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Inter-linkages Approach for Wetland Management: The Case of the Pantanal Wetland

This report was prepared based on the proceedings from a workshop convened by United Nations University, Institute of Advanced Studies (UNU-IAS) and the Joint United Nations University and Federal University of Mato Grosso Pantanal Regional Environmental Programme (PREP) entitled 'Pantanal Wetland: Inter-linkages Approach for Wetland Management - best practices, awareness raising and capacity building' held in Porto Cercado, Mato Grosso, Brazil, 26-30 October 2003. The workshop convened participants from academic institutions, NGOs, governments and the private sectors of the three countries involved, Brazil, Paraguay and Bolivia. A follow-up workshop was convened by PREP in March 2004.

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Abbreviations

CBD	Convention on Biological Diversity
CDM	Clean Development Mechanism
CMS	Convention on Migratory Species
COP	Conference of the Parties
GEF	Global Environment Facility
JI	Joint Implementation
JPOI	Johannesburg Plan of Implementation
LULUCF	Land use, land use change and forestry
MEA	Multilateral Environmental Agreement
MOU	Memorandum of Understanding
Ramsar Convention	Convention on Wetlands of International Importance especially as Waterfowl Habitat
UNEP	United Nations Environment Programme
UNESCO	United Nations Education, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNU	United Nations University
UNU-IAS	United Nations University Institute of Advanced Studies
PREP	Joint UNU and Federal University of Mato Grosso Pantanal Regional Environmental Programme
WHC	World Heritage Convention

Foreword

Exceptionally rich in biodiversity, the Pantanal, the largest continental wetland in the world, provides numerous environmental goods and services to the inhabitants of the region. The vital role wetlands play in supporting biodiversity and humanity, and their increasingly threatened status, is recognized by the Convention on Wetlands of International Importance especially as Waterfowl Habitat. However, wetland ecosystems, such as the Pantanal, are complex and in light of the interconnected nature of ecological systems, several other MEAs are relevant to the conservation and sustainable management of this wetland.

This policy report advocates that the management of the Pantanal wetland requires better coordination among the relevant MEAs through an Inter-linkages approach. The report draws on the conclusions of a workshop convened in 2003 in Brazil by the United Nations University Institute of Advanced Studies (UNU-IAS) and the Joint United Nations University and Federal University of Mato Grosso Pantanal Regional Environmental Programme (PREP) at which the pressing need for a regional management framework for this valuable wetland was recognised. The will for cooperative action has been demonstrated; the remaining challenge is to translate the proposed cooperation treaty into a reality. The Inter-linkages approach should be considered as a useful policy tool to create a treaty governing the management of the Pantanal wetland.

The mission of PREP is to train personnel to produce new scientific and technological knowledge with the aim of proposing public policies for the sustainable development of the Pantanal basin. PREP also aims to promote cooperation and exchange of information with institutions dealing with similar ecological regions in the world. PREP is a network of cooperating institutions; its central node is the Federal University of Mato Grosso (UFMT) in Cuiabá, Brazil where the program administration is located. The PREP is also a node within the CPP (Pantanal Research Centre), which is a network of academic institutions in Brazil.

As part of the UNU system, which serves as the think tank of the UN, UNU-IAS is charged with 'advancing the frontiers of knowledge and promoting learning for policy makers so as to meet the challenges of sustainable development'. UNU-IAS has been involved in developing and working on the Inter-linkages approach for several years as part of its Sustainable Development Governance programme. UNU-IAS places great importance on its engagement in the policy community by providing innovative policy tools in governing global environmental changes. I hope that this report contributes to a better understanding of the policy environment of the Pantanal wetland management, and paves the way for establishing a much needed regional management framework.

A H Zakri
Director, UNU-IAS
November 2004

Executive Summary

Wetlands are highly valued for the services they provide and species they support. These ecosystems, through interactions of their physical, biological and chemical components, perform many vital functions such as water storage, storm protection and flood mitigation; water purification through retention of nutrients, sediments and pollutants; and stabilization of local climate conditions, particularly rainfall and temperature. At the same time, wetlands are one of the biggest depositories of biodiversity; they are amongst the richest ecosystems on the planet. Wetlands provide crucial habitats for many species of bird, fish and other wildlife. Much of this species diversity comprises migratory species. Wetlands also play a key role, both qualitatively and quantitatively, in the supply of water for human settlements, agriculture and other economic activities. They can also provide energy resources such as peat and plant matter.

Threats to wetlands are increasing however: these ecosystems are under pressure mainly due to ongoing drainage, conversion to alternative land uses, pollution and over-exploitation of their resources. Moreover, global climate change poses great environmental threats to wetlands, since changes in climate will lead to changes in the hydrological regime, and because wetlands ecology strongly depends on the local dynamics of the hydrological cycle. Climate modification may cause some wetlands to dry up and others to increase in size, fundamentally altering their ecology, biodiversity and species composition. Migratory species, which require separate breeding and wintering habitats and stop-overs along their migration routes, are likely to be amongst the worst affected, since their long migrations contribute to their vulnerability.

Conversely, changes in the composition and distribution of vegetation in response to climate change may further impact on the global and regional climate by influencing the release and uptake of greenhouse gases. By absorbing greenhouse gases and acting as carbon sinks, wetlands may play a role in mitigating climate change, though such mitigation options in turn may have an impact on wetlands and their associated biodiversity. For example, certain afforestation schemes may reduce biodiversity and change the species composition of a wetland.

The Pantanal wetland, spread between Brazil, Bolivia and Paraguay is the largest continental wetland in the world. While in the past, traditional stakeholders managed the wetland with minimal impacts, today the Pantanal is threatened by both the intensive economic development of the region and resultant increased human population, and by global environmental changes such as climate change. The importance of this region as an ecological sanctuary has been recognized at various levels and its protection and management involves various Multilateral Environmental Agreements (MEAs). These include the Convention on Wetlands of International Importance especially as Waterfowl Habitat (hereafter Ramsar Convention), the Convention on Biological Diversity (CBD), the United Nations Framework Convention on Climate Change (UNFCCC), the UNESCO World Heritage Convention (WHC) and the Convention on Migratory Species (CMS).

The management of the Pantanal wetland requires closer coordination among the relevant MEAs, due to its complex ecological inter-linkages. So far, the development of MEAs has been largely *ad hoc*. Each MEA tends to focus on a single issue, despite the close connections and overlaps between them, such as the interrelationship between biodiversity and climate change. These complex inter-linkages present governance challenges: unless well coordinated, conflicting objectives and a duplication of efforts may prevail. A systematic approach to environmental decision making and management of the Pantanal is thus urgently needed to identify and to capitalise effectively upon the synergies that exist in the natural environment. The Inter-linkages approach offers a coordinated way to do this.

The United Nations University (UNU) has been pursuing the Inter-linkages approach for several years through a series of workshops and policy reports. The strategic concept behind Inter-linkages is that sustainable development requires an approach that promotes greater connectivity between ecosystems and societal actions. On a practical level this involves greater cohesion among institutional, environmental issue-based and development focused responses to the challenges of sustainable development.

In view of this, UNU-IAS together with PREP convened a workshop entitled "Pantanal Wetland: Inter-linkages Approach for Wetland Management – best practices, awareness raising and capacity building" in Porto Cercado, Mato Grosso, Brazil, 26-30 October 2003. The workshop recommendations, outlined later in the report, call for the integrated sustainable management of the Pantanal through the creation of an effective regional framework for managing transboundary ecosystems. The idea of developing a Pantanal Cooperation Treaty was supported by the majority of stakeholders participating in the workshop. This report builds on those discussions and key points arising from the workshop, and promotes an Inter-linkages approach for wetland management to enable the creation of such a regional framework for the management of the Pantanal wetland.

1 Introduction

The Pantanal is the world's largest freshwater wetland extending over 81,000 square miles across the borders of Brazil, Bolivia, and Paraguay. Providing a habitat to an estimated 658 species of bird, as well as over 190 species of mammal, 50 reptiles, 1,132 species of butterfly and 270 fish species, the Pantanal is one of the world's most biodiverse ecosystems.[1] It also provides a wintering ground for a large number of migratory bird species.

At the same time, the Pantanal is of enormous social and economic value in both traditional and contemporary societies. Through interactions of its physical, biological and chemical components it performs many vital functions including water storage, water purification and stabilization of local climate conditions. The wetland also plays a key role, both qualitatively and quantitatively, in the supply of water for human settlements, agriculture and other economic activities. While large parts of the Pantanal have remained pristine, today the ecosystem is under unprecedented pressure from economic development, alterations of its water courses and conversion to other land uses. Moreover, global climate change poses great environmental threats to wetlands as climate change will lead to changes in the hydrological regime and wetlands ecology strongly depends on the local dynamics of the hydrological cycle. Climate modification may cause some wetlands to dry up and increase the size of others, fundamentally altering their ecology, biodiversity and species composition.

Due to the complexity of its ecosystems, several Multilateral Environmental Agreements (MEAs) are relevant to the protection and sustainable management of the Pantanal: the Ramsar Convention on Wetlands, the Convention on Biological Diversity, the United Nations Framework Convention on Climate Change, the UNESCO World Heritage Convention and the Convention on Migratory Species.

Despite considerable ecological interdependence between the sectors addressed by each specific MEA, each of these agreements was created to address one specific sector or topic. As a result, although there may be many complementary factors among them, conflicting objectives and a duplication of efforts are often witnessed in the implementation of different MEAs. In order to identify and effectively use the synergies that exist in the natural environment, a systematic approach to environmental decision making and management is urgently needed. The Inter-linkages approach offers a coordinated way to achieve this goal.

Inter-linkages is an integrated approach to environmental decision making and management. It examines the interlinked and complex nature of environmental problems and solutions proposed, as well as the systems to implement these solutions. Its objective is to identify and effectively use the synergies that exist in the natural environment, and to *coordinate* between international environmental agreements as well as with other regimes in the three phases of international governance: negotiation, institutionalization and implementation. [2]

Because of the transboundary nature of many ecosystems and environmental problems, they are often addressed at the regional level; the Pantanal is a case in point. Regional institutions can take global environmental issues and refocus them into priorities and a manageable agenda for national governments; indeed the role of regional institutions in addressing transboundary issues has been reaffirmed in the Johannesburg Plan Of Implementation. [3] So far, however, most work on Inter-linkages has been undertaken at the global rather than regional or national levels. Recognising the importance of cooperation at the regional level between Brazil, Bolivia and Paraguay—the three countries in whose territory the wetland lies—stakeholders at the workshop convened by UNU-IAS and PREP in Brazil in October 2003 expressed their willingness to draft a treaty for the sustainable management of the Pantanal wetland.[4]

The challenge now is to translate this will into action. This report is based on the proceedings from the workshop and aims to demonstrate areas of synergy between MEAs associated with the Pantanal, and with wetlands more generally. It sets out the current ecological status of the Pantanal wetland and its ecological inter-linkages, presents the concept of Inter-linkages, and then discusses inter-linkages between the MEAs concerned. It proposes the Inter-linkages approach as a tool for drawing up a regional framework for the management of the Pantanal. It concludes with some policy implications for how synergies between relevant MEAs in the context of wetlands can be better exploited.

2 Ecological Inter-linkages and Threats to the Pantanal

Wetlands are defined under the Ramsar Convention as *"areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salty, including areas of marine water the depth of which at low tide does not exceed six metres".* [5] Wetlands are sites of exceptional biodiversity, providing crucial habitats for many native and migratory species of birds, fish and other wildlife. These ecosystems, through interactions of their physical, biological and chemical components, also perform many vital functions such as water storage, storm protection and flood mitigation; water purification through retention of nutrients, sediments and pollutants; and stabilization of local climate conditions, particularly rainfall and temperature.

The Pantanal is a wetland of high national and international importance. Economic development in the countries where the Pantanal lies, and globalization of economies, are increasingly affecting the Pantanal, both directly inside the area and indirectly through side effects from catchment area development programs. Natural stress factors, such as pronounced floods and dry periods, low nutrient levels and fire, mean that the Pantanal is a very fragile ecosystem. Its natural capital is very high; mean commercial and non-commercial values of wetland ecosystems are estimated at USD 8498 per ha per year and the Pantanal extends over about 15 million ha. [6] However the value of the Pantanal is more related to non-commercial than to commercial values(table 1 & 2).[7]

Table 1. Commercial values of the Pantanal

Aquatic	**Terrestrial**
Fish	Cattle and other domestic animals
Other aquatic animals	Terrestrial game animals
Aquatic crops	Terrestrial crops
Recreation and tourism	Recreation and tourism
Fluvial transport	Timber

Table 2. Non-commercial values and services of the Pantanal

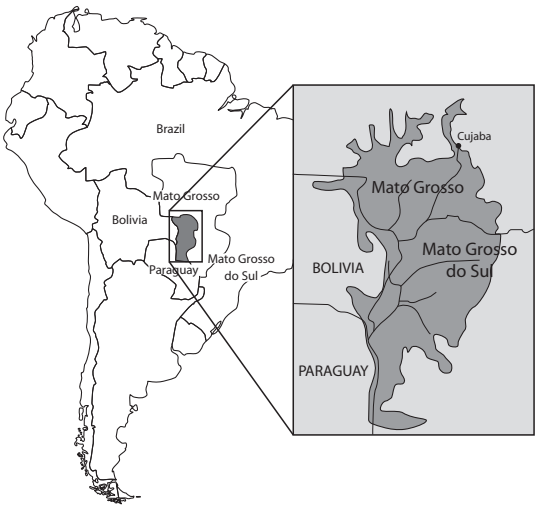
Water storage
Buffering of water level fluctuations
Water purification
Buffering of local and regional climate (temperature, air humidity)
Maintenance of biodiversity
Scenic beauty
High quality of life for local people

2.1 Ecological Characteristics of the Pantanal

The Pantanal, located in the centre of South America, is the largest continental wetland in the world. It is situated in the upper reaches of the Paraguay River, one of the main tributaries of the Paraná River. The upper Paraguay drains an area of approximately 500,000 km² distributed between Brazil, Bolivia and Paraguay. The most striking feature of the Pantanal is the annual flood regime; the Pantanal is essentially a large, gently sloping basin that receives runoff from a large upland watershed. This flood pulse is released through a single, downstream channel, the Paraguay River. [8] In the dry season, the Pantanal appears to be a flat savannah, interrupted by gallery forests, marshes, and shrub swamps. In the wet season it changes into a shallow lake. The annual flooding is caused by the lack of a sharp gradient contrast between the rivers and the floodplain. During the rainy season, the rivers in the floodplain are unable to carry the increased volume of water and flood extensive portions of the Pantanal basin. The flood pulse occurs annually but with temporal and spatial variations, and the amplitude of the flood pulse is modulated by long-term climatic events.

The human residents of the Pantanal have a distinctive life style that is largely dictated by constraints of the landscape. Natural river levees are used to grow fruit trees. During the dry season low-lying areas are used for seasonal crops and the natural grass savannas are used as pastureland for cattle. During the flood period, fishing is the most common activity and cattle usually congregate on local elevated areas. This type of traditional ranching does not interrupt ecological processes and maintains the natural landscape of the Pantanal.

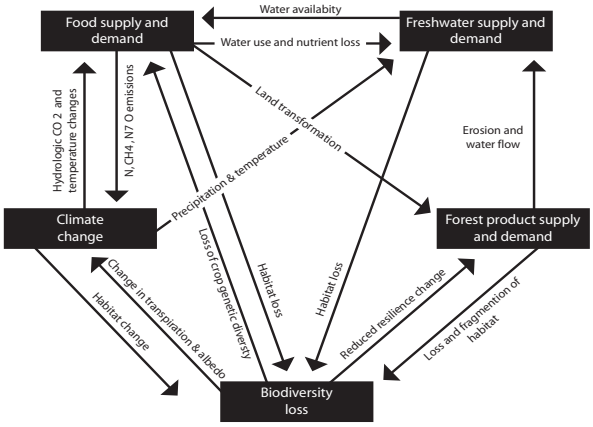
Figure 1. Location of the Pantanal wetland



2.2 Ecological Inter-linkages in the Pantanal

Wetland ecosystems are complex, and there are a number of feedback loops between different ecological sectors such as between climate change and biodiversity. These interconnections and inter-linkages at the ecological level underpin the rationale for developing inter-linkages at the policy level.

Figure 2. Inter-linkages and natural interdependence of ecological factors[9] (Source: E Ayensu *et. al.*1999)



As noted earlier, wetlands are among the most biologically diverse ecosystems on the planet, providing crucial habitats for many native and migratory species of birds, fish and other wildlife. The Pantanal supports thousands of different species, including some that are endangered, however, the available data on the biodiversity of the Pantanal are few and as yet fragmentary; a comprehensive assessment of the biodiversity of the Pantanal is required.[10] Wetlands, therefore, have a key role to play in the conservation of global biodiversity. The Pantanal is a hotspot of biodiversity and the animal fauna includes giant anteaters, armadillos, capybara, the Brazilian tapir and jaguar.[11] The wetland is also a refuge for many endangered species, such as the howler and capuchin monkeys, caiman, giant black eagle, and deer of the Pantanal.[12] The Pantanal provides an essential habitat for part of the migratory cycle of many species, in particular birds and fish. For example, it provides a wintering ground for many migratory species of bird, some of which are endangered, that summer in North America.

Maintenance of wetlands in their current state, and thus the goods and services they provide and the species they support, is crucially linked to averting serious changes in land use and climate change. Changes in climate affect the boundaries, composition and functioning of ecological systems, and changes in the structure of vegetation, particularly forests, affect the Earth's system through changes in biogeochemical cycles, particularly of carbon and nitrogen. Thus attention to one ecological aspect of the Pantanal cannot be considered without taking into account the impacts of changes in other ecological sectors, and vice versa.

2.3 Threats to the Pantanal

The key threats facing the Pantanal are both global and local. According to a conservation assessment by the World Wildlife Fund and the Biodiversity Support Program, the Pantanal is "globally outstanding" in terms of biological distinctiveness, "vulnerable" in terms of conservation, and has "highest priority" for conservation action in the region. [13] The hydrological cycle is the driving variable for wetlands, and it may be altered locally by water deviation and both globally and locally by climate change.[14] Observed changes in climate, including increased land and ocean temperatures, changes in precipitation and rises in sea level, have already affected biodiversity and will place additional pressure on many ecosystems.[15] It is estimated that a warming of 3–4°C could eliminate 85% of all remaining wetlands.[16] One of the most pronounced effects on wetlands by climate change is through alterations in hydrological regimes; specifically the nature and variability of the hydroperiod and the number and severity of extreme events.[17] This may lead to drying up of some wetlands and increasing the size of others, fundamentally altering their ecology, biodiversity and species composition and potential for supplying economic benefits. For example, fish migrations will be affected by both temperature and flow patterns. The most apparent faunal changes may occur in migratory or nomadic bird species that use networks of wetland habitats across or within continents because changes in habitats may disrupt migration patterns. Climate change will also significantly impact on wetlands' critical function of global biogeochemical cycling, such as the cycling of carbon, sulphur and nitrogen.[18] Net primary production, respiration and decomposition rates will also be affected by climate change change.

The impact of major climatic events on wetlands is larger than on most other ecosystems. Slight changes in precipitation that lead to only a small change in the water level of large lakes strongly affect wetland hydrology, and extreme flood events affect populations and community structure.[19] Lack of rainfall during the low water period negatively affects the growth of terrestrial vegetation and favours wild fires that modify plant communities and reduce populations of terrestrial animals. In the Pantanal, wild fires during extremely dry periods have been shown to destroy communities of flood adapted trees like *Vochysia divergens*, which are nesting sites of aquatic birds, and to kill swamp deer, capybara and other animals.[20]

Terrestrial ecosystems store the majority of their carbon in the soil as organic matter which may be released when the soil is disturbed, for example due to the drainage and destruction of wetlands. As wetlands are important reservoirs of carbon, comprising approximately 15% of the terrestrial biosphere carbon pools, the release, maintenance or enhancement of these stores under a changing climate will in turn potentially affect future climate change.[21] The terrestrial biosphere, which is at present a carbon sink, is projected to become a carbon source by the 22nd century. The wetland carbon sink may also be affected, although the direction of the effect is uncertain due to the number of climate-related contributing factors and the range of possible responses.[22] Wetlands could become a source for greenhouse gases, either directly due to projected changes in climate or indirectly due to changes in their disturbance regimes. Wetlands are also natural sources of greenhouse gases such as methane and sulphur dioxide.[23]

The ecological inter-linkage between climate change and the wetlands is complex, however, for wetlands also influence local (and potentially global) climatic conditions though their capacity to store carbon and their ability to stabilize local rainfall and temperature.[24] Wetlands may also play a role in mitigation efforts to reduce climate change. Any major change in the hydrology and vegetative community of a wetland has the potential to affect the carbon sink. Past and present land use and land cover change are the main factors that affect terrestrial sources and sinks of carbon and land use and land use changes account for about 1.6 gigatonnes (17%) of the annual emissions of carbon released into the atmosphere from human activities.[25] Thus land use and land use change have the potential to offset emissions and can play a key role in mitigation options under the Kyoto Protocol and Marrakesh Accords, for example by reducing land based emissions through the conservation of existing carbon pools or sequestration of carbon into the terrestrial biosphere.[26] Such mitigation efforts may have positive or negative impacts on wetlands and changes in wetlands themselves may also affect local and regional climate.

As temperatures rise, species will migrate towards higher latitudes and altitudes in both hemispheres, and the species composition and functioning of plants, particularly the efficiency with which they use water. The result may be large changes in the distribution, composition and abundance of major biomes. If the climate changes rapidly, as projected, mismatches may occur between the new climatic conditions and plants that have adapted to the current conditions over the course of centuries. Even in areas where the type of ecosystem does not change there may be modifications to species distribution and losses in biodiversity at the species level.[27]

Rapid rates of climate change are also likely to increase rates of habitat loss and species extinction. In particular, migratory species, which require separate breeding and wintering habitats, as well as stopovers along their migration routes, are likely to be affected. Significant effects of climate change on migratory species of several taxa have been demonstrated, underscoring the importance of coordination between initiatives and research to address climate change and biodiversity, particularly of migratory species. In general, climate change poses additional stress to ecosystems and species affected by habitat fragmentation. A fragmented habitat poses a barrier to migration and thus to adaptation by moving to other areas, which may, in turn, lead to low genetic diversity and increased vulnerability.

While climate change will undoubtedly have an impact on wetlands, the extent of its impacts remains contentious and further research in this area is needed.[28] It has been argued that in the coming decades impending changes in human population and economic development will affect wetlands to a much larger degree than changes in climate.[29] Moreover, it has been predicted that by the year 2100 land use change will have the largest global impact on biodiversity, followed by climate change. Human induced changes in biodiversity alter ecosystem processes and affect the resilience of ecosystems to environmental change. This will have profound effects on ecosystem services used by humans. Species diversity has functional consequences because the number and kinds of species present determine the organismal traits that influence ecosystem processes. Species traits may mediate energy and material fluxes directly or may alter abiotic conditions, such as climate, which regulate process rates. In addition to its effects on the current functioning of ecosystems, species diversity influences the resilience and resistance of ecosystems to environmental change.[30] However, extreme climatic events will multiply the negative impacts of human induced changes.[31]

Although the large size of the floodplain and its remoteness have kept a good part of the Pantanal's ecological integrity intact despite nearly 250 years of low intensive agricultural use, recent intensive economic developments in the Pantanal catchment area have caused concern. These are mostly intensive agricultural developments and other changes in land use practices in the catchment area and on the floodplain itself which, amongst other things, reduce habitats available and migration corridors for many animal species.[32] At the local level, several major development projects have been initiated with the aim of increasing the contribution of the Pantanal and its catchment area to the national economy. This economic development and consequent population increase pose a new threat to the Pantanal due to their negative environmental consequences. Since 1974, the

Brazilian government—two thirds of the Pantanal lies in Brazil—has initiated several major development projects in the Pantanal, such as the Program for the Development of the Pantanal (PRODEPAN), the Program for the Development of the Cerrados (POLOCENTRO), and the National Alcohol Program (PROÁLCOOL), the aim of which was to encourage the use of ethanol as a fuel substitute for gasoline and to increase ethanol production for industrial uses. Infrastructure has been improved through the construction of roads and electricity lines, and large agri-industrial projects have stimulated cattle ranching and plantations of soybean and sugarcane. The resultant pollution of water and soil from farm chemicals and mercury, as well as increasing industrial pollution from urban centres, has become a problem.

In response to, and as a result of this economic development, human population increased markedly in the states of Mato Grosso and Mato Grosso do Sul, accompanied by a shift towards urbanisation. Rapid urban growth in centres such as Cuiabá have had a great impact on the area. These developments led to a change in the make up of stakeholders in the Pantanal and the few existing studies on the social use of biodiversity show that landscape units are used differently by the traditional stakeholders who are familiar with the conditions of the Pantanal, while new landowners from outside the Pantanal frequently apply non-sustainable practices.[33] Traditionally, stakeholders in the region were ranchers, state and federal governmental agencies, and Indian nations. Prior to the 1970s, the traditional stakeholders had limited impact on the resources they used and did not have the means to induce major environmental changes, such as altering the flood pulse by building dams or changing water quality by increasing the sediment load in rivers. As economic development proceeded rapidly however, new stakeholders emerged along with the industrialization such as agriculture, modern cattle ranching, transport industry, hydroelectric energy production and mining. The Pantanal's distinctive ecosystem is also increasingly under threat from tourism and overfishing.[34] Other new stakeholders included non-profit local and international environmental organizations.

The activities of these new stakeholders have impacted on the watershed on a large scale. The implementation of industrialized soybean, corn, sugar cane and cotton monoculture transformed millions of square kilometers of savannah land into open fields. Riparian forests along rivers have been cut down or degraded which has led to increased erosion and sedimentation, and disruption of the local hydrologic pattern as witnessed in the Taquari and São Lourenço rivers. This has made navigation difficult and also hindered waterfowl and fish migration. Local cattle raising in the Pantanal has suffered productivity losses due to competition from highland cattle breeding where pastures may be used all year round.

Moreover, several large transportation infrastructure projects were initiated to move commodities to large metropolitan areas and seaports: these included three waterway or hidrovia projects—the Araguaia-Tocantins, Madeira-Amazonas, and Paraguay-Paraná Hidrovia—and the Ferronorte railway. The Paraguay-Paraná Hidrovia, a large-scale fluvial transport project involving Brazil, Paraguay, Bolivia, Uruguay and Argentina, is of particular concern for the sustainable management of the Pantanal. The goal of this project is to improve river transportation to accommodate more barge traffic through dredging, channel modification, and port installation. Depending on how it is implemented, this project could potentially modify various key ecological processes in the Pantanal, including the flood pulse.[35] The Hidrovia, if fully constructed, would reduce the area flooded in the Pantanal.[36]

A large hydro-electrical facility was recently constructed on the Manso River, a principal tributary of the Cuiabá River, in pursuit of promoting electricity production under an initiative by the Brazilian federal and states governments. In addition to hydroelectric production, the project aims to regulate seasonal flooding. A lower and shorter flood peak in the Cuiabá River, however, could have profound ecological impacts in the northern Pantanal. Current navigation traffic on the Paraguay River has already damaged levees and riparian vegetation.[37] Such developments associated with economic development in the Pantanal catchment area will seriously impact the ecosystem and negatively affect the livelihoods of traditional stakeholders, such as indigenous and fishing communities that depend on the water resources and on the flood pulse to sustain their life style.

3 Inter-linkages Approach for Wetland Management

In light of the ecological inter-linkages in this wetland ecosystem, an integrated and holistic approach at the regional level is needed to provide an effective framework for management of the Pantanal and similar wetlands. For example, when examining conservation measures, the impacts on biodiversity need to be taken into account as do the potential impacts on climate change. In other words, the environmental, economic, and social impacts of activities of stakeholders in the Pantanal should be considered in managing the wetlands. The Inter-linkages approach provides a way to do this conceptually and practically.

Over the past three decades we have witnessed the creation of a plethora of MEAs to address a range of environmental challenges. More than 200 MEAs and numerous international organisations have been created since the 1972 United Nations Conference on the Human Environment to deal with a range of environmental challenges. The growing number of such agreements, however, has not been matched by progress towards the goals of sustainable environmental management on the ground.

One of the key criticisms of the current environmental governance system stems from the fact that the global environmental institutions developed unsystematically and are mostly issue-based, resulting in a disconnect between the interrelated reality of ecosystems and the piecemeal nature of environmental institutions. Moreover, the existing national architecture for executing MEAs is generally disjointed. As the number of MEA ratifications by a government increases, the work is divided by the domestic authorities among relevant ministries and departments, further increasing fragmentation of implementation at the national level. The consequence is coordination and communication problems, conflicting institutional roles and often, a duplication of labour. Such *ad hoc* developments have led to fragmentation—both horizontal and vertical—and a lack of coherence that has reduced institutional performance to deal with ever worsening environmental problems.

As the worsening state of the global environment and lack of progress towards the goals of sustainable development testify, a systematic approach to environmental decision making and management is urgently needed to identify and effectively use the synergies that exist in the natural environment, and to coordinate among MEAs in the three phases of international governance—negotiation, institutionalisation and implementation. It is suggested that improving interlinkages between institutions and promoting greater connectivity between ecosystems and societal action will reduce overlap and conflicts, capitalise on inherent synergies, and generally create more effective environmental laws.[38] The Inter-linkages approach offers a coordinated way to do this.

3.1 Evolution of the Inter-linkages Approach

During the nineties, inter-linkages began developing between environmental treaties, for several different reasons. First, science firmly established the complexities and interconnectivity of issues such as climate change, biodiversity, soil degradation and water issues. In addition, the publication of the 1987 Brundtland Report, commissioned by the World Commission on Environment and Development, which developed guiding principles for sustainable development, established the connection between environmental issues and socio-economic concerns in the public consciousness and reversed the conceptual trend of approaching 'environment' and 'development' issues separately. The adoption of an integrated approach under the broader principle of 'sustainable development' was endorsed at the United Nations Conference on Environment and Development in 1992.

As the complexities and interconnectivity of environmental issues was increasingly appreciated, in 1997 a group of practitioners and policy science experts convened the first workshop to address synergies between agreements developed as a result of the Earth Summit process—Framework Convention on Climate Change (FCCC), Convention on Biological Diversity (CBD), Framework Convention on Desertification and the Forestry Principles.[39] In the following year, a collaboration of other scientists under a joint project of the World Bank, United Nations Environment Programme (UNEP), and National Aeronautics and Space Association (NASA) looked at the primary scientific connections between some of the key environmental and development issues.[40] These initiatives culminated in the first international conference on Interlinkages convened by the UNU and UNEP in 1999. This event triggered a series of activities in the field of policy-making that attempted to rationalise and manage the complexities of MEAs. These activities occurred mainly in the context of UN reforms, preparations for the 2002 World Summit on Sustainable Development 2002 and UNEP's International Environmental Governance process.[41]

UNU has been pursuing the Inter-linkages approach for several years through a series of workshops and policy reports. The 1999 report "Inter-Linkages: Synergies and Coordination between Multilateral Environmental Agreements" identified five key areas of the current system of environmental management in which synergies can be identified and exploited: scientific mechanisms, finance, issue management, information harmonization and institutions.

3.2 Understanding the Inter-linkages Approach

Inter-linkages is a strategic approach to managing sustainable development that seeks to promote greater connectivity between ecosystems and societal actions. In practice, this means translating this natural connectivity into a greater degree of cohesiveness among institutional, environmental issue-based and development focused responses, as well as the range of international, regional and national mechanisms that share this challenge. The Inter-linkages approach is comprised of two fundamental elements: synergism and coordination. It is believed that a synergistic approach to sustainable development will lead to more effective and resource efficient assessment, negotiation, decision making, planning and implementation of policies. Similarly, improved coordination at the international, regional and national levels and between institutions will minimise inadvertent conflicts between environmental policies and measures, and between different international regimes.[42]

Potential Benefits of the Inter-linkages Approach[43]

- More effective MEAs
- Robustness
- Improved compliance and meeting treaty's objectives
- Strengthened implementation of MEAs (supporting provisions) and also local, regional and global nexus
- Cost-effectiveness
- Procedural and management burden-relief
- Prioritised and mainstreamed MEAs with national development strategies
- Greater opportunities for financing
- Strengthening of international law

Synergies can be conceptualised as the point of convergence between environmental sciences and environmental politics. They arise when scientifically identified environmental inter-linkages, such as those between biodiversity and climate change, are accommodated within the policy–making process; policies are formulated to prescribe actions which meet objectives in two or more environmental issue areas.[44] For example, under the UNFCCC, carbon sequestration activities which aim to mitigate climate change must also contribute to the conservation of biodiversity and the sustainable use of natural resources. Synergies may also exist between institutions. Institutions that share a common practical connection may be linked to produce greater or more efficient outcomes. In the context of the Pantanal, the CBD and Ramsar Convention work closely together in the shared aim of conserving biodiversity.

Coordination relates to the need to minimise inadvertent conflicts between environmental policies and between different international regimes, such as the trade and climate change regimes, or between institutions at different scales, such as global and national institutions. In the development of MEAs, coordination is crucial to prevent the adoption of inconsistent policies that, when implemented, may prove contradictory.[45] Due to the inter-linkages between natural ecosystems, care must be taken that the environmental outcomes that arise from the implementation of one agreement do not hinder the intended outcomes in the implementation of another.

This definition of Inter-linkages and its constituent components of synergism and coordination makes two basic assumptions about the current state of MEAs. Firstly, it assumes that these institutions have not reached their full and effective performance potential because of their intrinsic design. Secondly, the theory assumes that the current international legislative environment is not conducive to the development of coordinated or synergistic approaches to collectively solving environmental problems. The complexities of the issues involved and the nature of treaty-making mean that international agreements are often negotiated in relative isolation.[46]

Based on these assumptions, the Inter-linkages theory postulates that in order to maximise their efficiency, environmental agreements must reflect the complexity and interrelatedness of ecosystems in their management of the environment through better coordination between institutions and agreements. The theory hypothesises that reflecting the relationship between given environmental elements, and the appropriate policy interventions in the MEA would create greater efficiency gains and effectiveness. Such gains may be manifested in policies, treaty making and in the organisations responsible for environmental management.[47]

The principle of subsidiarity calls for decisions to be taken at the level appropriate to the problems they address. Many ecosystems are best defined, understood and protected at the regional or local level, rather than the global level; the JPOI has reaffirmed the importance of engaging and strengthening regional and subregional institutions to implement sustainable development commitments.[48] A good example of this is the Mekong River Commission for Sustainable Development which has established a framework for cooperation between governments in the region for joint management of the Mekong's water and natural resources.[49] In this way, regional institutions may provide a platform for cooperation, and serve as a bridge between the global and the national, as both regional and national levels usually demand the adoption of policy decisions that comply with global arrangements, but that also account for regional/national specificities and needs. Regional arrangements might also be better positioned to identify overlapping and potentially conflicting goals

and policies among different issue areas and across policy levels of decision making. The legitimacy and sense of identity embedded in many of these institutions provides them with an unparalleled capacity to convey authority and establish policy trends to promote the formation of a regional consensus.[50] Due to the transboundary nature of the Pantanal ecosystem, the focus in this report is on inter-linkages between MEAs, implemented at a regional i.e. tri-national level.

The Inter-linkages approach is designed with the aim of making MEAs meet their objectives, providing greater consistency and coherence between MEAs—standardized interpretation, definitions and indicators—and solving related problems outside and inside MEAs mandates. Inter-linkages can also enable MEAs to meet forgotten supporting provisions, which include non-binding techniques for the achievement of the treaty's objectives, capacity building programmes, financial assistance clauses and technology transfer provisions.[51] These supporting provisions, common to all MEAs, may be better achieved through joint programmes. This approach can lead to improved architecture for MEA focal point coordination at the national level and better scientific coordination at an international level.[52]

High levels of financing are often in short supply in environmental agreements. The Inter-linkages approach can produce financial benefits through coordination of funding mechanisms of relevant MEAs. Such coordination could increase cost effectiveness and reduce waste, thereby making existing funding stretch further. The Global Environment Facility (GEF) which serves as the financial mechanism for four MEAs—CBD, UNFCCC, United Nations Convention to Combat Desertification and the Stockholm Convention on Persistent Organic Pollutants—is a good example of the application of Inter-linkages. Another way in which the Inter-linkages approach can work is through incremental schemes whereby the "financial mechanism of one MEA could, for example, fund the incremental cost of upgrading the project or activities funded by the financial mechanism of another MEA to ensure that the objectives of both regimes are met".[53]

Another important aspect of potential synergies between MEAs lies in the harmonisation of methodologies, procedures and formats for the information gathering and analysis required of the Parties to MEAs. Harmonisation of information and institutions could help to alleviate the multiple burdens placed on national authorities, the implementing architecture of which is generally disjointed. The idea behind the procedural streamlining is that much of the information gathered in reporting activities shares basic commonalties, but is collected and recollected by different domestic departments, ministries or national centres. By creating systems that could centralise the collection and data storage and then harmonize reporting formats, the procedural burden could be substantially alleviated. Joint programmes between institutions are a useful way to improve inter-linkages between MEAs, for example, joint capacity building programmes could be created at the national level. According to a survey undertaken by the GEF on capacity development for sustainable development, countries overwhelmingly ranked elements such as education, awareness, training and technology transfer among the highest needs for implementing MEAs.[54]

As illustrated above, the Inter-linkages approach can be used to foster effective environmental management through the development of better-integrated management mechanisms based on synergies that exist in the environment.[55] In managing an ecosystem as complex as the Pantanal, the development of a regional management framework and the coordination amongst five key MEAs at a regional and national level is a matter of urgency. The management of this vast wetland provides an opportune example of where the Inter-linkages approach can be implemented.

4 Inter-linkages between the Ramsar Convention on Wetlands and other MEAs in the Pantanal

Five MEAs are important in the sustainable management of the Pantanal wetland, namely the Ramsar Convention on Wetlands, Convention on Biological Diversity, United Nations Framework Convention on Climate Change, UNESCO World Heritage Convention and the Convention on Migratory Species. The broad objectives of these five conventions are mutually compatible and there is scope for close cooperation between these agreements.

The Pantanal is primarily protected under the Ramsar Convention on Wetlands. The Ramsar Convention, which dates from 1971, was established to deal with the conservation and sustainable use of wetlands. It is the only environmental convention established to address one particular ecosystem, and initially gave special attention to the ecological requirements of migrating birds which depend on an entire network of wetlands for nesting, migration and wintering periods. At the time of writing, there were formally 141 Contracting Parties upon accession, and each Contracting Party must designate at least one Wetland of International Importance (Ramsar site). There are currently 1387 Wetlands of International Importance in the list which represents the largest global protected areas network totalling 122.7 million hectares.[56]

The convention is based on three pillars: the list of Wetlands of International Importance, international co-operation and the wise (sustainable) use of all wetlands. International cooperation is an integral part of the Ramsar Convention as articulated in Article 5, *"The Contracting Parties shall consult with each other about implementing obligations arising from the Convention especially in the case of a wetland extending over the territories of more than one Contracting Party or where a water system is shared by Contracting Parties. They shall at the same time endeavour to coordinate and support present and future policies and regulations concerning the conservation of wetlands and their flora and fauna."* The Ramsar Convention has identified three objectives in order to implement good global governance:

- Clarifying common areas of interest/overlap
- Simplifying and harmonising approaches and guidance to Parties
- Enhancing collaboration on implementation at national and global levels

In order to seek inter-convention synergies, the Ramsar Convention has signed Memoranda of Cooperation/Memoranda of Understanding and developed Joint Work Plans and programmes of work with all other MEAs whose mandate extends to the Pantanal.

4.1 Inter-linkages with the Convention on Biological Diversity

One of the key agreements adopted at the Rio Earth Summit in 1992 was the Convention on Biological Diversity (CBD). The CBD has three main goals: conservation of biological diversity, sustainable use of its components, and fair and equitable sharing of the benefits of use of genetic resources.[57] Governments that have ratified the CBD are required to develop national biodiversity strategies and action plans. At the World Summit on Sustainable Development (WSSD) in 2002, Parties endorsed the 2010 biodiversity target, which aims to achieve a significant reduction in the rate of biodiversity loss by 2010. Since wetlands support large amounts of biodiversity, their conservation falls under the mandate of the CBD. The ecosystem approach to biodiversity conservation advocated by the CBD, which is a strategy for the integrated management of land, water and living resources to promote conservation and sustainable use in an equitable way, further underpins this link.

Among others, the shared aim of conserving biodiversity has led the Ramsar Convention to establish close links with the CBD. The Ramsar Convention has been the lead implementation partner on Inland Waters for the CBD since the third Conference of the Parties (COP3) of the CBD in 1996 and a series of Joint Work Plans have been developed, first in 1998-1999 focusing on inland waters. A second Joint Work Plan 2000-2001 encompassed all ecosystem themes and cross-cutting areas, and a third Joint Work Plan for 2002-2006 will deal with all ecosystem themes and cross-cutting areas adopted for CBD COP6 (2002) and Ramsar COP8 (2002). These themes include, inter alia,

- All ecosystem themes (inland waters, marine & coastal, forests, agriculture, drylands, mountains)
- Cross-cutting issues (e.g. invasive species, monitoring and indicators, inventory and assessment, communication, education and public awareness (CEPA), traditional knowledge, protected areas, incentives)
- Joint cooperation with other conventions
- National reporting and streamlining reporting—drawing on UNEP national pilot projects

Further examples of enhanced cooperation between Ramsar and the CBD relate to information sharing, for example CBD COP6 guidelines on impact assessment were adopted by Ramsar COP8 with annotations for Ramsar context. In addition, technical guidelines have been jointly developed by both conventions such as guidelines on rapid assessment methodologies for inland waters and coastal/marine ecosystems. CBD and Ramsar also carried out a joint review and elaboration of CBD inland waters programme of work for CBD

COP7 (2004). Information sharing has been further enhanced by increased participation in the joint technical working groups.

So far, the two Conventions have made available their guidance to respective Parties by adopting each other's guidance for common national implementation. Cooperation on this front is moving forward and entering a new phase; they are jointly developing new initiatives, technical guidance and programme implementation, so as to produce simplified and consistent guidance on national implementation of both Conventions. Such developments can increase the efficiency with which commitments under the Conventions are implemented and reduce the burden on national authorities.

4.2 Inter-linkages with the United Nations Framework Convention on Climate Change

UNFCCC aims to stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. The 1999 Kyoto Protocol to the UNFCCC established targets and timetables for industrialised countries to reduce or limit their emissions which will enter into force shortly, following Russia's recent ratification.

Climate change has been observed to affect ecosystems and their biodiversity. Addressing climate change requires a two pronged approach: mitigation and adaptation. Mitigation involves actions to reduce greenhouse gas emissions and thus stabilise climate change. Examples of mitigation activities include switching to renewable energy sources and expanding forests and other "sinks" to remove greater amounts of carbon dioxide from the atmosphere. Adaptation describes actions taken to help communities and ecosystems cope with changing climate conditions. Since mitigation options alone are not adequate to avoid the impacts of climate change on wetlands, adaptation activities specifically designed to reduce the impact of climate change on ecosystems must also be considered.

The changing climate and efforts to address this issue will have varying impacts on biodiversity. For instance, habitat destruction as a result of climate change would have a direct impact on biodiversity, changing species composition and likely leading to a reduction in biodiversity. Indirect impacts on biodiversity could occur through the introduction of new species, which may change the competitive dynamics in a given habitat. The survival of many wetlands in their current state, and the species they support, is thus closely linked to averting serious climate change. Yet at the same time wetlands may potentially play a key role in climate change mitigation. Current efforts to conserve biodiversity and use ecosystems sustainably can affect the rate and magnitude of projected climate change. It is therefore imperative to take into account the impact of climate change on conservation planning and vice versa.[58]

As it stands, several articles of the UNFCCC are relevant to wetlands. First, the inclusion of land use, land-use change and forestry (LULUCF) activities as a mitigation option.[59] This is limited to afforestation, reforestation and deforestation. Although there is no explicit mention of human activities related to wetlands it does not directly exclude it. Second, the Kyoto Protocol does not set emissions limits for developing countries, but it includes two flexibility mechanisms—the Clean Development Mechanism (CDM) and Joint Implementation (JI)—to achieve greenhouse gas emissions reductions in an efficient and economical way. CDM allows industrialized countries to pay for projects that cut or avoid emissions in developing nations and in return are awarded credits that can be applied to meeting their own emissions targets. The JI programme, although not applicable to the example of the Pantanal, allows industrialized countries to meet part of their required cuts in greenhouse-gas emissions by paying for projects that reduce emissions in other industrialized countries.

Both these mechanisms, CDM and JI[60] , include carbon sequestration project activities. The CDM strategic provisions in LULUCF and CDM guidelines state that: *"LULUCF activities must contribute to the conservation of biodiversity and the sustainable use of natural resources."*[61] In addition, the guidelines note that: *"In the course of 'sinks' related activities under CDM and JI, their impacts on biodiversity and natural ecosystems as well as its socio-economic and environmental impacts need to be taken into account".*[62] Additionally, Article 4.9, of the UNFCCC calls on Parties to take full account of the specific needs and special situations of the least developed countries, including those that possess wetlands, in their actions with regard to funding and transfer of technology.

In light of this, the Ramsar Convention has developed a close working relationship with the UNFCCC. As one example, the Ramsar COP8 (2002) adopted a resolution on climate change and wetlands, which had three goals:

- Providing a basis for focusing on key cross-cutting issues for future common action
- Underlining Ramsar Parties' commitments to conservation, sustainable use, and management of inland and coastal wetland
- Providing existing mechanisms for climate change adaptation and mitigation action

Reforestation is a mitigation option under the UNFCCC; however, it has potential to conflict with the requirements of the Ramsar Convention – particularly if reforestation occurs over existing wetlands. Ramsar COP8 recognised this potential for conflict and agreed to ensure that mitigation of climate change focuses on revegetation and forest management, and that afforestation and revegetation do not conflict with commitments to conservation and sustainable use of wetlands.

In recognition of the fact that climate change may substantially affect the ecological character of wetlands and their sustainable use, COP8 Resolution VIII.3 calls on Parties to:

- Manage wetlands to increase resilience to climate change and extreme climatic events
- Promote restoration & management of peatlands and other wetlands which sequester carbon or are significant carbon stores
- Research the role of wetlands in carbon storage, sequestration, and sea-level rise mitigation
- Give special attention to strengthening institutional capacities, and synergies to address climate change and wetland linkages

4.3 Inter-linkages with the Convention on Migratory Species

The Convention on Migratory species (CMS) promotes and maintains the local and global conservation of migratory species as well as the preservation of habitats and migration routes such as the Pantanal. International efforts aimed at the conservation of migratory species are based on the fact that migratory species form part of the natural heritage shared among countries; they are part of our genetic resources and part of a complex relationship between endemic plants and other unknown species which are indicators of ecological change. Long migrations may make migratory species vulnerable and necessitate joint actions between countries for their conservation. Migration also implies biological dependence between migratory species and natural space, as well as such threats caused by human activities as habitat decrease, fragmentation, wholesale hunting, and illegal trafficking.

Amongst its rich biodiversity, the Pantanal supports many migratory species. The region is an important migratory bird stopover point and wintering ground, used by birds from three major migratory flyways—bringing ospreys from the Nearctic latitudes to the north, woodstorks from the Argentine pampas to the south and flycatchers from the Andes to the west.

In order to ensure the protection of such species and others for which the Pantanal provides a habitat, a Memorandum of Co-operation between the Ramsar Convention and the CMS was signed in 1997. This led to a Joint Work Plan—finalised in 2002, with both CMS and the African-Eurasian Migratory Waterbird Agreement (AEWA). This work plan focused on collaboration on migratory waterbirds, as well as turtles, and a range of cross-cutting issues. These latter issues will, in essence, utilise the ability of the Ramsar Convention to provide site networks and technical information to help CMS deliver agreed outcomes.

Several priorities for action between Ramsar and CMS have been identified. These include, at the national level: strengthening national institutions dedicated to the study and management of Ramsar sites which have migratory species, and promoting capacity building of staff dedicated to the study and management of wetlands and migratory species; creating national conservation strategies through the participation of NGOs and states; promoting the participation of civil society in plans for conservation of migratory species and wetlands; and supporting environmental education plans and programmes as an instrument for awareness raising for the conservation of wetlands and migratory species.

Extending into the territory of three states, the management of the Pantanal must be tackled at a tri-national level. Key priorities for action between Ramsar and CMS include stimulating further joint working programmes and promoting action and proposals with reference to species considered as priorities from a regional perspective. Other areas for action include:

- Determining and supporting case studies where the proposals from the CMS and Wise Use might be applied
- Promoting institutional and financial strategies to continually manage and monitor Wetlands and Migratory Species avoiding the overlap of resources and projects
- Evaluating the impacts of regional projects in Ramsar Wetlands and their connections with CMS
- Promoting the participation of the CMS as a special instrument in the use of the CBD in relation to migratory species

4.4 Inter-linkages with the World Heritage Convention

The World Heritage Convention (WHC) is a binding international instrument that sets out the terms under which both cultural and natural heritage of internationally recognized value should be protected for the

benefit of present and future generations. The WHC also lays the foundations for the creation of the World Heritage List. To be inscribed on this List, a site must be of outstanding universal value in regards to a series of criteria. For natural World Heritage sites, a site must demonstrate at least one of the following:

- Major geological processes, or records of earth's history
- Major biological processes, evolutionary or migratory
- Be of outstanding natural beauty
- High levels of biodiversity

World Heritage sites are subject to regular monitoring from the World Heritage Centre, and any threats to their integrity are reported to the World Heritage Committee, who may then request the country in question to carry out specific actions to ensure that the threats are eliminated. Once a site is inscribed on the World Heritage List, a country is obliged to ensure that those values for which the site was included on the List are conserved.

Of the 172 natural World Heritage sites, 24 overlap one way or another with Ramsar sites. The Pantanal national park in Brazil, for example, is designated as one of the World Heritage sites, and the existing Ramsar sites in Bolivia and Paraguay—Rio Negro in Paraguay, and Bolivia's Otuquis national park and natural area of integrated management, and the San Matías natural area of integrated management—are under review. Currently, Bolivia has only one natural World Heritage site—Noel Kempff Mercado National Park, which does not fall within the Pantanal ecosystem. Brazil has seven World Heritage sites, including the Pantanal conservation complex.

Given the important overlap between World Heritage and Ramsar sites and the potential for increases in this overlap, the two secretariats to these Conventions established formal links and signed an MOU during the Ramsar COP7 meeting in Costa Rica, 1999. This expresses an intention to cooperate in helping countries conserve sites recognised by both Conventions and proposes the eventual development of joint work plans to exchange information, share databases, prepare and participate in joint missions.

The MOU between Ramsar and WHC proposes *"activities to be undertaken include sharing information with the view to identification of potential wetland sites that may meet the criteria for nomination as World Heritage and/or wetlands of international importance, including trans-boundary sites..."* This shows that there is interest from both Conventions to support any interest on behalf of Bolivian, Paraguayan and Brazilian authorities to consider either enlarging the current Pantanal World Heritage site to include trans-boundary sites, or at the very least, add Bolivian and Paraguayan protected areas in the Pantanal to the World Heritage List.

Within large areas such as the Pantanal subjected to such a wide a diversity of land uses and jurisdictions, it is necessary to identify areas where conservation issues are the highest priority. World Heritage designation helps ensure that such high priorities are respected to achieve shared conservation objectives in the Pantanal. Joint Ramsar-WHC monitoring missions to various sites, which are subject to both Conventions have been carried out in the past, but so far cooperation has been limited to these types of monitoring missions, as well as technical support, or the provision of financial support for workshops and training related to site conservation. There is little evidence of past systematic cooperation between Ramsar and WHC in the establishment of new Ramsar or World Heritage sites, but the potential exists for engaging both national Ramsar stakeholders and the World Heritage secretariat to support the development of a trans-boundary framework for the coordination of management efforts throughout the Pantanal.

4.5 Moving forward

Much of the work done towards implementing the Inter-linkages approach is focused at the international level, and yet much of the real work of implementation can take place only at the national level. Ramsar Conferences of the Parties have strongly urged collaboration between national focal points of different conventions for many years, to ensure better and more strategic actions, including more focused and encompassing decisions of the Conferences of the Parties. Yet the real extent of national collaboration is still very variable. An analysis of 131 National Reports to Ramsar's COP8 provides some insights. Some 57% of countries have national level co-ordination, such as Inter-ministerial committees, sub-committees on biodiversity, National Ramsar/wetlands committees—but often this is only in the form of 'informal dialogue'. Some 58% of countries have National Wetland/Ramsar committees, the key Ramsar national collaboration mechanism. This mechanism is expected to include other convention focal points, ministries, government agencies, and other key sectors (especially water management), NGOs and research experts, yet not many do so.

These committees do not appear to achieve the goals of synergism and collaboration for a number of reasons: national focal points, generally assigned to only one convention, tend to guard their organizational turf; environment ministries are often less "powerful" than other sectors of the government; and these other sectors tend to be less engaged. Furthermore, at meetings of the Conventions, delegations are of-

ten not briefed by other Conventions' focal points, so they may be unaware of issues of common ground or relevant decisions adopted by their governments in other conventions. The result is a lack of awareness, and at times, contradictory stances on the same topic in different fora.

This leads to clear challenges for collaboration i.e.:

- Most joint activity at global level (secretariats, subsidiary bodies) needs to enhance national level collaboration

- Many bilateral work plans mean even more complexity for Parties

- Different governance schedules & priorities (COPs, subsidiary bodies) & differing subsidiary body modus operandi increases the difficulties of developing and reporting of joint work

Some answers may lie in the development of more substantive multi-convention joint work plans, but these would need a clear analysis of common ground and overlap of national implementation requirements, as a reason and basis for implementation harmonization. A key question to be addressed is: "Are there conflicting national requirements under different conventions?" For example, streamlining national reporting should follow from common analysis of the real needs from contracting parties, and national harmonization of implementation. The problem rather than the symptom should be addressed, i.e. streamlining of reports should be the starting point for activity.

At the regional level, the creation of a regional, legal and institutional framework will better promote the sustainable management of the Pantanal. A Pantanal Cooperation Treaty between the three countries, which involves setting out a legal framework for the sustainable management of the Pantanal, could be a starting point to foster regional cooperation.

5 Conclusion and Way Forward

The potential for the integrated sustainable management of the Pantanal is at a critical stage. On the one hand, the wetland is facing unprecedented threats from economic development, alteration of its water courses and conversion to other land uses. Moreover, global climate change may pose great environmental threats to wetlands through changes in the hydrological regime upon which wetlands ecology strongly depends. Climate modification may lead to the drying up of some wetlands and the increase in size of others, fundamentally altering their ecology, biodiversity and species composition. The complexity of the Pantanal ecosystem and the interconnected nature of different aspects of its ecology, what has been referred to here as ecological inter-linkages, underpin the inter-linkages identified at the policy level.

On the other hand, political willingness to act towards the conservation of the Pantanal is growing. At the global level, reflecting the ecological inter-linkages within and between ecosystems such as wetlands, steps are being taken to better coordinate between MEAs and capitalise on inherent synergies. These steps have been demonstrated by the five MEAs involved in the Pantanal which, through the development of joint work plans and MOUs are working together more closely to reduce duplication of efforts, streamlining the reporting and monitoring procedures to unburden national governments and increasing productivity and efficiency. There is scope for further coordination along these lines, for example discussions should take place on how wetlands protection and climate change can be better taken into account in negotiations on the Kyoto Protocol's next commitment period.

At the regional level, the workshop held in Brazil in 2003 demonstrated enthusiasm to develop a Pantanal Cooperation Treaty, and the workshop recommendations call for the negotiation and conclusion of such a treaty in order to implement joint action for the integrated sustainable management of the Pantanal. Capitalising on the inherent synergies in the environment and reflecting these in coordination between MEAs, as the Inter-linkages approach advocates, can lead to an effective regional framework for managing transboundary ecosystems. This report suggests the Inter-linkages approach should be used as a policy tool in its development. The time seems ripe to push the dialogue into the international political arena. Moreover, establishing a regional cooperation framework on the conservation and sustainable management of such an ecosystem is timely in light of the forthcoming 2010 biodiversity target and MIllennium Development Goal review.

During the Pantanal workshop participants were divided into five working groups to assess aspects of the implementation of the Inter-linkages approach for management of the Pantanal. The findings of the working groups were condensed and the eight key policy recommendations of greatest importance were proposed:

1 To promote the negotiation and conclusion of a Pantanal Cooperation Treaty between Bolivia, Brazil and Paraguay in order to implement joint action for the Integrated Sustainable Management of the Pantanal.

2 To review and harmonise environmental legislation between the three countries in order to promote public and private investment that contributes to the conservation and sustainable development of the Pantanal.

3 To make possible more effective cooperation which includes the strengthening of research and knowledge between the three countries with respect to international environmental conventions and programs, which all parties belong to and which provide references for the formulation of policies for the Pantanal.

4 To disseminate information about the rules and legislation that each of the three countries considers relevant to their respective geographical areas of the Pantanal.

5 To promote the participation of all sectors of society in the decision making process by establishing Policies and Mechanisms of Inclusion, Communication, Information and Dissemination.

6 To promote permanent formal and informal capacity building for interested parties in order for them to take active and qualified roles in the democratic decision making process for the promotion of sustainability in the Pantanal. To create and promote an open system of information and geo-referenced databases of the Upper Paraguay Basin in order to allow for the formulation, implementation and execution of public policies and community action towards the sustainable development of the Pantanal.

7 To seek the necessary mechanisms for the establishment of integrated policies for research and education in the region with a view to contributing to the conservation and sustainable development of the Pantanal.

8 To identify sustainability indicators for human activities with the aim of measuring the advance and impact of applied public policies for the sustainable development of the Pantanal, its surrounding areas and its area of influence.

Following the workshop, the Rector of UNU sent a letter detailing the workshop and these recommenda-

tions to the appropriate authorities in Bolivia, Brazil and Paraguay. A follow-up workshop was convened by PREP in March 2004. The main decisions from this meeting were:

1 To follow up the outcomes of UNU letter in the three Countries

2 To elaborate an agenda for the year, aiming to give visibility to PREP work and gain support for the 2003 Pantanal Workshop recommendations

3 To carry out a study aimed at the harmonization of environmental legislation in Bolivia, Brazil and Paraguay, as a step towards the Pantanal Cooperation Treaty

4 To promote capacity building to build a Pantanal Fund

5 To initiate work on information systems in the context of GEF delta America

This report has provided a detailed case study of the application of the Inter-linkages approach to a wetlands ecosystem at the regional level. By detailing the outcomes of the 2003 Pantanal workshop and setting out the scientific underpinnings for the integration of MEAs, it not only promotes the Inter-linkages approach and urges progress with the regional framework for sustainable management of the Pantanal, but also serves as a tool for policy makers. The example presented here is specific to the Pantanal, but the lessons are more widely applicable to other transboundary ecosystems.

Endnotes

[1] "On the ground in the Pantanal; one of the most biologically rich environments," October 20, 2004, Available at < http://www.panda.org/about_wwf/where_we_work/latin_america_and_caribbean/where/brazil/pantanal/area/species/index.cfm>.

[2] W B Chambers, 'How can Inter-linkages Improve the Legal Effectiveness of International Environmental Agreements,' *UNU-IAS Working Paper*, 2004.

[3] The Action Plan laid out at the World Summit on Sustainable Development in 2002 to meet sustainable development commitments.

[4] The "Pantanal Wetland: Inter-linkages Approach for Wetland Management – best practices, awareness raising and capacity building" workshop was held in Porto Cercado, Mato Grosso, Brazil, from 26 to 30 October 2003.

[5] Ramsar Convention, Article 1.1.

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

[7] Presentation by Wolfgang Junk, Max Planck Institute for Limnology, at "Pantanal Wetland: Inter-linkages Approach for Wetland Management – best practices, awareness raising and capacity building" workshop 2003.

[8] V Ponce, "Management of Droughts and Floods in the semiarid Brazilian Northeast: the case for conservation," *Journal of Soil and Water Conservation*, Vol. 50 (5), 1995, 422.

[9] E Ayensu, D van Classen, M Collins, A Dearing, *et. al.* "International Ecosystem Assessment", *Science*, 286 (5440), 1999, 685–686.

[10] C Da Silva, K Wantzen, C da Cunha, & F Machado, "Biodiversity in the Pantanal Wetland, Brazil", in B Gopal, W Junk, J Davis (eds), *Biodiversity in wetlands: assessment, function and conservation*, Volume 2, Backhuys Publishers, Leiden, The Netherlands, 2001.

[11] V Laabs, W Amelung, A Pinto, M Wantzen *et. al.* "Pesticides in Surface Water, Sediment and Rainfall of the Northeastern Pantanal Basin, Brazil," *Journal of Environmental Quality* 3, 2002, 1636–1648.

[12] "On the ground in the Pantanal; one of the most biologically rich environments," October 20, 2004, Available at <http://www.panda.org/about_wwf/where_we_work/latin_america_and_caribbean/where/brazil/pantanal/area/species/index.cfm>.

[13] Report of a Workshop on the Conservation of Freshwater Biodiversity in Latin America and the Caribbean, Santa Cruz, Bolivia, September 27–30, 1995, Implemented by World Wildlife Fund and Wetlands International and supported by Biodiversity Support Program.

[14] W Junk, P Bayley & R Sparks "The Flood Pulse Concept in River-Floodplain Systems," in D Dodge (ed.): *Proceedings of the International Large River Symposium (LARS)* Canadian Special Publication of Fisheries and Aquatic Sciences 106, 1989, 110–127.

[15] UNEP/CBD "Report of the Ad Hoc Technical Expert Group on Biodiversity and Climate Change," UNEP/CBD/SBSTTA/9/INF/12, UNEP, Nairobi, 2003.

[16] "Biodiversity and Climate Change; Impacts on Biodiversity", October 20 2004, Available at http://www.unep-wcmc.org/climate/impacts.htm>.

[17] The hydroperiod is the period of time during which a wetland is covered by water.
R Watson, A Dixon, S Hamburg, A Janetos & R Moss *Protecting Our Planet, Securing Our Future: Inter-linkages Among Global Environmental Issues and Human Needs,* WB/NASA/UNEP publication 1998.
However a lack of data and regional climate change scenarios make it difficult to accurately predict such impacts.

[18] D Sahagian & J Melack (eds) *Global Wetland Distribution and Functional Characterisation: Trace Gases and the Hydrologic Cycle*. Report from the Joint GAIM, BAHC, IGBP-DIS, IGAC, and LUCC Workshop, Santa Barbara, CA, USA. *IGBP Report* 46, 1998, 92 pp. cited in "Climate Change and Wetlands: Impacts, Adaptation and Mitigation," Ramsar Convention COP8 Information Paper, Doc 11, 2002.

[19] W Junk "Tropical/subtropical wetland biodiversity: Status of knowledge, threats and sustainable management," in T Bernard, K Mospele & L Tamberg (eds.) *Environmental monitoring of tropical and subtropical wetlands*. Proceedings of a Conference in Maun, Botswana, December 4–8, 2002. Okavango Report Series No.1, Harry Oppenheimer Okavango Research Centre, University of Botswana, Botswana, 2003, 45–69.

[20] C Nunes da Cunha & W Junk "Composição florística de capões e cordilleiras : localização das espécies lenhosas quanto ao gradiente de inundação no Pantanal de Poconé, MT Brasil", Anais do II Simpósio sobre Recursos Naturais e Socio-econômicos do Pantanal. Manejo e Conservação, Corumbá-MS, EMBRAPA, 1996, 387–4505 cited in W Junk "Tropical/subtropical wetland biodiversity: Status of knowledge, threats and sustainable management," in T Bernard, K Mospele & L Tamberg, (eds.) *Environmental monitoring of tropical and subtropical wetlands*. Proceedings of a Conference in Maun, Botswana, December 4–8, 2002. Okavango Report Series No.1, Harry Oppenheimer Okavango Research Centre, University of Botswana, Botswana, 2003, 45–69,
See note 19.

[21] J Patterson, "Wetlands and Climate Change: feasibility investigation of giving credit for conserving wetlands as carbon sinks." Special publication 1, Wetlands International, Ottawa, Canada, 35 pp, 1999.

[22] "Climate Change and Wetlands: Impacts, Adaptation and Mitigation," Ramsar Convention COP8 Information Paper, Doc 11, 2002.

[23] D Sahagian & J Melack, (eds.) 'Global Wetland Distribution and Functional Characteristics: Trace Gases and the Hydrologic Cycle. Report from the Joint GAIM, BAHC, IGBP-DIS, IGAC, and LUCC Workshop, Santa Barbara, CA, USA. IGBP report 46. 92 pp., 1998, cited in "Climate Change and Wetlands: Impacts, Adaptation and Mitigation," Ramsar Convention COP8 Information Paper, Doc 11, 2002.

[24] There is some evidence from Florida that draining of wetlands may have inadvertently increased the frequency and severity of agriculturally damaging freezes in the south of Florida, C Marshall, R Sr Peilke, L Steyaert, "'Crop freezes and land-use change in Florida" *Nature*, Vol. 246, 2003, 29.

[25] B Bolin & R Sukumar, "Global Perspective", in: *Land use, Land-Use change and Forestry*, R Watson, I Noble, B Bolin, N Ravindranath, D Verardo & D Dokken, (eds), A Special Report of the IPCC, Cambridge University Press, Cambridge, UK, pp. 23–51, 2000 cited in "Climate Change and Wetlands: Impacts, Adaptation and Mitigation", Ramsar Convention COP8 Information Paper, Doc. 11, 2002.

[26] IPCC *"Climate Change 2001: Synthesis Report. A contribution of working groups I, II and III to the Third Assessment Report of the Intergovernmental Panel on Climate Change,"* R Watson and the core writing team (eds), Cambridge University Press, Cambridge, UK and New York, NY, USA, 2001.

[27] R Watson, A Dixon, S Hamburg, A Janetos & R Moss, *"Protecting our planet, securing our future: inter-linkages among global environmental issues and human needs"* WB/NASA/UNEP publication, 1998.

[28] Ramsar Convention, Resolution VIII.3 "Climate Change and Wetlands: Impacts, Adaptation and Mitigation", Ramsar COP 8, 18-26 November 2002.

As N Arnell & L Chunzhen *et. al.* 2001 note in the context of climate change on global water resources "the *potential impacts of climate change must be seen in the context of other changes which affect water management. Few studies have explicitly compared climate change with other pressures, but in many environments it is likely that over a time horizon of less than 20 years, climate change impacts will be very small relative to other pressure,"* N Arnell & L Chunzhen *et al.* Chapter 4. Hydrology and Water Resources. In: *Climate Change 2001: Impacts, Adaptations, and Vulnerability. Contribution of Working Group II to the Thirds Assessment Report of the International Panel on Climate Change.* J McCarthy, O Canziani, N Leary, D Dokken, K White (eds) Cambridge University Publication Press 2001, 191–233 cited in "Climate Change and Wetlands: Impacts, Adaptation and Mitigation", Ramsar Convention COP8 Doc. 11, 2002.

[29] C Vörösmarty, P Green, J Salisbury & R Lammers, "Global Water Resources: Vulnerability from climate change and population growth," *Science*, 289 (5477), 2000, 284–288.

[30] F Chapin, E Zavaleta, V Eviners, R Naylor et. al. "Consequences of Changing Biodiversity", *Nature* 405, 2000, 234–242.

[31] See note 19.

[32] C Da Silva, K Wantzen, C da Cunha, & F Machado, "Biodiversity in the Pantanal Wetland, Brazil", in *Biodiversity in wetlands: assessment, function and conservation*, volume 2, B Gopal, W Junk, J Davis, (eds), pp. 187–215, 2001, Backhuys Publishers, Leiden, The Netherlands.

[33] Ibid.

[34] M Bordas, "The Pantanal: an ecosystem in need of protection" *International Journal of Sediment Research*, 11 (3), 34–39, 1996 cited in W Collischon, C Tucci, & R Clarke, "Further evidence of changes in the hydrological cycle of the River Paraguay: part of a wider phenomenon of climate change?" *Journal of Hydrology,* 245, 2001, 218–238.

[35] V Ponce, Hydrologic and environmental impact of the Paraná-Paraguay waterway on the Pantanal of Mato Grosso, Brazil: A reference study. San Diego State University Report, 1995, 123 pp.

[36] S Hamilton, 1996 "*Hydrological aspects of the environmental impact studies for the proposed Paraná-Paraguay waterway ("Hidrovia"): A critique with emphasis on the Pantanal region*." Report to the Rios Vivos Coalition Paraguay-Paraná-Plata, Michigan State University: 14 pp.

[37] K Wantzen, C Da Silva, D Figueiredo & M Migliácio, "Recent impacts of navigation on the upper Paraguay", *Revista Biologica de Ecologia.* 6, 1999, 173–182.

[38] See note 2.

[39] UNDP *"Synergies: National Implementation of Rio Agreements"* Expert Meeting Organised by the UNDP Sustainable Energy and Environment Division, New York, UNDP, 1997, cited in W B Chambers, see note 1.

[40] R Watson, A Dixon, S Hamburg, A Janetos & R Moss "*Protecting Our Planet, Securing Our Future: Inter-linkages Among Global Environmental Issues and Human Needs,"* WB/ NASA/UNEP publication 1998.

[41] See note 2.

[42] Ibid.

[43] Chambers, W. B. Presentation at Pantanal workshop 2003.

[44] Ibid.

[45] Ibid.

[46] Ibid.

[47] See note 2.

[48] UNU *Inter-linkages: Synergies and Coordination between Multilateral Environmental Agreements,* UNU Policy Report, Tokyo, 1999.

[49] M Tuozzo, "Perspectives on cross-scale policy coordination and Policy Integration in Asia; Moving towards regional models of sustainable development governance"*UNU-IAS Working paper*, 2004.

[50] Ibid.

[51] See note 2.

[52] Ibid.

[53] See note 50.

[54] GEF "Capacity Development Initiative Assessments: A Synthesis", Washington, 2000, cited in Chambers, W. B., 'How can Inter-linkages Improve the Legal Effectiveness of International Environmental Agreements,' *UNU-IAS Working Paper*, 2004.

[55] UNU *Inter-linkages: Synergies and Coordination between Multilateral Environmental Agreements*, UNU Policy Report, Tokyo, 1999.

[56] The Ramsar Convention on Wetlands, 20 October 2004, available at < http://www.ramsar.org/>

[57] Convention on Biological Diversity, Article 1.

[58] IPCC, "*Climate Change and Biodiversity"* IPCC Technical Paper. United Nations Environment Programme and the World Meteorological Organisatoin, Geneva, Switzerland, 2002.

[59] Kyoto Protocol, Articles 3.3 and 3.4.

[60] Kyoto Protocol Articles 6 and 12.

[61] UNFCCC "Report of the Conference of the Parties on Its Seventh Session," held at Marrakech from 29 October to 10 November 2001, Addendum Volume 1, UNFCCC, Bonn (Decision-/CMP.1), FCCC/CP/2001/13/Add.1.

[62] UNFCCC "Modalities and Procedures for Afforestation and Reforestation Project Activities under the Clean Development Mechanism in the First Commitment Period of the Kyoto Protocol" (Decision 19/CP.9), FCCC/CP/2003/6/Add.2, UNFCCC, Bonn.

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