EX-ACT Case Study

Food and Agriculture Organization of the United Nations

Sri Lanka Post-Tsunami Programme — DRAFT

June 2016, GHG appraisal, Asia Region, IFAD Project

Photograph: Sudeesa/Seacology

Summarized Results

⇒ The "**Sri Lanka Post-tsunami Programme**" aimed at the restoration of coastal ecosystems and rehabilitation of the fishing communities (reconstruction of buildings, houses and roads) affected by the December 2004 tsunami

⇒ The project resulted in a slight climate mitigation potential from afforestation and restoration of coastal environments (mangrove), changes in land uses

⇒ Expected long term benefits from the project on coastal environment are increased carbon sequestration from rehabilitated blue carbon ecosystems, i.e. mangrove and seagrass, and other ecosystems services such as fishery resource, coastal protection

Aiding and rehabilitating Sri Lankan fishing communities victims of the December 2004 tsunami

Keywords: Sri Lanka, Blue Carbon, Mangrove rehabilitation, rebuilding

Authors: Laure-Sophie Schiettecatte, Louis Bockel & Martial Bernoux

IFAD
Investing in rural people

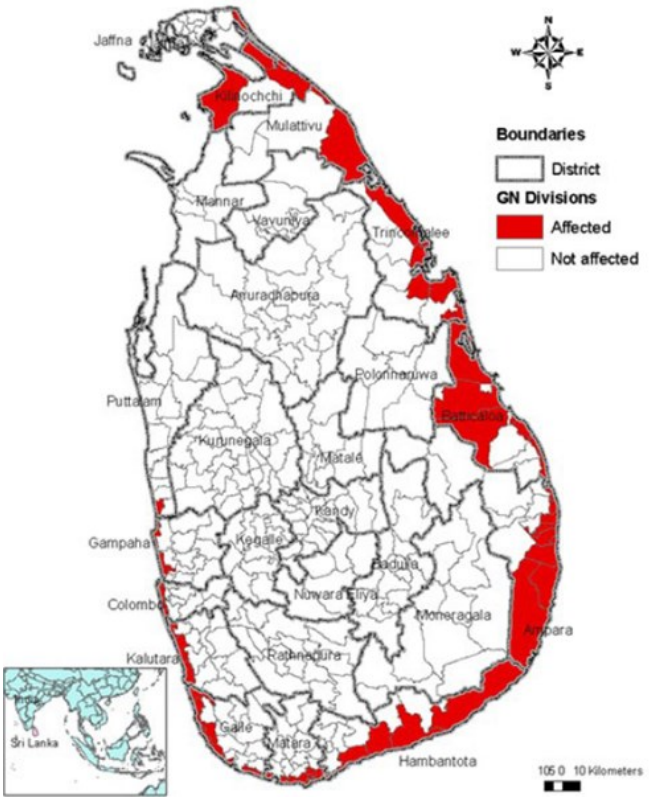
Note for the readers

Present analysis is based on the document Project Completion Report Validation "Post Tsunami Coastal Rehabilitation and Resource Management Programme" of June 2015. Data used from this report regrouped 2 projects, the **Post-Tsunami Livelihoods Support and Partnership Programme** (PT-LSPP), and the **Post-Tsunami Coastal Rehabilitation and Resource Management Programme** (PT-CRRMP). Both programmes shared the same goals and objectives, and are referred together below as the "greatest programme". In addition, a GEF project initially part of the PT-CRRMP but then became a separate project, the **Participatory Coastal Zone Restoration and Sustainable Management Project** (PCZRSMP), is also included in the EX-ACT analysis.

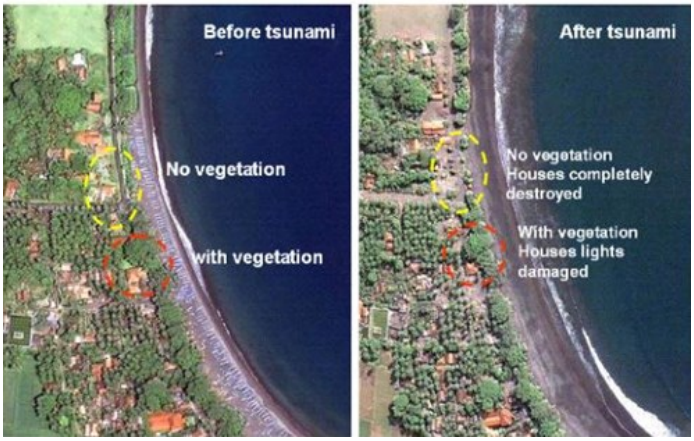
PT-LSPP & PT-CRRMP Context and objectives

Project rationale and objectives. The "greatest programme" aimed at aiding and rehabilitating Sri Lankan fishing communities who were victims of the December 2004 Tsunami. The programme's goal was to "*restore the assets of women and men directly or indirectly affected by the tsunami and to re-establish the foundation of their previous economic activities while helping them diversify into new, profitable income-generating activities.*"

Immediate objectives were: (a) women and men in tsunami-affected areas have recovered their assets, have re-established their usual economic activities while diversifying them in other and new profitable income-generating activities; (b) income levels per household member have risen above poverty levels tsunami-affected; (c) communities have been strengthened and are managing coastal resources and have been provided with essential social and economic infrastructure; and (d) the participation of women in social and economic activities has improved.



The **total project cost**, without GEF project, is **US$ 38.31 million**, financed at 84.7% by IFAD. By end of projects, **the number of direct beneficiaries was estimated to be 65,840 and 405,820 indirect ones**, of which 235,820 are women. The **GEF project** cost is **US$ 6.92 million** and focus at the protection and restoration of coastal ecosystems damaged from the tsunami.



The greatest programme consisted of the following 5 components: (A) Community-based coastal resource management, (B) Support to artisanal fisheries development, (C) Microenterprise and financial service development, (D) Social and economic infrastructure development, (E) Policy support and programme management.

The GEF programme consisted in 4 components: (A) Development and demonstration of best practices for effective restoration and sustainable management of key coastal ecosystems, with integration of adaptation to climate change vulnerabilities, (B) Mainstreaming effective ecosystem restoration and sustainable management, including integrated options to address for climate change vulnerabilities, into the planning and implementation of post-tsunami reconstruction, (C) Empowerment of coastal communities for local natural resources management enhancing sustainable livelihoods and adaptation to climate change vulnerabilities, (D) Learning, evaluation and adaptive management increased.

Data used for EX-ACT analysis

1. Agro-ecological variables

The project area is characterized by a tropical climate with a moist moisture regime. The dominant soil type was specified as LAC soils according to the IPCC classification. While the project will be implemented about a period of 10 years, EX-ACT will account in addition for a 10 year period of capitalization, which is needed in order to capture the full impact of from management of coastal areas on soil and biomass carbon stocks.

2. Investments Inputs from the PT-LSPP & PT-CRRMP

About 2,130 houses are built or rehabilitated with the projects, as well as 12 new districts offices, 18 landing sites and 76 new community buildings. In addition the project provide at the construction of 205 km of roads, table 1 & screenshot 1.

Table 1: Investments in houses, roads, landing site, new offices and buildings with the PT-LSPP and PT-CRRMP projects.

PT-LSPP and the PT-CRRMP Programmes	
Home new and rehabilitated (nb)	2130
Roads (km)	205
Landing sites (nb)	18
New district offices (nb)	12
Community buildings constructed (nb)	76

EX-ACT Screenshot 1: Construction of buildings and roads

Buildings and roads (in m2)		
Housing (concrete)	0	127800
Road for medium trafic (concrete)	0	717500
Industrial Buildings (concrete)	0	0

3. Mangrove restoration

- 250 ha of mangrove will be planting and we assume that 100% of the biomass will be restored, screenshot 2.
- In addition 1,050 ha of mangrove will benefit from co-management activities lowering down their degradation level from moderate (about 40% of the biomass lost) to a low degradation level (about 20% of the biomass is lost), screenshot 3.

4. Reforestation

52 ha of forest are established as vegetation belt along the coast at Panama and Kinnya, in addition to 20 ha of fuel wood plantation at Komari, screenshot 4.

5. Other land use changes

About 8 ha of degraded land will be used for planting of economically important plant species such as coconut, cashew and fruits plants, in Vakarai & Panama/Pottuvil, screenshot 5.

EX-ACT screenshot 2: restoration of the mangrove, i.e. additional replanting of 250 ha.

6.1.3. Rewetting

Type of vegetation	Area rewetted (ha) Start	Without		With		Percentage of nominal biomass restored Without	With
Mangrove	0	0	D	250	D	0%	100%
Tidal marsh	0	0	D	0	D	0%	50%
Seagrass meadow	0	0	D	0	D	0%	50%

EX-ACT screenshot 3: restoration of the mangrove, i.e. additional replanting of 250 ha.

5.1. Forest degradation and management

AEZ map — Zone 1 = Tropical rain forest — Zone 2 = Tropical moist deciduous forest — Zone 3 = Tropical dry fore

Type of vegetation that will be degraded	Degradation level of the vegetation: Initial State	At the end: Without project	At the end: With project	Fire occurrence and severity: Without (y/n)	Periodicity (year)	Impact (% burnt)	With (y/n)	Periodicity (year)	Impact (% burnt)	Area (ha) Start
Mangrove	Moderate	Moderate	Low	NO	1	100%	NO	1	100%	1,050
Select the vegetation	Select level	Select level	Select level	NO	1	100%	NO	1	100%	

EX-ACT screenshot 4: reforestation as vegetation belt and fuelwood plantation

2.2. Afforestation and Reforestation

AEZ map — Zone 1 = Tropical rain forest — Zone 2 = Tropical moist deciduous forest — Zone 3 = Tropical dry forest

Type of vegetation that will be planted	Fire Use? (y/n)	Previous land use	Area that will be afforested/reforested: Without	*	With	*
Plantation Zone 2	NO	Degraded Land	0	D	72	D

EX-ACT screenshot 5: Other land use changes, plantations of coconut, cashew and fruits plants

2.3. Other Land Use Changes

Fill with your description	Initial land use		Final land use	Message	Fire Use? (y/n)	Area transformed (ha): Without	*	With	*
@ Vakarai & Panama	Degraded Land	→	Perennial/Tree Crop		NO	0	D	8	D

Information, gaps and assumptions

Inputs & Investments: we considered the surface of new houses built with the project to be of about 60 m^2, we also included in the computations restored houses as new ones.

The project will distributed 1,000 energy efficient stoves in order to reduce the destruction of mangrove for firewood purposes. It is expected a 25% reduction of firewood consumption with the use of these stoves. More data about the annual fuelwood consumption might allow to determine mitigated emissions from the use of climate smart stove and from the decrease degradation on mangrove forest.

EX-ACT results

The following table (screenshot 6) summarizes the GHGs sequestration and the share of the balance per GHG from project implementation. Results are given in tonne CO_2 equivalent (tCO_2-e). Positive numbers represent sources of CO_2-e emission while negative numbers represent sinks. The left table section summarizes estimated CO_2-e emissions and sinks from the scenario without-project (left column), from the scenario with-project (middle column) and the total balance (right column). The middle table details the Carbon Balance under project implementation, showing the C sequestration from biomass and soil, and carbon emissions associated to reconstruction. The right table details annual CO_2-e fluxes for the different activities without and with-project implementation.

Project Name	Sri Lanka Post_Tsunami	Climate	Tropical (Moist)	Duration of the Project (Years)	20
Continent	Asia (Insular)	Dominant Regional Soil Type	LAC Soils	Total area (ha)	1380.123

Components of the project	Gross fluxes Without	With	Balance	Share per GHG of the Balance All GHG in tCO2eq CO_2 Biomass	Soil	Other	N_2O	CH_4	Result per year Without	With	Balance
	All GHG in tCO2eq Positive = source / negative = sink										
Land use changes											
Deforestation	0	0	0	0	0		0	0	0	0	0
Afforestation	0	-29,269	-29,269	-23,034	-6,235		0	0	0	-1,463	-1,463
Other LUC	0	-751	-751	-48	-703		0	0	0	-38	-38
Agriculture											
Annual	0	0	0	0	0		0	0	0	0	0
Perennial	0	-1,208	-1,208	-1,123	-85		0	0	0	-60	-60
Rice	0	0	0	0	0		0	0	0	0	0
Grassland & Livestocks											
Grassland	0	0	0	0	0		0	0	0	0	0
Livestocks	0	0	0				0	0	0	0	0
Degradation & Management	0	-127,760	-127,760	-108,125	-19,635		0	0	0	-6,388	-6,388
Coastal wetlands	0	-150,995	-150,995	-128,720	-22,275		0	0	0	-7,550	-7,550
Inputs & Investments	0	284,603	284,603			0	0	0	0	14,230	14,230
Fishery & Aquaculture	0	0	0			0	0	0	0	0	0
Total	0	-25,380	**-25,380**	-261,050	-48,934	0	0	0	0	-1,269	-1,269
Per hectare	0	-18	-18	-189.1	-35.5	0.0	0.0	0.0			
Per hectare per year	0.0	-0.9	-0.9	-9.5	-1.8	0.0	0.0	0.0	0.0	-0.9	-0.9

The with-project situation leads to a rather neutral carbon balance with CO_2-e sequestration of about **-25,000 tCO_2-e** over the 20 years duration of the present analysis. While investments from the "greatest project" leads to carbon emissions, i.e. **284,600 tCO_2-e**, the restoration of coastal zone and sustainable management allow for the sequestration of about **- 310,000 tCO_2-e** in the biomass and soil compartment (middle table). From this, mangrove restoration and replanting on 1,300 ha provide important benefits for GHG mitigation, accounting for a total of sequestering roughly - 280,000 tCO_2-e over 20 years.

Restoration of mangrove in degraded coastal areas will not only positively act in term of climate mitigation but will have also positive effects on adjacent ecosystems (terrestrial and marine such as seagrass and coral reefs) and the different services they provide (nursery ground, fishery resources, tourism, coastal protection…).

About EX-ACT

The Ex-Ante Carbon-balance Tool (EX-ACT) is an appraisal system developed by FAO providing estimates of the impact of agriculture and forestry development projects, programmes and policies on the carbon-balance. The carbon-balance is defined as the net balance from all greenhouse gases (GHGs) expressed in CO_2 equivalent that were emitted or sequestered due to project implementation as compared to a business-as-usual scenario.

EX-ACT is a land-based accounting system, estimating C stock changes (i.e. emissions or sinks of CO_2) as well as GHG emissions per unit of land, expressed in equivalent tonnes of CO_2 per hectare and year. The tool helps project designers to estimate and prioritize project activities with high benefits in economic and climate change mitigation terms. The amount of GHG mitigation may also be used as part of economic analyses as well as for the application for additional project funds.

EX-ACT can be applied on a wide range of development projects from all AFOLU sub-sectors, including besides others projects on climate change mitigation, sustainable land management, watershed development, production intensification, food security, livestock, forest management or land use change. Further, it is cost effective, requires a compared small amount of data, and has resources (tables, maps) which can help finding the required information. While EX-ACT is mostly used at project level it may easily be up-scaled to the programme/sector level and can also be used for policy analysis.

http://www.fao.org/tc/exact/ex-act-home/en/


Photo: Volodymyr Burdiak/Shutterstock

Blue carbon

The Blue carbon has been defined as "The carbon stored, sequestered or released from coastal ecosystems of tidal marshes, mangroves and seagrass meadows". Residing mostly in sediments this "blue carbon" can be released to the atmosphere when these ecosystems are disturbed, i.e. converted or degraded. Globally coastal ecosystems provide a wide variety of services, such as fishery resources, nursery ground for coastal fish and crustaceans, water quality, retention of shoreline, functions to adjacent coastal ecosystems, and revenues for local communities from tourism activities, with over two billion people relying directly on these services. Despite this, they are also highly vulnerable and have already been altered by anthropogenic activities, with a current conversion rate from 0.7 to 3% per year. Globally, mangrove lost already 35% of their coverage, and seagrass 29%. Drivers of their loss include conversion to aquaculture and fisheries activities, industrial and urban pollution, urban, coastal and tourism development, overharvesting for fuelwood and timber extraction, land clearing for agriculture, and climate change. Habitat destruction will thus carry the loss of these services and will contribute to GHG emissions, with subsequent economic consequences. Indeed if these emissions were accounted for, it is estimated that global deforestation would increase by up to 19%, and result in an economic damages of US$ 6 to 42 billion annually.

http://www.fao.org/tc/exact/user-guidelines/blue-carbon-fisheries-and-aquaculture/