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Mangroves for the Future
INVESTING IN COASTAL ECOSYSTEMS



COASTAL
SUSTAINABILITY
LEARNINGS FROM MFF (INDIA) PROJECTS

INDIA • 2011

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**COASTAL
SUSTAINABILITY**
LEARNINGS FROM MFF (INDIA) PROJECTS

MANGROVES FOR THE FUTURE SINCE 2006

MEMBER COUNTRIES

INDIA • INDONESIA • MALDIVES • SEYCHELLES • SRI LANKA • THAILAND • PAKISTAN • VIET NAM

OUTREACH COUNTRIES

BANGLADESH • CAMBODIA • MYANMAR • TIMOR-LESTE



PHOTOS: PRADIP SAHA

Restoring India's Coastline



Many of us will never have to stand at land's end, watching the incoming tide, and wonder how to feed our families. But more than 20 million people in India, living along its coasts, depending on a delicate balance between ocean and land ecologies, are doing exactly that today.

India's 7,517 km coastline spans 13 states and Union Territories and is a complex web of salt marshes, mangrove forests, rocky coasts, coral reefs, sea grass meadows and offshore islands which buffers the nation from the force of the ocean. Major global coral reef systems exist here; the Andaman Islands account for nearly 80 per cent of the world's coral diversity. Moreover, the coastline hosts five per cent of the world's mangrove forests¹, with over 125 plant species². Indeed, mangroves are the symbolic mascot of India's varied coastal ecology.

Approximately 26 per cent of the country's population lives within 100 km of the coastline³. Largely impoverished, they rely on the ocean and the coast for their livelihoods.

Today, both coastline and people face disequilibrium. The characteristics of the coast are changing, forcing us to ask important questions about the future of its ecology. People's lives, too, seem edgier; like the flora and fauna on which they depend, they are today more vulnerable to changes.

The well-being of the coast does not depend solely on the coastal population; it is affected by activities and aspirations on the mainland. Thus, coastal ecologies are affected by mainland economic growth and urbanization. Some of India's largest urban centres — Mumbai, Chennai, Kolkata — are along the coast. These cities, and others, discharge untreated domestic sewage and industrial effluent into the oceans every day. Hundreds of chemical compounds pour into the oceans, disturbing the fine balance between saltwater and freshwater. Intensive shrimp farming threatens mangroves. Growing poverty is pushing local populations to use mangroves for fuelwood. Excessive groundwater withdrawal and dwindling flow in rivers have increased salinity in coastal areas. Much of the change experienced is a result of human activities focused on economic growth.

Subsistence farmers, fisherfolk and all the communities linked with these groups face extreme hardship. With no transferable skills, the millions living at land's end will move mainland-wards, to city centres and push an infrastructure, already stressed, to its limits.

And there is another puzzle to solve: climate change. Rising sea levels are eroding coasts. Shrinking beaches have put fishermen in further trouble. The frequency and intensity of coastal storms and cyclones have increased. Upto 7.1 million people stand to lose their livelihoods⁴. The tsunami of 2004 was a rude reckoning of how vulnerable these communities really are in the face of extreme and unpredictable changes in their environment.

Fortunately, science today understands better the reasons for the observed changes on India's coast. The Government of India has also taken note and engaged in the process of restoring³ these fragile habitats, by reviewing policies such as Coastal Regulation Zones (CRZs) and Marine Protected Areas (MPAs). Grassroots communities and organizations are also becoming more proactive in saving coastal ecology.

Fortunately, talk has turned into a lot of action.

PHOTO: PRADIP SAHA

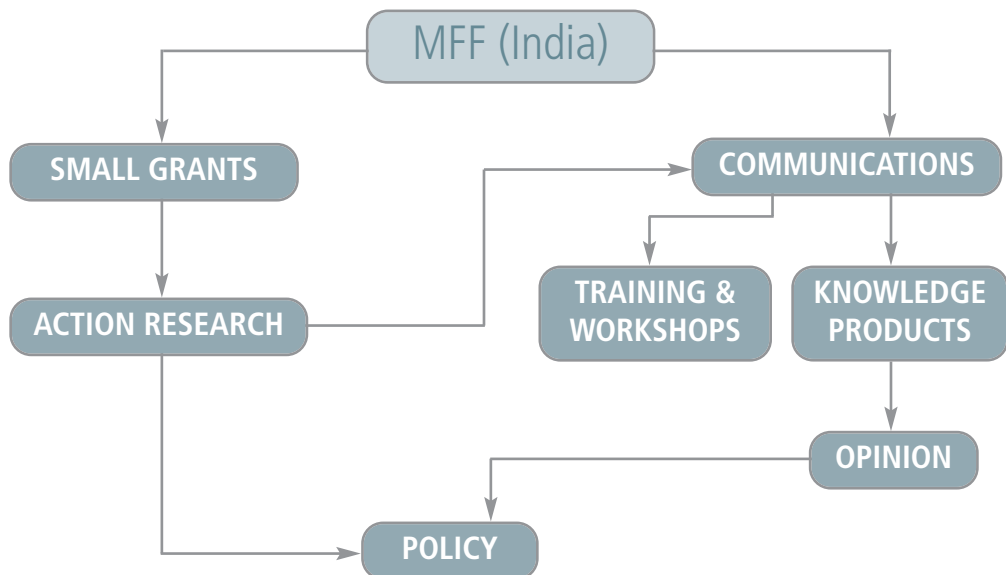


MFF (India): Investing in Coastal Futures

The 2004 tsunami was a call to action for the international community; its aftermath demonstrated the extreme fragility of coastal ecosystems and the livelihoods of those who depend on these. In response to this crisis and with an objective to put into place local solutions, Mangroves for the Future (MFF) began their work across the countries most affected in South and South East Asia. MFF is present in eight member countries and its actions are decided, and overseen by, a Regional Steering Committee (RSC) co-chaired by IUCN and UNDP. The RSC ensures that all programmes under the MFF banner are consistent with regard to vision and mission.

In recognition of the action needed to protect India's coastlines and the communities dependent on them, Mangroves for the Future (India), known as MFF (India) was launched in late 2007. In order to ensure that ground level work is ultimately translated to have replicable impact, ownership is required at all levels. Keeping this in mind, MFF (India) has been stressing on meaningful and varied partnerships since its inception.

The Government of India has taken special cognizance of the work required to protect its diverse and unique coastal and marine habitats. A National Coordinating Body (NCB) was created in 2007, to institutionalize the work of MFF (India) and its vision. The ownership of the Government is clear and the Additional Secretary, Ministry of Environment and Forest (MoEF), Government of India is the NCB chairperson. There are 16 members of the NCB, bringing together individuals with skills from all relevant backgrounds, comprising eminent persons from the Government, international and national



civil society, private sector, academic and research institutions. The presence of NCB Chairperson in the RSC ensures that India's specific concerns are addressed and that actions taken within the National programme are supported by the MFF vision.

The roadmap for MFF (India) has been developed in its National Strategy and Action Plan (NSAP). This framework document outlines the priorities for MFF (India) in line with those of the country and is in line with India's National Environmental Policy and Biodiversity Action Plan for maximum integration between policies and action. The NSAP has identified five coastal states for field level interventions: West Bengal, Andhra Pradesh, Tamil Nadu, Orissa and Gujarat. However, applications from other states are also eligible.

In 2008, applications for action research under the Small Grants Programme were put forward by a variety of actors, looking to better understand the causes and impacts of changes on India's coastal habitats and the effects these have had on the livelihoods of the coastal population. These actors range from community-based organizations to government institutions. Nine projects were



• **LIVELIHOOD SECURITY AND SUSTAINABILITY**

• **COASTAL AND MARINE BIODIVERSITY RESEARCH**

• **INFORMATION AND KNOWLEDGE DISSEMINATION**

selected, each for a duration of between 3 months to 15 months, and for an individual project cost of up to USD 25,000. Each project focused on one of three areas: livelihood security and sustainability, coastal and marine biodiversity research, information and knowledge dissemination. These projects were complemented by ongoing training for MFF (India) project partners and knowledge products aimed at taking the learnings from MFF (India) to a wider audience.

MFF (India) programme has a strong and conscious focus on action interventions. The process of action research is intrinsically catalytic, where results obtained in the short-term can be translated into more institutionalized processes. The phase of action research provides a scientific baseline for common understanding and allows for informed decision-making.

Mobilizing change cannot come without the active participation of all stakeholders that contribute to, and can benefit from, changes in practices that focus on living within the planet's natural boundaries. One of the most important features of the MFF (India) programme has been the active participation of the private sector. The private sector views MFF (India) as a strong knowledge partner and the first phase of action research will result in options for further work, through co-financing of interventions and active private sector support.

The core objective of MFF's work is to develop sustainable action and awareness. Beyond actions of the coastal population, coastal ecology is highly affected by economic activities on the mainland. Keeping this, and the need for a long-term solution in mind, MFF (India) also undertakes knowledge dissemination projects and capacity building exercises, especially targeted towards researchers and policy makers.

In its work between 2008-2011, MFF (India) not only facilitated informed change, but also ensured that agents of change were localized. Small grants were seen as a way to support local actions and provide immediate local benefit. In addition to the small-grants framework, the selection of strong and established project partners increased the potential that the work would extend beyond the project period.

The results of work done under the auspices of MFF (India) until 2011 have been very positive and it is clear that the small grants framework can act as catalytic seed investment for sustainable and scalable change. These successes are evident in the reports of the projects. Moreover, all projects were selected on their potential for policy leverage. The fruits of this are also clear. In many of the case studies, the small grants projects have been adopted for further exploration by government agencies. In addition, the effective inclusion of the private sector has led to new understandings of possible partnerships. The positive, results based, integration of private sector into the work done by MFF (India) has prompted the Government of India to include private-sector representation in the national committee looking after coastal and marine issues.

MFF strongly believes in investing in coastal futures by developing natural infrastructure. The second phase of the work for MFF (India) will continue to operate within a small and medium grants framework, with a major focus on the policy potential of the project proposals. It is also expected that the continuing concerns in the region about the coastline will require MFF (India) to undertake collaborative programmes with neighbouring countries. In this way, MFF (India) expects to build a national and regional cadre of individuals, organizations and private sector players who can take the messages of coastal conservation and livelihoods forward.

SMALL GRANTS

LARGE STEPS

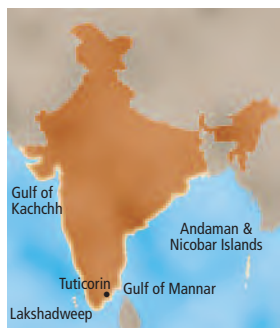
CORAL REEFS OF INDIA—CURRENT STATUS, THREATS AND CONSERVATION MEASURES: A NATIONAL WORKSHOP

Suganthi Devadason Marine Research Institute (SDMRI), Tuticorin

Workshop at Tuticorin, Tamil Nadu

PHOTO: DEEPAK APTE





Coral reefs are key indicators of coastal health. They are home to many fish species. Although coral reefs cover less than 0.1 per cent of the ocean they support almost one quarter of marine biodiversity⁵. They are also natural barriers to protect coastlines from the ferocity of tidal waves. Reefs are under severe threat by pollution and human actions. In recognition of the importance of reefs within the coastal habitat, and to mark the end of the International Year of the Reef 2008, MFF (India) started work by hosting a national workshop. In December 2008, the national workshop on the Coral Reefs of India was held at Tuticorin, a port town off the Gulf of Mannar in Tamil Nadu. The focus was on coral reefs and coastal ecology. Representatives from all the four major reef areas in India were present: the Gulf of Mannar, Gulf of Kachchh, Lakshadweep, Andaman & Nicobar Islands. The main objective of the workshop was to bridge geographic differences and develop common priorities for future work on coral reef research and conservation management in India.

The workshop was held under the auspices of the Ministry of Environment and Forest, Government of India and had 51 representatives from around the country. The workshop focused on five main areas: Coral Status and Conservation; Coral Associates; Coral Diseases and Molecular Studies; Reproduction, Recruitment and Restoration; and Coral Environment and Threats. It brought together government officials, civil society actors, scientists and students.

The focused subject of the workshop, with its diverse range of representatives, provided a unique opportunity for the compilation of knowledge, across disciplines, in the five subject areas. This also allowed for valuable identification of knowledge gaps between research, academia, field practice and policy. As with all workshops bringing together delegates with a similar professional objective, or geographic background, similarities were found with respect to challenges and opportunities for continued work. The need for a holistic perspective on reef conservation was agreed upon. 28 research papers were presented within the five-pillar framework. These broad predefined research areas ensured that not only quantitative science was highlighted for discussion, but also social sciences and the impact of lifestyles on coral health.

The papers presented at the workshop were peer reviewed, and 26 of them were compiled into the publication *Coral Reefs in India – status, threats and conservation measures*. This knowledge product will be an important baseline for research, taking note of all relevant coral reefs and coral ecology. This will also provide a useful base for advocacy groups to build awareness at the local level.

Beyond local level actions, the workshop and the publication will go a long way in helping to understand the status of reef ecology and the changes that are required in enabling policy frameworks.

Once information is compiled and documented, multiple actors can address gaps in policy, action and research. Knowledge products such as *Coral Reefs of India – current status, threats and conservation measures* are also valuable tools for new actors, and new communities interested in the topic of coastal ecology.

Co-Financing/ Contribution In-Kind	NO
Sustainable	NR
Replicable	NR
Policy/Advocacy	YES
Community Participation	NR

NR: Not relevant

**STUDY OF FLORISTIC DIVERSITY AND NATURAL RECRUITMENT
OF MANGROVE SPECIES IN SELECTED MANGROVE HABITATS OF
SOUTH GUJARAT**

Gujarat Ecological Education and Research (GEER) Foundation, Gandhinagar

Coastal Research in Southern Gujarat

PHOTO: BHARAT JETVA





The coastline along the southern part of Gujarat is under severe threat from spreading human habitation and industrial activities. The increasing pressures of community dependence on mangrove forests has been linked with its decreasing density. No clear study has been done of the mangrove forests in southern Gujarat and there was a clear need to codify the existing status and to better understand the relationship between the livelihoods of local communities and the ability of the mangroves to regenerate.

Gujarat's 1,650 km long coastline hosts 936 sq km of mangrove forests. This state in western India is home to 22 per cent of India's mangrove population⁶. This study focused on developing a status survey of the mangrove forests in southern Gujarat.

Through the process of mapping, mangrove species in south Gujarat were recorded for the first time. *Sonneratia apetala* and *Avicennia officinalis* are two mangrove species thought to be very rare, but were found growing in abundance in south Gujarat. Two new mangrove areas were identified in Navsari and Valsad districts. Additionally two mangrove species *Bruguiera cylindrical* and *Bruguiera gymnorrhiza* were rediscovered, increasing the total list of mangrove species in Gujarat to 15. Such information is particularly useful for the forest department in order to understand naturally occurring areas for future plantation development.

In addition to compiling information on biological and ecological mangroves in the area, the study specifically focused on the intimate linkages between local communities and the use of the mangrove forests for livelihoods. In order to plan for future conservation activities, this symbiotic relationship will need to be understood. Alternative options will then need to be developed if the mangrove forests are no longer to be tapped.

The study results not only provide a better understanding for stakeholders like the forest department, when planning mangrove restoration, it also leads to better better-informed awareness campaigns in the area. A film, in both English and Gujarati, was developed with a focus to promote the awareness of the importance of mangroves and subsequent conservation. The Chief Minister of Gujarat released the film and as such raised the importance of the issue to the attention of the state. The film was made, outside of the project budget, by the project partners, and indicated their level of ownership with regard to awareness actions. In May 2009, a report of the project findings was also published and presented before the State Level Steering Committee for the conservation of mangroves and coral reefs.

The project was particularly successful in making clear the value of strategic dissemination and awareness building of key decision makers at all levels of policymaking. The Purna Estuary studied in south Gujarat is under consideration at the state level as a biodiversity hotspot. Another study site has been marked as a potential genetic resource centre. The Ministry of Environment and Forest is financing a mapping exercise of mudflats by the project partner. This project clearly demonstrates the value and potential of small grants as catalysts that can ensure second generation actions.

Co-Financing/ Contribution In-Kind	YES
Sustainable	YES
Replicable	YES
Policy/Advocacy	YES
Community Participation	YES

SUSTAINABLE COASTAL LIVELIHOOD INTEGRATED MANGROVE FISHERY FARMING SYSTEM

M.S. Swaminathan Research Foundation (MSSRF), Chennai

Vellar-Pichavaram-Coleroon Estuary, Cuddalore district, Tamil Nadu

PHOTO: V. SELVAM





Evolution of our knowledge about coastal habitats shows us that ecosystems aren't only natural resource reserves. They are three-dimensional matrices involving, and impacted by, not just the ocean but the people who work and live within them. The growth of shrimp farming in India, from a small scale cottage industry activity in the 1980s, illustrates this evolving dynamic.

By the 1990s shrimp farming was growing at 8.4 per cent a year. Attracted by revenue potential, farmers converted coastal agricultural land into shrimp farms. With intensive activity, there was a correlated increase in inputs required to sustain coastal aquaculture. With increased use of artificial feed, practice of monoculture, combined with poor environmental management, productivity started to fall. In 1996 the Supreme Court put a halt to intensive shrimp farming. Intensive farming practices and the legal ban left shrimp farmers, who had converted their lands, without a livelihood. This resulted in up to 60 per cent of landowners abandoning their farms along the coast.

This project was developed as a model to showcase potential for rectification of the impacts of bad farming practice and the legal ban. The action research study, in the Vellar-Pichavaram-Coleroon estuarine region in Cuddalore district, Tamil Nadu, looked to innovative ways of working with shrimp farmers to enable sustainable community-based fish farming systems. It involved reclaiming abandoned lands and building local infrastructure such as bunds and embankments, to plant mangrove habitats. The farm area was then fed with mangrove-based fishery seeds and organic inputs for their development. Tidal water also provided natural feed and oxygen at no cost to the farmer. The use of tidal water in the demonstration sites allowed not only community-based livelihood options to be developed, but also introduced an energy-efficient method of production.

The demonstration sites were successful. Organic inputs, like dead fish or organic waste, replaced synthetic feed. The organic feed improved species health and growth as well as survival rates of the transplanted mangroves. A parallel social process of building capacity and creating awareness ensured sustainability at project sites. Through hands-on demonstrations, workshops, group discussions and exposure visits, farmers assimilated the potential of the Integrated Mangrove Fishery Farming System (IMFFS).

The project went beyond restoring lost livelihoods. It extended livelihood opportunities: Women were provided with options for alternative livelihoods with the use of air-conditioned chillers to help them sell fish. Women also received training on producing organic pesticides, that was then sold to farmers.

Beyond farmers, the ambit of dissemination related to the viability of IMFFS was broadened to forest department officials and central government ministries. That helped dissipate prevailing pessimism — local as well as at the official level — about using abandoned shrimp farms. Indeed, the study's demonstration of how abandoned saline ponds could be used, whilst also restoring ecosystem balance, went a long way in convincing owners of degraded land and abandoned shrimp farms to participate, by providing their land at no cost. This proved that it is possible to combine ecological restoration and generation of alternative livelihood.

Using field knowledge, the project created an enabling policy environment that allowed for replication. Now, the Aquaculture Authority of India is considering the IMFFS model to be eligible for eco-labeling, given its environmental advantages and potential for carbon sequestration. IMFFS's clear success is best demonstrated by the fact that the central government wants it up-scaled in many states.

Co-Financing/ Contribution In-Kind	YES
Sustainable	YES
Replicable	YES
Policy/Advocacy	YES
Community Participation	YES

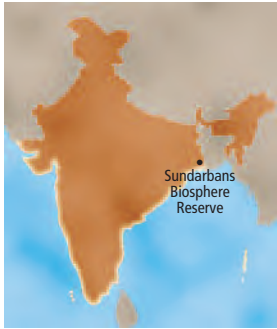
CRITICAL EVALUATION OF ALTERNATE LIVELIHOOD PROGRAMME IMPLEMENTED TO REDUCE DEPENDENCE ON SUNDARBANS MANGROVES

Department of Forest, Government of West Bengal

Sundarbans Biosphere Reserve, West Bengal

PHOTO: PRADEEP VYAS





The coast along the Bay of Bengal, spanning India and Bangladesh, is home to an estimated 4.2 million people, all beholden to the Sundarbans ecosystem⁷. Such dependence as well as unregulated mangrove exploitation has consistently stressed the ecosystem. Numerous projects have tried to combat this state of affairs, but because actions taken — to conserve mangroves while improving livelihood opportunities — have not been systematically analysed, there was no comprehension of which key success factors were worth replicating.

Thus this project was designed by the Sundarbans Forest Department, to understand changes for effective action. To fathom, for instance, the extent mangroves are actually used. The project reviewed previous actions, evaluated impacts. The intent: an intervention strategy with the highest potential for sustainable success.

The project focused on all 14 Eco-Development Committees (EDCs) and 51 Forest Protection Committees (FPCs) with which the forest department had worked in the Sundarbans Biosphere Reserve (SBR). Its purpose was to provide recommendations to improve upon previous interventions, for future work on conservation and for building partnerships with communities. Documenting all actions undertaken in the recent past by the forest department also aimed to provide a balance between man and nature. The project analysed the results and sustainability of past interventions, using questionnaires, focus group discussions and groundtruthing.

The project studied over three decades of information on fuelwood and honey collection and fishing in the mangrove forests, including a review of the extent of illegal practices. The data provided a baseline to understand what communities required from the forest. The database also acted as an indicator of the extent of alternative livelihood generation required to safeguard the forest.

Eco-tourism was seen as one alternative. EDCs currently get 25 per cent of the revenue derived from eco-tourism; the study recommended an increase in the benefit-sharing for EDCs. Goateries, piggeries and beekeeping were other alternative livelihoods.

This socio-economic survey revealed that for change to be truly sustainable, there was an immediate need to understand the communities that live in, and off, the Sundarbans. It showed that simple infrastructure development in public areas could do as much for mangrove conservation as resource awareness generation. Building roads, jetties, community centres and solar power would improve community well being, and provide better potential for processing and marketing products. In turn, such actions would improve trust levels between the communities and the forest department, enabling more participation. The findings also suggested promotion of energy-efficient cookstoves, to reduce firewood dependence.

The study highlighted the vulnerability of these populations to extreme weather events, such as Aila, the super-cyclone of 2009. It clearly illustrated the need to understand the lives of the community within this backdrop, before suggesting alternative livelihoods. As a direct result, MFF (India) has now included Disaster Risk and Reduction (DRR) strategy to be incorporated in future project work in this location. The study made clear the importance of challenging predefined stereotypes when engaging with forest-dependent communities.

Co-Financing/ Contribution In-Kind	YES
Sustainable	YES
Replicable	YES
Policy/Advocacy	YES
Community Participation	YES

STATUS OF SHELTERBELTS IN SOUTHERN INDIA COASTAL LINE

Environment Protection Training & Research Institute (EPTRI), Hyderabad

Coastal areas in Orissa, Andhra Pradesh, Tamil Nadu, Puducherry, Kerala, Karnataka

PHOTO: PRADIP SAHA





With the devastating impact of the 2004 tsunami, and its aftermath, attention is now being paid to developing bioshields or shelterbelts against possible future extreme weather events. Hard solutions such as sea walls are often the first point of recourse when thinking about protecting India's coastlines. More attention needs to be paid to soft solutions such as shelterbelts, that have proved to be sustainable and cost effective, when planning for the future. Bioshields are land's first defence against the power of the ocean's tide and winds. The importance of these barriers is specifically relevant with the increasing frequency and intensity of cyclonic storms.

The first step in understanding the potential of planting shelterbelts along India's coastline requires an understanding of the current status of existing shelterbelts. This information will contribute to developing a comprehensive strategy for coastline protection. The Environment Protection Training and Research Institute (EPTRI) mapped the coastline across Karnataka, Kerala, Tamil Nadu, Andhra Pradesh and Orissa. In addition to providing a dynamic status report of the coastline, EPTRI investigated the extent to which human activity impacted and will continue to impact existing coastal land use and land cover.

This information was compiled using secondary information and comprehensive questionnaires in order to understand and document the extent of present shelterbelts coverage upto two km inland of the coast. Satellite maps were used in order to cross-reference ground level data, but also to provide possible sites for the cultivation of new shelterbelts. The state forest departments were the primary sources of data but project site visits were carried out to understand the impacts of anthropogenic activities.

While the effects of anthropogenic activities were clearly evident, the study also showed that the reasons for degraded ecosystems went beyond population pressures and livelihood stress of specific local communities. The role of industrial pollution, decreasing freshwater flows due to upstream activities and siltation were also key indicators of decline, especially of mangroves.

The study illustrated the key components required for coastal restoration efforts including potentials for new mangrove generation. Joint planning by all stakeholders including local communities, the forest department and NGOs was seen to be critical to the success of intervention efforts. The creation of village level mangrove committees meant that all stakeholders had equal opportunity to participate in the process of restoration. The high levels of participation led to a greater sense of ownership and ultimately resulted in sustainable conservation actions.

Non-mangrove shelterbelts were also documented in the study and provided an additional understanding of the potential for future activities. Efforts at mixing agriculture, plantations and silviculture were documented as success stories, both with regard to shelterbelt creation but also with possibilities for livelihood generation.

Perhaps most importantly, what the project showed was the success that could be achieved in minimizing the impact of storm surges inland through the development and careful planning of bioshields. The report and supporting maps provide a useful toolkit for local forest department representatives and government to prepare for future activities on developing shelterbelts.

Co-Financing/ Contribution In-Kind	YES
Sustainable	NR
Replicable	YES
Policy/Advocacy	YES
Community Participation	NR

NR: Not relevant

MANGROVE CONSERVATION AND REGENERATION AT MITHAPUR

Tata Chemicals Society for Rural Development (TCSR), Mumbai

Mithapur, Okhamandal region, Gujarat

PHOTO: SATISH TRIVEDI





Mangrove forests that once flourished along India’s coastal landscapes are now largely barren as a result of the impacts of economic activity and anthropogenic actions. In order to understand the importance of human behaviour and economic activity, ownership and active engagement of all actors is required.

TCSR, a trust run by private sector giant Tata Chemicals, undertook a study to understand the potential of restoring coastal wastelands for mangrove plantations. The selected site was a 215 hectare revenue wasteland located at Rukshmani Creek on the Mithapur coast in Gujarat. 20 hectares, that had been impacted by over-exploitation of fuelwood and fodder collection, overgrazing, pollution inflows and consecutive years of drought, were selected for work. TCSR hoped to show that through planned and systematic action, wastelands could be restored and that by doing this livelihood could be positively impacted through the provision of alternate livelihoods.

In order to restore the project site, land was selected nearby to develop a mangrove nursery. This nursery received regular tidal inflows, critical for the growth of mangrove plants. Local communities were trained to cultivate the nursery and ultimately transplant the mangrove seedlings to the wasteland. The seeds for the nursery were selected from the *Avicenna* mangrove species easily accessible in the project area. Over 52,400 seedlings were transplanted into the project area.

The core of this project was the way in which it focused on developing local capacity through incentive mobilization and education. Women were trained for nursery management, which was a central activity to ensure the success of the overall project. This earned them 466 days of employment during the project period and created opportunities for future alternative livelihoods. Additionally, youth mobilization through the development of eco-clubs was one of the main project actions. These eco-clubs reached out to students and cultivated youth leaders to be the brand ambassadors for mangrove conservation in the area.

The strength of the project lay in the team approach that TCSR brought to the intervention logic. The Gujarat Forest Department was, at all times, kept informed of the project process and ultimately agreed to ensure the maintenance of the plantations being set up within the project scope. TCSR’s commitment to the project deliverables was cemented by the fact that they contributed two-thirds of the project finances.

TCSR continues its work, beyond the project period, of mangrove restoration, in the remaining 195 hectares of the wasteland area and will focus on developing eco-clubs and creating rural entrepreneurship activities for the local communities.

Working to conserve and restore any ecosystem cannot be the refuge of only one set of actors. Ultimately sustainability and replicability of interventions will be realised if all stakeholders are involved in the project process. As many of the causes of anthropogenic stress are due to the attempts by people at the bottom of the income pyramid to survive, it is not surprising that interventions that focus on financially viable alternatives for livelihood choices are very likely to succeed in immediate uptake.

Co-Financing/ Contribution In-Kind	YES
Sustainable	YES
Replicable	YES
Policy/Advocacy	NR
Community Participation	YES

NR: Not relevant

SUSTAINABLE FRESHWATER AQUACULTURE IN MANGROVE DOMINATED INDIAN SUNDARBANS

Department of Marine Science, University of Calcutta, Kolkata

Jharkhali, 24 Parganas District, Sundarbans, West Bengal

PHOTO: ABHIJIT MITRA





In mangrove areas, especially in that of the Sundarbans in the Bay of Bengal Delta, raising freshwater prawns has been largely a subsistence activity, done in a traditional method with low-level inputs. Traditional practice focused on fertilising the prawn ponds with manure from cattle or poultry. As supplementary feed, rice or wheat bran is used, in addition to oil seed cakes. However with increasing demand prawn culture has become a more intensive, commercial activity. As a result farmers are focused on total yields, with a correlated focus on per unit size and weight as per market requirements.

For prawn farmers, this current demand on the yield and size of the final product resulted in the focus of feed shifting to commercially available protein-rich inputs such as meats and flesh of live mussels. It has been understood that the sustained use of such protein feeds had an overall negative impact on water quality in the landscape and ultimately the survival of the prawns themselves.

This project focused on using science to complement traditional practices for prawn feed. It aimed at developing feed that relied on inputs that were locally available and could improve the quality of the water bodies. It aimed at having an overall positive impact on the survival and size of the prawns, thereby boosting economic opportunity whilst also improving environmental sustainability.

The challenge of the project was twofold; it first had to find a locally available alternative to the commercial feed for the prawns, but it also had to demonstrate, within the project period, the potential to match if not surpass the yield and health of the prawns that were raised on commercial feed. This would be critical in establishing the confidence of the prawn farmers to take the actions forward.

The study, done in the 24 Parganas district of West Bengal, examined the possibilities of developing eco-friendly nutritive feed for freshwater prawns. Land for the project was provided free of cost by farmers and two ponds were developed throughout the project period. The first pond was a control site, where traditional methods were employed using commercial feed. The second pond was tested with alternative feed options and compared to the control for the health of the prawns and the water quality of the pond.

Porterasia coarctata, a locally available salt marsh grass, combined with soy bean dust, mustard oil cake, rice and wheat bran, with vitamins and minerals was found to be a viable alternative feed for the prawns. This had overall positive impact on the growth rates of the prawns as well as the water quality of the pond. The floral feed was also found to improve the colour of the prawns and regulate their final size. This positively impacted the market potential of the final product.

In addition to the positive impacts of the alternative feed in the pond, new livelihood opportunities for local women were generated when upscaling this activity by developing nurseries for the salt marsh grass.

The project served to generate large amount of interest from the local community, who understood the long-term benefits of switching feed. Based on the positive experiences coming out of the study, a guidebook in Bengali was developed for local farmers. The forest department is keen to upscale and promote this practice as it leaves the environment cleaner.

This project has shown that science and research can overcome local concerns on environmental sustainability and enhance economic returns. The long-term viability of this project, despite the local level successes, will depend on the marketing of the intervention to coastal communities.

Co-Financing/ Contribution In-Kind	YES
Sustainable	YES
Replicable	YES
Policy/Advocacy	YES
Community Participation	YES

MANGROVE RESTORATION AND AFFORESTATION: PARTICIPATORY ASSESSMENT OF CURRENT PRACTICES

M.S. Swaminathan Research Foundation (MSSRF), Chennai

Mangroves in Tamil Nadu and Andhra Pradesh

PHOTO: V. SELVAM





It is only relatively recently that we have come to understand the importance of conserving mangrove forests within the coastal habitat. In the 1990s mangrove conservation measures were focused on re-plantation but were varied in their results. The challenges for the successful uptake of conservation policy measures needed more discussions with regard to the socio-economic incentives that might be required for sustainability of mangrove restoration. Although mangrove management and restoration activities have increased with the availability of funding opportunities, there has been no clear prescriptive understanding of how best to channel research for the most effective output and impact.

The M.S. Swaminathan Research Foundation (MSSRF) focused on the coastal belt of Tamil Nadu and Andhra Pradesh to assess, understand and document some of the main concerns in traditional mangrove restoration practices. They focused on biases in species selection for mangrove restoration and its subsequent impacts, as well as the way in which livelihood concerns and community participation were considered. Joint Mangrove Management (JMM) actions, in participation with the forest department and local communities, were also investigated. The study developed recommendations for social, institutional and policy linked strategies for mangrove restoration and afforestation measures.

The study found that although the mangrove cover had increased as a result of consistent activity on conservation and restoration, there had been a decline in the relationships among all stakeholders. The project identified a steady decline in contact points between the forest department and village communities. For real ownership, the JMM needed to be strengthened by a larger participation of all stakeholders such as NGOs and local communities. Ownership, on the part of local communities, was seen to be an important indicator of longevity in intervention actions.

Further, the work done indicated the importance of seeing local communities in a holistic fashion and to understand their needs beyond the mangroves. Welfare schemes and housing were seen as two important components that came out of the study that impacted the overall well-being of communities and their potential to engage with conservation activities. Access to cooking gas in the mangrove areas was also seen as an important way of decreasing stress on forests being used for firewood. Village Forest Councils (VFCs) or stakeholder forums were indicated as critical components for sustainability of intervention strategies. These forums provide an important role in confidence building and empowerment on the part of mangrove dependent communities.

Policy linkages are important when leveraging work done in coastal belts, such as those in Tamil Nadu and Andhra Pradesh. The study brought forward that large-scale national policy packages such as the National Rural Employment Guarantee Scheme (NREGS) have to integrate with local specific realities for maximum impact.

Co-Financing/ Contribution In-Kind	YES
Sustainable	NR
Replicable	NR
Policy/Advocacy	YES
Community Participation	YES

NR: Not relevant

ASSESSING SELECTIVE TRACE METAL CONTAMINATION OF EDIBLE BIVALVES FROM ESTUARINE REGIONS OF GOA

National Institute of Oceanography (NIO), Panaji

Mandovi–Zuari–Cumbarjua Estuarine Complex, Goa

PHOTO: NIO





This study, by the National Institute of Oceanography (NIO), aimed to determine trace metal concentrations in bivalves, specifically oysters and venerid clams. These species are important to the Goan economy and form a fulcrum of activity to the coastal communities that harvest them.

Along India’s coastlines, rising levels of pollution from industrial activity are impacting the livelihoods of the poorest communities. Bivalves such as *Crassostrea gryhoides* (oysters) and *Paphia malabarica* (venerid clams) are an important part of the nutritional diet of the coastal Goan community. Edible and flourishing along the 200 km mangrove belt on the Central West Coast, these bivalves provide an important opportunity for livelihood support. However, mining along Goa’s rivers, that invariably meander into the Arabian sea, are causing metal seepage into the aquatic environment. This has raised concern for human health, as well as aquaculture. Bivalves accumulate metal pollution in their tissues faster than other organisms. So, their health becomes an interesting way of understanding the potential impacts of mining activities along the central west coast in Goa.

The NIO project focused on ascertaining the relationship between metal contamination and environmental conditions, such as increased mining activities along the rivers. The research involved measuring trace metals in water, sediments and the tissue of bivalve catches. The study aimed to help people engaged in bivalve collection find safer spots.

The study found that the trace metal goes up significantly during monsoon and post-monsoon. This clearly implicates the health of women engaged in bivalve collection. Also, the presence of metal in tissues implicates the health of consumers. Post-monsoon traces of cadmium in tissues of both *C. gryphoides* and *P. malabarica* were recorded as very high and beyond permissible levels. Higher presence of cadmium can be linked to use of fertiliser in agriculture. Iron in water, sediment and bivalve catch was very high, varying 100 to 1,000 times higher than permissible levels. This clearly indicates the effect of iron mining in Goa.

The project made awareness for fisherfolk about the potential impacts on human health a central part. Women fisherfolk were trained to understand the effects of metal poisoning in humans.

This study has had important consequences for developing a relationship between upstream human activities and downstream human livelihoods. Moreover, such information educates the public about the impacts of changing environments on human health. In the case of the central west coast, Goa, the results will impact tourism, another large income opportunity for coastal communities. Monitoring of metal contamination of bivalves will continue. At the same time, responsible use of the information will be critical when working with the communities, who haven’t created the problem, but have everything to lose due to its impact.

To combat metal pollution, utmost care should be taken to treat the effluent before releasing to the environment.

Co-Financing/ Contribution In-Kind	YES
Sustainable	YES
Replicable	YES
Policy/Advocacy	YES
Community Participation	YES

Bridging the Gap

In addition to steering the National programme with its partner organizations, the MFF (India) Secretariat undertakes outreach initiatives, with an aim to fill the capacity and knowledge gap at the National, state and local levels around coastal conservation and restoration. Specific target groups for these products are public officials, academicians and all stakeholders working with and on coastal habitats.

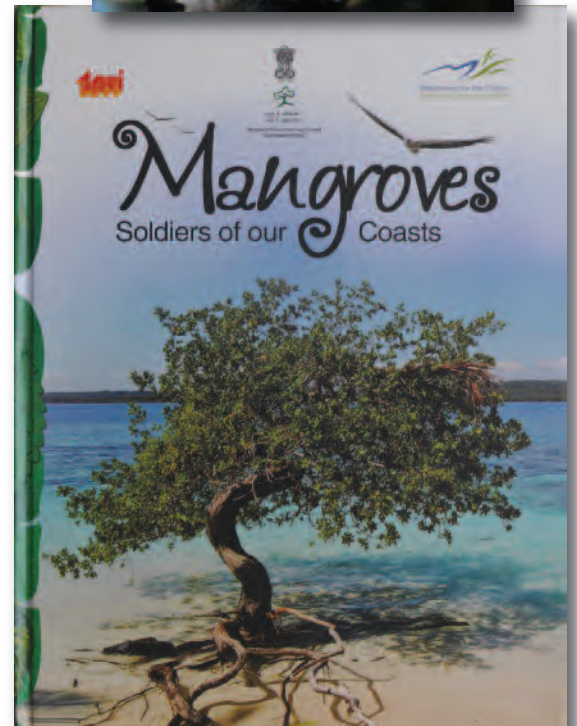
Publications

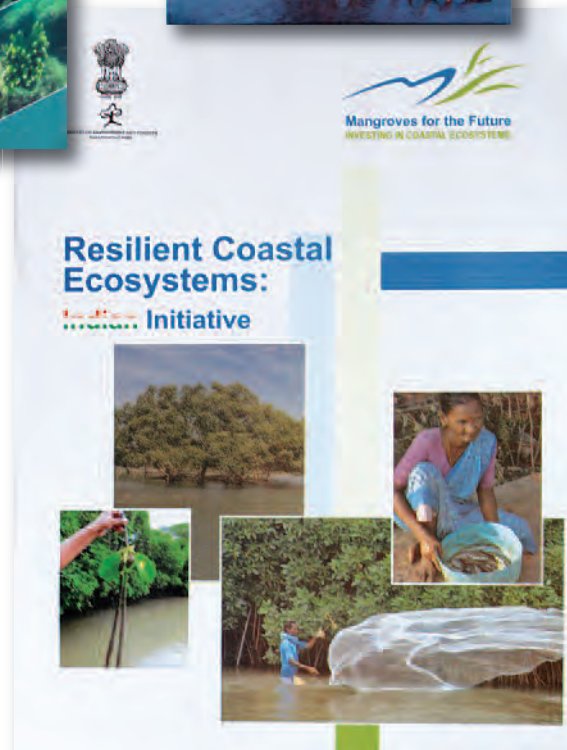
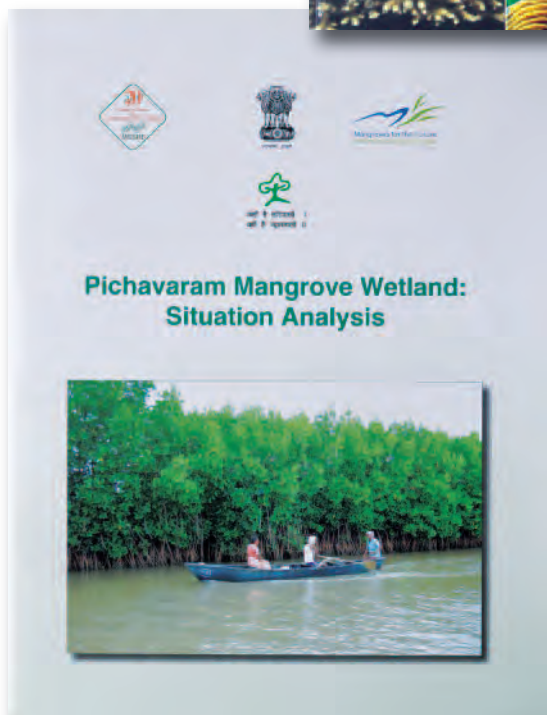
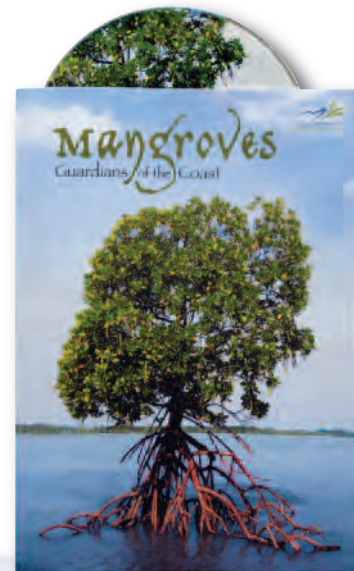
These knowledge products are demand driven and are also developed out of the learnings and findings of local projects to ensure their relevance for project management. Recently, *Mangroves: Guardians of the Coast*, a video has been developed focusing on mangroves which will be screened by India's national TV channel. A blog, <http://fishtalesindia.org> is also online to target youth and give them the chance to not only learn about, but discuss issues relating to freshwater marine life and coastal ecosystems.

Capacity Building

MFF (India) works with stakeholders to help them develop a better understanding of the tools required to work within coastal conservation, be it through workshops on project writing skills, scientific writing or knowledge seminars on Integrated Coastal Zone Management (CZM). As part of this, MFF (India) hosted a regional workshop in Thailand, in August 2011, focused on strengthening science communication in project results. An international workshop was also held by M.S. Swaminathan Research Foundation (MSSRF) to discuss current and future research and policy interventions required for coastal conservation. More than 100 international delegates participated, including MFF countries, which served to strengthen project results and further opportunities for future work.

In addition, MFF (India) aims to provide centralized documentation and dissemination of best practices, success stories as well as challenges on programme uptake, so that all its partners may benefit from the experiences of the programme collective.





Communities living as part of South Asia's coastal ecosystems are some of the world's poorest with high vulnerability and low resilience to change

Mangroves and the coastal ecosystems of which they are a part are central to biodiversity and mainland protection, whilst also providing a livelihood opportunity for millions of people

In order to bridge the challenges posed to coastal ecosystems, we must find ways to make man and nature work together

PHOTO: PRADIP SAHA



MFF (India): Steering Ahead

The MFF (India) Small Grants programme has provided valuable steps towards a better understanding of the potential for coastal ecosystem conservation and regeneration. MFF (India) will continue its commitment to the Small Grants programme. A second round of small grants has begun with an aim to find new findings and new research that can enrich policy inputs for coastal conservation. Already, the importance of developing recovery plans for endangered species like whale sharks and gastropods is being highlighted for incorporation in the MFF (India) programme. Additionally MFF (India) will develop management plans for sensitive habitats such as seagrass beds (Gulf of Mannar) and the Vembanad-Kol backwaters, in Kerala, one of the largest wetlands in India.

The next steps of MFF (India) will be multidimensional – working at project and policy levels, and at all times being informed by the results of action-research and scientific debate. Continued capacity building for coastal states will contribute to effective conservation plans for mangroves and the work done will feed into Integrated Coastal Zone Management (ICZM). At the same time, a focus on trade policy and incentives will be extended in order to prevent over-exploitation of the mangrove forests.

The impacts of coastal habitat destruction and the dependency of communities on the forests for their livelihoods are not determined necessarily by nationality or state borders. The lessons learnt through the MFF (India) programme will be applicable across South Asia, where coastal ecosystems are unified by geography and circumstance.

In addition to understanding the nuances at play in the rapidly shifting coastal ecosystem landscape, the economic incentives at play in this area have to be brought into clearer focus. MFF (India) will work with the private sector in Gujarat to develop environmentally sustainable coastal area development. The work done by the forest department in West Bengal, on alternative livelihoods, and the results it provided in the short span of the project time, has paved the way for a greater understanding of how relationships between direct stakeholders can be improved. This work will now be extended in the form of a large grant in Sundarbans. The project will be co-financed by MFF (India) and the West Bengal Forest Department.

Coastal ecosystems will continue to be dependent on actions upstream, as much as those in the immediate environment. Economic growth incentives and livelihoods will need to be brought into consistently greater focus when understanding the opportunities for coastal futures. MFF (India) will continue its work to develop knowledge products so that all stakeholders can understand the realities at play at land's end.

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PHOTO: PRADEEP VYAS

About this Book

This publication shares the experiences and lessons learnt from MFF (India) small grant projects, and its own initiatives of various publications and on national, international workshops on coastal and marine biodiversity research and management and other capacity building initiatives.

This book is an abridged narrative of the projects and the authors have heavily relied on the final technical reports of the implementing partners. The complete technical reports of these small grant projects can be found at the MFF (India) website: www.mangrovesforthefuture.org/india

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The implementing partners of MFF (India) small grant projects:

Suganthi Devadason Marine Research Institute (SDMRI), Tuticorin
Gujarat Ecological Education and Research (GEER) Foundation, Gandhinagar
M.S. Swaminathan Research Foundation (MSSRF), Chennai
Department of Forest, Government of West Bengal
Environment Protection Training & Research Institute (EPTRI), Hyderabad
Tata Chemicals Society for Rural Development (TCSR), Mumbai
Department of Marine Science, University of Calcutta, Kolkata
National Institute of Oceanography (NIO), Panaji

About MFF

Mangroves for the Future (MFF) is a partner-led initiative promoting investments in coastal ecosystems for sustainable development. MFF provides a collaborative platform for countries, sectors and organizations to address challenges to coastal ecosystem and livelihood issues; thus directing them towards a common goal.

MFF builds on a history of coastal management, before and after the 2004 Indian Ocean tsunami, particularly the need to continue the momentum and partnerships generated by the immediate post-tsunami response. Initially focusing on six countries worst-affected by the tsunami, India, Indonesia, Maldives, Seychelles, Sri Lanka, and Thailand, MFF has expanded to include Pakistan and Viet Nam. MFF will continue to reach out to countries in the region that face similar issues, with an overall aim to promote an integrated ocean wide approach to coastal zone management.

MFF seeks to achieve demonstrable results in influencing regional cooperation, national programme support, private sector engagement and community action. This will be achieved using a strategy of generating knowledge, empowering institutions and individuals, to promote good governance in coastal ecosystem management.

Learn more at: www.mangrovesforthefuture.org

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