



ADAPTATION FUND

REQUEST FOR PROJECT/PROGRAMME FUNDING FROM THE ADAPTATION FUND

The annexed form should be completed and transmitted to the Adaptation Fund Board Secretariat by email or fax.

Please type in the responses using the template provided. The instructions attached to the form provide guidance to filling out the template.

Please note that a project/programme must be fully prepared (i.e., fully appraised for feasibility) when the request is submitted. The final project/programme document resulting from the appraisal process should be attached to this request for funding.

Complete documentation should be sent to:

The Adaptation Fund Board Secretariat

1818 H Street NW

MSN P4-400

Washington, D.C., 20433

U.S.A

Fax: +1 (202) 522-3240/5

Email: afbsec@adaptation-fund.org



ADAPTATION FUND

PROJECT/PROGRAMME PROPOSAL TO THE ADAPTATION FUND

PART I: PROJECT/PROGRAMME INFORMATION

Project/Programme Category:	SMALL - SIZED PROJECT
Country/ies	INDIA
Title of Project/Programme:	CONSERVATION AND MANAGEMENT OF COASTAL RESOURCES AS A POTENTIAL ADAPTATION STRATEGY FOR SEA LEVEL RISE
Type of Implementing Entity:	NIE
Implementing Entity:	NATIONAL BANK FOR AGRICULTURE AND RURAL DEVELOPMENT (NABARD)
Executing Entity/ies:	M. S. SWAMINATHAN RESEARCH FOUNDATION (MSSRF)
Amount of Financing Requested:	US\$ 689,264 (in U.S Dollars Equivalent)

Project / Programme Background and Context:

Background

Climate change has become a serious issue that threatens to undermine the drive for sustainable development at a global level. Since the industrial revolution, the mean surface temperature of Earth has increased by an average of 1° C per century due to accumulation of greenhouse gases. Most of this change has occurred in the past 30 to 40 years, and the rate of increase is accelerating, with significant impacts at both a global as well as regional and local levels. While it remains important to reduce greenhouse gas emissions and reverse climate change in the long-run, many of the impacts of climate change are already in evidence. As a result, governments, communities and civil society are increasingly concerned with anticipating the future effects of climate change while searching for strategies to mitigate, and adapt to its current effects.

In India nearly 100 million people living along the coastline are reliant on climate-dependent activities such as agriculture, marine fisheries and aquaculture. The livelihood security of these coastal communities and ecological security of the coastal zones of India are already under stress due to high population density, urbanization, industrial development, high rate

of coastal environmental degradation and frequent occurrence of cyclones and storms. Sea level changes and occurrence of extreme events such as cyclones and storm surges are going to aggravate this problem (INCCA, 2010)¹. According to Aggarwal and Lal (2000)², predicted sea level rise would lead to inundation of seawater in about 5,700 km² of land along the coastal states of India and nearly 7 million coastal families could be directly affected if the sea level increases by 1 m by 2100. Farming families, fishermen, aqua farmers and others will bear the full force of these impacts through less stable livelihoods and rising risks to their health, safety and homes. Many fisheries-dependent communities already live a precarious and vulnerable existence because of poverty, lack of access to social services and lack of essential infrastructure.

As indicated above the coastal area of India is highly vulnerable to climate change and the present project is designed to link ecological rehabilitation of degraded mangroves, utilization of saline lands for livelihood development and preparing the communities for facing the climate change challenges through adaptation measures.

Mangroves and climate change

The Coastal Zone Management Subgroup of the IPCC (Dronkers *et al* 1990)³ identified mangroves as one of the important ecosystems that would enhance adaptive capacity to climate change. According to this group, adaptive responses required to protect human life and property in coastal areas from climate induced problems fall broadly into three categories namely, retreat, accommodation and protection. This subgroup suggested that conservation of natural protection-value coastal resources such as mangroves and coral reefs is an important option to increase adaptation in the accommodation type of response to sea level rise. It also suggested that in the protection category of adaptive response mangroves can be raised as a soft structure to protect coastal land from increasing sea level instead of hard structures such as seawalls. They suggested that apart from the physical protection given by the mangroves the fishery resources associated with mangroves provide livelihood security to communities. Considering the above it is envisaged in the project that conservation and management of mangrove wetlands including restoring mangroves in

¹Indian Network for Climate Change Assessment (INCCA) 2010 Climate change and India: a 4x4 assessment - A sectoral and regional analysis for 2030s Published by Ministry of Environment & Forests, Government of India pp – 160.

²Aggarwal, D. and M. Lal. 2000. Vulnerability of Indian Coastline to Sea Level Rise. Proceedings of the APN/SURVAS/LOICZ Joint Conference on Coastal Impacts of Climate Change and Adaptation in the Asia-Pacific Region, APN and Ibaraki University, Ibaraki,

³Dronkers, J. T. E. Gilbert, L.W. Butler, J.J. Carey, J. Campbell, E. James , C. McKenzie, R. Misdorp, N. Quin, K.L. Ries, P.C. Schroder, J.R. Spradley, J.G. Titus, L. Vallianos, and J. von Dadelszen. 1990. Strategies for Adaption to Sea Level Rise. Intergovernmental Panel On Climate Change. Response Strategies Working Group. 147 pp.

degraded areas and integrated mangrove fish farming in abandoned shrimp farms in an integrated manner would enhance the adaptive capacity of coastal communities to climate induced problems.

Mangroves of India

India is endowed with mangrove forests both on the east and west coasts as well as in its island territories. There are two major types of ownership for mangrove wetlands in India. The first type includes mangrove wetlands owned and managed by the Forest Department and these mangroves are legally protected as Reserve Forests, Sanctuaries and National Parks. These mangroves are considered as protected mangroves. The second category includes mangroves present in the lands owned by the Revenue Department of the state government. The second category of mangroves comprise small patches of about 10 to 30 ha up to 200 to 300 ha each. These mangroves are considered as unprotected mangroves since they are not managed under any legal instruments.

As shown below, mangroves provide protection to a large number of people in the states of Tamil Nadu, Andhra Pradesh, Odisha and West Bengal.

- In Tamil Nadu about 17,781 people living in 17 villages near Pichavaram and 37,255 people living in 26 villages near Muthupet are protected by the respective mangroves (Selvam *et al* 2002)⁴.
- In Andhra Pradesh 79,400 people living in 39 villages are protected by the Godavari mangroves and 31,065 people living in 28 villages are protected by the Krishna mangroves (Ravishankar *et al*)⁵.
- In Odisha about 207 villages receive protection from the mangroves of Bhitarkanika and Mahanadi mangroves (Das and Sandhu, 2014)⁶.
- In West Bengal the Sunderbans mangrove forest protects nearly 4.33 million people living in 54 islands (<http://icfre.gov.in>)⁷.

⁴ Selvam, V., Gnanappazham, L., Navamuniyammal, M., Ravichandran, K.K. and Karunagarn, V.M. 2002. Atlas of mangrove wetlands of India, Part-I Tamilnadu, M.S.Swaminathan Research Foundation, India pp 100

⁵ Ravishankar, T., Gnanappazham, L., Ramasubramanian, R., Sridhar, D., Navamuniyammal, M. and Selvam, V. 2004. Atlas of Mangrove Wetlands of India Part 2- Andhra Pradesh, M.S. Swaminathan Research Foundation, Chennai pp 136

⁶ www.epw.in/.../Role_of_Exotic_Vegetation_in_Coastal_Protection.pdf

⁷ <http://icfre.gov.in/ForFTIFCpapersubtheme5.4/Dr.RahaSunderban> and global warming.pdf

Table 1: Protected and unprotected mangroves of India

State	Mangrove wetlands	Total area of the wetland (ha) ⁸	Mangrove area in protected zone in 2011 (ha) ⁹	Mangrove area in unprotected zone
West Bengal	Sunderbans	426,000	215,500	
Odisha	Mahanadi	67,000	22,200	3,275 ¹⁰
Andhra Pradesh	Godavari and Krishna	58,250	35,200	8,980 ¹¹
Tamil Nadu	Pichavaram and Muthupet	14,300	3,900	1,500 ⁷
Gujarat	Gulf of Kutch and Gulf of Khambat	111,323	105,800	
Maharashtra		20,000	6,135 ¹²	7,092 ¹³
Karnataka		-	600	305 ⁹
Kerala		-	600	663 ⁹
Total		696,873	389,935	21,815

Since the early 1990s mangrove management in India has focused mainly on the restoration of degraded mangroves and protection of existing mangrove forest. These restoration programmes have been mostly restricted to the areas owned by the Forest Department. As a result, mangrove forest cover in areas owned by the Forest Department has increased by 617 km² from 1987 to 2011. However, mangrove areas located outside the Forest Department land have been neglected since these unprotected mangroves are considered as “no man’s mangroves” and they have been heavily degraded, losing much of the protective capacity that previously existed.

As shown in Table 1, in Andhra Pradesh alone, where the project is to be implemented, about 8,980 ha of unprotected mangroves are present, which is about 12% of the total mangrove area of Andhra Pradesh. Table 2 shows the area of unprotected mangroves present in different districts of Andhra Pradesh. The maximum area of unprotected mangroves (3,000 ha) is present in the Krishna district followed by Srikakulam district (2,150 ha). The smallest area of unprotected mangroves is in Vishakhapatnam district.

⁸Forest Working Plans of different sites and states

⁹ENVIS, Centre for Coastal Zone Management and Coastal Shelter Belt, Institute for Ocean Management, Anna University, Chennai <http://www.iomenviis.nic.in/index3.aspx?sslid=1131&subsublinkid=121&langid=1&mid=1>

¹⁰Patnaik, S.K. 2002 Mangrove conservation in Orissa – an overview In Mangrove conservation and restoration; Proceeding of the National workshop on Mangrove conservation and restoration, Bhubaneswar, MSSRF, Orissa Forest Department, pages 1-7

¹¹MSSRF Personal communication with government /Non-government agencies

¹²<http://www.downtoearth.org.in/content/mangroves-public-land-maharashtra-will-be-reserved-forests>

¹³Space Application Centre (SAC) 2012. Project Report Mangrove Inventory of India at community level. SAC, Ahmadabad 84 pp.

Table 2: Protected and unprotected mangroves in Andhra Pradesh

Name District	Protected mangroves (ha)*	Unprotected mangroves (ha)**
Srikakulam	0	2,150
Visakhapatnam	0	30
East Godavari	33,300	1,500
West Godavari	0	400
Krishna	19,000	3,000
Guntur	6,000	300
Prakasam	0	600
Nellore	3,000	1,000
Total	61,300	8,980

* Owned and managed by the Forest Department using the Forest Act; ** present in lands belonging to the Revenue Department and not managed.

The focus of the project will be on developing a community-based approach that is suitable for unprotected mangroves located in lands not owned by the Forest Department. If successful, this approach will serve as a model to manage the large area of unprotected mangroves located along the Indian coasts.

Project location

The project will be implemented in the Krishna delta (lat. 15°44'–16°40'N and long. 80°20'–81°30'E) in the state of Andhra Pradesh on the southeast coast of India (Figure 1). It is a lobate shaped delta covering an area of about 4,600 km². The elevation of the delta lies between the sea level and 15 meters inland. The region is influenced by tropical sub humid climate with hot humid summer and mild winter. The hottest months are April to June, when the average highest temperature reaches 33°C. The coldest month is January. Annually, maximum temperature varies from 23°C to 33°C. The annual mean rainfall is about 1,250 mm. Alluvial soil occupies the deltaic plain, which is fertile with very high clay content. The soil of the coastal tract is sandy, coarse, deep and occasionally saline¹⁴. About 4.5 million people, depending on agriculture, fisheries and aquaculture, live within the delta. About 540,000 ha are irrigated with river water within the delta. In the Krishna delta mangrove forest is present in about 22,000 ha of which about 3,000 ha are unprotected since they are located outside the area owned by the Forest Department.

¹⁴Kumar, B., M. S. Rao, A. K. Gupta and P. Purushothaman. 2011. Groundwater management in a coastal aquifer in Krishna River Delta, South India using an isotopic approach. Current Science: 100 (7) 1032-1043.

Figure 1. Location of the Krishna Delta, Andhra Pradesh



Context: Vulnerability of project region to climate change

Predicted changes in atmospheric temperature in the region and its impact

According to a study conducted by Muralidhar *et al* (2012)¹⁵ the maximum temperature in the project region will increase by 1°C by 2020 and 2°C by 2050 due to climate change. Currently, temperature reaches its peak in May and June whereas the prediction indicates that the high temperature period will extend for two and half months during 2020 and 2050. This will increase the in risk in aqua farming, since it will increase water salinity and dissolved oxygen problems. The increase in temperature during the winter months will be positive for shrimp farming leading to better food conversion rate and a faster growth rate.

Predicted changes in sea level in the project region and its impact

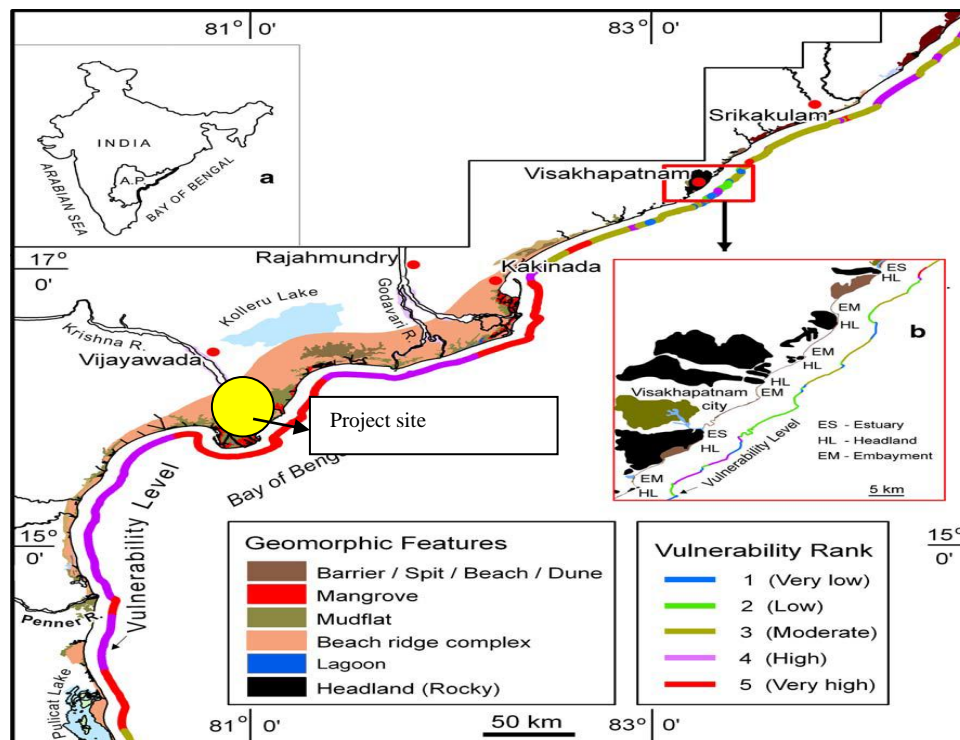
Climate change and associated sea level rise is another major concern. According to Aggarwal and Lal (2000)¹⁶ sea level along the Indian coast would rise by 15 to 35 cm by 2050 and 46 to 59 cm by 2100. Along the Indian coast, there has already been a sea level

¹⁵Muralidhar, M., M. Kumaran, M.Jayanthi, B.Muniyandi, A.G.Ponniah, Udaya S. Nagothu, Patrick White and Ambekar Eknath. 2012. Case study on the impacts of climate change on shrimp farming and developing adaptation measures for small-scale shrimp farmers in Krishna District, Andhra Pradesh, India, Network of Aquaculture Centers in Asia-Pacific, 126 p.

¹⁶Aggarwal, D. and M. Lal. 2000. Vulnerability of Indian Coastline to Sea Level Rise. Proceedings of the APN/SURVAS/LOICZ Joint Conference on Coastal Impacts of Climate Change and Adaptation in the Asia-Pacific Region, APN and Ibaraki University, Ibaraki,

rise of 1cm on average since 1900 per decade (Adaptcap)¹⁷. Rao *et al* (2008)¹⁸ predicted that such an increase in sea level would result in 894 km² in the Krishna and Godavari delta region alone become saline leading to displacement of 1.29 million people if the sea level rises by about 0.6 m. Most of the people living in the area are poor farming and fishing families who are highly vulnerable in socio-economic terms. Because of the above reasons, the project region is considered highly vulnerable to sea level rise due to climate change (Figure 2).

Figure. 2 Map showing high vulnerability of the project site to predicted sea level rise (Rao *et al*, 2008)



Predicted changes in Cyclonic Storms in the project region and its impacts

As per the State of Environment Report, Andhra Pradesh (2009),¹⁹ an analysis of the frequencies of cyclones during 1891-1990 shows that nine coastal districts of Andhra Pradesh are severely vulnerable to cyclonic storms. As indicated in the State Action Plan on Climate Change, the coast between Ongole and Machilipatnam, which is in the project

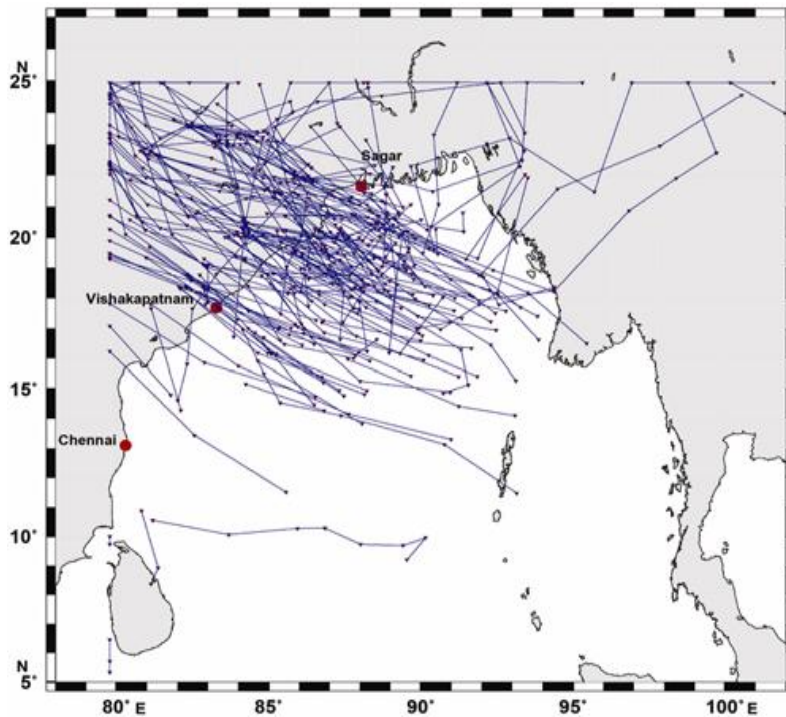
¹⁷ <http://www.adaptcap.in/climate-change-projections/>

¹⁸ Rao, N., K., Subraelu, P., Venkateswara Rao, T., Hema Malini, B., Ratheesh, R., Bhattacharya, S., and A. S. Rajawat. 2008: Sea-level rise and coastal vulnerability: an assessment 15 of Andhra Pradesh coast, India through remote sensing and GIS, *J. Coast Conserv.*, 12, 195–207.

¹⁹ State of Environment Report, Andhra Pradesh (2009) EPTRI pp. 318.

region, is recognized as vulnerable to high storm surges. Unnikrishnan et al²⁰ (2011) compared the simulations for the occurrence of tropical cyclones in the Bay of Bengal between a baseline scenario (1961–1990) and the future scenario (2071–2100) due to climate change using a regional climate model namely, Providing Regional Climates for Impacts Studies (PRECIS), developed by the Hadley Center for Climate Prediction Research. As shown in Figure 3, this study indicates that the frequency of cyclones during the late monsoon (October-December) season during the future (2071–2100) scenario is found to be much higher than that during the baseline scenario (1961–1990) and intensity will also be very high due to increased wind speed. These highly intensive cyclones will hit the east coast of India from south of the project region to Kolkata in the north.

Figure 3. Predicted Track of Cyclones during 2071–2100 from PRECIS simulation (Unnikrishnan et al 2011)



Predicted Changes in the Flood situation due to climate change and its impact

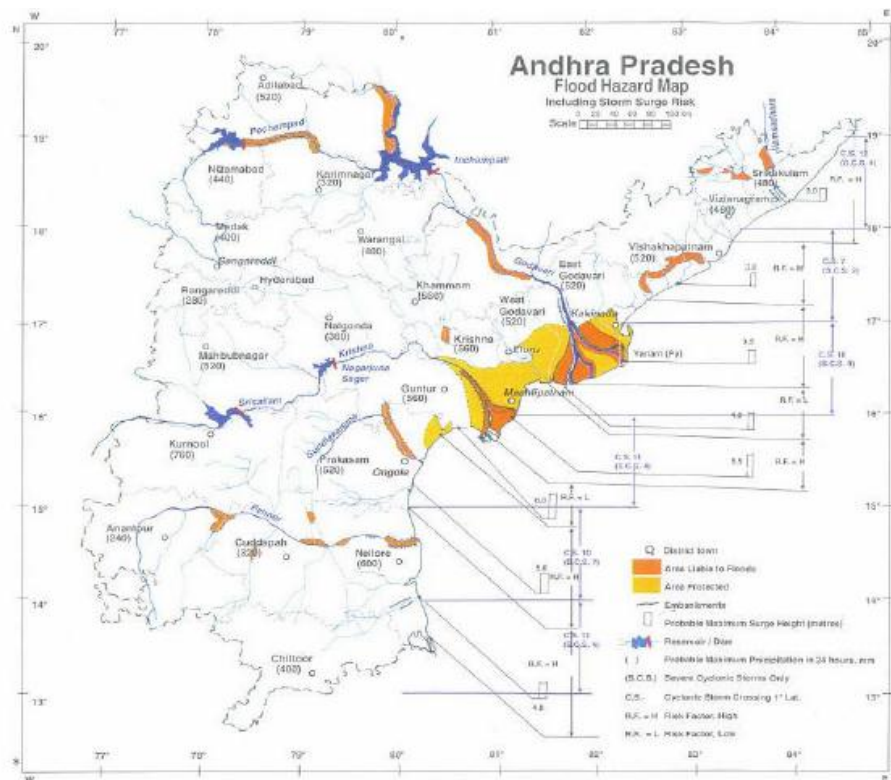
The Indian Network of Climate Change Assessment (INCCA 2010)²¹ predicted that rainfall is likely to range between 858 to 1,280 mm in the 2030s along the east coast of India, which is

²⁰A. S. Unnikrishnan^{1*}, M. R. Ramesh Kumar and B. Sindhu. 2011. Tropical cyclones in the Bay of Bengal and extreme sea-level projections along the east coast of India in a future climate scenario. *Current Science*: 101:(3) 327-331.

²¹Indian Network of Climate Change Assessment (INCCA). 2010 Climate change and India. A sectoral and regional analysis 2030s. Ministry of Environment and Forests, Government of India.

an increase by 0.3% to 4.4% when compared to rainfall during the 1970s. In the east coast, the number of rainy days are likely to decrease by 1–5 days. The intensity of rainfall is likely to increase between 1mm/day and 4mm/day. The catchment area of the Krishna river is located in the Western Ghats in the states of Maharashtra and Karnataka and in this area INCCA (2010) predicted that rainfall in the 2030s will increase by 6 to 8% when compared to the 1970s. Thus, due to the combined effect of increased rainfall both in the catchment area and delta itself due to climate change, Krishna delta is considered as highly vulnerable to floods (Figure 4).

Figure 4: Flood Hazard Map Andhra Pradesh
 (Source: State Action Plan on Climate Change for Andhra Pradesh, 2011)



Cumulative impact of climate change in the project region

Thus, the project region is highly vulnerable to the predicted changes in the climatic condition and sea level rise and associated extreme events such as cyclones and floods. The cumulative effect of sea level rise and increased intensity of cyclonic storms lead to salinization of land and water resources. According to a conservative estimate by Aggarwal and Lal (2010)²² a total area of 35,000 ha of prime agriculture land in coastal Andhra

²²Aggarwal, D. and M. Lal. 2000. Vulnerability of Indian Coastline to Sea Level Rise. Proceedings of the APN/SURVAS/LOICZ Joint Conference on Coastal Impacts of Climate Change and Adaptation in the Asia-Pacific Region, APN and Ibaraki University, Ibaraki

Pradesh will become saline due to sea level rise alone. INCCA (2010) indicates that salinization will lead to lesser productivity of land resources, which in turn will reduce income and increase poverty in vulnerable coastal areas.

Socio-economic context

About 4.5 million people live in the Krishna delta. The male population is 2.26 million whereas the female population is about 2.25 million. According to the 2011 census, average literacy is 73%. The District Rural Development Agency of Krishna area classified nearly 17% of the population as poorest of the poor and 37% as poor²³. This classification is based on assets including land, house, appliances as well as income. The land use pattern indicates that nearly 55% of the land area of the delta comes under cultivation. It also indicates that nearly 8.7% of the delta area is under forest cover, including 22,000 ha of mangroves. Brackish water aquaculture is practiced in about 4,000 ha. Agriculture remains the mainstay occupation of most of the people. The total number of cultivators in the delta is about 0.2 million and total number of agriculture labourers is about 0.6 million. According to the Marine Fisheries Census 2010 (CMFRI, 2010)²⁴ the total number of fishing families in the delta is 13,073 and the total fishing population is 43,005. All of families are considered as below poverty line families. These fishing families operate 2,200 non-motorised and 1,300 motorised crafts for marine fishing.

The Green Revolution (1965-1985) and the subsequent agricultural productivity boom, highly benefited the farmers of the Krishna delta. However, large landowners were the main beneficiaries whereas small landowning families benefited from a trickle-down effect and began to diversify their activities too. Nevertheless, economic disparities between landed and landless, relying on wage labor, increased. Meanwhile, the amount of freshwater discharged into the canal system that irrigates agricultural land in the deltaic region, decreased considerably over a period of time. This led to overexploitation of ground water resources leading to increased salinization of land and water. This problem is likely to be further aggravated by future sea level rise. It is predicted that due to increased sea level 894 km² in the Krishna and Godavari delta region alone will become saline, leading to displacement of 1.29 million people. Most displaced people will be poor farming and fishing families.

²³http://www.rd.ap.gov.in/IKP_MNDL/District%20Notes/Krishna%20Notes_151008.pdf

²⁴Marine Fishery Census 2010 Andhra Pradesh Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, Government of India, New Delhi and Central Marine Fisheries Research Institute, Kochi, Indian Council of Agricultural Research, New Delhi

Due to salinization of land and water resources farmers have tried to diversify their livelihood options. For example, there has been government and institutional support for aquaculture that boomed briefly, but was followed by problems due to poor management practices and falling yields. As a result, aquaculture has had a mixed impact in the Krishna delta. It sustains many livelihoods and has triggered infrastructure development to transport the production and opened up the coastal zone. However, it also led to uncontrolled conversion of agriculture land to aqua farming and increased land salinity.

In order to sustain livelihood security of the fishing and farming families in the Krishna deltaic region a much better balance between aquaculture, agriculture and environmental preservation needs to be achieved.

Purpose of the Project

The aim of the project is to overcome the consequences of salinization and other impacts of the coastal area due to sea level rise and seawater inundation due to increased cyclonic storms and storm surges through appropriate adaptation strategies such as (i) restoration of degraded mangroves and (ii) demonstration of Integrated Mangrove Fishery farming System (IMFFS). Restoration of mangroves will be taken up in degraded, saline and unprotected mangrove areas located in Revenue Department land and thus, it will serve as a model for management of similar areas of unprotected mangroves. Restoration of degraded mangroves will be undertaken with native multiple mangrove species that will improve the health of the mangrove forest, which in turn, will avoid ingress of seawater. It is also proven that an increase in the height of the mangrove substratum is almost equal to predicted annual increase in sea level. The mangrove ecosystem helps to build the land through sedimentation of suspended solids in the root zone preventing exposure of land, water, other coastal resources and livelihood assets to saline water inundation. IMFFS will be demonstrated in lands owned by small aqua farms so that it can be a model for other farmers both to sustain income from fish farming as well as improve protection from cyclonic storms. IMFFS also increases the opportunity to integrate both physical security against sea level rise and livelihood security of the coastal community. The raised bunds of this farming system can act as embankments protecting coastal villages from salt water intrusion during storm surges.

Project / Programme Objectives:

Goal

- The overall goal is to enhance the adaptive capacities of the local community and other stakeholders by strengthening their institutional mechanisms, restoration and management of coastal resources and building livelihood assets.

Objectives

- To assess the baseline situation and monitor vulnerability due to the predicted impact of climate change on natural and social systems and build on the current coping mechanisms and adaptive strategies.
- To train and build the adaptive capacities and climate resilient livelihood options for the stakeholders.
- To develop and demonstrate replicable models of community based mangrove restoration in unprotected mangroves and mangrove based agro-aqua farming systems as potential means to adapt to seawater inundation due to sea level rise triggered by climate change.

Project Components and Financing:

PROJECT COMPONENTS	EXPECTED OUTCOMES	EXPECTED OUTPUTS	AMOUNT (\$)
1. Community mobilization and organization	Improved community organization to undertake climate change adaptation measures	1.1. Gender balanced village level institutions formed in Sorlagondi, Nali and Basavanipalem villages	10,500
		1.2. 1,500 people oriented to CC, SLR and adaptive capacity concepts and measures involving mangroves	1,833
		1.3. Annual micro plans prepared for optimal utilization of resources	1,000
Sub- Total: Component 1			13,333
2. Capacity building for coastal protection and livelihoods	Trained stakeholders on coastal protection and livelihoods	2.1 200 stakeholders trained on mangrove restoration	8,333
		2.2 50 farmers trained in IMFFS	6,667
Sub- Total: Component 2			15,000
3. Restoration of mangrove areas for coastal protection	Restored and healthy mangrove replanted area contributing to protection of coastal erosion sea level rise	3.1 Replanted mangrove area close to 3 villages for future coastal protection	98,417
		3.2 Established mangrove nursery serving 3 villages	8,533
Sub- Total: Component 3			106,950
4. Demonstration of Integrated mangrove based fishery livelihoods	Demonstrated fishery related sustainable livelihoods integrated with mangroves	4.1 Two models of IMFFS demonstrated with the participation of local community and stakeholders	291,334
		4.2 Two culture of fish or prawn culture, or both, undertaken in the IMFFS farms per year	11,933
		4.3 Cage and pen culture established for crabs, fish, clams and cockles	83,333
Sub- Total: Component 4			386,600
5. Knowledge Management for Improved Coastal Protection	Prepared and published materials on ways to upscale coastal protection and livelihood systems in mangrove areas	5.1 Resource materials prepared for dissemination among various stakeholders	11,667
		5.2 Stakeholders brought together and knowledge on CC, SLR, vulnerability and measures to improve adaptive capacity shared	41,661
Sub- Total: Component 5			53,334
6. Project Execution cost			60,050
7. Total Project Cost			635,266
8. Project Cycle Management Fee charged by the Implementing Entity (if applicable)			53,998
Amount of Financing Requested			689,264

Part III Section G gives detailed activity based project budget information

■ **Projected Calendar:**

MILESTONES	EXPECTED DATES
Start of Project/Programme Implementation	October 2014
Mid-term Review	June 2016
Project/Programme Closing	September 2018
Terminal Evaluation	June 2018

PART II: PROJECT / PROGRAMME JUSTIFICATION

A. *Describe the project / programme components, particularly focusing on the concrete adaptation activities of the project, and how these activities contribute to climate resilience. For the case of a programme, show how the combination of individual projects will contribute to the overall increase in resilience.*

The problem of salinization of land due to sea level rise and thereby losing the livelihoods of the coastal community can be avoided if the adaptive capacity of the community is enhanced for which the following activities are planned as adaptation strategy.

Component 1 Community mobilization and organization

The project will be implemented in three villages namely, Sorlagondi, Nalli and Basavanipalem, in the Krishna delta of Andhra Pradesh. The total number of households in these villages is 1,104 and total population is 3,905 (male: 1,959; female: 1,946). These villages are governed by the traditional controlling system (traditional Panchayat) and elected local self-government. During the initial phase of the project they will be mobilized and organized into a village level institution to prepare, Implement, monitor and sustain project activities.

Village level institutions are the local informal institution that brings together the men and women of different socio economic categories based on the common objectives and governed by collectively developed rules and regulations. This would provide scope for accommodating the process mode and help to include socially and economically marginalized groups. This would act as a local forum for micro planning and implementation in transparent methods.

Output 1.1 Gender balanced village level institutions formed in Sorlagondi, Nali and Basavanipalem villages

Activity 1.1.1 Organizing project orientation meetings to community

Project orientation meetings will be conducted to traditional leaders, men, women and youth and women SHG leaders in project villages as well as to leaders of local self-government before initiating the project activities. These orientation meetings will help the community to understand the objectives and approach of the project and facilitate developing rapport with the community members. The community members will also be sensitized through village level meetings on the climate change induced issues such as sea level rise, increased frequency and increased incidences of cyclonic storms, decrease in fish catch and how the proposed activities will reduce their vulnerability.

Activity 1.1.2 Sensitizing the community on gender

Orientation meetings will be organized to sensitize the community on gender, different approaches followed for women development and empowerment as the project provides equal representation of men and women in all project activities and interventions

Activity 1.1.3 Organizing exposure visits

Exposure visits to men, women and youth will be organized to successful Joint Mangrove Management programme and Integrated Mangrove Fishery Farming Systems in MSSRF project villages. During the visits, participants will interact with the community of successful project villages to understand the importance of community participation, structure and functions of village level institutions, strategies to be followed to plan, implement and sustain project activities. Past experiences of MSSRF indicates that such exposure visits to successful programmes enhances the confidence levels of the community.

Activity 1.1.4 Conducting Participatory Rural Appraisal (PRA)

PRA is a useful tool to understand (i) socio-economic situation of the village, (ii) interdependency between coastal resources and user communities, (iii) major concerns of the villagers to coastal resource utilization and socio-economic development. The PRA also helps in building rapport with the community living in the project villages. In PRA, tools such as timeline, social mapping, gender analysis, wealth ranking, resource mapping, seasonal mapping, Venn diagram, problem analysis etc. will be used to identify major concerns of the people. These major concerns form the basis for preparing a microplan which includes both livelihood and developmental concerns of the villagers. The stakeholder analysis will be done using the Venn diagram where the community will provide information about the stakeholder's involvement and their relationship with them on natural resource management and socio-economic development. During PRA, special focus will be given on vulnerability assessment. Information related to climate change vulnerabilities and the adaptation capacities of the will be collected in the project villages. In addition, information on the current mean sea level in the project area, predicted sea level and how predicted sea level would affect coastal resources and community will be collected from secondary sources. PRA provides opportunity for the participating community in identifying the problems/issues and empower them in decision making to resolve those issues.

Activity 1.1.5 Forming village level institutions:

Organizing community into Village Level Institutions (VLIs) involves a systematic and intensive process. The objectives of VLIs are

- (i) to provide a platform for the people to participate in the project planning, implementation, monitoring and sustaining initiatives
- (ii) to provide opportunity for women and marginalized community in decision making and
- (iii) to create ownership of all project activities implemented in the village.

The structure and function of the VLI is as follows: Each VLI has a general body and executive body. The General Body (GB) is constituted with one adult male and female representative of each willing household and acts as the decision making body. The Executive Committee (EC) consisting of selected representatives from the GB for implementing project activities. The office bearers such as President, Secretary and Treasurer will be elected from the EC. The EC is the planning and implementing body. These VLIs will be oriented towards climate change related issues specific to sites and proposed actions and how these actions will reduce their vulnerability. They will also be oriented on the AFB's Environmental and Social Policy (approved in November 2013) for understanding the principles and practices that have been adopted to enhance development benefits and avoid unnecessary harm to the environment and communities. The functioning of VLI including its role in sustaining project activities will be strengthened through training and capacity building.

Activity 1.1.6 Implementing entry point activities

The entry point activities proposed for the project include processes related to identification and prioritization of major concerns of the villagers through PRA, providing technical, institutional and partial financial support to solve one or two such concerns to build rapport and trust and also to assess capacity, network and interest of the community in developmental activities.

Output 1.2 1,500 people oriented to CC, SLR and adaptive capacity concepts and measures involving mangroves

Activity 1.2.1 Organizing orientation meetings on CC, SLR and adaptive capacity

In each of the project villages a series of meetings will be held with women, men and youth to explain them what is climate change, how it is happening, impacts of climate change at global, national and site level particularly vulnerability to predicted rise in sea level, increased in the intensity of cyclonic storms and the concept and practice of adaptive responses to such impacts. They will also be oriented towards the role of mangroves and integrated mangrove fishery farming system in adaptive capacity of community to sea level

rise and cyclonic storms. Similar kind of meetings will also be held with leaders and members of traditional Panchayat, fisher and farmers groups and women self-help groups. Separate orientation meeting will also be with leader and members of elected local self-government. Such orientation will help these stakeholders to prepare themselves to take active participation in planning, implementation, monitoring and sustaining project interventions.

Output 1.3 Annual micro plans prepared for optimal utilization of resources

Micro plan is a realistic plan prepared by the people for the people in the places where it is going to be implemented. Such a kind of plan provides opportunity for active participation of people and also makes them take responsibility and ownership of actions taken.

Activity 1.3.1 Preparing annual micro plan

The village level institution with the facilitation of MSSRF and others such as traditional Panchayat, elected self-government and officials from Revenue Department prepare the micro plans. Preparation of micro plans involves the following steps. Results obtained from PRA and concerns of the community with reference to vulnerability to climate changed induced issues such as increasing sea level and increased intensity of cyclonic storms will be presented to VLI and other stakeholders. These concerns will include degraded mangroves and low incomes from fishing, unsustainability of aqua farming, etc., and also other developmental concerns that the VLI can address. After the presentation, an exercise will be taken up in which women, men and youth participate and prioritize the concerns. Once the concerns are prioritized, actions to address those concerns will be identified. Mangrove restoration, IMFFS and mangrove based cage and pen culture will be included in the actions to be taken to address the concerns. Along with these any other actions to mitigate climate change and increase adaptive capacity and also other developmental issues will also be considered. Following this, the micro plan will be prepared in a prescribed format, which will show activities to be undertaken, time line for each activity, resources required to complete each activity and share of resources-wherever possible-by various stakeholders including that of the people. The micro plan also indicates person or group of persons, to whom authority and responsibility is given to complete the activities. In such a way about 12 micro plans, 3 annual micro plans for each village for 4 years will be prepared.

Activity 1.3.2 Implementing micro plan and monitoring

After preparation of the micro plan it will be presented to General Body of the Village Level Institution for its approval. Once it is approved, micro plan will be implemented as per the

plan. Progress of the implementation will be monitored by a group or committee selected by VLI along with MSSRF staff. Progress will be presented to VLI once in three months.

Component 2 Capacity building for coastal protection and livelihoods

Output 2.1 200 people trained on mangrove restoration, IMFFS and fish culture

Activity 2.1.1 Selecting trainees

Through VLI interested women, men and youth in the project villages will be select for mangrove restoration training. A resolution will be passed in the VLI functioning that priority will be given to vulnerable groups such as landless farming families, land and assetless fishing families, women headed families and women in training and all other activities of the project. The following process will be followed to ensure participation of vulnerable groups in training programmes..

Advertisement: Hand out showing details of training programme will be prepared and displayed in public places. This hand out will also indicate that priority will be given to members belonging to vulnerable groups such as landless, assetless, women headed families and women members. It will be advertised that interested persons can approach the VLI for selection.

Application: Interested persons will be requested to apply in a prescribed format; Field staff such as Field Assistant and Animators will motivate members of vulnerable groups to apply for training.

Screening: Invited applications will be screened by VLI and MSSRF and it will be made mandatory that at least 50% of the trainees should be from vulnerable groups.

A list of grassroots NGOs will be prepared and invitation will be send to interested NGOs to nominate suitable person. Interested leaders of the traditional Panchayat and local self-government will be selected by interacting with them. Nomination will be invited from District level Forest and Fisheries Department for training to their field staff. Training on mangrove restoration will be conducted by MSSRF.

Activity 2.1.2 Organizing training on mangrove restoration techniques to VLI members

Members of the VLI including women, men and youth will be provided with hands on training on mangrove restoration techniques including designing of canals for tidal flushing, which makes the biophysical condition of the mangroves suitable to support mangrove growth and

digging of canals in a fish bone type so that maximum flushing will occur during high and low tides. They will also be trained on how to select healthy mangrove propagules (plant materials) and how to plant them. They will also be trained on care and management of plantations including periodical removal of seaweeds, if there is any, in the canal and application of neem oil spray to control disease, if any pest attack the mangrove plantations (normally there will not be any pest attack on mangroves). This technical knowledge will help them work effectively during the implementation of the project as well as in future restoration activities.

Activity 2.1.3 Organizing training on mangrove restoration to NGOs and Self government

Similar training will also be provided to representatives of local NGOs and local Self-government leaders and members. Apart from this, they will also be trained in identifying areas suitable for mangrove afforestation and provided orientation on the process relating to getting government permission. All these will help in sustaining project activities.

Activity 2.1.4 Organizing training on mangrove restoration to government officials

In addition, staff of the Forest and Fisheries Department working at the field level will also be trained on mangrove restoration. In all the training programmes three different approaches will be followed: i) theoretical orientation to scientific basis of mangrove restoration, ii) field visits and iii) hands on training. These technical trainings provided to community and stakeholders will help in sustaining the mangrove restoration workers in the future.

Output 2.2 50 farmers including at least 20 women trained in IMFFS

Activity 2.2.1 Selecting aqua farmers for training

Through village level meeting and VLI, interested women and men aqua farmers, who own aqua farms and are willing to adapt IMFFS practices, will be select for the training.

Activity: 2.2.2 Organizing training on IMFFS

Selected women and men aqua farmers will be given orientation to the concept of IMFFS and how it act both as a source of livelihood and as a measure of protection against cyclonic storms. With the help of aqua farm engineers training will be provided on designing of the aqua farm so that it become tidal fed. Training will also be provided on how to construct and maintain structural features such as inner bunds, outer bunds and inlet and outlet. MSSRF will provide training on selection of mangrove species for IMFFS, planting and after care. Aqua farming professionals will provide training on sustainable fish, shrimp and crab culture.

Component 3 Restoration of mangrove areas for coastal protection

Role of mangroves in increasing adaptive capacity of the local community to climate change

The Coastal Zone Management Subgroup of the IPCC (Dronkers *et al* 1990)²⁵ broadly divided the adaptability responses to sea level rise into three categories namely, (i) retreat, (ii) accommodation and (iii) protection.

- **Retreat** involves no protection of coastal land and structures; areas vulnerable to sea level rise are abandoned and these areas will be allowed for retreat of coastal wetlands (including mangroves).
- **Accommodation** category of adaptive response implies that people continue to use the lands that are at risk due to sea level rise but modify land use patterns to ensure that changes take care of new threats such as salinization and flooding. Conversion of saline affected areas into sustainable aquaculture systems and cultivation of saline tolerant crops are commonly the predicted changes in the land use pattern. Conservation of the natural protection value of coastal resources such as mangroves and coral reefs is another important option suggested in the accommodation category of adaptation.
- **Protection** category of adaptive response involves protecting coasts from rising sea level, cyclone and storm surges by means of (i) “hard” engineering measures such as construction of seawalls, dykes, and flood defense systems and (ii) “soft” measures such as restoration and conservation of existing protective coastal ecosystem such as mangroves and coral reefs.

As indicated above, mangroves play an important role both in the accommodation and protection categories of adaptive responses to sea level rise, cyclones and storm surges. Recent research indicates that a platform of coastal wetlands such as mangroves and salt marshes rises with the rate of sea level rise, under a recent study (McIvor *et al.*, 2013)²⁶. As a result, entry of seawater inland is prevented by these wetlands and this clearly indicates that diverse mangroves and other coastal wetlands can act as first line of defense against sea level rise, as well as cyclone and storm surges. The study also indicates that this result

²⁵ Dronkers, J. *et al.*, 1990. *Op cit.*

²⁶ McIvor, A.L., Spencer, T., Möller, I. and Spalding, M. (2013) The response of mangrove soil surface elevation to sea level rise. *Natural Coastal Protection Series: Report 3*. Cambridge Coastal Research Unit Working Paper 42. Published by The Nature Conservancy and Wetlands International. 59 pages. ISSN 2050-7941.

is possible only if the plant communities of these wetlands are well conserved and a continuous supply of sediment is ensured.

A strong focus on bio-diverse forests is important to increase the so-called “resilience” capacity of coastal habitats to climate changes. Since changes occur locally, mixing of different species endowed with a variety of requisite tolerances (e.g. salinity, mean water heights, sediment patterns) within the mangrove forests enhances the adaptation capacity of the habitat. Monoculture mangrove forests also tend to provide less protection against high waves, due to the mostly rectangular planting and the same spatial tree ages. Once destroyed by extreme weather events, monoculture mangrove forests have a lower rejuvenating capacity than bio-diverse habitats.

Above all, it is well established that mangroves play a dominant role in reducing the impact of cyclones and tsunamis and thereby reduce human loss and damage to property in the coastal areas. A super cyclone with wind speed of about 258 km per hour struck the coastal areas of Odisha on 29th October 1999 causing extensive damage to life and properties. Badola and Hussain (2005)²⁷ conducted a study to evaluate the extent of damage caused in villages that were under the umbrella of the mangrove forest and areas that were not sheltered by mangroves. Three villages with three different physical settings, (i) a village within the shadow of a mangrove forest, (ii) a village which was not in the shadow of mangroves and also not protected by an embankment that was constructed to avoid seawater intrusion, and (iii) a village not protected by mangroves but protected by an embankment were selected for the study. All these three villages were located at equidistance from the sea and the socio-economic conditions were also the same. Eleven variables such as the cyclonic damage to houses, livestock, fisheries, trees and other assets owned by the people and the level and duration of flooding, were used to compare the damage in these three villages. In the mangrove protected villages, variables had the lowest values for adverse factors such as damage to houses. The economic loss incurred per household was higher in the village that was not protected by mangroves but had an embankment. An attitude survey conducted among the people of the villages nearby to Bhitarkanika areas showed that they were aware of the role played by the mangroves in protecting their lives and properties during the super cyclone and also appreciated the protective functions performed by the mangroves.

²⁷Badola, R. and S.A. Hussain, (2005). Valuing ecosystem functions: an empirical study on the storm protection function of Bhitarkanika mangrove ecosystem, India. *Environmental Conservation*, 32 (1): 85–92.

It is well established that an established mangrove wetland is rich in bio-resources such as fish, prawns and crabs and may provide livelihood security for poor and often landless fishers. However, many of the mangrove areas are managed for the purpose of coastal protection only, mostly from a forestry-only point of view. The values of the mangroves in small-scale fisheries and their role as nursery grounds for fish, prawns and crabs are largely ignored. Thus, there is an urgent need for augmentation of fishery resources potential of mangroves to enhance the livelihood security of coastal fishing families. Restoring and sustaining mangrove wetlands – which is the dominant wetland in tropical coastlines – and augmenting its fishery resources, could be an important strategy both to mitigate the impact of sea level rise as well as to enhance the adaptive capacity of local communities.

Causes of mangrove degradation

Causes of mangrove degradation can be classified into three types (i) past unscientific management practices, which increased soil salinity, and in turn prevented mangrove regeneration, (ii) anthropogenic pressure such as dependency by local people on mangrove forests for their basic needs like firewood, fencing, fishing poles, fodder and house building, and (iii) natural processes such as geo-morphological characters like sand bar formation in the river mouth.

Strategies to halt degradation

During 1990 to 2000, MSSRF launched a project entitled Joint Mangrove Management (JMM) all along the east coast of India in the states of Tamil Nadu, Andhra Pradesh, Odisha and West Bengal in partnership with State Forest Departments and local communities. The main aim of this project was to restore and sustain mangroves located in Cauvery, Krishna, Godavari, Mahanadi, Devi and Ganges Delta. In this project a science-based, people-centred and process-oriented approach was followed to restore degraded mangroves, avoid further degradation of healthy mangroves and long-term sustainability of both restored and healthy mangroves. It was a science-based approach because all mangrove management activities were based on a sound understanding of the ecological processes that operate within and upon mangrove wetlands. It was people-centred because the local community played a major role in the decision making process and gained partnership status with Government agencies in conservation and managing mangrove wetlands; and it was a process-oriented approach because it consisted of a series of steps which accommodated changes in perception, socio-economic circumstances and problems, and the priorities of

stakeholders. Following this approach nearly 3,000 ha of mangroves were restored and degradation of mangroves in about 25,000 ha avoided²⁸.

The participatory research in the JMM project revealed that mangroves of Krishna delta (and that of Cauvery delta and Godavari delta) were mostly degraded because of the past unscientific management procedures followed by the Forest Department from late 1890s to 1970s. In this system of “Clear felling in coupes”, mangrove trees were felled on a rotation basis every 20 or 30 years for revenue generation in coupes (plots) of about 10 to 15 ha. Studies indicated that coupe felling exposed large areas of mangrove wetland to sunlight, which caused evaporation of water. As a result, soil in the coupe-felled area shrank, changing the flat topography into a trough. Tidal water entered the trough-shaped portions and became stagnant. Evaporation of stagnant water increased soil salinity to a level lethal to mangroves. As a result, no regeneration of mangrove plants was seen in the coupe-felled area. **It was found that nearly 80% of mangrove degradation was mainly due to this unscientific management practice.** Since the 1970s, clear felling in mangroves has been completely stopped and thus further large-scale degradation of healthy mangroves due to this reason, has been avoided²⁹. **Restoration of degraded mangroves is very important and is one of the major components of this project.**

In the JMM project, it was found that resources used by the community such as collection of firewood, poles for fishing and house construction, and collection of forest materials for fencing, were secondary causes of degradation. The village level institution (named the Village Forest Council in Andhra Pradesh) adapted different strategies to avoid these causes of degradation. First, the strategy was that in the houses where firewood was intensively used, firewood based stoves were replaced with kerosene based and LPG based stoves. For this purpose village level institutions worked with the State Forest Department and District Administration to mobilize government support, particularly in obtaining subsidies for this purpose. Secondly, government permission was also obtained to collect firewood from *Prosopis* trees (thorny trees used only for firewood) in government waste land for those families which could not afford to replace firewood based stoves. In order to meet demands for fishing poles, *casuarina* trees were grown as alternatives and for this purpose both government and Panchayat lands were used (MSSRF, 2002 and Ravishankar et al

²⁸ MSSRF, 2002. The Mangrove: Decade and Beyond. Activities, lessons and challenges in mangrove conservation and management during 1990-2000. MSSRF, Chennai. 40 pp.

²⁹ Selvam, V., R. Ramasubramanian and K.K. Ravichandaran. 2012. Genesis and present status of mangrove restoration practices in saline blanks. In Macintosh, D.J., R.Mahindpala, M.Markopoulos (eds). Sharing Lessons on Mangrove Restoration. Mangroves for the Future, Thailand and IUCN, Switzerland. 133-140.

2004)^{30, 31}. Project village level institutions will follow similar strategies where such risks are identified.

The project will emphasize the protective value of the mangroves in the short term, rather than the productive value of mangroves, which will provide benefits in the medium to longer term. The Forest Act of the Government of India and Coastal Zone Notification of the Government of India, which is implemented by the individual State Governments, ban any tree felling activities in the mangrove forest. Secondly, after the 2004 Asian Tsunami, there were changes in the attitude of coastal communities towards the protective value of mangroves and now they have taken a decision not to destroy mangrove forests and have their own controlling mechanism to deal with this issue³².

Box 1: Community Awareness has increased since the 2004 Asian Tsunami

For much of his life, Viroj Dedsongprak paid little attention to the mangrove forests that surrounded his Thai village. He thought nothing of it when neighbors chopped down trees for firewood or plowed them under for shrimp ponds. Then came the 2004 Asian tsunami. Viroj's village was largely spared while more exposed communities were devastated. The 46-year-old fisherman credits the spidery network of mangroves, nipa palms and malaleucas for saving his home, and is now doing what he can to preserve his region's biodiversity. "Before the tsunami, we really didn't understand the importance of mangroves...but...since the tsunami, there is an increased awareness about mangroves and people are more involved in protecting them," he said. "We know that they are important to protect us from the waves and other natural disasters."

Many Indian Ocean communities were hit by the December 2004 tsunami, which killed more than 216,000 people and leveled hundreds of fishing villages. The tsunami has prompted many governments to reconsider how they manage coastal ecosystems, and to strike a balance between development and preservation.

The World Conservation Union is teaming with the United Nations Development Program to launch a five-year project to fund ecosystem restoration and sustainable development in 10 countries affected by the tsunami. "Mangroves for the Future," will help governments address long-term problems including reckless development, shrimp farming and industrial pollution that have resulted in the loss of 25 percent of the mangrove forests in Indian Ocean countries. These ecosystems need to be valued for the services they provide in coastal areas estuaries, brackish lagoons, beach forests and mangroves that provide protection from storms, along with nurseries for fish and habitat for birds, reptiles and mammals. Involving coastal communities is key -- they depend on the ecosystem for fishing and crabbing will determine whether a project succeeds.

Source: Adapted from Wetlands International. Green Coast, 2006

Permission from the Government for mangrove restoration

The mangrove restoration work will be taken up in degraded mangrove land, which is owned by the Revenue Department of the Government of Andhra Pradesh. This land is under the

³⁰.MSSRF, 2002. The Mangrove Decade and Beyond – Activities, lessons and challenges in Mangrove conservation and Management: 1992-2001. M. S. Swaminathan Research Foundation, Chennai 44 pp.

³¹Ravishankar, T., L. Gnanappazham, R. Ramasubramanian, L. Navamuniammal and D. Sridhar. 2004. Atlas of Mangrove Wetlands of India: Part 2 - Andhra Pradesh. M. S. Swaminathan Research Foundation, Chennai, India

³²Wetlands International – south Asia. 2006. Green Coast for Nature and People after Tsunami 38 pp.

control of Revenue Department, Krishna District. The Revenue Department has given written permission for mangrove restoration in 200 ha of its land (Appendix 1). As per the practice, permission is initially given for a two-year period, which is extended by the District Administration subsequently. As per the Coastal Regulation Zone Notification (2011) dated 06 January 2011 issued by Ministry of Environment & Forest, Govt. of India, any mangrove areas more than 100m² will be declared as Coastal Zone Management 1 (protected area) and thus, mangrove forest raised in the revenue area will be protected permanently under the Coastal Zone Management Notification.

Already MSSRF and the partner NGO, Praja Pragathi Seva Sangam (PPSS) in partnership with local communities, have raised mangroves in about 140 ha during 2007-2010 and this area has already been brought under joint protection of the village level institution and Forest Department. To facilitate Notification of the area under CRZ by Government, it is proposed under the project, to involve the concerned Department (Forest Department) in the planning, implementation and monitoring of the project. Such important steps will be discussed in the Project Advisory Committee of the project to be established at State level. Senior officials of the Forest Department and Environment Department will serve as members of the Project Advisory Committee, which gives policy support and guidance to the project.

Output 3.1 200 ha of replanted mangrove area close to two villages for future coastal protection

Unprotected degraded mangroves of about 200 ha have already been identified for restoration on the basis of the following criteria: i) degraded mangroves located close to project villages so that mangroves grown there protect the villages from cyclones, ii) degraded mangrove land owned by Revenue Department and iii) land where mangrove restoration will not pose any problem with the community of nearby villages. The area for restoration was identified with the help of the local community, traditional Panchayat leaders, self-government and local NGOs. The Revenue Department has given written permission for mangrove restoration in the about 200 ha of degraded mangroves, which is located in its land. As per the practice, permission is initially given for a two-year period, which is extended by the District Administration subsequently. As per the Coastal Zone Management Notification (2011), any mangrove areas more than 100m² will be declared as Coastal Zone Management 1 (protected area) and thus, mangrove forest raised in the revenue area will be protected permanently under the Coastal Zone Management (CZR) Notification. The following activities will be carried as part of the above output.

Activity 3.1.1 Conducting biophysical inventory

Biophysical survey of the identified land will be conducted to understand soil type, soil slope, sources of tidal water, current pattern of tidal inundation, soil and ground water salinity, flora and fauna present, if there is any in the degraded area, dependency of local community, if there is any, on the degraded mangrove land. The results will be shared with VLI and other stakeholders. The results will also be used for establishing the baseline and for monitoring.

Activity 3.1.2: Preparing degraded mangroves for restoration

On the basis of the slope and sources of tidal water a canal design will be prepared. This canal design, which will be fish bone in shape, will consist of a main canal, which brings tidal water into the degraded mangroves and feeder canals that distribute tidal water to all degraded areas. The main canals will be dug at an angle of 45^o to the natural creek and the side canals will be dug at an angle of 30^o to the main canal. The fish bone shaped canals will facilitate easy inflow and outflow of tidal water. The canals with the following dimension will be dug. The top width of the main canals will be 2.5 m while the bottom width will be 1 m and the depth of the main canal will be 0.6 m. The dimensions of the side canals will be 2.0 m top width, 0.5 m bottom width and the depth of the main canal will be 0.5 m. The distance between the two side canals will be 10 m. The digging of canals will be 100 ha in each year (year I and II). The members of VLI, particularly willing landless people and women, will be employed in all these work.

Fish bone type of canal method is commonly employed to restore mangroves along the east coast of India since these canals avoid stagnation of tidal water in degraded mangroves and prevent increase in soil salinity, M S Swaminathan Research Foundation has developed this restoration method and has restored 1,447 ha of degraded mangroves along the east coast of India. Based on the experience, the Ministry of Environment and Forests (MOEF) of India formed a sub-committee to evaluate this mangrove restoration method and declared this is the best available mangrove restoration technique and included them in its National Mangrove Action Plan (Selvam et al 2012)³³. According to Sunil Kumar (2011)³⁴ Andhra Pradesh Forest Department (APFD) has successfully restored about 748 ha of mangroves in Krishna mangroves following the canal method. The dimension of the main canal used by

³³ V. Selvam, R. Ramasubramanian and K.K. Ravichandran 2012. Genesis and present status of restoration practices in saline blanks in India. In the Proceedings Sharing Lessons on MFF Regional Colloquium 30–31 August 2012, Mamallapuram, India. IUCN India

³⁴ D. Sunil Kumar,(2011). Conservation and Restoration of Mangroves in Andhra Pradesh. In: Towards Conservation and Management of Mangrove Ecosystem in India (Ed. J.R Bhat, D. J. Macintosh, T.S. Nayar, C. N. Pandey and B.P Neelaratana). IUCN India. Page 161-166.

APFD was 3 m (top width) x 1m (bottom width) and 0.6 m deep and dimension of the feeder canal was 1.6 m (top width) x 0.5 m (bottom width) and 0.4 m deep.

Activity 3.1.3 Planting mangrove saplings

Nursery raised mangrove saplings will be planted 2 m apart along the canals at about 20 cm down the slope. Planting of mangrove saplings will be taken up in 100 ha each in year I and year II. The members of VLI, particularly willing landless people and women, will be employed in all these works.

Activity 3.1.4 Monitoring and after care

A small monitoring committee will be formed comprising members from VLI, MSSRF, self-government and local NGOs and they will regularly monitor plantation in terms of survival, growth, peoples' cooperation etc. They will also report problems, if there is any, to VLI. VLI with the support of MSSRF, will take necessary after care measures. An anticipated issue is the silting of canals, particularly in the mouth region of feeder canals, which will be overcome by desilting after each monsoon season. Normally causality in mangrove plantation is minimal and dead ones will be replaced by nursery grown mangrove saplings.

Output 3.2 One central mangrove nursery established serving three villages

In each year (year I and II) about 200,000 mangrove saplings will be raised in the mangrove nursery for planting in 100 ha. Mangrove nursery will be useful as the survival rate of nursery raised seedlings in restoration areas is higher than the direct dibbled seeds/propagules. This is due to well established root system, as the mangrove saplings will be maintained for 8-9 months in the nursery before transplantation in the degraded areas. Mature and healthy fruits / propagules of mangroves will be collected from the Sorlogondi Reserve forest and will be used for nursery raising. *Avicennia marina* and *Avicennia officinalis* will be planted more in the restored area as they tolerate wide range of salinity and should be able to grow well in the restored area. Since the multiple species provide better protection than the monoculture of mangrove species, other species namely *Avicennia alba*, *Rhizophora apiculata*, *Rhizophora mucronata*, *Bruguiera gymnorhiza*, *Excoecaria agallocha* and *Ceriops tagal* will be raised in the mangrove nursery and used for planting.

Activity 3.2.1 Identifying land for mangrove nursery

For establishment of mangrove nursery suitable land close to or in the restoration area itself will be identified. Near to the restoration site reduces transportation cost of mangrove saplings.

Activity 3.2.2 Establishing mangrove nursery

Mangrove nursery will be raised in polythene bags (5"x8"). Clayey soil from the mangrove forest will be used to fill the polythene bags. Small perforations will be made at the bottom of the bag in order to drain excess water. Healthy mangrove propagules will be planted directly in the bags. Initially the plants will be watered twice and after one month they will be placed in sunken beds in the intertidal area where the tidal water flow provides adequate moisture. Organic fertilizers will be provided after 60 days to get healthy mangrove seedlings. The sapling bags will be shifted periodically to prevent entry of roots into the soil. The saplings will be maintained for at least 8-9 months in the nursery before planting in the restored area.

Component 4 Demonstration of Integrated mangrove based fishery livelihoods

Role of Integrated Mangrove Fishery Farming System in increasing adaptive capacity of local community to climate change

As indicated in the Accommodation category of adaptive responses to sea level rise of the IPCC, capacity of a local community can be enhanced by changing the land use pattern in *saline* areas by introducing new sustainable production systems. One such system is the Integrated Mangrove Fishery Farming System, wherein the raising of mangrove trees is integrated with fish culture. It is a new kind of farming system where conventional earthen aquaculture ponds are modified in such a way to provide about 40% of the area for raising mangrove plantation and 60% of the water area for fish cultivation. Space for growing mangroves and other vegetation is created by constructing linear bunds or mounds inside the pond (Figures. 5 and 6). These farms can be designed in such a way to be tidally fed (water exchanged during high tide and low tide), which makes them environmentally friendly and economically profitable. Above all, the presence of dense mangrove trees would ultimately mitigate the impact of sea level rise, whereas sustained harvest of fish would assist the adaptive capacity of the coastal community. Currently, in the project region, temperature reaches its peak in May and June whereas future prediction indicates that the high temperature period will extend for another 15 days during 2020 and 2050. This will result in increased risk in aqua farming, since it will increase water salinity and dissolved oxygen problems. However, this risk will be significantly reduced in the proposed Integrated Mangrove Fishery Farming System since mangrove trees will provide necessary shade that will prevent heating up of the pond water, which in turn will prevent increase in salinity, and reduction in dissolved oxygen.

In India, coastal aquaculture, mainly shrimp farming - otherwise called prawn farming - emerged as an important sector of fisheries in the late 1980s and it is characterized by

small-scale family-operated farms. Currently more than 0.15 million farmers are growing prawns in 0.16 million ha of brackish water areas, both on the east and west coasts. During the early phase of prawn farming, a semi-intensive culture system was followed, which increased prawn production at the rate of 8.4% per year till the mid 1990s. Under this system high numbers of prawn juveniles (about 150,000 individuals) were stocked per ha. In order to achieve higher shrimp production and profits, about 6 to 7 ton of commercial feed were used per cycle of 4 months. However, only 30% of this amount was eaten by the shrimp due to quick disintegration of feed and the decayed feed caused severe environmental problems. It resulted in deposition of large amounts of organic matter in shrimp farms, which in affected the quality of the pond water. As a result, there was a need for frequent water exchange, which caused heavy expenditure on pumping systems. When the shrimp ponds were prepared for the next culture cycle, heavy doses of chemicals such caustic soda were used to remove this organic matter. Secondly, during culture, piscicides (chemicals that kill fish), antibiotics, borax, and other chemicals were used to control diseases, eradicate fish and other predators. Use of such commercial feeds and chemicals caused severe environment problems (e.g. deterioration of water quality in the nearby system) and also increased input cost. Thirdly, outbreak of diseases – due to poor environmental conditions and importing of infected prawn juveniles – reduced the market price. All these factors severely affected shrimp production in India and aquaculture suffered setbacks in terms of production, value and area. As a result, shrimp production, which was around 1.06 million tons in 2007-08, reduced to 0.76 million tons in 2008-09 (most of these problems are now solved due to shifting of shrimp farming from semi-intensive to extensive farming, limited use of commercial feeds, and used of certified disease-free shrimp juveniles).

In the **Integrated Mangrove Fishery Farming System** the above issues are avoided in the following ways. In the construction of inner bunds (see Figure 5) in an IMFFS farm, a large quantity of soil is removed from the bottom of the pond, which makes the bottom level of the pond below the tidal level. As result, tidal water enters into the pond during high tide and drains out during low tide each day through normal gravitation processes. This daily exchange of water brings in a lot of fresh food in the form of plankton (microscopic plants and animals that float and drift in large numbers in sea and brackish water) to the pond. This avoids using artificial feed for culture. Since pond water is flushed out daily there is no accumulation of organic load and water quality is well maintained. This prevents reduction in oxygen level, and outbreak of diseases, and hence there is no need to use chemicals during the culture period, preventing deterioration of environmental conditions. Since no commercial feed is used, no energy is used for water exchange and no aerator is used for

increasing the oxygen content of the water. Farm input cost in IMFFS is low compared to the semi-intensive farming system.

In IMFFS ponds, mangrove trees can be grown along the inner and outer bunds and mounds. The mangrove plants, when they grow as trees in about 3 to 4 years, will provide necessary nutrients and feed to fish/crab/prawn culture in the pond. The mature leaves, twigs and other plant matter, which fall into the water, will degrade and release nutrients and result in the formation of detritus (finely decomposed particles). These detritus particles become substrate for bacteria and fungal growth and also convert nitrogen present in the detritus into protein. In addition, a variety of enzymes, are also produced during the process of decomposition. The presence of nitrogen, carbon, protein, enzymes, and fungi and bacteria increase the nutritive value of the detritus. Crabs and prawns nourish detritus and thus, receive naturally balanced food. Thus, IMFFS ponds are ideal for extensive culture of fish, prawn and crabs.

In an IMFFS farm only environment friendly extensive system of farming (e.g. low stocking per unit area) will be followed, which will sustain aqua farming by preventing environmental degradation, reducing input cost, and providing sustained profit.

In one of the project villages namely, Nali, about 50 ha of shrimp farms have been abandoned due to the reasons explained above. These abandoned farms belong to fisherfolk living in the village for which they have legal title. These aqua farmers have expressed their willingness to provide their abandoned shrimp farms for converting them into IMFFS. Since the abandoned shrimp farms are going to put into productive use, the community has no reservation to provide their abandoned shrimp farms for IMFFS. Construction cost of IMFFS farm in abandoned shrimp farms will be provided by the project. In addition, input costs such as for fingerlings from the licensed hatchery will be provided for the first crop only and the recurrent cost in the subsequent years will be borne by farmers. The participating aqua farmers have given their agreement indicating that they are willingly giving their legally owned abandoned shrimp farms for developing into IMFFS farms, willing to continue aqua farming in the IMFFS farm using their own inputs from the second year onwards, and protecting mangroves from any destruction. The owners of the abandoned shrimp farms of Nali have given an undertaking showing that they are willing to provide their abandoned farms and working with MSSRF to transform them into IMFFS and continue to carry out aquaculture after the 1st year. As the land and other IMFFS related assets are owned and managed by the farmers, user rights will automatically be safeguarded.

Output 4.1 **Two models of IMFFS demonstrated with the participation of local community and stakeholders**

Activity 4.1.1 **Identifying farmers and aqua farms for demonstration**

Aqua farmers, who have abandoned their aqua farms due and interested to take up IMFFS in the long run, will be identified for participation in the demonstration. This work has already been completed. In the project village of Nali 50 ha of shrimp farms have been abandoned and they are belong to fishers living in the village for which they have legal title. These aqua farmers have expressed their willingness to provide their abandoned shrimp farms for converting them into IMFFS.

Activity 4.1.2 **Constructing two types of IMFFS farms**

As shown in Fig 6, two types of IMFFS farms, one with inner bunds and one with inner mounds will be constructed. Design for the farms will be prepared in consultation with aqua culture engineers construction will be carried out using earthmovers and labourers from the village. The farm will be constructed in such a way that it will be filled with water during high tide. During low tide, water will not completed drained out but 3 to 4 feet will be allowed to stand for culture operation. About 60 to 70% of the space will allotted for fish culture and remaining space will be used raising mangrove plantation.

Activity 4.1.2 **Raising mangrove plantation in the IMFFS farms**

Nursery raised mangrove saplings will be planted at 1.5 m interval both at the low and high tilde level long inner and outer bunds. Their survival and growth performance will be monitored regularly.

Figure 5. Design of Integrated Mangrove Fishery farming system

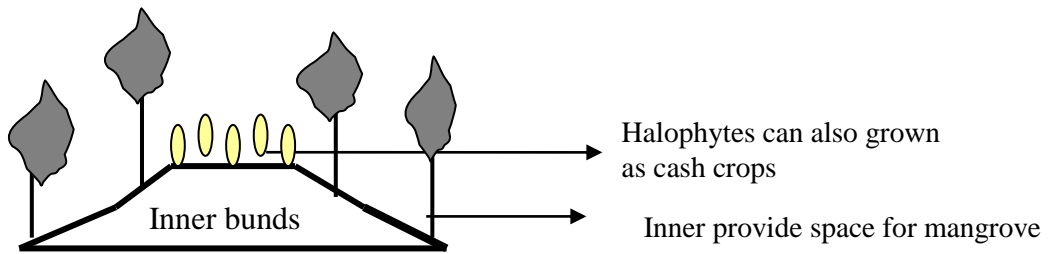
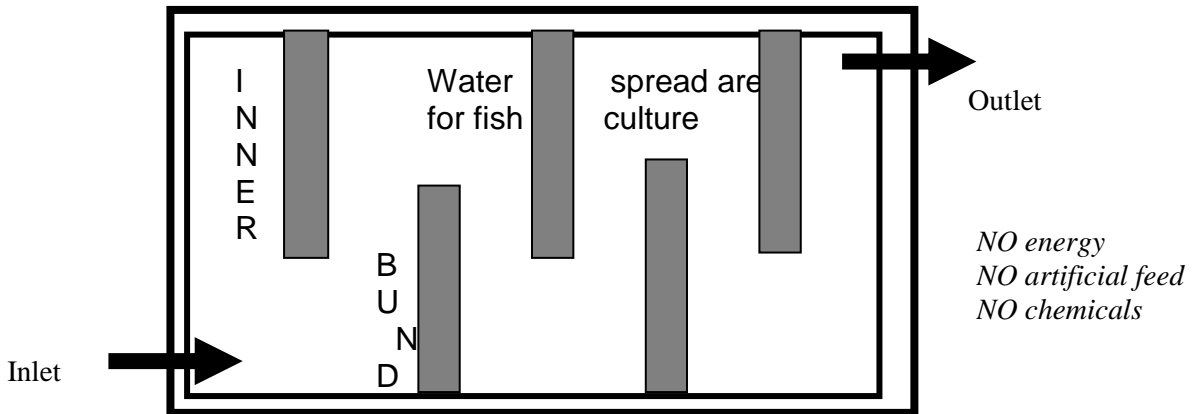
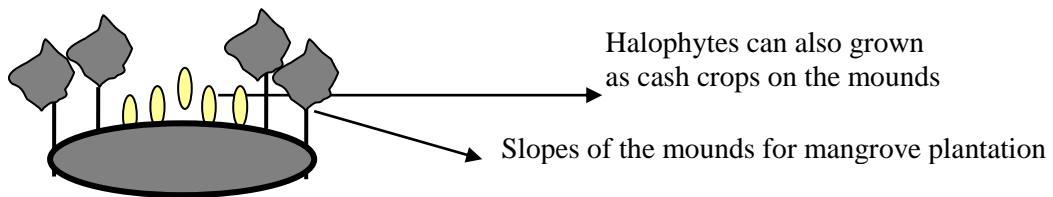
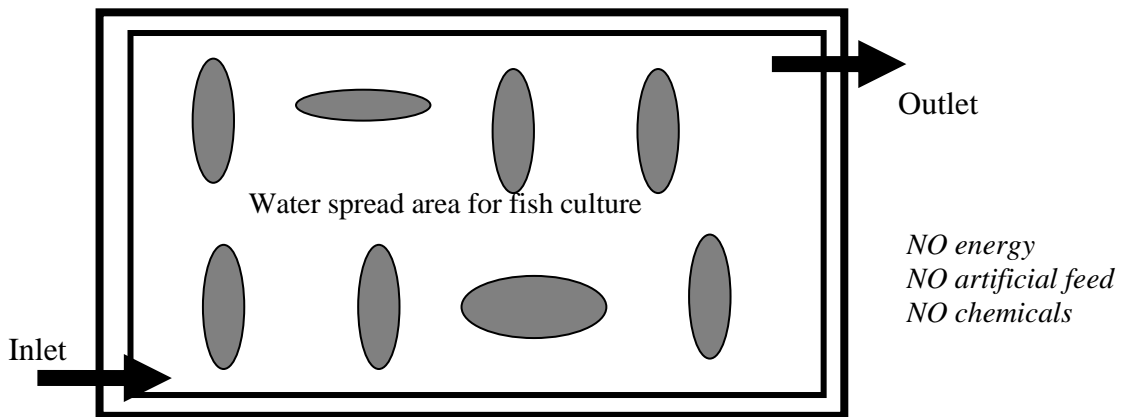


Figure6: Another design of the seawater based integrated agro-aqua farm



Output 4.2 Two culture of fish or prawn or both, undertaken in the IMFFS farms per year

Activity 4.2.1 Deciding on culture organism

Discussion will be held with both participating aqua farmers and National Centre for Sustainable Aquaculture to decide on the organism, whether fish or shrimp along or both or crab, to be cultured. Availability of seeds, duration of culture, input cost and marketing will be criteria to be used to decide the culture organisms.

Activity 4.2.2 Stocking of fishes/shrimps/crabs

Disease free fingerlings of fishes/shrimp/crabs will be used for stocking in the ponds. Good quality, healthy certified fingerlings will be procured from the hatcheries for stocking. Number of fingerlings will be stocked vary depending upon the organism selected. Linkage will be established with NaCSA and the Fisheries Department for purchase of quality seeds and other technical assistance.

Activity 4.2.3 Monitoring of IMFFS ponds

Salinity, dissolved oxygen and pH will be measured regularly and the parameters will be recorded in the monitoring registers. These parameters will be measured using simple kits available in the market. Culture of fish/shrimp/crab will be monitored on weekly interval for their growth. The community members will be trained during the initial phase of the project for water quality and fish growth monitoring which will help them to monitor them after the end of the project.

Activity 4.3.4 Harvesting and cost benefit analysis

The fishes/crabs/shrimps will be harvested after attaining optimum growth and will be marketed immediately. Net profit will be calculated on the basis of the market price. The farmers will use part of the profit to continue farming.

Output 4.3: Cage and pen culture established for crabs, fish, clams and cockles

The project site has the potential for cage and pen culture for crab, fish, clams and cockles. The Central Institute of Brackishwater Aquaculture (CIBA), Government of India has initiated cage culture of fish namely, *Etroplus suratensis* (common name: pearl spot) in the back waters of Krishna estuary near Nagayalanka village, which is located about 10 km north of the project villages³⁵. Pearl Spot is a dominant fish in mangrove water and has high market

³⁵ http://www.ciba.res.in/index.php?option=com_content&view=article&id=408&Itemid=107&lang=en

value in state of Kerala in southern India. In addition, Bay of Bengal Programme of the FAO successfully demonstrated pen culture in the mangrove environment and considered that pen culture has good prospects for both economic and social feasibility.

Activity 4.3.1 Selecting participating families

Landless, assetless and women headed families, who are willing to take up cage and pen culture as their long term sustainable livelihood option will be selected with the help of VLI. They will be oriented to cage and pen culture with help of experts.

Activity 4.3.2 Construction of cages and pens

High-density polyethylene (HDPE) frames, floats, anchors will be used to fabricate cages of 12 m diameters with the help of experts.. Each cage would consist of HDPE framed cage with nylon net enclosures of different mesh sizes for culture of fishes. The cages will be deployed in the suitable places identified. High value fish seed like sea bass and grouper will be stocked in these cages and reared for 6–8 months. Similarly the pens of 3x5 m size will be constructed with the bamboo and nylon rope. These pens will be kept in suitable places for rearing crabs. Totally 10 structures will be constructed in year I.

Activity 4.3.3 Stocking of fish crab juveniles

The sea bass juveniles procured from Rajiv Gandhi Center for Aquaculture (RGCA) will be stocked in the cages after acclimatization. They will be fed with live feed collected from the creeks. They will be also given supplementary feed to avoid cannibalism. The fishes will be grown for 6 to 8 months in the cages. The crab lets (juveniles) procured from Rajiv Gandhi Center for Aquaculture will be stocked in the pen after acclimatization. In few pens wild crabs and water crabs will be stocked. Trash fish will be given for feed. The project will help the landless and women headed families in stocking the cages/pen for the entire three-year period (years II-IV).

Activity 4.3.4 Monitoring survival and growth performance of fish and crab

The growth of fishes and crabs will be monitored every week. The weight of randomly collected fishes/crabs will be recorded for monitoring.

Activity 4.3.5 Harvesting and cost benefit analysis

The harvest will be done after fish and crabs attaining optimum growth and cost: benefit will be worked out and profits will be shared equally among the landless and women headed families.

Component 5 Knowledge Management for Improved Coastal Protection

Output 5.1 Resource materials prepared for dissemination among various stakeholders

Activity 5.1.1 Preparation of resource materials in local language

Resource materials such as pamphlets, brochures, posters will be prepared in local language to increase awareness about climate change, sea level rise and role of mangroves and integrated mangrove-fishery in increasing adaptive capacity of community to sea level rise.

Activity 5.1.2 Dissemination of resource materials

Pamphlets and brochures and will be distributed to community members, NGOs, local self government and community based organizations during various forum. Posters will be displayed in prominent places in the villages and nearby towns as well as in many institutions including schools.

Output 5.2 Stakeholders brought together and knowledge on CC, SLR, vulnerability and measures to improve adaptive capacity shared

Activity 5.2.1 Documenting processes

The role of mangroves and IMFFS in increasing adaptive capacity to CC and SLR and process of restoring mangroves with the participation of stakeholders and establishing IMFFS farms with the participation aqua farms and increasing livelihood security of landless and women headed families through cage and pen culture will be documented both for knowledge enhancement and to facilitate replication of models.

Activity 5.2.2 Documenting best practices

Apart from mangrove restoration and IMFFS any other best practices that are followed by the community in the project site to cope with cyclones, increased salinization of soil and water resources, management of natural resources such as mangroves will be identified and documented and distributed for knowledge enhancement.

Activity 5.2.3 Organizing workshop at district level

A district level workshop will be organized for the managerial and field staff of the Forest Fisheries, Rural Development and Revenue Departments and grassroots NGOs on the thematic areas of climate change and sea level rise and their impacts, role of mangroves

and integrated mangrove-fishery farming system in increasing adaptive capacity to sea level rise. Process documents and documents on best practices will be distributed to these stakeholders for discussion and replication

Activity 5.2.4 Organizing workshop at national level

A national level workshop will be organized particularly for the scientific, management and policy making community to share the results of the project as well as process and best practices relating to increase adaptive capacity to CC, SLR and other CC induced issues.

B. Describe how the programme provides economic, social and environmental benefits, with particular reference to the most vulnerable communities, and vulnerable groups within communities, including gender considerations. Describe how the project / programme will avoid or mitigate negative impacts, in compliance with the Environmental and Social Policy of the Adaptation Fund.

The project will be implemented in three villages namely, Sorlagondi, Nalli and Basavanipalem, located in the Krishna deltaic region of Andhra Pradesh. The population and other demographic details of the villages collected by conducting Rapid Rural Appraisal (RRA) are given in below (Table 3).

Table 3: Demographic and socio-economic details of the project villages

Name of Village	Sorlagondi	Nali	Basavanipalem	Total	Percentage of Total %
Main Occupations of Land owning Households (HH)	Fishing, aquaculture and Agriculture	Fishing, aquaculture and Agriculture	Fishing, aquaculture and Agriculture		
Main Occupations of Landless HH	Fishing and Labouring	Fishing and Labouring	Fishing and Labouring		
Population	2,345	1,359	201	3,905	100%
Male	1,162	705	92	1,959	50.2
Female	1,183	654	109	1,946	49.8
Households (HH)	645	404	55	1,104	100%
(i) Landless HH	45	78	17	140	12.7
(ii) Land holding HH	600	326	38	964	87.3
Aqua farms and agri land HH	190	280	33	503	45.6
Aqua farms only HH	410	46	5	461	41.7
(iii) Scheduled Tribes HH*	30	25	0	55	5.0
(iv) Female headed HH	52	30	10	92	8.3

* No scheduled caste families live in the three villages; no indigenous people live in the project villages.

(1) Sorlagondi village

Sorlagondi village is located in Nagayalanka Mandal, Krishna district, Andhra Pradesh (Figure 7). It is a delta village with flat topography with multiple natural hazards especially periodic cyclones and floods. The 1977 Divisema cyclone devastated 714 lives and the livelihood assets of the village. There are about 645 households with a total population of 2,345 of whom 1,183 are women. About 52 families are headed by women. About 45 families are landless. Among the 600 families owning aquaculture ponds, approximately 131 households own less than 1 ha of agriculture land and 410 families have less than 1 ha of aqua farms. All the landless families belong to the fishing community and their primary occupation is fishing. All landholding families are involved in capture fisheries, agriculture and aqua farming but their income from aqua farming and agriculture is erratic due to frequent salinization of land, drought, flooding, cyclones, and management issues. Landless families are solely dependent on capture fishing – both in the sea as well as in the mangroves for their livelihoods. Rapid Rural appraisal also indicates that nearly 78% of the household use Liquefied Petroleum Gas (LPG) as fuel, complimented by Prosopis (a thorny small tree considered as weed) as fuel wood. There are only 30 cattle in the village. In Sorlagondi the community members rear 90 buffaloes, 25 cows and 8 bulls. However, no one is currently practicing cage culture of fish/ shrimp in the backwaters.

Figure 7: Project location in Krishna delta showing project villages



(2) Nali village

Nali village belongs to Nali Panchayat in Nagayalanka Mandal, Krishna District. This village has 404 households and total population of the village is about 1,359 including 654 women. About 30 households are headed by females. Approximately 326 families own either agricultural land or aqua farms, or both. However, land holding size is very small, and nearly 197 families own less than 1 ha of agriculture land. Average size of the aqua farm per family is about 0.5 ha. The main occupation of the village is agriculture and agricultural labourers; during the non-agriculture season nearly 150 people go for fishing in the sea. Most of the shrimp farms in this village are abandoned. The shrimp farmers who abandoned the farms are the main target group in this village. 78 households are landless, the largest number of landless people in the three villages in the project area (19.3%). Nearly 60% of the families use LPG for domestic use. Other families are dependent on Prosopis for fuel wood. Fuel wood is not collected from mangroves since it is a protected area and also located far away from the village. Cattle population in Nali village include 110 buffaloes, 30 cows and 450 sheep which mostly graze in the agriculture lands. Similar to Sorlagondi, no one is practicing cage culture of fish/ shrimp as a livelihood option.

(3) Basavanipalem village

Basavanipalem hamlet belongs to Ramakrishnapuram Panchayat in Koduru Mandal, Krishna District. This hamlet has 55 households belonging to the fishing community. The total population of the village is approximately 201, including 109 women. Many of the inhabitants are agricultural labourers and 33 families have agriculture lands of less than 1.5 ha. Only a few families use LPG as an energy source; fuel wood is mainly collected from Prosopis which is present in about 100 acre of government land nearby. Cattle population in this village include 30 buffaloes and 4 bulls. None of the households currently practice cage culture of fish/ shrimp.

Special attention will be given to livelihood opportunities for the vulnerable households – including the landless and female-headed households. Landless households will be involved in mangrove restoration work including canal digging, plantations, nursery, and maintenance so that project funds can directly flow to them. In developing the IMFFS farm, abandoned shrimp farms of the female-headed households will be utilized. Both female-headed households and landless families will be involved in alternate livelihood activities such as cage and pen culture of crabs, fish, clams and cockles in the mangrove water ways.

In all project activities equal wages will be paid to women and men. This system is followed in all other project activities of MSSRF and PPSS.

Social benefits: Mobilisation and organisation of the community into gender balanced village based institutions to plan, implement and monitoring the project activities is one of the major benefits of the project. In the village based institutions, representation will be given to marginalised groups e.g. women and tribes, which in turn will provide them the opportunity to participate in the decision making process. This will help in improving the social standing of the poor fishing community. The leaders and members of the village level institution will be provided training on leadership qualities, which will also benefit the community in the project villages in the long run. Thirdly, sensitization of leaders and members of the VLI on gender issues will help in mainstream gender in developmental process at the village level. The VLI members will also be given training on mangrove restoration and livelihood interventions to derive income from the mangrove restoration activities and the livelihood interventions.

Economic benefits: Employment opportunities in the form of wage labour will be created during the course of project implementation. The restoration of mangroves will help to improve the fish catch by enhancing fish breeding and feeding grounds and habitat for various aquatic species, as well as birds, reptiles and mammals. Significant economic benefits arise from the protective function provided by the restored mangroves including protection from natural hazards, carbon sinks and preventing coastal erosion and soil degradation. The project will help the individual farmers to convert their abandoned shrimp farms into IMFFS. The project will help the conversion of ponds and culture the fish and prawns in the first crop.

Environmental benefits: Environmental benefit from restored mangroves includes protection of the coastal areas from cyclones and prevention of soil erosion. The floral and faunal diversity of the restored area will also improve. The restored mangroves will sequester more carbon and act as a carbon sink and thereby play a role in preventing CO₂ increase in the atmosphere. No chemicals and artificial feeds are used in IMFFS and cage/pen culture, thus preventing water pollution. In IMFFS the water exchange is through tides and there is no need for diesel or electric motors for water pumping.

In summary, the main social, economic and environmental benefits from the project are given below, compared to the baseline scenario:

Benefit areas	Key benefits	Baseline scenario
Social	<p>Community mobilized and organized for improved natural resources management through village level institutional capacity development</p> <p>Capacity is built to work collectively for the mangrove management and climate change risks and vulnerabilities</p> <p>Specific training will be offered related to mangrove restoration and livelihoods</p> <p>Landless, women and tribal groups will have representation at village level institutions</p> <p>Participation of these marginalized groups in decision making processes will be ensured</p>	<p>Lack of village-based institutional mechanism to address mangrove management and CC issues</p> <p>Lack of leadership quality to address issues relating to natural resource management and CC related issues</p> <p>No trained personal in mangrove restoration, IMFFS and cage culture</p> <p>Lack of village based institution for landless, Women and tribal groups No participation of marginalized groups in decision making process</p>
Economic	<p>Employment in mangrove restoration and IMFFS pond preparation for landless and other poor families in the project villages</p> <p>Sustained income from IMFFS and cage and pen culture</p> <p>Increased fish catch in the mangrove restored area</p> <p>Reduced loss of livelihood assets like boats, nets, prawn farms and agriculture fields from the cyclones and high waves</p> <p>Reduced loss of physical structures like houses, and</p>	<p>Landless; economically poor; engaged in capture fishery; agricultural labour on a seasonal basis only</p> <p>Low income from capture fishery due to depletion of fishery resources</p> <p>Low or recurrent loss from shrimp farming. No income from the abandoned shrimp farms</p> <p>High risk in shrimp farming as currently practiced.</p> <p>Lack of crab and fish culturing options</p> <p>High risk to assets, safety, and livelihoods from</p>

	other assets in the villages during cyclones and other natural disasters	unprotected exposure to risk of natural disasters High risk to infrastructures during cyclones and other natural disasters
Environmental	Restored area acts as carbon sink Increased forest cover for coastal protection and fishery production Protection of coastal areas from cyclones, erosion Improved species diversity in the mangrove restored area Zero energy in IMFFS and in cage and pen culture No use of chemicals and fertilizers, commercial feed IMFFS and cage/pen culture	Lack of mangroves – no carbon sink No mangroves in the degraded area for ecosystems services Limited coastal protection Lack of biodiversity in mangrove areas No IMFFS ponds, and cage / pen culture in practice Use of commercial feed in shrimp farms

As may be seen from the above, implementation of the project will not cause any negative social and environmental impacts. Local communities have been consulted in design of the project and components proposed are in line with the prevalent regulations, policies and standards of National and Sub-national Governments. Components proposed under the project have been designed with consideration towards the Social and Environmental Policy of the Adaptation Fund.

C. Describe or provide an analysis of the cost-effectiveness of the proposed project / programme.

An important criterion that favours mangroves as a first line of defense against sea level rise is the economic benefits of mangroves, including the availability of commercially important wood and non-wood products and aquatic products such as fish, prawn, crab, mussel and oysters. The annual economic values of mangroves, estimated by the cost of the products and services they provide, have been estimated to be (\$200,000-\$900,000 equivalent) per ha (Gillman et al 2006)³⁶. An estimate indicates that the value of Malaysian mangroves with respect to storm protection and flood control alone would be around (\$300,000) per km,

³⁶ Gilman, E., Van Lavieren, H., Ellison, J., Jungblut, V., Wilson, L., Areki, F., Brighthouse, G., Bungitak, J., Dus, E., Henry, M., Sauni, I. Jr., Kilman, M., Matthews, E., Teariki-Ruatu, N., Tukia, S. and K. Yuknavage. 2006. Pacific Island Mangroves in a Changing Climate and Rising Sea. UNEP Regional Seas Reports and Studies No. 179. United Nations Environment Programme, Regional Seas Programme, Nairobi, KENYA.

which is based on the cost of replacing the mangroves with rock walls. It has been estimated that a hectare of mangroves is worth \$9,900 per year not just in fish production but also nutrient recycling, as a carbon sink, coastal protection, etc. (Costanza 1997)³⁷. An assessment of the Rekawa mangrove-lagoon ecosystem, in Sri Lanka in 2005 indicated the value of mangroves in terms of erosion control and buffer against storm damages to be around \$300 per ha per year (Gunawardena and Rowan 2005)³⁸. The economic valuation conducted in a mangrove plantation in Gazi, Kenya showed that the restored mangroves of one hectare provide fish catch worth \$113.09 (Kairo *et al.* 2009)³⁹. The project proposes to spend \$533 per ha for restoring the mangroves and the long-term benefits are likely to be very high.

A feature of the cost/benefit analysis of the IMFFS is that only very limited energy is required for recurrent annual operations. Since water is exchanged daily by tides through natural gravitation cycles, pumping of water in and out of the ponds to maintain water quality is not required. Also there is no need to purchase and use aerators for increasing the oxygen content of the water. Secondly, daily exchange of water brings in lot of fresh food in the form of planktons (microscopic plants and animals that float and drift in large numbers in sea and brackish water) to the pond. This avoids using artificial feed. Zero use of energy and artificial feed greatly reduces input cost and also avoids environmental pollution. The input cost for pumping water into the aquaculture system is not required which reduces the input cost to a great extent.

Fingerlings will be procured from certified hatcheries. These fingerlings are able to grow in the system without any external inputs like feed and other chemicals. The natural system will provide the necessary food in the form of plankton to the marine species growing in the system.

Convergence with the government schemes will be made during the project implementation for potential future upscaling. As a very large area of saline affected mangrove rehabilitation/potential aquaculture lands are available -- 8,980 ha of unprotected mangrove

³⁷ Costanza R., 1997. The value of the world's ecosystem services and natural capital. In *Nature*, Vol. 381 pp 253-260.

³⁸ Gunawardena, M. and Rowan, J.S. 2005. Economic valuation of a mangrove ecosystem threatened by shrimp aquaculture in Sri Lanka. *Environmental Management* 36: 535–550. Online at: <http://www.springerlink.com/content/g427666386762009/>

³⁹ Kairo J, Wanjiru C and Ochiwo J, 2009. Net Pay: Economic analysis of a Replanted Mangrove Plantation in Kenya. *Journal of Sustainable Forestry*, 28:395 — 414

area in Andhra Pradesh alone -- the community will be linked with the government schemes like Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) for preparing the land for introducing the IMFFS for coverage of a far larger area. Technical inputs will be provided through the project to improve the networking of aqua farmers. The farmers will also receive training and capacity building for their skills improvement related to aqua-farming. Similarly, the MGNREGA funds will be utilized for de-silting the canals in the mangrove restored area. This could be the contribution of the Government to the project.

The project would result in the following positive externalities:

- Out migration of vulnerable community members results in family disintegration, drudgery for women and school dropouts. Improved livelihood opportunities and increased household income will assist to relieve these conditions over time
- Lack of collectiveness and capability to address the emerging socio-economic and environmental threats. Improved village level organization and training will assist the communities to gain confidence and find solutions
- Land and water resources remain degraded and unproductive. Project investments will directly rehabilitate unproductive areas
- Productive lands and fresh water resources, both surface as well as groundwater, becoming more saline and getting degraded over time. Project investments will directly improve these conditions.
- Increase in fishery production will not happen. Improved productivity will result through the project.
- Natural and social systems remain exposed to vulnerabilities. Project investments will improve the community's capacity to improve and manage the local natural resources on a sustainable basis.

Comparison of the chosen option *vis-a-vis* alternative options is given below:

Activity proposed	Alternatives	Benefits
Restoration of mangrove areas for coastal protection	Construction of wall/embankment	Mangroves restoration is less expensive Requires less maintenance Enhances livelihoods through increase in fisheries
Cost per ha including maintenance cost for two years comes to INR 32,000 to 35,000 (\$535 to 585)	Cost per km of constructing sea wall in the state of Kerala INR.125,00,000/- (\$208,333) ⁴⁰	Carbon sinks Removal of pollutants Coastal erosion prevention and gradual soil accumulation

⁴⁰http://www.irrigation.kerala.gov.in/pjt_&_pgm/Anti_sea_erosion_%20works.php

Demonstration of mangrove dependent fishery livelihoods		
Demonstration of Integrated mangrove and fishery farming systems (initial cost INR 250,000 per ha; recurring INR 30,000 per ha per culture cycle, equivalent to to \$ 500.)	Conventional shrimp farming – high cost (Initial cost INR 480,000 per ha \$ 8,000); (recurring cost INR 270,000 per ha each culture cycle i.e. \$ 4,500)	<p>Less recurrent cost in IMFFS, cage and pen culture</p> <p>Less risk in IMFFS and cage and pen culture</p> <p>Eco-friendly techniques</p> <p>No need of water exchange</p>
Cage and pen culture of crabs, fish, clams and cockles (INR 350,000 (\$ 5,833) per cage/pen ; recurring cost INR 150,000) \$2,500	Conventional aquaculture (initial cost INR 480,000 per ha i.e. \$ 8000); (recurring cost per ha culture cycle INR 270,000 cycle i.e. \$4,500)	<p>Suitable livelihood for land less community</p> <p>Eco-friendly techniques</p>

Alternative options are either very expensive or socially unacceptable to the community. The major advantage of the proposed project as against alternative options is in its ability to provide sustainable livelihoods through increased mangrove areas and IMFFS to the vulnerable fisheries community living in the project area. As such, the proposed programme is environmentally sound and socially acceptable and enables the community to address the core issue of sea level rise and salinization.

To sum up the following key characteristics of the programme would considerably enhance its cost effectiveness:

1. The major project components viz. mangrove restoration and IMFFS are highly replicable under similar conditions in the coastal region of the country.
2. The project provides the most suitable livelihood option to the beneficiaries, thereby ensuring sustainable livelihoods.
3. Locally available mangrove and fisheries species, that are adaptable to the local conditions, are being promoted.
4. Participation of experienced NGOs and community right from inception of the project makes it community driven with high level of local ownership.
5. Being cost effective, government departments would evince interest in up-scaling of the project through various programmes.
6. The implementation mechanism by involving the lead NGO which has local presence and a long-standing work relationship with the community, is highly cost effective.

D. Describe how the project / programme is consistent with national or sub-national sustainable development strategies, including, where appropriate, national or sub-national development plans, poverty reduction strategies, national communications, or national adaptation programs of action, or other relevant instruments, where they exist.

India is a large developing country with diverse climatic zones. The livelihood of the vast population is dependent on climate-sensitive economic sectors like agriculture, forestry and fisheries. Climate change vulnerability and climate change impact studies in India assume a high degree of uncertainty in the assessment due to limited understanding of many critical processes in the climate system, existence of multiple climatic and non-climatic stresses, regional-scale variations and nonlinearity. The costs of not addressing climate change or to adapt to it are very uncertain, but their consequences are enormous. Early actions on adaptation therefore are prudent and consistent from the viewpoint of the precautionary principle.

The restoration of mangroves will be carried out in lands owned by the Revenue department and IMFFS will be introduced in privately owned land. These activities will not come under Forest Act, 1980, as the activities are planned outside the area administered by the State Forest Department.

The Environment (Protection) Act, 1986 has had a crucial role in the conservation and management of mangrove ecosystems. It declares industrial and other activities such as discharge of untreated water and effluents, dumping of waste, land reclamation and bunding are restricted in order to protect the coastal environment. The Coastal Regulation Zone Notification 2011 ensures (i) protection of livelihoods of traditional fisher folk communities, (ii) preservation of coastal ecology and; (iii) promotion of economic activities that have to be necessarily located in coastal regions. As per CRZ 2011, mangroves are declared as an Ecologically Sensitive Area and protected under Coastal Regulation Zone I, where no construction activities are allowed.

National policy	Project elements related to the policy
The National Policy on Mangroves and Coral Reefs 2006 indicates that Mangroves and coastal reefs are important coastal resources that provide habitats for marine species, and protection from extreme weather events. In the case of mangroves the objectives of the policy is to help the coastal state governments in rehabilitation of degraded mangrove areas and enhance mangrove cover by replantation. Conservation and	Restoration of mangroves in 200 ha in Krishna wetlands in Andhra Pradesh is aiming to fulfill the objective of replanting of mangroves in the mudflats as per the National Policy on Mangroves and Coral Reefs (2006). National Disaster Management Guidelines for Cyclone and Tsunami Management (2008).

Management of Mangroves and Coral Reefs was initiated in 1986 for Conservation and protection of the mangrove ecosystems from further degradation, afforestation of degraded mangrove areas, maintenance of genetic diversity, especially of the threatened and endemic species, and creation of awareness among the people on importance of mangrove ecosystem and the need for conservation.

As per the 2008, National Disaster Management Guidelines for Cyclone and Tsunami Management by the National Disaster Management Authority, establishing mangroves is listed as one of the interventions for disaster management.

NATCOM report 2004 stated that rising sea levels will cause salinization of land and water resources, displacement along one of the most densely populated coastlines and measures needs to be taken up to reduce impact of such CC induced problems.

National Action Plan on Climate Change (NAPCC) identifies eight national missions to provide multi-pronged and integrated framework for addressing climate change, focusing on adaptation/mitigation, energy efficiency and natural resource conservation and capacity building/stakeholder involvement on climate change issues.

Under the National Mission on Sustainable Agriculture (NMSA), developing mangrove and non-mangrove bio-shields to minimize the impact of coastal storms and seawater inundation is one of the mission interventions suggested.

State Action Plan on Climate Change (SAPCC) – Andhra Pradesh

The restored mangrove area, as well as IMFFS, will mitigate the impact of the sea level rise.

The proposed project addresses most of the elements of NAPCC and NMSA

The project is aligned to the following interventions proposed under the State Action Plan for addressing the above issues:

- Restoration and plantation of new mangrove belts across the coast
- Revitalize community based

12th Five Year Plan of India

- initiatives like Joint Forest Management to check forest degradation and loss of biodiversity
- Promote shelter belt plantations in coastal areas to reduce damage from cyclones, etc.

As per 12th Five Year Plan under National Mission for a Green India, eco- restoration of mangroves and wetlands is an important component. It is further indicated in the Plan document that “sensitive ecosystems such as the mangroves are also threatened by climate change. Identification of coastal vulnerability and assessment of the consequence of coastal inundation should, therefore, receive high priority during Twelfth Five Year Plan”

E. Describe how the project / programme meets relevant national technical standards, where applicable, such as standards for environmental assessment, building codes, etc., and complies with the Environmental and Social Policy of the Adaptation Fund.

The technical standard provided here is based on experience gained in the restoration of mangroves over two decades. Similarly the good management practices adapted in aquaculture such as like shrimp seeds from certified hatcheries will be used. Soft crab and juvenile crabs of *Scylla serrata* and other fishes collected from the wild will be used for farming.

Activity	Technical Standard	Application to the project	Monitoring
Restoration of mangrove areas for coastal protection	Guidelines for Mangrove Restoration, Ministry of Environment and Forest, Government of India, 2000	Canal design and construction for tidal flushing Selection of species for plantation Planting of mangrove saplings	Inventory report Survival report Field visit and Photos
Demonstration of Integrated Mangrove Fishery Farming Systems	Coastal Aquaculture Authority, Govt. of India Improved extensive farming system as per the Guidelines of the Coastal Aquaculture	Registration of ponds Stocking density, feed and other operation	Field visit and Photos

Cage and pen culture in mangrove areas	Authority, Govt. of India, 2005		
	MPEDA certified fingerlings will be used As per the Guidelines of the National Fisheries Development Board, 2014, Govt. of India	Release of Hatchery reared Juveniles Site selection, cage and pen fabrication, selection of fingerlings, culture operations	Receipts from the hatcheries Field visit and photos
	As per the methods provided by Rajiv Gandhi Centre of Aquaculture, Govt. of India		
	MPEDA certified fingerlings will be used		

- The project component for mangrove restoration is aligned with the provisions of the Environment (Protection) Act, 1986 and the Forest Conservation Act, 1980. Restoration activities will be carried out as per the guidelines issued by the Ministry of Environment and Forests, Govt. of India in 2000. Once the area is fully developed into mangroves, the same would fall under CRZ I and therefore cannot be utilised for any other purpose
- IMFFS ponds will registered with Coastal Aquaculture Authority, Government of India
- Fish culture (fish, shrimp, crab) activities will be carried out as per the guidelines provided by the Coastal Aquaculture Authority, Government of India
- Fish Fingerlings or juveniles will be brought from the hatcheries certified by the Marine Product Development Authority, Government of India
- The project activities involves labour payments for various works and these labour payments will as per the approved Standard Schedule of Rates (SSR) of Government of Andhra Pradesh which ensures wage payments as per the Minimum payment norms prescribed by National/Subnational Governments. This takes care of social security issues of labourers involved in execution of the project works
- Coastal Zone Regulation: As per the new Coastal Regulation Zone (CRZ) notification of the Ministry of Environment and Forests dated January 7, 2011, the ecologically sensitive areas like mangroves and mudflats form CRZ I. The CRZ notification of 2011 brought the participation of local communities in coastal management plans. The proposed activities are permissible under the CRZ notification. Further, as per the prevailing regulations extensive and improved extensive shrimp farming can be undertaken within the CRZ with a production range of 1 to 1.5 tonnes/ha/crop with stocking density of 40,000 to 60,000/ha/crop. The IMFFS system proposed in the project is an improved extensive

farming system where tidal water is used for farming and the stocking density is low (less than 30,000/ha). In this view, the project meets the applicable requirements under CRZ and environmental permissions are not be required

- As such the project complies with the Environmental and Social Policy of the Adaptation Fund

F. Describe if there is duplication of project / programme with other funding sources, if any.

A pilot scale project is being implemented in the Pichavaram mangrove area in Tamil Nadu with the support of GIZ New Delhi where the IMFFS system was introduced for climate change adaptation in 6 ha. Similar study has been expanded to other areas in Tamil Nadu and Andhra Pradesh to integrate both mangrove restoration and IMFFS to strengthen the resilience of the coastal community to climate change vulnerability.

Project	Objectives	Component	Geographic coverage
Integrated mangrove fishery farming system to enhance adaptive capacity of coastal Community to sea level rise supported by <i>Gesellschaft für Internationale Zusammenarbeit (GIZ)</i> , New Delhi	<ul style="list-style-type: none"> To build the technical and participatory management capacity of the community and local self-government to ensure sustainable coastal livelihood in the mangrove areas To establish access to mangrove and related fishery resources and fishery based livelihoods 	Integrated Mangrove Fishery Farming System in 6 ha	Mudasaloodi village in Pichavaram, Tamil Nadu
Augmenting water resources: Role of seawater supported by Department of Science and Technology, Government of India between January 2011- December 2014	<ul style="list-style-type: none"> To develop and demonstrate different science based biosaline agriculture methods and techniques for cultivation of selected commercially important halophytes To develop and demonstrate replicable models of seawater based agro-aqua farming system 	Integrated Mangrove Fishery Farming System in 5 ha Cultivation of halophytes in 5ha	3 villages in Vedaranyam block, Nagapattinam district, Tamil Nadu
Seawater farming as adaptive capacity to the coastal community supported by Department of	<ul style="list-style-type: none"> To develop and demonstrate the efficiency of halophytes in reducing the soil salinity To develop and demonstrate science based bio-saline agriculture methods and 	Integrated Mangrove Fishery Farming System in 4 ha	2 villages in East Godavari district in Andhra Pradesh

Science and Technology, Government of India between November 2011-October 2014	techniques for cultivation of selected fodder halophyte <ul style="list-style-type: none"> • To develop and demonstrate replicable models of seawater based agro-aqua farming systems 	Cultivation of fodder grass in 1 ha	
--	--	-------------------------------------	--

The GIZ supported project was started in Tamil Nadu in May 2012 and construction of the IMFFS farm was completed in December 2012. The planned outcomes of the GIZ-supported project (not in the project region or in Andhra Pradesh) are

1. Technical and participatory management capacity, including that of community and local self-government built to ensure sustainable coastal livelihood in the mangrove areas
2. Community access to mangrove and related fishery resources and increased fishery based livelihoods

The above two outcomes have been partially achieved. The project was implemented with the participation of two villages from which 20 families were selected for the establishment of IMFFS. These families were identified based on the vulnerability, such as women-headed poor families who were landless or who had very limited assets. Another criteria used for selection was knowledge and experience in raising mangrove plantation and fish culture. The technical capacity of these families to implement the IMFFS system was enhanced by orienting to the concept of IMFFS and providing hands on training in engineering aspects such as assessing suitability of land, designing and constructing IMFFS farms, management aspects such as maintaining tidal flow, water quality monitoring and management, and techniques related to fish culture such as selection of juveniles, monitoring of survival rates, harvesting, etc. This was achieved by construction of two model IMFFS farms in about 6 ha of land. The people were also trained on practices of sustainable fisheries in mangroves such as maintaining mesh size of the fishing nets, not harvesting pregnant female crabs, etc.

On a pilot scale only, two ponds were stocked with sea bass. Uniform size sea bass fingerlings were brought from the Rajiv Gandhi Center for Aquaculture where the community members were trained. The community was able to harvest 200 kg of sea bass with a culture period of 6 months.

Regarding access to mangrove and related fishery resources, the two villages received about 6 ha of saline areas where mangroves were present in a degraded state. These 6 ha have now been converted into IMMFS.

The major lessons learnt from the project are

- Short duration and high market value species like crab and shrimp farming could be tried over a longer duration species such as sea bass
- Mixed culture involving mussels and clams along with short duration fish culture, is preferable since clams and mussels will provide income throughout year (except monsoon period).
- Participating farmers should be involved from the beginning of the stage of the project. i.e. from project formulation
- Collective decision making overall on strategic management (species selection, protection for ponds and mangroves) but individual farm management (e.g. growing fish in the pond) is more successful and sustainable.

The above lessons have been used in designing the project and will further used and added to during implementation.

Linkage with other climate change adaption interventions in project region

AdaptCap project: The AdaptCap project, a European Commission-financed initiative implemented with coastal communities in Tamil Nadu and Andhra Pradesh, during January 2011 to December 2013. The aim of this project is to increase knowledge, planning and adaptation capacities of coastal communities concerning climate change adaptation (CCA), disaster risk reduction (DRR) and climate change mitigation (CCM) in Andhra Pradesh and Tamil Nadu, India. The project opens up the opportunity to mainstream climate change mitigation, risk reduction and adaptation in the planning at grassroots level. It is being implemented in nine subprojects in the areas of improving infrastructure such as construction of embankments to prevent seawater intrusion, water management and utilization of solar power.

The project has employed a variety of participatory tools in planning, innovating, implementing and monitoring community led pilot initiatives. Convergence with these pilot projects will be taken up in the following ways: The community of the proposed Adaptation Fund project villages will be taken to visit the AdaptCap project villages in Andhra Pradesh to interact with the local communities on the capacity building aspects, and the community will be exposed to process that were followed to interlink CCA, CCM and DRR. Secondly, lessons learnt by AdaptCap in the processes of identifying pilot projects and sustaining them will be utilized in the proposed Adaptation Fund project to innovate, particularly in terms of long term management and sustainability.

Capacity building strategy plan under ClimaAdapt for Andhra Pradesh: BIOFORSK-Norway, International Water Management Institute (IWMI), WALAMTARI and MS Swaminathan Research Foundation (MSSRF), are implementing the Norwegian Embassy funded ClimaAdapt Project in Andhra Pradesh during April 2012- May 2016, which primarily aims at using information communication technology (ICT) for improving the adaptive capacity in agricultural practices. The project is implemented through Farmers Organizations, which is similar to the village level Institutions of this project and the interaction of the project villagers will help to learn about the importance of adaptation to climate change. Since MSSRF is one of the implementing partners in the project the experience and the adaptation strategies of the project, particularly how ICT is being used, will be linked in the proposed project. No component of the ClimaAdapt project overlaps with the current project. However, ICT based strategies such as disseminating weather information through mobile phones will be attempted with the support of the Information, Education and Communication Division of MSSRF. Already in one of the proposed project villages namely, Sorlagondi, MSSRF is providing information on potential fishing zone and ocean state forecast. This service will be utilized to disseminate weather related information to participating aqua-farmers.

Case study on the impacts of climate change on shrimp farming in Andhra Pradesh, India by the Network of Aquaculture Centres in Asia-Pacific (March 2009 – May 2012):

The study highlighted that shrimp farming is threatened by changes in temperature, precipitation, drought and extreme climatic events (cyclones, storms, floods) that affect infrastructure and livelihoods which can impact aquaculture both negatively and positively. In order to solve issues related to these this study, it is suggested that a number of local interventions and policy changes be made. For example, the study suggested that farmers need to make a decision to resist climate change or to accept climate change and find ways to live with the consequences. Also, increased rainfall intensity together with increasing sea level rise is leading to increased frequency and higher floods. To resist this impact the farmer can resist flooding by strengthening and increasing the height of the individual ponds dykes and farm bunds. To live with flooding, the farmer can purchase nets that are deployed on the top of the dykes so that when a flood occurs, the shrimps remain in the ponds. These kinds of simple and practical suggestions will be incorporated in the proposed project.

G. *If applicable, describe the learning and knowledge management component to capture and disseminate lessons learned.*

The project will conduct a situation analysis in the villages to identify and capture the vulnerabilities and adaptive capacities including best practices to learn and plan the

interventions. The project will blend traditional knowledge and practices with frontier technologies to enhance adaptive capacities. Similarly the monitoring and evaluation systems will enable documenting the programme process and progress. This will be captured using printed and multimedia tools and shared with various stakeholders for replication. Lessons drawn from the project will be documented in local language and shared amongst stakeholders. Also lessons from the project will be brought to the attention of state and national level climate change and disaster risk reduction departments through meetings, reports, as well as website postings. Specific targeting of project analysis and policy information will be derived from early assessments of existing gaps or weaknesses in policy matters. In addition, opportunities for dissemination through regional and international conferences, publications in journals and books, or web-based content will be explored by the implementing agency. Brochures in regional language will be brought out for disseminating the information about climate change vulnerability and the impact of project interventions. Baseline information on the availability of the saline land suitable for mangroves in Krishna estuary will be carried out through a field survey along with the community. The remote sensing maps will be used to demarcate different land uses and the thematic map will be prepared for the area suitable for mangroves.

H. *Describe the consultative process, including the list of stakeholders consulted, undertaken during project preparation, with particular reference to vulnerable groups, including gender considerations, in compliance with the Environmental and Social Policy of the Adaptation Fund.*

Consultative meeting with Stakeholders

The stakeholders of the project include local community, community based organizations such as traditional Panchayat, local self-government, grass roots NGOs and government agencies such as the departments dealing with Forest, Revenue, Fisheries and Agriculture.

So far, four consultative meetings were held and as a follow up two visits were organized.

- (I) Consultative meeting with community and local self-government on 21st June 2013
- (II) Consultative meeting with community and local self-government on 22nd June 2013
- (III) Consultative meeting with Fisheries Department, 23rd June 2013
- (IV) Joint Consultative meeting with community, local self-government, Fisheries Department and NABARD on 26th Sept 2013
- (V) Joint Field visit 26th Sept 2013
- (VI) Consultative meeting with community on 11-13 May 2014.

Consultative meeting with Community in June 2013

The first and second consultative meetings were held in Sorlagondi and Nalli villages on 21st and 22nd June 2013 respectively. In this meeting leaders and members of the traditional Panchayat including fishery society, leaders and members of local self-government, women SHGs leaders and members, youths, women and Yenadhi tribes participated. Group Discussion was the techniques used in the meetings. During these meetings these grassroots level stakeholders revealed that farming, fishing and landless labourers of the coastal area are suffering from various climatic and non-climatic stresses such as

- Salinization of land and groundwater, which is the primary source of vulnerability in a large portion of the Krishna delta
- Reduction in agricultural yield due to the impact of cyclones, seawater and fresh water floods, drought and groundwater/ land salinity
- Lack of access to credit for vulnerable fishing and farming community during times of distress (following storms or droughts)
- Lack of climate resilient agriculture crops and fish species for farming and culture purposes

The current adaptation strategies followed by the local community include (i) migration to other villages or town for farm and non-farm work, (ii) working in shrimp farms, (iii) growing alternative crops, (iv) borrowing from money lenders. The fishing community (the poorest and most vulnerable of the residents) requested the development of a mangrove bio-shield as one of the major options to reduce their vulnerability to cyclones and sea level rise. They also expressed the need for lower input cost in capture and culture fishery, and diversification of income sources as measures to increase their adaptive capacity. Women in the coastal villages stated that salinization of the ground water has increased their work in obtaining fresh water. They are fetching drinking water from far off places, especially during summer. The mangrove plantation in the degraded area might help to reduce the saline water intrusion and slow the salinization process in the future.

Consultative meeting with Fisheries Department

A consultative meeting with staff of the Fisheries Department, Government of Andhra Pradesh was held in Guntur on 23rd June 2013. In this meeting Deputy Director of Fisheries, Assistant Director of Fisheries and other field staff of the Fisheries Department participated. A presentation on mangroves and its role in enhancing fishery resources, IMFFS and about the proposed project was made. The Deputy Director appreciated IMFFS approach and informed that it is similar to traditional farming where the input for the fish culture like feed

and chemicals will be much reduced and there would not be any pollution problem. The system is eco-friendly and suitable for saline soils which are not fit for agriculture. He also informed that the restoration of mangroves will not only improve the feeding and nursery ground for the fishery but also enhance the coastal protection from natural disasters like cyclones. He informed that Fisheries Department will provide support to the project particularly in linking with Coastal Aquaculture Authority of India, which will help in marketing IMFFS produce.

Joint Field visit

Mr. Balaramamurthy, Deputy Director of Fisheries, Ms. Annie Alexander and Mr. Madhu Murthy of NABARD visited project site during 26th September 2013. They visited mangrove restoration site and old IMFFS farms along with traditional leaders, women representatives, representatives of Yenadhi tribes and local self-government. They also interacted with community of the project villages. During the meeting community leaders explained the link between mangroves and fisheries and benefits that would result from restoring mangroves. They also explained that IMFFS is a good model of eco-friendly aquaculture, which can be replicated in large scale. The officials of the Fisheries Department informed that they would help the IMFFS aqua farmers to get quality seeds and also provide technical guidance during farming operations.

Consultative meeting with community in May 2014

The village level consultative meetings were organized in all the three project villages during 11-13 May 2014. In this meeting, leaders and members of traditional Panchayat, local self-government, women SHG, representatives of Yenadhi tribes and youth participated. Participatory techniques such as social mapping, resource mapping and wealth ranking and group discussion were held. A complete profile of the socio-economic situation of the villages was gathered during these meetings. During the meeting it was agreed to establish village level institutions to restore the degraded mangroves, establishing Integrated Fishery Farming System and culture of fishes in cage/pen in their villages. The villagers showed suitable areas for implementing the above activities. The respective elected local self-government presidents informed that they would explore and provide support to sustain the activities even after withdrawal of the project. The community members, local self-government and the landless community expressed their willingness to participate in the project. As an important outcome of the meeting the local self-government passed a resolution to co-operate in the project activities and also protect the restored areas. It also ensured to get financial support from Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) for desilting the canals after withdrawal of the project.

I. Provide justification for funding requested, focusing on the full cost of adaptation reasoning.

Enhanced adaptive capacities are needed in the project villages. The restoration of mangrove areas and demonstration of IMFFS will play a vital role in improving coastal protection from sea level rise and natural disasters and for livelihood improvement. Science based and participatory processes are to be adopted to accomplish the selected adaptive strategies. Long-term sustainability of interventions also requires financial capital. If the project is not executed then socio-economic losses and environmental degradation would be much higher in future than in the present state. The component-wise comparison of baseline situation with the project scenario is presented below:

Component 1: Community mobilization and organization

In the baseline scenario, projects are taken-up without much stakeholder consultations especially during the planning stage. Stakeholders, especially vulnerable communities who are the direct beneficiaries of projects, are not taken involved while designing various components or at other stages of implementation. Hence mobilization of the stakeholders, constitution of village level institutions PRA, etc. are not given the required focus.

Adaptation Alternative: In the proposed project systematic efforts will be taken in mobilizing the stakeholders so that a gender balanced village level institution (VLIs) will be established for performing various roles, planning implementation and sustaining the project activities thereafter. The activities involved are initial and periodic meetings with villagers to mobilize and organize them into groups. Participatory Rural Appraisal will be conducted on the basis of secondary information already available with the revenue and village authorities, and supplemented by remote sensing and GIS data. As a part of the PRA, a vulnerability assessment will also be carried out. In order to generate interest amongst the community about the project and to bring them to the fold of the project, it is proposed to take-up certain entry point activities that are of high priority for the community. These interventions will help to gain confidence of the villagers and help the agency to take them along with a better common understanding and commitment.

Component 2: Capacity building for coastal protection and livelihoods

In the baseline scenario, the community does not have the capacity to regenerate mangroves and take-up livelihood activities like IMFFS. Mostly these communities are resource poor having less access to institutions than can provide capacity building.

Presently, there are no exclusive activities from the extension machinery of the Government that are directed at building capacity of the targeted community.

Adaptation Alternative: In the project scenario provision has been made to develop the skills of 200 villagers (100 male and 100 female) in mangrove nursery rearing, mangrove plantation and rearing, silviculture and also group dynamics, so that the villagers are able to continue the activities even after withdrawal from the project by the agencies. 50 farmers will be trained in IMFFS and related cage culture aspects, and will be taken for exposure visits to locations where similar activities are successfully undertaken. This will ensure the community to have requisite capacity in not only undertaking the activity, but also sustaining it on a long term basis.

Component 3: Restoration of mangrove areas for coastal protection

In the baseline scenario, generally coastal areas and communities are prone to multiple hazards such as cyclones, floods, storm surges and tsunamis. In addition, the predicted sea level rise due to climate change increases vulnerability in at least three ways; (i) permanent submergence of some of the coastal areas, which leads to permanent loss of coastal habitats, human settlements and shoreline infrastructure; (ii) impact due to changed high tide line due to sea level rise, which results in periodical inundation of seawater into non-saline lands including agriculture areas and coastal aquifers and (iii) exposure to increased intensity of cyclones and associated storm surges.

Adaptation Alternative: Mangroves play an important role in adaptive responses to sea level rise and salinity ingress from seawater. The roots of the mangrove physically buffer shorelines from the erosive impacts of ocean waves and storms and will provide a bio shield to the coastal villages to combat climatic changes in terms of salinity incursion and the consequent loss of livelihoods and dwellings. Additionally, mangroves protect riparian zones by absorbing floodwaters and slowing down the flow of sediment-loaded river water. This allows sediments to drop to the bottom where they are held in place, thus containing potentially toxic waste products and improving the quality of water and sanitation in coastal communities. Creation of mangroves will prevent soil erosion from the coast and will also improve the biodiversity in the coastal mud flats/swamps thereby improving the natural productivity of the coastal waters which is the natural habitat of many varieties of fish, crustaceans and mollusks. The project will restore the degraded mangroves, create mangroves in suitable mud flats near the coast which will help to conserve the shelter of many commercially important animals/organisms including fishes and crustaceans which will

increase the income levels of the community. About 200 ha of suitable land have been identified in Krishna wetland in Andhra Pradesh for regeneration under the project.

Component 4: Demonstration of mangrove dependent fishery livelihoods

4.1 Demonstration of Integrated Mangrove and Fishery Farming Systems

In the baseline scenario, in the absence of proper livelihoods for the community, out migration may persist in the area resulting in family disintegration, drudgery for women and school drop-outs. Excess salinity in the soil makes it difficult to undertake cropping. Impacts of frequent cyclones and flooding cause heavy damage to livelihoods including farming and fisheries. Salinization of the ground water makes the life of the community miserable. The current adaptation strategies, in the absence of alternative livelihoods, include migration to other villages or towns, working as labourers in shrimp farms, sheep rearing, etc., which do not provide adequate income for sustenance. There is an urgent need for augmentation of fishery resources and the full potential of mangroves to enhance livelihood security of coastal fishing families. Thus, restoring and sustaining mangrove wetlands – which is the most dominant wetland in tropical coastlines – and also restoring it in areas where biophysical and social conditions are suitable, could be an important strategy to both mitigate the impact of sea level rise as well as enhance adaptive capacity of local communities.

Adaptation Alternative: One such system is the Integrated Mangrove Fishery Farming System, wherein raising of mangrove trees is integrated with shrimp/fish culture. It is a new kind of farming system wherein conventional earthen aquaculture ponds are modified in such a way to provide about 40% of the area for raising mangrove plantation and 60% water spread area for fish cultivation. Space for growing mangroves and other vegetation is created by constructing linear bunds or mounds inside the pond. The IMFFS activities will improve the adaptive responses and resilience of the otherwise marginalized coastal fishermen who are most vulnerable to the vagaries of nature due to climatic imbalances. These interventions demand physical activities that encompass technical designing and execution of canal systems for mangrove restoration and pond preparation for IMFFS, and need qualified and skilled human resources as well as financial resources. Restoration of degraded mangroves, creation of mangroves in suitable areas and introduction of integrated mangrove fishery farming systems in saline areas will enhance the adaptive capacity of coastal communities to sea level rise.

4.2. Cage and Pen Culture of crabs, fish, clams and cockles

The marginalized community, particularly the landless, depend on capture fisheries which are declining in many coastal areas due to over exploitation and other climatic factors such as increasing water temperature, water salinity, etc. Communities are often forced to migrate to other areas for their livelihoods, at significant social and economic costs.

Adaptation alternative: The accommodation category of adaptive response of the Coastal Zone Management Subgroup of the IPCC, implies that people continue to use the lands that are at risk due to sea level rise but modify land use patterns to ensure that changes take care of new threats such as salinization and flooding. Cage and pen culture of fishery resources is one of the adaptation strategies by which the marginalized community could slightly modify the land use and receive sustainable income for their efforts.

Component 5: Knowledge Management for Improved Coastal Protection

At present one of the weakest links in the implementation of many projects is the inability to capture processes and factors that contribute to success. Thereby, it becomes difficult to replicate and upscale pilot projects implemented in the country.

Adaptation Alternative: Under the project a systematic monitoring and evaluation system is proposed to ensure effectiveness and efficiency of the project. It is also proposed to identify best practices and least cost methods that are suitable for a wide range of stakeholders and for various uses in different locations. Project activities will enhance the capacity of the community to make sure that coastal lands are used productively as an adaptive strategy adjust to sea level rise and enhance their livelihoods. Documentation of the project during as well as after implementation, better networking and better publicity for policy makers – at the local, state and national levels – are all ways to improve knowledge, promote better understanding and provide greater development impact in the future.

J. *Describe how the sustainability of the project/programme outcomes has been taken into account when designing the project / programme.*

Sustainability: Restored mangroves

There are two issues relating to sustainability. One is what will happen immediately after the programme and second is long-term sustainability. Sustainability of mangrove restoration immediately after the project will be ensured by empowered village level institutions that will be established. During the last phase of the project, village level institutions, MSSRF, PPSS and local self-government will prepare a joint management plan for sustaining the restored mangroves. The process of preparing joint mangrove management plan involves conducting SWOT (Strength, Weakness, Opportunity and Threats) analysis of the restoration, a joint

visit to the site and identification of concerns and anticipated problems, identification of management activities to be carried out, timeline and the finance required and roles and responsibilities of different stakeholders. Activities are mainly related to de-silting of canals for restoration, causality replacement and protection against cattle, if any. To ensure the physical sustainability of restored mangroves, skilled communities are required and the project process will ensure building their capacities in this regard. Despite having skilled persons a collective approach with good leadership and social inclusiveness is a prerequisite, which will be taken care by the village level institutions.

Long term sustainability: As per the Coastal Zone Management Notification (2011), any mangrove areas more than 100 sq. m will be declared as Coastal Zone Management 1 (protected area) and thus, mangrove forest raised in the land owned by Revenue Department will be protected permanently under the Coastal Zone Management Notification. Already MSSRF and the partner NGO, Praja Pragathi Seva Sangam (PPSS) in partnership with local community, raised mangroves in about 140 ha during 2007-2010 and this area has already been brought under joint protection of the village level institution and Forest Department. To facilitate Notification of the area under CZR by Government, it is proposed to involve the concerned Department (Forest Department) in planning, implementation and monitoring of the project.

Sustainability: Integrated Mangrove Fishery Farming System

The IMFFS is going to be taken up in abandoned shrimp farm lands owned by small and marginal aqua farmers. The participating abandoned shrimp farms owners have agreed to provide land for demonstrating IMFFS and in this regard they had passed a resolution at a stakeholders meeting and submitted the resolution; the farmers reiterated the same in the village level meeting organized in November 2013. Beyond the project period, the IMFFS farm will be sustained by farming families themselves. This is possible because funds for the first fish culture will be given as seed money by the project, and income from first year's harvest will be utilized by the farmers to carry on the next culture cycle. The participating farmers have given an undertaking indicating that they would carry on aqua farming in the IMFFS farm and protect the mangrove plantings in the IMFFS beyond the project period. **During the course of the project, location specific management protocol will be developed jointly by these aqua farmers, MSSRF, and National Centre Sustainable for Aquaculture, Government of India and an undertaking will be signed with these farmers to follow the protocol.** Such a system was followed in the IMFFS farms developed for crab culture in Sorlagondi village by MSSRF and partner NGO, PPSS. The IMFFS farms owners, who belong to a tribal community (Yenadhi) and the poorest households, collect young crabs

from mangroves and stock them in the IMFFS ponds. They provide trash fish as feed and thus, keep cash inputs to a minimum. This model was developed in 2007 and still it is functioning well. In this project, in order to have a guarantee from the participating farmers, an agreement has been entered with them ensuring that they will continue farming with their own inputs from the second year onwards. Most of the participating aqua farmers have already registered their farms with the Coastal Aquaculture Authority (CAA) of the Government of India and they also have the certificates from Marine Product Export Development Authority (MPEDA) of the Government of India to sell their produce and hence, no problem will be encountered in marketing produce from the project.

Roles and responsibilities of different stakeholders in sustainability

Institutions/ Agencies	Roles and Responsibilities
Village Level Institutions established in the project	Lead role in the preparation and implementation of Joint management plan for restored mangroves; approaching local self-government for resources; ensuring equitable sharing of project funding and benefits
Local Self-government (Panchayat Raj Institution)	Providing support by passing a resolution in its general body; providing resources through MNREGA
MSSRF	Establishing linkages between VLI and PRI and government agencies Providing solutions to technical issues
PPSS	Social mobilization, conducting regular meetings, monitoring implementation of management plans
Government Agencies	Forest Department – support by providing seedlings; protection; long terms sustainability National Centre for Sustainable Aquaculture (NaCSA), Government of India--supply of disease free shrimp seeds; marketing support, monitoring water quality
Individual farmers	Continuing farming and protecting mangroves in IMFFS farms from second year onwards using their own resources

Replication/Upscaling

The proposed activities such as restoring mangrove vegetation and Integrated Fishery farming system can be linked to local self-government (Panchayat Raj Institution) and the

Forest and Fishery Departments of the state government. This will ensure replication of the models demonstrated in the project.

Replication of mangrove restoration: Establishing mangroves is listed as one of the interventions for disaster management by the National Disaster Management Authority ⁴¹ and disaster management is a mandate of local self-government (Panchayat Raj Institution). Using this as an opportunity, local self-government can be a major player in replication of mangrove restoration in non-forest land (land not owned by the Forest Department). The added advantage is that the local self-governments are guided and financially supported by the Revenue Department and hence, there will not be any issue for the local self-government to get permission from the Revenue Department to establish mangroves in the land owned by the latter.

Another advantageous opportunity is that local self-government can provide resources for replication of mangrove restoration through MGNREGA (Mahatma Gandhi Nation Rural Employment Guarantee Act). This scheme is planned and implemented by local self-government with financial support from Government of India. De-silting of water bodies, waterways, and undertaking plantations are approved activities that can be taken up under MGNREGS. In order to achieve this, local self-government should pass a resolution in its General Body meeting (Grama Sabha) indicating that they would like to restore mangroves in lands owned by the Revenue Department and submit this to the District Authority. This one of the major opportunities available for replication of mangrove restoration in Revenue Department owned lands.

The National Fisheries Development Board (NFDB), Government of India, considers that fishery resources can be enhanced through mangrove plantations and in this regard they have a scheme called “Development of fish breeding grounds through mangrove plantations”. As indicated in its scheme brochure, 75% of the cost of raising mangroves will be provided as a grant and the remaining 25% will be met from MGNREGA. This scheme can be utilized by Fishers associations and NGOs, with the support of local self-government to replicate mangrove restoration in lands adjacent to their villages.

Opportunities are available for NGOs to replicate this model with the support international donor agencies such as Mangroves for the Future and GIZ.

Replication of IMFFS: The experts including the former Director of Aquaculture Authority of India, visited the IMFFS in Tamil Nadu and indicated that this model can be replicated on a large scale by two ways: (i) fish cultured in the IMFFS farms can be sold in premium price by

⁴¹ National Disaster Management Authority (NDMA). 2008. National Disaster Management Guidelines: Management of Cyclones. NDMA, Government of India, New Delhi.

indicating that there is less carbon footprint in the IMFFS farm and (ii) IMFFS can be used in large aquaculture estates as treatment to reduce organic loads. Hence, during the project period, exposure visits will be organized for large scale aqua farmers to show them the advantage the IMFFS and to encourage them to include IMFFS as a component in their larger aquaculture estate. This can be achieved through Aquaculture Authority of India, Marine Product Export Development Authority (MPEDA) and National Centre for Sustainable Aquaculture (NaCSA), Government of India. Farmers to farmer learning programme will be organized under the project to provide exposure to IMFFS to other aqua farmers in the region. This will help in self replication of the IMFFS model by aqua farmers themselves. Such cross learning among aqua farmers would help in replication of IMFFS through Self Help Groups, which has financial support from various banking institution.

The following specific measures are proposed under programme intervention to replication and scaling-up of the activities on large scale:

- Community being the primary stakeholders' lesson drawn from the programme will be documented in local language and shared.
- Lessons from the programme will be brought to the attention of State or national level climate change and disaster risk reduction departments.
- Specific targeting of programme analysis and policy information will be derived from early assessments of existing gaps or weaknesses in policy matters.
- Opportunities for dissemination through regional and international conferences, publications in journals and books, or web-based content will be explored by the implementing agency.
- The brochures in regional language will be brought out for disseminating the information about climate change vulnerability and the impact of programme interventions

Possible areas for replication and up-scaling of proposed activities:

Restoration of Mangrove areas for coastal protection: As indicated in Table 1 of this proposal, 21,815 ha of degraded mangrove are located mostly in the lands owned by Revenue Department, where this model can replicated. In Andhra Pradesh alone this model can be replicated in about 8,980 ha (See Table 2 of this proposal)

IMFFS: The estimated brackish water area suitable for undertaking shrimp cultivation in India is around 11.91 lakh ha spread over in 10 coastal states and union territories. In the total area only 10% area (around 1.2 lakh ha) is under shrimp farming leaving a large scope

for expanding the small scale shrimp farming in India. In Andhra Pradesh large areas of saline affected lands are available for replicating Integrated Mangrove

Roles and responsibility of different stakeholders in replication

Institutions/ Agencies	Roles and Responsibilities
Local Self-government t (Panchayat Raj Institution)	Identifying land for mangrove restoration and its ownership; passing resolution in its general body to undertake restoration; resource mobilization through MGNREGA; implementation of restoration and management plan
MSSRF	Establishing linkage with government institution; mapping and technical support in mangrove restoration and IMFFS; joint plan preparation
PPSS	Establishing linkage with government institution; social mobilization, monitoring, capacity building of community
Government Agencies	Revenue Department: granting permission to local self- government Forest Department: granting access to collect seedlings; long term protection under Forest Act
Individual farmers	Learn from IMFFS farmers and replicating IMFFS in their abandoned shrimp farms

K. Provide an overview of the environmental and social impacts and risks identified as being relevant to the project / programme.

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
Compliance with the Law	The project complies with Environment (Protection) Act, 1986 and Forest Conservation Act, 1980 and Coastal Zone Regulation Notification, 2011	None
Access and Equity	The project provides fair and equitable access to the project beneficiaries and will not be impeding access to any of the other requirements like health clean water, sanitation, energy, education, housing, safe and decent working conditions and land rights.	None
Marginalized and Vulnerable Groups	The project is basically aimed at providing opportunity to marginalised community living in the programme area participation in decision	None

	making processes in development schemes as well as to enhance their livelihood and income and as such will not have any adverse impact on other marginalised and vulnerable groups	
Human Rights	The project does not foresee any violation of human rights	None
Gender Equity and Women's Empowerment	The project activities will be planned, implemented and monitored by village level institutions with 50% women members; project covers 50% women beneficiaries and provision has been made for capacity building and training on restoration and IMFFS techniques including management skills and strengthening of livelihood. This will ensure participation by women fully and equitably, and that they receive comparable socio-economic benefits and that they do not suffer adverse effects.	None
Core Labour Rights	Payments to labour under the project will be made as per Government approved norms duly following minimum wage rate and hence ensuring core labour rights.	None
Indigenous Peoples	Not applicable to this project	None
Involuntary Resettlement	The programme does not displace any community and hence issue of resettlement does not arise	None
Protection of Natural Habitats	The mangrove restoration will be taken up in 200 ha of revenue land for which necessary permission has been obtained from the Revenue Department and as such does not affect any of the natural habitats	None
Conservation of Biological Diversity	The project promotes biological diversity through regeneration of various species of mangrove and rearing of fish. IMFFS conserves both plant as well as aquatic bio-diversity. Mangroves are of high value for bio-diversity conservation and are an important resource for coastal communities. They provide the habitats for diverse marine and terrestrial flora and fauna.	None
Climate Change	The project supports enhancing the adaptive capacity of the fisher community against adverse impacts of climate change and is not expected to contribute to GHG emissions	None
Pollution Prevention and Resource Efficiency	IMFFS is designed in such a manner that that only very limited energy is required for operation since water is exchanged by tides through gravitation in and out ponds, more over no chemicals are used and hence does not create pollution related issues	None
Public Health	No adverse impact on public health related issues is envisaged.	None
Physical and Cultural Heritage	No adverse impact on cultural heritage related issues has been identified.	None

Lands and Soil Conservation	Restoration of mangroves is envisaged to help in land and soil conservation and will not create any damage to land and soil resources.	None
------------------------------------	--	------

Addressing issues related to equitable access:

Restored mangroves will be a common property of the community. This common property will be controlled and managed by the village level institutions to be established by the project. These village level institutions through discussion and negotiation develop strategies for free access to resources, particularly fishery resources. Secondly, in all activities, equal wages will be paid to women and men.

The vulnerable community will be given preference in all income generating activities. Abandoned aqua farms owned by female headed families will be given priority in the development of IMFFS so that these families will have sustained future income. Landless and tribal families, who are dependent on capture fisheries for livelihoods will be given preference in the mangrove fishery based livelihoods such as cage and pen culture of fish and crabs. The processes of selecting women headed families, landless and tribal families as priority group in social livelihood enhancement activities such as training and capacity building, IMFFS, cage and pen culture, will be taken through village level institutions, by consensus. This will ensure that these vulnerable groups continue to enjoy these benefits for long term, which in due course change their social and economic status.

The training and capacity building will be provided for all the interested community for silviculture practices for mangrove restoration and IMFFS farming practices, but priority will be given to women headed families, landless and tribal families. Under the project intervention support for IMFFS will be provided for the first cycle only. Subsequently the farmers will sustain the project activities.

The proposed interventions are not envisaged to pose any risk or any other potential impacts on marginalized and vulnerable groups. The area is located in the highly vulnerable area for cyclones and more than 10,000 people were killed in the 1977 cyclone. The mangroves restored will enhance the coastal area protection. The poor vulnerable groups will get priority in the project activities, for example, mangrove restoration work. The project would help in building the climate resilience capabilities of these groups. Further, there will not be any relocation of the people's livelihoods. The mangroves will be restored in the degraded area that will provide livelihood in the form of labour initially and later through fish and other marine species capture. Similarly the abandoned shrimp ponds at present do not support any livelihood. The IMFFS provide sustainable shrimp farming with less input cost.

The project implementation would include grievance redressal provision for addressing any social and environmental policy violation. The contact details of NIE Coordinator / Contact Person would be available to stakeholders and community and would be displayed at common/ predominant places along-with the project details. This is expected to promote social auditing of project implementation. Information on the same would also conveyed during inception workshop.

In view of the above the project is categorized as “**Category C**” with no adverse Environmental or Social Impacts.

PART III: IMPLEMENTATION ARRANGEMENTS

A. Describe the arrangements for programme implementation

The project structure will include Village level institution in each project village (for project planning, implementation and monitoring) with support from project staff (Research Fellows, field staff under the supervision of Project Coordinator). The implementation would be guided by a Project Advisory Committee at State Level.

Project Management

Project Advisory Committee (PAC)

At the District level, the project will be supported by a Project Advisory Committee. This committee will be co-chaired by Prof. M. S. Swaminathan and Secretary, Department of Environment, Forests and Science and Technology, Government of Andhra Pradesh.

The members of Project Advisory Committee will include

- District Collector, Krishna District
- Representative of Forest Department
- Representative of Environment Department
- Representative of Fisheries Department
- Representative of NABARD
- One mangrove expert
- One fishery expert
- Three representatives of the Voluntary / NGO sector

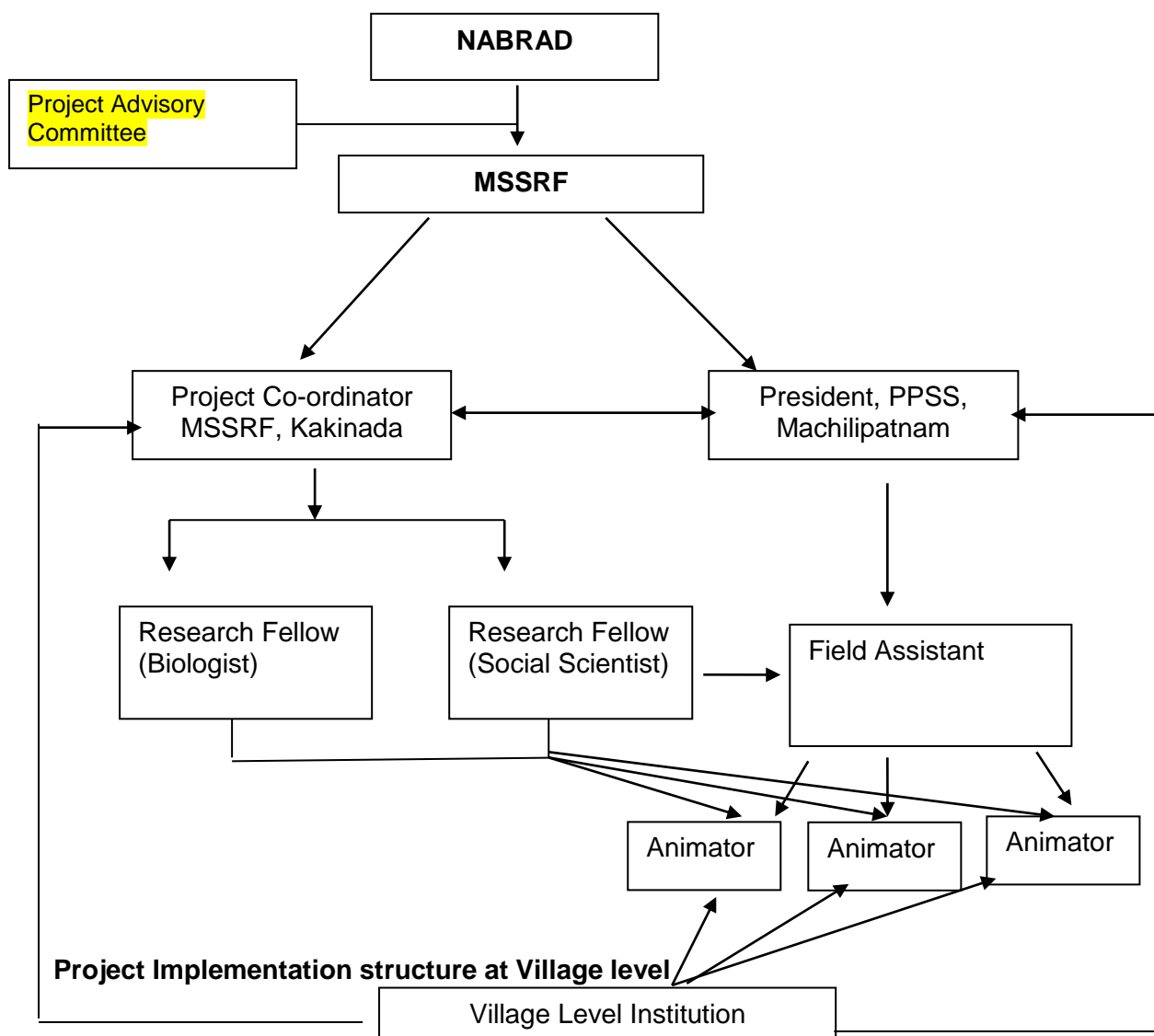
The Programme Director, MSSRF will be Member – Secretary of the Committee. The committee will meet at least twice in a year. The committee will provide policy guidance and advice to Programme Director, MSSRF in all activities related to the smooth implementation of the project activities.

Project Implementation Structure at Organizational Level

MSSRF will execute the project in partnership with a local NGO called Praja Pragathi Seva Sangam (PPSS). Praja Pragathi Seva Sangham (PPSS) was registered in 1993 under Societies Act of 1860 with Registration No.298/93, with its headquarters at Machilipatnam (Andhra Pradesh). The socio-economic development and environmental initiatives are implemented in Krishna district. PPSS has worked with MSSRF in implementing various

projects from 2007 onwards. MSSRF will have its site headquarters in Kakinada, whereas the partner NGO, will have its site office in Machillipattinam. From MSSRF, a Project coordinator will coordinate all the activities and work closely with the PPSS. There will be two research fellows, one will look after mangrove restoration and aquaculture. The other research fellow will take care of community mobilization and organization, as well as training and capacity building. Field assistants will be permanently stationed at Machillipattinam with PPSS, and assist in data collection and field activities. Research Fellows and Field assistants will work with Animators at village level to implement activities (Figure 9).

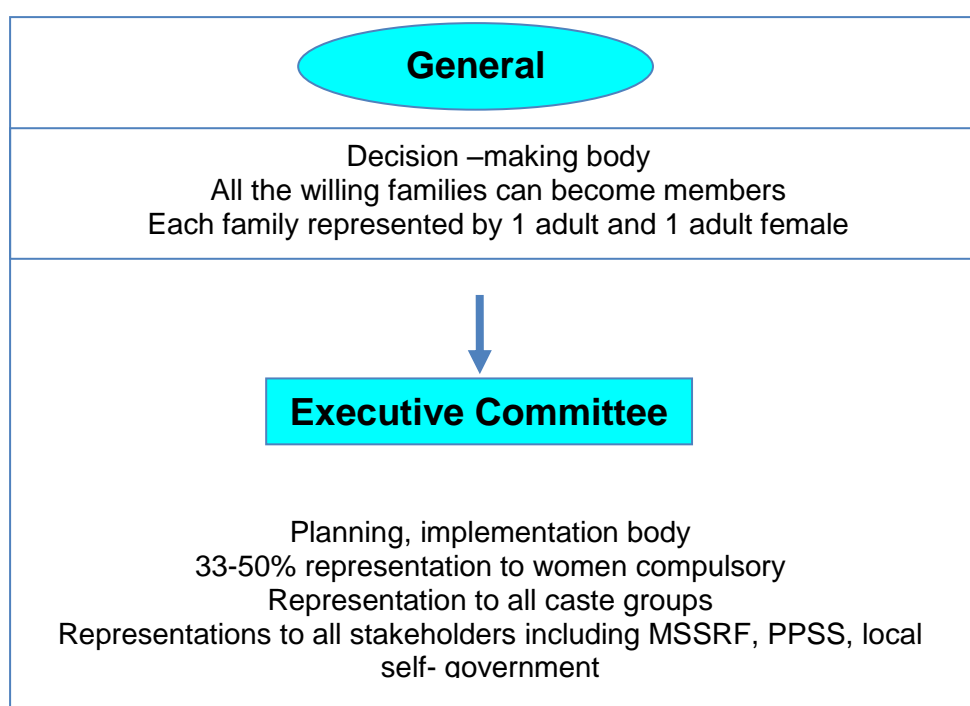
Figure 9: Project Implementation Structure at the Organization Level



Project Implementation structure at Village level

At the village level, project planning, implementation and monitoring will be done with the participation of a gender balanced village level institution (VLI). The VLI in each village will be constituted in a democratic process ensuring its composition with representation from different age groups, caste, class, religion and ethnicity of the villages. Major purpose of these institutions are (i) to provide a platform to participate in planning project interventions, implementing and monitoring (ii) to provide space for women and marginalized communities to participate in decision making and to (iii) create ownership of all project activities implemented in the village. The organizational structure of the VLI is given below (Figure 8). The VLI will have a three-tier structure. The bottom-tier is the General body (GB), comprised of one adult male and female from each willing household in the village. It is the decision making body, which identifies issues to be tackled, solutions, and plan of activities to implement solutions and approves micro plans prepared by the EC. The middle tier is the Executive Committee (EC) that consists of selected representatives from the GB who are well informed, knowledgeable and willing to work for the common cause, and are committed to village development. The EC consists of Office Bearers i.e. President, Vice president, Treasurer, Secretary, Joint secretary. In EC, 50% representation will be given to women. The EC prepares micro plan, which will be implemented after approval by the GB.

Figure 8: Structure of the Village level institution



Job Description for Research Fellows and Field Assistant

Research Fellow 1:

- Bio-physical inventory in mangrove wetlands and degraded wetlands
- Aqua culture in IMFFS ponds
- Monitoring of activities related mangrove restoration, water quality and growth of fishes in IMFFS and cage/pens
- Data collection, analysis and reporting
- Working with VLI in planning, implementation and monitoring

Research Fellow 2:

- Community mobilization: Orientation of the project activities and conducting participatory research in the project villages
- Establishment of Village level institutions and organizing regular meetings with the stakeholders
- Collection of socio-economic data, analysis and compilation
- Organizing training and capacity to stakeholders
- Data collection, analysis and reporting
- Working with VLI in planning, implementation and monitoring

Field Assistant 1:

- Assisting research fellows and VLI in their activities

Research Fellows will submit monthly report to Site Coordinator, who will send quarterly reports to the Programme Director. The Programme Director will send both technical and financial reports as per the required schedule to NABARD.

Animators 3:

- Assisting the research fellows in mobilizing the community, organizing the village level meetings, and in field activities such as restoration of mangroves, IMFFS and cage/pen culture of fishes.

Agreements between MSSRF and PPSS

A Memorandum of Understanding will be signed between MSSRF and Praja Pragathi Seva Sangam (PPSS), to implement the project in the Krishna District of Andhra Pradesh. The following are the roles and responsibilities of MSSRF and PPSS in project implementation.

Roles and responsibilities of MSSRF and PPSS

MSSRF	PPSS	Joint responsibility
Community mobilization and organization		
Analyzing the current status of the coastal resources, environment and their management		<p>Constituting a gender balanced village level institution (VLI) in each village</p> <p>Organizing exposure visits to restored mangroves and IMFFS areas for the community</p> <p>Conducting Vulnerability and Capacity Assessment through Participatory Rural Appraisal</p> <p>Identifying concerns to enhance coping mechanism and adaptive strategies of the community</p>
Restoration of mangrove areas for coastal protection		
<p>Land suitability and topography survey of the degraded area</p> <p>Analyzing issues relating to management of mangroves with different stakeholders using participatory tools and preparing a long term plan</p> <p>Monitoring the growth of mangroves</p>	<p>Raising mangrove nursery</p> <p>Digging canals / de-silting of canals</p> <p>Planting of mangroves/ casualty replacement / watch and ward</p>	
Demonstration of mangrove dependent fishery livelihoods		
Layout and design preparation for IMFFS	Pond preparation Planting mangroves	Monitoring of mangroves and fishes for their growth
Cage and pen layout and fabrication preparation	Releasing of fish juveniles	Harvesting
Capacity building for coastal protection and livelihoods		
<p>Training programmes towards livelihood strengthening activities and adaptive capacities</p> <p>Organizing gender sensitization project to the community</p>		<p>Awareness on predicted sea level rise due to climate change and its implications on coastal resources and livelihoods</p> <p>Training need assessment and identifying target groups</p> <p>Organizing exposure visits for the community to identified best practice areas</p>
Monitoring and Evaluation		
Data analysis and reporting the progress and best practices		<p>Indicators for Monitoring</p> <p>Periodic participatory monitoring</p> <p>Data collection based on indicators</p>

Role of NABARD as NIE:

NABARD will bear full responsibility for the overall management of the project, and will bear all financial, monitoring, and reporting responsibilities to the Adaptation Fund. NABARD would be involved in periodic monitoring (on-site and off-site) of the project. Periodicity and structure of monitoring is given below:

1. On-site detailed round of monitoring would be done on a six monthly basis jointly by NABARD Regional Office (Andhra Pradesh) and Head Office. The frequency of monitoring would be increased if considered necessary
2. District Development Manager i.e. NABARD officer stationed at the district would be a part of the monitoring committee for implementation of the project at local level
3. NABARD would be part of steering committee that would be meet every six months. The committee would deliberate and review the progress of implementation
4. Quarterly report submission formats would be designed for submission by executing entities for desk appraisal of progress. This will be structured as a part of the off-site monitoring surveillance system and would be designed to generate warning signals, if any
5. Progress reporting would be done to AFB each half year or more frequently as per the requirement of AFB
6. NABARD would create a platform for sharing and dissemination of knowledge at the regional and national level.

Role of MSSRF

M. S. Swaminathan Research Foundation is the Executing Entity (EE) and it is responsible for execution of the project as per the proposal at the field level ensuring social inclusion including participation of vulnerable groups and women, gender mainstreaming, partnership with local agencies including district level government departments, local self-government, NGOs and CBOs and execute proposed environmental management practices in mangrove restoration and IMFFS. MSSRF also assume key administrative and operational functions, including: a) development of annual work plans; b) management and supervision of project activities; c) procurement, disbursement, and financial management; d) monitoring and evaluation (e.g., preparation of financial reports and annual implementation reports); and e) ensuring compliance with NABARD's procedures for governance and program implementation.

Funds Flow

At the project level, M.S. Swaminathan Research Foundation (MSSRF) will prepare Annual Work plan and submit the same to NABARD for release of funds. After evaluating progress of implementation and action plan submitted by MSSRF, NABARD would release the fund to the project. At the village level, a detailed annual micro plan will be prepared jointly by the Village Level Institutions (VLIs), Praja Praghathi Seva Sangham (PPSS) and M.S. Swaminathan Research Foundation (MSSRF). The annual micro plan contains details of what activity will be undertaken by whom, timeline for the activities and fund requirement to complete the activities. The micro plan will indicate fund requirements and will be presented to the General Body of the VLI and their concurrence will be obtained before implementation. The GB approved micro plan will be approved by the Programme Director, MSSRF. The funds will be disbursed to VLI and PPSS as per the approved micro plan quarterly. MSSRF is responsible for submitting the Utilization certificate to NABARD. PPSS and the VLI will keep all the records relating to the expenditure such as M book, bills, vouchers and cash book. All the expenditure of MSSRF, PPSS and VLIs will be audited by internal auditors of MSSRF and MSSRF is responsible for proper utilization of funds.

B. Describe the measures for financial and project / programme risk management.

Details on identified risks, the perceived level of those risks, and the planned mitigation measures are presented below:

Identified risk	Perceived level of those risks	Planned mitigation measure
Failure in Community Mobilisation to undertake the activities of mangrove-fishery - inertia against change	Low	<ul style="list-style-type: none">• Exposure visit to successful interventions on same lines.• Entry point activities to gain confidence of the community.• Promotion of Community Ownership through village committees
Not all necessary stakeholders may take part in the process with the capacity and commitment required. Afterwards, there can be resistance from some stakeholders in adopting	Low	The participatory meetings have been used to mitigate these risks. A training programme for community members, community leaders, and civil authorities will raise awareness about locally important issues related to climate change and adaptation would be conducted.

the proposed measures.		
Financial mis-management	Low	<ul style="list-style-type: none"> • Periodic Monitoring – on-site and off-site for verification of expenditures • Social audit through transparency and display of project information on sanction and progress at public places. • Annual project auditing
Slow progress of the work due to climatic unfavourable factors	Low	Work-plan based on the suitability of season for certain works like plantation, earthwork, fingerling rearing would prepared and monitored
Extreme weather events during the project lifetime undermine confidence of local communities in adaptation measures promoted by the project	Medium	The project implementation team at grass roots level and the Village Level Institutions (VLIs) will be sensitized on disaster risk and early warning communication based on the existing early warning system in the project area operated by Government Agencies. This will enable basic preparedness planning. Primary target groups for these efforts are IMFFS fishers and community-based institutions
Limited capacity of partner organisations to deliver project outputs	Low	The project has a strong capacity building and training component. The project will carry out capacity assessments of community institutions (VLIs etc.) during the inception phase and incorporate capacity building where necessary
Failure to create ownership of the project at the local level	Low	Project design has already involved the key stakeholders in problem identification and project design. The project will also ensure that they are involved in implementation and phase out activities to create ownership at the community level and build in sustainability to project interventions

The grant will be deposited in a separate bank account and MSSRF will keep a separate ledger account. This ledger will be structured in line with the approved budget heads. Income and expenditure will be shown separately. The accounts will be maintained in such a manner that the auditor can ascertain that the funds received for the project have been utilized for the approved work plan. MSSRF will establish an internal system of financial monitoring to examine proper use of the fund and MSSRF will appoint an external auditor every year for auditing the accounts and the audited report will be sent to NABARD.

Experience indicates that two major risks are expected: (i) natural disasters such as cyclone and (ii) flooding in the coastal areas, which will affect mangrove plantation; de-silting of canals dug for free tidal flow in the mangrove plantation sites and replacing dead mangrove seedlings are two management activities taken up to manage this risk. Permission for suitable land for restoring mangroves has already been taken from the Revenue Department

for two years. As per the practice in vogue, an extension for two more years is routinely given by Revenue Department provided the agency does good work in the area allotted, benefitting the community. In view of this, project with four years phasing should be considered.

NABARD's role in financial and project risk management is given below:

1. NABARD as part of structured / periodic monitoring would take-up the scrutiny of books of accounts as well as scrutiny of audit and accounting systems of the project fund at Executing Entity level. Release of fund would be based on the scrutiny of accounts and utilization of funds, progress of implementation and action plan submitted by MSSRF.
2. Risk parameters identified would be specifically monitored during the field visits as well through reporting mechanism by NABARD. Monitoring objectives will also include identification of project bottlenecks and risks as early as possible to address them.
3. NABARD has a Regional Office at the state capital, Hyderabad and also has posted an officer, called the District Development Manager (DDM the project district. NABARD has already earmarked two officers at the Regional Office level, designated as the nodal officers and trained them for implementation of CC adaptation projects. NABARD officials/teams at district and state level would be involved in project guidance, steering, monitoring, auditing, co-ordination with State, District officials for resolving any bottlenecks in project implementation
4. Officers from NABARD Head Office will also visit the project at intervals for addressing risks, if any.

C. Describe the measures for environmental and social risk management, in line with the Environmental and Social Policy of the Adaptation Fund.

Even though the project is classified as "Category C" project and is not envisaged to pose any risks indicated under Environmental and Social Policy of Fund any risks that may arise during the project implementation would be mitigated as indicated below:

- Project implementation teams would be sensitized on these aspects
- Project Advisory Committee would specifically review issues related to social and environmental risk during its period meetings
- NABARD Regional and Head Office would identify specific risks that may arise during implementation based on the monitoring of project and built in reporting mechanism for the same

- Social audit that would be put in place would also help in mitigation of some of risk enlisted under Environmental and Social Policy of the Fund. Community would be sensitized on contents under Environmental and Social Policy of the Fund.

In order to ensure that executing entity is fully aware of their responsibilities with regards to provision of the Environmental & Social Policy of Adaptation Fund, NABARD would take-up following steps. Steps would also be taken to ensure that the direct beneficiaries would be made aware of the grievance and complaint mechanism. The mechanism would ensure that the grievances are received and addressed in a transparent manner:

- Initial orientation during the inception of the project about the systems and procedures related to environmental and social policy and grievance mechanism.
- Providing guidelines and orientation on the Environmental and Social Policy of the Adaptation Fund to the project team through separate workshop.
- Grievance mechanism would be informed to community during the project inception workshop. The same would include mechanism available in the country and of the complaint handling mechanism of the Fund.
- Implementing Entity Co-ordinator and contact person would handle complaints received related to violation of any of the provisions of Environmental and Social Policy of the Adaptation Fund.
- As part of grievance mechanism, communication details of implementation entity co-ordinator and contact person would be available to direct beneficiaries as well as community at large through display of project information boards placed at prominent common places within the project area.

D. Describe the monitoring and evaluation arrangements and provide a budgeted M&E plan.

Based on the result framework presented below a monitoring and evaluation system will be prepared. Based on the baseline done at the time of PRA bench-mark for each of the proposed interventions would be firmed up. The system will encompass a clear data collection and compilation plans for monitoring qualitative as well as quantitative results indicators using appropriate methods and tools. Data will be collected periodically at specified intervals and analyzed to track the progress. The details on the reporting and monitoring mechanism are given below.

Inspection and annual workshop:

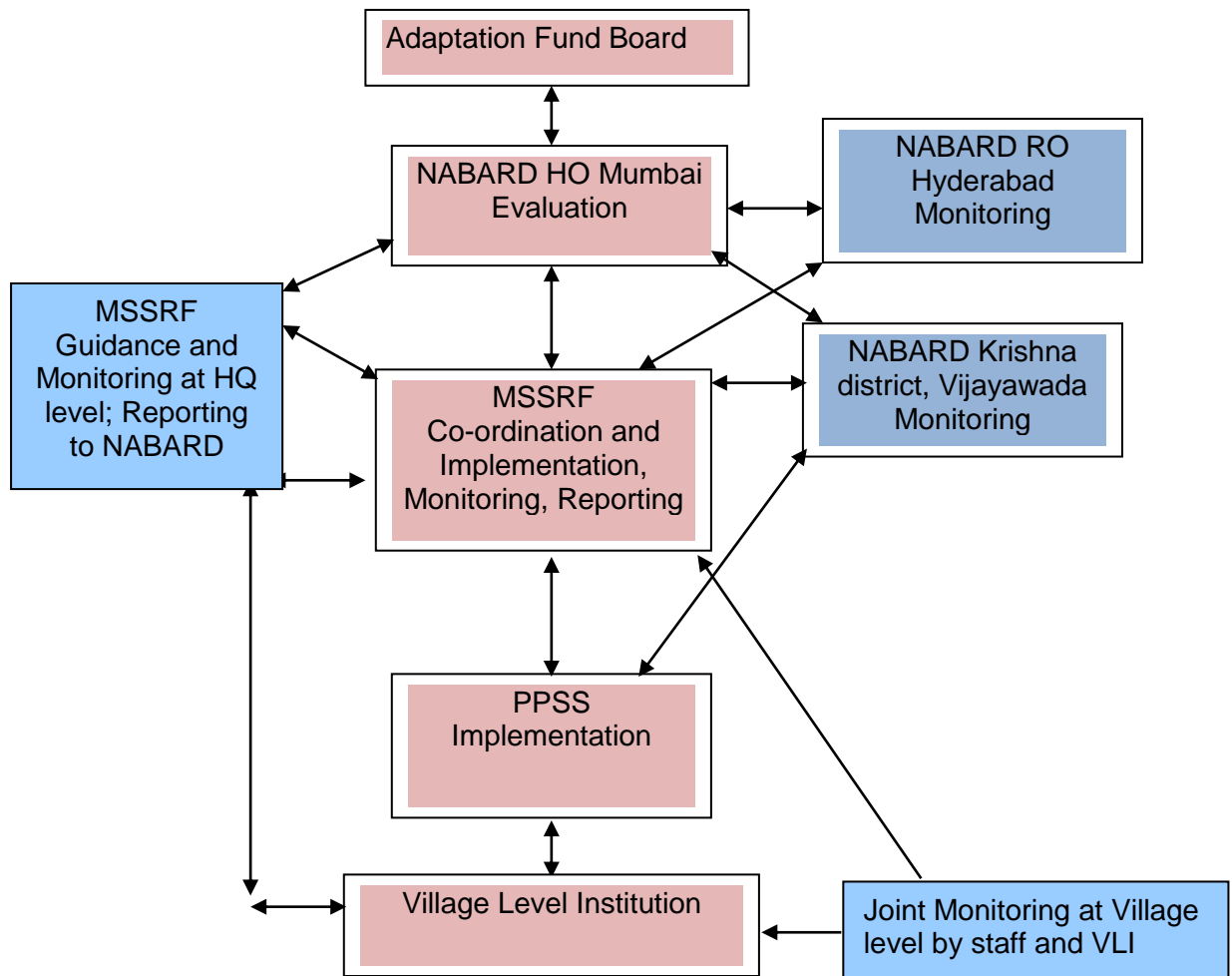
An **Inception workshop** will be held within the first two months of project implementation to:

- introduce the project team
- orientate key stakeholders on the objectives and results framework
- provide an update on the project start up activities
- agree roles and responsibilities of each institution
- provide an overview of reporting, monitoring and evaluation requirements
- present the financial reporting procedures and arrangements for audits
- plan and schedule Steering Committee meetings
- recheck assumptions and risks, and
- to plan project implementation

The Project Co-ordinator, MSSRF will prepare and disseminate the inception report with an overall work plan and budget for the four year period as well as a detailed work plan and budget for year one with milestones and progress indicators to guide implementation during the first year of the project. The Inception Report will also include a more detailed narrative on the institutional roles, responsibilities, coordinating actions and feedback mechanisms of project related partners.

Three Tier System of Monitoring: A three-tier system will be followed to review the progress and reflect critically to ensure efficiency and effectiveness of the project interventions. At the village level, participatory monitoring will be done by the community and the implementation staff of the project. At the district level, the project coordinator, MSSRF and NABARD official of Krishna district will monitor the project activities. At state level, the Programme Director, MSSRF will monitor and review the work with the project coordinator (Figure 10). Participation of community representatives will be encouraged both at district and state level monitoring meeting to share their views and inputs. At all levels monitoring will ensure that the activities planned are completed and the results are achieved).

Figure 10: Monitoring Structure



1. Quarterly Progress Monitoring: In case of variation decisions to improve the performance will be made in the quarterly meetings by analyzing the results. Monitoring reports will be prepared based on the analyses and will incorporate the challenges and internal and external difficulties encountered during implementation of activities and in monitoring process. Strategies to overcome the challenges and difficulties to be evolved during the review meetings at each level. The reports will be shared with different stakeholders for various uses. The programme director will attend the quarterly meeting to be aware of the trends and also to ensure the quality of analysis done in the meetings.

2. Quarterly Progress Reports will also be prepared by the Site Coordinator and submitted to the Programme Director to ensure continuous monitoring of project activities and to allow for corrective measures in due time. These reports will provide an update on progress on the delivery of outputs, a quarterly expenditure report and a work plan for the next quarter. Where a six-monthly report is being prepared, it shall subsume the quarterly

report (i.e. there will not be double reporting at the six monthly stage). A copy of the report will be given to the village level organization for their records.

3. Six monthly Progress Reports will describe progress on implementation as well as lesson learning, a risk update and management and an ongoing assessment of sustainability and acceptance of project interventions by the stakeholders particularly the beneficiaries. The report will also include the expenditure report and a workplan and budget for the following reporting period. The bi-annual progress reports will be submitted to the Programme Advisory Committee for regular review and approval.

4. Midterm review with both internal and external evaluators will be conducted and an **impact** evaluation will be done after the project period as the nature of interventions demands a long period to realize its fullest impact. A comprehensive external Mid-Term Evaluation will be conducted mid-way through project implementation. The evaluation will review progress against milestones and assess progress made towards the delivery of outputs and achievement of objectives as well as identify corrective actions if needed. It will focus on the effectiveness of delivery, timelines and efficiency of implementation, and risk management. It will present the initial lessons of project design, implementation and management. The findings will be used to enhance implementation during the final half of the project's term.

5. A Final Evaluation will be conducted 3 months before project closure and will focus on the impact and sustainability of project results. The report will summarize the results achieved (objectives, outcomes, outputs), lessons learned, and make **recommendations** on any actions needed to ensure sustainability, replicability and scaling up.

6. Results and lessons learned from the project will be periodically disseminated within and **beyond** the project intervention zone using a variety of media (briefing notes, website as well as through existing information sharing networks and forums).

Budget for M & E Plan:

Monitoring and evaluation plan Activity	Responsible person	Yr. I	Yr. II	Yr. III	Yr. IV	Total \$	Timeframe
Inception workshops	Project Director	1,250				1,250	Within 2 months of project starting and yearly thereafter
Inception report	Project Director					part of execution cost	Within 2 months of project starting
Impact Assessment (beginning of 2nd and 4th year) during the other years the mid-term and terminal report will include impact study	Programme Director, MSSRF		833		833	1,667	Annual
Bi-annual Progress Reports	Programme Director, MSSRF					part of execution cost	6 monthly
Quarterly Progress Reports	Programme Director and Project Co-ordinator					part of execution cost	Quarterly
Participatory Monitoring and Evaluation by beneficiaries	Programme Director					part of execution cost	Quarterly
Annual field visits by representatives of Programme Advisory Committee	Programme Director					Part of execution Cost	Annual
Minutes of Advisory Committee Meet	Programme Director					part of execution cost	Quarterly
Mid-term Evaluation	External consultant			3,333		3,333	Mid term
Final evaluation	External consultant				5,000	5,000	3 months before end of project
Audits	External auditor	100	100	100	100	400	Every Year
		1,350	933	3,433	5,933	11,650	

Reporting Mechanism

- The executing entity, MSSRF will collect the data, analyse and submit reports to NABARD, the Implementing Entity
- Project Inception Report : during the start of the project
- Annual report on Project Performance Report (PPR)
- Annual Audited financial statement
- Apart from the above reports the monitoring reports will be compiled on half yearly basis
- NABARD would update the progress of implementation to AFB as per the instruction of Fund Board and sanction terms and conditions.

E. Include a results framework for the project proposal, including milestones, targets and indicators.

Outcome/Output	Indicator	Baseline	Target	Source of Verification	Risks and Assumptions
Component 1: Community mobilization and organization					
Outcome 1: Improved community organization to undertake climate change adaptation measures	Number of men and women in 3 villages trained in participatory approaches and micro planning and implementing project activities Number of stakeholders participating in the VLI meetings, planning and implementation of activities	Very limited awareness about climate change and its impacts and possible adaptive measures to reduce vulnerability in the project villages	At least 60% people (of which nearly 50% of women) living in the project villages directly benefited from reduced vulnerability to climate change related impacts	Minutes books of the VLI Micro plans prepared by the VLIs	Assumptions: Women are able to participate freely in the project activities within the villages Risks: Traditional values and governing structures restrict the participation of women
Output 1.1: Gender balanced village level institutions formed in Sorlagondi, Nali and Basavanipalem villages	Frequency of VLI meetings organized with quorum	No VLI institutions in place	3 gender balanced VLI institutions for 3 participating villages	Minutes of meeting and membership numbers	Each village is willing to participate
Output 1.2: 1,500 people oriented to CC, SLR and adaptive capacity concepts and measures involving mangroves	Number of orientation meetings organized in the three villages	No orientation to CC, SLR and adaptive capacity	1,500 people including 50% women	Proceedings of the orientation meetings	People will be interested to learn about CC, SLR and adaptive capacity
Output 1.3: Annual micro plans prepared for optimal utilization of resources	Number of micro plans with detailed activities	No micro plan is available	12 micro plans (3 annual micro plans for each village for 4 years)	Micro plan document	All stakeholders will participate and contribute in the preparation of plans
Component 2: Capacity building for coastal protection and livelihoods					
Outcome 2: Trained	Number of women, men and	0 trained community	At least 50%	Training	Assumptions:

stakeholders on coastal protection and livelihoods	<p>youth trained on mangrove restoration technique</p> <p>Number of women, men and youth trained in designing and establishing IMFFS farms</p> <p>Number of members of local self-government, government institutions and local NGOs trained on mangrove restoration and IMFFS establishment</p>	<p>members in mangrove restoration and IMFFS in 2 villages (Nali and Basavanipalayam)</p> <p>5% of the stakeholder groups know mangrove restoration techniques</p>	<p>marginalized and vulnerable members of the community and youth trained</p> <p>At least 20% members of stakeholder organizations working in coastal resource management and improving adaptive capacity of community to climate change in the project region trained</p>	<p>documents including visuals and reports</p> <p>Surveys and interviews</p>	<p>Stakeholders willing to learn</p> <p>Risks: Traditional values and governing structures restrict the participation of women</p>
Output 2.1: 200 stakeholders trained on mangrove restoration	Number of training programmes organized with equal women and men trainees	<p>0 community members trained in mangrove restoration</p> <p>10% field staff of the Forest Department trained in mangrove restoration</p>	<p>At least 120 women, men and youth of community members of the VLI in three villages trained in mangrove restoration</p> <p>At 60 representatives of local NGOs and local self-government trained</p> <p>At least 20 field staff of the Forest and Fisheries Department trained</p>	<p>Training reports and visuals</p> <p>Survey and Interviews</p>	Stakeholder organizations will nominate suitable trainees
Output 2.2: 50 farmers trained in IMFSS	Number of training organized with equal women and men trainees	0 trained farmers on IMFFS	50 farmers including at least 20 women trained in IMFFS	Training report and visuals	Farmers will be willing to adapt IMFFS practices
Component 3: Restoration of mangrove areas for coastal protection					
Outcome 3:	VLI plan for mangrove	0 community plan is	200 ha of degraded	Remote sensing	Assumptions:

Restored and healthy mangrove replanted area, contributing to protection of coastal erosion and sea - level rise	restoration and protection in each of 3 villages Mangrove restored with 300,000 mangrove saplings Conditions of mangrove plantation: 80% survival of planted saplings and growth rate.	available for mangrove management 800 ha of degraded mangroves present nearby project villages	mangrove restored by the village level institutions through community planning with about 300,000 mangrove saplings	imageries including Google maps Community monitoring report	Healthy planting materials available at the time of planting Risks: Unforeseen extreme climatic events such as floods and cyclonic storms
Output 3.1: Replanted mangrove area close to 3 villages for future coastal protection	Area of mangrove restored with multispecies of mangroves	800 ha of degraded mangrove near project villages	200 ha of degraded mangroves restored	Remote sensing imageries Field survey	Sufficient labour available for land preparation
Output 3.2: Established central mangrove nursery serving 3 villages	Number of saplings of different mangrove species raised	No nursery present	One centralized nursery	Field visit and visuals	Suitable land available for nursery establishment
Component 4: Demonstration of Integrated mangrove based fishery livelihood					
Outcome 4: Demonstrated fishery related sustainable livelihoods integrated with mangroves	VLI plan for IMFFS establishment and management Reduction in input costs of shrimp and fish farming compared to conventional aqua farms	100 ha abandoned shrimp farms present near project villages	IMFFS established in 50 ha in abandoned shrimp farms by participating farmers with a minimum of 600 mangroves plants per ha 300 kilograms of prawn per year per ha of IMFFS	Remote sensing imageries including Google maps Monitoring report	Assumptions: Farmers in the area cooperate to develop IMFFS Risks: Unforeseen market price fluctuation
Output 4.1: Two models of IMFFS	Number of IMFFS ponds	No IMFFS farm	50 ha abandoned shrimp developed into IMFFS	Remote sensing imageries	Stakeholders will extend cooperation

demonstrated with the participation of local community and stakeholders			farm	including Google maps Monitoring reports	
Output 4.2: Two culture of fish or prawn or both undertaken in the IMFFS farms per year	Number of culture by IMFFS farmers	No culture in IMFFS farms	100 culture in 50 ha of IMFFS farms in a year	Operational records of the IMFFS farm Sales records Monitoring reports	Healthy seeds available for culture
Output 4.3: Cage and pen culture established for culture of crabs, fish, clams and cockles	Number of cages and pens established for culture of fishes	No cage / penculture in the project villages	Large extent of suitable water bodies for cage and pen culture	Field visit Visuals Monitoring report	Assumptions: Canal fishing fishermen accepting cage and pen culture for the poor people Risks: Unforeseen extreme climatic events such as floods and cyclonic storms
Component 5: Knowledge Management for Improved Coastal Protection					
Outcome 5: Prepared and published material on ways to up-scale coastal protection and livelihood systems in mangrove areas	Awareness materials on CC, SLR, Vulnerability and Adaptive capacity prepared in local language and distributed to community and other stakeholders	0 awareness materials available	4 awareness materials – brochures and pamphlets on CC, Vulnerability and Adaptive capacity, Mangroves and IMFFS prepared	Printed awareness materials Workshop proceedings and	Assumptions: All material is high quality, and accessible to

	<p>Number of meetings and workshops held</p> <p>Number of brochures and phamlets prepared and distributed</p>		<p>One workshop for district level stakeholders organised</p> <p>One National level workshop organized</p>	<p>reports</p> <p>Visuals</p>	<p>stakeholders. Attendance at organized meetings, etc. is high</p> <p><i>Risks:___Inadequate participation</i></p>
<p>Output 5.1: Resource materials prepared for dissemination among various stakeholders</p>	<p>No of phamphlets distributed to various stakeholders</p>	<p>No pamphlets available</p>	<p>Awareness materials (2,000 each) prepared</p>	<p>Awareness materials</p>	
<p>Output 5.2: Stakeholders brought together and knowledge on CC, SLR, Vulnerability and measures to improve adaptive capacity shared</p>	<p>Number of workshops organised</p> <p>Number of stakeholders participated</p>	<p>0 workshops organised on CC., SLR and vulnerability to CC adaptive capacity</p>	<p>2 workshops, one at district level and the other at national level organised</p>	<p>Workshop proceedings and reports</p> <p>Visuals</p>	

F. Demonstrate how the project / programme aligns with the Results Framework of the Adaptation Fund

Project Objective(s)¹	Project Objective Indicator(s)	Fund Outcome	Fund Outcome Indicator	Grant Amount \$
To enhance adaptive capacities of the local community and other stakeholders by strengthening their institutional mechanism, restoration and management of coastal resources and building livelihood assets	Joint Action Plans by local community and other stakeholder groups to restore degraded mangroves and to protect existing mangroves to avoid further degradation and to diversify livelihoods through Integrated mangrove fishery system	Outcome 5: Increased ecosystem resilience in response to climate change and variability-induced stress	5.Ecosystem services and natural assets maintained or improved under climate change and variability-induced stress	106,950
		Outcome 6: Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted areas	6.2 Percentage of targeted population with sustained climate resilient livelihood	386,600
Project Outcome(s)	Project Outcome Indicator(s)	Fund Output	Fund Output Indicator	
Improved community organization to undertake climate change adaptation measures	Number of men and women in 3 villages trained in participatory approaches and micro planning and implementing project activities	Output 3 Target population groups participating in adaptation enhancing and risk reduction activities	3.1.1 Number and type of risk reduction actions or strategies introduced at local level	13,333
	Number of stakeholders participating in the VLI meetings, planning and implementation of activities			
Trained stakeholders on coastal protection and livelihoods	Number of women, men and youth trained on mangrove restoration technique	Output 3 Target population groups participating in adaptation enhancing and risk reduction activities	3.1.1 Number and type of risk reduction actions or strategies introduced at local level	15,000
	Number of women, men and youth trained in designing and establishing IMFFS farms			

¹ The AF utilized OECD/DAC terminology for its results framework. Project proponents may use different terminology but the overall principle should still apply

	Number of members of local self-government, government institutions and local NGOs trained on mangrove restoration and IMFFS establishment			
Restored and healthy mangrove replanted area, contributing to protection of coastal erosion and sea-level rise	Area of mangrove restored and managed by the village level institutions Area of non-degraded mangroves brought under the management of Village level institutions to avoid degradation in the future	Output 5 Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	5.1. No. and type of natural resource assets created, maintained or improved to withstand conditions resulting from climate variability and change (by type of assets)	106,950
Demonstrated fishery related sustainable livelihoods integrated with mangroves	Area of farming system developed to integrated mangrove plantation and fish culture Number of cage/pens established for culturing crabs, fish, clams and cockles	Output 6: Targeted individual and community livelihood strategies strengthened in relation to climate change impacts, including variability	6.1.1.No. and type of adaptation assets (physical as well as knowledge) created in support of individual- or community-livelihood strategies	386,600
Prepared and published material on ways to up-scale coastal protection and livelihood systems in mangrove areas	Number of men and women and stakeholder groups with enhanced knowledge and capacity to undertake climate change adaptation measures	Output 3: Targeted population groups participating in adaptation and risk reduction awareness activities	3.1.1 No. and type of risk reduction actions or strategies introduced at local level	53,334

Alignment with Adaptation Fund Core Indicators

Impact	Indicator
<p><i>Increased adaptive capacity of communities to respond to the impacts of climate change</i></p>	<p>Number of beneficiaries (direct and indirect)</p> <p>Direct Beneficiaries</p> <ul style="list-style-type: none"> • At least 750 men and 750 women oriented to CC, SLR and adaptive capacity concepts and measures • At least 120 community members of trained in mangrove restoration. At least 60 representatives of local NGOs and local self-government and 20 field staff of the Forest and Fisheries department trained in mangrove restoration • At least 30 men and 20 women farmers trained in IMFFS • Awareness materials on CC, SLR and adaptive capacity concepts and measures distributed to at least 1500 members living in the project area
	<p>Increased income, or avoided decrease in income</p> <p>Direct Beneficiaries</p> <ul style="list-style-type: none"> • At least 1150 men and 1150 women (60% the population) getting employment in mangrove restoration and IMFFS works • Increased fish catch in the mangrove restored area benefiting at least 10% (Total = 12.7%) of the poor landless community • 50 farmers getting income through IMFFS • Income of at least 100 members of the landless community increased through cage

	culture
<p><i>Increased ecosystem resilience in response to climate change-induced stresses</i></p>	<p>Natural habitats protected or rehabilitated</p> <p>Direct Benefits</p> <ul style="list-style-type: none"> • About 200 ha of degraded mangrove are restored by planting 300,000 mangrove saplings • At least 10 villages get protection from the cyclonic storms and other climate change related vulnerabilities • Increase in the availability of crabs and other fishery resources in the restored area <p>Indirect benefits</p> <ul style="list-style-type: none"> • Increase in forest cover to reduce the impact of desertification • Restored mangroves act as Carbon sink

G. Include a detailed budget with budget notes, a budget on the Implementing Entity management fee use, and an explanation and a breakdown of the execution costs.

Component	Activity	Year 1	Year 2	Year 3	Year 4	Total (\$)
Component 1 Community mobilization and organization	Output 1.1: Gender balanced village level institutions formed in Sorlagondi, Nali and Basavanipalem villages					
	Activity 1.1.1 Organizing project orientation meetings to community	500	-	-	-	500
	Activity 1.1.2 Sensitizing the community on gender	500	-	-	-	500
	Activity 1.1.3 Organizing exposure visits	500	-	-	-	500
	Activity 1.1.4 Conducting Participatory Rural Appraisal (PRA)	4,500	-	-	-	4,500
	Activity 1.1.5 Forming village level institution	500	-	-	-	500
	Activity 1.1.6 Implementing entry point activities	4,000	-	-	-	4,000
	Output 1.2: 1,500 people oriented to CC, SLR and adaptive capacity concepts and measures involving mangroves					
	Activity 1.2.1 Organizing orientation meetings on CC, SLR and adaptive capacity	1,833	-	-	-	1,833
	Output 1.3: Annual micro plans prepared for optimal utilization of resources					
	Activity 1.3.1 Preparing annual micro plan:	500	-	-	-	500
	Activity 1.3.2 Implementing micro plan and monitoring	500	-	-	-	500
	Total : Component 1		13,333	-	-	-
Component 2.0 Capacity building for coastal protection and livelihoods	Output 2.1: 200 stakeholders trained on mangrove restoration					
	Activity 2.1.1 Selecting trainees	-	-	-	-	-
	Activity 2.1.2 Organizing training on mangrove restoration techniques to VLI members	2,500	-	1,500	-	4,000
	Activity 2.1.3 Organizing training on mangrove restoration to NGOs and Self government	1,250	-	1,000	-	2,250
	Activity 2.1.4 Organizing training on mangrove restoration to Government officials	1,250	-	833	-	2,083

	Output 2.2 : 50 farmers trained in IMFFS					
	Activity 2.2.1 Selecting aqua farmers for training	-	-	-	-	-
	Activity 2.2.2 Organizing training on IMFFS		3,333.5	-	3,333.5	6,667
	Total : Component 2	5,000	3,333.5	3,333	3,333.5	15,000
Component 3 Restoration of mangrove areas for coastal protection	Output 3.1: Replanted mangrove area close to 3 villages for future coastal protection					
	Activity 3.1.3 Conducting biophysical inventory	-	-	-	-	-
	Activity 3.1.4 Preparing degraded mangroves for restoration	37,916.5	37,916.5	-	-	75,833
	Activity 3.1.5 Planting mangrove saplings	3,333.5	3,333.5	-	-	6,667
	Activity 3.1.6 Monitoring and after care	1,000	3,167	6,957	4,793	16,916
	Output 3.2: Established central mangrove nursery serving 3 villages					
	Activity 3.2.1 Identifying land for mangrove nursery	-	-	-	-	-
	Activity 3.2.2 Establishing mangrove nursery	5,333	3,200	-	-	8,533
	Total : Component 3	47,583	47,617	6,957	4,792	106,950
Component 4 Demonstration of Integrated mangrove based fishery livelihoods	Output 4.1: Two models of IMFFS demonstrated with the participation of local community and stakeholders					
	Activity 4.1.1 Identifying farmers and aqua farms for demonstration	-	-	-	-	-
	Activity 4.1.2 Constructing two types of IMFFS farms					
	Pond preparation	130,000	130,000	-	-	260,000
	Construction of sluice gates	14,583	14,583	-	-	29,167
	Activity 4.1.3 Raising mangrove plantation in the IMFFS farms	867	867	217	217	2,168
	Output 4.2: Two culture of fish or prawn or both, undertaken in the IMFFS farms per year					
	Activity 4.2.1 Deciding on culture organism	-	-	-	-	-
	Activity 4.2.2 Stocking of fishes/shrimps/crabs	4,166.5	4,166.5	-	-	8,333
	Activity 4.2.3 Monitoring of IMFFS ponds	1,800	1,800	-	-	3,600
Activity 4.2.4 Harvesting and cost benefit analysis	-	-	-	-	-	

	Output 4.3: Cage and pen culture established for crabs, fish, clams and cockles					
	Activity 4.3.1 Selecting participating families	-	-	-	-	-
	Activity 4.3.2 Construction of cages and pens	58,333	-	-	-	58,333
	Activity 4.3.3 Stocking of fish crab juveniles	-	5,000	5,000	5,000	15,000
	Activity 4.3.4 Monitoring survival and growth performance of fish and crab					
	Feed cost	-	3,333.3	3,333.3	3,333.4	10,000
	Activity 4.3.5 Harvesting and cost benefit analysis	-	-	-	-	-
	Total : Component 4	209,749.5	159,749.8	8,550.3	8,550.4	386,600
Component 5 Knowledge Management for Improved Coastal Protection	Output 5.1: Resource materials prepared for dissemination among various stakeholders					
	Activity 5.1.1 Preparation of resource materials in local language	6,667	-	-	-	6,667
	Preparation of Brochure and Pamphlets	-	1,667	1,667	1,666	5,000
	Activity 5.1.2 Dissemination of resource materials	-	-	-	-	-
	Output 5.2: Stakeholders brought together and knowledge on CC, SLR, vulnerability and measures to improve adaptive capacity shared					
	Activity 5.2.1 Documenting processes	-	5,000	-	-	5,000
	Monitoring of Project activities along with community	1,667	1,667	1,667	1,666	6,667
	Activity 5.2.2 Documenting best practices	-	-	2,500	2,500	5,000
	Activity 5.2.3 Organizing workshop at district level	-	-	8,333	-	8,333
	Activity 5.2.4 Organizing workshop at national level	-	-	-	16,667	16,667
	Total : Component 5	8,334	8,334	14,167	22,500	53,334
Total : (Component 1,2,3,4 & 5)	283,999.5	219,034.3	33,007.3	39,175.9	575,217	
Project/Programme Execution cost	Project Execution cost					
	Research fellows 2 nos.	8,000	8,000	8,000	8,000	32,000
	Field Asst. - 1 no	2,000	2,000	2,000	2,000	8,000

	Travel	700	700	700	700	2,800
	Contingency and other office expenses	1,400	1,400	1,400	1,400	5,600
	Monitoring and Evaluation	1,350	933	3,433	5,933	11,650
	Total for Execution Cost	13,450	13,033	15,533	18,033	60,050
	Total Project / Programme Cost	297,449.5	232,067.3	48,540.3	57,208.9	635,266
	NIE Management Fee	25,283	19,726	4,126	4,863	53,998
	Amount of Financing Requested from AFB	322,732.5	251,793.3	52,666.3	62,071.9	689,264

H. Include a disbursement schedule with time-bound milestones.

S.No	Major Activity	Time line
1	Community mobilization and organization	0-6 months
2	Participatory Rural Appraisal	0-6 months
3	Implementing entry point activities	0-6 months
4	Identification and demarcation of site for mangroves and IMFFS	0-6 months
5	Restoration of mangrove areas for coastal protection	7-24 months
8	Land preparation and development of integrated mangrove fishery farming system (IMFFS) and cage and pen culture for fish culture	7-24 months
9	Planting of mangroves and halophytes in the IMFFS farm and participatory monitoring	7-24 months
10	Fish culture in the IMFFS farm, in cages and pens and participatory monitoring	18 – 42 months
11	Capacity building and training programmes	3- 42 months
12	Programme Management activities including reporting	3 – 50 months
13	Mid-term monitoring by stakeholder's team	24 months
14	Final evaluation	45 months

The details on timeline is given in the Annexure 2

Disbursement schedule in \$


	Upon Agreement signature	One Year after Project Start ^a	Year 2 ^{b/}	Year 3	Year 4 ^{c/}	Total
Scheduled Date	October 2014					
Project Funds	148,725	148,725	232,066	48,541	57,209	635,266
Implementing Entity Fee	12,642	12,642	19,726	4,126	4,863	53,998
Total	161,366	161,366	251,792	52,667	62,072	689,264

PART IV: ENDORSEMENT BY GOVERNMENT AND CERTIFICATION BY THE IMPLEMENTING ENTITY

- A. Record of endorsement on behalf of the government** *Provide the name and position of the government official and indicate date of endorsement. If this is a regional project/programme, list the endorsing officials all the participating countries. The endorsement letter(s) should be attached as an annex to the project/programme proposal. Please attach the endorsement letter(s) with this template; add as many participating governments if a regional project/programme:*

<i>Ravi Shankar Prasad, IAS, Joint Secretary, Ministry of Environment and Forest (MoEF), Government of India</i>	Date: 14 August 2014
--	----------------------

- B. Implementing Entity certification** *Provide the name and signature of the Implementing Entity Coordinator and the date of signature. Provide also the project/programme contact person's name, telephone number and email address*

I certify that this proposal has been prepared in accordance with guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans (National Action Plan on Climate Change) and subject to the approval by the Adaptation Fund Board, <u>commit to implementing the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund</u> and on the understanding that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.	
 (Dr. R. M. Kummur) Chief General Manager NABARD, Head Office, Mumbai (Implementing Entity Co-ordinator)	
Date: September, 01, 2014	Tel. and email: +91 22 2653 0083, +91 7738175446 rm.kummur@nabard.org
Project Contact Person: Dr. P. Radhakrishnan, General Manager, NABARD, Head Office, Mumbai	
Tel. and Email: +91 22 2653 9384, +91 9167499397 p.radhakrishnan@nabard.org , climate.change@nabard.org	

Annexure 1
Budget Notes Details

Budget Note	Item / Particulars	Total \$	Details
	Community mobilization and organization		
1	Stakeholder mobilization and organization	3,333	@ \$1,111 per village for 3 villages.
2	PRA in the coastal villages and Baseline document	5,000	For 5 days in 3 villages @ \$ 833 per village Baseline @\$ 833 per village
3	Entry point activities for 3 villages	5,000	Drudgery reduction and other critical works prioritized by the community @ \$ 1,667 per village for 3 villages.
	Capacity building for coastal protection and livelihoods		
4	Meetings/workshops/capacity building	15,000	Specific training on mangrove restoration for 200 members and IMFFS for 50 farmers spread over YI and YII and two routine trainings in YIII & Y IV.
	Restoration of mangrove areas for coastal protection		
5	Canal digging in 100 ha each in year I and II	75,833	Digging of 650 cum /ha @ \$ 0.58/cum in 100 ha (Main canal Top width 2.5 m bottom width 1m and side slope 1:1.5, side canal Top width 2 m bottom width 0.5 m and side slope 1:1.5). Total coverage 200 ha in two years.
6	Mangrove Nursery development for planting in 100 ha	8,533	Nursery rearing \$ 0.03 /plantlet for 160,000 plants /100 ha. Total coverage 200 ha in two years.
7	Planting of mangrove saplings	6,667	\$ 0.02 per plant for 160000 plants/100 ha. Total coverage 200 ha in two years.
8	Causality replacement	4,333	25% replacement in second and third years
9	Desilting of canals	7,583	10% of canal digging cost
10	Watch and ward	4,000	2 persons for 6 months @ \$ 60/ month for four years. Watch & ward provided only during peak agri. months and it is assumed that the villagers will take care during lean season
	Demonstration of mangrove dependent fishery livelihood		
	Demonstration of Integrated Mangrove and Fishery Farming Systems		
11	Pond preparation in 50 ha	260,000	# as per the calculations given below
12	Construction of sluice gates	29,167	@ \$ 583 per ha
13	Planting of	2,167	@ \$ 0.05 per plant for planting 640 plants in

Budget Note	Item / Particulars	Total \$	Details
	mangroves		one ha in 25 ha each in Y I & YII and 25% replacement allowance in Y III & Y IV. Total coverage 50 ha
14	Release of fishes and shrimps	8,333	\$ 0.017 per seed for 10000 seeds /ha for 50 ha.
15	Watch and ward	3,600	2 persons for 6 months @ \$ 75/ month for four years. Watch & ward provided only during peak agri. months and it is assumed that the villagers will take care during lean season
Cage and pen Culture of crabs, fish, clams and cockles			
16	Cage and pen construction for fish culture	58,333	10 cages established @ \$ 5833.3 in the first year
17	Release of fishes, crabs	15,000	@ \$ 500 for fingerlings / year / cage or pen
18	Feed and Maintenance	10,000	@ \$ 333.3 for feed and maintenance of cages or pen/year
	Knowledge Management		
19	Knowledge Management for Improved Coastal Protection	53,333	Details provided separately below the table.
Project Execution cost			
20	Research fellows 2 nos.	32,000	\$ 333/ month for 2 persons (One with fishery back ground to look after the mangroves and IMFFS and the other with social science background to mobilise the community)
21	Field Assistance - 1 no	8,000	One field assistant to help the project execution and data collection @ \$ 167 per month
22	Travel	2800	\$ 58 per month
20	Contingency and site office expenses	5,600	\$ 117 per month
23	Monitoring and Evaluation	11,650	See the description below the table
	Sub-total for Execution Cost	60,050	9.45 % of total project cost
	Total Project Cost	635,266	
24	NIE cost	53,998	8.5 % of amount of financing requested
	Amount of Financing Requested	689,264	

Details on Knowledge Management for Improved Coastal Protection Component:

(Amount: US\$)

Activity	Total	Year 1	Year 2	Year 3	Year 4
I. Preparation of resource materials in local language to increase awareness about climate change and adaptation	6,667	6,667	0	0	0
II. Participatory Monitoring of the project activities along with the community	6,667	1,667	1,667	1,667	1,667
III. Documenting best practices of adaptation to climate changes for dissemination	5,000			2,500	2,500
IV. Process documentation – field implementation book, field guide	5,000		5,000	0	0
V. National Seminar and Workshops (1 each)	25,000			8,333	16,667
VI. Brochure and pamphlets	5,000		1,667	1,667	1,667
Total	53,333	8,333	8,333	14,167	22,500

Monitoring and Evaluation Budget Details:

(Amount: US\$)

Monitoring and evaluation plan Activity	Responsible person	Yr. I	Yr. II	Yr. III	Yr. IV	Total	Timeframe
Inception workshops	Programme Director	1,250				1,250	Within 2 months of project starting and yearly thereafter
Inception report	Programme Director					none	Within 2 months of project starting
Impact Assessment (beginning of 2nd and 4th year) during the other years the mid-term	Programme Director		833		833	1,667	Annual

and terminal report will include impact study							
Bi-annual Progress Reports	Programme Director					none	6 monthly
Quarterly Progress Reports	Programme Director and Project Co-ordinator					none	Quarterly
Participatory Monitoring and Evaluation by beneficiaries	Programme Director					none	Quarterly
Annual field visits by representatives of Programme Advisory Committee	Programme Director					none	Annual
Minutes of Advisory Committee Meeting	Programme Director					none	Quarterly
Mid-term Evaluation	External consultant			3,333		3,333	Mid term
Final evaluation	External consultant				5,000	5,000	3 months before end of project
Audits	External auditor	100	100	100	100	400	Every Year
		1,350	933	3,433	5,933	11,650	

Details on NIE cost:

The project management fee (8.5% of the total budget) will be utilised by NABARD, the National Implementing Entity, to cover the costs associated with the provision of general management support.

Table below provides a breakdown of the estimated costs of providing these services.

S.No.	Breakdown of costs for the project management fee Cost	Amount \$
1	Financial Management	8,333
2	Performance Management - Progress Monitoring- Field Monitoring	16,667
3	Information and Reporting (MIS etc.)	10,000
4	Programme Support - Technical and Other support to EE	18,998
Total		53,998

Notes:

1. **Financial Management:** This covers general oversight of financial management and budgeting and quality control. NABARD will:

- Ensure compliance with standards and internal control processes, transparency
- Manage, monitor and track AF financial resources including allocating and monitoring expenditure based on agreed work plans, financial reporting to the AFB and the return of unspent funds to AF
- Ensuring that financial management practices comply with AF requirements and support audits as required
- Ensuring financial reporting complies with AF standards

2. **Performance Management.** This includes:

- Providing oversight of the monitoring and evaluation function of the Executing Agency
- Undertake field monitoring of the project through District Development Manager, Regional Officer (Andhra Pradesh) and Head Office officials
- providing technical support in the areas of risk management, screening of financial and risk criteria
- providing guidance in establishing performance measurement processes; and
- technical support on methodologies, TOR validation, identification of experts, results validation, and quality assurance

3. Information and Reporting Management

This includes maintaining information management systems and specific project management databases to track and monitor project implementation. Progress reporting to AFB and create platform for information dissemination.

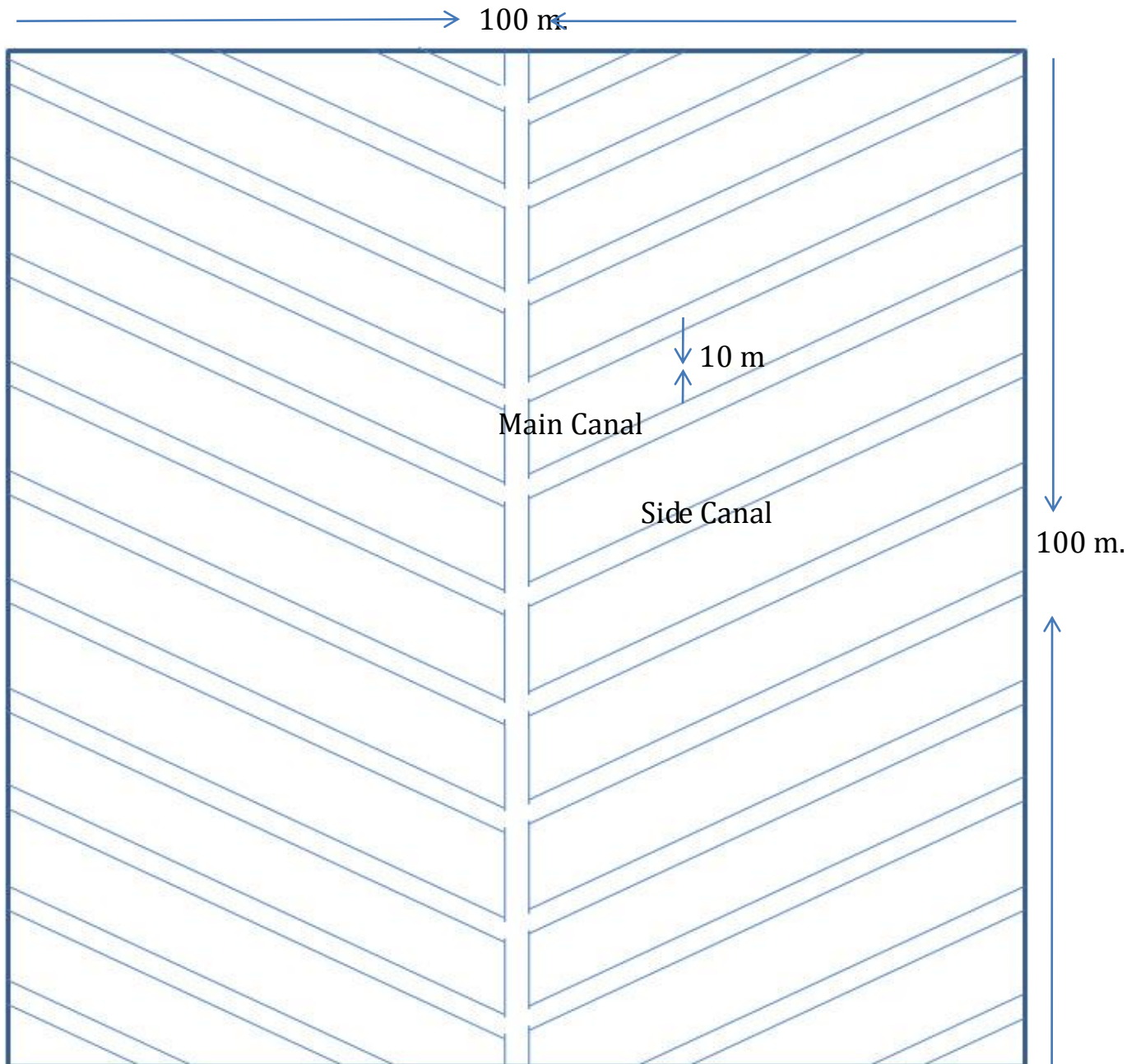
5. Program Support

This includes:

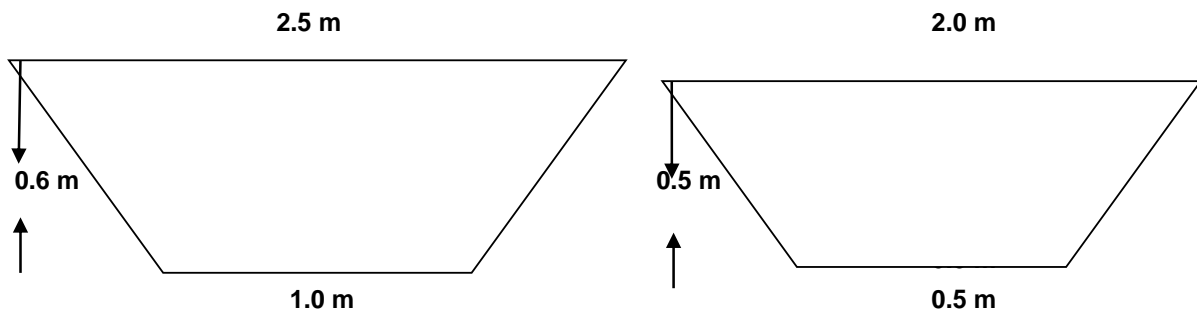
- Technical support, troubleshooting, and support missions as necessary
- policy, programming, and implementation support services
- supporting evaluation missions and participating in briefing / debriefing
- providing guidance on AF reporting requirements

Details of canals for restoration of mangroves:

Figure 11: Canals layout for Restoration of Mangroves



Main Canal dimensions:



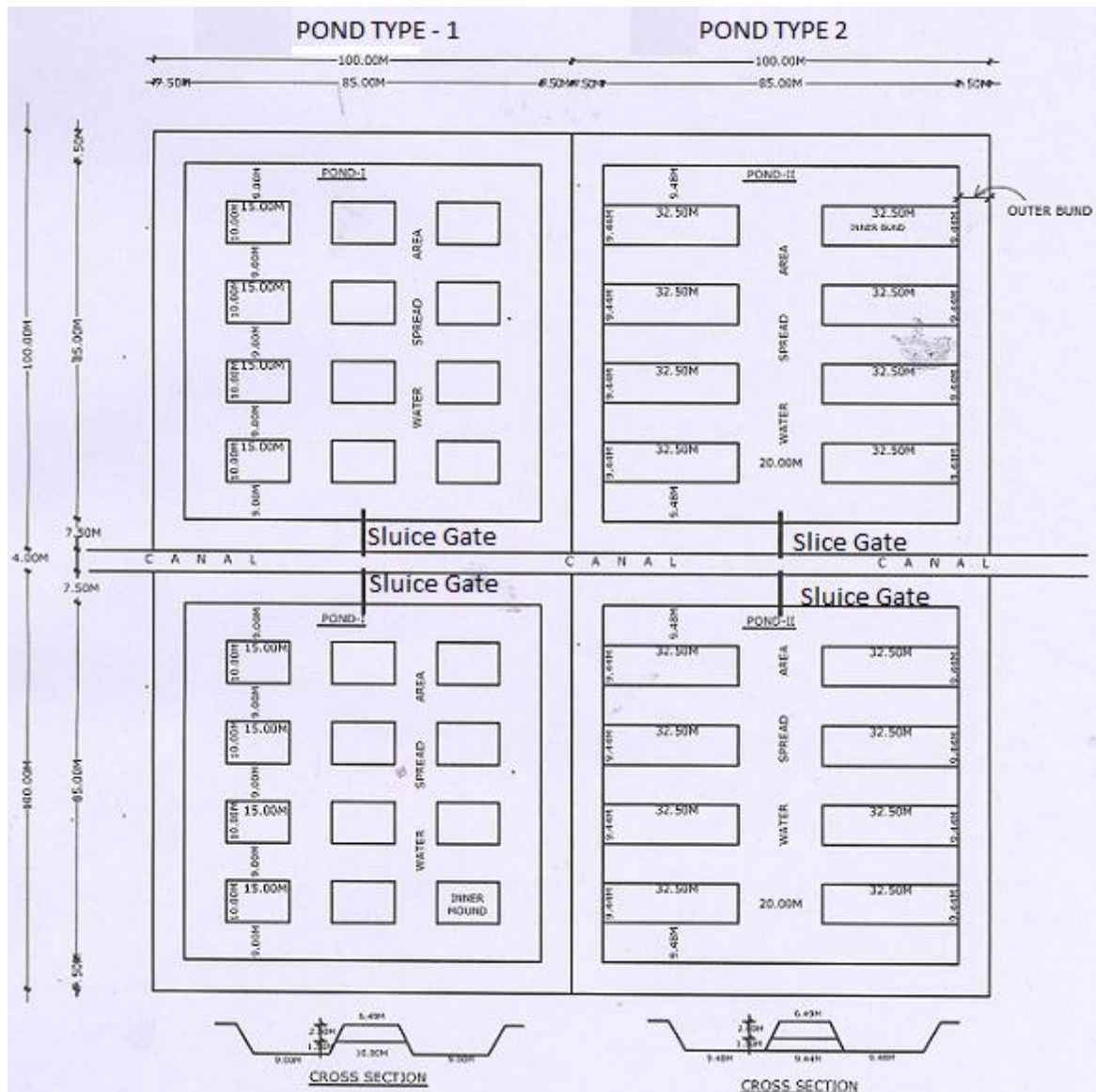
Calculation Details:

Main Canal		Side canal	
Top width	= 2.5 m.	Top width	= 2.0 m.
Bottom width	= 1.0 m.	Bottom width	= 0.5 m
Length	= 70 m.	Length	= 930 m.
Depth	= 0.6 m.	Depth	= 0.5 m.
Distance between two canals = 10 m.			
Calculation= $2.5+1.0/2 \times 0.6 \times 70 = 73.5$ Cu.m		Calculation= $2.0+0.5/2 \times 0.5 \times 930= 581.25$ Cu.m.	
Total Cu.m for 1 ha = 73.5 + 581.25 = 654.75 Cu.m. rounded to 650 Cu.m.			

Cost for canal digging = Rs. 35 x 650 Cu.m. x 200 ha. = 4550,000/60 = \$75,833

Details on IMFFS pond construction:

Figure 12: Layout Design of IMFFS Pond



Area Calculation Details:

Area of Pond 1		Area of Pond 2	
Total Area	= 10,000.00 sq. m.	Total Area	= 10,000.00 sq. m.
Outer Bund Area	= 2,775.00 sq.m.	Outer Bund Area	= 2,775.00
Inner Mound Area	= 1,800.00 sq.m.	Inner Bund Area	= 2,454.00
Water Spread Area	= 5,425.00 sq.m.	Water Spread Area	= 4,771.00

Cost Calculations Details for IMFFS Pond:

Pond Type 1:

Water Spread Area	Length, (m)	Width (m)	Depth (m)	Quantity (Cum)	Hours of JCB Machine work (hrs.)
Total soil Removal and Transport to the periphery	85	20	1.5	2,550	73
Digging of Soil and bund formation	85	20	1.5	2,550	73
	180	9	1.5	2,430	69
Total				7,530	215
Excavation rate of Slushy soil by JCB 70					35 cum / hr.
Bucket capacity of JCB					0.32 Cum
JCB Machine Hire (215 hrs. @ \$16.66 per hr.)					\$3,582
Transportation of Soil to the periphery (2550 cum) – 510 truck load @ \$1.67 per load					\$852
Levelling- consolidation of bunds and canal formation – 56 hrs. @ \$16.67 per hr.					\$934
Total Cost for 1 ha of Type 1 Pond					\$5,368

Pond Type 2:

Water Spread Area	Length, (m)	Width (m)	Depth (m)	Quantity (Cum)	Hours of JCB Machine work (hrs.)
Total soil Removal and Transport to the periphery	85	20	1.5	2,550	73
Digging of Soil and bund formation	47.4 (9.48x 5)	65	1.5	4,622	132
Total				7,172	205
Excavation rate of Slushy soil by JCB 70					35 cum / hr.
Bucket capacity of JCB					0.32 Cum
JCB Machine Hire (205 hrs. @ \$ 16.66 per hr.)					\$ 3,415
Transportation of Soil to the periphery (2550 cum) – 510 truck load @ \$1.67 per load					\$ 852
Levelling- consolidation of bunds and canal formation – 56 hrs. @ \$ 16.67 per hr.					\$ 934
Total Cost for 1 ha of Type 2 Pond					\$ 5,200

Note: Although two type of ponds excavation are proposed, the cost for Pond Type 2 @ USD 5,200 which is the lowest cost has been adopted for calculating the total cost. However, the payments will be made based on the actual cost during implementation.

Figure 13: Project location in Krishna delta showing mangrove restoration areas and IMFFS site



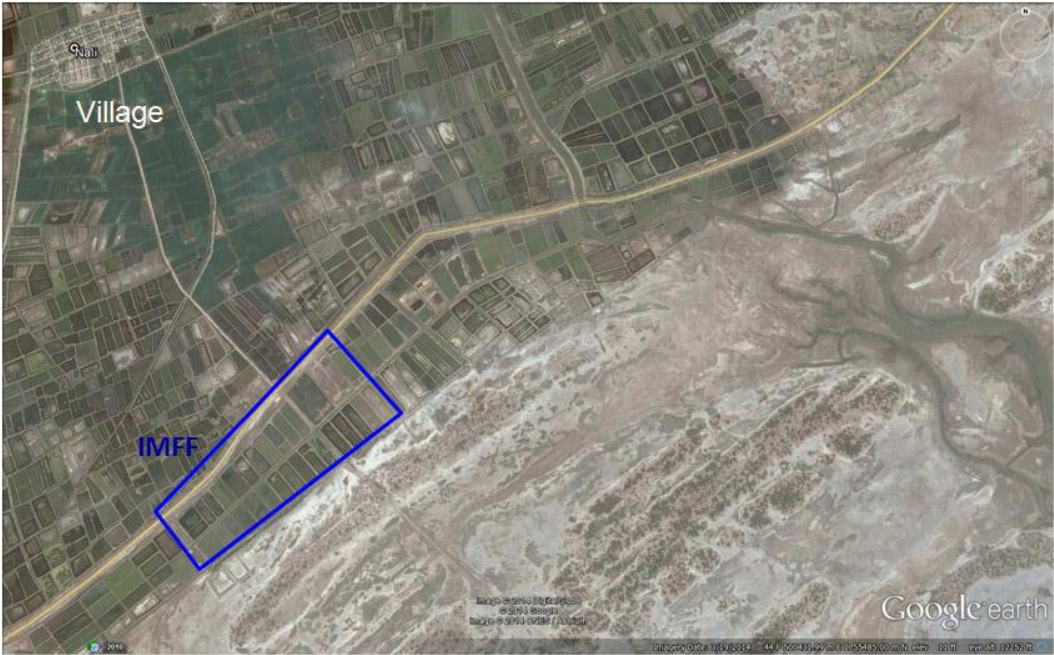
Figure 14: Mangrove restoration area near Sorlagondi village



Figure 15: Mangrove restoration area near Basavanipalem



Figure 16: Location of IMFFS site near Nali



Annexure 2

Program Timeline - Gantt Chart

Component	Year 1				Year 2				Year 3				Year 4			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Component 1 Community mobilization and organization																
Sub-component 1.1																
Output: Gender balanced village level institutions formed in Sorlagondi, Nali and Basavanipalem villages																
Output: 1500 people oriented to CC, SLR and adaptive capacity concepts and measures involving mangroves																
Project orientation meetings to community in three project villages (Sorlagondi, Nali and Basavanipalem)																
Sensitizing community on gender and different approaches to women development and empowerment																
Exposure visits to the community to successful participatory mangrove, IMFFS and coastal resources management projects																
Conducting PRA																
Establishing village level institutions (VLIs)																
Stakeholder analysis																
Vulnerability assessment																
Sub-component 1.2																
Output: Annual micro plans prepared for optimal utilization of resources																
Prioritizing the concerns																
Providing technical, institutional and partial financial support for the entry point activity																

Component 2: Capacity building for coastal protection and livelihoods															
Output: 200 people trained on mangrove restoration, IMFFS and fish culture															
Output: 50 farmers including at least 20 women trained in IMFFS															
Orientation workshop to the community on climate change and sea level rise and their impacts, role of mangroves and integrated mangrove-fishery farming system in increasing adaptive capacity to sea level rise															
Organizing orientation workshop to government and grassroots NGOs climate change and sea level rise and their impacts, role of mangroves and integrated mangrove-fishery farming system in increasing adaptive capacity to sea level rise															
Hands on training on mangrove restoration techniques															
Hands on training on mariculture practices															
Component 3: Restoration of mangrove areas for coastal protection															
Output: 200 ha of replanted mangrove area close to two villages for future coastal protection															
Output: One central mangrove nursery established, serving three villages															
Assessing suitability of the sites for mangrove restoration															
Preparation of mangrove nursery with different mangrove species															
Canal digging															

Planting of mangroves saplings																
Causality replacement																
De-silting of canals																
Component 4: Demonstration of mangrove based fishery livelihood																
Output: Two models of IMFFS and cage/pen culture demonstrated with the participation of local community and stakeholders																
Assessing suitability of the sites for IMFFS and cage /pen culture																
Preparation of design for IMFSS and cage/pen for culture																
Construction of farms and cage/pens																
Planting of mangrove and halophytes																
Monitoring performance of mangroves and halophytes planted																
4.1: Demonstration of IMFFS																
Output: Two culture of fish or prawn or both undertaken in the IMFFS farms per year																
Selection of species of fish for culturing																
Purchasing fish seed/prawn from hatcheries																
Releasing acclimatized fish seeds																
Monitoring water quality																
Monitoring survival and growth performance of fish																
Harvesting of fish and analysis of cost-benefit																
4.2 Demonstration of Cage and pen culture																
Cages and pens established for culture of crabs, fish, clams and cockles																
Purchasing fish crab juveniles from hatcheries																

Releasing acclimatized fish and crab juveniles																
Monitoring survival and growth performance of fish and crab																
Harvesting of fish, crabs and analysis of cost-benefit																
Component 5: Knowledge Management for Improved Coastal Protection																
Output: Resource materials prepared for dissemination among various stakeholders																
Output: Stakeholders brought together and knowledge on CC, SLR, Vulnerability and measures to improve adaptive capacity shared																
Preparation of resource materials in local language																
Participatory monitoring of the project activities																
Documenting best practices																
Process documentation																
National Seminar and Workshops																
Dissemination materials printed and distributed																
Evaluation (Mid-term and Final)																

Appendix 1: Permission from Revenue Department

**PROCEEDINGS OF THE COLLECTOR AND DISTRICT MAGISTRATE,
KRISHNA, MACHILIPATNAM
PRESENT: Dr. Buddhaprakash M.Jyoti, I.A.S.,**

Rc.E1.4060/2007

Dt. 29.06.2013.

Sub:- Mangroves Plantation - Bandar Division - Ganapeswaram, H/o.Sorlagondi (V) of Nagayalanka Mandal and Rama Krishnapuram (V) of Koduru Mandal - measuring an extent of @ Ac.500.00 Cents - permission in favour of Praja Pragathi Seva Sangham, Machilipatnam for development of Mangroves plantation for a period of Two years - Permission - Orders Issued.

- Read:-
1. This office Proceedings in Roc.E1.4060/2007, Dt.15.02.2008.
 2. Representation of the President, of Praja Pragathi Seva Sangham, Machilipatnam, dated.10.01.2013.
 3. Letter No.Rc.B.23/2013, Dt.30.01.2013 of the Tahsildar, Koduru.
 4. Letter No.Rc.B.35/2013, Dt.28.01.2013 of the Tahsildar, Nagayalanka.
 5. Letter Rc.B.40/2008, Dt.10.04.2013 of the Revenue Divisional Officer, Bandar.

ORDER:-

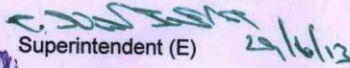
In view of the circumstances reported by the Revenue Divisional Officer, Bandar in the reference 5th read above, the President Praja Pragathi Seva Sangham, Machilipatnam is permitted to raise Mangroves plantation in an extent of Ac.250.00 Cents in R.S. No.647, which stands classified as U.A.W.D Vacant Government (Parra as per R.S.R), land at Ganapeswaram, H/o.Sorlagondi (V) of Nagayalanka Mandal, and in the land measuring an extent of Ac.250.00 Cents in R.S.No.704, which stands classified as U.A.W.D vacant Government (Kaaru Nela) land, at Rama Krishnapuram (V) of Koduru Mandal on temporary basis under conditions B.S.O.15, Para-3 (4) (ii) for a period of Two years only on free of cost without any transfer of title or alienation of land subject to the condition that the permission granted now can be withdrawn at any time without giving any notice.

The Tahsildar, Nagayalanka and Koduru are requested to allow the President of Praja Pragathi Seva Sangham, Machilipatnam for raising mangroves plantation only.

The Tahsildar, Nagayalanka and Koduru are requested to inform violation of conditions, if any, at once by M/s. Praja Pragathi Seva Sangham, Machilipatnam.

Sd/- L.Vijaya Chander,
for Collector, Krishna.

// B. O. //


Superintendent (E) 29/6/13
14.6.13
Ed.

To
The President,
Praja Pragathi Seva Sangham,
Machilipatnam

The Tahsildar, Koduru and Nagayalanka

Copy to the Revenue Divisional Officer, Bandar for information.
Copy to Stock file - spare 2.