect, a participatory integrated assessment (PIA) framework is presented in this paper to provide an effective means to mainstream wetland adaptation to climate change in rural sustainable development strategies, and thus to reduce climate vulnerability and to enhance rural community livelihood. The PIA approach includes relevant sectors (e.g., agriculture, water, wildlife, fishery, and ecosystem health) and integrates multi-stakeholder participation, environmental science, economic analysis, and multi-criteria decision making policy evaluation.

For illustration purpose, two case studies that promote the integration of climate change adaptation into wetland biodiversity conservation and water system sustainable development (SD) actions with multi-stakeholders participation are introduced. The two case studies are for two watersheds in Canada and China respectively. The study regions suffer from climate variations and may experience severer impacts of climate change on wetland ecosystem health, water resources, climate risks, and food security in the future.

Keywords: climate adaptation, wetland biodiversity, participatory integrated assessment

Introduction

Among the pressing global environmental issues are climate change and biodiversity loss. Global climate change is projected to have profound impacts on the natural environment. This will result in increased vulnerability to loss of biodiversity and ecosystem services. This will lead to increased vulnerability of human livelihoods, especially to those communities with high direct reliance on the natural environment for their livelihoods.

The risk of global warming is so high that it could affect our planet's life-support-system. The wetland ecosystems and water resources have to provide a number of economic sectors and communities in different jurisdictions with a range of different and often conflicting functions to meet their demands. While the demands for wetlands and water resources increase as populations and economies grow, the availability and the inherent functions of these natural resources are being reduced by climate change, land conversion, water pollution, and environmental degradation.

It is recognized internationally that climate change will affect the regional ability to achieve their sustainable development (SD) goals. Thus, government development action plans or strategies should make climate change risk information and adaptation policies an integral part of the planning process. The best practices and measures of adaptation policies or options should be implemented to ensure regional or community sustainability.

There have been a growing number of initiatives and programs underway that address various aspects of the water use conflicts and wetland degradation problems, such as comprehensive wetland conservation program, water use planning, pay for ecosystem services and water pricing to limit water consumption. Meanwhile, government established policies to improve water and wetland ecosystem health. What seems to be missing, however, is an overarching strategy that brings the climate change concern into wetland conservation planning and water use decision making process. For the most part, the impacts of climate change on wetland and water systems have received scant attention from government agencies and others responsible for wetland ecosystem and water resource management and planning.

A partial explanation for the limited response to take consideration of climate change in natural resources management might be due to the lack of knowledge and required information, or awareness of the issue by policy makers and general public. There are very few (if any) completed case studies internationally on the integration of climate adaptation and sectoral sustainability. Most policy makers and communities all over the world have limited knowledge of the current adverse effects and impacts associated with climate change in wetland ecosystem and water resource management and planning. It is also uncertain whether ecosystem conservation infrastructure and measures have the capacity to respond quickly and effectively to future climate risks. Effects of climate change on wetland functions and water shortage may be so significant that comprehensive adaptive actions or strategies are required, involving the participation and coordination of national/federal, provincial and local authorities and other stakeholders engaged in water resource or wetland conservation planning and management.

In this respect, a participatory integrated assessment (PIA) framework is presented in this paper to provide an effective means to address how wetland ecosystem challenges can be integrated through PIA research with climate adaptation policy evaluation. The PIA approach will include relevant sectors (e.g. agriculture, water, wildlife, fishery, recreation, and ecosystem health), multi-stakeholder participation, environmental science, economic analysis, and multi-criteria decision- making policy evaluation. The PIA will mainly address two questions:

- What are the challenges facing wetland managers and policy makers at local, regional and national level in addressing issues related to climate variation and change?
- How can we mainstream effective and desirable climate adaptation actions into rural development strategies, which can be implemented in the immediate and long term to address climate change and wetland ecosystem sustainability?

The PIA approach includes a series of research activities required to assess climate risks in wetland and water resource systems, and to prioritise adaptation responses. A range of adaptation measures that address various aspects of the wetland ecosystem resilience and water security concerns can be evaluated against community based SD indicator systems. The study will be able to identify desirable adaptation options, which will then be implemented to improve wetland ecosystem health and water use efficiencies and to enhance regional SD in a changing climate.

For illustration purpose, two case studies that promote the integration of climate change adaptation and wetland biodiversity conservation and water system sustainable development

(SD) actions with multi-stakeholders participation are introduced. The two case studies are for two watersheds in Canada and China respectively. The study regions suffer from climate variations and may experience severer impacts of climate change on wetland ecosystem health, water resources, climate risks, and food security in the future.

It should be noted that while the two case studies evaluated adaptation policies or options to climate change, they are not completed in terms of carrying out all the processes of the PIA approach, which will be discussed below. However, the two case studies represent the state-of-the-arts research in climate change risks assessment and adaptation evaluation, particularly in dealing with wetland ecosystem sustainability.

Findings from the two case studies have indicted that the potential effects of climate change on wetland biodiversity, ecosystem services and functions, and water resources are quite significant. The cases have also identified adaptation measures considered by stakeholders to be potentially effective for reducing vulnerability of wetland and water ecosystems. It is clear that wetland biodiversity and ecosystem sustainability goals will be unachievable without mainstreaming adaptation measures into wetland conservation or biodiversity programs under a changing climate.

Need for Linking Climate Change Adaptation and Wetland Biodiversity

There are natural linkages among UN Framework Conventions on Climate Change (UNFCCC), the Convention on Biological Diversity (CBD), and the Ramsar Convention on Wetlands, which all deal with the Earth's life-support-system. These Conventions or multilateral environmental agreements (MEAs), at their very essence, aim to protect our life-support-system. Climate change will affect the quality of ecosystems and biodiversity. This will lead to more serious ecosystem degradation including wetland deterioration and water shortage, all of which will further threaten biodiversity. In recognition of the importance of the linkages among UNFCCC, CBD, and Ramsar, integrated assessment (IA) which take consideration of MEAs will be appropriate and necessary.

Ecosystems are important in climate regulation and deliver a range of other services of importance to human wellbeing. Diverse ecological systems tend to be more dynamic and resilient to climate change. Failure to halt the losses of biodiversity caused by overexploitation, pollution, invasive species and habitat change, and to manage the impacts of climate change on biodiversity, will therefore have increasingly significant implications for human health and wellbeing, rural livelihoods, and ecosystem services including climate regulation. The messages provided by IPCC Fourth Assessment Report (AR4) are clear and simple, biodiversity and ecosystem resilience are necessary for climate adaptation and human wellbeing. Climate change is unequivocal and inevitable (IPCC, 2007).

Climate change is one of the most important drivers of ecosystem damage including biodiversity loss, species distributions shifts, and the changes of species population sizes, the timing of reproduction or migration events (Reid *et al.*, 2005). Loss of wetland biodiversity will have a number of direct consequences to human wellbeing. In addition to the intrinsic value of wetland ecosystem, there are many direct human benefits from biodiversity, which is directly used by humans, and especially the poor people in developing countries. The natural biodiversity of wetlands is what provides habitats for fishes and wildlife, and places for recreation. Wetland ecosystems also provide many other services such as carbon storage, stabilization of hydrology to reduce flooding risks, prevention of droughts to mention just a few.

While biodiversity conservation and sustainable resource management can contribute to both climate change mitigation and adaptation, incorporating climate change adaptation options and measures into biodiversity protection strategies can reduce negative impacts of climate change on biodiversity and thus ensure ecological sustainability (Secretariat of CBD, 2007).

The Ramsar Convention Resolution VIII.3 “Climate change and wetlands: impacts, adaptation, and mitigation” emphasizes the need to manage wetlands so as to enhance ecological resilience to climate change and to reduce the risk of flooding and drought. The Resolution VIII.3 recognizes that adaptation to climate change is an important area of cooperation between the Ramsar and the UNFCCC, and that activities that promote wetland adaptation to climate change also contribute to the conservation and sustainable use of biodiversity and sustainable resource management (Ramsar Convention Bureau, 2002).

At the Eighth Conference of the Parties (COP8) of the Convention on Biological Diversity, biodiversity and climate change integration was highlighted in Decision VIII/30, which recommends the incorporation of biodiversity considerations into all relevant national policies, programmes and plans, in response to climate change. It further suggests the development of methods and tools for the implementation of biodiversity conservation activities that contribute to climate change adaptation (CBD, 2006).

Successful integration of wetland biodiversity conservation and climate adaptation policies will require new approaches built upon a foundation of better research into the links between the climate change and the sustainable wetland ecosystem management. One challenging issue in evaluating wetland ecosystem sustainability under climate change conditions is to design the effective adaptation options or policies that can reduce potential damages to wetland biodiversity and ecological functions associated with global warming. This will be facilitated by participatory integrated assessment (PIA) and policy evaluation.

The Participatory Integrated Assessment (PIA) Approach

This section will introduce a participatory integrated assessment (PIA) framework to provide steps on how wetland ecosystem adaptation to climate change can be mainstreamed in SD strategies to reduce climate risks and to enhance rural community livelihood. Integrated study requires an interdisciplinary and holistic approach to deal with the interrelations among the economic, ecological, and social systems. The PIA approach needs to include relevant sectors (e.g., agriculture, water, wildlife, fishery, and ecosystem health), and to link environmental science, economic analysis, and multi-criteria decision making policy evaluation.

In addition, the PIA employs a process that includes prior and meaningful consultation with, and the informed participation of multi-stakeholder representatives, particularly female members. Such participation will take place throughout project design, implementation, and evaluation. A series of training workshops, household surveys and progress review meetings can be arranged, giving women many opportunities throughout the study to help shape the results.

The PIA is an action-oriented approach assisted by multi-stakeholder consultation and multi-criteria decision-making tools. It can be applied to investigate implications of a range of adaptation options or measures for enhancing rural community sustainability. Computer-based and participatory methods that combine local knowledge with scientific technical knowledge can be adopted to form the PIA approach. The main 7 elements of the PIA approach are illustrated in Figure 1 and are described briefly below.

Stakeholders, policy makers, researchers, planners and public

The procedure begins with developing partnerships and engaging multi-stakeholders for the PIA research project. The study team needs to build and network committed partnerships with multi-stakeholders in the whole process of the project. Participatory integrated approach requires a partnership among multiple stakeholders including the local vulnerable communities and higher-level governmental decision makers, organizations from civil society, private sector, practitioner, and scientists. Successful integration of climate adaptation options and rural SD strategies will target clearly defined groups of stakeholders and apply participatory, decision support methods to assist the stakeholders to assess, synthesize and communicate knowledge that is relevant, credible and useful for them to identify desirable and effective climate change adaptation options. Stakeholders should be substantively engaged in the project activities of setting the objectives and priorities, developing work plans, evaluating the processes and information needs for adaptation policy evaluation, assessing and communicating information, and developing adaptation strategies.

Climate and data availability

Information and data on climate risks of wetland biodiversity and rural livelihood are required for selecting effective adaptation measures. Data on climate risks and impacts of climate change scenarios can be derived from several different sources including existing data from previous studies on climate change, government documents, consultant reports, and scientific literature. In areas where climate risks and impacts are not available, additional expert consultation and climate change impact research efforts will be needed to fill the data gaps for those key sectors that are relevant to wetland conservation and sensitive to climate change. Computer techniques such as simulation models and geographical information system (GIS) can be used to provide additional information on climate risks and impacts (both positive and negative). Data on climate risks and impacts will be analyzed and synthesized, and will then be documented for the PIA.

Establish rural SD indicators

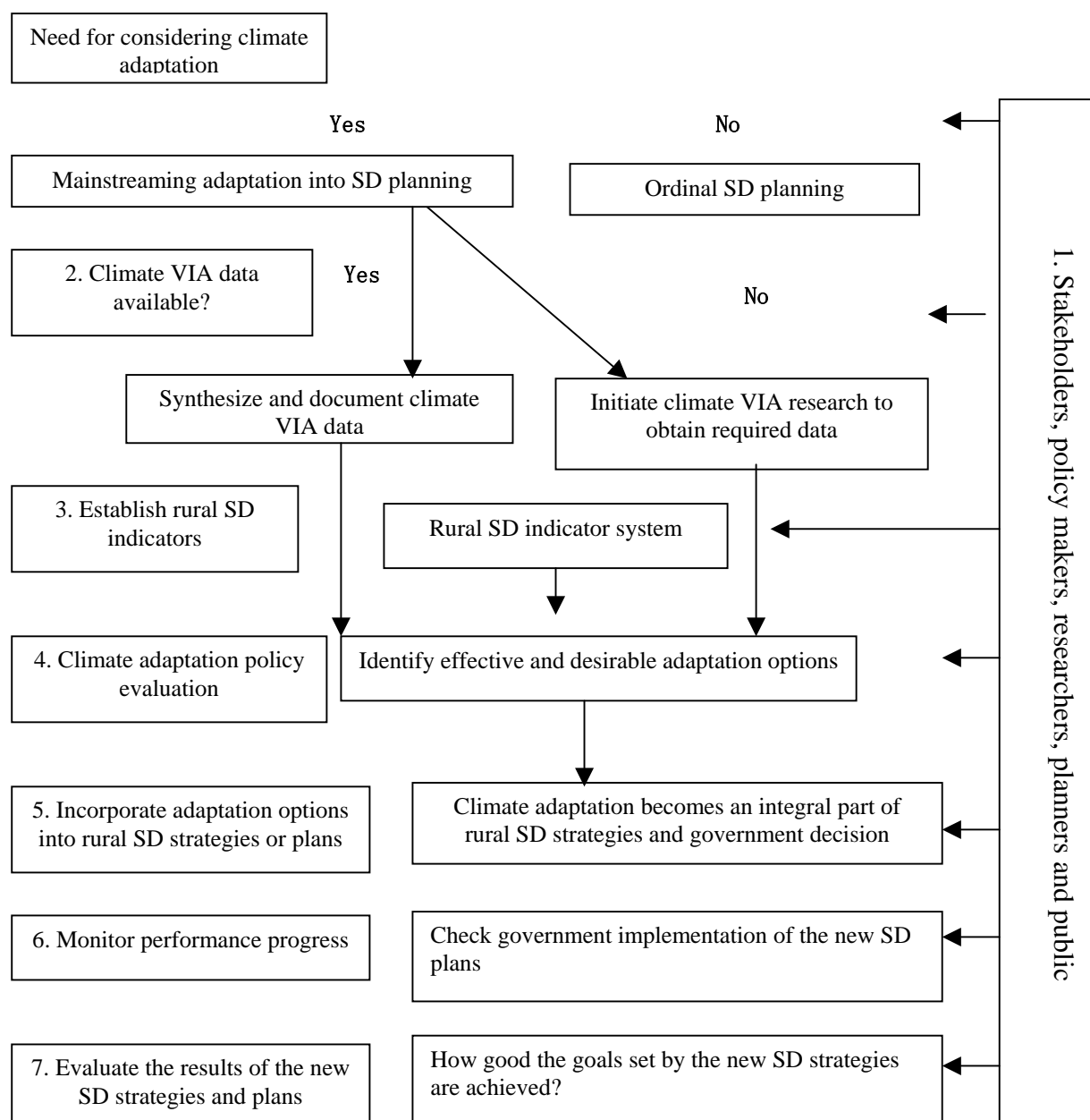
This research step is to identify sustainable wetland ecosystem management and rural livelihood goals for adaptation policy evaluation. It should be recognized that the goals and values toward wetland ecosystem management and rural sustainability have to reflect key concerns of several government agencies and the rural communities. The research procedure thus will follow with an identification and prioritization of local sustainability goals to ensure that the research approach is in line with rural communities' sustainability goals, as well as key economic sectors' ecosystem sustainability, food security, natural resource protection, poverty reduction and wellbeing improvement goals. These goals are evaluation criteria by which the social, economic, and environmental effects of alternative wetland ecosystem management practices and adaptation options to climate change can be evaluated. One major source of information used to identify wetland ecosystem sustainability and rural community livelihood goals for the proposed research will be the UN Millennium Development Goals (MDGs), government reports and documents, and other published materials.

Climate adaptation policy evaluation

This step will identify and inventory a set of wetland biodiversity adaptation options or measures to climate change in the study region. Environmental and economic impact analysis methods will be used to identify social, economic, and environmental impacts of water adaptation options. Results generated by this step will provide a base for selecting effective wetland adaptation options to reduce climate vulnerability and to enhance wetland ecosystem

sustainability. Given the large number of existing and potential wetland ecosystem adaptation practice and policy options, a primary screening process will be conducted by researchers and stakeholders to select among a list of alternative adaptation options those of more possible measures for further evaluation. The climate adaptation policy evaluation can be carried out by employing a multi-criteria decision making technique to select effective and desirable wetland ecosystem adaptation options, which can enhance ecosystem sustainability, and also more importantly to improve local poverty alleviation and rural community livelihood.

Figure 1. PIA framework for mainstreaming climate adaptation into rural sustainability plan



Incorporate adaptation options into rural SD strategies or plans

The project team will document and identify a list of effective adaptation measures in dealing with wetland system vulnerability to climate change. Key knowledge gaps that impede

effective adaptation decisions will also be identified and plans for additional collaborations of stakeholder and scientific organizations that target the identified gaps will be developed and promoted for follow-up action. Recommendations of practical adaptation for integrating into rural sustainable development plans will be presented for implementation.

Monitor performance progress

This step will engage multi-stakeholders and policy makers at different level to incorporate desirable adaptation options into wetland sustainability strategies or plans. Effective ways will be adopted to distribute risk and adaptation information among stakeholders, policy makers, practitioners and the public using effective communication methods. Climate risk communication materials will be designed, tested, and disseminated to assist adaptation options implementation. Climate risk information sheets and brochures will be distributed. The project team will also provide climate risk information in other forms such as local newspapers, TV program, and so on. Local knowledge on climate risks and adaptation options will also be included in the communication package. Workshops and training courses will be held to integrated scientific results and local knowledge on climate risks and adaptation options to promote mainstreaming wetland adaptation options to climate change in rural SD strategies. New rural community sustainability strategies or plans will be implemented in which climate adaptation in wetland conservation will be an important integral part.

Evaluate the results of the new SD strategies and plans

The last two steps will monitor and evaluate the effectiveness and usefulness of the new SD strategies imbedded with wetland adaptation options to climate change after implementation. The purpose of the monitoring and evaluation is to determine whether the new strategies: 1) follow the planned direction; 2) generate the intended benefits and/or 3) cause adverse impacts. Evaluating the new SD strategies' effectiveness in reducing climate risks from climate variation and change can provide feedback to further improve the strategies.

International Cases

General IA approach adopted by two case studies

Mainstreaming climate adaptation options into rural sustainable development strategies is a new research direction in climate change impact, vulnerability and adaptation research. There are very few (if not) real cases available internationally in this new research area. The work of mainstreaming climate adaptation and sustainable wetland ecosystem management represents a new direction in climate change adaptation research.

In this section, two international case studies that promote the integration of climate change adaptation and wetland biodiversity conservation, and water system sustainable development (SD) actions with multi-stakeholders participation are introduced. Based on experience from the two case studies, the PIA approach introduced in the preceding section can be applied in a real world context to mainstream wetland ecosystem adaptation to climate change into rural sustainability planning. The two cases are presented briefly given the limit of the space. More detailed information regarding the two cases can be obtained from the references cited.

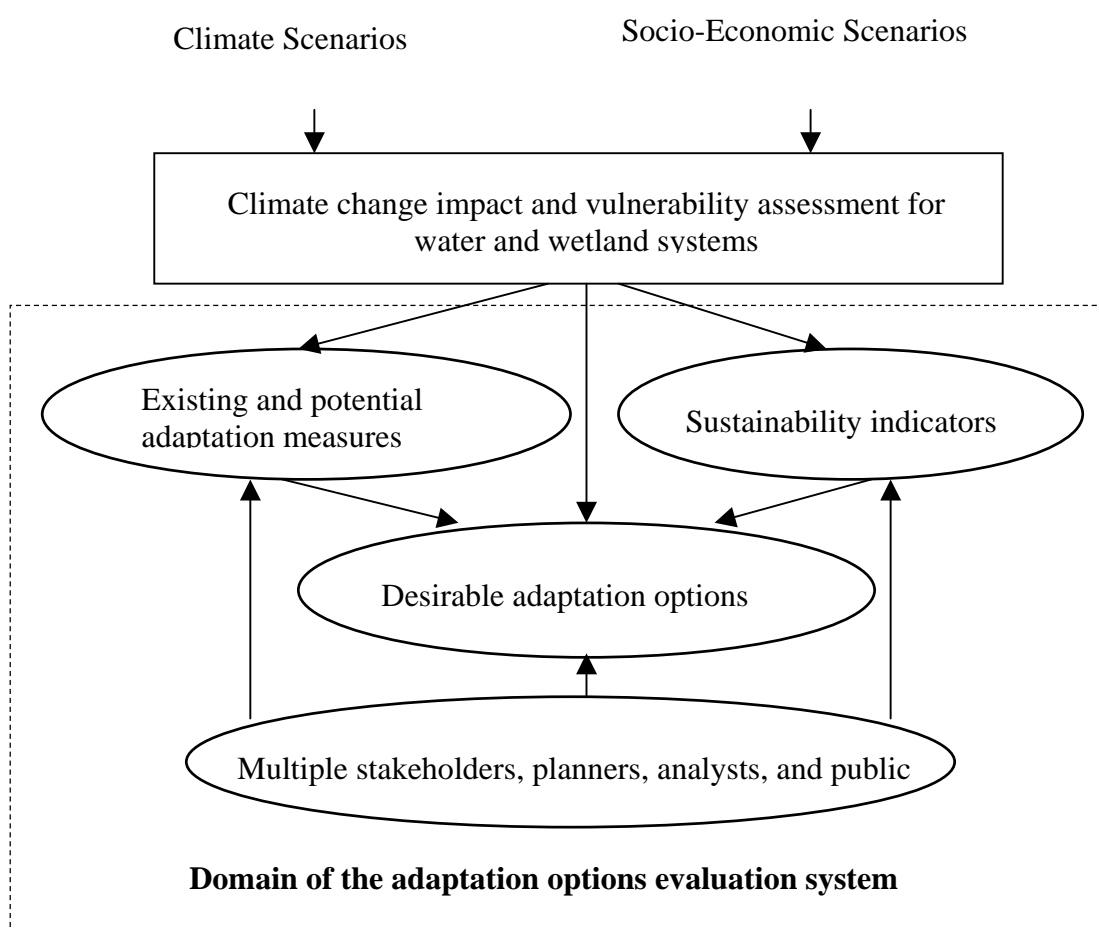
The two case studies are for two watersheds in Canada and China respectively. The study regions suffer from climate variations and may experience severer impacts of climate change on wetland ecosystem health, water shortage, climate risks, and biodiversity loss in the future. While the two regions' adaptive capacity are at quite different levels, both are facing substantial and multiple stresses, including wetland degradation, rapidly growing demands for

water, biodiversity loss, and other environmental risks that may be amplified by climate change.

Most policy makers and communities across the two study regions have limited knowledge of the current adverse effects and impacts associated with climate change in wetland ecosystem and water resource management and planning. Effects of climate change on wetland functions and water shortage may be so significant that comprehensive adaptive actions or strategies are required, involving the participation and coordination of national/federal, provincial and local authorities and other stakeholders engaged in water resource or wetland conservation planning and management.

While the two projects developed and applied different research tools or methods in climate vulnerability and adaptation assessment, their research methodologies follow a general integrated assessment (GIA) approach (Yin *et al.*, 2007a and 2007b; Mortsch *et al.*, 2006). The GIA is a research framework, which integrates climate change scenarios, socio-economic scenarios, vulnerability indicator specification, climate vulnerability identification, adaptation option evaluation, and multi-stakeholder participation. These research activities and their linkages are illustrated in Figure 2.

Figure 2. Flow-chart showing the general integrated assessment (GIA) research framework used for the two projects



The GIA provides an effective means for the synthetic assessment of climate vulnerabilities and evaluation of the general performance levels of a set of adaptation options through a multi-stakeholder decision making process. The two research projects contributed to science

on regional vulnerability assessment and adaptation evaluation. Different computer modeling and non computer-based methods were adopted to form the GIA approach. These include survey, workshops, community engagement, multi-stakeholder participation, general circulation models (GCMs), ecological simulation modeling, statistical methods, GIS, remote sensing, and multi-criteria decision-making (MCDM).

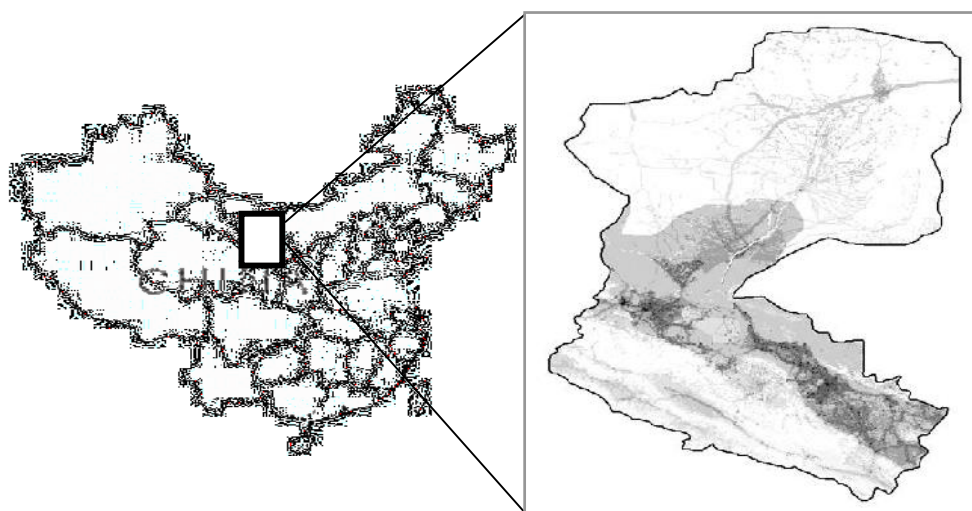
AS25 Project: Vulnerabilities and adaptation to climate change in northwest China

Research problem, objectives, and study area

The AS25 project, being carried out in northwest China with financial support from the Global Environmental Facility (GEF), is one of 24 such projects taking place in developing countries around the world under the global project “Assessments of Impacts and Adaptations to Climate Change (AIACC)” (Leary *et al.*, 2007). The purpose of this study was to provide decision-makers with the information needed to reduce resource vulnerability and to improve the adaptive capacity of the region in order to cope with climate change.

The study region is the Heihe River Basin in northwest China and the key sectors included in the research project are: water resources, agriculture, and dry land ecosystem (Figure 3). Heihe River Basin includes predominantly arid and semi-arid areas in the north and is dominated by mountains in the south. With barriers such as extremely fragile ecological conditions, fewer financial resources, poorer infrastructure, lower levels of education, and lesser access to technology and markets, the region has been suffering from climate variations and may experience severer impacts of climate change on water resources, food production, and ecosystem health. Moreover, the region’s adaptive capacity is lower than in the coastal region of China. People in the region are facing substantial and multiple stresses, including rapidly growing demands for food and water, large populations at risk to poverty, degradation of land and water quality, and other issues that may be amplified by climate change.

Figure 3. Map of the Heihe River Basin



This project addressed three major questions:

- How vulnerable is the Heihe River Basin in north western China to current and future climate stresses in some sensitive sectors?
- What can the vulnerabilities of these key sectors teach us about future vulnerability?
- What are the desirable adaptation options to deal effectively with future climate changes?

Research activities

The AS25 project examined the extent to which three key sectors in the Heihe River Basin were vulnerable to climate variations and change, and adaptation options desirable to deal with climate vulnerabilities. In particular, the study carried out the following activities:

- Developed an integrated assessment (IA) approach to identify the societal vulnerabilities to climate change scenarios.
- Applied the IA in the study region to assess current and future climate vulnerability and risks, and to identify a number of resource sustainability indicators.
- Evaluated a number of adaptation options that could be undertaken to reduce vulnerabilities associated with climate change in the study region.
- Held a series of workshops and policy surveys with participation by a broad range of public and private stakeholders, to identify sustainability indicator priorities, as well as a series of desirable adaptation policies.
- Improved the understanding and knowledge of the interactions between regional sustainability and climate change adaptation.
- Suggested a list of desirable and practical adaptation options and/or plans to effectively handle climate change risks and to ensure sustainable development.

Major scientific findings of climate vulnerability and adaptation assessment

Research on recent climate change trend in northwest China for the past 50 years and future climate change scenario development using eight coupled global atmospheric and oceanic circulation models (AOGCMs) and a nested regional climate model (RCM) is discussed in the Final Report of AS25 project (Yin, 2006). Here only findings on the assessment of climate vulnerability and adaptation policy evaluation for water system are briefly presented.

By using vulnerability indicators, the climate vulnerability of the study region under current climate conditions was investigated. The methods for the compilation of indicators, geographic allocation, and synthesis of resource system vulnerability were carried out. The application results indicate the relative vulnerability levels of ecosystem and water systems in different areas exposed to climate stimuli. Key climate vulnerabilities are described below:

- One important water vulnerability indicator is water withdrawal ratio defined as the ratio of average annual water withdrawal to water availability. The water withdrawal ratios in the Heihe River Basin under current climate conditions are extremely high (83%~ 125%), far exceeding the critical threshold levels set by both the World Meteorological Organization and the Chinese government.
- The Palmer drought severity index (PDSI) trends in growing season for lower and middle reaches of the Heihe River Basin showed that the study areas had been drier in the past decade. This trend would continue under changing climate.

- The trend of water use conflict in the study basin had been increasing in the past decade. The trend of this social indicator suggests that water shortage in the growing season becomes more and more serious because of decreased water supply and increasing population and per capita water use.
- The water shortage vulnerability in Heihe River Basin ranked from the most vulnerable to the least invulnerable for nine counties in the region. Climate change will have different impacts on water system vulnerability in nine counties of the basin.
- Resource system vulnerability was also assessed through the application of geographic information system (GIS) for mapping the indicators. It provides information on the geographical distribution of current climate vulnerability levels in different parts of the study region. Various vulnerability maps show the relative vulnerability levels of water and land resources in different areas exposed to current climate stimuli. A map of composite indicator representing the vulnerability of both agricultural and domestic water users to climate stresses in the form of long hot and dry spells was also generated to identify areas of high vulnerability in the region as a whole.
- A method was developed using NOAA's Advanced Very High Resolution Radiometer (AVHRR) to measure the Normalized Difference Vegetation Index (NDVI), which showed the density of green vegetation over the region. Results of the NDVI and ecosystem degradation map indicate that the most severely affected region is the northern part of the basin, while conditions are better in the south.
- Another sub-study dealt with climate change and arid and semi-arid ecosystem health in the Heihe River Basin. The results indicated that the ecosystem of Heihe River Basin is very vulnerable, with various vulnerability degrees in different parts of the region. The most vulnerable ecosystem is located in the lower reach of the basin with unmanaged grassland under extreme arid condition, which is extremely sensitive to climate change.
- Comparing with the year of 2000, the pressure on ecosystem in the Heihe River Basin will increase significantly in 40 years. The rate of the Human Appropriation of Net Primary Productivity (HANPP) will surpass 50% (dangerous level) even under the best social economic scenario. Moreover, in some areas of the study region, the HANPP rate will overshoot the system collapse limit.

Following a method designed by Yohe and Tol (2002), the AS25 project assessed the potential contributions of various adaptation options in improving the adaptive capacities of the water resource system. The method uses adaptive capacity determinants to evaluate alternative adaptation options.

The results of the adaptation policy evaluation indicate that the feasibility of adopting technical and engineering adaptation practices is relative low. These options include expanding sprinkle, trickle, pipeline irrigation, building reservoir in upstream and increasing exploitation groundwater. It is very difficult for farmers to obtain considerable capital support. As a result, farmers and water resource managers are reluctant to invest in these engineering works with high financial risks. On the contrary, water-saving practices such as cropping and cultivation structure adjustments are more feasible because of relatively small capital requirements.

The AS25 researchers also applied an analytic hierarchy process (AHP) method, a multi-criteria decision making (MCDM) technique, as an adaptation evaluation tool to identify the priorities of evaluation criteria and to rank desirability of alternative adaptation measures. The

results indicated that the reform of the economic structure was ranked as the most desirable adaptation option for the Heihe River Basin. The option of establishing farm-water-user society also scored fairly high. The moderate performance levels for improved water allocation policies, water permits and trade, and increased awareness and education options were due to the fact that these were relatively new measures in water resource management in the study region. The scores for installation of water-saving equipment and technologies and implementation of water price-system options were ranked near the bottom of the list by most participants (especially from an economic perspective) and were not considered to be desirable adaptation options. It appears that regional stakeholders consider these two options expensive alternatives for dealing with water shortage and farmers do not want higher water prices. The construction of water works was judged to be the most inefficient option from an economic perspective, and was ranked the lowest desirable by regional respondents.

Policy implications and future directions

Working in partnership with local, provincial and national governments and other key stakeholders (water-use professionals, farmers, and other organizations), the study identified alternative effective adaptation measures which could become practical options to deal with water vulnerabilities which would likely become more severe in the study region due to the impacts of climate change. A properly developed and implemented adaptation action plan consisting of various effective measures could have positive benefits to the well-being and productivity of all people living in the region.

These effective adaptation measures can help reduce water resource vulnerability and water use conflicts. Since water is the key determinant which influences all the economic activities and livelihood of the region, a reduction in water resource vulnerability will mitigate the impacts of climate change on the agricultural sector and protect the livelihood of farmers. Water-system sustainability can also improve ecosystem health and reduce sand storms that have created a global environmental impact. The study has generated the information for decision-makers to improve the adaptive capacity of the resource system to cope with climate risks in Heihe River Basin.

As a reasonable follow up, a pilot adaptation action project should be carried out in selected rural communities across the study region to reduce climate risks and rural poverty, and thus to improve livelihood in poor regions. Building on the AS25 project results, experience, partnership and networks, the pilot action project can strengthen efforts to establish and maintain a skilled body of expertise in the Heihe River Basin to support efforts to implement desirable climate adaptation options to cope with climate variation and change. The follow up study will be able to provide decision-makers with the information needed to improve the adaptive capacity of water resource system to cope with climate change in the Heihe River Basin of northwest China. The follow up study will implement effective adaptation measures in the region to enhance regional sustainability.

The findings from the AS25 study have indicted the potential effects of climate change on water resources, the vulnerability of water users and the options for adapting to changes. The case has identified adaptation measures considered by stakeholders to be potentially effective for reducing vulnerability of water users by increasing economic efficiency of water use, improving environmental quality, promoting equality and reducing water costs. Through public consultation activities, the stakeholders' understanding of adaptation options and their possible effects were greatly enhanced. The increased awareness among local officials will facilitate the successful implementation of alternative adaptation policies (Yin *et al.*, 2007b).

The Great Lakes case study

Research problem, objectives, and study area

The “Great Lakes Coastal Wetland Communities: Vulnerability to Climate Change and Response to Adaptation Strategies” project was conducted by Mortsch *et al.* (2006) and funded by the Climate Change Impacts and Adaptation Program (CCIAP), Natural Resources Canada.

Researchers from Environment Canada, the Department of Fisheries and Oceans, and the University of Waterloo undertook this collaborative research project. The main purposes of the study were to assess the wetlands vulnerability to climate change scenarios and to evaluate three adaptation options very briefly. The study region is composed of several selected areas in Lake Ontario, Lake Erie, and Lake St. Clair. The integrated assessment was based on several methods including literature reviews, field surveys, stakeholder engagement, and modelling. Two key questions addressed in the study were:

- What are the responses of Great Lakes coastal wetland communities (wetland vegetation and associated wetland-dependent birds and fishes) to historical and projected water level changes?
- How can human-planned adaptations to changing water levels – infrastructure (lake regulation and dykes) and land-use policy maintain ecosystem functions and values?

The rationale of this study was based on the consideration that global warming or climate change could cause significant impacts on long-term lake levels. Most scientific projections indicate that global warming would cause prolonged declines in average lake levels in the future. These lake level declines could create large-scale ecological concern for wetland ecosystem health in the Great Lakes Basin. The coastal wetlands are by far the most diverse and productive part of the Great Lakes ecosystems. Nearly all species of Great Lakes fish rely on coastal wetlands for habitats from permanent residence, to migratory pathways, to feeding, nursery grounds and spawning areas. The most common types of wetlands along the shoreline are marshes, where the vegetations can tolerate fluctuations of lake levels. Many wetlands also have species successions that are dependent upon water level fluctuations. In addition to providing habitat, coastal wetlands play other ecological functions including coastal erosion protection and water quality improvement. Projected long-term reductions in water levels could alter the current distribution and abundance of coastal wetland communities in the Great Lakes region.

Major research activities

The Great Lakes project examined the extent to which wetland ecosystems in the Great Lakes Basin were vulnerable to climate variations and change, and three adaptation options to deal with climate vulnerabilities. In particular, the study carried out the following activities:

- The study developed vulnerability indicators for measuring the current sensitivity of coastal wetland vegetation and wetland-dependent breeding birds to lake level changes, and for measuring the fish sensitivity to hydrologic and thermal changes associated with climate change.
- Ecological models and GIS were used to identify the response of wetland vegetation communities, breeding bird (abundance), and fish habitat (suitability) to water level variability associated with climate variations and changes.
- The project evaluated three adaptation options including wetland dykes, large-scale water level regulation, and coastal land-use planning changes that could be undertaken

to reduce vulnerabilities associated with climate change in wetland communities of the study region.

- The research effort also included a series of workshops and policy surveys with participation by a broad range of public and private stakeholders.

Key findings of the Great Lakes wetland study

Findings of the Canadian case study illustrated that wetland plant species with limited drought-tolerance and modes of colonization were the most vulnerable. As a result, wetland biodiversity, particularly among submerged aquatic and floating leaved plants, could suffer. In addition, obligate wetland breeding bird species with nesting and foraging preferences that require specific hydrologic conditions were identified as most vulnerable. Moreover, these high-risk bird species are already identified as at-risk species within the Great Lakes region, indicating existing stresses that may be exacerbated further by climate change.

The case study also indicated that the lower water levels projected under most climate change scenarios will have impacts on the distribution and abundance of wetland vegetation, bird, and fish communities; major shifts in all taxonomic groups are likely with long-term water level declines beginning with vegetation responses.

Based on a preliminary adaptation option evaluation of three of human adaptations to climate change, i.e., wetland dykes, large-scale water-level regulation, and coastal land-use planning, the study indicated that land-use planning and policy actions that protect the natural processes which create wetlands and maintain their ability to adapt to varying water level conditions should be a high priority. The study suggests that mechanisms be established to incorporate climate change trends and potential impacts information, such as projected changes in wetland distribution and functioning, into regional development policy and planning at various levels of government. This is particularly important since there were no example found on current land-use planning or policies within the Great Lakes region that utilizes human-directed adaptation to climate change to reduce potential impacts to Great Lakes coastal wetlands and other natural coastal areas.

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References

- CBD.** 2006. VIII/30: Biodiversity and climate change: guidance to promote synergy among activities for biodiversity conservation, mitigating or adapting to climate change and combating land degradation decisions adopted by the Conference of the Parties to the Convention on Biological Diversity at its eighth meeting, Curitiba, 20-31 March 2006. <http://www.cbd.int/doc/decisions/COP-08-dec-en.doc>
- IPCC.** 2007. The IPCC Fourth Assessment Report Climate Change 2007: Synthesis Report, Intergovernmental Panel on Climate Change. http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf

- Leary, N., J. Kulkarni and C. Seipt.** 2007. Assessment of Impacts and Adaptation to Climate Change. Final Report of the AIACC Project. The International START Secretariat, Washington, DC, USA.
- Mortsch, L., J. Ingram, A. Hebb and S. Doka (eds).** 2006. Great Lakes Coastal Wetland Communities: Vulnerability to Climate Change and Response to Adaptation Strategies. Final report submitted to the Climate Change Impacts and Adaptation Program, Natural Resources Canada. Environment Canada and the Department of Fisheries and Oceans, Toronto, Ontario.
- Secretariat of CBD.** 2007. International Day for Biological Diversity: Biodiversity and Climate Change, 22 May 2007. Secretariat of the Convention on Biological Diversity. <http://www.cbd.int/programmes/outreach/awareness/biodiv-day-2007.shtml>
- Ramsar Convention Bureau,** 2002. Wetlands: water, life, and culture, 8th Meeting of the Conference of the Contracting Parties to the Convention on Wetlands (Ramsar), Valencia, Spain, 18-26 November 2002. http://www.ramsar.org/res/key_res_viii_03_e.htm
- Reid, W. et al.** 2005. Millennium Ecosystem Assessment. Washington, DC. Island Press.
- Yin, Y.Y.** 2006. Vulnerability and Adaptation to Climate Variability and Change in Western China. The International START Secretariat, Washington, DC, USA. http://www.aiaccproject.org/Final%20Reports/Final%20Reports/FinalRept_AIACC_AS25.pdf
- Yin, Y.Y., N. Clinton, B. Luo and L.C. Song.** 2007a. Chapter 5 Resource System Vulnerability to Climate Stresses in the Heihe River Basin of western China. In: Neil Leary et al., (eds.) *Climate Change and Vulnerability*. Earthscan.
- Yin, Y.Y., Z.M. Xu and A.H. Long** 2007b. Chapter 12 Evaluation of Adaptation Options for the Heihe River Basin of China. In: Neil Leary et al., (eds.) *Climate Change and Adaptation*. Earthscan.
- Yohe, G. and R.S.J. Tol.** 2002. Indicators for social and economic coping capacity – moving toward a working definition of adaptive capacity. *Global Environmental Change*, **12**: 25–40.

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