Project ReCap is a scientific project with societal conscience and accords equal importance to issues of ethics and equity.

Overall Objective

To enable the ecological and social security of coastal ecosystems in selected locations of Tamil Nadu and the Union Territory of Pondicherry.

Specific Objectives

1.To restore and conserve key coastal habitats viz. coastal and littoral forest types, mangroves and sand dunes.

2.To reduce the risk and vulnerability of coastal ecosystems

3.Enhancing and strengthening the capacity of local communities to address and overcome natural hazards.

4.To create opportunities for additional and sustainable livelihoods

5.To document the process of learning and difficulties and disseminate the results to other partners for expansion, model, replication.

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ReCap

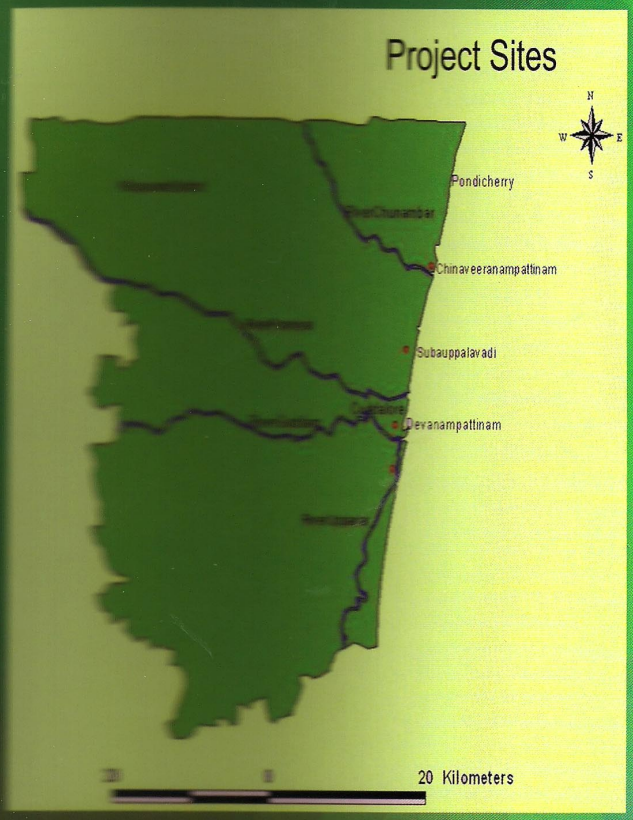
Practical Guidelines for the Restoration of Degraded Tropical Coasts

Caritas INDIA
The Joy of Service...

TO ENABLE EVERY HUMAN
PMSSS

CARE EARTH

2009



FOREWORD

The tsunami of 2004 that took away precious lives and destroyed the livelihoods of thousands of people along the Indian Coast was a wakeup call for us to take up concerted efforts of coastal protection. The Pondicherry Multipurpose Social Service Society (PMSSS) was one of the key organizations that took up a number of initiatives to rebuild the confidence and lives of the poor and marginalized people of the coast after the tsunami.

Project ReCAP is one such initiative that is being jointly implemented by PMSSS and Care Earth with the financial support of CARITAS. A number of people have been involved in the development and implementation of this pilot project, and I wish to congratulate them for their efforts. The current training manual is one of the outputs of the project and I hope it will be used by a wide range of people. I wish the project all success.

Rev. Fr. R. Ratchagar
Executive Director
Pondicherry Multipurpose Social Service Society

March 2009

Pondicherry Multipurpose Social Service Society (PMSSS), with the technical support of Care Earth Trust (CET) since 2007. Based on an intensive planning phase, the project has identified and focused its efforts on three coastal villages spanning 12km through Cuddalore and Pondicherry. The three villages are Chinnaveeranampattinam, Suba-uppalavaadi and Devanampattinam. Of these Devanampattinam had taken the brunt of the tsunami that led to the loss of many human lives and property.

Due to the sustained awareness building initiative of PMSSS and Care Earth, there is an emerging awareness amongst coastal people that ecological degradation was indeed the main cause for the onslaught that the Bay of Bengal witnessed on December 26, 2004. With the participation of the village people Project ReCAP launched an ecological restoration program. The lessons learnt and the scope of replicating the restoration initiative is presented in the sections that follow.

Coastal Afforestation Program: Definitions and Rationale

In this section we introduce the various concepts through simple definitions. We also discuss the rationale in adopting and recommending the specific approach to coastal restoration adopted by Project ReCAP.

Within the Bay of Bengal LME there are islands, reefs, mangroves and beaches that are habitats that support a great diversity of life.

These habitats can be considered as landscape elements. The boundaries between the terrestrial (example beaches) and aquatic landscape elements (example reef) are not often distinctly marked.

Coastal area, as the name implies, pertains to the part of the landscape that abuts the sea. It is geographically a narrow belt that runs more or less parallel to the shoreline. However, in some parts, as in creeks, estuaries and backwaters the coastal area extends inwards till a point where the tidal influence is no longer significant.

Throughout the coastal areas of the Bay of Bengal there are several distinct landscape elements. However, within the Cuddalore-Puducherry coastal area the predominant landscape elements are **beaches, sand dunes, backwaters, estuaries** and **freshwater pools** and the associated biological communities like mangroves, beach vegetation and human settlements of various categories.

Within the Cuddalore-Puducherry coastal area there are both **natural, human-altered and cultivated vegetation**. Amongst terrestrial vegetation we find short shrubs, herbs and grasses on the sand dunes. These are called sand binders. Then there are plantations raised for various purposes including exotic species of trees like Casuarina. Crops, kitchen gardens and hedgerows form a vegetation mosaic within human settlements.

Coconut is a maritime palm that naturally colonized the coastal zones throughout the Indian and Pacific Oceans. Although coconut

The principles that guide the Project ReCAP are the following:

1. Coastal areas are resilient units of the LME and therefore capable of reviving their character with a little human assistance
2. Human assistance can be most effective only when it is focused on the critical landscape elements within coastal areas
3. If human assistance has to be sustained, it has to come through well-informed involvement of the local people

The Approach

Project ReCAP adopted a two-pronged approach in an attempt:

- ☒ To understand the ecological history: gain insights on what was there in the past so that an achievable goal is set
- ☒ To evolve a replicable strategy to achieve the set goal: develop a practical field method through which firsthand ecological information is obtained; the information thus gathered will serve as a benchmark for future monitoring

Reconstructing the ecological past and setting the achievable goal

The Project began by selecting the target villages. While the choice was made apriori, at least one of four villages that were initially chosen was dropped. The village was dropped after numerous visits to the site and prolonged consultation with the villagers. The

villagers felt the futility of the restoration plan as the landscape was earmarked for a miniport.

Lesson 1: do not impose a project plan on any convenient target group or landscape

Interactive meetings and PRA exercises (including the use of mental maps) helped the local people come out with what they foresaw as the scope of the restoration plan.

Field exercises involved landscape mapping. Landscape mapping was done at two levels:

Level 1: Creating a map depicting the major landscape elements within the coastal area
Level 2: Identifying critical landscape elements and assessing their structure for creating a set of baseline information

Creating a map depicting the major landscape elements

This was achieved by first demarcating the boundaries within which the restoration would be carried out. The boundaries were drawn using Survey of India topo-sheets guided by local wisdom. For practical purposes, the coastal area that accommodates the 3 villages was considered as a single geographical unit. Each of the 3 villages that were chosen for restoration was treated as a distinct landscape of varying topography, geographical orientation and extent.

Matrix for inventorying presence/absence of landscape elements in coastal areas

Landscape element	Present			Absent	Remarks/Additional features
	Minimum	Moderate	Extensive		
Littoral forests					
Rocky beach					
Dunes					
Creeks					
Estuaries					
Backwaters					
Mangroves					
Turtle breeding sites					
Shorebird habitats					
Coconut plantations					
Other plantations					
Agricultural lands					
Salt pans					
Aquaculture ponds					
Human settlements					
Meadow/pastures					

Explanation: The matrix is useful in making qualitative assessment of coastal areas. There are different types of landscape elements included in the matrix; not all of these are present in the same village. It is therefore important that the information on only those elements that are present is documented. The 3 grades of extent minimum, moderate and extensive are relative to the size of the village/landscape and as such there is no specific measurable extent that is attributed. A column to record absence is included mainly to guarantee that the element was not present; at a later date there will be no debate as to whether the element was present but overlooked. The last column is for the sake of remarks that the observer wishes to record. Remarks can be on any aspect; what kind of shorebirds were most common; whether sea turtles were observed laying eggs and if yes which species; are saltpans in use? What kind of human settlements, etc.

The diversity of landscape elements within each village was assessed using the checklist and data format provided below. After the diversity of landscape elements was assessed, all plants were and enumerated element-wise. The plants thus enumerated were categorized as native, exotic or invasive and as indicators of any past or present ecological condition. The ecological conditions assessed were mainly soil salinity and moisture. Plants that were representative of a specific landscape element were classified as remnants.

Plants that were present within human habitation were separately enumerated. The list of plants thus prepared was used as the reference for the proposed afforestation. More than 20 species of trees including Thespesia populnea (poovarasu), Syzigium cumini (naaval), Borassus flabellifer (panai), Delonix elata (vaaganarayan), Anacardium occidentale (munthiri), Moringa pterigosperma (murungai), Casuarina equisetifolia (savukku) were commonly found around homesteads indicating a clear preference by the villagers.

Mapping the density, orientation and ecological structure of sand dunes

Note: for this exercise equipment needed are GPS, magnetic compass, measuring tape (not less than 50m) and a 1m x 1m square frame (or quadrant)

Amongst the natural barriers that saved human lives during the 2004 tsunami, **sand dunes** emerged as the most significant landscape element throughout the coasts of southern India. It is this observation that prompted the Project ReCAP to pay greater attention to restoring the sand dunes.

Sand dunes are of two kinds; those that are devoid of vegetation and those covered by soil binders. Common soil binders observed are Ipomoea pescaprae, Spinifex littoralis, Pedalium murex, various species of sedges and grasses (add photos). Sand dunes that are devoid of soil binders are easily eroded by wind and waves and therefore tend to be more dynamic than those with plant cover.

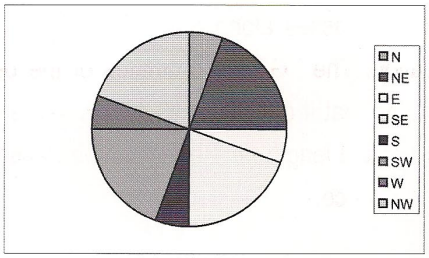
The density and orientation of sand dunes were assessed using **line transects.** Line transects are straight lines that are drawn using magnetic compasses along a specified direction from a benchmark location. The GPS coordinates of the benchmark location is noted so that it can be located on a future date. The compass direction and length (in meters) of the transect is also noted for future reference.

Example 1: Distribution of dunes along the transects

Village	No of transects	Total length (m)	Orientation of sand dunes measured using a magnetic compass								Total dunes
			N (350-10deg)	NE (10-80deg)	E (80-100deg)	SE (100-170deg)	S (170-190deg)	SW (190-260deg)	W (260-280deg)	NW (280-350deg)	
1	9	728	1	5	0	8	0	2	0	6	22
2	9	780	0	2	1	12	0	7	0	2	24
3	8	665	0	16	0	0	0	3	0	11	30

1 Chinnaveeranampattinam; 2 Subauppalavaadi; 3 Devanampattinam; N North; NE Northeast; E East; SE Southeast; S South; SW Southwest; W West; NW Northwest

Explanation: In Example 1 the information on how the dunes are arranged along transects in 3 coastal landscapes (villages) is presented in the form of a table. To understand the contents of the Table we shall note that the second column shows the number of transects walked in each landscape. The third column presents the total length covered by transects; example in village 1, a total length of 728m were covered by 9 transects. Columns 4-11 show number of dunes that were oriented in each direction; these directions are derived using a magnetic compass simply by dividing a circle into 8 segments (see diagram below). The last column shows the actual number of dunes observed.



Example 2: Summary of dune vegetation

Village	No of Dunes	Dunes with Vegetation (%)	No of Quadrats	Percentage of dunes where soil binders and other plants were observed			
				Ipomoea	*Spinifex*	Grass/sedge	Others
1	22	100	66	100	35	18	23
2	24	100	69	96	91	19	86
3	30	100	89	100	8	94	35

1 Chinnaveeranampattinam; 2 Subauppalavaadi; 3 Devanampattinam

Explanation: To understand Example 2 let us first look at column 2 of the table. The numbers presented here tell us how many dunes were actually studied. Column 3 shows that in each village all dunes (100%) had some vegetation on them at the time of study. As column 4 shows, the 1m x 1m frame (quadrat) was laid on each dune for counting the plants within; example 66 quadrats were laid in village 1. The remaining 4 columns tell us how many dunes had certain species of plants of interest. The plants of interest are soil binders. Column 5 suggests that in village 1 all dunes had Ipomoea. Similarly, we find in column 6 that Spinifiex was found only in 35% of the dunes. We may consider the above information as baseline data. When after a year or two we visit the same village and study vegetation on the same dunes, we can see if major changes have taken place during the intervening period.

A team of two observers walk the transect counting dunes on either side. Dunes that are extensive (more than 20m across along any direction) are not included for the assessment. Once a dune is encountered the perpendicular distance from the transect to its midpoint is measured in meters. A straight line is then drawn along the crest of the dune (through the length of the dune) such that it intersects the transect. From the point of intersection, the angle defined by the line is noted using the compass. This is the angle of orientation of the dune.

After obtaining the physical measures of each dune, the ecological structure is assessed. This is done by placing the 1m x 1m frame/quadrant on the dune and enumerating the plants (species and individuals) (attach data format). Depending on the size of the dune, one or more quadrants may be sampled per dune. Dunes on which no vegetation was found are also noted.

As many transects as necessary to can be laid. Each transect can be of a different length. The data thus collected is used to infer the following after the baseline information is scrutinized:

☒ Rate of encounter of dunes; say how many in every 10 or 100m of transect

☒ Most frequent direction in which they are oriented and how it relates to the shoreline

☒ How closely they are located; this can be inferred from the perpendicular distances measured

☒ The density and diversity of vegetation on the dune

Future monitoring of dunes is possible by analyzing changes in rate of encounter of dunes along the transect, changes in the orientation and changes in the ecological structure. For this, the same landscape is visited, the same transect is walked and the survey procedure repeated. When repeated periodically following a seasonal calendar the data provides more information on the dynamics of sand dunes. The following can be inferred from the data:

☒ Changes in the encounter rates and orientation of dunes over time

☒ Changes in the density and diversity of vegetation over time

☒ How dune dynamics are affected by the presence of vegetation

The exercise is useful in determining where afforestation is to be undertaken. The exercise will also be useful in monitoring the impact of the afforestation in the coastal area (a table showing the summary of how we had analyzed the data can be added).

Assessing the ecological structure of mangroves

Equipment needed: digital camera, GPS, graduated pole/stick

Ecological structure of mangroves concerns the different species of plants and their abundances within a specified area. Entering mangrove swamps for enumeration is not easy for various reasons including the unique structure of roots, loose silt and high density of plants. Use of plots or transects is not practical either.

It is possible to identify and list the species of plants in mangrove swamps by walking along the periphery. In the event that the swamp is extensive, it is better to use a boat. What are the species found at the time of the initial survey? This is easy to list from a distance or a boat. It is also possible to visually assess which species was apparently most numerous during the survey. However what is difficult is to assess the density and height of the plants.

There are ways of getting around the practical constraints. First of all we need to decide on the scope of the evaluation. In a restoration project the basic information needed is about the condition of the mangrove vegetation before any intervention was launched. We also need information on how the intervention has helped the restoration process.

The restoration can itself be of two kinds; one where a patch of degraded mangrove is subjected to habitat improvement by deepening channels (example the fishbone intervention that is commonly adopted) by which the tidal flows are improved. The patch of mangrove is then protected from human interference and grazing (if any) by creating a barrier (a fence or deep channel). Without further intervening, the patch is allowed to restore.

In this case, where there is a fence, it is possible to periodically assess the edge of the mangrove patch (at different points) in relation to the fence. In other words, the distance between the outermost plants in the patch and the fence (after noting the species it belongs to, approximate height, etc) can be monitored at 20-30 points. Data thus obtained will indicate whether the mangrove patch is shrinking or expanding after the restoration was initiated.

The second approach is to restore a degraded mangrove by planting saplings of various species. In this approach it is possible to count the number of surviving saplings periodically and measure heights (where accessible) to evaluate the trends of restoration.

Both approaches are feasible. They however serve different purposes. Ultimately, it is for the villagers to decide as to what they want to see restored. If fencing off a patch is acceptable, then it is ideal. If not, the second approach is more viable. It is a matter of choice.

Lesson 3: Adopt restoration and evaluation strategies that are easily understood and appreciated by the local participants

Coastal Afforestation for Ecological Restoration: Dos and Don'ts

- ☒ Do not associate afforestation with planting trees; ecological restoration is not all about growing trees.
- ☒ Planting is needed only for restoring landscape elements that are characterized by a specific vegetation type.
- ☒ Choose the most appropriate species of plants based on expert guidance and the choice of local people (see Table provided below for guidance).
- ☒ When the preferred plants are trees, do not focus on TDEF; it is more appropriate to restore the littoral vegetation.
- ☒ Re-vegetation within human settlements should be sensitive to the likes, dislikes and needs of the people; avoid planting species like Pandanus, even if they are ecologically the best, when people are not in favor of the plant.
- ☒ Avoid planting Casuarina; if people have a preference for the species, it can be planted inland and not along the beach.
- ☒ A successful restoration project will soon enhance biodiversity locally; some of it may be useful while others are seen as dangerous or a nuisance. Educate the people on how to deal with unexpected results.

List of Plants Recommended for Coastal Afforestation

Tamil name	Scientific name	Type of plant	Where to plant
Poovarasu	Thespesia populnea	Tree	Littoral, homestead
Kadal poovarasu	Hibiscus tiliaceus	Tree	Littoral
Punnai	Calophyllum inophyllum	Tree	Littoral, homestead
Pungam	Pongamia pinnata	Tree	Littoral, homestead
Nochchi	Vitex negundo	Small tree	Homestead
Vaaganarayan	Delonix elata	Tree	Homestead
Phalasa	Butea frondosa	Tree	Homestead, littoral
Panai	Borassus flabellifer	Palm	Homestead, littoral
Thengai	Cocos nucifera	Palm	Homestead, littoral
Odhyan	Lannea coromandelica	Tree	Littoral
Naaval	Syzigium cumini	Tree	Littoral, homestead
Vembu	Azadirachta indica	Tree	Homestead
Paala	Manikara hexandra	Tree	Littoral
Aalam	Ficus bengalensis	Tree	Littoral
Peyatthi	Ficus hispid	Small tree	Littoral
Thaalai	Pandanus odoratissimus	Small tree	Littoral
Nithyakalyani	Catharanthus roseus	Shrub	Littoral, homestead
Aattu paadam	Ipomea pescaprae	Creeper	Littoral
Ravanan meesai	Spinifex littoralis	Grass	Littoral
Vettiver	Vettiveria zizanoides	Grass	Littoral, homestead
Naanal	Saccharum spontaneum	Grass	Littoral
Sottha moongil	Arundo donax	Grass	Littoral
Moongil	Bambusa & Dendrocalamus	Bamboo	Homestead
Eechai	Phoenix pusilla	Palm	Littoral
Karungkandal	Avicennia spp	Tree	Mangrove
Pazhaver maram	Rhizophora spp	Tree	Mangrove
Thillai	Excoecaria agallocha	Tree	Mangrove
Vaadumai	Terminalia catappa	Tree	Homestead, littoral
Munthiri	Anacardium occidentale	Tree	Homestead
Savukku	Casuarina equisetifolia	Tree	Homestead
Theikku	Tectona grandis	Tree	Homestead
Nilgiri	Eucalyptus spp	Tree	Homestead

Project ReCAP is a small but sure step towards building our understanding and capacity for coastal restoration. Worldwide studies on Climate Change and Global Warming predict that coastal communities would be the most vulnerable group in the coming decades. The nature and frequency of natural disasters would also continue to change and increase - while being prepared for the next tsunami may be preposterous as some would claim, it is indeed a fact that storm surges and cyclones would continue to wreck damage.

It is in this context that we need to come together to develop and implement initiatives for coastal protection. It is also important that these initiatives operate on a programme mode rather than be dictated by the vagaries of project funding. The challenges are many, and sometimes may appear unsurmountable, but it is imperative that we continue to combine our efforts to take on the challenge of reforesting the coasts.

Your Notes