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Indus for All Programme

The journey towards a prosperous Indus ecoregion

Glimpses of 2007 - 2008



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All images have been contributed by the Indus for All Programme except where indicated. We thank all the contributors.

Publication compiled and written by Rina Saeed Khan

Edited by Dr. Ghulam Akbar

Text and Editorial Support by Rab Nawaz, Nasir Ali Panhwar, Muhammad Zafar Khan and Ali Dehlavi

Cover and Design by Nida Shams

Printed by Pleasant Services Karachi

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This Publication is developed and published under the Communications and Awareness Raising Component of the Indus for All Programme, WWF - Pakistan.

Top to Bottom:

- 4th meeting of the Indus Ecoregion's Steering Committee.
- A group of schoolchildren celebrating their best performance in Nature Carnival - 2008 in Karachi.
- Mr. Fred Smiet and Ms. Yasmeen Jawed, officials of the Royal Netherlands Embassy along with Programme staff visiting a creek near Karachi coast.
- Team Leader: Indus for All Programme presenting a souvenir to the Secretary Forest and Wildlife, Government of Sindh for his participation in Nature Carnival-2008.

Indus for All Programme

The journey towards a prosperous Indus ecoregion

With the introduction of Global - 200 in 1997, WWF embarked on a new approach of conserving biological diversity and ecological processes around the world. The approach involved addressing a broader range of issues and partnerships on a larger landscape level.

As part of Global 200, the ecoregion conservation journey in Pakistan began with the Indus Ecoregion, which is one of the 238 ecoregions in the world and also among the five which exist in Pakistan.

The basis for Indus Ecoregion Programme is a study titled “Root Causes of Biodiversity Loss in Mangrove Ecosystem” conducted in 1999. This was followed by a rigorous consultative process in 2002 and 2004 towards making the Indus Ecoregion Plan.

The first six-year implementation phase of the Indus Ecoregion Programme started in 2006 and is known by the Indus for All Programme, which marks the beginning of the ecoregion journey in Pakistan.

Government of Sindh's Perspective



It gives me immense pleasure to note that the Indus for All Programme, being implemented by WWF - Pakistan, has completed one and half years apart from its inception period of nine months. The content of this report is evidence that much has been achieved in a short span of time. Sindh faces numerous ecological, social and economical challenges and these can only be addressed through a pragmatic and integrated approach. As the Chair of the Steering Committee of the Indus Ecoregion Programme, I have been closely associated with the Programme and noted the valuable guidance and support provided by the diverse Committee members.

The ecological crisis is so complex that no single organization can address it in isolation; hence I am impressed by the 3M approach adopted by the Programme, whereby the stakeholders representing micro, meso and macro levels are engaged in implementation throughout. The Indus for All Programme stems from the Indus Ecoregion Plan and aims to address priority aspects relating to sustainable natural resource use practices in the ecoregion. The synergy developed by Indus Ecoregion Conservation Plan and the Sindh Vision 2030 is another outstanding effort of the Indus for All Programme's team. It is because of this strategic approach that various departments of the Government of Sindh are developing their future plans to achieve both livelihood and nature conservation objectives.

I hope that in the coming years, the Programme will make a lasting impact on the local communities and natural resource management will become a successful model, that will also be replicated by other stakeholders.

Nazar Hussain Mahar

Additional Chief Secretary (Development),
Government of Sindh

Views of the Royal Netherlands Embassy in Pakistan



The Royal Netherlands Embassy considers Indus for All Programme as one of the pillars of our programmes in Pakistan. The annual investment of RNE on the environment is 14 million Euros and all our programmes are first and foremost about people, in this case, the people in the Lower Indus. Certainly plant and animal biodiversity are important and so is the preservation of ecosystems but what attracts us to support this programme is the focus on people and their livelihoods. People should be living in harmony with nature and in coexistence with biodiversity - not in conflict with it.

I am confident that WWF - Pakistan is well positioned to manage such a complex programme. As a strong NGO, it is able to bring stakeholders from all different levels from the local to the national. It is able to bring different levels of government from tehsil to district up to provincial and national. Furthermore, WWF has acted in similar programmes in other countries. I have asked them to bring their experience from other countries to the Lower Indus area as one can learn from international experiences. In the future, the Lower Indus can be an example for the rest of the world. Finally, as in all large river basins, the Lower Indus depends on development in the Upper Indus, basically, the rest of Pakistan.

Together WWF and Indus for All Programme must be alert on all developments that might take place upstream and that affect the livelihoods of people downstream. I have visited some of the field sites and I was very impressed not only by the commitment shown by the field staff of WWF, but also the local people's commitment to the programme, and the commitment shown by the Government of Sindh in the integration of the Indus for All Programme into Sindh Vision 2030. With the preparations finalized, it is now time for the programme to engage in action on the ground and to improve the lives of local communities. I wish them well.

Fred Smiet

First Secretary/Senior Advisor Environment & Water,
The Royal Netherlands Embassy in Pakistan

WWF - Pakistan's View point

WWF-Pakistan feels privileged to be playing a pivotal role in the implementation of the Indus for All programme. This is one of the two large programmes that WWF - Pakistan is directly involved in implementing, the other being the Ministry of Environment's Pakistan Wetlands Programme. Both programmes are a challenge to WWF - Pakistan in terms of scaling up our successful interventions from local to regional and national levels.

During the programme launch in August 2007, some of the WWF staff visited Keti Bunder, one of the field sites of the programme along the Indus Delta. It was heartening to see that very small interventions can bring substantial benefits to communities. A small wind turbine installed as part of this Programme is providing electricity to a village of about 20 households, a village where there was no electricity and no school. Through the Programme a small hut has been established and teachers are being recruited to provide schooling.

Of course, the real challenge is to maintain and scale up these efforts, that the wind turbine keeps working and the schools have teachers that come regularly. There were some shocking realizations; 50 years ago the Keti Bunder town council gave a loan to the Karachi town council because they were more prosperous. Now the very existence of this remote community is uncertain.

Clearly, the community of Keti Bunder has suffered because limited resources such as irrigation water was diverted for use by others. These are the typical consequences of linear strategies of "development" that often benefit only selected sections of society.

So, learning from these new insights, we expect that the Government of Sindh, and civil society will become more sophisticated and thoughtful in designing future development strategies and programmes. These need to be based upon sound research of ground realities, and balance the needs of both ecologically significant areas and local communities.

WWF - Pakistan appreciates and acknowledges the willingness and excellent support of the Government of Sindh, especially since this programme often creates pressure on government institutions to change the way they operate.

Ali Hassan Habib

Director General
WWF - Pakistan



Achieving Programme Goals - A Prologue

Indus For All Programme has completed 18 months of its implementation (January 2007-June 2008). In this period, the Programme made significant on-the-ground progress at all four sites and continues to lay the foundation for influencing government policies and plans. In the wake of significant changes to Pakistan's socio-political canvas, beneficiaries were not made to feel any slackening in activities and field staff demonstrated integrity as they pressed on with their work.

The recent political upheaval has not only altered attitudes but affected partnerships as government stakeholders at all levels were reassigned to entirely new portfolios. Inflation reached 17.2 per cent in April 2008 from 6.9 per cent a year earlier, recording its highest year on year change in three decades. At the time, food inflation reached 25.5 per cent, from 9.4 per cent a year before, exactly at the start of the Programme's implementation period. Sadly, as Programme beneficiaries suffer a decline in real income and are hard hit by price hikes in food, fuel and lighting, medicare and education, we foresee them to heighten their consumption of natural capital in order to survive. While the framework within which Programme investments take place is a prime concern, the question of implementation is essential also. In this regard, we note an inflation-induced erosion in the Programme's overall budget in the January to June 2008 period.

To reiterate, despite the odds, the Programme has achieved strong progress on the ground. The results of the socioeconomic and ecological assessments, after rigorous internal and external reviews, are now available. Some of the socioeconomic parameters

measured include; poverty head count, household size, literacy rate, disease prevalence, household expenditure, toilet facilities, sources of drinking water and communities' dependence on natural resources, among others. With regards to species diversity, new floral species were discovered at both Keenjhar Lake and Pai Forest while some species were re-discovered at Keenjhar Lake. The process of community mobilization has matured significantly since last year, as the target for the number of Community Based Organizations (CBOs) to be formed was achieved at three of the four Programme sites and Memoranda of Understanding (MoUs) were signed with new and existing CBOs. Development interventions initiated this year such as establishment of vocational centres for girls at all the four sites, installation of wind turbines, provision of water boat tanker at Keti Bunder will aid in coping with the challenge of establishing more female CBOs.

Concrete recommendations from detailed surveys of riverine forests upstream Sukkur and downstream Kotri will be instrumental in attracting the attention of policymakers to the poor state of the riverine forests in Sindh and deteriorating state of livelihoods of the dependent communities. The Friends of Indus Forum finalized its charter and membership criteria during its second meeting in April 2008, which further strengthened the group's commitment to advocate poverty-environment issues of the Indus Ecoregion at the provincial and national levels. The Programme has recently launched an Indus Ecoregion Environmental and Social Digital Atlas that will provide up-to-date environmental and socioeconomic information to users at the landscape level. Moreover, Decision Support Systems (DSS) have been developed for each Programme district. These provide a detailed knowledge base for environmental management at the district level in order to strengthen district-level planning.

A prominent feature of the Indus for All Programme is the Partnership Fund. It is a Small Grants Programme, which will address needs and assist interventions made by the government, local NGOs / CBOs and the academia in the Indus Ecoregion in particular and also in the Indus Basin, in general.

The 5-month funding suspension (December 2007 to April 2008) was perhaps the biggest challenge for the Programme this year. The slow pace of activities presented a major hurdle in maintaining the trust established with local communities and policy-makers. Staff at both the Programme Management Office and the Field Offices shifted their focus from their regular activities to smaller tasks specifically focused on ensuring that these relationships are not compromised with communities; if, however, the suspension had been prolonged for another quarter, the Programme would have faced serious setbacks.

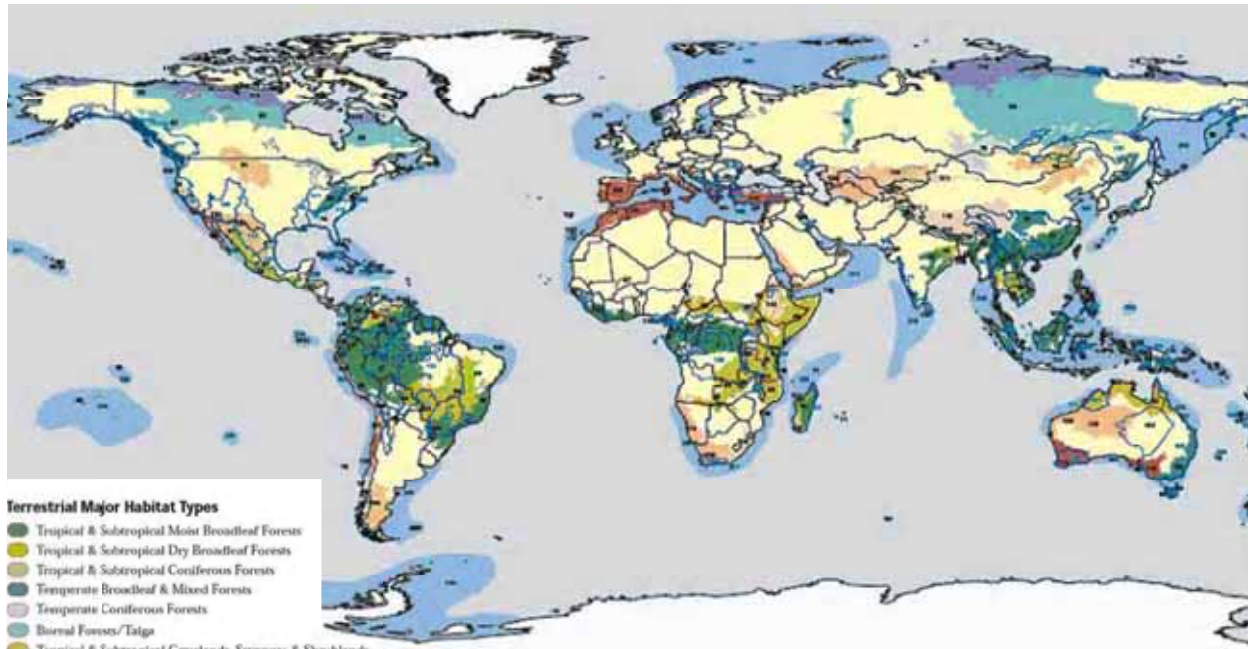
The Programme continues to identify appropriate solutions to protecting the fragile biodiversity at the Programme sites which lie altogether outside site-level interventions and the planned 3M interventions such as strengthening of non-resource-based income sources. A prime example is advocating for the increased flow of the Indus River itself. By instituting a WWF initiative outside of the framework of the Programme, the Friends of the Indus Forum (see <http://foreverindus.org/indusforum>), advocacy will be tested as a tool to develop an enabling environment (political and legal) for individual initiative and private enterprise in support of the Indus Ecoregion Conservation Vision.

Dr. Ghulam Akbar
Team Leader
Indus for All Programme
WWF - Pakistan

Global 200 Ecoregions

The Global 200 is a ranking of the earth's most biologically outstanding terrestrial, freshwater and marine ecosystems. It is the first comparative analysis of the earth's ecosystems that covers all habitat types on the planet, providing a blueprint for biodiversity conservation on a global scale. In 1997, the World Wide Fund for Nature-International (WWF) with support from other scientific institutions such as the United Nations Environment Programme, Birdlife International and the National Geographic Society carried out the Global 200 analysis that resulted in

identification of 238 ecoregions. An ecoregion is defined as "a large unit of land or water harbouring a geographically distinct assemblage of species, natural communities and environmental conditions". The natural resources and conditions of an ecoregion provide the basis for the development of ecoregion conservation programmes, action plans and a long-term biodiversity vision. The Global 200 ecoregions have been scientifically prioritized to reflect their ecological significance and representation of our planet's biodiversity richness.



G-200 Map showing global biodiversity hotspots called ecoregions

- Top to Bottom:**
- Tibetan Plateau: © WWF - Canon / Ronald Petocz
 - Western Himalayan: © Rab Navaz / WWF - Pakistan
 - Rann of Kutch
 - Arabian Sea: © WWF - Canon / Martin Harvey





The Indus Ecoregion

The Global 200 analysis identified five ecoregions in Pakistan. The Indus Ecoregion is the only ecoregion that lies fully within Pakistan's boundaries, while all the other ecoregions are trans-boundary. The other four trans-boundary ecoregions are: Western Himalayan Temperate Forests, Tibetan Plateau, Rann of Kutch and the north Arabian Sea. The Indus Ecoregion is one of the priority ecoregions at regional level and the most prioritized ecoregion of the five Global-200 ecoregions falling within Pakistan.

The Indus River provides mineral-rich soil and water to its floodplains and gives rise to extensive mangrove forests in the delta region. Indus Ecoregion is home to a number of endemic species like the Indus blind dolphin, Rita Catfish and ten plant species. The Indus Flyway is a globally recognized route for migratory birds from Siberia and Central Asia. There are concerns, however, that extensive deforestation, industrial pollution, sea water intrusion and global warming are affecting the vegetation and wildlife of the Indus floodplains, while ruining agricultural production as well. This is also one of the poorest regions of Pakistan, literacy rates are very low, big landlords control most of the land and the local communities are almost completely dependent on natural resources for their survival.

The ecological significance of the Indus Ecoregion has led WWF - Pakistan to concentrate the majority of its initial efforts on this ecoregion which is located mainly in the southern province of Sindh. Initial planning for activities in all the other ecoregions has also been started. The successful planning and lessons from the Indus Ecoregion Programme will provide a platform for developing conservation programmes in other ecoregions in Pakistan.



Sindh map showing boundaries of Indus ecoregion.

Vision of the Programme

“Mankind co-exists with nature in complete harmony and biodiversity flourishes in its respective habitat”

Top to Bottom:

- Indian Roller (*Coracias benghalensis*), one of the unique bird species found in the Indus Ecoregion.
- Babul (*Acacia nilotica*), a commonly found tree species in the Indus ecoregion.
- Indian Cobra (*Naja naja*), found in the Indus ecoregion.
- Water lotus, a common scene in freshwater wetlands in Sindh.

History and Heritage of Indus Plains

The Indus River has given its name to India and its flood plains have been extremely fertile, giving birth to one of the world's old civilizations. More than 4,500 years ago, this is where the ancient Indus civilization began. Excavations reveal that there were two main cities: Mohenjodaro and Harrapa, located three hundred and fifty miles apart in the plains of the Indus. Besides these cities, there were several other smaller towns. The inhabitants of the Indus built canals and used the water for irrigation. Their towns were exceptional, they were laid out on a rectangular grid system and the streets were lined with flat, double storey houses made of burnt bricks. The houses had bathrooms and rubbish shoots and excellent drainage systems. The people of the Indus built no palaces or temples and were quite content to live in the same manner as their forefathers for hundreds of years. Then the nomadic Aryan tribes invaded India around 1500 BC, destroying the Indus valley civilization and killing its inhabitants. Thus ended one of the most advanced civilizations of the ancient world.

Much later came the Arab Muslim invasions into Sindh. Mohammad Bin Qasim, the young Arab invader, built a castle at Bhambore, at the base of the Indus River in the 7th century. Mohammad Bin Qasim established the first Muslim presence in this region. Later Islam was spread throughout this area through the Sufi saints. These mystics preached love and tolerance and won over the Hindu population who converted in large numbers. Many of these saints are buried in the Makli necropolis, one of the largest graveyards in the world, located near the city of Thatta. It is said to be the burial place of over 125,000 Sufi saints! This region is also home to one of the world's largest forts, called Rani Kot. This gigantic fort with solid walls runs 35 km in length and connects barren hills. It was used by the Talpurs who ruled Sindh from 1783 to 1843. Their resplendent sand stone tombs, embellished with delicate carvings, are found across Sindh.

People and Wildlife of Indus Ecoregion

The Indus Ecoregion covers approximately 65% of the province of Sindh, occupying 22 districts while a small part of the ecoregion extends slightly into Balochistan. Located in an arid and semi arid climate, the ecoregion is home to riverine forests along the Indus River, mangrove forests in the coastal areas and desert ecosystems in the periphery. The ecoregion also includes freshwater lakes like Keenjhar, Haleji, Manchar, Baqar and Hadero and brackish water coastal lagoons like Narreri, Jhubo, Mehro, Sanhro and Pateji.

These diverse ecosystems are home to different species, from Marsh crocodiles to Hog deer. The local communities who live there, are dependent on their natural resources for survival. In the delta region, these communities are mostly fishermen, mat makers and small agriculturalists who own livestock. The local people say that due to decreased freshwater in the Indus River and seawater intrusion, their lives have become very difficult. Since the days of British colonial rule a series of dams and barrages have tamed the Indus River as it weaves its way to the Arabian Sea. The river's decline has been devastating to those living along its banks in the south. Not only is there less freshwater in the river, the environment is also threatened by increasing pollution, illegal hunting and logging, climate change, population growth, bad governance and desertification.

Some of the more threatened species in the Indus Ecoregion include the Hog deer, Chinkara, Palla fish, Marsh crocodile, Gavial, Smooth coated otter, Indus Dolphin, Green turtle, Marbled Teal duck, Houbara bustard and vultures. The indigenous tree species which are at risk are Kandi, Gugar, Lohero and Bahan.

Top to Bottom:

- Mohenjodaro: One of the world's oldest civilizations (4,500 years ago) that exist in the Indus Plains in the ecoregion © Nasir Panhwar.
- Grey Heron (*Ardea cinerea*), the ecoregion is home to a largest number of water birds.
- A view of Keenjhar lake; the largest freshwater lake in Pakistan.
- An old traditional Bungalow in Chotiari: representing the unique architecture of Sindh.





Organising the communities

The social mobilization process is ongoing, with new community-based organizations (CBOs) being formed at each of the four priority sites. Some of the CBOs have started work by holding meetings, celebrating World Environment Day and preparing project proposals. A total of 9 CBOs have been formed and 14 MoU's signed in the Indus Ecoregion. Trainings and exposure visits are being organized for the CBOs. So far, the CBOs have collaborated with the Programme by organizing medical camps and livestock vaccinations in their area.



Programme Objectives

A series of workshops, consultations and other extensive efforts by WWF - Pakistan and various stakeholders culminated in the development of the Indus for All Programme. The overall objectives of this Programme, as a first phase of the Indus Ecoregion Conservation Programme, is to ensure improved natural resource management which will contribute to improved livelihoods and sustainable development. The Programme will also mainstream poverty-environment linkages at the policy, planning and decision making levels. The idea is to improve institutional capacity and awareness for sustainable environmental management at various levels and to improve alignment and collaboration for stakeholders' interventions.

With the local people claiming that the delta is dying due to the decreased flow of the Indus River below the Kotri Barrage, the Programme is much needed and welcomed in Pakistan. Currently funded by the Royal Netherlands Embassy in Pakistan, it is now in the first 5 years of the 50-year Vision of the Indus Ecoregion Conservation Programme.

The objectives of the Indus for All Programme have been designed in light of WWF-Pakistan's extensive experience of working with local communities, realizing that only after engaging them in natural resource management and advocating for environment supporting policies they can achieve lasting change on the ground. To achieve its objectives, WWF - Pakistan also realized that it needs to work with a number of partners at all levels to gain support for various interventions, policy changes and coordination of diverse stakeholders. Every partner in the viewpoint of Indus for All Programme has its unique standing and importance; however, local communities, provincial governments and non-government allies stand high because of their direct role at the site level.

Joint Ownership of the Programme

The Indus for All Programme, during its current phase, is operating at four sites of the Indus Ecoregion representing critical ecosystems in Thatta, Sanghar and Nawabshah districts. During the planning stage, it was envisioned that district governments and the local communities would take joint ownership of this programme by notifying District Coordination Committees (DCCs) under the chairmanship of the concerned District Coordination Officers (DCOs). It was further envisaged that representatives of the local government departments, Community Based Organizations (CBOs) and Local Non-Government Organizations (LNGOs) will become an integral part of the DCCs.

At the provincial level, the Indus for All Programme is overseen by the Indus Ecoregion Steering Committee, chaired by the Additional Chief Secretary (Development) of the Planning and Development Department, Government of Sindh and represented by five provincial secretaries of the most relevant departments such as Forest and Wildlife, Environment, Fisheries, Irrigation and Finance. The heads of the Coastal Development Authority and Sindh Irrigation and Drainage Authority are also members of the committee as are representatives from the academia, Planning Commission of Pakistan, and civil society organizations such as Pakistan Fisher Folk Forum, IUCNP and UNDP Small Grants Programme.

The Indus Ecoregion Steering Committee started functioning before the inception phase of the Indus for All Programme and within the first few months of the implementation phase, all the three DCCs were notified, their first meetings held and decisions at the local level were taken. There appears to be willingness on the part of the provincial government departments and local communities to share their resources and make this Programme a success.

Top to Bottom:

- A view of the team building exercise organized for the Programme staff.
- The former Chief Secretary Sindh, Mr. Ejaz Ahmed Qureshi and the former Additional Chief Secretary Sindh, Mr. Ghulam Sarwar Khero viewing the painting exhibition organized by the Indus for All Programme.
- Sharing experience among community members: Keenjhar communities visiting Sonmiani.

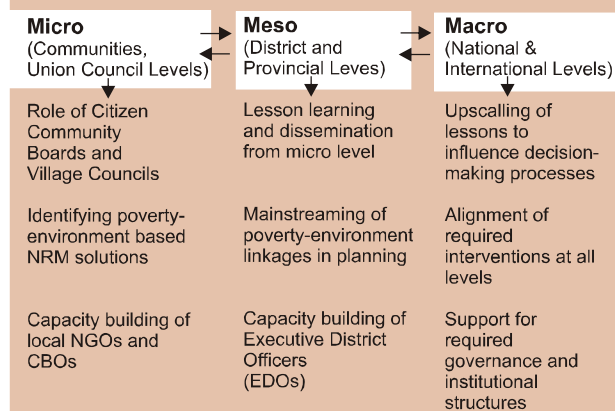
Conservation Information Centres

The Indus for All Programme wants to establish four Conservation and Information Centres, one each at its sites. The objective is to provide information, create awareness about nature conservation and promote conservation activities among local communities. These centres will also promote alternate livelihood sources for local communities, who could one day take over the running of the centres. They will help the CBOs to engage in activities such as eco-tourism, organizing nature camping and adventure touring for schools and visitors and promoting local crafts.

Programme approach

The implementation of the Indus for All Programme will follow the 3M approach, which links changes at the local level (micro) with changes at the sub-national (meso) and national levels (macro) in an effort to synchronize field-scale lessons and community aspirations with policy-level decisions. At the micro level the Programme intends to address stakeholders at village and union council levels; at meso the stakeholders at district and provincial levels and at macro the stakeholders at national and international levels.

3M Approach



Implementation of the Programme

The Indus for All Programme has begun the implementation of priority interventions identified by the Indus Ecoregion Programme in July 2006. According to the planned timescale there was a 9-month inception phase from July 2006 to March 2007, followed by a 5-year project implementation phase from April 2007 to March 2012. This will be followed by a 3-month post-project implementation planning.

The scope of the Indus for All Programme includes recommendations that emerged from a number of consultations made during the ecoregion visioning process spreading over five years regarding the PRSP (Poverty Reduction Strategy Paper), NEAP (National Environmental Action Plan), National Devolution Plan and National Water Management Act, from 1999 to 2004.

Currently 15 priority sites have been identified by the programme. These encompass critical habitats such as mangroves and freshwater lakes. For now, the Programme is focusing on four priority sites in three districts selected for interventions. Those include Keti Bunder (deltaic ecosystem), Pai forest (forest ecosystem), Keenjhar Lake (freshwater wetlands ecosystem) and Chotiari reservoir (desert-wetland ecosystem). WWF-Pakistan has field offices in all four areas from where the project staff can work in the sites with the local communities.

Top to Bottom:

- A view of a meeting with creek community at Keti Bunder.
- Dr. Ghulam Akbar, Team leader, Indus for All Programme delivering a presentation in the Programme's launch ceremony.
- A view of the Programme Partnership Fund's Technical Committee meeting.



Partnership Fund

In addition to its extensive activity and operational budget, the Indus for All Programme also has a Partnership Fund built into the Programme. This fund will allow partners such as government departments, NGOs, academic institutions and local communities to implement projects with the assistance of the Programme's fund scheme. A Partnership Fund Technical Committee comprising members from the Government of Sindh, civil society organizations, academia and small grants programmes of different national and international organizations approve the project proposals for award of the funds.





Spreading awareness

The Programme has also prepared posters, brochures, leaflets and stickers for raising awareness about conservation issues in each of the four sites. The media has been invited to visit the four priority sites and report on the Programme's activities in the press and on TV. The Programme intends to complete an Indus Ecoregion documentary which will be shown on TV channels by the end of the year. There is also a school outreach programme to ensure that local school children become aware of the environmental issues facing each one of the sites.



Poverty-Environment Linkages

The rationale for developing the programme stems out of the poverty-environment nexus since the number of people living below the poverty line in Pakistan almost doubled from 17% in 1988 to 34% in 2007. During the first year of the programme, livelihood and natural resource management plans for all the four sites were prepared. Studies include socio-economic baselines, poverty profiles, ecological assessments and sensitivity surveys. Currently five ecosystem valuation studies are underway by an international consultant. Already 4 direct use surveys have been completed.

Additional studies include a Nara canal survey and a comparative study of the riverine ecosystems of up-stream Sukkur and down-stream Kotri.

Capacity Building & Trainings

A GIS lab has been established in the office of Sindh Forest Department at Hyderabad and various personnel have been trained in the application of GIS in Natural Resource Management including forest monitoring. A person has been deputed at the Sindh Forest Department Hyderabad and another at Sindh Government's Planning and Development Department. GIS data are being provided and a GIS based Social & Environmental Digital Atlas and a Decision Support System has been developed.

The Programme has organized exposure visits of senior officials of Government to India and Nepal in order to have first-hand experience of co-management of natural resources.

Trainings in natural resource management have also been provided to officials of the three target district governments, i.e. Thatta, Nawabshah and Sanghar. A traditional ecological knowledge study of the ecoregion is under way and a communication and awareness strategy has been developed. The www.foreverindus.org website has been developed and launched.

Friends of Indus Forum

This forum comprises conservation activists, writers, intellectuals and all those passionate about nature. They have come together to protect the natural heritage, biodiversity and natural resources of the province of Sindh including the River Indus. The forum agrees that the vicious cycle of poverty and destruction of natural resources has been exacerbated in recent years and that this trend first needs to be halted and then reversed to preserve the biodiversity richness of the ecoregion. This is an entirely voluntary forum, based on the interests of the individual members. The forum hopes to serve as an advisory body for the Government of Sindh and any other interested groups for the revival of the environment. It intends to lobby policy makers and involve the media, academia, youth and civil society to promote nature conservation. So far, three meetings have been held and an initial charter was shared with about 30 participants.



(Image of the home page of the Indus Ecoregion Programme's website)

Top to Bottom:

- A local woman preparing a mat from Typha grass: Local women in the ecoregion are heavily dependent on natural resources.
- Snaps of the resource material developed by the Programme to promote public awareness regarding numerous issues of the ecoregion.
- The group photo after the 3rd Meeting of the Friends of Indus Forum.

Right: Mangroves forest in Chhan creek of Keti Bunder.

Deltaic Ecosystem

A wide river flows through a lush green mangrove forest. The water is calm, reflecting the sky and the dense foliage. The sky is a clear, bright blue. The trees are tall and leafy, forming a thick canopy along the riverbanks.

The Indus Delta comprising almost 30,000 km² is a triangular fan-shaped area. It is about 240 km in length along the axis of the Indus. It includes 17 major and numerous minor creeks, and an extensive area of mud flats. About three decades earlier there were about 160,000 ha of mangrove forests which have reduced to about less than 80,000 ha. The delta holds 97 % of the total mangrove forests of Pakistan. Nearly 95 % of the total mangrove cover in the delta is comprised of *Avicennia marina* locally called Timer.



Wind electricity

The programme has installed five new wind turbines in Hajamro and Khobar Creeks of Keti Bunder where there is no electricity. Around 20-25 households can benefit from one wind turbine by generating enough electricity for an energy saver light bulb. Now there is increased economic activity in the night such as the grading of shrimps and women can do their chores at night more easily. The women can also make their embroidery at night and there are more social gatherings in the evenings.



Keti Bunder

The Indus River supports one of the world's largest irrigation canal systems, which sustains millions of people in the upper area of the Indus basin, but at the expense of those living downstream. Before the river water was diverted into these canals, the Indus delta used to occupy an area of more than 600,000 hectares, consisting of creeks, mud flats and thick mangrove forests stretching from the city of Karachi to the Rann of Kutch. Over the years, because of the lack of freshwater in the Indus River below the Kotri Barrage, the delta is dying.

The Indus delta consists of 17 creeks which are now full of seawater and the continued loss of freshwater in the delta due to poor water policies could spell the death of a critical 10 percent of the mangrove forest that still survives. Many of these mangroves are located near Keti Bunder, a small fishing town in Thatta district, which is struggling to handle one crisis after another. Keti Bunder was once a prosperous commercial centre on the delta, a gateway to the Arabian Sea. Located around 200 km south-east from the city of Karachi, Keti Bunder town has had to change location thrice during the last century due to seawater intrusion. According to a resident of Keti Bunder town: "If we must move again, who would give us a place to settle?"

The farmers of Keti Bunder have all become salt-water fishermen. Now their catches are declining because of the same lack of freshwater, which is killing off the mangroves. Not only do these precious mangrove forests protect the coast from typhoons and tsunamis, they are also a breeding ground for shrimps, crabs and other fish. The fishermen say soon they will have nothing left. They have welcomed the Indus for All Programme which hopes to improve livelihoods in the area while conserving the remaining mangrove forests.

Top to Bottom:

- A fisherman community inside Mangroves in Chann creek: People in the creeks live in makeshift thatched huts.
- Local women making embroidery in vocational centre established by the Programme.
- A wind turbine installed by the Programme in one of a remote creek villages of Keti Bunder.

Seawater intrusion

Keti Bunder was in the news recently when a high tide silently swept into the town and flooded several villages in the nearby creeks. "It was sudden and completely unexpected. No doubt, it was because of global climate change and the lack of freshwater in the delta", explained Zahid Jalbani, who is the Site Manager for the Indus for All Programme and is currently mobilizing the local community to take charge of their natural resources. Journalists from Karachi have been invited to visit the area and write about the ecological damage that is going on. "Two things can be done; the government can make sure that at least 10 MAF (million acres feet) of water is released below the Kotri Barrage which is in keeping with the 1991 Indus Water Accord and secondly, rehabilitate the degraded mangrove forests to minimize the sea intrusion", he added.

Due to seawater intrusion, both underground and surface freshwater resources in the Keti Bunder area have been degraded. In previous years, the local people used to grow red rice, bananas, coconuts and melons. Now their agricultural lands have either been swept away by the sea or spoilt by water logging and salinity. Eight species of mangroves were reported to occur in the area. Only three species have survived: *Avicennia marina*, *Aegiceras corniculata* and *Rhizophora mucronata*. The gradual decrease in fresh water and an increase in saline water have seriously constrained mangrove growth.

The Keti Bunder union council consists of a total of 42 settlements of which 28 have already been engulfed by the intruding sea. There are four major creeks in the area: Chann, Hajamro, Khobar and Kangri or Turchan. Marine fishing is the main source of livelihood. Today, the total population of Keti Bunder town and adjacent creeks is about 12,000. There has been a substantial migration to Karachi and other areas in recent years. Access to education in the area is very low with 90% of the local population illiterate.

Right: Ali Hassan Habib, Director General WWF - Pakistan sharing thoughts with community of Hajamro creek, Keti Bunder.





Boat tanker

A boat water tanker has been delivered by the Programme and is operational. The boat delivers water to villages in the creek area twice a month. Since the average consumption of a household of 7 members (cooking, drinking and bathing) is 80-96 liters which costs Rs 50-60 per day, each household is now saving Rs. 0.38 per liter or Rs. 30 per day. This has also saved them trips to Keti Bunder for freshwater. It would take them almost 1-3 hours to get to Keti Bunder by boat. Now freshwater is delivered to their door steps.

Programme activities

The mangrove forests of Keti Bunder are categorized as 'Protected Forests' and the land, water lakes and mud flats have been notified as a 'Wildlife Sanctuary'. Hajamro and Chann creeks, which are deep water channels with small settlements, are part of the Indus for All Programme site. In this area, dense mangroves cover 2,631 hectares, medium mangroves cover about 1,996 hectares and sparse mangroves occupy 3,588 hectares. The Chann area is particularly vulnerable and is losing mangrove cover on a daily basis due to intense wave action by the advancing sea. The mud flats in this creek are eroding away at a rate of about 43 feet per month.

Around Keti Bunder town, there is little vegetative cover. According to a local resident: "All this was on the banks of the old river. Now it is the shoreline of the sea and it's washing away." The local people have to purchase water from water tankers that come in from other towns like Baghan or Gharo. Hence, the cost of living is quite high. The Indus for All Programme has helped the local community to form five community-based organizations (CBOs) to address their problems.

The CBO based in Keti Bunder town is running a water tanker boat service which distributes 4000 litres of water to each village in the area twice a month (the boat has a capacity of 16,000 litres). The Programme

has also helped install five wind turbines. Each wind turbine generates electricity (for light bulbs) for around 25 households in each village in the areas where electricity is not available.

The Programme has also organized medical camps in the Keti Bunder area which have treated patients for free. They have also held livestock vaccination camps and helped repair 14 boats owned by the local community in the aftermath of the recent storm. Four water tanks have also been fixed. The Programme has held a resource users workshop and is currently conducting a traditional ecological knowledge survey to learn from the local people.

The fishermen of Keti Bunder now catch only seawater fish and shrimps. The fish catch is sold directly to Karachi. The fishermen complain that their catch is down to 70-80% than a few years ago. According to a local fisherman, "I remember when I could throw out one net and catch 500 or 1000 fish. One cast was worth a lot of money. Now, the combined catch of 8 to 10 fishermen working all day amounts to less than 100 rupees."

Regenerating mangroves

The mangrove stands (dense, medium and sparse all included), as per the latest available satellite imagery of 2005, exist on about 10 per cent of the delta area, i.e. on only about 75,000 ha. There is a very high potential of plantation of Timer (*Avicennia marina*) and Kumni (*Rhizophora mucronata*), on the wet mudflats adjacent to the present mangrove stands, subject to the availability of sufficient freshwater and silt.

Top to Bottom:

- A water tank provided by the Programme to the communities in one of the creek villages of Keti Bunder.
- Extensive erosion of mangroves by advancing sea in Chann creek.
- A woman in a creek village making an embroidery in the light of an energy saver bulb at night. Electricity to light bulbs is generated by wind turbines.
- A mangrove nursery established by the Sindh Forest Department.

Right: Showing of various sizes of shrimps collected in Keti Bunder. Selling of shrimps is another income generating activity in Keti Bunder.







Since mangroves are rich breeding areas for fish and shrimps, the Indus for All Programme is keen to plant new mangroves and regenerate the forests to help the fishermen in Hajamro Creek. The CBOs have been sensitized about the importance of protecting the mangroves by controlling cutting and grazing. Local festivals have been organized by the Programme in which theatre has been used to teach people about the importance of protecting the mangroves. Even the religious leaders of the area have been mobilized to deliver sermons on nature conservation. The local community is currently involved in planting mangroves on mud flats.

To spread awareness about the ecological problems being faced by Keti Bunder, the Programme hopes to establish an information centre in the town. The Sindh Forest Department has agreed to hand over a two-room residence for establishing a Conservation Information Centre. The Indus for All Programme will shortly start renovating this building.

Experts say the sea has intruded 54 km upstream along the main course of the Indus River, ruining thousands of hectares of fertile land, contaminating underground water channels and killing off the

Disappearing fish

Around 63 fish species and 24 shell species were recorded in the Keti Bunder area. Fish and shrimp species have decreased in recent years and some fish species such as the Palla fish have nearly vanished. The prized Palla fish has migratory habits and for breeding ascends upstream in the Indus from the Arabian Sea. It was reported to travel up to the Kotri Barrage for breeding from July to September, before returning to the Arabian Sea. Due to the low discharge of the Indus, the fish has been unable to migrate upstream for breeding and hence the stocks of Palla fish have depleted alarmingly in the last 15 years.

mangrove forests. These problems are bound to increase in the coming years and one of the foremost conservation priorities of the Indus for All Programme is to increase Indus River discharge to the delta through the promotion of efficient water management practices upstream.

Another important priority is to reduce pressure on the existing mangrove forests cover from grazing and wood cutting. Ultimately, however, the government has to release adequate freshwater below the Kotri Barrage to give relief to the poor communities living in the delta whose lives and ecosystems are being destroyed by seawater intrusion.

Wildlife sanctuary

Keti Bunder North and South is a wildlife sanctuary mainly for the water birds. The migratory birds include pelicans, egrets, herons and waders. A total of 69 species were recorded in the Keti Bunder area during the ecological assessment conducted in 2008. Among terrestrial mammals, Wild boar, Asiatic jackal, Fishing cat and Indian porcupine are common. Reptiles of the area include cobras, vipers and lizards. The marine mammals include Bottlenose dolphins, Hump-backed dolphins, Common dolphins and Finless porpoises.

Top to Bottom:

- An interactive theatre organized by the Programme to raise awareness among local communities in Keti Bunder.
- A view of Mangroves in Keti Bunder.
- Fishermen in Keti Bunder collecting and grading fish; Fishing is the major source of livelihood in Keti Bunder like the other deltaic areas in Sindh.
- Palla fish (*Tenulosa ilisha*) a delicacy of the River Indus.

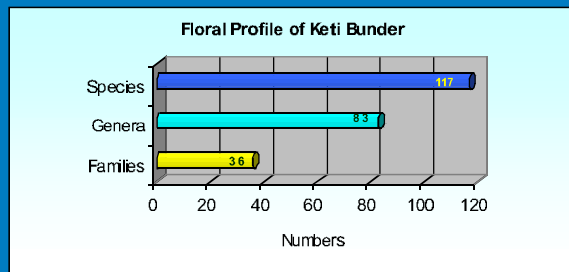
Right: A beautiful scene of Sunset at Keti Bunder.



GLIMPSES OF SOCIO-ECONOMIC AND ECOLOGICAL PROFILE (Recorded in 2008)

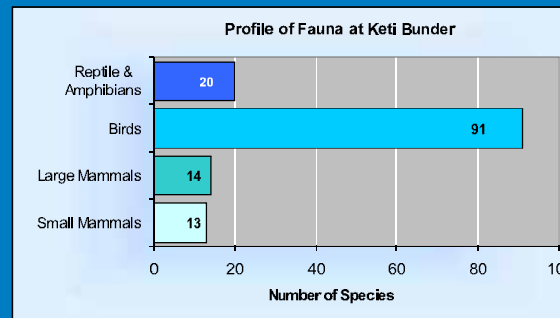
FLORA

Keti Bunder was found to be floristically the poorest comparing all the four sites with a total of 117 species (α - diversity) in 83 genera and 36 families including 2 species of Pteridophytes in 2 genera and 2 families, 79 species of dicotyledonous angiosperms in 56 genera and 29 families, and 36 monocotyledonous angiosperms in 25 genera and 5 families. Poaceae with 28 species is the largest family. The dominant species of the inland vegetation are *Aeluropus lagopoides*, *Halostachys belangerana*, *Arthrocnemum macrostachyum*, *Tamarix indica* and *Salvadora persica* etc. In the creeks, *Avicennia marina* is the dominant species with small stands of *Aegiceras corniculata* at few places. Overall the mangrove cover is declining in the face of various anthropogenic factors surmounted by low flow in River Indus.



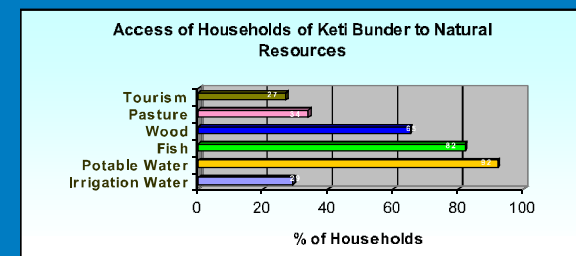
FAUNA

A total of 83 animals of 14 large mammal species, belonging to four orders were recorded from Keti Bunder. Out of 14 recorded species of large mammals, 10 were observed directly while the remaining four were recorded on the basis of indirect evidences. Moreover, 13 species of small mammals were observed or collected from Keti Bunder. A total of 20 reptile species were observed or collected by the team. A total of 91 species of birds were recorded during the surveys. Under marine fish, a total of 78 species were recorded from Keti Bunder creeks.



SOCIO-ECONOMIC - SUMMARY OF FINDINGS

The total number of households sampled at Keti Bunder was 142 from Inland villages and 104 from creek villages. The average household size was 5. About 11 % of household heads are literate. Ninety per cent of the population over the age of 15 years was illiterate and only one tenth of the households send male children for primary education. Forty eight per cent of individuals are classified as being dependent. The average income reported was Rs.7000 per month. Using the head count ratio to measure poverty, 28% of households are found to be below the poverty (Rs.879 per capita per month). One out of every 4 houses was found to be poor in creek villages of Keti Bunder. A higher proportion (30%) of poor households was found in inland villages as compared to creek villages of Keti Bunder. Expenses incurred in treating for Typhoid at Keti Bunder costing the local community over Rs.1,200 per person per annum. Fishing is the major profession reported by 89% of village heads in creek villages and 67% in inland villages; the main form of livestock owned by majority of the locals was buffaloes. Many households reported high income losses due to reduction in fish catch and depleting mangroves. Natural disasters reported at Keti Bunder included cyclones, storms and floods.



Blatter *et al.* (1929) compiled "The Flora of Indus Delta" and documented an overall total of 332 plant species in the Indus delta (279 indigenous and 53 introduced). Ecological assessments carried out during 2008 revealed 117 plant species in total belonging to 76 genera and 33 families. Of these, 28 grass species (Poaceae family) have been identified.

Right: Freshwater wetlands in Sindh such as Haleji provide refuge to a large number of migratory water birds.



Freshwater Wetlands Ecosystem

Wetlands serve as habitats for spawning, rearing and nursery grounds for production of shrimps, lobsters and fish and also provide breeding, rearing, staging and wintering grounds for a number of globally important fish, shellfish species and millions of waterfowl. Wetlands clean impurities from the system and can be regarded as the kidneys of the landscape. Sindh province has many wetlands, which are either connected with River Indus or too many other seasonal rivers and streams. Some of these wetlands are of international importance such as Ramsar Sites like Haleji and Keenjhar lakes. Based on their rich biodiversity, extensive and rich food webs and high productivity, the wetlands are regarded as “biodiversity supermarkets”.

Keenjhar Lake

Located around two hours' drive from the centre of Karachi, Keenjhar Lake is a freshwater lake that was created by the union of two natural lakes in the 1970s as part of the Kotri Barrage Canal Irrigation Project in Thatta District. Today the lake is heavily polluted. At one of the two main entry points to the lake, trucks, tractors and construction vehicles are parked practically inside the lake, spewing diesel and exhaust into the water. The drivers are not only washing their vehicles, but cooling themselves off in the lake in the sweltering summer heat.

Around them, there are literally thousands of visitors splashing in the water or swimming in the shallow shore. The lake is huge, they say it is 32 km long and spread over 130 square km. The water near the shore is a cloudy grey colour and smells of diesel, yet the frolicking families seem to be oblivious to the contamination. "The lake gets around 10,000 to 15,000 visitors every weekend. As for the trucks, well, there is no one to stop them so the drivers just come all the way into the water" explains Raheela Memon who is working with the Indus for All Programme which is now trying to conserve the lake by mobilizing the local community.

The local fishermen (around 40,000 of them live around the lake on its shores in clusters of small villages) are suffering from drinking the polluted water. In each community, more than half the population has some sort of water borne disease. "We want a safe, clean lake. It's not just us, but the whole of Karachi that uses water from this lake" says the head of the village near one of the two main entrances to the lake. He points out that it is not just the diesel that is polluting the water in the lake. Industrial effluents and domestic sewage are pouring into the lake from the main Kalri Baghar canal that feeds it.

The Kalri Baghar feeder starts from the Kotri Barrage, so polluted water carrying effluents from the Kotri Industrial area, eventually lands up in Keenjhar. From there, it is pumped into the water supply of the city of Karachi at the rate of 900 cusecs of water daily. Keenjhar Lake was actually created as a reservoir that would supply water to the residents of Karachi as well as provide irrigation for agricultural land in Thatta.

Ancestral fishing

The local villagers still like to fish in the traditional way of their ancestors. They do this by lying flat on a metallic pitcher pot and paddling into the lake. They use a small net to catch the fish in the lake. They lay out this small net and catch the fish in a shorter period of time hence this is a more sustainable method of fishing. The other, more recent form of fishing was putting poison into the lake where it overflows into ponds to kill the fish. The CBOs have been sensitized and they no longer practice this form of fishing.

The Legend of Noori

Keenjhar Lake has a remarkable cultural status in Sindhi literature because of the legendary romance of Noori and Jam Tamachi. The shrine of Noori is located in the middle of the lake, where the water is at its deepest, almost 25 feet. Legend has it that the Sindhi King, Jam Tamachi of the Sammah dynasty fell in love with Noori, a local fisherwoman. The king married her and she became his queen. On top of the shrine lie two graves.

Top to Bottom:

- Washing of vehicles inside the lake is a common scene.
- A traditional fishing practice in Keenjhar Lake by using metallic pitcher.
- Keenjhar Lake also holds a cultural significance for having the tomb of Noori, the heroine of the legendary folklore "Noori Jam Tamachi".

Right: Schoolchildren portraying their thoughts about Keenjhar Lake in an art competition organized by the Programme at the bank of the lake.



DIRECTORATE OF FISHERIES SINDH INLAND HYDERABAD

MAP OF KINJHAR LAKE



SALIENT FEATURES OF LAKE





Migratory visitors

A large number of visitors to the lake are migratory birds from as far as Siberia and Central Asia who enter Pakistan through the Indus flyway. The most abundant and regular visitors are the ducks, waders or shore birds, and the gulls and terns. There are two types of migrants – local migrants from within the region and true migrants from the Northern region. The true migrants come in the winter months. Unfortunately, many are hunted by the local people. The threatened and rare species are the Ferruginous Duck, Dalmatian Pelican, Black bellied Tern, Black headed Ibis, White Stork and Cotton Teal.



Tourist attraction

Keenjhar Lake is also a designated wildlife sanctuary and Ramsar Site. It is an important breeding and wintering ground for migratory birds. Pakistan presently has 19 sites designated as wetlands of international importance under the Ramsar Convention, and Keenjhar Lake is one of them. The lake supports as many as 400 species of birds including herons, egrets, cormorants, flamingos, tufted ducks, coots, moorhens and jacanas. The lake is also famous for its extensive reed beds, typha grass and the lotus flowers which grow near its banks. The lake is also rich in fish fauna. However, the quantity and quality of fish in Keenjhar Lake has decreased in recent years.

The picturesque lake is a prime tourist attraction in the area, but there are inadequate facilities for the thousands of visitors who come here each week. In the past there have been quite a few fatal accidents when boats became over loaded and ended up sinking in the middle of the lake. There are no life guards or proper rescue services on the lake.

Aside from the thatched huts that are rented out to tourists who want some shade from the sun, there are 12 tourist lodges nearby that are owned by the Sindh Tourism Development Corporation (STDC). The only restaurant on the lake is also run by the STDC. There is definitely a need to improve the tourist infrastructure and the Indus for All Programme is working on that.

The Indus for All Programme is also planning to build an information centre near the entrance to the lake. The provincial Fisheries Department has agreed to hand over a piece of land for establishing this Conservation Information Centre. The objective of the centre is to spread awareness about nature conservation among both visitors and the local communities.

Fishy Lake

Keenjhar Lake provides a rich habitat for a variety of fish and so far 48 species have been recorded in the lake. Amongst them are Pallo, Sole, Dahi, Rohu, and Khago (Rita catfish). Fishing has been the main source of livelihood for the communities. However, there has been a decline in fish production in the lake due to diversion of freshwater to a bypass canal during monsoon season when juvenile fish are abundant and also due to unsustainable exploitation and pollution. Today, only around 30-40% of the people living in the surrounding areas are engaged in fishing.

Top to Bottom:

- Ill-planned tourism is increasing threats to the waters of Keenjhar Lake.
- Keenjhar Lake provides wintering ground to thousands of migratory birds.
- Fishing and mat making from typha grass are major sources of livelihood at Keenjhar Lake.

Right: Planting a hope - Programme encourages local communities to plant trees.





Women take charge

Some of the CBOs formed by the Programme are now better able to understand the threats they face. In the remote village of Jhimpir on the other side of the lake, the 'Roshni Keenjhar Development Organisation' decided to celebrate World Women's Day on 8 March 2008 on their own and invited the Programme staff to attend the event. At the event they gave speeches on environmental health and women's issues - all the subjects which the project staff has been discussing with them!



Involving communities

The local communities are mostly fishermen who have no other source of freshwater so they use the polluted lake water for drinking, cleaning, bathing and washing their clothes. There are hardly any medical facilities nearby so the Indus for All Programme, with the help of several local community-based organizations, set up four medical camps in the area. Over a thousand people from 14 villages in the area were treated for mostly water borne diseases.

There are four major occupations for community livelihood: fishing, stone mining, mat making and to some extent agriculture. Several villages have primary schools, but literacy rates are very low. The Programme plans to target 38 villages and ten CBOs in the area will be established by the end of the summer of 2008. They have been encouraged not to allow the hunting of ducks and other migratory birds on the lake. They have also been asked not to catch juvenile fish in the lake. "We have completed the sensitization process, the local people better understand the threats to the lake now and I think in one more year they will be ready to implement projects" says a staff member of the Indus for All Programme.

Currently these fishing communities are in a bad shape. They say that fish in the lake has decreased in the past eight years and so many of community members have now turned to stone mining as a means to make a living. They sell the stones they excavate from the hills near the lake to construction sites. This is dangerous and back breaking work but since Thatta town is 25 km away, there are no other jobs in the area.

Forming CBOs and building their capacity is a painstaking process and the project staff is going about it in a slow and steady manner. According to Aslam Jarwar, the Site Manager at Thatta, "Our emphasis is on self-sufficiency. We tell them, this is your environment, your children, your future... how can you

change it?" The Programme staff has slowly won over the trust of the local community by working with them in the heat and dust.

The Programme would like to see the CBOs eventually engaged in activities such as eco-tourism and promoting local crafts. Around 25 members of the CBOs have already visited Sonmiani Bay on an exposure visit and for trainings. They would like more training on how to run their CBOs. The Programme staff has also developed good relations with the various government line departments and the District Coordination Officer.

Tourism development is the key to higher income for the local communities, especially on the National Highway side of the lake. Irrigated agriculture and aquaculture on the eastern and northern embankments, arid agriculture and livestock and poultry development on the western mountainous range could also offer ample employment opportunities for the poor communities.

The Programme has recommended that interventions to restrict the outflow of fish seed in various channels and the intensive stocking of fish seed including the establishment of a separate fish hatchery for Keenjhar could help restore the degraded fish resources. "What we need badly is more fish in the lake. Then we would not have to turn to stone extraction for income", says a member of a local CBO. "If our fishing problems are solved, we would work with the government and the Programme to make sure that the lake stays clean."

If the Programme is successful and the local people can take ownership of the lake and the government cooperates with them, then in a few years time Keenjhar Lake could become an ideal tourist destination.

Top to Bottom:

- Stone mining in surroundings areas of Keenjhar Lake pose a threat to land stability and vegetation cover.
- Like the members of Roshni Keenjhar Development Organization, the Programme promotes meaningful engagements of stakeholders at grassroots level.
- Fishermen at work in Keenjhar.

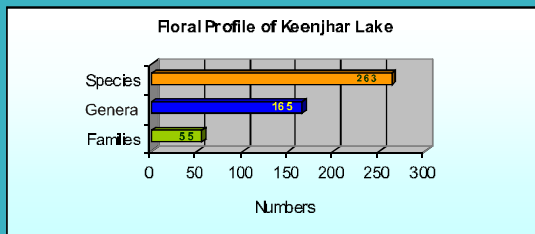
Right: A local herder at Keenjhar Lake.



GLIMPSES OF SOCIO-ECONOMIC AND ECOLOGICAL PROFILE (Recorded in 2008)

FLORA

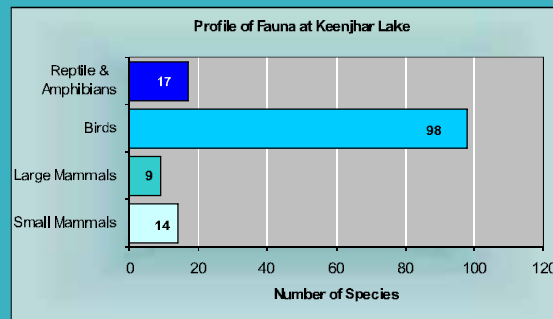
Keenjhar Lake was found to be floristically the richest site, with an α -diversity of 263 plant species in 55 families. Of these, one was Pteridophyte, 185 dicotyledonous angiosperms in 120 genera and 44 families, 77 monocotyledonous angiosperms in 44 genera and 10 families. Poaceae was the largest family with 51 species, followed by Fabaceae (20 species). *Cyperus* was found to be the largest genus with 9 species. Beside high diversity, another uniqueness of this site is a high number (70) of such species which are not found in any other Indus for All Programme's current sites.



FAUNA

A total of 26 animals of nine mammal species, belonging to three orders were recorded from the study area. Out of nine recorded species of large mammals, six were observed directly while the remaining three were recorded on the basis of indirect evidences like tracks, faeces and interviews. In small mammals a total of 14 species were found in Keenjhar Lake during the whole survey. The 14 species found in the summer represented four orders

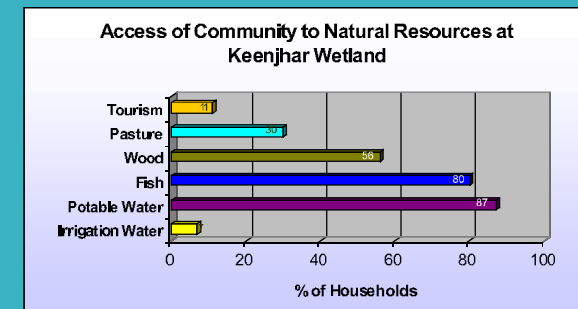
and eight families. A total of 17 reptiles and amphibian species were recorded. A total of 98 resident bird species found during the survey. In freshwater fisheries a total of 55 species were recorded from Keenjhar Lake comprising of nine orders and 14 families.



SOCIO-ECONOMIC - SUMMARY OF FINDINGS

The total number of households surveyed at Keenjhar Lake was 309 from 38 villages. In terms of demographic profile the average household size was 7 with over 60% household heads categorized as being illiterate. As a percentage of the total number of households at Keenjhar, a high number own cows (14%), followed by goats (11%), and buffaloes (6%). About half of household heads reported fishing to be their main source of income while 11% were in construction, 8% in mining and 3% in agriculture. The three most common types of livestock owned were cows (14%), goats (11%) and buffaloes (6%). Over

half of the respondents from Keenjhar agreed that fish production and catch have decreased in the last five years coupled with a substantial decrease in the number of migratory birds visiting the lake. Sixty seven per cent of the respondents were of the opinion that decline in fish production has decreased their income by 38%. The most common form of natural disaster reported at Keenjhar was cyclones and storms. The most expensive disease to treat at Keenjhar was Typhoid costing over Rs.1,000 per person per annum. The average household income was Rs.6,122 a month at Keenjhar Lake. Using the head count ratio to measure poverty, 58% of households are found to be below poverty (Rs.879 per capita per month). Keenjhar has the highest poverty rate out of all four sites.



Right: A view of the Chotiari reservoir, where people use the typical smaller boats to travel and fish in water.



Desert and Wetlands Ecosystem

Chotiari reservoir is formed by group of sub-tropical lakes covering an area of about 37 km² and after completion of the entire work; it will cover about 86 km². The reservoir is interconnected between several lakes namely Baqar, Akanwari, Tajar, Phuleli, Seri and Sao Naro. These lakes are surrounded by the Nara canal, which is a major source of water to these lakes. On the eastern side, the reservoir extends into the Thar Desert. The reservoir has a depth of 3 m to 26 m with a sandy, silty and muddy bottom, which provides a suitable surface for the growth of algal and aquatic plant species.

Chotiari Wetlands Complex



Conservation Information Centre

The Indus for All Programme is currently completing an information centre located near Baqar Lake. The Sindh Irrigation and Drainage Authority (SIDA) gave the Programme a piece of land for the centre and the Forest Department provided timber for its assembly. The local communities took part in its construction. The Programme will furnish this centre, designed by a local architect in a traditional style, and install displays and information corners. Local CBOs will then run this centre with the support of the Programme staff.



Lakes in a desert, bordered by both sand dunes and a forest. As unusual as it may sound, this unique ecosystem exists near Achro Thar desert around 30 km from the town of Sanghar in Sindh. The Chotiari reservoir, as the water body is known, is not exactly a natural lake. It was created by several small and large lakes formed by the natural depression along the left bank of the Nara Canal. Its construction began in 1994 and was completed in 2003. It took so long to complete, because of all the successive changes in government. The purpose behind the construction of the reservoir, which is spread over 18,000 hectares, was to store rainwater and flood water from the nearby Indus River (during the monsoons) to use in times of drought. The freshwater and brackish lakes are a source of fish for the local fishing communities and a home for crocodiles, otters and fresh water turtles. The lakes are also a feeding and nesting ground for a variety of resident and migratory birds like the Marbled Teal.

The Chotiari reservoir, whose custodian is the Sindh Irrigation and Drainage Authority (SIDA), is a controversial project, however. The local people say that the construction of the reservoir with its long embankments and dykes built to convert the different lakes into a single reservoir has disturbed the natural flow of water into the lakes and spoiled the water quality in some of the lakes. "The reservoir has upset the natural ecology of the lakes and displaced many communities", says a staff member of the Indus for All Programme which has its field office in Sanghar town. The reservoir was also supposed to increase the production of fish in the area but that has not occurred. There is an uneven supply of water into the reservoir. Either there is too little water or there is too much water in the reservoir.

Mat maker's colony

Rani is a fisherwoman and mat maker who lives in a colony of mat makers on the banks of the Nara Canal near Chotiari town. All the houses here are built of typha grass. She first cuts the typha grass from the banks of the canal then dries it in the sun. When it is ready she weaves it tightly into a mat, either for thatching the walls or for use in the roof. She can sell these mats anywhere from Rs 100 to Rs 400 depending on the size. There is plenty of raw material that is locally available, free of cost.

Top to Bottom:

- A woman preparing a mat from typha.
- Traditionally constructed Conservation Information Centre established jointly by the Indus for All Programme and its partners.
- A typical fishermen village near Chotiari Reservoir.

Right: Pakistan's brilliant agama (*Trapelus agilis pakistanensis*), is a reptile species found in Chotiari area.





Living off the land

Amina Junejo's large family compound is located on the banks of Chotiari reservoir. Her people are not fishermen but own a number of livestock. Amina's family gets water from the reservoir for their livestock and free fodder and fuel wood from the grazing lands nearby. The family home is made from Khipa, a bush that grows naturally in the desert. Her family could afford to send her to school and she herself is a teacher. She says they are content living off the land. Even their clothes are washed by caustic soda dug out from a nearby lake and the salt they use in their food also comes from yet another lake!



Water problems

When the water level goes down in the reservoir, the fish production also declines. And when the water level goes up, it causes water logging in the adjacent areas. Fertile agricultural lands have already turned barren in the western and southern areas. The rising water level in the lakes, in fact, destroyed large parts of the nearby Makhi forest in the past few years. The communities who lived in the forest had to leave and are only returning now that the water level has gone down.

The forest is slowly regenerating. The people who live there are dependent on their livestock and on the collection of honey from the small bees found in the forest. The other main communities in this area are the fishermen, mat makers (who make mats from the typha grass that grows freely near the reservoir and the Nara canal) and agriculturalists (mostly tenant farmers or seasonal labourers who work in the nearby cotton and wheat fields).

There are around 60 villages or hamlets in and around the reservoir, with an estimated population of 16,250. Overall, the socio-economic status of these communities is well below the national average income levels and literacy rates are very low. Many of the people here are followers of Pir Pagaro, the spiritual leader who lives in nearby Khairpur District. Every 3-4 years, he visits the area and is given a warm and festive welcome. The people follow his religious teachings and are extremely loyal to him.

The construction of the reservoir has also disturbed the habitat of the unique wildlife species found in the area. Two important species, the crocodile and the otter, are on the verge of extinction. The Hog deer is also an endangered species of the area. There is lots of hunting in the area and due to unsustainable fishing practices the fish stocks are also being depleted. Around 60 species of freshwater fish have been

recorded from the lakes. The local fishermen can cook up to 25 different kinds of dishes from fish alone!

Though, the legal status is questionable, but one positive aspect of the water logging is that several new fish farms have been established near the embankments of the reservoir. Thus, in part, the fishing communities displaced by the creation of the reservoir are finding livelihood working at fish farms. There was considerable activism by an NGO called the Pakistan Fisher Folk Forum against the fishing contract system, in which the contractor maximizes profits by paying meager wages to the fishermen while selling the fish for much higher prices in nearby towns. Phullel village, located on the banks of the reservoir, is the centre of activism by the Fisher Folk Forum. They have succeeded in lobbying the government to abolish the fishing contract system for now.

Lovely lotus

The lotus flowers grow naturally all along the Nara Canal and near the embankments of the Chotiari reservoir. The flowers are not only beautiful to look at they are used in various foods as well. The fruit of the lotus is also eaten as dessert, whereas the roots are used as vegetables and cooked. They make for a tasty and nutritious meal!

Top to Bottom:

- Increasing water level in Chotiari Reservoir has submerged the natural forest.
- A traditional community hut locally called chora.
- Lotus adds aesthetics to the waters of Chotiari Wetlands Complex.

Right: A scene of Mallakhra - a traditional wrestling event organised by the Programme to disseminate conservation messages - The Programme uses traditional communication methods to raise public awareness about natural resource issues.





Programme activities

“We have organized the local community and even started a school in the village up to class 5. There are lots of problems here, this is a poor community. And now there is less fish in the reservoir. We want the Sindh Government to maintain the water levels in the reservoir, particularly during the dry season” explains Abdul Rehman, the head of the local chapter of the Fisher Folk Forum. The Fisher Folk Forum has become partners with the Indus for All Programme and is currently joining hands with WWF-Pakistan to increase nature conservation activities in the area.

For the first year of its activities the Programme has focused on completing ecological surveys and socio-economic studies and forming CBOs in the area. Four CBOs were already established in the Chotiari area, and the Programme has made three more. Several MoUs have been signed and a work plan finalized. The Programme plans to install biogas plants in the area. The beneficiaries have already been identified. Solar energy estimates have been made and work has started on improving access to freshwater and sanitation.

In June, the Programme has opened up a vocational centre, with the community providing women's embroidery. The women of this area make beautiful embroidered bed covers (*Rilis*), stitching them with colourful pieces of cloth in traditional patterns. It takes them over a week or so to make one *rili* and these can easily be sold in large towns and cities for income generation.

The Programme is also establishing a nursery for energy plantation to provide alternate fuel wood in the area so that people will stop cutting trees in the forest. Already, there has been widespread deforestation in the area on account of agricultural expansion and the increasing demand for fuel wood. The Programme is engaging the local religious leaders to give sermons on Islam and conservation. They have also arranged

cultural festivals in the area in which interactive theatre was used to teach people about the importance of safeguarding the environment. Local singers were also encouraged to sing about nature. To further spread their message, the Programme organised medical camps in the Chotiari reservoir area for 3-4 days. Around 200 people per day came to receive treatment and learn about the Programme.

The Indus for All Programme has introduced environmental education in some of the local schools with various awareness programmes. They have formed nature clubs and celebrated environment days. More than 30 schools in and around Sanghar have been involved in nature walks, tree plantation activities, competitions, debates and tableaus about the environment.

Forest of the Hurs

Makhi forest was once famous for its rich reserves of quality honey, commercially valued wood and plants with medicinal values. The forest was also the stronghold of the freedom movement launched by the Hurs (followers of Pir Pagaro) against the colonial British power during the 1930s. During the uprising, the Hurs would hide in the forest. To suppress the “Hur Revolt”, the British rulers converted a large part of these woodlands into agricultural areas. Today, the rise of water in the reservoir has destroyed much of the forest, while other areas have been cut for the settlement of new land owners.

Top to Bottom:

- Chotiari community has tremendous potential for traditional handicrafts.
- A view of historic Makhi forest, which is disappearing with every passing day.
- The programme organised a free medical camp for the communities of Chotiari.
- Rilli (embroidered bed covers) are famous piece of art throughout Sindh.

Journalists have also been taken on exposure visits to the Chotiari site. Both the electronic and print media have covered the threats to Chotiari's fragile ecosystem. These issues have also been discussed by the District Coordination Committee (DCC). The Programme staff facilitates the DCC meetings regularly to focus their attention on natural resource management. Important issues which come up at these meetings are water seepage and drought, illegal logging and the declining vegetative cover.

The Chotiari reservoir area is exceptionally rich in biological diversity and possesses a great potential for tourism. More motor boats should be provided and desert safaris can easily be arranged. The Programme

recommends that the whole site should be declared a Protected Area, with specific zones reserved for the conservation of Marsh crocodiles and Hog deer. The local people also need vocational centres, fish farms, agricultural and other skills which can be managed through training programmes. To increase income through fishing, fish seeds need to be put into the lakes. Although there are many threats to this ecosystem, the problems are not insurmountable. With proper planning and implementation, Chotiari could soon become a world famous biodiversity hotspot.

Reduced reptiles

A considerable population of Marsh crocodiles was recorded in the Makhi area in 1997, but they have become increasingly rare. The crocodiles were hunted by the local fishermen, who used to sell their skins in the market. They have stopped this practice now due to an international ban on the trade of crocodile skins. The python, which was once found in abundance, has also become rare and is on the verge of extinction from the area. A variety of other snakes and geckos are also found in the Chotiari area.

Top to Bottom:

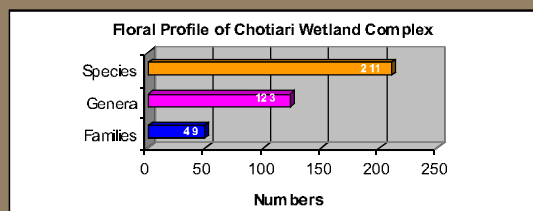
- The areas around Chotiari along with Nara wetlands are providing the ideal habitat for Marsh crocodile.
- Schoolchildren participating in an awareness raising walk on World Environment Day-2008 celebrations in Sanghar.
- Chotiari has tremendous potential for fisheries resources.
- Rice cultivation in outskirts of Chotiari Reservoir. The agricultural lands around the Reservoir are under serious threat from water logging and salinity.



GLIMPSES OF SOCIO-ECONOMIC AND ECOLOGICAL PROFILE (Recorded in 2008)

FLORA

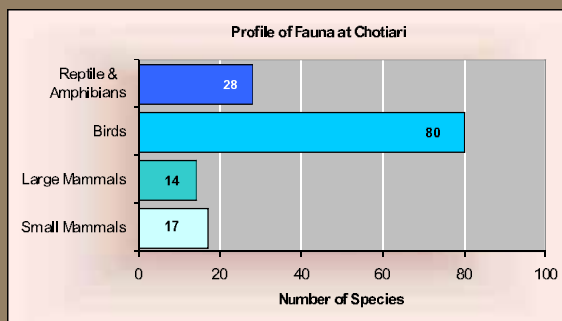
Chotiari Wetlands Complex was the second richest site with an α -diversity of 211 species in 123 genera and 49 families. Out of these 3 were Pteridophytes in 3 genera and 3 families, one Gymnosperm, 144 dicotyledonous angiosperms in 86 genera and 39 families, and 63 monocotyledonous in 33 genera and 6 families. The number of species exclusively found in this site was 40, second after Keenjhar. The dominant species of this site were *Calligonum polygonoides*, *Crotalaria burhia*, *Calotropis procera* etc., which are all tough xerophytes. Along water reservoir, 41 wetland species were recognized.



FAUNA

A total of 58 animals species including 14 different species of large mammals belonging to three orders were recorded from the study area. Of these 14 species eight were observed directly while six mammals were recorded on the basis of indirect evidences like tracks, faeces and interviews. A total of 17 small mammal species were recorded belonging to eight families and four orders. Under reptiles and amphibians a total of 28 species were recorded. A total of 80 species of birds were recorded

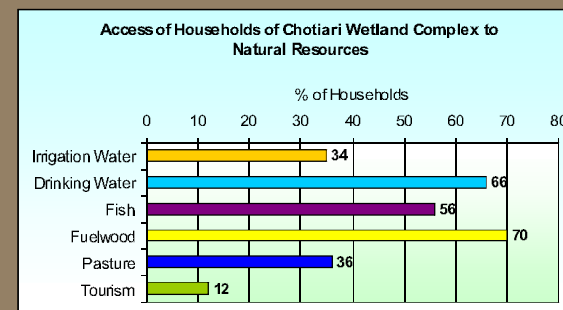
including important species such as Marbled teal, Sind babbler, Pallas's fish-eagle, and White-backed vulture. Under fisheries a total of 47 species of fish were recorded from 9 orders and 14 families.



SOCIO-ECONOMIC - SUMMARY OF FINDINGS

Out of the 35 villages recorded at Chotiari, 273 households were selected from 24 villages for this survey. The average family size was 7 and every fourth household head had primary education although 52% of head of households were illiterate; 57% of individuals are from among the dependent population (over the age of 60 years). Fuelwood was identified to be the most accessible natural resource. The major occupation reported at Chotiari is agriculture followed by fishing. Roughly half of all respondents agreed that estimated losses of income in the past five years was due to natural resource/ biodiversity depletion. The losses reported were of

the following: 21% for fish, 17% for forest, 15% for irrigation and 10% for grazing lands. Floods were reported as the most common natural disaster in Chotiari. Using the head count ratio to measure poverty, 53% of households are found to be below the poverty (Rs.879 per capita per month). The average household income was Rs.6,619 per month while income of male and female members per month was about Rs.4,587 and Rs.1,516, respectively. The cost of treating cholera patients was the highest in Chotiari, which was about Rs.1,500 per person per annum.



Right: Pai forest in Navabshah, once a riverine forest, now turned into an irrigated plantation.

Forest Ecosystem

An aerial photograph of a riverine forest ecosystem. The foreground shows a green field with a narrow, winding path or stream. The middle ground is dominated by a dense, dark green forest. In the background, there are more green fields and a hazy horizon under a bright sky.

The Sindh province owns 0.241 million ha Riverine forests, which are about 1.7 % of the total landcover of the province. These forests are one of the important ecosystems of Sindh and their perpetuation rests on annual regular inundation from the Indus River during the monsoons. The principal plant species found in these forests include *Prosopis cineraria* (Kandi), *Tamarix aphylla* (Lawa), *Tamrix dioica* (Lai), *Populus euphratica* (Bahan) and *Acacia nilotica* (Babul). These forests once presenting a highly productive ecosystem, are now in a dismal state (especially in lower Sindh) due to various anthropogenic factors.

Pai Forest



Extinct forest

Near Pai forest lies a barren landscape which was once the vast Mari Forest, cut down in the last eight years by the local people. Over the years, the Mari forest had started to degrade due to the reduction of freshwater in the River Indus. According to a local villager "50% was naturally gone and 50% the people cut down. The forest used to stretch for 50 km and now nothing is left. It is all gone". The once fertile land has now become barren. The local people who cut down the forest for agricultural land have discovered that they cannot grow any crops since there is hardly any fresh water.



Until recently, there were dense riverine forests on both sides of the Indus River in Sindh. These riverine forests relied on flooding by the Indus River for irrigation and in turn they protected its banks from erosion. The thick forests were also home to a variety of animals like Hog deer, Wild boar and Jungle cats. The people who lived around these forests depended upon them for honey, wood and fresh milk (for their livestock could graze freely). With the diversion of water upstream, these riverine forests started to degrade and the Sindh Forest Department became helpless in the face of political interference. Today, only a few patches of these riverine forests remain. Many have been cut down for their virgin agricultural land.

About 90 per cent of the riverine forests are today either under illegal possession or leased to local influential people on nominal government rates. The lease policy was started as recently as 2005 when a minister in the Sindh Government convinced the provincial government to approve it. Now, those who have cut down the leased forests are facing the consequences of deforestation. There is erosion of fertile land and scant rainfall in the area. Pai forest, spread over 1933 hectares, is located in district Nawabshah off the Sukkur-Karachi highway. It has survived against all odds and is the only forest left in the vicinity. "There was a much larger forest nearby called Mari forest which was cut down by the local people. Now they have lost everything- their livestock, the income from honey, and have to look around for jobs" says Mumtaz Ali, the Community Development Officer at the Indus for All Programme's office in nearby Nawabshah town.

Hog deer and other mammals

Only a few Hog deer are left in Pai forest and the Programme hopes to increase this number. These shy and reclusive animals have been hunted extensively in Sindh. Due to the shortage of water in Pai forest, they are forced to venture out of the safety of their habitats and are shot by the villagers in the adjoining fields. There are also several wild boar in the forest as well as other animals like Jackals, Jungle cats, Bengal foxes and Mongoose.

Top to Bottom:

- A view of riverine forest at Ketri Shah, Sukkur.
- Mari forest - once a thick riverine forest; is now converted into a desolate area.
- Hog deer in Pai Forest is under continuous stress.

Right: Karir (*Capparis decidua*) in blossom at Pai Forest.





Game reserve

The Sindh Wildlife Department designated Pai forest as a game reserve and it has been protected over the years, although there have been other encroachments as well. Pai forest was once a natural riverine forest but it became separated from the Indus River when a flood protection embankment was built along the banks, and now it is an irrigated forest ecosystem. The Indus River is around 11 km away. However, Pai forest still has many of the same tree species one would find in a riverine forest: Babul (*Acacia nilotica*), Kandi (*Prosopis cineraria*) and Lai (*Tamarix dioica*). The forest is also home to over 80 species of birds and there are some Hog deer left in the forest, along with Gray partridges, Jackals, Wild boar and Jungle cats. The forest has been used for sport hunting for many years now. Mostly dignitaries come and hunt for partridges.

What remains of the forest is under threat from both local communities who cut trees for fuel wood and influential people who want to benefit from illegal encroachment. The local people also graze their animals in the forest, damaging the natural vegetation and young saplings. The cattle of this area are considered among the best in Pakistan. The Indus for All Programme is organizing the local communities, who live around the forest, to form community based organizations to protect the forest.

Partridge hunting

The over-hunting of Gray partridge is rampant in the forest. High level and local influentials, often break the sanctioned hunting limit. Every year, new beats are made in the forest for the hunt. This involves leveling the land in selected forest compartments and planting new trees. Cotton is grown in these leveled areas since the pests which attack the cotton attract partridges who feed on them. There are no longer any Black partridges in the forest, though the Programme would like to re-introduce them.

Shortage of water

There is a serious shortage of water in the Rahib Shah Minor canal which is supposed to provide the forest with irrigation. Influential landlords have siphoned off the water in the canal for their own use and since the forest is located at the tail end of the canal, it hardly receives any water. The landlords are also slowly encroaching upon the Pai forest land. All around the forest is irrigated agricultural land where crops like cotton, wheat, oil seeds and sugarcane are grown. There are also a number of banana orchards, which have become a cash crop in the area in recent years.

Over the years 13 tube wells have been installed in the forest to provide the trees and animals with water. Only 8 are operational, however, and this is still not enough to meet the water needs of the forest. It is facing drought conditions which have resulted in the loss of fertility and hardness of soil. Out of a total of the 2421 hectares notified during British rule under Pai Riverine forest, only 1913 hectares are officially designated now as irrigated plantation on allocated irrigation water and tube wells. The remaining area, with the exception of 121 hectares of the Agriculture Department's Seed Farm, is mostly under the control of Pakistan Army; which has leased it out to a private party for cultivation. The net area under the administration of the Divisional Forest Officer Nawabshah is only about 1395 hectares.

Top to Bottom:

- Pai forest sustaining the pressure of small ruminants of neighbouring communities.
- A typical farming community in vicinity of Pai forest.
- Civet cat (*Viverricula indica*) in Pai Forest.
- Pai forest provides a popular hunting ground for Grey partridge.

Right: A view of Pai forest.





Honey bee marketing

There is plenty of scope for this activity in the forest, although it is restricted to only a few individuals at present. Honey bees are found naturally in the forest, and all that needs to be done is to collect their seasonal honey combs. This is completely organic honey, grown the natural way and has a potentially large market. Last year, one person made over 140,000 rupees by selling honey from Pai forest in nearby cities.



Community participation

There are around 25 villages located adjacent to the forest and so far five Memoranda of Understanding (MoUs) have been signed with the community-based organisations. The villages have a mix of ethnic groups including Sindhi Samat castes; Baloch tribes; and Punjabi/ Seraiki castes. The main livelihood sources are agriculture, livestock, and government service. School education infrastructure is widespread but health facilities are sporadic. The area also has a number of local civil society organisations and advocacy groups.

Most village leaders have identified the lack of irrigation water, illicit wood cutting, unemployment and diseases as major issues. According to one villager: "We cut trees from the forest because we have no alternate sources for fuelwood. The nearby Mari forest is now gone, where else can we go for wood. If we had gas, then we would not need to cut trees."

The Programme staff is currently encouraging the CBOs and other civil society organisations to save the forest. "We alone can't stop the hunting, so we want the local communities to be involved in it, like the trophy hunting that takes place up in the mountains of Pakistan", explained Usama Anwar, the Site Manager of the Indus for All Programme in Nawabshah.

One of their plans involves allowing visitors to hunt in the forest in a controlled manner with bag limits. The community can assist in the hunts and benefit financially. There are around 10-12 beats that are made in the forest each year in the forest compartments for the partridge shoots. There are 140 compartments in total, with 17 hectares to one compartment.

The main conservation priority for the Indus for All Programme in Pai forest is to first halt the destruction of the remaining habitat and then rehabilitate it. In addition, they would like to implement a two year hunting and trapping ban on the partridges found in the area and introduce blanket protection of Hog deer for an unlimited period. The Programme would also like strict enforcement of habitat protection. The local people have now become so aware of protecting the forest and its wildlife, that recently when some outsiders tried to enter the forest and cut the trees, the local people stood against them and chased them off. According to a local villager: "The forest is our asset. We won't let others come and spoil it. We now understand what conservation is and we are going to work for it".

Colourful Birds

A number of colourful birds can be found in Pai forest. The more common ones are doves, bee-eaters, larks and parakeets. There are other more special visitors which are migratory birds. Amongst the most colourful is the Green Pigeon. There is currently a species of Pallas's fish-eagle that is nesting in the forest. It appears that due to the cutting down of nearby riverine forests, Pai forest has become a sanctuary for these birds.

Top to Bottom:

- A wild honey comb in Pai forest.
- Beautiful birds inhabit the forest at Pai.
- Selling of honey extracted from the forest is a profitable for an entrepreneur.

The Programme is also turning the Forest Guards quarters in the forest (built during Ayub Khan's era) into an information centre for visitors. The Sindh Forest Department has handed over the three room building to establish the Conservation Information Centre. A local CBO has stepped forward to help manage this centre in the future. The CBO has also raised a small potted nursery to promote tree planting in the neighbouring communities. The women of the area are planting Neem, Kandi and Babul in their nurseries. They are also planning to plant organic vegetables in the levelled land in the forest.

The Programme would like to display teaching exhibits for schoolchildren and other visitors in the centre. They would also like to encourage nature camping in the forest and build walking trails. They are also thinking of building a watch tower (equipped with binoculars) and a proper entrance gate to Pai forest.

Pai forest is today on its way to being conserved, but what about the other remaining riverine forests? "This is just the start for us, we have identified other forests upstream from

Sukkur which can be saved as well. Unfortunately, downstream from Sukkur till the delta, not much is left", says Usama Anwar, the Site Manager. With the help of the Sindh Forest Department, the Indus for All Programme can eventually try and protect what's left of these once famous riverine forests of the Indus River.

Women's empowerment

Zeenat Bibi lives in a village near the forest and has just returned from a training course organised by the Programme in Hyderabad city. She is a member of the local CBO formed by the Programme. "We didn't know anything about CBOs at first. Then the women all got together and decided to open up a centre for embroidery and handicrafts. 25 women in the village agreed to be part of this CBO and now we are generating our own income", she explained. "We no longer need to cut trees from the forest and sell the wood in the market for money. This will help to save the forest".

Top to Bottom:

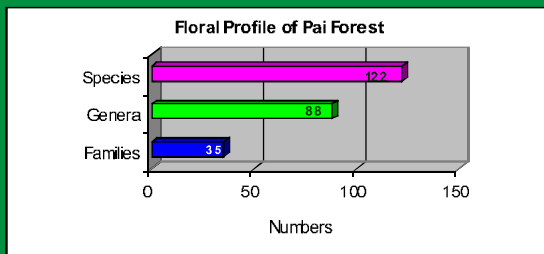
- A view of Pai forest.
- Pai forest meets the fuelwood needs of the surrounding communities.
- Programme focuses special attention on local women for their capacity building and participation in Natural Resource Management activities.
- A historic rest house inside Pai forest.



GLIMPSES OF SOCIO-ECONOMIC AND ECOLOGICAL PROFILE (Recorded in 2008)

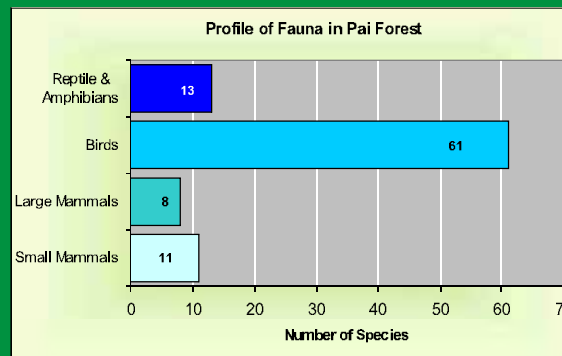
FLORA

Pai forest was the second poorest site with 122 plant species in 87 genera and 34 families. Out of these, one was Pteridophyte, 94 dicotyledonous angiosperms in 66 genera and 31 families, and 27 monocotyledonous angiosperms in 21 genera and 3 families. The largest family was Poaceae with 21 species. However, this is the lowest number of grass species among all sites. The dominant species of this site were found to be *Prosopis juliflora*, *Prosopis cineraria*, *Salvadora oleoides*, *Capparis decidua*, *Desmostachya bipinnata*, *Acacia nilotica*, *Suaeda fruticosa* etc. Eucalyptus trees also exist in the forest, which were planted years ago.



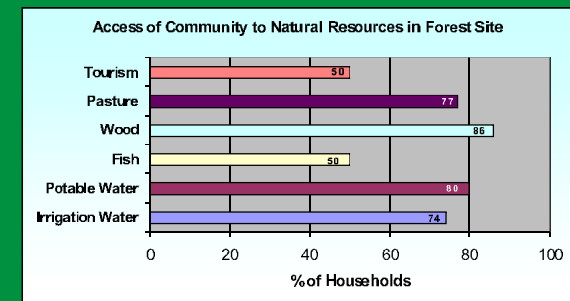
FAUNA

A total of 27 animals of eight different large mammal species belonging to two orders were recorded from Pai forest. Out of the total eight species recorded from Pai Forest, six species were observed directly while the remaining two species were recorded on the basis of indirect evidences such as the presence of faecal materials and interviews. A total of 11 small mammal species were recorded from Pai Forest and its surroundings. The 11 species belong to 5 orders and 6 families. Under reptiles and amphibians, 13 species out of 47 species possibly occurring in the area, were observed or collected. A total of 61 bird species were observed in and around the forest.



SOCIO-ECONOMIC - SUMMARY OF FINDINGS

Survey data were collected from 236 households in 10 villages; 5 small, 3 medium and 2 large. The average family size of the villages surveyed was 7. About 53% of individuals were reported to be the dependent population. The highest proportion of houses was recorded with only one room. Fuelwood was identified to be the most accessible natural resource; the second and third were reported to be drinking water and grazing grounds in terms of accessibility. Although reports of overall natural disasters occurring at Pai forest are the lowest compared to all the sites, storms and cyclones were reported over the past five years. The cost of treating typhoid patients was the highest in Pai forest and costed over Rs.2,000 per person per annum. Twenty eight per cent of the respondents reported loss of income due to deforestation. A large number of respondents owned shops. Also, a high proportion of locals (62%) had cows as their main form of livestock. Using the head count ratio to measure poverty, 49% of the households are found to be below poverty (Rs.879 per capita per month).



New Records

Euphorbia helioscopia (New for Sindh)



Ranunculus sceleratus (Collected after long gap)



Lotus krylovii (New for Sindh)



Sporobolus species Nov. (New to Science)



Endemic Species

Abutilon sepalum



Acacia nilotica subspecies *hemispherica*



Justica vahlii var *scindica*



Corchorus pseudo-olitorius



Fauna at the Four Sites - A Comparison

During the surveys over four sites and two seasons, a total of 20 large mammal species were recorded with the maximum species being recorded in Keti Bunder where cetaceans such as Hump-backed dolphin (*Sousa chinensis*), Finless porpoise (*Neophocaena hocaenoides*) and Bottle-nosed dolphin (*Tursiops truncatus*) were recorded in the creek habitats. There was no significant difference of large mammals over summer and winter.

A total of 23 species of small mammals were recorded over the four sites and two seasons. The highest number of species was recorded from Chotiari Reservoir in summer and the lowest number from Keenjhar Lake in winter. Most of the species were associated with agriculture habitats with the remaining habitats having relatively low representation. The surveys updated the distribution for the Cairo spiny mouse (*Acomys cahirinus*) which was trapped at Keenjhar Lake.

During the survey for reptiles and amphibians, a total of 47 species were recorded from four sites over summer and winter seasons. The highest number of reptiles and amphibians were recorded from Chotiari Reservoir with 28 species and the lowest number from Pai Forest in winter with 13 species. Species such as the Indus valley toad (*Bufo stomaticus*), Indian house-gecko (*Hemidactylus flaviviridis*) and Indian monitor lizard (*Varanus bengalensis*) were common throughout the field sites.

In terms of avifauna, a total of 186 species of birds were recorded over the four sites. Chotiari Reservoir and Keenjhar Lake had the highest number of recorded species with 98 and 80, respectively. Species that were previously thought to be rare were regularly recorded breeding at the sites. An example of this is the Pallas's fish-eagle (*Haliaeetus leucoryphus*) which was observed breeding at Pai Forest, Keenjhar Lake and Chotiari Reservoir.

Freshwater fish surveys were carried out at Chotiari Reservoir and Keenjhar Lake where total of 55 species were recorded from Keenjhar Lake and 47 species were recorded from Chotiari Reservoir. A total of 125 species were recorded from Keti Bunder under the marine fisheries study.

During the water quality study it was found that most of the sites had parameters above the acceptable levels. In Keti Bunder the total dissolved solids were observed to be high from hand pumps. The water in Keenjhar Lake was found to have low Dissolved Oxygen whereas Phenol, BOD and COD were high. The water at Chotiari Reservoir was shown to be safe for drinking (according to WHO standards), however, the ground water samples in the surrounding areas were found to be of low quality. At Pai Forest the levels of Arsenic was found to be high, which is probably due to geological formation rather than industries.

Socio-Economic - An Overall Scenario

The Programme has compiled robust socio-economic baselines for 2007. These cover Keti Bunder, Keenjhar, Chotiari, Pai and Keti Shah sites. The soundness of the baselines is owed to the fact that they were preceded by comprehensive 2006 preliminary assessments. A baseline is essential for systematic identification of gaps and opportunities, monitoring and evaluation of progress, and for determining priority issues and exact livelihood interventions.

Comparing sites, the socio-economic baselines point out that poverty on a head count basis is highest in Keenjhar, but by a small margin. While Keti Bunder's count – only one measure of poverty was comparatively low, other measures obtained – speak to different miseries. Of the four sites, at Keti Bunder male illiteracy is the highest; vulnerability as measured by dependence on a single livelihood source (fisheries) is the highest; and, isolation and absence of basic civic infrastructure rank Keti Bunder poorly in terms of supply of water and sanitation. For all sites, 48% of households fall below the poverty line (Rs. 879 per capita per month). As effects of the Programme's interventions and government's policies are determined or heavily influenced by household or community behaviour, the baselines provide essential understanding and a basis to proceed with planned Poverty-Environment linkage and indicator studies.

Population growth does not have to lead to natural resource degradation. What it does automatically, however, as the ratio of population to land in the

aggregate increases, is to eventually cause reorganisation of communities until they successfully gather other foods or marketable products. At the four sites, average family size is close to 7, a high number that reflects household planning to deliberately create inputs to labour from within the household itself planning for old age insurance, and an attempt by the household to beat high odds of infant mortality. The percentage of households with a family size of 4-8 is only 14% at Keti Shah while it is above 50% at the other four sites. By itself, this baseline result might not be a prescription for an intervention; however, when combined with high levels of disasters and shocks (almost 70% of respondents reported storms and cyclones in the past five years at Keti Bunder and Keenjhar) and high indebtedness (with close to 40% non-repayment at Keti Bunder mainly due to declining incomes), collective management of biodiversity appears likely to be less successful in Programme sites and be replaced by individual extractive strategies characterized by short time horizons.

Analysis of respondent perception revealed the extent of degradation of various natural resources in each site. Fishing was reported to be the major profession in Keti Bunder, Keenjhar and Chotiari. Although mining, agriculture and livestock herding are also practiced, however, the majority of the households in Keti Bunder reported high income losses due to reduction in fish catch and depleting mangroves. Similarly, in Keenjhar over half of the respondents agreed that fish production / catch

have decreased in the last five years and 44% of the respondents stated that the number of migratory birds visiting the lake has also substantially decreased. More than half of the respondents were of the opinion that decline in fish production has decreased their income to 38%. Fuelwood was identified to be the most accessible natural resource at Chotiari and Pai forest.

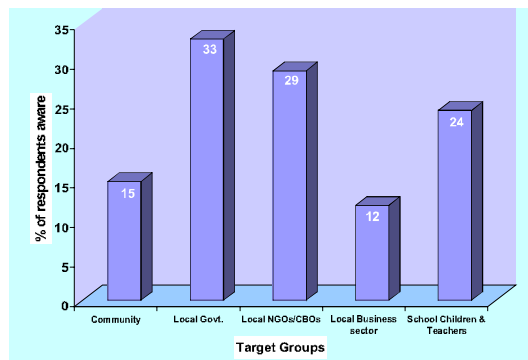
Roughly half of all respondents expressed their views in agreement on an overall basis about degradation of forest animals, grazing lands, birds (both migratory and local). Apart from forest wood, other natural resources reported at Pai forest were water for drinking and irrigation. Some of the major professions in Pai Forest are agriculture and shop keeping. Twenty eight per cent of the respondents reported loss of income due to deforestation.

The Indus for All Programme is developing interventions to provide a sustainable means of protecting the biodiversity and natural resources of its sites while sensitizing local communities about wise use of these resources which they are dependent on for their livelihoods.

An Overview of People's Opinion about the Indus Ecoregion and Associated Natural Resource Issues

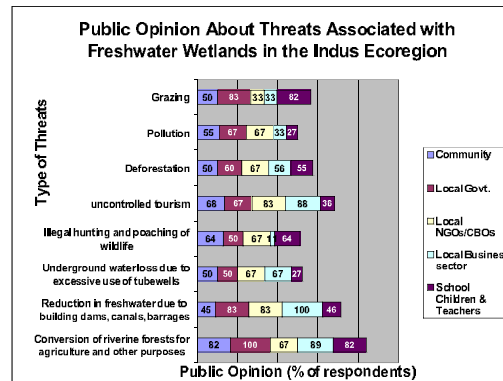
Indus for All Programme, jointly with the Pakistan Wetlands Programme, conducted an opinion survey with the help of Gallup International Pakistan. Overall, the survey consisted of four parts, the fourth one, termed as “*sensitivity survey*”, is about the Indus ecoregion, while the remaining three deal with the Pakistan Wetlands Programme. The purpose of the Indus for All Programme's sensitivity survey was to ascertain people's knowledge, perceptions and opinions about the Indus ecoregion and associated natural resource issues.

Awareness of People about Geographical Location of the Indus Ecoregion



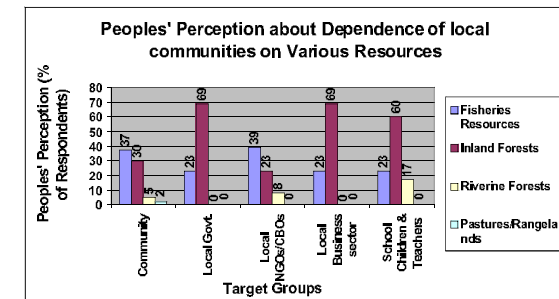
The survey results show that slight awareness about different ecosystems of the Indus ecoregion generally exists at all sites, although very few know of its aggregation in the form of the term 'Indus Ecoregion'. Within the three main ecosystems, i.e. freshwater wetlands; riverine forests and coastal ecosystems, awareness about the term coastal ecosystem is the lowest among the local stakeholders.

From the four priority sites, stakeholders in Chotiari Wetlands Complex and Pai Forest are relatively more aware about their own ecosystems, including its associated benefits and threats as compared to the stakeholders from Ketu Bunder and Keenjhar sites. Respondents from Pai Forest seem to be most aware of their own forest ecosystem while simultaneously they also appear to be most dependent on the local biological diversity. On the other hand, Ketu Bunder's stakeholders are least aware about their sites' coastal ecosystem/ mangrove forests including their benefits and existing threats.



People's perception regarding the dependence of local communities on various natural resources varies among different target groups. Community members at the Programme sites are of the opinion that most of them are dependent on fisheries resources, whereas the other target groups including local government officials, representatives of local businesses and local NGOs and schoolchildren and teachers think that the people at Programme sites are mostly dependent upon inland forests.

Talking of natural resource issues associated with the ecoregion; the opinion of people is quite contrasting. Local community and local government representatives think that conversion of forests for agriculture and other purposes is the most serious natural resource issue in the Indus ecoregion. While, the local NGOs and local business sector are of the opinion that reduction of freshwater flow into the Indus delta is the most pressing issue associated with the ecoregion.



At all sites, conservation of the Indus ecoregion and its associated biodiversity is given some importance, except at Chotiari Wetlands Complex, where stakeholders do not think that conservation of the Indus ecoregion and associated natural resources is very much important.

Economic Valuation Studies

The Programme is completing five studies on the economic valuation of ecosystems by end 2008. The purpose of a valuation is to reveal the true costs of using up a scarce environmental resource. Once completed, these studies will provide constructed Rupee values of rangeland, forest, freshwater, deltaic and agricultural ecosystems situated at the four sites.

Each study will come up with a comprehensive value known as a Total Economic Value (TEV). Because this value is comprehensive, it can actually be used in cost-benefit analysis (CBA), modification of national income accounts to reflect natural capital stock depletion, and even in formulating environmental regulations.

Before a TEV is obtained, Direct Use Value (DUV), Indirect Use Value (IUV), and Non-use Value (NUV) must be calculated and added together. The first of these pertains to the direct consumptive use made of the natural resource; the second to benefits realized off site but that would not be realized without the resource's presence at the site; and, the third pertains to the benefit derived from knowing the resource exists, can be used, or, passed on to future generations.

DUV Assuming Current Harvest is Sustainable

DUV (PKR, millions)	DUV (USD, millions)	Discount Rate
71,507	945	1%
14,301	189	5%
7,151	94	10%
4,767	63	15%
3,575	47	20%

A preliminary DUV estimate primarily for fisheries was already generated in June 2008. The annual DUV for Keti Bunder is in the order of Rupees 715 million, or, US dollars 9.45 million. Assuming that the harvest for the fishery at Keti Bunder is sustainable, then the present value of the fishery is shown in the table above for various values of the discount rate. The table is adapted from the Programme's draft report of 30.6.08 and uses August 2008 exchange rates.

Hydrographers can contribute to the feasibility of building a port-cum-fish harbour at Keti Bunder as is envisaged by state politicians. They can do this by including in the costs column of a CBA previously missing values such as *annual maintenance dredging*. Similarly, the values in the above table, once they are



Dr. Ben Groom, International consultant, with local communities during economic valuation survey.

added to IUV and NUV, must be incorporated as costs in any future CBA as one of the costs of partially or wholly destroying a deltaic ecosystem.

The Programme's NUV results are presently being considered as a chapter in an International Food Policy Research Institute (IFPRI) book on the subject of Choice Experiments, a type of method used to calculate NUVs. The Programme is also preparing to conduct recreational valuation research for the South Asian Network for Development and Environmental Economists (SANDEE). Other work is envisaged for Pakistan's Ministry of Environment for developing regulation on how to conduct valuations of forests and forest products.

Right: The Indus Flyway is a globally recognized route for migratory birds from Siberia and Central Asia. © Ghulam Rasool Mughal

Future Plans



Future Plans

The Indus for All Programme endeavours to attain its objectives after successful implementation on ground for 18 months. As concerns to the main focus of the programme, natural resource management through livelihoods improvement, the first step was the establishment of a baseline of ecological parameters (flora and fauna including limnology) at four sites. This will act as a benchmark for establishing what impacts the programme has on the biodiversity of the four sites during and after the implementation of its interventions. Now that the detailed assessments have been completed, the data will be uploaded on the Programme's Indus Ecoregion Social and Digital Atlas and district-specific Decision Support System.

The main thrust behind the natural resource management and livelihood nexus is the Natural Resource Management (NRM) plans that are being developed by the Programme and focus on the four sites and at least two species of concern. These plans are being developed in collaboration with all the stakeholders starting from the communities up to the provincial departments and when implemented will prescribe down NRM specific strategies for all the stakeholders such as local government, line departments, NGOs and CBOs. The plans will aim to bring all the stakeholders to one objective of conserving natural resources whilst improving the lifestyles of the local communities.

The remaining NRM based activities of the Programme focus on improving the current state of resources with the objective to rehabilitate the main habitats that the programme is focusing on *i.e.*, riverine forests, freshwater lakes, rangelands and mangroves. The majority of the interventions will be implemented through the above-mentioned NRM plans. The Programme is also supporting NRM related research such as climate change and species

distribution. This is being done in collaboration with local and foreign universities with the aim to benefit local and foreign students alike. The end product of these studies will be research and policy papers based on sound scientific research.

For environment mainstreaming in national/provincial policies, five ecosystem-based valuation studies are being prepared. There is also a working paper on the modification of national income accounts in respect of their treatment of the environment. These include site-specific papers on poverty-environment linkages; development of site-specific poverty-environment indicators; conducting Payment for Environmental Services (PES) feasibility studies; and integration of priority environmental issues into national plans such as the Poverty Reduction Strategy Papers (PRSPs) and Medium Term Development Frameworks (MTDFs). Poverty-Environment linkages and guiding Poverty-Environment indicators will also be incorporated into Taluka and District level planning. This will be supplemented by an overarching Poverty-Environment manual that covers Pakistani as well as regional best practices.

Considering livelihood support to local communities as an integral part of the long-term natural resources conservation in the Indus Ecoregion, the Programme, like the NRM plans, has also developed Livelihood Plans for each of the four sites. Also developed in close coordination with the local communities and other important stakeholders, these plans concentrate on specific type of livelihoods such as mat making, fishing and handicrafts, and prescribe interventions to allow communities to earn more income from the livelihoods without damaging the natural resource base. These plans will also be complimented by natural resource-based enterprises at each site, allowing communities to come up with their own ideas

on how to diversify and or improve their livelihoods and implement them at an entrepreneurship level.

The Programme is providing alternate sources of energy to communities so that they can improve their lifestyle, reduce their expenditure on commodities such as kerosene oil and reduce the burden on natural resources. Future livelihood plans also include the establishment of vocational centres targeting girls; facilitation at the four priority sites of a 30 per cent improvement in access to potable water supply and sanitation facilities; implementation of energy efficiency and supply schemes such as fuel efficient stoves, biogas plants, solar and wind turbines technology and Best Management Practices for the agrarian communities for efficient use of irrigation water for crops like cotton, sugarcane and rice.

To improve natural resources and livelihoods, forest cover and fish stock, the capacity development of the government departments and local communities will continue in the future. In this respect the Programme has already established a GIS laboratory at Hyderabad and provides services of one GIS Expert to Sindh Forest Department primarily to raise capacity of Forest Officers in GIS related operations, monitoring of forest cover over different temporal and spatial scales, digitizing boundaries of the forest lands and using GIS as planning tool in their future interventions. A number of GIS training workshops and digitization trips are planned in future to accomplish the objectives. In the fisheries sector the programme is planning to build the capacity of the Sindh Fisheries Department to harness the most possible return from the marine and freshwater fish stock with the overall objective to enhance fishermen's incomes by 2 per cent above inflation. This will be realized through a plan that will be implemented in collaboration with the Sindh Fisheries Department and other relevant stakeholders.

Similarly, the Programme has provided services of one Policy Analyst to Planning and Development Department (P&D), Government of Sindh to help synergise the outputs of Sindh Vision 2030 and Indus Ecoregion Conservation Plan. Moreover, all the concerned government departments have to develop sectoral plans to address the overall conservation objectives of the Indus Ecoregion vision and access funding from the allocations under the annual development plans (ADPs). In this regard, substantial efforts have been made by some departments in this direction by developing meaningful proposals that have been submitted to P&D for accessing funds. Similar efforts will continue in future so that the vision of Indus Ecoregions is achieved in letter and spirit.

To improve institutional capacity and awareness for sustainable management at various levels, the Programme's outputs are mainly divided over capacity building, awareness raising, and exposure visits. Under capacity building, the Programme is targeting a diverse range of stakeholder such as Civil Society Organizations (CSOs), Provincial and District Governments and communities and is focusing, primarily on environmental issues as well as related subjects such as health and sanitation. The programme also realizes the importance of building the district government's ability for assessing the environmental impacts of medium to large scale infrastructure projects and development plans. In order to sensitize the CSOs and local NGOs in environment related civil rights, the Programme is planning to develop and disseminate a guide on environment related legislations and civil rights in Sindh. Development of a Poverty-Environment manual is also in the process to raise understanding of policy-makers and other relevant stakeholders in poverty-environment linkages.

To get the message across to communities, the programme will continue its series of activities and workshops designed for the rural population, such as interactive theatre, puppet shows, celebration of environmentally important days and religious sermons on conservation and Islam. A comprehensive component for school outreach is underway. Formation of school nature clubs and training of school teachers along with development of a wide array of resource material is planned in this regard. To supplement our stakeholder understanding of the environmental issues in the ecoregion the Programme will be developing outreach material such as posters, brochures, guidebooks, billboards, newsletters manuals and flipcharts. The Programme will also maintain its website.


A multi-pronged approach is underway to engage press and electronic media to highlight conservation and environmental issues of the Indus Ecoregion. The Programme is also planning to develop a documentary highlighting extent of the natural resources in the Indus Ecoregion, nature and intensity of dependence of local communities on these resources, prospects and potentials for future development, threats that these resources are abreast with and the mitigation efforts by various stakeholders. To further augment the environmental awareness, the Programme is also documenting traditional knowledge on NRM. Four Conservation Information Centres, one at each site, are being planned to develop for raising awareness, building capacity of grassroots partners, promoting eco-tourism and other livelihood opportunities and above all harnessing the sense of ownership of natural resources in the minds and hearts of local communities. For establishment of these centres successful negotiations are underway with partner organisations such as UNDP Small Grants Programme, Sindh Forest Department, Sindh

Livestock & Fisheries Department, Indus Valley School of Art and Architecture and respective Community-based Organizations. Since the Programme has already developed a number of training manuals for youth, local women and teachers for awareness raising, environmental education and livelihood activities, an array of trainings for these target groups are planned in future.

Realizing the significance of exposure visits of the members of Steering Committee, Programme staff and local communities to other ecoregions in South Asia, the Programme is planning to arrange one exposure visit to Indo-China Fresh Water Ecoregion and a number of in-country exposure trips to different demonstration sites and CBOs for learning and experience sharing.

Under the final objective of improving alignment between stakeholders, the Programme will continue regular meetings of the District Coordination Committees at three districts and the Indus Ecoregion Steering Committee and Sub-committee meetings. The Programme will also arrange yearly trips for the steering committee members to other ecoregions, something which has proven very useful in widening support from the members, most of which are bureaucrats and are often not that sensitive to the ecoregion approach. The Programme will also implement its training component for its staff, ensuring that the Programme Management Team and Field Team are equipped with latest technologies, skills and knowledge to implement the Programme's objectives.

Keeping in mind that the Indus for All Programme is not merely confined to four sites rather it is the first step to address all the fifteen priority sites in the Indus Ecoregion, a Small Grants Programme entitled **Partnership Fund** has been established in the Programme. This fund will receive proposals for funding not only from Indus Ecoregion at large but also

A background image showing a person's hand splashing water in a blue-tinted environment. The water is splashing upwards, creating a spray of droplets. The hand is visible in the center, with water splashing around it. The background is a soft, out-of-focus blue.

from Indus Basin, as well. Government departments, non-government organisations and academia are encouraged to apply for grants for such projects which are highly complementary to the overall objectives of the Indus Ecoregion Conservation. The grants fall under different financial slabs such as those within range of one million rupees or below and those that can avail maximum ceiling of three million rupees for each project. The Partnership Fund will certainly help address the priority conservation and livelihood issues of the entire Indus Ecoregion.

The Programme must succeed in influencing long-term economic plans and decision-making processes so that they become strategic tools. These tools

should be capable of developing inter-sectoral frameworks for poverty-environment policy formulation and development of action plans that give required weight to conservation. The future is on our doorstep. What we do today and tomorrow will help define the world of the third millennium and the place in it that is occupied by the Indus Ecoregion.

Eventually, an Indus Ecoregion Phase-II proposal will be developed on the basis of a post-project implementation strategy. It is essential that it incorporates lessons from Phase-I as to how the goal of conserving biological diversity was achieved by working with and for rural communities. How did we satisfy the needs of communities without threatening

future generations and without destroying biodiversity and ecological processes that are the foundation for human life and other species.

Join
“Friends of Indus Forum”
For a Prosperous Indus Ecoregion
Log on to www.foreverindus.org/indusforum/

Our Partners and Stakeholders



Our Mission

WWF - Pakistan aims to conserve nature and ecological processes by:

- Preserving genetic, species and ecosystem diversity
- Ensuring that the use of renewable natural resources is sustainable, both now and in the longer term
- Promoting actions to reduce pollution and the wasteful exploitation and consumption of resources and energy

Vision of the Indus Ecoregion Programme

“Mankind coexists with nature in complete harmony and biodiversity flourishes in its respective habitat”

Indus For All Programme, WWF - Pakistan

Programme Management Unit (PMU)

606, 607 Fortune Centre, Block-6 P.E.C.H.S, Shakra-e-Faisal, Karachi.
Tel: 021-4544791-92, 7012290, 4555194 Fax: 021-4544790

Programme Implementation Units (PIU)

Chotiari Wetlands Complex

House # 129/2, Housing Society,
Near Government Boys High School,
Nawabshah Road, District Sanghar, Sindh.
Tel: 0235-542837, Fax: 0235-542791

Keenjhar Lake

House # B/112,
Hashimabad Society Makli,
District Thatta, Sindh.
Tel: 0298-772318, 772319, 610426.

Keti Bunder

Adnan House, Rano Mori Stop,
P.O. Keti Bunder, via P.O. Mirpur
Sakro, District Thatta, Sindh
Tel: 0298-620406, 610976, 619366

Pai Forest

House # A-3, M.U.C.E.T Employees
Co-operative Housing Society,
District Nawabshah, Sindh.
Tel: 0244-366364, Fax: 0244-282496