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NITI Aayog

DMEO

DEVELOPMENT MONITORING AND EVALUATION OFFICE

Best Practices Compendium

Environment and Forest Sector

Evaluation of Umbrella Centrally Sponsored Schemes

January 2021

Overview

In August 2019, NITI Aayog commissioned an evaluation of Umbrella Centrally Sponsored Schemes (UCSS) under the Environment and Forest Sector. A part of this evaluation was focused on identifying global and home-grown best practices, case studies, interventions etc. to strengthen the implementation of various schemes under the Environment and Forest Sector.

This document is a by-product of the evaluation and presents a compendium of best practices collected through primary and secondary sources, and provides details on implementation mechanisms and impact of such practices. The document is intended to facilitate knowledge sharing and highlighting high impact and innovative practices which have resulted in positive changes for all stakeholders in environment and forest sector, both in India and outside.

Numerous practices have been documented, covering areas like innovation, technology, convergence, involvement of civil society organizations etc. These practices have been included based on their key impact and contribution to the wider public policy context, by highlighting lessons learnt which may be useful for scale-up or cross-adoption.

It is highlighted that the practices included in this document are not exhaustive, and it is acknowledged that various high-impact interventions and activities are being undertaken across the country, based on global and local lessons, which may not have been included in this document.

This document is expected to be used by policy makers, scheme managers, and implementers for learning lessons from proven successful implementation of interventions. The document aims to bring in one place the available resource of best practices and promulgate knowledge sharing.

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Part I: Human Resource Development

A. Eco-tourism

India has a diverse geographic landscape and is gifted with huge biodiversity. Eco Tourism in India has potential to generate direct and indirect revenue for government and local population. Below case studies highlights how ecotourism can be developed as a self-sustaining revenue generation model to generate benefit to local community as well as conserve the ecology and biodiversity of the area.

1. Andhra Pradesh

The Tourism Development Corporation of Andhra Pradesh took the initiative of Identifying and selecting the potential eco-tourism spots. They implemented multiple eco-tourism projects with assistance of the local community, at Belum caves and Jungle Bells at Tyda in Visakhapatnam District. This project successfully generated employment opportunities to the local tribal youth and ethnic minorities in the area. The eco-tourism has provided a unique opportunity for the ethnic groups to be integrated in the development around these areas. Further to the initiative the Andhra Pradesh Tourism Development Corporation (APTDC), along with the AP Forest Department initiated development work of eight new eco-tourism destinations these are Nelapattu (Nellore District), Balapalli (Kadapa District), Maredumilli (East Godavari District), Mamandur, Talakona, Nanniyal (Chittoor District), Ettipotala (Guntur District) and Kambala Konda (Visakhapatnam District)[1].

In all these locations the ecotourism activity is governed by the local indigenous tribal communities. In case of Maredumilli the Valamuru and Somireddypalem has been engaged in the eco-tourism activity. The Forest Department under the community-based forest managemnt project constructed Eco-tourism Centre infrastructure. Andhra Pradesh Tourism Development Corporation has been supporting the operation of development activity and provides marketing training to the tribes in services like food and beverage service, housekeeping, guide services, etc. The forest department has also developed a revenue sharing mechanism involving the local tribal community. The revenue generated by ecotourism activity is apportioned between the maintenance of the infrastructure and services rendered by the community which involves 30 tribal families of Valamuru, Somireddypalem and Addaraveedhi villages. The eco-tourism development has encouraged sustainable development by addressing the employment need of the local tribal community and minimizing the adverse ecological impact. The local communities are involved from infrastructure development to maintenance and execution of the project activity, preserving and strengthening traditional activities and integrating it to tourism-related enterprises.

[1] *https://www.academia.edu/23506418/ENVIRONMENTAL_CONSERVATION_AND_SUSTAINABLE_DEVELOPMENT*

2. Periyar Tiger Reserve in Kerala

Kerala Tourism Department has taken significant steps to deliver focused attention on ecotourism. The state has a separate ecotourism wing that has been created to provide policy support and guidance for the development of the ecotourism activities in the State. A project 'Thekkady Tiger Trail' was started to promote the local community participation in the conservation and management of forest and develop eco-tourism activity. For implementation purpose eco-development committees (EDCs) was set up involving the local community. The committee-initiated efforts towards reducing the negative impact of anthropogenic activity on the Sanctuary and to involve encroachers in conservation, instead of exploitation. An important outcome of the project was the conversion of former poachers have been integrated in the ecotourism activity that has developed a genuine interest in conserving the Sanctuary. As per the study by University of Calicut[2], under the project about 40,000 people of 5,540 families had been benefited. The eco-tourism activity involved Bamboo Rafting, Day Trekking Programme, Tribal Heritage, Bamboo Grove, Jungle Inn and Wild adventures. The development work provided alternate livelihood opportunity to local population and decreases the illegal trading of forest goods.

3. Bhitarkanika Wildlife Sanctuary (BKWS), Odisha

The ecotourism activity around the Area has emerged as an economic rescuer for local population. Eco-development committees (EDCs) involving local people have been set up. The economic activity in nearby villages of Bhitarkanika were restricted due to remoteness and lack to resources such as proper electricity and presence of industry, limited infrastructure and communication development. The sanctuary has 410 villages in the vicinity and a large number of people are dependent on the forest resources for their sustainability. As agriculture and fishing were two limited economic activity, ecotourism has provided different avenues of employment opportunities[3]. The income generated among community members has also resulted in the improvement of local livelihoods by developing infrastructure, education and health. The Bhitarkanika hotspot has been going well in terms of tourism business. The below graph presents the revenue earned in the starting phase of the project. The forest department and EDCs have been continuously organizing a number of training programmes to improve employment opportunity for the villagers such as tailoring, coconut cultivation, duckery, aquaculture, health camps for cattle immunization so as to reduce forest dependency of the locals and gain support for conservation. The ecotourism has delivered a major change in the society in terms of education of children. The ecotourism has not only resulted in economic development but has also initiated sociocultural development.

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[2] THAMPI, Josh, Ecotourism in Kerala, India: Lessons from the Eco-Development Project in Periyar Tiger Reserve, Nr.13, June 2005

[3] http://dspace.iimk.ac.in/bitstream/handle/2259/886/136-145.pdf?sequence=1

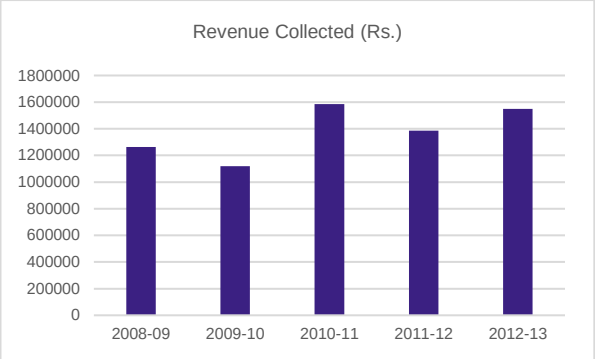


Figure 1: Revenue collected over the period

Figure 2: Trend in the number of tourist inflow

B. MIS for plantations

1. Maharashtra

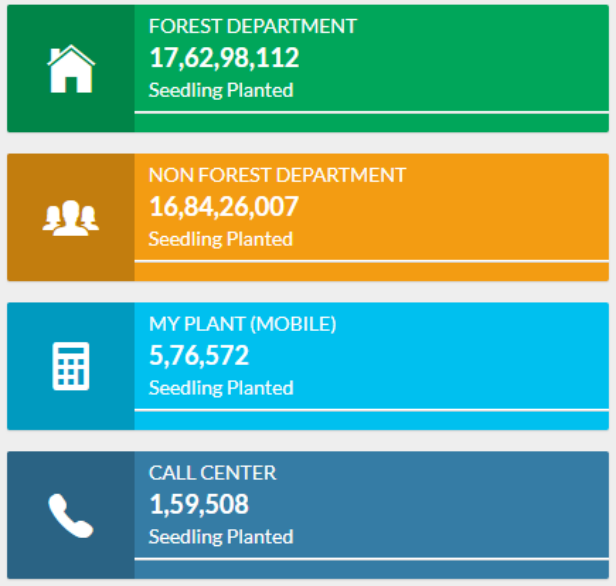
Maharashtra has implemented a real-time Plantation Management Information System (PMIS) for reporting forest conservation and protection related activities such as, afforestation as well as reporting of fire incidents. PMIS is guided by the State's ambitious 50-Cr. Plantation Programme under the Green Maharashtra Mission. For fully leveraging the MIS, digital connectivity among all the offices at range, division, and circle level, and headquarters is the essential prerequisite. This was achieved by utilizing National Informatics Centre (NIC) enabled leased line and BSNL's broad based connectivity.

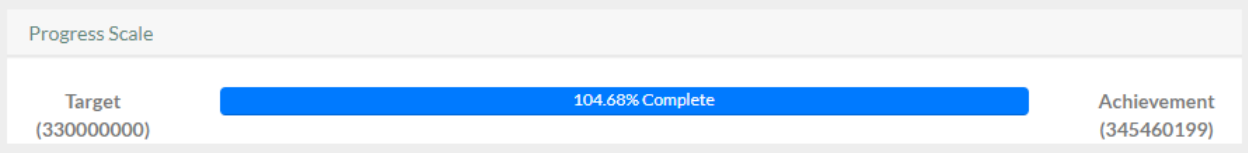
The portal reports data about the plantation sites, number of saplings planted in those areas, and their monitoring including the survival rate of the saplings. PMIS has gained significant momentum in the last three years. It enabled the Department to monitor plantation of 2,81,38,634 saplings over 65,675 sites under 2-Cr. Plantation Drive on 1st July 2016 followed by monitoring of plantation of 5,43,35,049 saplings over 94,257 plantation sites under the 4-Cr. Plantation Drive during the 2017 Monsoon. During the 2018 monsoon, plantation of 15,88,71,352 saplings over 1,45,683 plantation sites under the 13-Cr. Plantation Drive was monitored.

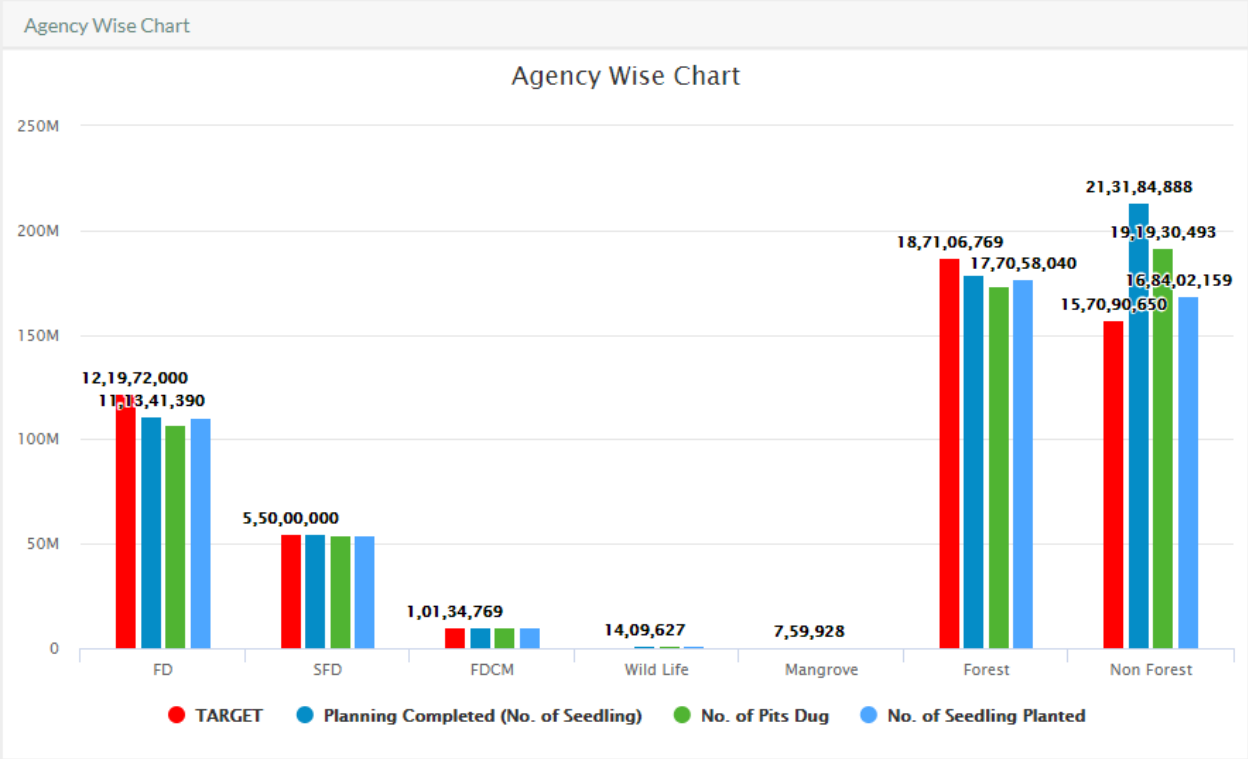
PMIS was integrated with mobile based Application 'Vanyukt Shivar', for monitoring pre-plantation, plantation and post-plantation survival monitoring. Vanyukt Shivar app, developed by Maharashtra Remote Sensing Application Centre (MRSAC), enables field officials to monitor survival and capturing/reporting photographs of survival. Additionally, 'MyPlants' mobile app was developed to enable non-Forest stakeholders as well to upload information about plantation undertaken during the plantation drive. 'My Plants' app enables people and organisations to feed in the data about the number of saplings they planted with the Forest Department. This includes details such as numbers of plants and species among other details, which creates a database of trees. The information captured in the app is automatically fed in the department website, thereby creating an integrated approach for reporting the aforementioned activities.

This MIS has also generated interest among other states as a good practice and plans are in place for adopting the model.

Some snapshots are provided below:







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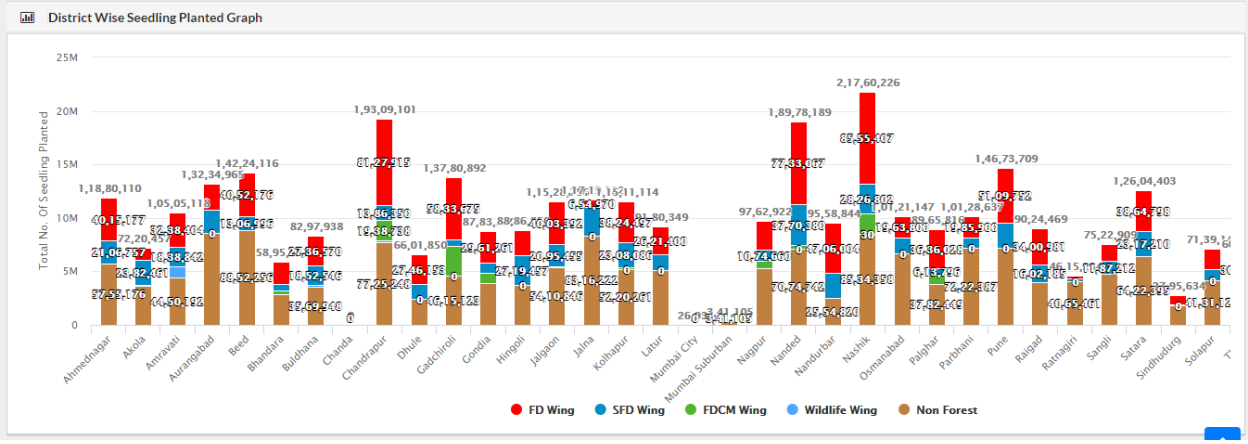


Source: Maharashtra Forest Department
http://mahaforest.gov.in/internal.php?lang_eng_mar=Eng&id=255

C. Landscape based approach to wildlife conservation

The landscape approach has been a well-known method of conservation for decades, however in India it has not seen a significant uptake. India encompasses a diverse range of ecosystems, from grasslands, coastal regions, forest cover to deserts and wetlands. Held in these ecosystems are about 8% of the world's biodiversity in its flora and fauna. These species interact and impact each other in a complex pattern; this, when coupled with the intricate relationship of human beings with ecosystems makes evident a need for a sustainable and inclusive conservation strategy.

1. Gir National Park

The Gir National Park (Saurashtra region of Gujarat in western India) is one of the seven sites selected for conservation of biodiversity through the Global Environment Facility and is implemented by the World Bank. It poses an ideal case for the implementation of the landscape approach in India. The Gir landscape is home to the only population of the Asiatic lion, a critically endangered species, however it also encompasses 97 villages in and around the PA, who depend heavily on natural resources of the forest for survival, including for fuel wood, subsistence, grazing of cattle, collection of resources for sale, among other things. Therefore, their survival, much like that of the lions, depends heavily on the biodiversity of the region. Through the course of the last few decades, it has become apparent that conservation needs can only be met through effectively addressing the needs of the population surrounding it as local communities have no incentive to support conservation activities that impinge on their rights to subsist on the forest.

While most Protected Areas (Pas) are created to prioritise the protection of endangered flora and fauna, with no explicit regard for people residing in the area, and depending on natural resources, the GEF-India Eco-Development Project strengthened the existing idea of integrated planning for management practices of the park while providing alternate livelihood opportunities for the locality. This created a sense of ownership and a lack of distance from the local ecosystem as they no longer felt alienated from their primary source of subsistence. Unless people and their needs are considered, it leads to the disruption of local culture and economy, which in turn creates a narrative of hopelessness and resentment[4]. This often results in retaliatory actions towards both, the forest officials, as well as the species that receive benefits from the conservation schemes, or cause depredation to their crop and livestock. Attitudes towards alternate forest resources were also an important consideration communities are slow to accept change as traditional cooking methods and foods, along with their habitual dependence on forest produce such as fodder are closely tied to their understanding of their sense of community, and therefore made the older generation in particular unwilling to change these practices. The traditional Maldhari grazing community also resisted the attempts to relocate them which would address habitat sharing issues.

In addition to the eco-development project, the Asiatic Lion Conservation Project by the MoEFCC divided the Greater Gir Region into zones, and established Zone Plans, which include the core, sanctuary and buffer zones, and Theme Plans, which include habitat improvement, wildlife health service, addressing human-wildlife conflict, awareness generation and ecotourism. This took into consideration the various aspects essential to the

[4] *https://link.springer.com/article/10.1023/B:BIOC.0000040009.75090.8c*

meeting the developmental needs of the local communities and their attitudes towards development and the critical need for recovery of the Asiatic lion species in the area.

D. Deploying response teams and experts for human wildlife conflict mitigation

Source: Menon, V, and Chaudhary, RG (2017). Conflict to Co-Existence: A dozen cost effective human interventions for co-existence with wildlife. Wildlife Trust of India, Noida - 201301, National Capital Region, India.

The Need

Human-carnivore conflict is increasingly in the news of late, with reports of leopards killed by angry mobs, or tigers straying out of their territories into human inhabited areas.

Conflict generally arises when local people, dependent on forests for their various daily needs, inadvertently come into contact with carnivores, possibly resulting in an attack. The shrinking of wild habitats and depletion of prey animal populations also lead big cats in particular to venture into human-use areas to prey on domestic cattle. Retaliations by people only aggravate conflict situations, increasing the risk of animal and human casualties. The need of the hour is to prevent these conflicts and resolve them safely when they do occur, without endangering humans or animals. Conflict mitigation demands an understanding of an animal's ecology and movements, and the root reasons for conflict. It also requires local communities to be sensitised.

The Solution

Taking a holistic approach, a team comprising a biologist, sociologist and veterinarian is constituted in high conflict areas. The biologist determines why animals may be straying into human-use areas and the sociologist works with local communities to sensitise and prepare them for possible conflict scenarios. This trio works with the state forest department and forms the Primary Response Team (PRT) along with local volunteers. The PRT is trained to handle crowds, identify the presence of carnivores and negotiate safe passage for them in conflict situations. Only if a situation escalates does a PRT inform and call in a Rapid Response Team (RRT).

The RRT is a team of specialists equipped to deal with displaced carnivores and injured humans. RRTs provide assistance in human-carnivore conflict mitigation and management of conflict animals, apart from in situ emergency relief to displaced or distressed wildlife. Each RRT comprises a transport vehicle, trained wildlife veterinarian, animal attendant, forest department staff, and necessary equipment and supplies.

1. Pilot Project - Dudhwa Tiger Reserve

WTI has constituted one RRT in Dudhwa Tiger Reserve and nine PRTs in certain fringe villages. Conflict between humans and big cats is an escalating issue in this landscape and

has caused the death of over 150 people in the last 10 years. Since these teams have been set up they have saved the lives of 14 big cats and innumerable people by averting and mitigating conflict in nearly 200 conflict cases.

E. Climate change adaptation for wildlife conservation

While climate change has been an accepted eventuality for decades, and its impacts widely researched, there is often a limitation in the mainstreaming of its extension beyond temperature change and other immediate physical impacts. Embedded in this change are a series of consequences that ripple and create outcomes that are unpredictable in their reach on various spheres of life. In order to understand these impacts with a degree of confidence, significant investments into research and modelling based on scenario analysis are required. There is currently a lacuna of such research into the realm of integrating climate change into the conservation planning paradigm in India.

The inclusion of climate change into risk reduction planning is an aspect that is becoming increasingly important across the field of land and biodiversity conservation. Based on interactions with stakeholders across various levels, it has become apparent that it is not a priority to do so when the immediate needs of development or conservation are unmet. However, this leaves India vulnerable to the impact of these changes which remain unaccounted for, and therefore unplanned for.

The well-known and popularly understood impacts of climate change, such as temperature rise, sea-level rise, change in precipitation patterns, increased likelihood of extreme events, among many others, all birth a series of changes on biological diversity across the world through a disruption of the complex relationships that various elements within an ecosystem have with each other. Specifically, in India, with its significant ecological diversity, as well as a growing population with developmental needs, the need to account for these elements is essential. For the period of 1901-2009, the Indian subcontinent has had a recorded increase of mean surface annual temperature of 0.56°C across 100 years[5]. There have also been differences recorded in the regional and temporal pattern of monsoons during the same period, however both General Circulation Models and Regional Climate Models have a poor record in projecting future trends of monsoons. The more recent attempts to create projections based on RCP 4.5 and RCP 8.5 scenarios under the CMIP5 model has yielded a better understanding among Indian climate scientists. In the short term, under both RCP scenarios, the range of temperature rise across a large part of India is projected to be from 1°C and 2°C, whereas across the north, northeast Himalayan regions and Rajasthan it could range from 2°C to 3°C. On a longer term, under RCP4.5 the warming across India is projected to be 2°C – 3°C and 5°C for the Himalayas, and under RCP8.5 a warming of 5°C and 7°C are predicted respectively. Precipitation across India is projected to increase by 6% to 14% by the 2080s, with certain zones receiving as much as 40-50% higher precipitation. With this in mind, some predictions can be made of the impacts on terrestrial ecosystems and aquatic ecosystems.

[5] *Sukumar, Sharma, et al (2016; 89-102)*

Based on the study by Sukumar et. al., the use of vegetation models coupled with climate projections predicted a change in vegetation type between 77% and 68% of forested area across India, between 1975 and 2085, with a tendency towards more moist forests. In states with significant forest cover such as Chhattisgarh, Karnataka and Andhra Pradesh upto 73%, 67% and 62% of the forests have been projected to change. The most vulnerable parts of India to these predicted impacts of climate change has been understood through the creation of a forest vulnerability index based on parameters such as forest density, forest biodiversity, and vegetation- type shift (based on model predictions), which indicated that the upper Himalaya, central and northern areas of the Western Ghats and certain portions of central India face the most vulnerability. Overall, it was observed that drier forests will be more severely impacted than those that receive higher rainfall in these future climate scenarios. Based on this study, roughly one-third of India's forested area will be impacted by the future changes to the climate, so much so that their basic constitution could be altered. These projections have been done without taking into account the one of the major pressures that currently impact India's forests – anthropogenic disruptions, such as fuel wood collection, NTFP extraction, free-grazing of livestock, fragmentation due to development projects, etc. Further, in the recent past invasive alien species, such as the Lantana Camara in south India, have had a significant impact on the ecosystem and the species that come together in a delicate, complex web to uphold it. All of this could change the ecosystem with little consistency, as different species could migrate to or adapt to differing landscapes. Thus, the management of conservation activities and species would be incomplete without an understanding of the unpredictability of these impacts. Through more specific studies, perhaps a better case could be made for specific activities to be undertaken across various landscapes.

Climate change is similarly predicted to have a significant impact on aquatic ecosystems. Changes to coastal, marine and in land fresh water systems are imminent, and will impact fish and other forms of aquatic life that form the ecosystem. However, less is known about the aquatic ecosystems and the impacts climate change is predicted to have on them. These ecosystems already face significant impacts due to the developmental needs of the Indian society, adding to which climate change impacts such as the change in rainfall patterns, temperature rise causing a change in evaporation rates and currents, salinity and acidity content of water bodies, nutrient cycling etc. will create a domino effect on the aquatic ecosystem and the patterns of the various species that form it. For example, coral reefs were impacted by sea surface temperature changes in India between 1997 and 1998, which have been associated with the El Nino-Southern Oscillation. Therefore, if the frequency of ENSO events increases (as it has been predicted to) it appears to be a given that coral reef species will face significant bleaching and mortality and would decline significantly.

Sukumar et al. summarise certain broad adaptive strategies for terrestrial ecosystems and aquatic ecosystems.

- **Anticipatory planting of species taking into consideration latitudinal and altitudinal changes**

A change in temperature would most likely result in a universal change in species' migratory patterns from lower to higher latitudes, as well as towards higher altitudes from lower altitudes.

However, on a more regional level, the changes would be contingent on the impacts of climate change at a smaller scale. Therefore, the use of models for specific regions could vastly improve the understanding of forest cover change and species movement in order to aid the predicted shifts through planting activities, and can increase adaptation, the genetic variability of plant species would also need to be taken into account.

- **Restoration of degraded and altered ecosystems**

In order to maximise the probability of a minimum number of species surviving, conservation management activities should promote the plantation of mixed species, which should account for their existing presence in different biomes and their resilience to the variability there. Additionally, the inundation of invasive alien species is a factor that needs to be closely monitored and actively controlled through the restoration of the ecosystem by planting native species.

- **Implementing sustainable forest management practices**

Scientific practices in order to encourage the growth of trees and forest cover in order to increase carbon sequestration, proper care of natural forests in order to lessen the risk of fires that cause large scale destruction, care with regards to diseases and pests and the sustainable use and collection of NTFP are some practices recommended by the authors.

- **Redesigning the existing PA network**

The rationalization of existing PA boundaries, and the redrawing of new boundaries while accounting for climate change induced impacts, such as the altered migratory patterns of species to higher altitudes, is an important activity in the ambit of adapting to climate change.

- **Shifting to landscape approach to conservation planning**

The shift towards landscape level planning is an essential step towards the sustainable, long term management of pressures from development needs and climate change disruptions. Corridor planning and management to ensure connectivity of habitats given the complexity of the differing land ownership patterns (government, private) across a landscape forms an integral part of this.

- **Building institutional mechanisms for climate change adaptation**

In addition to the governmental institutions at the Centre, it is central to adaptation to set up institutions at a more local scale and build capacities in order to ensure the sustainable implementation of these strategies.

F. Biosphere Reserve Entrepreneurship

1. Lake Vänern Archipelago and Mount Kinnekulle

Source- BIOSPHERE RESERVE ENTREPRENEURSHIP A pilot study on social entrepreneurship in the biosphere reserve Lake Vänern Archipelago and Mount Kinnekulle, Sweden,2011, Bergstrand., Bert-Ola, Björk. Fredrik

ÅNGSÅGSFÖRENINGEN

Ångsågsföreningen is a non-profit organization working in Biosphere reserve Lake Vänern Archipelago and Mount Kinnekulle with a core idea of bringing back the oldest steam-saw, which will result in preserving and developing the cultural heritage and will spread associated local cultural knowledge by educational efforts. The finance for the association is mainly through grants and has been developing their own sources of finance (income through educational efforts, tourism through cultural historical items) available at http://www.angsag.se/

BERITS TEXTILSERVICE

Berits Textilservice is a textile company engaged in Biosphere reserve Lake Vänern Archipelago and Mount Kinnekulle. Their idea is to make clothes out of Eco textile and repaired old clothes. the venture is also engaged in educational efforts to involve more people to understand the value of re-using and re-designing clothes.

LOCAL SYNERGIES OF FOOD & ENERGY

In Biosphere reserve Lake Vänern Archipelago and Mount Kinnekulle, 'Local synergies' project has been initiated to connect the food and energy production taking place in the reserve into a large-scale local ecosystem. The side products from the local biogas production is utilised in the local food production like pig farming and growth of vegetables. The methane gas generated is developed into car-fuel. The waste generated from the food production is utilised again in biogas production.

2. Yayu Biosphere Reserve (Ethiopia)

In Yayu biosphere reserve Sustainable agriculture initiatives have been started which targets at coffee production. This initiative is linking local coffee production with the organic and free-trade markets. This is done through the training and assistance regarding the harvesting, processing, certification and marketing procedures provided under the initiative. The strategy revolving around fundraising and extracting renewable energy from coffee-waste is expected to drive further local development.

3. Entlebuch Biosphere Reserve (Switzerland)

In Switzerland the initiatives focusing on "development of the BR-linked label" has been started in Entlebuch BR, the project focuses on identifying the high-quality products that can be manufactured within the BR. As per the Swiss National Tourist Office three of identified products has awarded the prestigious 'NaturPur' label. The initiative will promote and provide market linkage to the local manufactured products. the initiative is a success and has been executed with interdepartmental coordination.

G. Public Private Partnership

Sector	PPP model	State/ year	Entities involved	Private Members	Project cost	Concession period
Water & Sewage	BOT including the Design and Finance	West Bengal 2007	▪ Kolkata Metropolitan Development Authority ▪ Naba Diganta Industrial Township Authority	Jamshedpur Utilities and Services Company Limited and Voltas Limited	Rs. 70.09 Cr.	30 years
Water Supply	Operations & Management Contract	Maharashtra 2006	▪ Maharashtra Jeevan Pradhikaran	Subhash Projects & Marketing Limited, UPL Environmental Engineers Limited and Hydro Comp Enterprises India Private Limited	Rs. 182 Cr.	10 years
Urban Water Supply	Operations & Management Contract	Karnataka 2005	▪ Karnataka Urban Infrastructure Development and Finance Corporation (KUIDFC)	Veolia Water (formerly known as Compagnie Generale des Eaux, France)	Rs. 32 Cr.	42 months (Later extended to 59 months)

Source: Public private partnerships in India, Ministry of Finance, Government of India[6]

1. Salt Lake Water Supply and Sewerage Network in West Bengal

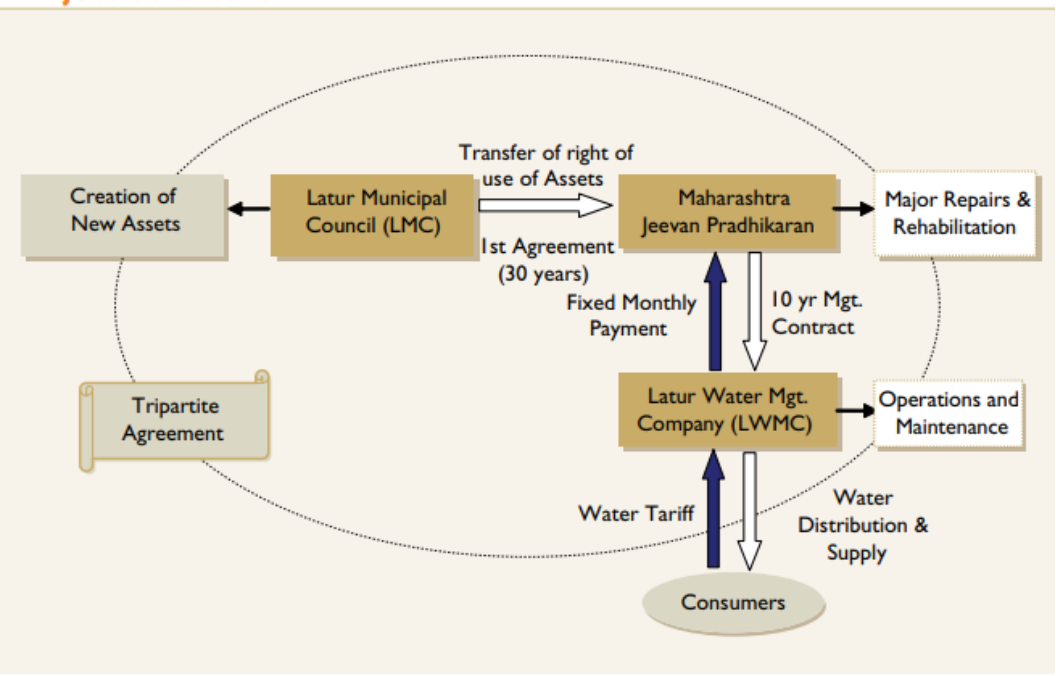
The Salt Lake City in Kolkata had emerged as Information Technology / Information Technology Enabled Services hub in the state. Although having a consumer mix at the city (office spaces, government institutions), the area lacked an organized water supply and sewerage system. The efforts were made by Kolkata Municipal Development Authority (KMDA) in coordination with the Nabadiganta Industrial Township Authority (NDITA) to work on a combined water supply-cum-sewerage project which was to be implemented under the Built-Operate-Transfer (BOT) PPP arrangement. Central government's scheme of Jawaharlal Nehru National Urban Renewal Mission (JNNURM) provided the financial assistance for the project. Based on the proposal received the KMDA and NDITA selected a private developer. Under the partnership the private developer was responsible for the development, functioning and maintenance of the water/sewage network and treatment plant at the site. For 30 years the private developer was allowed to charge the consumers for the service of water supply and sewerage tariff.

[6] *https://www.pppinindia.gov.in/toolkit/ports/module3-rocs-slwsasn5.php?links=slwsasn5*

2. Latur Water Supply Project in Maharashtra

Latur had been facing acute water shortage and huge pressure from demand side. The demand coverage was as low as only 70% of the population could receive water once or twice per week. One of the major reasons for huge gap was the water leak and high percentage of Non-Revenue Water (NRW) due to inefficiency of the supply system. The government initiated the “Stage V water supply scheme – a bulk water supply and distribution project”. Maharashtra Jeevan Pradhikaran (MJP) was handed the responsible for the operations and maintenance of available water supply schemes. MJB also has the right to raising finance required to complete the water supply scheme through a collaborating with a private operator. This decision to coordinate with a private party was driven by lack/limited of resources in Latur to finance and manage the water supply networks. Hence the project was implemented based on the PPP model with a “hybrid version of a management contract” wherein the private operator took greater responsibility then that of a standard level of technical/ commercial risks in the management contract.

Project Structure



3. Urban Water Supply Improvement Project in Karnataka

With the assistance from World Bank the Government of Karnataka (GoK) initiated a “water supply service delivery improvement programme” with private sector participation. The funding assistance for this project was from the World Bank through the nodal agency -Karnataka Urban Infrastructure Development and Finance Corporation (KUIDFC). The private developer was responsible capital works of the rehabilitation, operation and maintenance of the water supply network. KUIDFC plays an important role in the project for the maintaining the effective

operations and necessary assistance to the private developer. Further to coordinate the O&M activity a Project Improvement Units (PIU) was established.

H. Payment for Ecosystem services

1. Yasuni National Park, Ecuador[7]

The Yasuni National Park in Ecuador is generally considered to be one of the richest biodiversity 'hot spots' in the world. It is also rich in natural resources, including oil.

In 2007 Ecuador proposed a plan under which it would stop oil exploitation in the region if sufficient funds could be raised to compensate for lost oil revenues; the deal called for a compensation payment of 50 per cent of an estimated US$7.6 billion in lost oil revenues.

According to the UN, by November 2011 US$116 million had been raised – enough to temporarily stop oil exploitation in what is described as a 'core' area of Amazonian rainforest. Funds were raised from a wide variety of sources – termed 'crowdfunding'. Regional governments in France and Belgium contributed while countries which pledged support included Chile, Colombia, Peru, Australia, Spain, Georgia and Turkey. A New York investment banker donated her annual salary and several celebrities also contributed.

Supporters of the scheme – a form of national scale PES – say it could be a model for the way the world pays to protect important places. The money raised is guaranteed to be used only for nature protection and renewable energy projects. The challenge now is to broaden the scheme, ensuring the conservation of a wide range of vital ecosystem services while at the same time guaranteeing ongoing development revenue for the country.

The biological diversity of the Yasuni area has astonished scientists. One six-square-kilometre patch of the park was found to have 47 amphibian and reptile species, 550 bird, 200 mammal and more species of bats and insects than anywhere in the western hemisphere. The Yasuni region is also home to as yet uncontacted indigenous tribes.

2. Supplying New York City[8]

New York City authorities are responsible for providing more than 9 million people in the city and surrounding counties with 5 billion litres of freshwater each day, most of it sourced from a 5 200 square-kilometre watershed area in New York State.

In the 1980s the city was faced with the need for new legislation on water management as water quality showed signs of deteriorating. Rather than investing in new filtration plants, officials decided to adopt a more progressive approach which would protect the water at source, by acquiring some upstate watershed land and protecting the surrounding forest.

While development rights in some sensitive watershed areas were purchased over the years, the main part of New York City's programme – an early type of PES – has been a

[7] *Sources: http://www.guardian.co.uk/environment/gallery/2011/dec/30/yasuninational-park-ecuador-rainforest; http://www.eartheconomics.org/Page126.as*
[8] *Source: Appleton 2002; Perrot-Maître and Davis 2001; Stanton et al 2010*

series of agreements with landowners who control more than 70 per cent of land in the catchment area. These agreements – often involving long and complex negotiations – include compensation to farmers and others for keeping lands in their natural state and for undertaking environmentally beneficial land and stream management measures.

Farmers also receive payments for implementing pollution prevention measures and for the cost of additional labour involved. Forest landowners who adopt good forest management practices such as low impact logging can benefit by receiving additional logging permits in other areas. Certain forest landowners are also entitled to an 80 per cent reduction in local property taxes.

A 9 per cent increase in New York City water bills funded much of the US$1.5 billion decade-long expenditure programme in the watershed area. Building the filtration facility, however, would have cost between US$4 and US$8 billion, plus annual operating costs of another US$250 to US$500 million. The benefits of New York's watershed protection measures are not only financial; the programme is considered to be a successful experiment in taking shared responsibility for watershed protection and, according to officials, it continues to deliver safe and healthy water.

3. Farmers and Forest Dwellers in Mexico[9]

The Scolel Te Plan Vivo project involves more than 670 producers and nearly 50 communities in the central and northern Chiapas and northeast Oaxaca areas of southern Mexico. It is a model for community-based, sustainable land use and sequestration projects in developing countries.

The project, established in 1996 and operating on an entirely commercial, self-sufficient basis since 2002, aims to deliver a wide range of CO_2 sequestration and emissions-reduction benefits from changes in land use activities. Local people involved in the scheme – the so-called producers – combine existing land uses and agricultural activities with sequestration projects such as the creation and restoration of indigenous forest and woodland as well as agroforestry activities. Most are small-scale farmers, forest dwellers and other land users with recognised land tenure or user rights. Altogether the Plan Vivo project brings together about 2 400 Mayan and Mestizo families.

Under the scheme, sequestration and emission reductions are 'bundled' together with social and other benefits: together the delivery of these services combines to make up credits – Plan Vivo certificates – paid to producers. Over the years the project has developed rigorous carbon accounting procedures with producers being paid for the supply of ecosystem services only at the end of a certification and monitoring process.

Project coordinators – usually local or national NGOs, or nonprofit organizations – recruit producers and coordinate training. They negotiate purchase-contracts with buyers of credits in the carbon market and oversee carbon payments too. Plan Vivo is estimated to have been responsible for sequestering many thousands of tonnes of CO_2. By the end of 2010 the project had sold more than 432,166 Verified Emission Reduction offset credits

9 Vital Graphics on Payment for Ecosystem Services, Realising Nature's Value

(VERs) on the carbon market. It has also brought about major changes in land use and various social benefits.

I. Supporting adaptation to climate change[10]

Climate change disproportionately harms people in developing countries with fewer resources to cope with volatility, and smallholder farmers who depend on agriculture are particularly at risk. For example, an examination of historical data on climate and yields in India suggests that farmers recovered only 14 percent of yield losses due to changing weather patterns.[11]

There are some strategies that have been proven effective:

- **Take up of technologies and practices that support resilience**: J-PAL affiliates have tested a range of strategies to encourage the take-up of technologies that could mitigate the impacts of climate change on agricultural productivity, including stress tolerant seeds that maintain yields in the face of extreme weather, techniques that preserve soil quality, and are testing technologies to store rainwater to help farmers cope with erratic rainfall (**Odisha, India**[12], **Sierra Leone**[13], **West Bengal and Odisha India**[14], **Mozambique**[15], and **Tanzania**[16]).
- **Livelihood programmes**: J-PAL affiliates have also tested livelihoods programmes that help households diversify their incomes in several contexts. A **multifaceted livelihood program**[17] that provided ultra-poor households in seven low- and middle-income countries with a productive asset, training, regular coaching, access to savings, and consumption support led to large and lasting impacts on their standard of living. Also, this strategy could help smooth consumption in the case of weather shocks by creating

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15 Boucher, S., Carter, M., and Malacarne, J. 2018. "Achieving development impact with complementary stress-resistant seed & financial technologies (Mozambique)." AEA RCT Registry.
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economic opportunities outside of agriculture (**Bangladesh**[18], **Nicaragua**[19], and **Zambia**[20]).

- **Lean season loans for small-holder farmers:** In the absence of formal credit markets, many farming households engage in costly coping strategies, such as reduced food consumption, informal borrowing, and short-term work on other farms, to make ends meet between harvests. Because farmers earn the majority of their income at harvest, they may face food insecurity in the period between cash flows, or struggle to invest in their plots for the next planting season. As weather and precipitation become more unpredictable due to climate change, farmers will experience greater challenges to coping with seasonality. In Zambia, J-PAL affiliated researchers examined the impact of access to seasonal credit on the wellbeing of farming households as well as agricultural output. They found that access to food and cash loans during the lean season increased agricultural output and consumption, decreased off-farm labor, and increased local wages.

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Costas, M., Mobarak, M., Mommaerts C.D., and Morten, M. 2019. "Migration and Informal Insurance." Working Paper.
19 Macours, K., Premand, P., and Vakis, R., 2012. "Transfers, Diversification and Household Risk Strategies: Experimental Evidence with Lessons for Climate Change Adaptation." Working Paper, Paris School of Economics.
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