Wetlands : A Matter of Dollar Value

Adesh Kumar and Amita Kanaujia*
Biodiversity & Wildlife Conservation Lab, Department of Zoology, University of Lucknow, Lucknow-226007
***Email:** kanaujia.amita@gmail.com

Introduction

Wetlands are priceless ecosystems that occupy about 6% of the world's land surface (Fig.1). They comprise both land ecosystems that are strongly inclined by water, and aquatic ecosystems with special characteristics due to shallowness and proximity to land (www.iucn.org/themes/wani). Although various different classifications of wetlands exist, a useful approach is one provided by the Ramsar Convention on Wetlands. It divides wetlands into three main categories of wetland habitats: (1) marine/coastal wetlands; (2) inland wetlands; (3) man-made wetlands. Figure 1 shows the distribution of wetlands around the world.

Status of wetlands in India was assessed by Anon (1990) and Garg et. al (1998). According to Garg (1998) nationwide wetland inventory carried out 7.6 million ha of wetland units in the country of which 4.0 million ha are coastal wetlands and 3.6 million ha are inland wetlands. The livelihoods of millions of people in India also depend on wetlands ecosystem. According to Wild Life Institute of India some 70-80% of individual fresh water marshes and lakes in the indo-gangetic plain have been lost in the past 50 years. Most of the world's civilizations have developed and flourished near wetlands. Wetlands of India, estimated to be 58.2 million hectares, are important repositories of aquatic biodiversity while Uttar Pradesh had approximately 1145178 hectares wetland area. Wetlands have accessible significant economic, ecological and cultural values. Some wetlands are exclusively used by people for food, fodder and building materials.

Services provided by wetlands

Wetland ecosystems are often undervalued. A small number of people become conscious the range of products derived from freshwater habitats like wetlands: food such as fish, rice and cranberries; peat for fuel and gardens; medicinal plants; poles for building materials; and grasses and reeds for making mats and baskets and thatching houses. These complex habitats act as giant sponges,

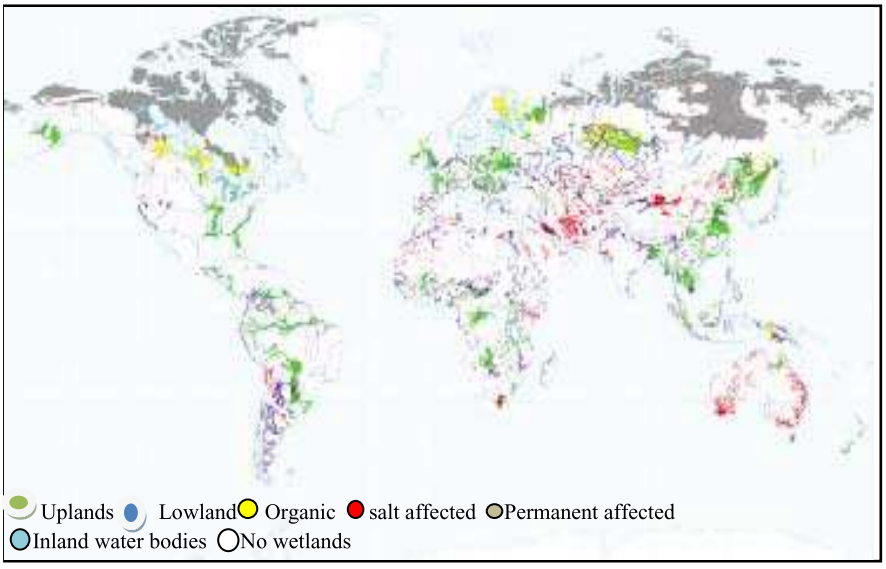

Fig. 1: Global Distribution of Wetlands

(Source: US Department of Agriculture, Natural Resources Conservation Services, 1997)

Table 1: Services provided by inland and coastal wetlands

Source: Millennium Ecosystem Assessment (Finlayson et al. 2005)

Scale is low •, medium ●, to high: ⬤; not known = ?; blank cells indicate that the service is not considered applicable to the wetland type. The information in the table represents expert opinion for a global average pattern for wetlands; there will be local and regional differences in relative magnitudes.

Services	Comments and Examples	Permanent and Temporary Rivers and Streams	Permanent Lakes, Reservoirs	Seasonal Lakes, Marshes, and Swamps, Including Floodplains	Forested Wetlands, Marshes, and Swamps, Including Floodplains	Alpine and Tundra Wetlands	Springs and Oases	Geothermal Wetlands	Underground Wetlands, Including Caves and Groundwater Systems
Inland Wetlands									
Provisioning									
Food	production of fish, wild game, fruits, grains, and so on	●	●	●	●	•	•		
Fresh water	storage and retention of water; provision of water for irrigation and for drinking	●	●	•	•	•	•		●
Fiber and fuel	production of timber, fuelwood, peat, fodder, aggregates	●	●	•	●	●	•		
Biochemical products	extraction of materials from biota	•	•	?	?	?	?	?	?
Genetic materials	medicine; genes for resistance to plant pathogens, ornamental species, and so on	•	•	?	•	?	?	?	?
Regulating									
Climate regulation	regulation of greenhouse gases, temperature, precipitation, and other climatic processes; chemical composition of the atmosphere	•	●	•	●	•		•	•
Hydrological regimes	groundwater recharge and discharge; storage of water for agriculture or industry	●	●	•	●	•	•		•
Pollution control and detoxification	retention, recovery, and removal of excess nutrients and pollutants	●	●	•	●	•	•		●
Erosion protection	retention of soils and prevention of structural change (such as coastal erosion, bank slumping, and so on)	●	•	•	●	?	•		•
Natural hazards	flood control; storm protection	●	●	●	●	●	•		•
Cultural									
Spiritual and inspirational	personal feelings and well-being; religious significance	●	●	•	●	•	●	•	•
Recreational	opportunities for tourism and recreational activities	●	●	•	•	•	•	•	•
Aesthetic	appreciation of natural features	●	●	•	●	•	•	•	•
Educational	opportunities for formal and informal education and training	●	●	•	●	•	•	•	•
Supporting									
Biodiversity	habitats for resident or transient species	●	●	•	●	•	•	•	•
Soil formation	sediment retention and accumulation of organic matter	●	•	•	●	•	?	?	
Nutrient cycling	storage, recycling, processing, and acquisition of nutrients	●	●	●	●	•	•	?	•
Pollination	support for pollinators	•	•	•	●	•	•		

Services	Comments and Examples	Estuaries and Marshes	Mangroves	Lagoons, Including Salt Ponds	Intertidal Flats, Beaches, and Dunes	Kelp	Rock and Shell Reefs	Seagrass Beds	Coral Reefs
Coastal Wetlands									
Provisioning									
Food	production of fish, algae, and invertebrates	●	●	•	●	•	●	•	●
Fresh water	storage and retention of water; provision of water for irrigation and for drinking	•		•					
Fiber, timber, fuel	production of timber, fuelwood, peat, fodder, aggregates	●	●	●					
Biochemical products	extraction of materials from biota	•	•			•			•
Genetic materials	medicine; genes for resistance to plant pathogens, ornamental species, and so on	•	•	•		●			•
Regulating									
Climate regulation	regulation of greenhouse gases, temperature, precipitation, and other climatic processes; chemical composition of the atmosphere	●	●	●	•		•	•	●
Biological regulation (C11.3)	resistance of species invasions; regulating interactions between different trophic levels; preserving functional diversity and interactions	●	●	●	•		•		•
Hydrological regimes	groundwater recharge/discharge; storage of water for agriculture or industry	•		•					
Pollution control and detoxification	retention, recovery, and removal of excess nutrients and pollutants	●	●	●		?	•	•	•
Erosion protection	retention of soils	●	●	•				•	•
Natural hazards	flood control; storm protection	●	●	•	•	•	●	●	●
Cultural									
Spiritual and inspirational	personal feelings and well-being	●	•	●	●	•	•	•	●
Recreational	opportunities for tourism and recreational activities	●	•	•	●	•			●
Aesthetic	appreciation of natural features	●	•	●	●				●
Educational	opportunities for formal and informal education and training	•	•	•	•		•		•
Supporting									
Biodiversity	habitats for resident or transient species	●	●	•	●	•	●	•	●
Soil formation	sediment retention and accumulation of organic matter	●	●	•	•				
Nutrient cycling	storage, recycling, processing, and acquisition of nutrients	●	●	●	•	•	•		●

soaking up rainfall and slowly releasing it over time. Wetlands are like extremely efficient sewage treatment works, absorbing chemicals, filtering pollutants and sediments, breaking down suspended solids and neutralising harmful bacteria.

Wetland systems directly support millions of people and provide goods and services to the world outside the wetland. People make use of wetland

soils for agriculture, they catch wetland fish to eat, and they cut wetland trees for timber and fuel wood. Direct use may also take the form of recreation, such as bird watching or sailing, or scientific study. For example, peat soils have preserved ancient remains of people and track ways which are of great interest to archaeologists. (http://wwf.panda.org/about_our_earth/about_freshwater/intro/value/)

The diversity in functions that wetlands perform makes them incredibly valuable ecosystems. They have a very high ecological value, as long as the water and primary productivity upon which countless species of plants and animals depend. Wetlands support high concentrations of birds, mammals, reptiles, amphibians, fish and invertebrate species. It has been estimated that freshwater wetlands hold more than 40% of the entire world's species and 12% of all animal species (www.ramsar.org). Many wetlands also have an important socio-cultural value. Although this value is still relatively unexplored, it is known that wetlands have religious and historical values for many local communities.

Apart from using the wetlands directly, people benefit from wetland functions or services. As flood water flows out over a flood plain wetland, the water is temporarily stored; this reduces the peak river level and delays the time of the peak, which can be a benefit to riparian dwellers downstream. Wetlands serve a number of important functions and provide benefits to humans and wildlife.

A list of the main services provided by different types of wetland (both inland and coastal) and their general relative magnitude. Depending on the intricacy of the wetland being valued, the services should be described for each of the main ecosystem components (e.g., constituent river, lake, marsh etc.) table: 1.

Economic value of wetlands

Cultural values and their social welfare indicators are as a subset of economic values and spiritual values and cultural identity which are in many cases closely related to ecosystem services. Economic and monetary valuation are therefore treated individually from socio-cultural valuation, whereby it is emphasized that ecological, socio-cultural, and economic values all have their separate role in decision-making and should be seen as basically balancing pieces of information in the decision-making process.

Numerous studies have assessed the economic value of ecosystems (e.g., Hartwick 1994; Barbier et al. 1997; Asheim 1997; Costanza *et al.* 1997; Daily 1997 a&b; Pimentel & Wilson 1997; Hamilton & Clemens 1999), and the concept of Total Economic Value (TEV) (Fig. 2) has become a widely used framework for assessing the utilitarian value of ecosystems. This framework typically disaggregates TEV into two categories: use values and non-use values.

Use values: are collected of three elements: direct use, indirect use, and option values. Direct use value is also known as extractive, consumptive or structural use value and mainly derives from goods which can be extracted, consumed or enjoyed directly (Dixon & Pagiola 1998). Indirect use value is also known as non-extractive use value, or functional value, and mainly derives from the services the environment provides. Option value is the value attached to maintaining the option to take advantage of something's use value in future.

Non-use values: derive from the benefits the environment may provide which do not involve using it in any way, whether directly or indirectly. The most important such benefit is existence value: the value that people derive from the knowledge that something exists, even if they never plan to use it. Thus people place value on the existence of blue whales or the panda, still if they have never seen one and probably never seen in future. Though, if blue whales became extinct, many people would feel a definite sense of loss (Dixon & Pagiola 1998). Bequest value, finally, is the value derived from the desire to pass on values to future generations, that is, our children and grandchildren.

Estimation of wetlands forms one of the many types of wetland assessment which can and should be used for different purposes and at different scales in support of wetland wise use, management and decision-making. These, their purposes, and the relationships between them have been brief in the

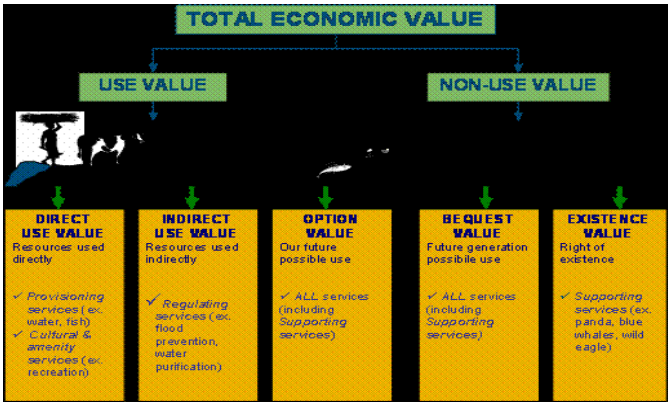

Fig. 2: The Total Economic Value Framework. Adapted from Millennium Ecosystem Assessment (2003), based on Pearce & Warford (1993) and Dixon & Pagiola (1998).

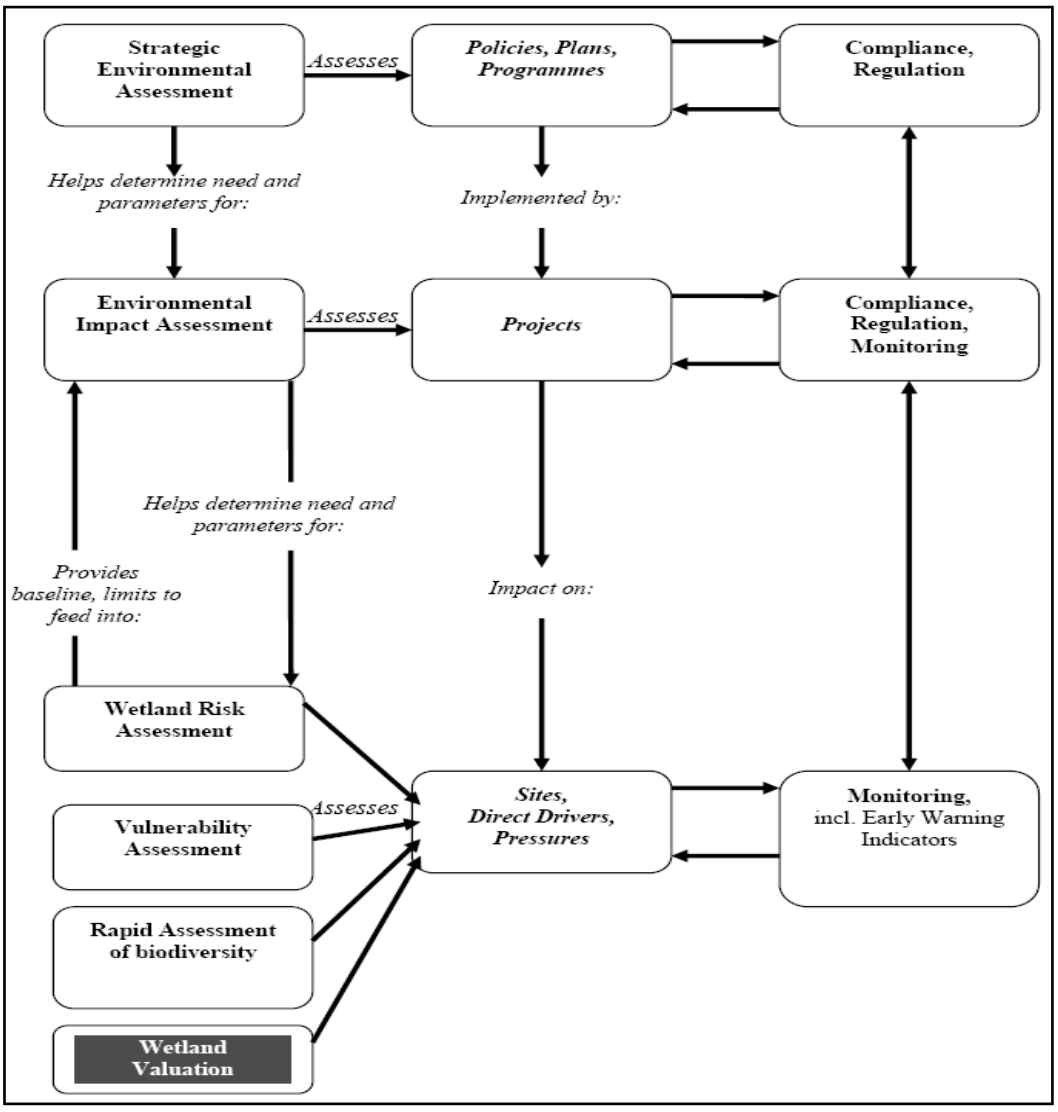

Fig. 3: The relationships between wetland valuation and the other wetland assessment tools available through the Ramsar Convention (from Ramsar Resolution IX.1 Annex E).

Table 2: The relationship between ecosystem functions and services and monetary valuation technique (source: de Groot 1992)

ECOSYSTEM FUNCTIONS	Maximum monetary values (US$/ha Year)	Direct Market Pricing	Indirect Market Pricing					Contingent Valuation	Group Valuation
			Avoided Cost	Replacement cost	Factor Income	Travel cost	Hedonic pricing		
Regulating services									
1.Gas regulation	265		+++	o	o			o	o
2. Climate regulation	223		+++	o	o		o	o	o
3.Disturbance regulation	7,240		+++	++	o		o	+	o
4. Water regulation	5,445	+	++	o	+++		o	o	o
5. Water supply	7,600	+++	o	++	o	o	o	o	o
6. Soil retention	245		+++	++	o		o	o	o
7.. Waste treatment	6,696		o	+++	o		o	++	o
8. Pollination	25	o	+	+++	++			o	o
9. Biological control	78	+	o	+++	++			o	o
Supporting services									
10. Refugium function	1,523	+++		o	o		o	++	o
11. Nursery function	195	+++	o	o	o		o	o	o
12. Soil formation	10		+++	o	o			o	o
13. Nutrient cycling	21,100		o	+++	o			o	o
Provisioning services									
14. Food	2,761	+++		o	++			+	o
15. Raw materials	1,014	+++		o	++			+	o
16. Genetic resources	112	+++		o	++			o	o
17. Medicinal resources		+++	o	o	++			o	o
18. Ornamental resources	145	+++		o	++		o	o	o
Cultural services									
19 Aesthetic information	1,760			o		o	+++	o	o

ECOSYSTEM FUNCTIONS	Maximum monetary values (US$/ha Year)	Direct Market Pricing	Indirect Market Pricing					Contingent Valuation	Group Valuation
			Avoided Cost	Replacement cost	Factor Income	Travel cost	Hedonic pricing		
20 Recreation & tourism	6,000	+++		o	++	++	+	+++	
21 Cultural & artistic	25	o			o	o	o	+++	o
22 Spiritual & historic						o	o	+++	o
23 Science & education		+++			o	o		o	o

- **(** In the columns, the most used method on which the calculation was based is indicated with +++, the second most with ++, etc.; open circles indicate that that method was not used in the Costanza *et al.* (1997) study but could potentially also be applied to that service.**)**
- **(**Maximum Dollar values are based on Costanza *et al*. (1997) and apply to different ecosystems (e.g., waste treatment is mainly provided by coastal wetlands and recreational benefits are, on a per hectare basis, highest in coral reefs). These monetary values are examples for illustrative purposes only: actual values will vary from location to location, depending on ecological, bio geographic and socio-economic conditions.
  Direct market pricing based on added value only (i.e., market price minus capital and labour costs, typically about 80%).

Convention's Integrated Framework for Wetland Inventory, Assessment and Monitoring, as Resolution IX.1 Annex E (http://www.ramsar.org/res/key_res_ix_index_e.htm). Fig.3 shows how wetland valuation fits into this Framework, and this is also described in Finlayson *et a*l. (2005).

Monetary valuation of wetland services

The comparative importance people attach too many of the values and their associated wetland services can be measured using money as a common denominator. Monetary or financial valuation methods fall into three basic types, each with its own repertoire of associated measurement issues. An overview of which methods are most often used to determine the monetary value for different services (Table 2).

1. Direct market valuation;
2. Indirect market valuation; and
3. Survey-based valuation (i.e., contingent valuation and group valuation)

Table 3 presents the global economic values of wetlands, aggregated by wetland type and continent. The table also illustrates that, wetlands in Asia have the absolute highest economic value at $1.8 billion per year. The high value given to Asian wetlands in this study could be explained by the high population density in most Asian countries. Large populations are accountable to mean high demand for wetland goods and services, and hence higher economic values.

The Millennium Ecosystem Assessment gave wetlands a value of US$15 trillion in 1997.A study of the role of coastal wetlands in reducing the severity of impacts from hurricanes in the United States found that they provided storm protection services with an estimated value of US$23.2 billion per year. The annual economic value of the remaining Danube River floodplains, including their flood mitigation function, was assessed in 1995 at EUR650 million. New York City found that it could avoid spending USD$3-8 billion on new waste water treatment plants by investing USD$1.5 billion in the purchase of land around the reservoirs upstate. This land purifies the water supply for free. In the Caribbean, the shoreline protection services provided by coral reefs are valued at up to US$2.2 billion annually. (http://wwf.panda.org/about_our_earth/about_freshwater/intro/value/)d services, and hence higher economic values.

Economic Valuation of Wetland as Numerous Use Systems in India

Economic valuation of wetland has been carried out in different parts of India to capture both use and non-use values of wetlands. Das *et al.*

Table 3: Total Economic Value of Global Wetlands by Continent and Wetland Type (Thousands of US$ per year, 2000)

	Mangrove	Unvegetated Sediment	Salt/Brackish Marsh	Freshwater Marsh	Freshwater Woodland	TOTAL
N America	30,014	550,980	29,810	1,728	64,315	676,846
Latin America	8,445	104,782	3,129	531	6,125	123,012
Europe	0	268,333	12,051	253	19,503	300,141
Asia	27,519	1,617,518	23,806	29	149,597	1,818,534
Africa	84,994	159,118	2,466	334	9,775	256,687
Australasia	34,696	147,779	2,120	960	83,907	269,462
TOTAL	185,667	2,848,575	73,382	3,836	333,223	3,444,682

Fig. 4: communities use the wetlands for various livelihoods purposes

Fig.5: Livestock are freely move during dry season in wetlands

Fig.6: Wetlands supply resources which are very useful raw materials for housing

(2002) estimated the economic value of ten wetlands in the Gangetic flood plain in Bardhaman district of West Bengal. The area of the wetlands varies from 10 ha to 275 ha with an average area of 66 ha. The estimated economic benefit from fisheries operation varies from Rs. 500 to Rs. 16,000 per ha per year; average irrigation benefit is Rs. 3.543 with a maximum of Rs. 16,000; average benefit of using wetland for jute retting is Rs. 200 per ha per year with a maximum of Rs. 625 per ha per year. Average benefit from fisheries operation varies from Rs. 2,484 per household, irrigation benefit - Rs. 1,105 per acre and jute retting Rs. 483 per household per year. Chattopadhyay *et al.* (2002) estimated the potential losses due to conversion of 1500 ha of East Calcutta Wetlands in the year of 1999-2000 as Rs. 338.90 million. The willingness to pay of the stakeholders to conserve the East Calcutta Wetland, the amount varies from Rs. 60/per household/year to Rs. 1200/per household/year, with an average of Rs. 380/per household/year.

Wetlands and Livelihoods

The livelihood concept argues that people have resources (natural, physical, financial, human and social) which they must to access and use. For wetland residents, the assets would comprise land and other wetland resources and the means of taking out. Wetlands are a multitude of resources; the wetland users similarly have a large number of communities for specific wetland resource and or use. The totality of all these communities is what modifies the wetland resources within the situation of trends and amazement to generate livelihood strategies. These livelihood strategies are simply composed of various activities of the wetland users including but not limited to fishing, farming, livestock keeping, extraction of medicinal plants and cultural activities (Fig.4).

Wetlands and Livestock farming:

Livestock are kept virtually by all the communities found in the wetlands. They keep cattle for meat, milk, skins, ploughing, and as social security, and as shelter nets or “banks” during floods or drought, source of income for school fees, and for customary activities like marriages and specific actions during funerals, Fig.5 (Kibwage *et al.*, 2008).

Everybody has free access to the grass, however, during wet seasons, livestock have to be accompanied by men or women or they are tethered to put a ceiling on their movement because they can damage crops. During dry seasons, livestock are left to move freely without being watched. Due to lack of control on the number of animals one should maintain and uncontrolled grazing, over-grazing is a common phenomenon within and around wetland leading to resource over-use.

Extracting wetland resources for housing and other construction activities:

Wetlands supply resources which are very useful raw materials for housing for example, roofing materials, clay for making bricks and or walls for thatched houses and reeds for making windows and even doors (Kibwage *et al.*, 2008). In wetlands, the resources extracted for housing and other construction activities are Cyprus, clay, grass, ropes, poles and sand. Papyrus, poles and grass are extracted for animal sheds, fencing, and housing respectively. Collection of grass, ropes and poles is done by women and children (Fig. 6).

Wetland fishing activities:

Fishing is one of the most regulated activities in some of IBA wetlands. Riverine fisheries have however not been closely monitored by the fisheries authorities although they have been used to fish for indigenous fish species and for baits. At the local Fishing committees are set up in order to resolve conflicts, receive visitors to the wetlands/villages, maintain law and order in the villages among others. The fishermen involved in these committees indicated that it the fishermen themselves who decided to protect the fishery resources and that the government only came in later to help them carry out enforcement of regulations on illegal and harmful fishing methods (Fig. 7).

Wetland cultural activities:

Cultural activities are founded on community's cultural values which are an important factor in sustaining wetland resources for community livelihoods. Human beings are known to be social beings whose behaviour is entrenched within a set of socio-cultural values, norms and knowledge defined by the community in which they belong and where

Fig. 7: A large number of people depend on the fishing for their livelihoods

they attain their identities, faith and deeds (Kurien, 2001; Hanna and Jentoft, 1996; Granovetter, 1992; Polany, 1957; Coser and Rosenberg 1957). These values define their supremacy structures and are what they bring to and guide their actions as they relate to natural resources such as wetland resources (Hanna and Jentoft, 1996). Understanding of these values is important in sustaining the resources (Kibwage *et al.*, 2008).

In the wetlands, religion as a cultural activity tends to take precedence among the residents. Religious groups believes that by praying in a cultural site within the wetland, the people seek blessings or protection, for or from fish catch, death, sickness, richness, bad wishes to neighbours, and good weather conditions. The keeping of sacred places has a very positive effect to the resources found in the sacred place (Fig. 8).

Fuel wood collection:

The use of wood as fuel among the households from the wetlands is most common activities. In most of the wetland there are no rules governing collection of fuel wood. Fuel wood collection is mainly the work of women and children in the three wetlands. Splitting of firewood is done by young males, adult males and females for their daily needs as well as livelihood (Fig.9).

Wetland craft industry and pottery:

Craft making provides employment and incomes to a number of inhabitants in and around wetlands. The most common craft items made using the wetland resources are mats which are made from Cyprus by both men and women and wetland materials extracted are mainly for making decoration mats, baskets, trays, floor and ceiling mats. Extraction of wetland resources for making crafts have a positive effect on the community livelihoods, however insufficient to control the extraction as well as confirm for the sustainable extraction of the resources.

Wetland water use:

Water is however used for domestic purposes in

Fig.8: peoples praying in a cultural site within the wetland, the people seek blessings or protection, for fish catch, death, sickness, richness, bad wishes to neighbours, and good weather conditions

Fig.9: Wood collection by people for their daily needs

Fig. 10: Use of wetlands water for domestic as well as agricultural purposes

Fig. 11: Gathering and extraction of medicinal herbs are completely free access to everyone within the wetlands

particular by all the residents of the wetlands and for rice cultivation and small irrigation for vegetable growing. Collection of water for domestic use was mainly by the women and children and access to it is free to all for both the residents and non residents in the wetlands (Fig. 10).

Wetland hunting, gathering (fruits and wild vegetables) and extraction of medicinal herbs:

Little residents of wetlands are involved in extraction of medicinal herbs from wetlands. Gathering of wild vegetables is undertaken by all households in the wetlands. Both gathering and extraction of medicinal herbs are completely free access to everyone whether a resident or non-resident (Fig.11). There is also free access to natural medicinal resources within the wetland. Extraction of herbs, preparation, processing and their administration to the sick, are all done by either adult males or adult females. The herbs are scarce in the wetland due to destruction of the vegetation in the wetland especially through clearing and burning of land in order to expand the area for cultivation and human settlement.

Wetlands Tourism and Livelihoods:

Tourism in and around wetlands can bring significant benefits, both economic and environmental, at site, regional and national levels. Local communities and local government can and often do benefit economically in terms of income and employment. At the national level, the income from tourism can be significant. The wetland itself can benefit directly when the income from tourism (entry fees, local products, etc.) is used directly for conservation measures at the wetland, thus linking tourism with long-term conservation. Income can be effectively used for training local guides and tour operators so that they understand the key features of the wetland and can explain simple conservation measures to the tourists they are responsible for and at the same time modify their own operations to minimize their impacts on the natural resource. Appropriate signage at wetlands, simple pamphlets, etc., can also demonstrate to tourists the values of wetlands and the benefits they deliver to us all. Tourism businesses can give a great deal of support to sustaining biodiversity in wetlands and other ecosystem.

Sustainable livelihoods: Wetlands already sustain a vast range jobs globally:

- Almost a billion households in Asia, Africa and the Americas depend on rice growing and processing for their main livelihoods.
- More than 660 million people rely on fishing and aquaculture for a living; most commercial fish breed or spawn in coastal wetlands, and 40 % of all fish consumed are raised in aquaculture.
- An estimated half of international tourists seek relaxation in wetland areas, especially coastal zones. The travel and tourism sectors support 266 million jobs, and account for 8.9 % of the world's employment.
- Rivers and inland waterways play a vital role in transporting goods and people in many parts of the world. In the Amazon basin, 12 million passengers and 50 million tons of freight are moved each year by 41 different shipping companies.
- Vast networks deliver fresh water and treat wastewater around the world, while employing significant workforces. For example, Bangkok's Metropolitan Waterworks Authority employs over 5,300 staff.
- The bottled water industry delivered over 70 billion gallons of water worldwide in 2013. Danone sells major brands such as Evian and Volvic, Bonafont and Mizone, and employs more than 37,000 people in its water businesses worldwide.
- Harvesting and processing plants, fruits, reeds and grasses also provide significant employment directly in or near wetlands, especially in developing countries.

Conclusions

Wetlands are a very important source of natural spring of resources upon which many rural economies and entire societies depend. Wetlands perform very significant functions that supply goods and services that have an economic value, including food, medicine, building materials, water treatment and climatic stabilization. Notwithstanding this

importance, though, wetlands all over the world have been modified and reclaimed - since 1900, more than half the world's wetlands have departed.

This article has addressed the economic values of global wetlands. The prerequisite by wetlands of recreational opportunities and amenities, and flood control and storm buffering are the wetland functions with the highest Median economic values at $492 and $464 per hectare per year respectively.

The economic value of wetlands per geographical region was showed that Asian wetlands have the highest economic values at $1.8 billion per year. The estimates derived in this article illustrate the magnitude of economic value of wetlands in addition to their biodiversity, scientific, ecological, socio-cultural and other important wetland values.

These estimates can be used to raise awareness with decision-makers about the economic profit of conserving and sustainably managing wetlands as per the principles and objectives of the Ramsar Convention as opposed to their reclamation and ultimately the need for their costly reinstallation. In order to recognize the range of values of wetlands and for decision-makers to include these values in their decision-making processes, efforts must be directed at such inventories of wetlands all over the world. Lastly, it is important that more economic valuation studies on wetlands be carried out to improve our knowledge and awareness of economic values of wetlands, including a comparative evaluation on the cost of humiliating and restoring these ecosystems and their natural functions.

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Ramsar Resolution IX.1 Annex E.

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