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Degradation of Sindh Indus Delta and Proposal for Sustainable Rehabilitation of Habitat

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Abstract

Pakistan is blessed with rich and diverse natural resources; including sindh Delta is habitat for mangrove ecosystem which develops from the muddy to sandy coast. Pakistan has 0.6 million hectares of mangrove ecosystem, one among the top ten in the world. Indus River delta and its mangroves are fencing for their longevity and endurance, due to scarcity of fresh water from several decades. The degradation of mangroves causes people to migrate away from the locality. After conducting the interviews with local people, it is concluded that viability and life on delta are interfacing a set of problems, uniquely the delta's Flora and Fauna as they mainly rely on the constant flow of fresh water. Salinity in sea water is expanding on the surfaces facing the coastal regions of the Sindh. The fertile land is being converted to infertile land and local citizens are migrating from the area. Delta provides the beneficial condition for fishing growth; approximately 100,000 people rely on Indus delta and deltaic aquaculture and fishing industry. Since many years the deltaic region remained declined and its capability was disregarded. About 42% area of mangrove forests has been shrunk in past twenty years, due to the negligence and scarcity of the water. As a result of that, coastal culture is vanishing day by day to a greater extent; therefore, it is proposed to cease such activity for the development of sustainable habitats.

Keywords: Ecosystem, Mangroves, Eco-tourism, Urban Activity.

Introduction

The Sindh Indus Delta is plagued by numerous problems-among them are the consumption and degradation of mangrove forests due to an absence of understanding of their economic and ecological value; sea intrusion onto agricultural land because of diminishment and reduction in freshwater flow to the Indus Delta (with consequent impacts on livelihoods); over-fishing and damaging fishing practices (for example the use of small-mesh nets); illegal wildlife trade; and an absence of basic education, health, and market access. The aim of this research is to promote integrated coastal management in certain areas while addressing the factors that add to contribute to livelihood vulnerability. This will be done by conferring environmental education in schools, conserving coastal biodiversity assets promoting eco-tourism and building limit in coastal communities with the goal that they can better manage their livelihood resources.

This paper will through light on the Degradation of Indus Delta and Proposal for sustainable rehabilitation and habitat. This research has come up in the aftermath of the mentioned constraints which focuses upon an alternate ecosystem. The Indus River is one of the world's longest rivers with a length of 2880 km. The river lagoon compasses parts of four countries (Afghanistan, China, India and Pakistan), spanning from the Himalayan mountains in the north to the alluvial and terrestrial plain of Sindh in the south. The river travels southwards across the Punjab and Sindh Provinces in Pakistan before entering the Arabian Sea through a delta close to the border with India. The size of the Indus

region is 1,081,788 km2. The absolute available freshwater discharge and flow in the Indus is about 180 billion m3, sustaining with it some 400 million tons of silt.

Significance of Indus Delta

The Indus River is critical for Pakistan's millions of people. Pakistan's economy relies heavily upon the productivity of its resources, and water in particular. The agricultural region uses up to 90% of Pakistan's entire water resources, outcomes one-fifth of its gross domestic product, endows to more than half of its exports, and employs half the labour force. The Indus Delta situated in Sindh Province is a landmark of Pakistan's coastline stretching up to 150 km along the Arabian Sea, formed by the flow of extensive quantities of silt washed down from upland and mountain areas. The Indus delta is among the fifth largest delta system in the world and has the seventh largest mangrove forest system. The existing delta covers an area of about 600,000 hectares and it is characterized by 17 dominant creeks and countless smaller creeks, mud flats and fringing mangroves. The Indus River delta is immensely generative area for freshwater fauna and an important region for water birds. It has been designated as a Ramsar site (a wetland of international importance) and a wildlife sanctuary. Prior to their destruction and devastation, the riverine forests of Sindh used to be a flawless habitat for hog deer. The Indus houses 25 amphibians and 147 fish species of which 22 are not found somewhere else in the world. In the historical days the delta was a hub of fishing, navigation and different exercises for major countries along the Arabian Gulf. With the establishment and modernization of Pakistan several dams gave the idea that considerably reduced the size of delta on account of the low water and simultaneously low sediment discharge in the sea. Hundreds of thousands of people directly or indirectly depend on the Indus delta and its ecosystem. For centuries local people were getting fuel wood, feed for the creatures from the mangrove forests. In addition to that other species were also useful source of food and income. Over the last five decades, mangrove forests being the house of several species and different creatures in Sindh, has been liable to over abuse and monstrous populace weight, and are in this manner decaying quick in the amount and in addition quality. Without understanding the worldwide criticalness, mangroves are being cut brutally. Close urban zones, mangroves are cleared for formative exercises. Lessened water stream in the River Indus – 6th biggest waterway on the planet — after the development of dams and floods upstream is additionally making harm mangrove backwoods and biological community they bolster. Avoidance regarding Protecting the Sindh Indus delta is a major issue which is not yet identified. The retrospective background related to the Sindh Indus delta is a fact that it provided the area with plethora of resources, it included timber which was used as charcoal for burning purposes. The delta was consisted of three parts, the upper part consisted of tamarisk forests and the other parts were consisted of sohand, pal grass and lana shrubs. It also provided an environment for the marine life to conceive and expand but poor maintained of protecting it jeopardized the sustainability of being able to provide resources so that they don't get scarce.

Methodology

The nature and complexion of this disquisition or research paper is qualitative. The procedure used is the analysis, "World Resources Report Case Study. Mangrove Restoration and Rehabilitation for Climate Change Adaptation in Vietnam" and "Reality of Indus delta (The global journal) written by Neil Powell, Maria Obseck and Arain S. Ghulam respectively in the light of degradation of Sindh Indus delta and proposal for sustainable rehabilitation of habitat. The data collected and complied for this research is through print media and electronic media like books, articles, journals etc.

Degradation of Indus Delta: Causes and Consequences

Cost of environmental degradation in Indus delta

Situated on a high wave-vitality coastline, the Indus Delta is vulnerable to erosion and rapid sea encroachment due to a rise in sea level. Less flow of fresh river water has exposed this ecosystem to environmental and social problems for example, loss of habitat and biodiversity and a decrease in the

profitable values of the environment. The increase in the salination in water is increased with the pace of time; people are left with no choice but to migrate to Karachi in the vicinity of Korangi. District Thatta played a vital role in rejoicing the perks Pakistan enjoyed in regard to the realm of agriculture but the conditions of water made a massive loss in the economy generated by agriculture in Thatta.

Land degradation

It has been estimated that the area of the Indus Delta has been decreased from 3000 km2 to 250 km2 due to several reasons. The active delta is now only 10% of its original area. It is assessed that up to 67 km of salt-water intrusion has occurred prompting the destruction of Indus delta and the groundwater resources. The salinity in the delta has increased and it is not odd to find salinities of 40–45 ppt or more in particular locations in the small creeks of the Indus Delta. Thatta is a major agricultural district in Sindh Province which is situated where the Indus River flows into the Arabian Sea. Much of the cultivable area has been adversely affected by salt-water intrusion. Approximately, up to 0.5 million ha of fertile land in District Thatta and adjoining regions, or around 12% of the total cultivated area in the entire Province, is now deteriorated by salt-water intrusion. According to a recent research (WWF – Pakistan, 2009) comparing changes in the coastline since 1952, the rate of erosion, and detectable changes in cropping patterns, average mud flat erosion in Keti Bunder (a major coastal town) amounts to 20 m per year. Indus delta facilitated in terms of providing ghee, butter, red rice and other agriculture productions and boosted the export system of agriculture production. Construction of the sukkur barrage endangered the delta process of flowing the fresh water. The new developments in the specific region played as an dissonance to the fishing occupation and its business but it hazared the breeding of mangrove eco system of the underwater creatures such as the palla fish, which is now almost extinct.

Loss of livelihoods

More than half a century ago Keti Bunder was a flourishing and prospering port city consisting of vast agricultural lands and rich in marine resources. Ships from as far as Europe used to anchor here. Its main agricultural product was Sindh ganja (red rice), coal, desi ghee (butter) and wood; it was wealthy to the point that its district once gave a loan to the Karachi municipality. The area was extremely suitable for the production of banana, coconut, melon and watermelon.[1] Presently, land degradation in the Indus Delta has prompted loss of yields and extreme harm to domesticated animals through rangeland consumption, lack of grain, field and watering regions, and a subsequent mass displacement of animals and human populaces. Both aggregate crop production and fish catch decreased steadily as salinity increased. A study conducted in three Talukas (administrative sub-units below District level) of the Indus delta including Keti Bunder, Gora Bari and Kharo Chan demonstrated that 30000 family units in these Talukas had brought about average annual losses of US$70000 in crop damage and US$45000 from reduction in fish catches as a result of salt-water intrusion (IUCN, 2003). On a broader spectrum, other observations and researches reflected that loss of dense mangrove forests has threatened the lives of more than 135000 people who depend on mangrove products to a total economic value of some US$1.8 million per year for fuel wood and fodder, and a coastal and marine fisheries sector that generates domestic and export earnings of almost US$125 million. Indus delta encompassing Sindh region was the most fertile area in comparative terms with the rest of the indus. The sohand and the the pal grass in the lower part of a delta was a sufficient resource for feeding animals such as buffalo.

Degradation of mangrove forests

There has been a substantial qualitative and quantitative loss of mangrove forests in Pakistan over the last 50 years. The area of mangrove forests in the Indus delta fell from 263000 ha in 1977 to 160000 ha in 1990, 106000 ha in 2003 [2] and to around 73000 ha in 2006 [3]. The evaluated loss of financial incentive for this 72% decrease in absolute mangrove cover in the Indus Delta is roughly US$ 616 million out of 2010. This figure depends on per-hectare esteems for fisheries, carbon sequestration and

species security got from a WWF – Pakistan think about on the aggregate monetary estimation of biological systems subject to the Indus River. It might intrigue approach creators to realize that carbon sequestration makes up 7% of thetotal loss(or US$ 44 million), while fisheries makes up right around 90% (or US$ 548 million) and the rest of the US$ 22 million identifies with non-utilize values set on species assurance by an agent test of Karachiites. The decay of Indus delta mangroves results in resource base reduction are reduced flow of pure water and navigational measures, alluvium from river Indus, intermix of industrial effluents, browsing/ grazing by livestock, wood & fodder harvesting, river meandering and erosion of creek banks, over fishing by nets with small holes and a gradual rise in sea level

Loss of fisheries resources

According to the Fisherfolk Forum, yearly fish creation has diminished from 5000 t in 1951 to only 295 t and the catch of shrimps has fallen by 47% over the most recent 10 years. Palla (Tenualosailisha) once ruled the fishery of Sindh with a record catch of 7900 tons in 1959, yet the gets of palla and dangri (Latescalcarifer) have declined from 600 tons in 1986 to 200 tons in 1995. Presently, It represents barely 15% of the total catch.[4] Loss of fish species because of changes in water quality or over-angling may bring about emotional moves in biological community elements, as touching weight on spineless creatures and green growth can be discharged, empowering fast development and potential sprouts of algal populaces.

Migration from the deltaic areas

Because of the displacement from the Indus Delta, around 300000 individuals have moved from the deltaic zones to Karachi and Hyderabad and in addition to the close-by town of Gharo. There has been an extensive movement to Karachi in the current years, where the local people end up living in the city's vast slums. [5]

Change in land-use patterns

Standard of living is worsening day by day in these communities and due to financial constraints, most people are forced to change their professions. Most of the livestock keepers have become wood cutters and the agriculture community has been largely converted to the fishing profession calling with unfriendly consequences for fisheries. Loss of fisheries and agricultural lands have constrained groups to embrace unsustainable practices, for example, utilizing illicit fishing nets and developing betel leaves with an over the top use of agrochemicals again harming the marine life.The other threats responsible for the downfall of the delta belt includes lack of awareness and knowledge, mismanagement, frequent exploitation, browsing and less frequent and low tides over deltaic region.

Sea Water Intrusion

The ceaseless reduction in fresh river water inflow below Kotri barrage is leading to salt water intrusion which alters the geomorphology of the delta and nutrient balance of the ecosystem. It is estimated that the sea water intrusion has taken place up to 67 km resulting in not only damaging terrestrial ecosystem in deltaic region but also affecting adversely the agricultural fields and other habitats. In the 1980s to 1990s, Korangi creek had a lot of fish but with the increase in the pollution the scarcity of it is highlighting it to be a real issue. It is getting polluted perpetually by the means of municipal sewage, Industrial effluents, domestic sewage and industrial estates. It gets contaminated not just by bacteria but along side toxic chemicals which then starts to flow to the areas of malir and lyari rivers and possess a serious threat to the marine life. However, The korangi creek still maintains to be a mangrove forest as it has been rehabilitated by the local authorities. Sea intrusion and water logging are major issues which degrade the Delta belt.

Over Harvesting

Over harvesting mangroves and fish by coastal communities is another cause of the destruction of these valuable assets, the mangrove forests. It is, however, difficult to find out the extent of damage due to its frequent use by local communities. Mangrove forests have remained a wellspring of fuel, timber, and fodder for coastal communities in almost all estuaries. As a consequence of increased population and poor physical infrastructure, demand for mangrove forests increased for firewood which is as important for their life as oxygen. Lack of alternate fuel wood worsened the issue. Alternatives such as kerosene oil or natural gas, are either not available or too expensive for the local communities. Although Timer wood is not favourable fuel wood compared to Rhizophora species due to lower calorific value and tendency to smoke, it is still used extensively by local people for domestic use. It is seldomly sold outside the coastal areas. The use of mangroves fuelwood is directly related to the population of the people living in the coastal areas. The diagnostic survey of Indus delta shows that 25% of households depend on mangrove wood for cooking & heating purposes.

Result and Discussion

The reduction of fresh water in River Indus is extremely unsafe for deltaic flora and fauna. Saline sea water intrusion is expanding day by day. Saline water contents are very harmful for horticulture and fruit plants. Due to reduction of Fresh water over the most recent 60 years this ratio of deposited soil is reduced, this is main cause of devastation of delta. In last two decades, four different types of Mangroves are totally washed far from the zone because of deficiency of fresh water. But, Avicenna Marina, Ceriops Tagal, Agi Ciras Corniculatum and Rhizophora Mucronata species are found here. Besides all the discussion, it is resulted that the Indus delta is dead, and the lower delta area that the immense waterway made, is biting the dust. In spite of the fact that there is no hope to reactivate the delta channels, it is conceivable to restore the mangrove environment and spare the marine and human populace of the locale from elimination. It is trusted saving the delta region will be a priority with the government of Pakistan, and that apart from an affirmation of intent and the commissioning of studies, some practical work will soon be commenced. [5]

Recommendations On Sustainable Rehabilitation of Indus Delta

- Policies should be made accordingly, to conserve the mangrove forests for the future green peace on Indus delta Sindh Pakistan.
- Fresh water issues could be solved in addition to make strong socio-economic conditions over the indus delta group and their livelihoods.
- Institutions can play great role in saving the mangrove forests and make fresh water approaches at indus delta to, diminish the weight of dams on upstream. It denied the lower stream group living conditions.
- The entire aquatic and terrestrial biodiversity need to be conserved particularly the mammals, water-birds and the mangroves. Protecting the existing mangroves should also be a priority.
- There is a need to prepare Management Plans for the Indus Delta region Wildlife Sanctuary outlining conservation initiatives such as community;
- An attempt should be made to control the feral dog population in and around Indus Delta region. This will not only help conserve the bird population but will help wildlife in general.
- Rehabilitate the marine and wildlife at the coast.
- Provide occupation to the local public.
- Attract the public in vicinities of the region towards the mangroves in terms of the better job opportunities.
- Accommodating the increasing population (local public/migrants) with suitable housing schemes.

- Complying with the standards of the world wildlife federation (WWF) and preserving the aquatic and other wildlife getting extinct.
- Developing an intermediate land between the waters and the dry land; wetland and swamps.
- Improving the overall ecosystem by increasing and harvesting a larger number of the existing Mangrove trees.
- Harvesting special flora and fauna (forestry and farming).
- Promote ecotourism in the mangroves for the entire region.
- Running an ecological training program in schools through awareness sessions, educational visits and dissemination of posters;
- Conducting research in the illegal trade of freshwater turtle and suggesting measures for addressing the same;
- Conserving sea turtles by securing their nests and creating awareness among beach hut watchers;
- Building the limit of fisher folk in natural resource management;
- Promoting mangrove based eco-tourism by building the required framework, developing an eco-tourism operational plan,
- Usually, rural populations living nearest to ecotourism resorts have low earnings, having a not very many feasible monetary alternatives; ecotourism can be made more viable by including local inhabitants in tourism activities.
- Ecotourism can speak for these people a valid economic alternative, with the extra favorable position that these tenants, through successful training and orientation, can be changed into efficient wardens and conservationists of these natural areas. Their welfare and quality of life depend on preserving their natural environment.

Conclusion

Indus Delta Is facing the lot of problems; a couple remedies are recommended for long survival of Indus delta. The Indus Delta is degrading from last two decades. The region and resources of Indus delta are reduced and facing the lot of trouble, government should take action under the crisis essentials. With interviews of all provinces and territories, fair water policies should be created and implemented to ban construction of any project above Kotri barrage until requirements of the Indus Delta and is Mangrove forests, due to it is specialized, technical, political and very sensitive issue between the provinces. The ecological role of Indus delta ecosystems is, economically and socially, highly significant. The Indus Delta region and its mangroves are well known for their high biological productivity and their consequent importance to the nutrient budget of adjacent coastal waters. They export organic matter, mainly in detritus form to the marine condition, hence giving a very nutritious nourishment food source for themselves and for the Benthic and terrestrial animals found in the mangrove areas as well with respect to those in neighboring estuarine and marine environments. Thus, they support local and commercial fisheries yields. Apart from nutrient export, mangroves also contribute to offshore fisheries by acting as nurseries and sanctuaries for some types of monetarily vital finfish and shellfish. The matter is difficult to find solution however efforts should be focused towards efficient development of the water system so that proper fresh water flow is maintained. Indus Delta with its resources needs to be managed and conserved. Since the ecology and the biodiversity of the region under discussion is highly rich, but on the contrary, there is almost zero institutional setup, preservation of the marine life, Aquaculture and the forests(mangroves) ; therefore it is high time to realize the conditions and take measures accordingly. Other minor threats include lack of knowledge, mismanagement, over exploitation, browsing and less frequent and low tides over deltaic region. Therefore, the need for monitoring of these depleting natural resources through latest airborne hyper spectral remote sensing techniques and rehabilitation of these forests through artificial planting of suitable species in the changed ecological conditions is extremely desirable.

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