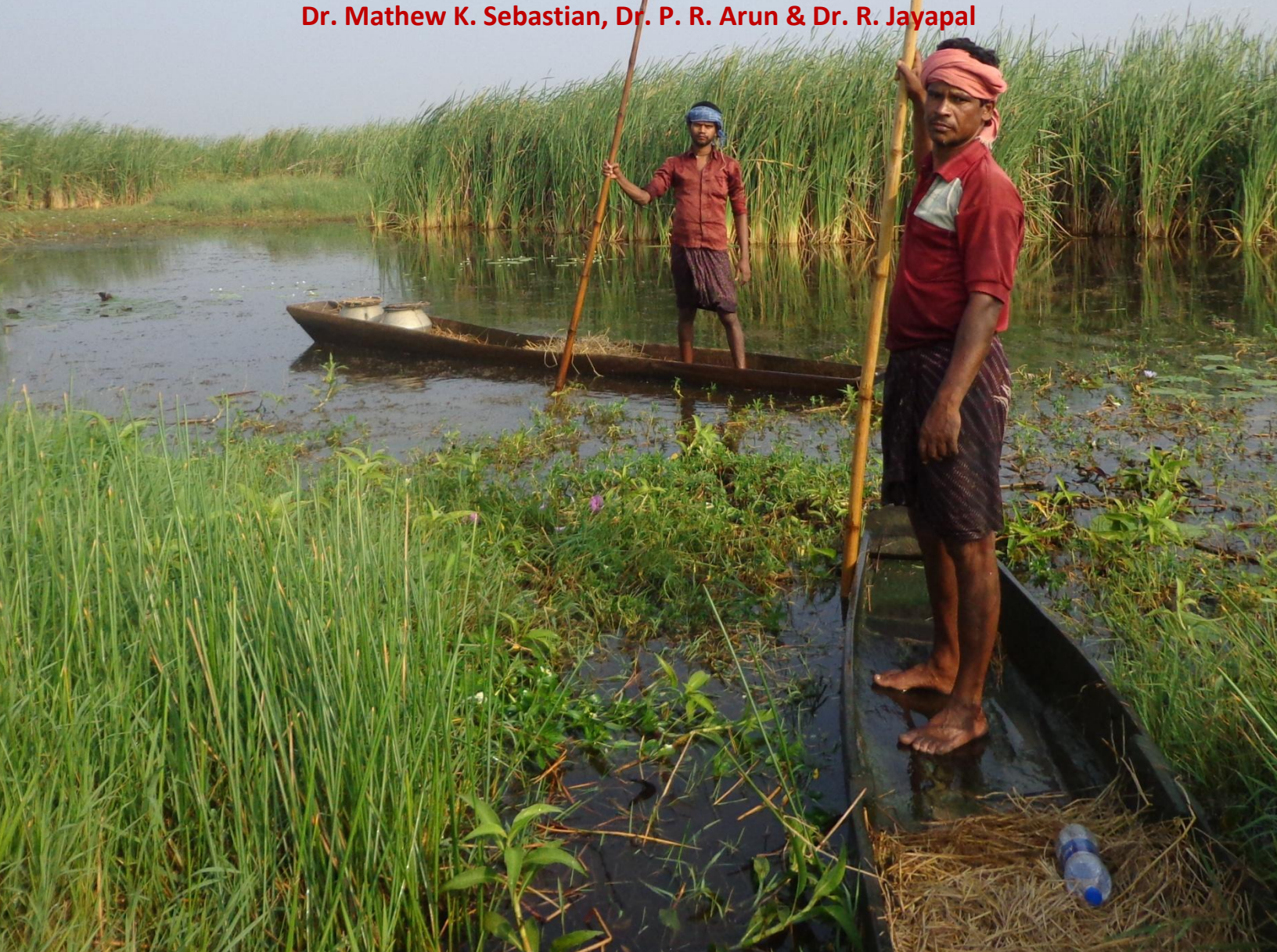


Documenting the biodiversity of Sompeta Wetland, Srikakulam District, Andhra Pradesh and developing biodiversity-mediated livelihood options for local communities

Interim Report

2016

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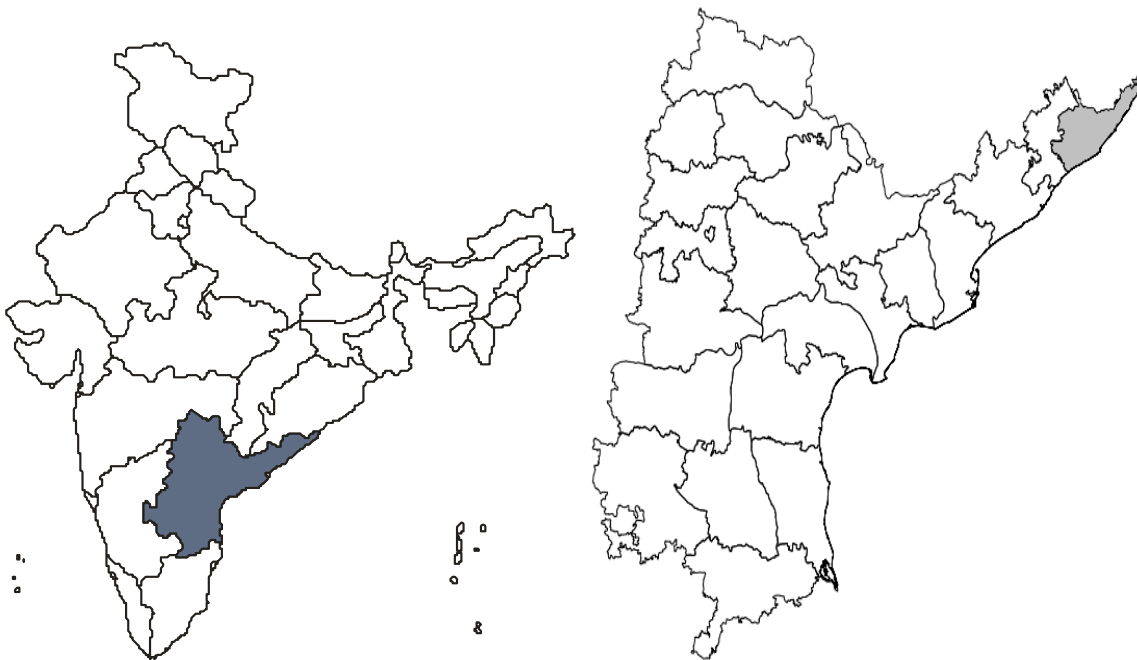
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Documenting the biodiversity of Sompeta Wetland, Srikakulam District, Andhra Pradesh and developing biodiversity-mediated livelihood options for local communities

1. Introduction

1.1. General features of Srikakulam district

The district Srikakulam, with an area of 5837 sq. km., situated between 18°20' and 19°10'N latitudes and 83° 05' and 84°90'E longitudes, is the north eastern most one in Andhra Pradesh. The district is divided into 38 Mandals under three Revenue Divisions viz. Srikakulam, Palakonda and Tekkali. The district shares borders with Orissa state in the north, Vizianagaram district of Andhra Pradesh in the south while Bay of Bengal lies in the east. In the district the altitude varies from a few meters above M.S.L. to above 1100 meters in the hills.



1.2 Population and literacy

In 2011, Srikakulam had population of 2,703,114 of which male and female were 1,341,738 and 1,361,376 respectively. In 2001 census, Srikakulam had a population of 2,537,593 of which males were 1,260,020 and remaining 1,277,573 were females. Population density is 463 people/sq. km. the sex ratio, 1015, is high as compared to all India average. The male literacy is 61.74 whereas the female literacy is only 55.31 (District Census Handbook, Srikakulam, 2011).

1.3 Geographical features

The district can be distinctively divided into three zones namely 1) the Hills, 2) the midland Plains and 3) the Coastal plains

1.3.1 The Coastal Plains

Coastal plains in the district are highly productive/ fertile area harbouring different types of ecosystems. Extensive sand bars / mounds are seen near Kallepalli, Srikakulam, Kalingapatnam, Bhavanapadu, Vajrapukotturu, and Baruva; along the estuaries of the river Nagavali near Kallepalli, river Vamsadhara near Kalingapatnam and the river Mahendratanya near Baruva.

Most of the wetlands are seen in the coastal plains followed by the midland plains. The coastal plains harbour four major large wetlands namely, Naupada, Sompeta, Ichapuram and Poondi. Apart from these major wetland complexes, there are hundreds of small and medium, seasonal and perennial wetlands in the coastal area. The major rivers of the district, Nagavalli, Mahendratanya and Vamsadhara drains into Bay of Bengal. The river Vamsadhara originating in the Eastern Ghats of Orissa state enters Srikakulam district in Bhamini Mandal and finally flows into the Bay of Bengal near Kalingapatnam. The river Nagavalli and its tributary, Suvarnamukhi originate in the Eastern Ghats and joins the Bay of Bengal at Kallepalli near Srikakulam town. Other smaller rivers such as Mahendratanya and Bahuda drain into the northern parts, a narrow stretch of land between the Eastern Ghats and the sea.

1.3.2 The Plains

The midland plains lie within the network of semi-perennial rivers like Vamsadhara, Nagavali, Bahuda, Mahendratanya, and their tributaries. In the plains there is little forest. The areas being highly fertile are under permanent agriculture or horticultural crops. The plains harbor a large number of small and medium wetlands.

1.3.3 The Hills

The hilly region, lying in the north and west of the district, forming part of the Eastern Ghats, is characterised with highly undulating terrain. This terrain covers parts of Palakonda, Pathapatnam and areas of Mandasa, Sompeta in the north-west and northern part of the district. About 1/3rd of the total area of the district is covered by the hills.

The Eastern Ghats run, roughly parallel to the sea from the north-east to the south-west.

1.4 Agriculture

Agriculture plays a major role in the economy of the district. The agricultural practices in the plains and hills vary. Tribals following primitive method of agriculture are predominant in the

hilly terrains. Though main crop is paddy; millets, horse grams and red grams are also raised. Vegetable/fruits such as Cabbage, Cauliflower, Tomato, Papaya, Jack Fruit, Cashew, Lemon, Guava etc, are also cultivated by the tribals near their dwellings.

The main Kharif crop is Meshta Jute (*Hibiscus cannabinus*) which is cultivated extensively in Palakonda, Amadalavalasa, and Rajam Mandals.

The most important wet crop is paddy, intensively cultivated in the plains. Cultivation of coconut and cashew in coastal areas and, mango in the plains is very profitable. Casuarina (*Casuarina equisetifolia*) is also raised in small plots mainly to meet their domestic fuel requirement and also as a source of income.

1.5 Irrigation

There are several irrigation projects in the district with vast expanses of water storage and channel systems. These irrigation / channels augment the number of wetlands in and around.

1.6 Fisheries

Inland fishing based on Beelas and tanks are a major source of income for the fishing communities. The traditional fishers, mostly migrants from Orissa, belonging to Scheduled Castes/Scheduled Tribes hold the fishing rights in these water bodies. The ownership of the tanks is vested with Grama Panchayats or Fisheries Department and these tanks are leased to the Fishermen Cooperative Societies.

1.7 Forests

Currently the forests in the district are largely mixed dry deciduous forests which are secondary in origin. Constant adverse biotic factors particularly, recurring annual forest fires, grazing and 'podu' cultivation are some of the factors which led to the present degraded condition of the forests.

1.8 Coastal Wetlands

The coastal plains consist of a strip of land 10 to 15 Kms in width all along the sea coast with a length of 193 Kms starting from Itchapuram of Kandivalasa Gedda. All coastal areas are thickly populated and the major towns of the district Viz., Srikakulam, Narasannapeta, Tekkali, Palasa, Sompeta and Itchapuram are situated in this belt. Thickly populated villages of fishermen communities and other agricultural communities are interspersing the coastal area from south to north of the district.

The major rivers of the district viz. Nagavalli drains into Bay of Bengal near Kallepalli, Vamsadhara near Kalingapatnam and the river Mahendratanaya near Baruva creating estuaries.

The coastal plains all along the seacoast are characterized by 'Beelas' (Back – Waters/ a typical wetland system which is fed by flood waters through a vast network of small streams/channels and connected to the sea through a creek/channel) and sandy dunes. The two major Beelas of the district are Sompeta swamp and Bhawanapdu swamp. While Sompeta swamp is situated near to the Sompeta town in the northern part of the district, Bhawanapadu lies near to Tekkali town in the central part of the district.

The Poondi backwaters with more than 500 acres of water spread area is a major wetland near Vajrapukkotturu in Nandigam Mandal.

Ichapuram wetland is partly situated in the extreme north of the Srikakulam district and partly in the Odisha state.

The coastal plains are highly productive harbouring different types of ecosystems. The sand bunds / mounds can be seen near Kallepalli, Srikakulam, Kalingapatnam, Bhavanapadu, Vajrapukotturu, Baruva etc., along the estuaries of the river Nagavali near Kallepalli, river Vamsadhara near Kalingapatnam and the river Mahendratanaya near Baruva.

2. Objectives and Methodology

2.1 Objectives

- Survey and document the biodiversity of avifauna, butterflies and piscifauna of Sompeta Wetland
- Explore and suggest enhancement of sustainable livelihood options for the local stakeholders

2.2 Methodology

Birds: The wetland and the surrounding coastal landscape is being divided into subunits based on their unique habitat features. Birds are sampled from these habitats using standard methodologies like Point-count for woodland birds and vantage-point based total counts for water birds. In case of shy bird taxa like those frequenting reeds and marshes of the wetlands, area-search method is adopted to maximize our detection. At the end, a detailed bird-habitat matrix with annotations will be produced.

Butterflies: The same methods, as birds, are being followed for documenting the Lepidopteran fauna. Micro-habitats particularly identified on the basis of vegetation composition and structure, presence of larval plants, and vicinity to water bodies is being identified and sampling of butterflies conducted accordingly.

Enhancement of livelihood options: A detailed survey of the locally available resources and existing livelihood practices and options for the local people is being assessed by collecting information through participatory tools, questionnaires and focused and semi structured interviews. Enhancement of livelihood options is being formulated in a participatory way.

3. Sompeta Wetland

Sompeta wetland is situated in Sompeta Mandal of Tekkali Division. It is locally known as 'Beela'. Beela is a low lying swamp/marsh area with a unique habitat for rich biodiversity with a distinctive hydrological regime. There are three distinct water bodies of varying size and characteristics in the Sompeta wetland complex. The first one is known as '*Peddha Beela*' which is linked to two other Beelas known as the '*Chinna Beela* (Mankkiapuram Beela) and *Tampara* which is eventually connected to sea near Idduvanipalem. An anicut of height 0.843 m distinguishes the Peddha Beela and Chinna Beela. The Anicut has a sluiceway that allows water to flow from the Peddha Beela to the Chinna Beela and not vice versa. This helps to prevent intrusion of salt water to the Peddha Beela enabling it to maintain fresh water characteristics.

Sompeta wetland complex spreads over nearly 4000 acres starting from Baruva in Sompeta



Part of the Peddha Beela during summer

Mandal to Kapaasuguddi in Kaviti Mandal, an approximate length of 20 kms, with varying widths. It falls within Rishikudda, Gollagandi, Baruvapeta and Benkili villages of Sompeta Mandal. It consists of marshes, swamps, mud flats, permanent shallow marine waters, marine sub tidal aquatic beds, coastal brackish/saline lagoons, seasonal/intermittent freshwater marshes/pools, permanent freshwater lakes, , aquaculture ponds, irrigated lands etc.

Sompeta wetland is fed by Mukundasagaram Pydigam reservoir and numerous water channels and small streams from the river Mahendaratanaya. Considerable flood waters also reach it during the monsoon. The area gets approximately 1200 mm rainfall annually, most of it during the south western season of June to September. summer where as middle portion of the wetland remains marshy even during summer.

3.1 Ecosystem Services provided by the Wetland

3.1.1 Regulatory services

3.1.1.1 Flood control

Srikakulam district receives around 1100 mm rainfall annually. The maximum rainfall happens during June to September and heavy rainfall occurs during few days bringing in flood waters from upstream inundating the low lying areas. During monsoon the entire Sompeta wetland complex gets inundated by flood waters. This flood water keep the wetlands replenished with water and nutrients and even in extreme summer all the three Beelas never dries up completely. These wetlands also help in controlling the flood in the surrounding areas which are thickly populated. It also sponges the flood and storm waters gradually releasing the water into the Beelas in lean months. Sediments are retained within the wetland and the thick vegetation which persists in the wetland controls soil erosion.

3.1.2 Provisioning services

3.1.2.1. Water regime

Numerous seasonal channels and streams feed 'Peddha Beela' during rainy season. The other two 'Beelas' are fed by the water from the Peddha Beela, with a typical water regime which have wider implications in terms of the water table, water quality and sustenance of the biodiversity of the surrounding areas.

Around 5000 acres of rice cultivation (two crops) is supported by these Beelas. Three lift irrigation projects, each covering an ayacut of 200 acres, is maintained by the water directly drawn from the Beela even during the extreme summer. Mostly vegetables are cultivated using the water from the lift irrigations. There are hundreds of acres of lush coconut and areca nut groves surrounding the Beela providing crucial income for the survival of local inhabitants.

Our PRA exercise brought out the information that 33 villages with an approximate population of 90000 reside within 3 km radius of the wetland. While 11 villages are exclusively engaged in agriculture, 8 villages are occupied by the marine fishers, and 4 villagers are engaged in fishing alongwith cultivation. One village, Manikkiapuram is engaged fully in inland 'Beela' fishing. Seventeen villages are engaged in farming alongwith rearing of the cattle. In two villages some of the households earn their livelihood from making mats where as spinning coir was taken up as an occupation by some households in two villages.

Due to the "Beela' the ground water table is always high. In fact the Beela is vital for supporting the water needs of the Paddy cultivated in the area. The area around the Beela is very fertile. In and around the Beelas there is lush green coconut groves interspersed with areca nut trees.

This area is also known for its vegetables. A food mile analysis in the nearby areas indicated that except potatoes all other food materials are locally produced. Three lift irrigation schemes which cater 750 acres of agriculture are operated in the area. Water could be sourced without any interruption from wells located in the wetland to pump to upstream areas.

3.1.2.2. Fisheries

The inhabitants of the Manikkapuram village of the Kaviti Mandal depend exclusively upon the Beelas for fishing. The residents here are traditional fishers belonging to fisher communities of Odisha origin. Here, around 400 families are engaged in subsistence fishing. All members in the family are engaged in fishing related activities by some means. While the men folk involve in capture fisheries, the womenfolk market the fishes locally earning extra income for the family. Traditional gears made of plant materials are used for fishing. The residents spent their free time in mending their fishing gears.



Fishers with fish trap in Peddha Beela

The residents spent their free time in mending their fishing gears. The Fishers here are organised into cooperative societies Patronised by the Department of Fisheries and the wetlands are leased out to these societies every year.

3.1.2.3 Fodder



Beelas are important grazing fields

Farmers in seventeen villages falling within the 3 km from the wetland are mainly into agriculture and rearing cattle. Hundreds of the cattle graze in the wetland during dry season. The villagers harvest fodder from the wetland for stall feeding thousands of cattle reared in homesteads. The wetlands act as a huge grazing ground for cattle during dry season. Almost all the families surrounding the wetland keep cattle as an additional source of income.

3.1.2.4 Materials for roofing and mats

The wetlands a rich source of raw material, such as *Scirpus* sp., to make mats. It is an income source crucial to hundreds of people. The material is also used for thatching and roofing.

3.1.2.5 Medicinal and Edible plants

Sompeta wetland and its surroundings are habitat for 495 plant species out of which many have medicinal properties and many edible. Local people depend on these plants as remedy for many maladies and also collect tubers and fruits to eat.

4. Biodiversity and Conservation Priorities

4.1 Wildlife Habitat and rare species

The wetland is a habitat for 491 plant species and 121 bird species that includes migratory species. In fact Sompeta wetland and its environs give shelter to 74 % of the plants and 52 % birds found in the whole of Srikakulam district. A twenty five acre hillock within the wetland harbours a wide variety of wild life such as wild boars, several species of snakes and bats.



Wild boars roaming in Peddha Beela

4.2 A potential IBA site?

Sompeta wetland is one of the last remaining wetlands of Coromandel Coast that holds a significant key to the aquatic biodiversity of the peninsular India. Spread over 1,600 sq. km in area with 20 km long shoreline that ranges from 0.5 to 2 km in width, Sompeta wetland is a complex ecosystem with a multitude of aquatic habitats including



Bengal Bushlark_



Oriental Pratincole

freshwater marshes and pools, irrigated paddy fields, stream mouths, mud flats, coastal brackish/saline lagoons, and tidal backwaters. This variety in physical features gives rise to a spectacular diversity of aquatic flora and fauna. This wetland complex is also a lifeline to around one lakh people, living in 33 villages around the wetland, who are directly dependent on the waters for their sustenance. The local communities have been waging a vigorous campaign to protect the wetland as parts of it were to be 'reclaimed' for industrial development We surveyed the Sompeta wetland during 15-24 March, 2016 for a preliminary assessment of the floral and faunal diversity. During our short survey, we recorded 125 species of birds including 48 water birds and another 16 wetland-dependent

avifauna. Interestingly, we documented presence of five species of globally Near-threatened birds, viz., Oriental Darter (*Anhinga melanogaster*), Eurasian Curlew (*Numenius arquata*), Black-headed Ibis (*Threskiornis melanocephalus*), Curlew Sandpiper (*Calidris ferruginea*), and Alexandrine Parakeet (*Psittacula eupatria*) in and around the Sompeta wetland. Other interesting observations include range extension of Bengal Bushlark (*Mirafra assamica*), which is otherwise distributed along the Indo-Gangetic plains east to Bengal and Brahmaputra floodplains, occurrence of a good population of Long-toed Stint (*Calidris subminuta*) – an uncommon winter visitor to India, and a large nesting colony of Black-breasted Weaver (*Ploceus benghalensis*) – a rare near-endemic species to India. Our survey also covered other taxa like plants, butterflies, dragonflies, fishes, herpetofauna, and mammals.

We plan to do more extensive surveys in the coming days to complete our documentation of the biodiversity of Sompeta wetland, and we will recommend the wetland to be designated as an Important Bird and Biodiversity Area (IBA) if warranted.



Long-toed Stint

4.3 Potential habitat for Pink Headed Duck

Pink-headed Duck is a shy and secretive bird, even potentially nocturnal, inhabiting secluded and overgrown still-water pools, marshes and swamps in lowland forest and tall grasslands, where there are lot of hiding places particularly areas subject to seasonal inundation. Both male and female of the species are 41–43 cm in size, long-billed with long necks and peaked heads. The male has a pink bill, head and neck while the female has a pale pinkish head and neck with a paler bill. The black of the body extends as a narrow strip on the front of the neck.

Pink Headed Duck from the wetlands of Srikakulam had been reported in the British Gazetteers. The Pink-headed Duck is a species not reported from the country for more than half a century. Its known distribution range includes northern Burma, north-eastern India, and central Nepal. Some, and possibly all, populations show local seasonal movements, resulting in scattered historical records as far as from Punjab, Maharashtra and Andhra Pradesh in India. The species was relentlessly hunted in the 19th and first half of 20th century for its skin which was prized as curios though its meat was less preferred. Indiscriminate hunting coupled with loss of habitat led to the fast disappearance of this bird from all known places of report.

Pink-headed Duck was last observed in the wild in 1949. Though amenable to live in captivity for a long time it failed to breed in captivity and in 1944 the last bird in the captivity died. As there have been some local reports of the sighting of this bird in Northern Burma, this bird has been categorised as ‘Critically Endangered’ instead of extinct. It is assumed that a small

population of around 50 birds may exist in Northern Burma which is yet to be explored fully. The elusive search of Pink-headed Duck is still in progress.

During our visits to Sompeta photographs of several species were shown to many villagers who were intimately connected to the wetlands. Alongwith the photographs of bird species already confirmed from those wetlands many villagers firmly reiterated, after seeing the photograph of Pink-headed Duck, that the bird was available during November to December end and sometimes upto January in the area around ten years back (Sebastian, et. al., 2012).

4.4 Conservation priorities

5000 acres of Paddy with 2 crops will suffer by the change in the hydrological regime of the wetland and its surroundings. Apart from the paddy cultivation thousands of acres of coconut farms and 750 acres of vegetable cultivation which depend on the three lift irrigation schemes will be in severe threat hitting the livelihood of around 3 lakh people in 33 villages. In effect the physical and operational interventions due to the establishment of any industrial activity would alter the natural system drastically in the coming years. In the process several species, known and unknown, is likely to disappear from the area, several crucial ecosystem services will be seriously undermined affecting the environmental security.

5. Profile of the immediate stakeholders of the wetland

5.1 Land Use Pattern

Table – 1 Land Use Pattern upto 10 km radius of the wetland (in ha)

Sl. No.	Particulars of land use	0 – 3 km	3 – 7 km	7 -10 km	0 – 10 km	Percentage
1.	Forest Land	0.00	0.00	3.10	3.10	0.003
2.	Land under cultivation					
	a) Irrigated Land	1789.89	1727.10	3376.23	7293.22	26.46
	b) Unirrigated Land	1532.51	3427.54	7498.35	12458.40	45.19
3.	Cultivable waste land	313.58	278.61	453.15	1045.34	3.79
4.	Area not available for cultivation	1585.02	2475.36	2710.31	6770.69	24.56
	Total Area	5221.00	7908.61	14441.14	27570.75	100

Data source: District Primary Statistics of Srikakulam District - 2001

The total area under cultivation within the 3 km radius is 3322.40 ha (irrigated – 1789.89, un irrigated -1532.51); within 3-7 km is 9225.45 ha (irrigated – 1727.10, un irrigated – 7498.35); 7-10 km is 10874.58 ha irrigated – 3376.23, un irrigated – 7498.35); 0-10 km 19751.62 ha

(irrigated – 7293.22, un irrigated – 12458.40). However the data shown above in the cultivable waste land is misleading as it contains wetlands also. As per the statistics 19751.62 ha cultivated land (irrigated and unirrigated) is in the 10 km radius of the wetland. The irrigated land is about 7293.22 ha and the unirrigated area is about 12458.40 ha.

5.2 Agriculture and cropping pattern

Agriculture is the mainstay of the community and the economic well being is heavily dependent on the agriculture. There are mainly two cropping seasons which includes the first crop season during rainy season and the second season during the winter and early pre monsoon seasons. The major crops of the first season are paddy, sugarcane, groundnut, bajra, finger millet and jowar. Of the bajra, finger millet and jowar are grown in dry lands with low irrigation facility. The crop of second season include Bengal gram, green gram, gingili and vegetable crops like brinjal, tomato, bhindi and other leafy vegetables.

5.3 Population

5.3.1 Table – 2 Distribution of population

Sl. No.	Particulars	0-3 km	0 -10 km
1.	No. of households	6729	36007
2.	Male population	13242	74522
3.	Female population	14795	80585
4.	Total population	28217	155107
5.	Average household size	4.2	4.3
6.	% of males to the total population	46.92	48.05
7.	% females to the total population	52.43	51.95
8.	Average household size	4.2	4.3
9.	Sex ratio (no. Of females per 1000 males)	1117	1081

Data source : District Primary Statistics of Srikakulam District. – 2001

5.4 Villages Covered for the present survey

Sompeta Mandal

1. Lakhavaram
2. Palasapuram
3. Zinkibhadra
4. Benkili

5. Rishigudda

6. Gollagandi

7. Baruva

8. Baruvpetta

9. Onturu

10. Ramayyapatanam

Kaviti Mandal

11. Iskalapalem

1. Manikkiyapuram

Kanchili Mandal

2. Baliaputtuga

1. Ammavariputuga

3. Kusumapuram

2. Kuttuma

4. Kapasaguddi

3. Kokkiliputtuga

5. Borivanka

4. Mandapalle

6. Kalingapatanam

5.5 Social Structure

The lion's share of the local community is agrarian belonging to the intermediary castes classified in the Backward Communities (BC) which is further classified into BC-A, BC-B, BC-C and BC-D depending upon their perceived backwardness. The forward communities are negligible in number. About 4.5% of the population belongs to Scheduled Tribes (ST) and about 6.60% belongs to Scheduled Caste (SC) communities. Thus approximately 11% of the population belongs to the socially weaker sections.

Majority of the villages display a multi-caste/multi-occupational social structure. The numerical strength of the Forward Caste (FC's) is nominal whereas Backward Castes under different categories (BC-A, BC-B, BC-C, & BC-D) dominate the social composition. Most of the castes still stick to their traditional occupations whereas few castes (such as members belonging to the weaving community, sweet making community, carpentry, black smithy etc.) are veering away from their traditional occupation because of the job opportunities outside their locality.

5.5.1 Livelihood Assets of the Stakeholders surveyed (Based on the 'The Sustainable Livelihoods Approach', Kollmair, M and St. Gamper, 2002)

The Sustainable Livelihood Framework (SLF) forms the core of the Sustainable Livelihoods Approach and serves as an instrument for the investigation of poor people's livelihoods, whilst visualising the main factors of influence. To achieve the SLF model objectives a qualitative and participatory analysis at the local level has to be conducted in detail.

The livelihoods approach is focused heavily on people. Therefore an accurate and realistic understanding of people's strengths (here called "assets" or "capital") is crucial to analyse how their livelihood options can be enhanced by converting their assets into positive livelihood outcomes (Bebbington, 1999). People require a range of assets to achieve their self-defined goals, whereas no single capital endowment is sufficient to yield the desired outcomes on its

own. Since the importance of the single categories varies in association to the local context, the asset pentagon offers a tool to visualise these settings and to demonstrate dynamical changes over time through constantly shifting shapes of the pentagon

5.5.1.1 Natural Capital

Natural resource stocks from which **resource flows and services** (such as land, water, forests, air quality, erosion protection, biodiversity degree and rate of change, etc.) useful for livelihoods are derived are usually defined as Natural Capital. It is crucial for those who derive all or part of their livelihoods from natural resource-based activities (Ecosystem People), as it is often the case for the poor stakeholders, since a good air and water quality represents a basis for good health and other aspects of a livelihood.

The main Natural Capital commonly available to the local community is the Beela which is the main source for water for irrigation, drinking, grazing field for livestock, fodder, roofing and thatching materials, edible and medicinal plants etc. Apart from this the Beela plays a major role in maintaining the ecological and environmental balance which facilitates in maintaining air and water quality which is required for a healthy living.

The rich biodiversity of birds and plants add to the natural capital which is mentioned elsewhere in this report.

Only about 40% of the local stakeholders own their land which makes them vulnerable to poverty.

5.5.1.2 Physical Capital

Physical capital comprises the **basic infrastructure and producer goods** needed to support livelihoods such as affordable transport, secure shelter and buildings, adequate water supply and sanitation, clean, affordable energy and access to information. It is heartening to note that all the villagers own their own houses though only 50% houses are pucca. As is the common case, marginalized communities i.e. SC's and ST's and other landless people are the owner's of 'kaccha' houses. Almost hundred percentage of the households, in many cases more than one member, owns a mobile phone and ninety percent own a TV in their house rendering them accessible to information and communication facilities. In most of the village streets, drinking water is provided through pipeline; 60% households own a bicycle whereas 40% households own a two wheeler, either a Moped or a Motorcycle. However it is interesting to note that the number of Motor Cars owned is very less. Even in affluent villages like Ammavariputtuga and Lakhavaram there are few Motorcars. The maximum number of Motor Cars available in a village are 3-5. Being an agrarian community in many villages 2-3 tractors are found.

Other Physical Capital on commercial basis available in the villages are threshers, flour mills, rice mills, and coir making factories.

5.5.1.3 Human Capital

In the context of the SLF it is defined as follows: "Human capital represents the **skills, knowledge, ability to labour** and **good health** that together enable people to pursue different livelihood strategies and achieve their livelihood objectives" (DFID, 2000). It is a major and decisive factor in order to make use of any other type of assets. In many times valuation of Human Capital is a complex issue since assets like indigenous knowledge cannot be valued appropriately.

It is noteworthy in most of the villages from the available human capital is high. Villagers traditionally are skillful in their occupation such as agriculture, fishing, weaving, sweet making, preparation of mats, house construction etc. In Manikiyapuram village which is traditionally a fishing village, the family members prepare most of the fishing gears. Even children are adept in catching fishes. The people are capable of enduring long hours labour being an agrarian and fishing community.



Village evening fish market

Generally people are enjoying reasonable good health since government supported health care is reasonable available and accessible to them. The exception is that few villages which fall in the Uddanam area. Kusumapatanam, Kalingapatanam and parts of Baruva in the Uddanam area are afflicted by the rare Chronic Kidney Disease (CRD).

There is ample formally educated skill available in all the villages. The availability of few Junior and Senior, both in the private and government sector has facilitated hundreds of youth to become diploma holders, graduates, and Post Graduates. In all the villages there are Graduate and Post Graduate Engineers and MBA's available. Diploma and ITI certificate holders are exist in all disciplines. Apart from this there are informally skilled plumbers and electricians in each village to cater to the local needs. The unfortunate aspects are that only 50% of these skilled people are employed in formal or informal sector.

5.5.1.4 Social Capital

'In the context of the SLA, it is taken to mean the social resources upon which people draw in seeking for their livelihood outcomes, such as **networks and connectedness**, that increase

people's trust and ability to cooperate or **membership in more formalised groups** and their systems of rules, norms and sanctions.'

It is noteworthy that due to various factors, the social capital of the study area is quite high. Srikakulam district has a long history of many social movements. The agitation against the proposed Super Thermal Power Plants in which three people lost their lives and many got injured, have united people like never before.

The villages have many formal and informal organizations and institutions which is listed below.

5.5.1.4.1 Irrigation Committees – Under the auspices of the Department of Irrigation the Committee advises about the irrigation water usage formalities.

5.5.1.4.2 Self Help Groups (SHG's) – The most vibrant social groups, locally known as 'Dokras', in a village which are run by women. In few villages there are SHG's run by men also. In a large village like Baruva more than 100 SHG's exist whereas in small villages more than 20 SHG's exist. Each SHG consists of 10-15 members. The monthly subscription is usually Rs.50/- SHG's are active in microfinancing and takes care of the immediate and urgent financial needs of the villagers to a large extent.

5.5.1.4.3 Youth Clubs – Minimum one youth club is available in a village; some villages having more than one. Youth clubs are active in organizing social, cultural and sports activities.

5.5.1.4.4 Non Governmental Organisations – Few villages have NGO's focusing on particular social activities.

5.5.1.4.5 Temple Committees – These are formed to organize festivals and other programmes associated with temples. These committees are temporary and formed as and when required.

5.5.1.4.6 Institutions

5.5.1.4.6.1 Schools – depending on the size of the village there are government primary and secondary schools.

5.5.1.4.6.2 Panchayat and Village Office – All the villages have Panchayat and Village Office. Village Offices are usually functioning in the Panchayat Office. Villagers rank Panchayat and Village offices as the most important offices impacting their life.

5.5.1.4.6.3 Anganwadis – In all the villages there are Anganwadis, sometimes more than one.

5.5.1.4.6.4 Banks – Few villages have a bank branch.

4.5.1.4.6.5 Fishermen Societies - In Fishing villages, Fishermen Societies under the auspices of the Department of Fisheries.

5.5.1.4.6.6 Temples – Temples are ubiquitous in all the villages. Even in small villages there are minimum three temples; in large villages there are more than ten temples. Temples act as a binding force among the villagers.

5.5.1.5 Finance capital

“Financial capital” denotes the financial resources that people use to achieve their livelihood objectives and it comprises the important availability of cash or equivalent, that enables people to adopt different livelihood strategies. Two main sources of financial capital can be identified:

- **Available stocks** comprising cash, bank deposits or liquid assets such as livestock and jewellery, not having liabilities attached and usually independent on third parties.
- **Regular inflows of money** comprising labour income, pensions, or other transfers from the state, and remittances, which are mostly dependent on others and need to be reliable.

The financial capital of the villagers are precarious. Being an agrarian economy, the state and scope of agricultural crops determine the economic well being of the community. The major source of income of the land owning community is from coconut, paddy, vegetable cultivation and cashew which are all price sensitive. Labourers depend on the agricultural season for work opportunities and in the off season they migrate to states like Gujarat, Punjab and cities like Mumbai and Bengaluru. Even many farmers who own 1-2 acres of land also migrate for extra income. The migration is rampant so that sex ratio all the villages are favouring females. The wages are also not high locally.

Because of the depletion of the fish population in the Beela (mostly due to uncontrolled overfishing), inland fishers are struggling to survive. Since Srikakulam coast is not particularly known for fish productivity and because of over exploitation the income for marine fishers is also low. The ban on fishing from May 15th to July 15th every year adds to their woes. Many marine fishers also migrate to industrial canters for extra income.

Women folk equally contribute to the financial well being of the family in various ways. The fish catch of the men folk is marketed by women folk in the markets and vending it carrying on the heads from place to place which adds substantially to the family income. The vegetables are also marketed by the women.

Most importantly when the men are migrating to outside places, women tend the family assets like agriculture and cattle. Women from fishing communities also work as agricultural labourers.

6. Enhancing the livelihood options of the stakeholders

- To maintain the integrity of the wetland in order to protect its biodiversity and also to maintain the ecosystem services derived from it.
- To derive maximum benefit out of the wetlands and its biodiversity, in a sustainable way, so that the stakeholders strive to protect the wetland

6.1 Measures to enhance the livelihood options

6.1.1. Development of Ecotourism

6.1.1.1 The scope

The natural setting of the wetland and its environs is ideal to become a thriving ecotourism centre. Even in extreme summer the core area is inundated by water suitable for boating by country boats. Having well developed conveyance facilities from different parts of the state and the country, the spot is easily accessible by rail, road and air. The three Beelas are unique in its characteristics and similar natural formations are not found anywhere else in the country.



Peddha Beela in summer - A potential ecotourism attraction

Different agricultural crops being cultivated in the surrounding areas can be developed for promoting farm tourism.

The avifaunal biodiversity is astounding harbouring many rare and IUCN category birds. It is an important site for migratory birds from different parts of the world. It can be a destination for bird watchers and researchers.

The coastal stretch and beaches adjacent to the Beela also offer avenues for ecotourists. Experiencing village life of people of different vocations such as fishers, farmers in different settings would be enjoyable for the visitors.

6.1.1.2 Components of the Ecotourism

6.1.1.2.1 Bird watching: As mentioned elsewhere in this report, even during off season more than 120 bird species are available in the Beela and its environs which include rare and threatened birds. During the migratory season i.e. from September to February, thousands of birds reach Sompeta Beela from different parts of the world.

6.1.1.2.2 Boating: Even during extreme summer around 50 ha. of water spread area exists in the Peddha Beela which offers ample opportunities for boating in country boats in a calm and serene environment.

6.1.1.2.3 Angling: Chinna Beela can be developed as an angling site by stocking appropriate fish species such as Mahseer along with the native species in the Beela.

6.1.1.2.4 Experiencing rural life and farm tourism: A lot of foreign tourists and native urban tourists turning towards rural areas to experience rural life and local culinary. The villages in the immediate vicinity of the Beela offers perfect setting for farm tourism with the number of traditional houses and farms cultivating different types of crops. There are a number of festivals celebrated associated with temples in each village which will be exotic experience for the tourists.

6.1.1.3 Infrastructure needed to develop ecotourism

6.1.1.3.1 Ecofriendly cottages: Adequate accommodation will have to be made available by constructing ecofriendly cottages in locations which will not be inundated during monsoon.

6.1.1.3.2 Home stays: Local houses that are ready to convert themselves to home stay facility for tourists.

6.1.1.3.3 Boat bay: Facility for parking and embarking on boats will have to create at different spots in the Beela without altering the ambience.

6.1.1.3.4. Bird watching tower: A bird watching tower at an appropriate location can be constructed which will facilitate the visitors not only for bird watching but also to enjoy the natural scenic beauty.



Traditional houses can act as home stays for tourists

6.1.1.3.5. Catering facility for the tourists: adequate facility for providing food to the tourists should be created.

6.1.1.4 Employment opportunities

6.1.1.4.1 For local fishing community: Fishers can be trained to take the tourists for boating and bird watching since they are experts in handling country boats and familiar with the locations for bird watching.

6.1.1.4.2 For unemployed graduates: can be trained as guides for bird watching. They also should be trained in soft skills, proficiency in English and Hindi and also in dealing with domestic and foreign tourists.

6.1.1.4.5 Opportunities in the home stay sector: The local houses opting for converting themselves into home stays will be earning substantial income from this activity.

6.1.1.4.6 Other opportunities : Once the ecotourism is established and the number of tourists increase, ample income generating opportunities will be available by meeting the requirements of the tourists such as increased demand for local products such as vegetables, milk, fish and other items required on a day to day basis.

6.1.1.2 Establishment of Dairy

6.1.1.2.1 Scope

Almost 50% of the households own cattle. Cattle population consists of local breed and hybrid breeds which are fed natural fodder. Most of the cattle graze on the grasslands of Beela. The quality of the milk is high as compared to the stall fed cattle. At present, a privately owned Dairy viz. Visakha dairy operated from Visakhapatnam, has organised cattle owners as a cooperative and collects milk at Rs.20-22/litre. They market the milk at Visakhapatnam at a much higher price.



A house hold cattle yard

There is ample scope for organizing the milk producers as a separate cooperative society or registering a Producers Company. The collected milk can be processed at Sompeta itself by setting up a chilling plant. Since the milk is naturally produced it can be marketed as an organic product fetching much higher price. The income earned by milk producers can be substantially enhanced by this measure.

6.1.1.3 Establishment of a unit for making Coir based products

Coir rope making units exist in Sompeta and Kaviti Mandals. Coir products such as coir mats, coir brushes, coir ropes, coir mattresses do have increasing demand in domestic and international markets as they are ecofriendly. Coir Board of India provides training to entrepreneurs to manufacture



Fibre extracted from coconut husk

these products. The coir pith available during the process can be converted to organic manure which can be sold locally to organic farmers who are increasing day by day or can be exported.

Coconut farmers can be organized as Cooperative Society and manufacturing units can be set up.

6.1.1.4 Value added products from lotus tubers and stems

Lotus plants are profusely growing in the wetland impacting the ecological balance of the wetland. Unless the unlimited proliferation is controlled it will seriously alter the characteristics of the wetland.

Almost all the parts of the plant viz. root, young flower stalks, and seeds are delicacies and being employed in the cuisine.

6.1.1.4.1 Uses of Lotus:-

- Lotus flowers, seeds, young leaves and rhizomes are all edible.
- The petals are sometimes used for decoration, while the large leaves are used as a wrap for food.
- Various parts of the sacred lotus are also used in traditional Asian herbal medicine.
- The tender seeds are munched in north-east India.
- The lotus stem is eaten almost in all parts of India, and pickled too.
- Young lotus stems are used as a salad ingredient in Vietnamese cuisine.
- The distinctive dried seed heads, which resemble the spout of watering cans, are widely sold throughout the World for decorative purposes and for dried flower arrangement.
- The rhizome is used as a vegetable in soups, deep-fried, stir-fried and braised dishes.
- Lotus rootlets are often pickled with rice vinegar, sugar, chili and garlic.
- The stamens can be dried and made into a scented herbal tea in Vietnam.
- The lotus seeds or nuts can be eaten raw or dried and popped like popcorn.
- In South Indian states, the lotus stem is sliced, marinated with salt to dry, and the dried slices are fried and used as a side dish.
- In Sri Lanka, the sliced lotus stem curry is a popular dish called as "Nelum Ala."

- A unique fabric from the lotus plant fibers is produced in Myanmar.
- The leaves are used as a flavouring agent and to wrap sweet and spicy mixtures (rice, meat, fruit etc.) for steaming (<http://www.krishisewa.com/articles/production-technology/485-lotus.html>)

6.1.1.4.2 Health benefits of Lotus root

- Lotus root is one of the moderate calorie root vegetables. 100 g root-stem provides about 74 calories. It is composed of several health benefiting phyto-nutrients, minerals, and vitamins.
- Lotus rhizome is very good source for dietary fiber; 100 g flesh provides 4.9 g or 13% of daily-requirement of fiber. Dietary fiber together with slow digesting complex carbohydrates in the lotus root help reduce blood cholesterol, sugar, body weight and constipation conditions.

- Fresh lotus root is one of the excellent sources of vitamin C. 100 g root provides 44 mg or 73% of daily-recommended values.



Lotus plants are abundant in Peddha Beela

Vitamin C is a powerful water soluble anti-oxidant. It is required for the collagen synthesis inside the human body. Collagen is the main structural protein inside the body, required for maintaining integrity of blood vessels, skin, organs, and bones. Regular consumption of foods rich in vitamin C helps the body protect from scurvy, develop resistance against viral

infections, boosting of immunity, wound healing and to scavenge cancer causing harmful free radicals from the body.

- In addition, the root contains moderate levels of some of valuable B-complex group of vitamins such as pyridoxine (vitamin B-6), folates, niacin, riboflavin, pantothenic acid, and thiamin. Pyridoxine (vitamin B-6) acts as a coenzyme in the neuro-chemical synthesis in the brain which influences mood. Adequate pyridoxine levels help control nervous irritability, headache, and tension. It also cuts heart-attack risk by controlling harmful homocysteine levels in the blood.
- Further, the root provides healthy amounts of some important minerals like copper, iron, zinc, magnesium, and manganese. Copper is a cofactor for many vital

enzymes, including *cytochrome c-oxidase* and *superoxide dismutase* (other minerals function as cofactors for this enzyme are manganese and zinc). Along with iron, it is also required in the production of red blood cells.

- Crunchy, neutral yet delicate flavor of root lotus is because of its optimum electrolyte balance. It composes agreeable ratio of sodium to potassium at the value 1:4. While sodium gives sweet taste to the root, potassium acts to counter negative effects of sodium by regulating heart rate and blood pressure (<http://www.nutrition-and-you.com/lotus-root.html>).

Local stakeholders can be trained in the processing of Lotus parts which can be marketed.

6.1.1.5 Value added products from Pandanus leaves



Pandanus plants

Pandanus odoratissimus is part of the Pandanceae family of plants, commonly referred to as screw pine. It is native to peninsular Southeast and South Asia and is one of the main wetland species of plants to be used to make handicraft products in this region. It is found in the back mangroves and has large prop roots and long, thin, spiny leaves. The leaves make a good fibre for weaving, as they are long, thick and durable.

Pandanus is an erect, evergreen, coarsely branched tree that looks like a large branched candlestick or holder. It can grow to a height of 15 m. Stems are hollow. Leaves are sword like, 1 to 2 m long and 4 to 7 cm wide, arranged spirally in three rows at the tips of the branches. In fully exposed leaves, the midrib is bent, and the upper third or so of the leaf hangs down, giving Pandanus plants their characteristic drooping

appearance

Uses: It is an important component in the food security system of the Maldives and considered as the best source of food during famine and scarcity. Red portion of the ripe fruit is eaten raw. Juice, locally called as *baipainkandhi*, is extracted from the fruits by cutting them into small pieces, boiling them in water with sugar and then crushed and strained. Fruit is also used in various food preparations. It is cooked with rice and sugar to prepare a delicious traditional food called *kashiko bondibaiy*. A sweet soup, called *kashiko baypeen*, is prepared from the fruit. A sweet namely, *kashiko foa* is prepared by cooking pieces of fruits with sugar and wheat flour and sold in local market. Leaves, after thoroughly dried and prickles removed, are used to make a kind of soft mat called *santhi*. Prop root, locally called *aloho*, is used as a brush to paint boats.

Hollow stems were once used to build houses but now are widely used to construct *hargue*, a place where boats are hauled for repair. Stems, which are fibrous and very soft, are widely used in making *hulhuashi*, a resting platform commonly found nearby the beach (<http://www.fao.org/docrep/010/ai387e/ai387e08.htm>)

Pandanus can be used to make a variety of woven handicraft products including bags, boxes, baskets, mats and slippers. The sale of these products can be an important source of supplementary income for women's groups in coastal villages and can also encourage wetlands conservation.

To prepare the leaves for weaving the spines must first be removed and the leaves must be rolled out to dry in the sun. The dried leaves are then stripped into fine strands. Pandanus fibre can be coloured using chemical or natural dyes allowing a diversity of colourful patterns to be created to produce unique designs (<http://mangroveactionproject.org/wp-content/uploads/2013/10/Pandanus-Handicrafts.pdf>)

Pandanus mats were commonly used in many parts of our country, especially in Kerala, till a few decades back for various purposes such as sleeping, sitting, dining etc. After the advent of plastic mats Pandanus mats became unpopular. However, due to its ecofriendly nature and the increased awareness about the ill effects of plastic, Pandanus mats have made a strong come back. Local stakeholders can be trained on all these aspects and cottage industries can be set up.

6.2 Feasibility of alternate livelihood options

An analysis of five types of sustainable capital of the stakeholders from where they derive the goods and services to improve the quality of lives indicate that the natural capital, social capital and human capital available in the community are high whereas their physical capital is moderate and financial capital is low. In order to lead a sustainable life all the capitals will have to be high. Since the first three capital mentioned above are high, the chances of improving the other two capitals viz. financial capital and physical capital is highly feasible.

The wise utilization of natural capital available i.e. the wetland its associated resources such as water, land, and biodiversity can be effectively utilized by the human capital available viz. the skill sets available with the community in the form of traditional skills coupled with educated human resource in various fields since their social capital is quite high.

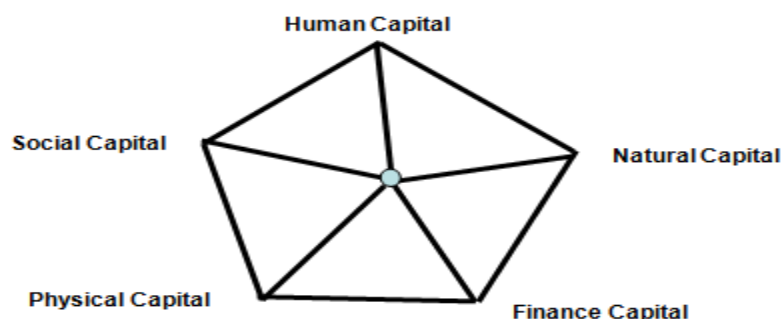


Figure -1 Asset Pentagon as the Core of Livelihood Base

6.2.2 Institutional Set Up required for executing the programmes

An effective and efficient institutional mechanism is required for the organization and implementation of the alternate livelihood options suggested. The programme will have several key components like formation of cooperative societies, awareness creation, training programmes, exposure visits, development of marketing network, developing infrastructure development, identification of appropriate funding agencies, preparation of Detailed Project Reports (DPR's) for funding, identification of beneficiaries etc.

Parayavaran Parirakshana Samiti (PPS) which has been active for the past many years in Sompeta taking up environmental issues has accumulated a lot of goodwill and acceptability among different stakeholders. PPS may form a separate wing for taking up the development activities and can hire specialists for initiating the above mentioned activities.

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