

Ecosystem services provided by the Telineelapuram and Telukunchi Wetland sanctuaries of Srikakulam district in Andhra Pradesh, India.

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ABSTRACT

Telineelapuram and Telukunchi bird Sanctuaries are very important wetlands and A-1 IBA (Important Bird Area) with code-IN229. Both the Important Bird Areas (IBA) in the coastal wetland of Srikakulam district of Andhra Pradesh in India. Telineelapuram and Telukunchi bird sanctuaries are small in size but rich in biodiversity. Telineelapuram harbours more than 450 Spot billed Pelicans and 800 Painted Storks, Telukunchi sustains thousands of Open Bills and many other birds. Birds are excellent indicators of ecosystem health. The IBA programme of Birdlife International aims to identify, monitor and protect a global network of IBAs for conservation of the world's birds and associated biodiversity. In recent time it has become an important ecosystem for wildlife as well as bringing significant benefits to the local people in term of crop yield and climate regulation. Ecological Services are defined as the benefits that people derive from nature (MEA 2005). The values of the wetlands are increasingly being acknowledged all over the world as a result of the ever increasing awareness about the role they have been playing in the development of civilizations and over all welfare of the humanity by ensuring water security and food security and several other services being derived from them. The study has been conducted to assess the economic benefits derived from these wetland resources by the rural people of the district and also to assess their socio-religious and cultural attachment with these wetlands. The fishermen completely depend on fish resource of these wetlands. Such resourceful wetlands have been found to degrade gradually due to anthropogenic activities like, encroachment, residential and commercial developments, dumping the garbage and wastes in the wetlands, etc. Therefore, appropriate measures should be adopted to conserve and save these important wetlands of the district.

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Introduction:

Over the past 50 years human activities have changed ecosystems more rapidly and extensively than at any comparable period in our history with more than 60% of the world's ecosystems already degraded (Millennium Ecosystem Assessment 2005). These changes have generated many economic gains but at growing environmental costs, including biodiversity loss and land degradation, which in turn has resulted in many economic, social and cultural losses.

Communities that rely on sustainable use of natural resources find themselves particularly vulnerable to biodiversity and ecosystem degradation.

Protected areas remain a cornerstone of global conservation efforts. The double impacts of climate change and biodiversity loss are major threats to achieving the Millennium Development Goals, especially those relating to environmental sustainability, poverty alleviation and food and water security. The growing awareness of the planet's

vulnerability to human driven changes also provides an opportunity to re-emphasize the multiple values of natural ecosystems and the services that they provide. Protected areas, when integrated into land use plans as part of larger and connected conservation networks, offer practical, tangible solutions to the problems of both species loss and adaptation to climate change. Natural habitats make a significant contribution to mitigation by storing and sequestering carbon in vegetation and soils, and to adaptation by maintaining essential ecosystem services which help societies to respond to, and cope with, climate change and other environmental challenges. Many protected areas could be justified on socioeconomic grounds alone yet their multiple goods and services are largely unrecognized in national accounting. This paper argues that there is a convincing case for greater investment in expanded and better- connected protected area systems, under a range of governance and management regimes that are specifically designed to counter the threats of climate change, increased demand and altered patterns of resource use.

Habitat loss, fragmentation, overexploitation of natural resources, pollution, and the spread of invasive alien species have long been recognized as the “Big Five” threats to global biodiversity. The *Global Biodiversity Outlook 3* published in 2010 showed that most threats to biodiversity were increasing, largely driven by our failure to protect ecosystem integrity, the growing surge in human population, and unsustainable approaches to consumption and unlimited growth. The same report found that expansion of protected areas was one of the few positive indicators of environmental performance (CBD, 2010).

The concept of ecosystem services has recently become a major conceptual framework for discussing economy–society–environment interactions. To promote conservation, the environment has been fitted into the dominant paradigms and language of economics, services and values (Daily 1997; ten Brink 2011).

Provisioning (goods directly acquired from nature, e.g., food, freshwater and timber) Regulating (control of natural processes, e.g., air quality regulation, carbon sequestration and pollination) Cultural (non-material contributions to human well-being, e.g., recreation, aesthetics and inspiration) Supporting (natural processes crucial for the delivery of other services, e.g., habitats, primary production and nutrient cycling) Protected areas are an efficient and effective means to address biodiversity loss, help buffer society from the effects of climate change, and maintain the critical ecosystem services on which all societies depend.

The main reason for promoting the concept of ecosystem services lies in its potential to contribute to environmental conservation. Highlighting the benefits derived from ecosystems fosters an understanding of humans’ dependence on nature, as users of ecosystem

services. However, the act of using ecosystem services may not be environmentally neutral. As with the use of products and services generated within an economy, the use of ecosystem services may lead to unintended environmental consequences throughout the ‘ecosystem services supply chain. The present article deals with the ecosystem services provided by the Telineelapuram and Telukunchi wetland sanctuaries and also pointed out some conservative measures.

Study Area:

The district Srikakulam ($18^{\circ} 20'$ to 19° , 10° N latitudes and $83^{\circ} 05'$ to $84^{\circ} 90'$, E longitudes) is the most north-eastern and second smallest district in Andhra Pradesh. Spreading over 5837 Km² of area, it shares borders with Odisha state in the north, Vizianagaram district of A P in the west and south. On its east lies the Bay of Bengal. It is divided into 38 Mandals under three Revenue Divisions viz. Srikakulam, Palakonda and Tekkali. My study area comes under the Tekkali division that covers the entire coastal plains of the district. Forest area in the district is 68641ha mostly mixed deciduous forest which covers 11.76% of the total geographical area. In recent years wild life is improving because of the protection of forest under participatory management. Agriculture in the plains is practiced on the modern lines using improved seeds, fertilizers and pesticides. The important wet crop is paddy, intensively cultivated in the plains. Fishing community depends on inland fishing based on beela’s and tanks for their income source.

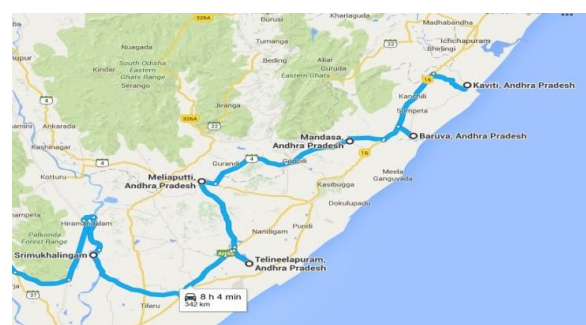


Figure:1 Location map of the study area in Andhra Pradesh

TelineelapuramWetland:

Telineelapuram bird sanctuary located near Tekkali with $18^{\circ} 34' 36.55''$ N latitude $84^{\circ} 15' 46.35''$ E longitudes. Area is about 7.04 hectares. This is one among the many wetlands near the Telineelapuram heronry and is a foraging ground for the Pelicans and Painted Storks thus playing a major role for the sustainability of the bird population in the heronry. Twenty eight bird species which include 3 ‘Near Threatened’ birds viz. Darter, Painted Stork and Spot Billed Pelican were recorded from the Sanctuary area only. Twenty four plant species were also recorded in the sanctuary area. Water for irrigation, grazing land for cattle and fisheries resources are the major ecosystem

services provided by the wetland. In my survey I found 126 bird species in the vicinity of this wetland sanctuary, out of which 12 species belong to the IUCN Red List. One thousand fishers depend upon the wetland on a regular basis for their livelihood. This wetland also provides numerous wetland services to lakhs of people in the surrounding villages.



Fig.2: Satellite image of Telineelapuram wetland

Telukunchi wetland:

Located in Telikunchi village of Ichapurammandal in Tekkali division with $18^{\circ} 15' 17.89''$ N latitude $83^{\circ} 46' 37.56''$ E longitudes. It is natural wetland with 0.5 hectare area. Telikunchi wetland is designated as an Important Bird Area. It harbours thousands Open Bills. During my study I was recorded 22 bird species along with Openbill and 'Near Threatened' species like Painted stork.



Fig.3: Satellite image of Telukunchi wetland sanctuary

The substantial chunk A substantial chunk of rural population, in India and elsewhere, depend upon wetlands for various means of their livelihoods such as agriculture, irrigation, fisheries, medicinal and edible wild plants, fodder, and materials for thatch and for preparation of various key utility items. The decline in the wetlands, while directly impacting the very existence of the ecosystem, make ecological refugees of the ecosystem people depending on the wetlands for their life needs.

Materials and methods:

India harbors a wide range of ecosystems which in turn catches the attention of a diverse avifauna to

exploit their resources. More than 650 species of birds have been reported in the country and their occurrence in three zoogeographical zones (Oriental, Palaearctic and Ethiopian region) is unique in the world (Grimmett et al., 2001; Mirza and Wasiq, 2007). Species diversity is an important component of the health of an ecosystem. Among species, birds have an important place because they are visible and highly valued by humans. Birds, furthermore, play an informational role in attracting public attention to natural habitat. The abundance and diversity of avian species, therefore, in a specific habitat could serve as a useful barometer of the ecological status of that habitat. Ecologically, birds are of tremendous importance as they are important pollinators and play a key role in seed dispersal. Around the late 1990s, the first migratory movement was recorded in these sanctuaries, which numbered more than 12,000 birds.

The study has been conducted during the period of January 2015 to December 2015. The two sanctuaries and their surrounding wetland areas were visited very frequently. A customized questionnaire was prepared to obtain information about the socioeconomic state of the villagers around the wetlands and their dependency, awareness and suggestions for improving the status of wetlands. The questionnaire survey among the stakeholders helped in collecting information on the ecological history, people's understanding about the ecosystem services provided by the wetlands, their dependence on the wetlands and their perceptions about the wetlands in their neighbourhoods. Data on several socio-economic parameters were collected. Focus Group Discussions (FGD) were conducted with members of the stakeholder communities participating to collect information on the history of the wetlands, recent changes in utilization of the wetlands and their general understanding about various other aspects related to wetlands and local environment.

Participatory Rural Appraisal (PRA) tools were employed on a limited scale to collect data on various ecological aspects in a participatory way. In order to ascertain the presence and absence of the migratory bird species, a novel methodology namely Participatory Biodiversity Appraisal (PBA) tool was tried which generated very interesting information. As part of the methodology, the stakeholders for whom the wetlands are integral parts of their day to day life and survival were shown pictures of 10 species of birds which are common and not so common to that particular area. If the person could identify all the birds correctly by their local names it was concluded that he is qualified enough to recognize other migratory /rare birds which is likely to be found in that area.

Result and discussion:

In the Participatory Rural Appraisal exercise conducted during the survey revealed that out of the 30 villages in the periphery of the Telineelapuram wetland 12 villages are involved in agriculture, and 10 villages

are engaged in cattle rearing along with agriculture. There are 8 fishing villages where some of the villagers also hold agricultural land. One village mostly depends upon coir spinning along with agriculture whereas two villages are engaged in mat preparation along with agriculture. Therefore, conservational measures should be adopted to save these important wetlands upon which a major portion of local people depend for their day to day necessities and also for their livelihood. The regular grounds for the birds to forage and for other activities will be lost because of the resultant changes. Since the wetland is apparently the main foraging ground for the Pelicans and Painted Storks of Telineelapuram, the very existence of such heronries may be doubtful. In Telukunchi bird sanctuary comes under Ichapuram wetland zone which also serves several ecological services to the local communities. The services provided by the wetlands discussed under the following headings.

Provisioning Services:

Wildlife Habitat:

Data collected by rapid surveys. Telineelapuram which is designated as an 'Important Bird Area' is part of the Naupada wetland complex. Telineelapuram and Telukunchi wetlands harbour large number of migratory birds such as Bar-headed Goose, Shoveller, Spot-billed Pelican, Grey Pelican, Sarus Crane, Common Teal, Cotton teal, Common Pochard etc. Many of these species are observed even during non-migratory season in parts of the wetland where there is sufficient water. . The wetland is an important haven and crucial foraging ground for thousands of birds throughout the year. It is the major foraging ground for more than 1000 Spot Billed Pelicans and 1500 Painted Storks of Telineelapuram.

Water supply:

During monsoons more than 8000 acres of the wetland area nearby Telineelapuram is submerged by the flood waters which gradually drains out through the Tekkali Creek further into the sea. However, in winter and summer substantial quantity of water is retained in the wetland. As noted above, Naupada wetland complex that includes Telineelapuram sanctuary sustains the ground water table of more than 30 nearby villages thus making provision for water for irrigation, drinking, for industries etc. In Telukunchi the ponds around the village are important water source for regular water needs of the village people and surrounding biota.

Fisheries:

Fishing rights here are leased out to M/s Jagannath Inland Fishermen Cooperative Society, Vaddithandra which have 520 members. In fact, the number of families depending upon fishing for their livelihood is around 800 as a lot of non-members in the cooperative society are also engaged in fishing. Females of the

fishing families are engaged in marketing fish catches in the nearby areas. Vaddithandra is an exclusive fishers' village. According to the fishermen, Tiger Prawn, White Prawn and Giant Fresh Water Prawn (Scampy) are abundant in the wetland since water quality is ideal for their growth.

Agriculture and animal husbandry:

Villages surrounding the wetlands, more than 30 in number, are lush green with paddy crops and coconut groves. Majority of the population depend upon agriculture and allied activities. Most of the farmers raise two crops of paddy. Cattle rearing, pig farming and poultry farming are common practices in these areas. Farmers in 12 villages falling within the 3 Km from the wetland are chiefly into agriculture and rearing cattle. Hundreds of cattle graze in the wetland during dry season. The villagers harvest fodder from the wetland for stall feeding. Thousands of cattle are reared in homesteads. These wetlands are rich source of raw material, such as *Scirpus* sp., to make mats. It is an income source crucial to hundreds of people. The material is also used for thatching and roofing.

Plant biomass resources:

These wetlands are source of several medicinal and edible plants collected by the locals. During winter and summer when the water recedes; thousands of cattle graze in the wetlands. These wetlands are source for raw materials for making mats, an important source of income for the locals. Materials for thatching the roofs, building houses, and making tools and crafts are also sourced from these wetlands.

Supporting services:

Because of its increasing popularity regarding migratory birds of these wetlands there is a big scope for tourism related developmental activities. Bird watching tends to be presented as 'one of the most ecologically sound and sustainable of versions of wildlife tourism' (Connell 2009), and at the same time 'one of the fastest growing wildlife-based activities' (Roe et al. 1997). Human health and well-being can be considered the ultimate or cumulative ecosystem service (Sandifer and Sutton-Grier, 2014). Birds are perceived as agents of ecosystem services (Whelan et al. 2008; Wenny et al. 2011), and their existence depends on ecosystem structures and processes. Although birds contribute to a broad array of human needs, the focus here is on cultural services related to bird watching. Similar to other forms of ecosystem-based recreation, bird watching provides an obvious example of a service that could not be used without the additional indirect consumption of travel, bird watching equipment etc., and it requires the birdwatcher to be present in an ecosystem. So many avian species Migrated to these wetlands from Siberia, Australia and central Asian countries, bird watching provides a good source income to the local communities.

Cultural services:

Support for bird conservation and introduction programs like festivals and bird watching holidays in the local institutions and schools enhance the cultural values of the local area. Birdwatchers from Andhra university and local forest departments have always been to a large extent motivated by the esthetic appeal of birds and, like many other naturalists, they derive pleasure from their interaction with birds and more generally with nature.

Regulating services:

Numerous streams and water channels drains water into the wetland which is discharged into the sea through the Tekkali creek. Most of these water flow-ways are linked to the river Vamsadhara. During monsoon the entire wetland complex receives the flood waters spreading it over thousands of acres. The mixing of the floodwaters with the sea water which intrudes through the Tekkali results in a unique water regime which has implications on the biodiversity and livelihood of thousands of inhabitants in more than 30 villages around the wetland. The floodwaters polluted by industries and agricultural pesticides and fertilizers get more or less purified and released into the Tekkali creek generating an appropriate environment for the survival of biodiversity. These wetlands play a vital role in erosion control and sediment restoration. It also plays an invaluable role in controlling the Stalinization of both water and soil.

Conservative measures:

The 'perfect storm' of unchecked population growth, unprecedented urbanization, huge rises in resource use and climate change, are combining to impact massively on biodiversity and ecosystems with serious consequences for people and the natural world. Ensuring a more sustainable future will require a suite of actions, including greater support for natural solutions and expansion of the world's protected areas. At the same time, it is crucial to examine who is empowered to act as custodians of natural landscapes and seascapes, and to locate conservation activities within the appropriate economic, political, social and cultural contexts.

The new agenda for protected areas requires greater inclusivity of a broader spectrum of actors and rights holders, with growing attention to landscapes and seascapes protected by indigenous peoples, local communities, private owners and other actors which complement conservation areas managed by state agencies. Greater attention also needs to be focused on ways to integrate and mainstream protected areas into sustainable development, including promotion of "green" infrastructure as a strategic part of responses to climate change.

Protected area systems are already providing multiple benefits and could become even more important in helping societies to meet development

needs, achieving these multiple objectives requires at least a considerable actions. Some recommendations for improvement of these wetlands as potential ecosystems are

1. Create buffer zone to improve ecosystem where ecosystem services are under threat in the Telineelapuram wetland area.
2. Expand habitat that is under conservation management beyond boundaries in buffer zone to build connectivity and resilience to climate change
3. Improving management within protected area to maintain conservation and reduce degradation of habitats through threats such as agricultural encroachment, overexploitation and invasive alien species. Diversion for industrial use is a major and serious one.
4. Restore degraded habitats within and around protected areas to enhance biodiversity values.
5. Develop innovative financing strategies for these protected areas for better functioning of the ecosystem.
6. Documentation of other taxa associated with the wetlands is very scarce and it needs to be done at the earliest.

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