Conservation of Riverine Resources through People's Participation: North-Eastern Godavari Basin Maharashtra, India.

FINAL REPORT FOR

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SAMVARDHAN

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Front Page: Project Leader Dr. Nilesh Heda discussing with fishermen of the Savali village.

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Dedication

Dedicated to

All the almighty rivers of Indian subcontinent…...

All the fish needs is to get lost in water. All man needs is to get lost in Tao.

Chuang Tzu
4th century BCE Chinese philosopher on whose teachings Lao-tse based Taoism.

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- **DHAMANI KHADI MAJUR SANGH**
- **DAILY LOKMAT**
- **LOWER PAINGANGA DAM OPPOSITION COMITY**
- **PEOPLE OF DHAMANI VILLAGE.**
- **PEOPLE OF MANABHA VILLAGE.**

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The Motivation

"I love any discourse of rivers, and fish and fishing".
Izaak Walton, The complete angler.

The seeds of this concept were sown in my mind 20 years ago at the beautiful bank of the river Arunavati, the then perennial tributary of the river Adan. Nurturing domestic, agricultural, aesthetic needs of the man and entire biosphere, I saw this river with deep love, gratitude and sometimes even with fear. Abode of numerous fishes, whiskered catfishes, silvery puntius, snake like eel, Glass fishes, this river attracted me very much. A group of local fisher folks (Bhoi) also attracted me equally.

How many different types of fishes are found when these anglers' throw their cast nets? Are there any friends, colonies, schools among these fishes? These are some of the questions that arose in my mind at that time.

After joining Center for Ecological Sciences, Indian Institute of Science, Bangalore I got the privilege to work with the 'Ecosystem people', the people who have bio-mass based civilization and culture. Two things I firmly came to know about these people that these people know that in a river, how many species of fishes live and in which part (Habitat) of the river, thus these people have very good deal of the knowledge about the natural world surrounding them. Second, these people respect and love the nature.

For them the river is not just a physical object but Mata (Mother), different animals as brothers. Thus, unknowingly they protect the same. Working with these people, chatting with them, asking queries is enchanting experience. I learnt more practical life of biology than what I was taught while in M. Sc.

Seeing Adan or Arunavati after about 20 years is a frustrating experience. Pollution, steep decline in availability of river water, shifting of Bhoi people from fishing to other more degraded occupations is common phenomena. Many areas of the river become the dumping ground for the domestic wastes, plastic bags and Ganesh statues. Many fish species has gone extinct in these years. In a short period how drastically everything changed! Can't we stop this situation? Can't we restore again the mother's old days? Certainly, we could. Knowledge based conservation measures with people's participation is only way to halt this, which is an important theme of this project

Chapter 1

Executive Summary

Present project is the fusion of classical ecology and direct social interventions. Knowledge based management of wetland and human resources are main themes of the project. It was hypothesized that, *the solutions to local problems would best begin at the local level by the local stakeholders which can be facilitated by empowerment done by external agencies like NGOs.*

Conservation of the riverine resources through people's participation is basic aim of the present project. Holistic approach of the river conservation where ecological, human resource, political, economical dimensions of the problem will be considered is philosophical and scientific base of the project.

The main objectives of the project includes, conservation of the riverine resources through holistic ecosystem approach, understanding the problems of river Adan and associated people and to create status report on the present condition of riverine resources and people's livelihood, creation of the institutional structures of the local people and capacity building of the same, to strengthen livelihood of communities by introducing aquaculture, *National Rural Employment Guaranty Act* (NREGA) and positive intervention by making use of the existing laws and government resolution for the conservation and sustainable use of the resources and to make effective awareness campaign.

Eroding rivers and other wetlands, vanishing fish fauna and diminishing employment opportunities of poor fishermen and labour are all interlinked problems identified. Increasing invasive species of freshwater fishes, increasing pollution are directly affecting fish fauna.
The ignorance of the common people and government machinery about the present condition of the wetlands is of grave concerned. The direct effects of these changes are on fishermen and resource dependent communities.

The project was effectively carried out and in the short span of one and half years many fundamental mile stones of long term positive social and environmental change have been laid. The important output produced was creation of people's institutional structures in the form of study groups, small saving groups and cooperative societies, identification of problems, target groups, and core work area and at selected places intervention for the sustainable livelihood and conservation of fishes and river has been implemented.

The main emphasis of the program is to build capacities of the local people to solve their own problems. In this situation the role of NGO or researchers is to catalyze the processes. All the positive processes have been completed through capacity building of the local people.
Sustainability of the processes has been maintained by developing leadership from the community. Through scientific aquaculture and NREGA, livelihood has been secured.

Through systematic awareness campaign the issue has been spread in all sections of the society. Through ecological field work present status of the wetland resources understood. Through group discussions, individual interviews and village community surveys present status of human resources has been portrayed.

During the project, it was learnt that, there is need to register for fishermen's cooperative society for effective utilization of the wetland resources, to fetch benefit from the government schemes and to lower discrimination. Although fish culture can elevate the condition up to certain extent but sustainability of river should be increased through *Whole Basin Management Approach* for sustainable future. NREGA can be effective tool for the restoration of natural resources and sustainable livelihood. Conservation of traditional tanks is essential to safe guard ecosystem goods and services. There is also need to establish FWPAs along the river.

During this project we have found out few villages, which are interested in doing positive changes. This discovery is important as in future other villages can learn lesson from these villages. The project was so dynamic and holistically designed that it touches all the facets of the people and landscape like poverty orientation, gender equity, human rights, democratic functioning, environment etc.

After a yearlong project now a ground is made on which larger interventions can be possible.

Figure 2: Traditional wisdom of conservation is important prerequisite for effective work.

Chapter 2

Background of Project

2.1 Rational of the project:

2.1.1 Towards Positive Intervention:

Conservation of natural resources and its sustainable use is only possible if local resource dependent people involved in the same. Involvement of local people can be achieved if livelihood of local people secured. We believe that, livelihood of local people can be secured through three kinds of processes (see figure 4).

1) Building knowledge base of biological resources and availability of knowledge for all.
2) Providing financial and scientific assistance in the form of revolving funds, low interest loan, value addition, capacity building about scientific resource culture etc and
3) Sincere implementation of the laws and government resolutions and whenever necessary advocacy of the issues.

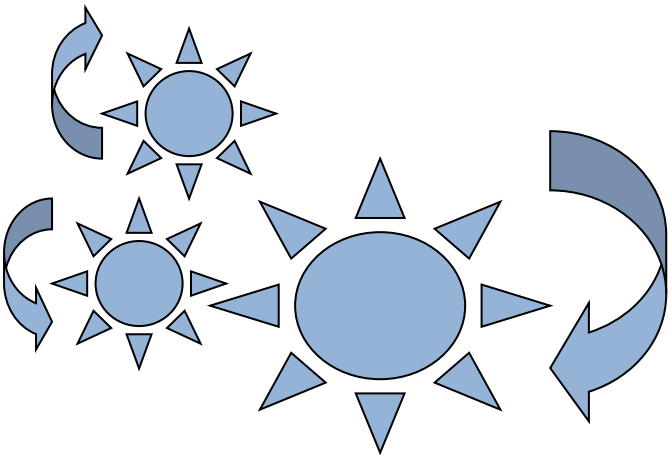


Figure 3: Three main components of positive intervention

2.1.2 Traditional Knowledge:

Local resource dependent people such as fishermen are victims of recent industrial revolution and widespread destruction of aquatic biodiversity. These communities possess practical knowledge about the resources and their conservation. Today, a growing body of literature attests not only to the presence of a vast reservoir of information regarding plant and animal behaviour but also to the existence of effective indigenous strategies for ensuring the sustainable use of local natural resources (Johnson 1992).

These strategies include multiple species management, resource rotation, succession management, landscape patchiness management and other ways of responding to and managing pulses and ecological surprises (Berkes et al. 1999).

2.1.3 Livelihood:

It was noted that, if livelihood of resource dependent communities were in danger then it would affect surrounding biodiversity by exploitation. There are many examples of these kinds of vicious circles e.g. destructive fishing techniques used by traditional fishermen.

2.1.4 Access to Knowledge:

There is another dimension to this situation, lack of knowledge about the two things viz.

Resources and laws, making situation worst. For an example, every year, state fisheries and irrigation departments auction water bodies to local people, but there is no mechanism of the information disbursement (how many water bodies? Distribution, their biological characteristics, auction value etc). As a result of this ignorance, those wealthy people who have access to information are benefited. Thus, for effective sustainable development, information dissemination in local language is essential.

2.1.5 Alternative Livelihood:

Angler's communities since antiquity depend on natural water bodies for their subsistence. Recent destruction in these natural entities creating direct influence on these communities, thus along with conservation there is a need to explore secure, eco-friendly livelihood options. These options should be as possible as analogous to their traditional skills. The traditional skill of fishing communities is *fishing* thus fish culture might be a best option for them. Agriculture may not be suitable for fishermen as historically they are '*fishermen*' and not '*agriculturist*'. In addition, recent episodes of farmer's suicides in this area created need of development of other sectors like aquaculture. Nevertheless, such options should be community chosen which require studies regarding community aspirations about the development and sustainable future

2.2 Background information on the scope of the project:

2.2.1 Fishes: Out of site out of mind:

Figure 4: Adan Fish Fauna. Osteobrama cotio peninsularis (Silas, 1952).

Fishes are most threatened biodiversity element in the ladder of life. Freshwater fishes are thought to be the world's most threatened group of vertebrates after amphibians. Unless they are protected, 20 % of the world's freshwater fishes may become extinct in the next 25-50 years (Moyle et al. 1992). The future extinction rate of fresh water animals is predicted to be almost 5 times greater than that for terrestrial animal and 3 times that of coastal marine animals (Saundersen et al. 2001).

2.2.2 Eroding Wetlands:

Inland freshwater wetlands of India are rich repositories of biodiversity and crucial for the livelihood and survival of millions of people. Unfortunately, these vital ecosystems are facing serious threats from development activities and they are disappearing from the landscape at an alarming rate. Recent studies show that, over last one decade 38% of wetlands of size of more than 2 hectare have disappeared from the Indian landscape.

2.2.3 Effects of ecological meltdown:

The cascading effect of this ecological meltdown is directly on the local communities who depend on these resources for subsistence. There are 387 communities of fisher folk

throughout the length and breadth of India dependent on 191,024 kilometres of rivers and canals and numerous wetlands and reservoirs (Anonymous 2002). These communities have been evolved over the period to sustainably harness the goods and services from the wetlands. These communities are dependent on wetlands in various degrees and are the victims of recent changes.

2.3 Problems Identified:

Since long ago, I am involved with fishing communities of Eastern Maharashtra. During my PhD fieldwork, I had a privilege to work with these communities and observed their condition keenly. During this period, I observed following situations and problems (Heda, 2007):

Figure 5: Adan Fish Fauna. Chanda nama Hamilton- Buchanan, 1822

2.3.1 Depleting fish fauna:

Fish fauna is depleting with accelerating rate due to spread of invasive species, habitat destruction, increasing anthropogenic pressure, destructive fishing methods of the non-traditional fishermen, construction of dams and discriminated management of the riverine resource including water. Thus, Tilapia [*Oriochromis mossambic (Peters)*] fishes are increasing in Kathani River.

Tilapia is invasive alien species of fresh water fish very much harmful to local fish fauna. Due to dam construction, down-ghat section of Adan River is changing in to mere ditches. Unfair use of river water by rich farmers leading to unavailability of water for fishes to perish. According to knowledgeable individuals river Adan was ones Perennial River but after dam construction and increased use of water pumps the river becomes annual and hardly flows for the period of 6 to 8 months.

Figure 6: Counting the scanty catch. A Traditional fisherman.

2.3.2 Endangered livelihood:

Due to above problems, livelihood of traditional fishermen is in jeopardy. Thus, ones the master of river now working in the big cities like Mumbai, Pune, Surat as labour due to drastic declining of fish fauna.

2.3.3 Paradigm shift:

There is need to shift to the other alternative livelihood options like fish culture.

2.3.4 Information deficit:

There is a lack of data on the availability, threats to the habitat and species and availability of the lakes and ponds for the fish culture

2.3.5 Discrimination:

Discrimination is another important man-induced factor which, depriving traditional fishing communities from the resources. Thus, in the downside of Adan dam due to over use of river water for the irrigation by wealthy farmers, period of water availability is decreased substantially affecting fish catching activity of local fishermen.

These various problems are interlinked with each other and can be visualized in figure 1. This diagram has been drawn by me taking inputs from local people during the documentation of my PhD work.

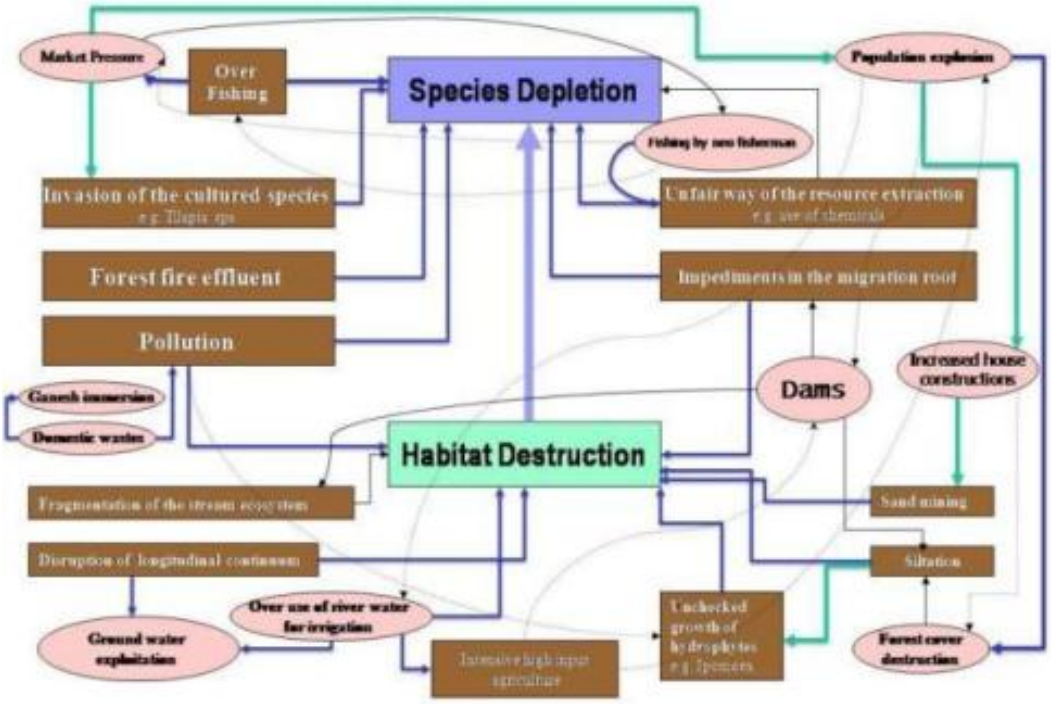


Figure 7: various problems related to river and their inter relationship (After Heda, 2007)

Chapter 3

Objectives of Project

All the objectives are designed considering the movement of the whole basin management which includes various human, ecological, economic, and cultural, human resources, political, and educational approaches.

Following were the main objectives of the project. There were substantial additions in the objectives as project progresses. The principals of adaptive management have been applied for the management of the project and fixing objectives.

3.1 Conservation of Wetland Resources:

3.1.1 Watershed conservation through NREGA

Local fishermen and labourers people will sensitized for the watershed development work through wise implementation of the NREGA.

3.1.2 Establishment of FWPAs

Fresh water protected areas will be established at river Adan for the fish fauna conservation. Local people will be main actors in the establishment of the FWPAs and sustainable utilization of the resources will be central theme of such initiatives.

3.1.3 Awareness campaign

An effective campaign of the awareness generation campaign will be initiated in the basin through capacity building workshops, popular lecturers, popular articles, Nadi Parikrama (River March) etc.

3.2 Status report on people:

Thus, status report may includes, economics of fishing, livelihood status, health problems, education problems, problems of fish culture, inventory of problems facing by people at State Fishery Department. Understanding attitudes of government department, way of working of government machinery related to fish-people-river, problems with local fishermen. Aspirations of local people regarding future, aspirations regarding livelihood options. Conflicts among various groups and their resolution.

3.3 Status report on Biodiversity:

Thus, status report may includes, present condition of wet land and fishes, inventorying of fish culture ponds, simple data base on various ponds suitable for fish culture, their biological characteristics, culture fishes suitable for fish culture, wild fishes suitable for fish culture, exploring possibilities of growing local indigenous species as a part of fish culture and documentation of unsustainable fishing techniques.

3.4 Harnessing government potential:

There are many laws and time-to-time issued government resolutions for fishing community's welfare. To fetch these benefits there is need to prepare a repository of various laws and Government Resolutions (GRs) in local language. To overcome the problem of discrimination (ecological and social) sound implementation of GR and law is essential. In order to build the confidence of local people it is essential to build capacity of local people and institutions regarding laws.

Thus, status report may includes, preparation of repository of laws and GRs, related to wet land and fishing communities. Dissemination of this material in local language in the form of small booklets, posters, web site and CDs. Capacity building of local fishing communities regarding laws, privileges.

3.5 Community structures:

There is need to create small local decision-making systems, need to strengthen existing traditional institutions and to do capacity building of the same. In the case of fishermen, to establish chain of cooperative societies and River Study Groups is essential. To harness potential of the various government schemes like NREGA there is a need to develop activism from local level, which can be possible by establishing labour unions.

Financial security is important for the sustainable future of these communities. Through this project, on pilot scale, we have tried to set up groups of local people. These groups were expected to culture fishes in small ponds (1 to 2 hectare area); a revolving fund has given to these groups. After a fishing season, group will return the fund to another group.

3.6 Scientific Fish Culture:

Although people posses good deal of the traditional knowledge, there is a lack of knowledge about the scientific fish culture. Thus, there is need to empower the local people regarding scientific aquaculture. Many environmental factors like productivity of ponds dissolve oxygen, growth of hydrophytes, disease outbreak etc influence aquaculture to which aquaculture groups should monitor properly. In small ponds afore mentioned scientific manipulations are possible to ensure *Maximum Survival Potential* of the fingerlings released.

Chapter 4

Approach

4.1 Capacity Building

There are three main stakeholders involved in the effective designing and implementation of project viz. Project staff members, Communities members and government departments.
Selection of staff is an important task and we have intentionally decided to choose as many as staff members from within the community. This facilitates the process of rapport building and development of the local leadership. Thus, two staff members have been chosen from the fishermen community. Sensitizing government department was an important task of the project. In this regard first priority of the project was to search for the sensitive government officers and maintaining contacts with them. Capacity building of the project staff and community members through meetings, exposure visits, and popular programs was the key point of the design and implementation of the project.

4.2 Philosophical Background

Project was the fusion of research, constructive action and activism with local target groups and spreading awareness for the involvement of the main stream communities. The important intervention was made to work government laws and resolution to work for local people.
Principals of *adaptive management* and of *complex systems* have been applied to the project objectives. In addition, *bottom to top approach* of problem solving is considered to find out and to solve the problems of the local level.

4.2.1 Dealing with complex systems:

The project was started with the fundamental assumption that, ***we are dealing with the complex systems***. Man and its relation with the nature is such a complex phenomenon. ***Simple systems*** are those with very few elements, which behave in a readily understood and predictable manner. ***Complicated systems*** are those with many elements that, once understood, still behave in a predictable manner where as ***Complex systems***, because of internal interactions and feedback mechanisms difficult to understand and tend to generate "surprises" (Ruitenbeek and Cartier, 2001). Management of such a complex systems can be done by the adaptive management.

> 🕮..... *because human understanding of nature is imperfect, human interactions with nature should be experimental. Adaptive management applies the concepts of experimentation to the design and implementation of natural resource and environmental policies. An adaptive policy is one that is designed from the outset to test clearly formulated hypotheses about the behaviour of an ecosystem being changed by human use... If the policy succeeds, the hypothesis is affirmed. But if the policy fails, an adaptive design still permits learning, so that future decisions can proceed from a better base of understanding.*
> *(Lee, 1993)*

4.2.2 Adaptive management:

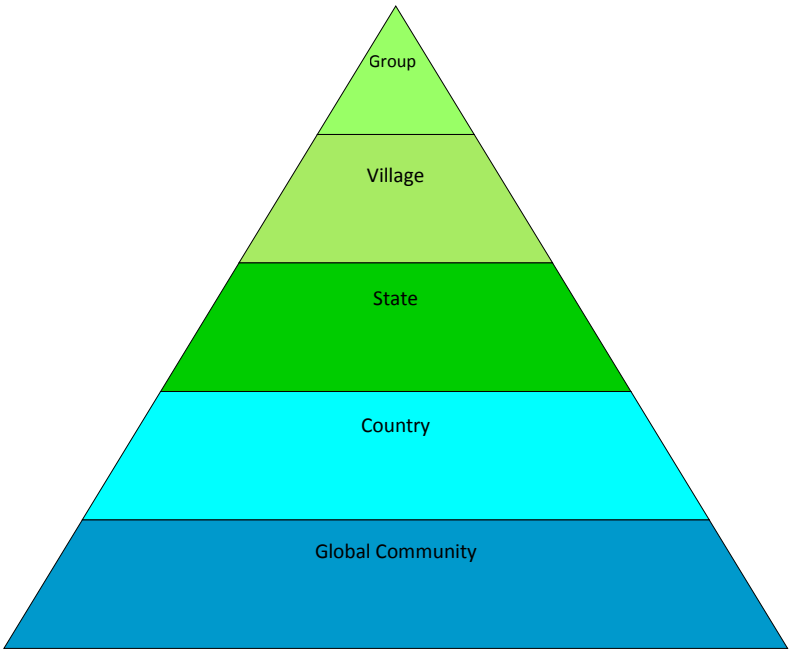
Concept of adaptive management has been first introduced in the decade of 1970 by C.S. Holling and Carl J.

Walters of British Columbia University. Initially, the concept has been applied to aquaculture but in between 1990 and 2000 it has widely applied to other fields also. The best use of this concept has been done in the hunting of the water birds in the North America (Johnson et al. 1993).

Adaptive management can be defined as, "*the systematic acquisition and application of reliable information to improve management over time*" (Wilhere 2002). This concept advocates that centralized management based on the solid unchanging laws cannot work properly. Thus, management should be decentralized, flexible, and at all times ready to make adjustments on the basis of continual monitoring of ongoing changes.

Understanding of adaptive management will be enhanced by first understanding the alternatives: *differed action* and *trial and error*. Under differed action, an ecosystem is not managed until after it is understood. Only minimal disturbance is allowed while basic research is conducted to determine key processes and relationships. Differed action is ecologically cautious approach, but it has economic cost due to the discontinuation of future revenues. Trial and error has been and continues to be the dominant paradigm in natural resource management. Trial and error typically emphasizes the 'trial' which entails resource utilization and produce revenue, but neglects error detection, which entails costly monitoring. Trial and errors approaches are also known as *learning by doing* or *evolutionary*. (Wilhere, 2002).

4.2.3 Bottom to top approach



During our project we concluded that "*solutions to local problems would best begin at the local level by the local stakeholders*". Local people have good understanding of their surroundings; this wisdom comes from hundreds of years of trial and errors. But in recent time this wisdom has been typically ignored. The main emphasis of our work was on the building of the capacity of the local people. If local people increase their capacities automatically the system of the problem resolution becomes sustainable.

Figure 8: Bottom to top approach: solutions to local problems would best begin at the local level by the local stakeholders.

Chapter 5

Landscape and Peoplescape

5.1 Part 1 - Study Area

5.1.1 India: The land of geographical diversity

India is a land of great natural diversity. This diversity embraces mangrove swamps of *Sunderbans* and rain forest of Western Ghats, coral reefs of *Lakshadweep* and wetlands of *Bharatpur*, hot deserts of Rajasthan and cold regimes of Himalayas. In addition, India is situated at the tri junction of African, Eurasian and Oriental biota.

Population wise India is a second largest country in the world and it is seventh territory wise. India is situated at north of the equator, between 8^0 4'' to 37^0 6'' North latitude and 68^0 7'' to 97^0 25'' East longitudes. The country's land is flanked by the Bay of Bengal and the Arabian Sea along the southeast and along the southwest respectively. From North to South, India measures about 3,214 km and from east to west, about 2,933 km. The total land area of India is 32, 68,090 square kilometres. Its land frontier is 15,200 km and coastline 6103 km.

Geographically India is divided into four major geographical regions viz.

- The Great Himalayan range,
- The Indo Gangetic plain,
- The Desert regions and
- The Deccan Plateau and Peninsula.

5.1.2 The Deccan Plateau and Peninsula

Figure 9: Map of Vidarbha showing all its 11 districts

Deccan plateau extending south of the Vindhya is geologically the oldest portion of the Indian land. The Aravalli, Vindhya, Maikala and Ajanta mountain ranges separate this Plateau from the Gangetic plain. This Plateau is flanked by the Eastern and the Western Ghats. Both the Ghats meet at the southern point in the Nilgiri hills. Godavari catchment is an important catchment of this plateau.

5.1.3 Vidarbha region of the Maharashtra

The eastern Maharashtra, part of central Indian Deccan plateau, is a land of great diversity, both ecological as well as ethnically. Buldhana Washim, Akola, Yavatmal, Amravati, Wardha, Nagpur, Bhandara, Gondia, Chandrapur and Gadchiroli districts constitutes Vidarbha region. This part (also known as Vidarbha region) is mosaic of various contrast ecosystems like dry deciduous forest, scrubland, grassland, agriculture, important river basins and natural and manmade water bodies. The rain fed rivers of this region are abode of about 100 fish species. The area is inhabited by both, Dravidian like Gond, Austro-Asiatic like Korku as well as historical populations like Muslims. These various communities occupied their own ecological niches and dependent on array of resources for livelihood. Dhivar, Bhoi, Kewat are depends since millennia on water bodies for various goods and services.

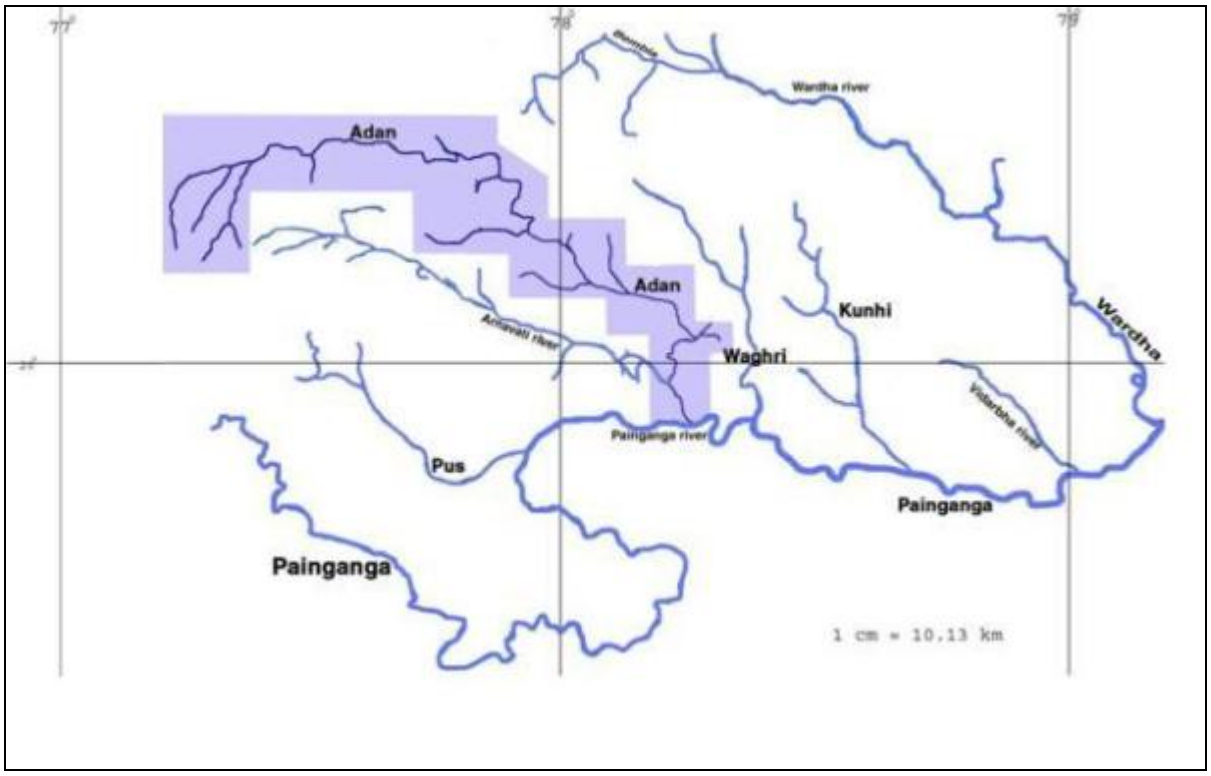


Figure 10: Riverine Network of western Vidarbha region. Adan River is highlighted with blue colour.

5.1.4 River systems and important river basins in India

Indian River systems are divided into 5-river systems viz. Ganga, Brahmaputra, Indus, East and the West coast river system. Of these Ganga, Brahmaputra and Indus river system have their origin in the glaciers of the Himalayas while the East and West coast systems together constitute Peninsular rivers and are fed by rainwater.

5.1.5 Peninsular river system

Peninsular river system constitutes East coast river system and West coast river system.

5.1.5.1 East coast river system

This system constituted by four principal rivers viz. Mahanadi, Godavari, Krishna, and Cauvery, drains entire peninsular region, east of Western Ghats in the west and the southern part of the central India including the Chota Nagpur region. The East Coast Rivers have the combined length of 6,437 km.

5.1.5.2 West coast river system

The west coast river system constitute the river Narmada and Tapti, both of which flow in the westerly direction of the country and drain the narrow belt of peninsular India west of the Western Ghat.

5.1.6 Godavari river system

Godavari is the second largest river in India after Ganga is often referred to as the Vriddh (Old) Ganga or the Dakshin (South) Ganga. This is one of the important rivers of the peninsular river system. Godavari river rises near Nasik (Trunbakeshwar) in Maharashtra at an elevation of 1,067 m AMSL and flows for the length of about 1465 km before it outfalls into the Bay of Bengal. The principal tributaries of Godavari are Parvara, Indravati, Kolab and Manjira (arising in the Balaghat hills), river Wardha (originates from the Multai plateau of the Satpuda range in Madhya Pradesh), Pench, Kanhan and Pranhita etc. Godavari Basin extends over an area of 312812 km^2, which is nearly 9.5% of the total geographical area of the country. The basin lies in the states of Maharashtra (152199 km^2), Andhra Pradesh (73201 km^2), Madhya Pradesh (65255 km^2), Orissa (17752 km^2) and Karnataka (4405 km^2). Godavari River has a catchment area of 31.3 million hectares and length 1465 km. The Godavari basin consists of large undulating plains divided by low flattopped hill ranges. The important soil types found in the basins are black soils, red soils, lateritic soils, alluvium mixed soils and saline and alkaline soils (Anonymous 2006a).

5.1.7 Penganga

Penganga is one of the important tributary of the Godavari (In fact, it first joins to Wardha River, then joins to Wainganga, Wainganga and Pranhita joins and meet Godavari) is about 480 km in length. It rises in the western boundary of the Buldhana district (20^0 31′ N and 76^0 2′ E). The Penganga rises near the Chikhli in Buldhana plateau in Maharashtra. The river has a general south – south – easterly course. The river is perennial but dwindling in volume to mere stagnant pools during the hot weather. The river Joins Wardha river near south of colliery town Ghugus (19^0 52′ N and 79^0 11′ E), in Chandrapur district. Adan, Kayadhu etc are the main tributaries of this river. It flows along the northern boundary of the Nanded district and a huge amount of land is irrigated by the project named “Upper Penganga Project" built on this river near village Shembal Pimpari in Pusad taluka of Yavatmal district.

5.1.8 Adan

River Adan, a principal tributary of the Penganga lies at Long 770.22′ Lat 200.17′ to long 780.21′ Lat 190.9′. The length of this river is 209.21 km. It rises in the Washim district of Maharashtra and flows through a curve, north, east and south, and meets Penganga River. The river Arunavati unites with the Adan at about 13 kilometres before it joins to Penganga. The

Figure 11: Position of Study area in Indian context.

valley of Adan is from 10 km to 22 km wide. The river ceases to flow in the summer, though pools are left in the latter part of its course.

Two dams have been built on Adan; one at its origin near Sonala village (20^{0} 19^{l} 11^{ll}. N and 77^{o} 11^{l} 52^{ll} E) and other near Karanja (Lad) city (20^{o} 24^{l} 57^{ll} N and 77^{0} 33^{l}. 53^{ll}E). The river is flows through scrubland and degraded type of dry deciduous forest with extensive agriculture.

5.1.8.1 Topography

The topography given here is the topography of the two districts combined viz. Washim and Yavatmal, through which Adan river flows. The area around river Adan does not have any large area under extensive hill ranges. Still the relief features offer interesting contrast between the plateau and the plains.

I. Ajanta hills:

The Ajanta range carrying on its flat top the Buldhana plateau (Balaghat) of Washim and Mangrulpir taluka, has steep rims facing north and descending to the Purna plains. This hilly ghat area at an overall elevation of about 400 m is extremely uneven and rough with a tangle of hill masses covered by forest (Anonymous 1977).

II. Tangle of hills:

The area of hilly terrain within the Washim district is seen in the southern part of the district along the boundary of the Yavatmal district. This tangle of the hill masses rising to an elevation of 500 – 600 meter is much less dissected than the northern scrap slope at a comparatively lower elevation. This slope in many places is cut into by the tributaries of the Penganga forming deep entranced valleys that constitute the main lines of the access and habitation development (Anonymous 1977).

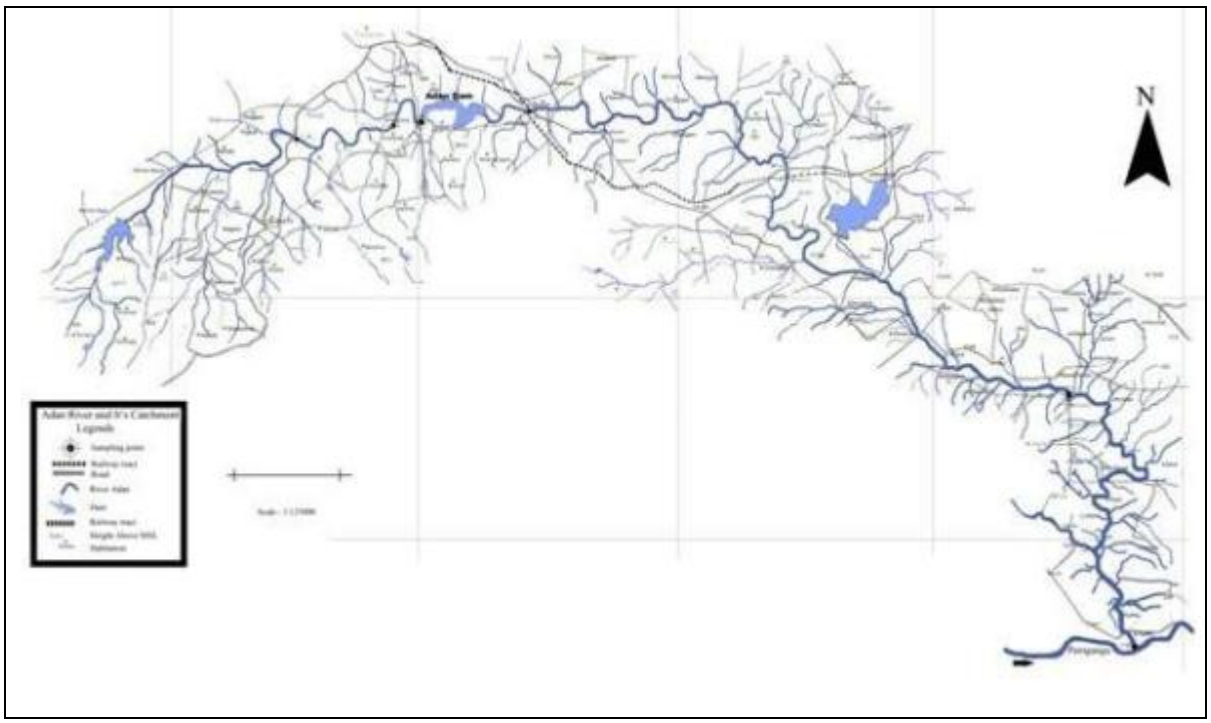


Figure 12: Map of Adan river basin prepared from toposheets.

III. Plateau:

This includes The Washim and Mangurlpir plateau. This is situated at an elevation of about 400 to 500 meter AMSL. Sloping gently to the east it is rolling country with a number of residual hills and knolls dotting the country plains. Along the rim of the plateau the terrain becomes much more nudged and uneven developing a ghat aspect. Comparatively the Washim taluka is much more level and even than Mangurlpir. The plate is drained eastwards mainly and to a lesser extent to north due to the recession of scrap on the northern edge (Anonymous 1977).

5.1.8.2 Geology and soil:

Entire area around Adan is more or less dominated by fertile alluvium tract. Excluding small patch of the Upper Gondwana Sandstone, the entire area is occupied by Deccan basalt flows with inter trapped beds at places with river alluvia and soils.

5.1.8.3 Climate:

The climate of this area is characterized by a hot summer and general dryness throughout the year except during the southwest monsoon season. The year may be divided into four seasons. The period from about the middle of November to the end of February constitutes the winter season. The summer season extends from March to June this is followed by Southwest monsoon season, which extends up to end of September. October and November constitute the post monsoon season.

I. Rainfall

The initial 100 km section of river area receive 800-900 mm rain fall whereas the latter part receive 1000 to 1200 mm per annum.

II. Temperature

Temperature rises rapidly after February until May, which is the hottest month of the Year. In May the mean daily maximum average temperature at Karanja was reported 42.4 ^{o}C and the mean daily minimum temperature is 27.5 ^{0}C. The heat in the summer season is intense during the days and the nights are comparatively tolerable. During the period from April to June on individual days, temperature rises up to about 46 ^{0}C or 47 ^{0}C (Based on data of 50 years from 1909 to 1959). The afternoon heat is some time relieved by thundershowers. With the arrival of the South West monsoon in this area by about mid June; at that time there is an appreciable drop in the day temperature and the weather becomes pleasant. After the withdrawal of the monsoon, the day temperature increases gradually and a secondary maximum in day temperature is reached in October. However, night temperature decreases progressively after September. Both day and night temperature is decrease rapidly from October until December, which is the coldest month in the year. The mean daily maximum temperature during this month is 29.3 ^{0}C and the mean daily minimum temperature is 11.9 ^{0}C in the rear of the western disturbances which moves across north India in the winter months, cold waves affect the area at times and night temperature may go down to about 2 – 4 ^{0}C.

III. Humidity

Except during the southwest monsoon season when the humidity is between 60 to 80 % the air is generally dry over the area. The summer months are the driest when the relative humidity is even less than 20 % in the afternoon on many days.

IV. Cloudiness

The skies are heavily clouded to overcast during the southwest monsoon season in the latter half of the summer season. In post monsoon season there is moderate cloudiness particularly in the afternoons. In the rest of the year, clear or lightly clouded skies generally prevail.

V. Winds:

Winds are generally light with some strengthening in speed in the latter part of the hot season and in the early part of the monsoon season. The winds are mostly from the north east or the east during the post monsoon and yearly cold weather season. By February winds becomes westerly to north western and continue to be so until June. In the Southwest Monsoon season, winds, from direction between southwest and northwest are most common.

5.1.8.4 Vegetation:

The vegetation of this area is divided into roughly three types (Anonymous 1977). This classification mainly depends upon the dominant plant species found.

I. Teak forest:

This type of the forest is mainly dominated by teak (*Tectona grandis*). Associated to teak are Salai (*Boswellia serrata*), Dhaora (*Anogeissus latifolia*), Ain (*Terminalia tomentosa*), Tendu (*Diospyros melanoxylon*), Palas (*Butea monosperma*) and Lendia (*Lagerstroemia parviflora*) etc are found in small number.

II. Mixed forest:
This is dominated by Salai (*Boswellia serrata*), Dhaora (*Anogeissus latifolia*), Ain (*Terminalia tomentosa*), Khair (*Acacia catechu*), Lendia (*Lagerstroemia parviflora*) and Makha (*Schrebera swietenioides*).

III. Babool (Acacia) forest:
The plain area is mainly dominated by the Acacia species.

5.1.9 Sampling Points

On each river, six sampling points were identified. During identification of the sampling points following criterion considered,

- All the part of river should to be covered.
- As many as habitat type to be covered.
- Diverse human interventions should be covered i.e. some sampling sites were adjacent to village some were in undisturbed place and so on.

5.1.9.1 Sampling sites

Sr. No.	Name of Site	Geographical Position
1	Shivni Bridge (Up side dam)	N 200 23|. 809|| and E 770 22|. 449|| E
2	Injori Bridge (Up side dam)	N 200 24|. 337|| and E 770 29|.565|| E.
3	Sangvi (Down side dam)	N 200 24|. 678|| and E 770 36|.461|| E
4	Mankopra (Middle)	N 200 23|. 653|| and E 770 40|.09|| E
5	Bori Arab (Middle)	N 200 20|. 980|| and E 770 51|.612|| E
6	Sangam 2 (Down Ghat)	190 54|. 240|| N and 780 12| 68|| E

Table 1: Sampling points and their geographical coordinates.

5.2 Part 2 – Methods

5.2.1 Net used

Cast net, gill nets baited hooks and locally available nets for fish sampling were used. Same mesh size nets were used for all samplings.

5.2.1.1 Cast net (Throw netting)

This is active method of the fish capturing. Cast net is flat but large size circular net made up of synthetic fibre. Along its margin, it is attached with the weights or sinkers. The net is thrown wide spread in the water from the bank or from within the water. As its margin sink down the water surface, the fishes are trapped in the centre of it. No sooner, the margin touches the bottom the net is hauled by a string attached on to the circular top of the net.

Figure 13: A cast net.

This net is used to sample shallow pools. The casting of net from the bank requires great manual dexterity and practice to achieve distance and correct shape of the net in the air to maximize the area sampled.
To achieve great accuracy, a skilled, indigenous fisherman appointed as field assistant. The circumference of the net used was 840 cm and mesh size was 9 mm X 9 mm.

5.2.1.2 Gill net

This is passive method of the fish capturing mostly used for the mobile fish species. The passively operated nets of fixed type are made of cotton or nylon threads, woven into the small meshes. The net is suspended vertical in water in a wall shaped manner, so that the advancing fishes enter the mesh and upon withdrawal get entangled by the gills. This net used to sample the deep pools and flowing water. The length of the net used was 4 meter and width was 1.5 meter with mesh size was 1 cm X 1 cm.

5.2.2 Sampling

5.2.2.1 Sampling duration

Samples collected in the period from February 2007 to August 2009. Samples collected as per season.

5.2.2.2 Preservation of the samples

Collected samples were preserved in 4 % formalin solution in plastic bottles. For further identification specimen was tagged with a code. Different bottles were maintained for different sampling sites and events.

5.2.2.3 Identification of the sample

The preserved fishes were identified in the laboratory as per identification keys given by Day (1878); Talwar and Jhingran (1991); Jayaram (1999) and Daniels (2002), Heda (2009).

5.2.2.4 Field notes and Data matrix

Concept of 'Catch per unit effort' (CPUE) (Perrow et al. 1996; Caughley 1980), considered for quantitative estimation of species richness measures and diversity indices. Considering this, for each attempt of cast net number of individuals of the species recorded. For gill net also, number of individuals of each species caught in one-hour period was recorded. After insitu identification and counting, fishes were again released into water. Along with the scientific name of species, local name of the species was also noted by asking field assistant.
A 100-meter patch of the river was measured at each sampling point (Bhat 2002) and random sampling made in that patch avoiding repetition on same place.

5.3 Part 3 - Peoplescape

5.3.1 Bhoi:

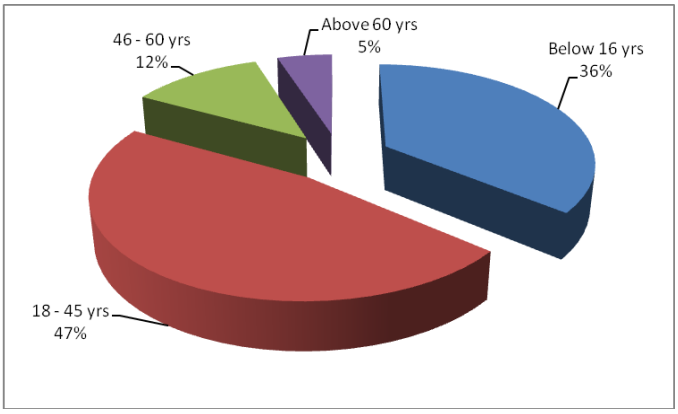


Figure 14: Demography of Bhoi People at Dhamani.

Sr. No.	Name of village	Number of households	Total Population
1	Injori	20	117
2	Khadi	1	10
3	Dhamani	29	134
4	Lohi	10	58
5	Manki	12	63
6	Mankopra	13	60
7	Mhasani	26	123
8	Ramgaon	26	124
9	Shivani	13	71
Total		150	760

Table 2: Survey of Different Bhoi villages completed.

Bhoi are traditional fishermen depends on rivers and other lentic water bodies for fishes. They believe in Hindu god, although their deity is *Machhindarnath*. The Machhindarnath (*Machhi* means fish and *Nath* means master) was believed to found to a Bhoi fisherman in a river and grow at the Bhoi's home. Machhindarnath started *Navanath* tradition of worship. The main present day occupations of Bhoi includes fishing, selling of perched rice and gram, agriculture, labour, settled pastoralism, sand excavation and supply on donkey's back etc. The old occupations of this community were mainly fishing and palanquin bearer.

5.3.2 Other Labours:

After starting the work on the issue of implementation of NREGA many other communities like *Dhangar* (Pastorals), Muslim, Buddhist, other backward classes joined mainly at Dhamani village.

Figure 15: Project Field Assistant Mr. Subhash Bavane.

Chapter 6

Summary of Findings

6.1 Conditions of people and Ecosystem:

Through a yearlong extensive field work, group discussions and on the basis of data collected it can safely conclude that, the condition of the livelihood of local fishermen is extremely bad in Adan river basin due to wide spread deleterious changes in the riverine ecosystem of this area. This situation is becoming worst due to weaknesses of the Peoplescape of the area too. These weaknesses include, lack of organizations among people, lack of education and high rate of alcoholism and gambling.

6.2 Reasons:

Due to the construction of dam, wide spread destruction of the forest, siltation, pollution and over use of the resources the wetland ecosystems of the area are eroding. Along with the natural erosion, corruption, non implementation of government rules and policies like NREGA, policies regarding fishermen cooperative societies, making situation worst. Traditional decision making and conflict resolution institutions and mechanisms are also making their escape from the society.

6.3 Lesson Learnt:

Solutions to local problems would best begin at the local level by the local stakeholders. In this situation the role of NGO or external agencies is just like catalyst.

6.4 What should be done?

We have understood that, there is need to strengthen the sustainability of the riverine ecosystem to ensure sustainable livelihood of the fishermen. In addition, there is a need to move to systematic fish culture and other ecologically sustainable livelihoods, wherever necessary and feasible. Holistic approach is the key for the effective conservation work.
Thus, while dealing with the conservation issues we have to address many issues related to the ecosystem like ecological, economical, and anthropological and so on.

6.5 Future direction:

In long run, to get rid of afore mentioned situation, there is need to do following things:

1) **Creation of social institutions:**
There is strong need to create social institutions like small saving groups (SHGs), study groups, cooperative societies and labour's associations.

2) **Strengthening local institutions:**
Strengthening local institutions like study groups of people, local Gram Sabha (Village institution), Gram Panchayat and fish cooperative societies. There is need to use recent laws and resolutions of the government of India for this purpose (Like Biodiversity Law 2002, NREGA etc).

3) **Livelihood Strengthening:**
Searching for new Eco-friendly livelihood options is essential to cope with the recent negative social changes. These kinds of new livelihood options should be coherent with that of their traditional occupations. Thus, aquaculture can be a good option for fishermen as they possess knowledge and interest in the same.

4) **NREGA:** NREGA can be an effective way to increase sustainability of riverine resources, poverty alleviation, to increase confidence of local people and to strengthen the democracy.

5) **Sustainability of river:** The sustainability of river should be increase for secure livelihood of the resource dependent people. This sustainability can be increase by creating Fresh Water Protected Areas (FWPAs) and positive interventions in the whole basin area. This can be possible by using NREGA for the water and soil conservation and plantation and by creating awareness among various sections of the society.

6) **Involvement of government machinery:** Emphasis should be given on the involvement of the **government machinery**, **media** and **educational institutions** in the endeavour of conservation as well as empowerment of the grass root people.

Chapter 7

Impact and Outputs

Initially the project has been started considering the conservation of the river Adan and associated water bodies and livelihood of local fishermen and labourers through scientific fish culture and data generation about the various components of the wetland ecosystems. This year due to severe drought in the study area, in the latter part of the project, we have shifted our attention on the livelihood of the local people through NREGA. There are 2 important impact geographical areas of our project viz. one where the drought intensity is low (*Savali*) where scientific fish culture was possible while in other area where the drought intensity was high thus all the water bodies were dry and fish culture was not possible (*Dhamani*).
Following are the impact of the project on various facets of the society and ecosystem.

7.1 Poverty orientation:

Considering the short span of the project visual effects on poverty elimination can be seen after some time. However, in this direction following important advances have been made.

7.1.1 Implementation of NREGA:

This year, there is a severe drought in the whole project area. In Adan river valley, due to severe drought the river becomes substantially dry. Due to these climatic changes, there is a shortage of the livelihood options in the area. Government of India has formulated NREGA to ensure secure employment of 100 days to unskilled labours. In addition, Government of Maharashtra formulated Maharashtra Rural Employment Guaranty Act (MREGA) which gives guaranty of 365 days employment in one financial year.

The procedure to secure employment through this scheme includes registration for work by labourer. Ones registered, people should get JOB CARDS within 15 days. After receiving job cards labourer can apply for job. As per law, after registration, people should get employment within 15 days; otherwise they can eligible for the unemployment allowance. 307 people of *Dhamani* village registered for job cards on 22 Jun 2007. Even after one and half years (In December 2008), they have not received their job cards.

Due to unavailability of the employment in the area large number of people migrating to mega cities for the employment. Fishermen communities of the *Dhamani* are land-less people, completely depends on Adan River for their livelihood. Due to present drought fishermen community lost their livelihood and there is a wide spread hunger in the area. Agriculture labour is another alternative livelihood option for the fishermen of this area but this year, agriculture also severely affected and there is no employment in the agriculture fields.
Considering this situation, we have made informal union of the 400 labourers from the *Dhamani* village. Through this informal union we have sent a letter on 26 November 2008 to *Sarpanch* (village head), *Gramsevak* (representative of government in the village) and collector

of the district, stating the present scenario. The letter has been sent by post but there was absolutely no action has been taken from the concerning authority.

Considering the inactivity of the concerned officials behalf of *Samvardhan* we have sent a letter to member of Parliament (MP), member of state assembly, collector of the district, chief executive officer (CEO) of the District Council (*Zilla Parishad*), Tahasildar and Block Development Officer (BDO) of the Karanja Taluka, Gramsevak and Sarpanch of the Dhamani village on 5 December 08. Interestingly no action has been taken by these people.

Using website of the Central Government regarding NREGA (http://nrega.nic.in/) we have downloaded list and Job Cards of registered people for scheme.

Figure 16: Labourer doing eco-restoration work under NREGA.

On 10 December 2008 we have personally met BDO and Gramsevak and enquire about the issue. As people got their Job Cards from website we have asked for the form number 1 (essential for the registration under NREGA) and form number 4 (essential to ask for work). Interestingly there were absolutely no such forms available in the Panchayat Samiti. Thus, people printed the forms from website. Response to people's query about Job Cards from concerning officers was many and contradictory. Initially they told that, the Cards has not issued from collector office, when people told them about the date of issue of job cards, they told that, job cards issued but those are in Panchayat Samiti. Another answer was considering the large number of Job Cards they have no time to prepare those Job Cards. Using downloaded forms people tried to submit the forms to Gram Panchayat. But concerning authority has not ready to receive the forms from the labourers. Thus on 5th January 2009 people sent a letter to DBO and Tahasildar for this injustice. Along with this an enquiry application has been submitted under the RTI.

At last, team has contacted news papers and on front page of popular news paper (DAILY LOKMAT) news has been appeared on 07 January 2009. In response to this on 7th January 2009 BDO along with Gramsevak visited Dhamani and issued Job Cards of people. On 19 January about 400 labours got their employment on the sanctioned 11 tanks along river side.

7.1.2 Registration of fisheries cooperative society:

Registration process of the fishermen's cooperative society has been initiated at *Dhamani* village so that in near future local people can leas water bodies for fish culture and can lower poverty.

7.1.3 Fish culture:

In *Savali* impact area direct fish culture has been initiated thus definitely impacted on the alleviation of the poverty. Detail report of this initiative is waiting.

Figure 17: Plantation by a fishing community woman at Adan River.

7.1.4 Small saving Groups (SHGs):

SHGs can play an important role in the safe guarding of the financial security of the local people by not only providing them secure source of the money in their hard time but also escape from the money lenders. In this direction SHGs has been established at Dhamani.

7.2 Gender Equity:

In the latter part of project, work with women of the fishermen community has been started at *Dhamani*. We have male dominated society and women's role in the decision making is limited.

At *Dhamani* women of the fishermen society has gathered and took direct part in the NREGA related work. Also, liquor consumption by male members of society is an important problem women are facing in our area. Thus, we have started our work considering this problem as a focal point. Soon, along with this problem women participated in the river conservation and livelihood issue. Although women's participation is needs to be strengthen in the future.

7.3 Human Rights:

Conceptually we have decided that, the employment is fundamental right of the local people and equitable sharing of the wetlands for fishermen and employment through NREGA can substantially change the situation. But the wide spread corruption and careless attitude of government officials is basic cause of the violation of the human right in this area. Thus, local people have registered for NREGA before 18 months but until we have demonstrated they have not received their job cards and employment. Also, many times people went to submit the application for the job, local authorities refused to take the same. Through the capacity building done by our project, now people are pursuing for their rights.

Registration of the fishermen's cooperative society is mammoth's tasks for the local poor people due to wide spread corruption. However local people without giving any bribe trying to register the same. The positive effects of this intervention will be seen in near future.

7.4 Democratic functioning:

Right to information act is an important tool by which local people can get information from government departments through democratic way. Lack of knowledge about the availability

of the water bodies for the aquaculture is an important factor which prevents local people to take water bodies on lease. Only those people who have access to information get the water bodies. In this direction using RTI we got information from fisheries departments, irrigation departments of the two districts viz. Yavatmal and Washim.

7.5 Environment:

Sustainability of the environment, especially river, is essential for the sustainable livelihood of the local people. Still large population of the fishermen depended on the natural water courses. Environmental impacts of the project can be summaries into following points-

Figure 18: River Conference (17-18 October 09).

7.5.1 Awareness generation:

Awareness generation regarding various environmental issues and their impact on the Peoplescape of the area is an important activity of the project which effectively addressed during project period. In this regard, local people, students, government officials and members of the main stream society has been sensitized through news letter, news paper articles, workshops, popular lectures, village meetings and group discussions. In long run this will create positive impact on safe guarding of ecosystem goods and services.

7.5.2 Data generation:

Data has been generated regarding wetland ecosystem Adan River and associated water bodies and biodiversity. This generated data will be utilized in the future for the effective management of this ecosystem.

7.5.3 People's Freshwater Protected Area (PFWPA):

FWPA declared by the local people are the area where minimum intervention has allowed and some positive intervention performed. In this direction a pool along Adan river called *BHAN DOH* has been selected and process of the creation of the PFWPA has been started.

7.5.4 Renovation of the traditional Water bodies through Student's Participation:

This area is famous for the traditional water bodies. In past, these water bodies were an important source of domestic and irrigation water. But due to catchment disturbances, siltation, encroachment and use of such water bodies for dumping domestic wastes deteriorated these traditional systems. As a case study during this project period we have chosen *Sarang Talaw*, a traditional water body of the Karanja city for its renovation. Student of the local K.N. College has participating in this process. The positive effects will be seen in the near future.

Figure 19: Student's of local K.N. College working to renovate traditional water body at Karanja.

7.5.5 Creation of the small check tanks in Adan river basin:

Through the implementation of NREGA construction of 20 tanks (Up to 31 August 2009) has been started in Adan river basin. This will help in halting siltation and to increase water table of the area. Also local people demanding the work of de-siltation from the fish culture ponds.

7.6 Issues immerged during project:

Following issues has been emerged during the project which we have tried to address and up to certain limit addressed effectively.

7.6.1 Need of the fishermen's cooperative society:

In order to take state owned water bodies on lease for fish culture there is a need to register for fishermen's cooperative society. In this direction people's empowerment has been done for *Dhamani* village. The process of the cooperative society registration is in pipeline.

7.6.2 Sustainability of river should be increased through basin approach:

During our study and interaction with local people it was observed that large number of people are still depend on natural sources for fishes. Thus, if the sustainability of river maintained then only people get livelihood in the long run. FWPAs can be an effective tool to maintain the sustainability of river. In this direction we are exploring possibilities of the protected areas setup by the local people. BHAN DOH, a pool along river Adan near *Dhamani* village has been chosen by local people for the future protected areas. Ecological studies for this kind of intervention have been started and in coming future this area will be declared as people's protected area.

7.6.3 NREGA: effective tool for the restoration of natural resources and sustainable livelihood.

In this direction some advances has been made (see 7.1.1) but needs to strengthen this process in the future. We have made informal union of the local labours but sensitizing Gram Panchayat member is very much essential for the same. Also we have only worked at Dhamani village for NREGA work, this work is needs to spread throughout Adan River basin.

7.6.4 Conservation of traditional tanks is essential to safe guard ecosystem goods and services

In ancient time, throughout Southern India, there was traditional system of small water bodies. It is estimated that, alone in the Bhandara district of Maharashtra there are estimated 70,000 small water bodies. These water bodies provides goods and services to human kind in the form of drinking water, water for irrigation, food, various aquatic plants etc. Recent time witnessed large scale destruction of these systems (See Box 7.1).

Box 7.1

Reasons Behind the deterioration of traditional water bodies

1) **Ignorance:** Due to easy and short term availability of water by other means, like centralized drinking water systems, the utility of traditional water bodies came to end. Thus, in Karanja city there are three traditional tanks. When state water supply department started their work, traditional water bodies has been completely ignored and left for the deterioration.

2) **Siltation:** Due to large scale destruction of the forested area and encroachment in the catchment of the tanks, the tanks has been silted and water holding capacity has decreased.

3) **Spread of invasive species:** Due to silt, organic pollutants and introduction of the invasive plants like ipomoea and water hyacinth there was excessive growth of the hydrophytes in the tanks.

4) **Pollution:** Pollution is a ubiquitous problem to inland water bodies. Thus, in Karanja city, *Sarang Talaw* is under the impact of human excreta and domesticated pollution.

7.7 Program efficiency and Effectiveness:

Empowerment of the people is essential part of our efforts. The unity and decision making through consensus is vanishing day by from the Indian villages due to party politics. People's dependency on NGOs and government machinery is increasing in Indian villages this is happening because efforts have not given to empower the local people. We believe that if village people empowered then only the outcome will be sustainable. Every program of the project has been designed keeping in mind the empowerment of people. It was conceptually decided that, people should have to deal with government machinery for their rights, not NGO staff.

7.8 Policy level outcome of the project:

7.8.1 Policy regarding fishermen cooperative society:

To register for fishermen's cooperative society is Mammoth's task for the local people. The department dealing with this matter does not have sufficient capacity, information disbursement mechanism, fieldwork and social responsibility. Thus, there is a need to revive completely this department's way of working. In addition, there is a need to provide high tech computer facilities and need to prepare database of cooperative societies and to increase transparency in the system. Also there is no direct attachment of this department with the villages and villagers have to go to distant office of this department.

7.8.2 Maharashtra river policy:

We are looking towards fresh water fish fauna of India as a production unit of valuable protein only. Due to this attitude there is good information about merely 8-10 species of aquaculture importance in contrast we have about 1200 species of fresh water fishes in Indian water. Regarding larger river systems, there being some decisions has taken but the effectiveness of such decision is a matter of debate. Thus, for rivers there is a need to devise national and basin wise (regional) river policy. Nature changes from place to place and time to time thus such kind of policy should be regional and may be different for every basin.

7.8.3 Policy regarding invasive species of the freshwater fishes:

The introduction of non-native species is widely recognized as one of the most serious threats to local fish fauna (Saundersen et al. 2001). In the cases where the direct cause of species

extinction is identifiable, introduced species head the list. The negative effects of introduced species include ecological impact, habitat degradation, economic loss and diseases.

Figure 20: Oreochromis mossambica (Peters, 1852), an invasive species of fresh water fish.

Niche competition by invasive species with the local species harms the later. Biological invasions dramatically affect the distribution, abundance and reproduction of many native species. The immediate effect of the biological invasion is loss of biodiversity. Invasive alien species of fresh water fishes are increasing in the Indian inland waters.

In past, various government departments (such as fisheries department) due to their ignorance to ecological consequences of invasive species introduced the same, blindly in the Indian water.

Those species today becomes worst enemy to local fish fauna. For Maharashtra, we have about 8 to 10 species of invasive fishes cultured and accidently introduced (For example Tilapia. Along with USA in many countries this fish is banned. Although In India, we can easily see this fish in diverse fresh water aqua regime). We do not have any firm and clear rules and policy for the introduction and eradication of these species.

In Indian scenario we are very much poor in the information base about invasive alien species of freshwater fishes. There are about 50 species of fresh water fishes, mainly introduced for the aquaculture purpose, established in various aquatic niches.

Although there is no quantitative information on the spread of invasive species in India, the qualitative scenario is very serious. Fish market survey reveals qualitative seriousness. Every market whether from advance cities like Pune or remote areas like Gadchiroli districts of Maharashtra represent tilapia or African Magoor in abundance.

Thus there is need to devise a clear cut policy on the introduction of invasive species on one hand and control and eradication on the other hand.

7.8.4 Policy regarding People's Freshwater Protected Areas:

Freshwater habitats are being subjected to unprecedented levels of human disturbances. Freshwater fishes are world's most threatened group of vertebrates after amphibians. The main reasons behind this ecological meltdown are habitat degradation, pollution and spread of invasive species. FWPA is one of the important solutions to halt this situation. Rivers are an important habitat, harbours rich fish fauna and support millions of masses. Throughout India, there was traditional, religiously supported system of preservation of riverine habitats.

These pools acts as *refugia* for fishes in the form of mini fish sanctuaries. Due to market forces and alienation of new generation from the nature, these traditional systems are collapsing. Thus, to make inventory of such systems, to renovate and to establish such systems in new context is utmost important. It is widely recognized that, FWPAs have the potential to be effective conservation and management tools in the protection of freshwater organisms and habitats and the safeguarding of natural freshwater ecosystem services.

Protected areas are places where some major threats can be effectively managed. Amongst a wide variety of protective mechanisms, the use of protected areas is the single most important tool available for biodiversity conservation. Protected areas also support ecosystem functions beyond their boundaries and have other economic and cultural benefits.

Comparison to terrestrial conservation mechanisms, both, state owned (e.g. National parks) and traditional systems (e.g. sacred Groves), there is a lack with respect to aquatic environment. Also, there is a lack of mechanism of establishment of FWPAs. Thus, special provision is needed to establish FWPAs through people's participation.

7.8.5 Policy regarding Effective implementation of NREGA:

NREGA is one of the important legislation passed by the government of India in the recent time. The law ensures employment for the period of 100 days (365 days in Maharashtra state). But the implementation of this act is not satisfactory due to many reasons including lack of interest from the government departments, lack of information to labours and conflict between labours and agriculturist.

There is need to revise the way of working of this act. This may includes information disbursement, capacity building of the Gram Panchayat and valuation of the work done by the labours.

Chapter 8

Spreading the Word

8.1 Dissemination of Output:

8.1.1 Workshops, meetings arranged:

Table 7 in the annex provides information regarding various meetings, workshops and events arranged during the project period.

8.1.2 Towards the preparation of Status Report:

Data collection for the preparation of the status report has been almost completed. The data mainly includes survey of the fishermen community, documentation of the traditional knowledge, fish and habitat identification and threats to riverine ecosystem. The writing work of the status report is underway.

8.1.3 Literature generated:

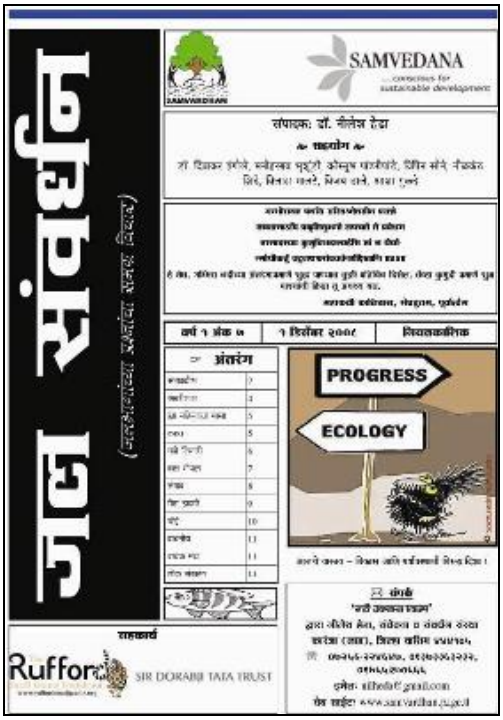


Figure 21: Front page of the News Letter JALSAMVARDHAN

1. Project Pamphlet:

At beginning of the project a pamphlet has been published in local *Marathi* language. The pamphlet explained details about the project objective and appeal to people to participate in the project.

2. News Letter *JAL-SAMVARDHAN*:

For the advocacy of the various issues immerging and for information dissemination a monthly newsletter (*JALSAMVARDHAN*) has been started in MARATHI language. So far, 9 issues have been circulated widely throughout Maharashtra. Mean while a Hindi issue also published. JALSAMVARDHAN is becoming popular and positive remarks are coming from common people as well as from scientific communities. Along with the printed version, the issue is published as E-Publication also and can be downloaded from:

http://jal.samvad.googlepages.com/home. JAL-SAMVARDHAN means water conservation in Marathi language. The main problem in the conservation of aquatic biodiversity and equitable sharing of the benefits is lack of the awareness among common people. There are lot of issues need to be spread among local people. The JALSAMVARDHAN is spreading it with great

care. Important soul of news letter is its scientific and holistic approach, grass root information and regularity.

3. Pamphlet for Fishermen community youth:

Participation of the Youths is important in the successful completion of the objectives of the project. Keeping this in mind, a pamphlet has been published and distributed in the basin followed by one day workshop.

4. Data Base of the water bodies:

Figure 22: Example user interface of the data base of the water bodies.

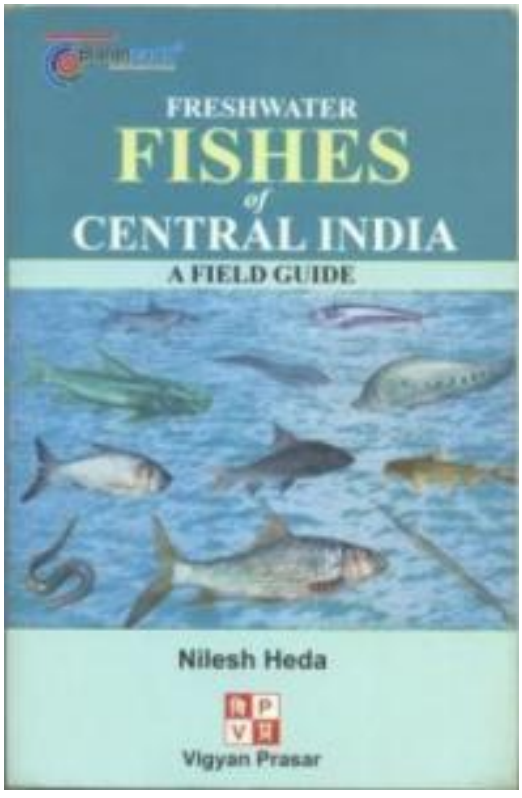


Figure 23: Front page of book on fishes of central India written by Nilesh

Information collected from District Fisheries and Irrigation Department by using RTI and inputs from the field survey, has been entered in the data base prepared in the MS Access. Due to the lack of expertise about MS Visual Basic the work is under construction. The database was prepared keeping in mind local people. The data base can be used as a tool to understand water bodies present in the village area so that people can know which water body is available for fish culture.

5. Website:

A website has been developed and can be access at www.samvardhan.page.tl. Since its publication the website clicked about 1000 times from throughout the world.

6. Slide shows and popular lecturers:

Project director is involved with the students of local K.N. College degree students. He has appointed as visiting lecturer for the environmental studies. A slide show and popular speech developed by him was performed at many places in the Vidarbha.

7. News Paper Article:

Regular news and articles in various newspapers has been published during project period.

8. Books:

During project period following two books of project director Dr. Nilesh Heda has been published.

1) **Fresh Water Fishes of Central India:** Book of Project director Dr. Nilesh Heda named *"Fresh Water Fishes of Central India"* has been published by VIGYAN PRASAR, Department of Science and Technology, Government of India.

2) ***Nisarga Niyojan: Loksahabhagane*** **(Management of Natural Resources Through People's Participation):** Gadgil M, Edlabadkar V, Heda N, Rekha N, Tofa D (2008), Published by Agharkar Research Institute, Pune, Vigyan Prasar, Noida and Vrikshamitra, Gadchiroli. Pp 96.

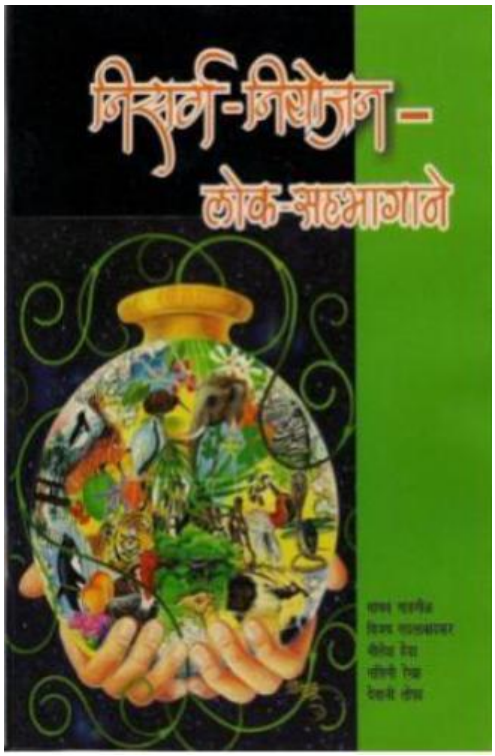


Figure 24: Front page of the Marathi language book on management of natural resources. Nilesh is one of the co-authors.

9. Research Papers:

A research paper of Nilesh Heda has been published in association with notable ecologist Prof. Madhav Gadgil in International Journal of Ecology. The citation of the research paper is as follow. Gadgil M. and Heda N. (2009). ***Of river, fish and poisons.*** International Journal of Ecology and Environmental Sciences. 35 (1): 1-11, 2009. © National Institute of Ecology, New Delhi.

10. Editorial of JAL-SAMVARDHAN

So far 9 editorial articles have been written and published in the JAL-SAMVARDHAN by project director. These editorials are important process documentation tool. The articles are written in Marathi language and we are translating the same in English. All compiled articles can be downloaded from http://jal.samvad.googlepages.com/samvedanatatatrustproject this link.

Chapter 9

Capacity Building

Capacity building about rights of various environment dependent people, various environment problems, fish culture and government functioning was key objectives of work. The area is virgin to various positive social interventions thus initially there was a kind of suspicion in the mind of people regarding usefulness of the program. Considering lot of issues, following target groups has been selected for the capacity building programs although there are overlaps among different groups in various capacity building programs. Main events of the capacity building program are shown in the following text.

Sr. No.	Target Groups	Issues for the capacity building program
1	Project Staff	1) Project concept 2) Ecological parameters. 3) Working in village environment.
2	Fishermen of the Adan river basin	1) Various government laws and resolutions. 2) Scientific fish culture. 3) Union of the people.
3	College and School Students	1) Various issues of the environment. 2) Issues of the local natural resource dependent people. 3) Student's role in the awareness generation. 4) Revival of the traditional water bodies.
4	Main stream society	1) Various issues of the environment. 2) Issues of the local natural resource dependent people. 3) Revival of the traditional water bodies and water conservation.
5	Government department	1) Various issues of the environment. 2) Issues of the local natural resource dependent people. 3) Revival of the traditional water bodies and water conservation.

Table 3 Targets of capacity building and issues involved.

9.1 Capacity building events

1. *Pani Pariwar* Meeting (27-28 April 2008)

Pani Pariwar (Water Family) is an informal group of People working in the various region of Vidarbha region on the issues related to conservation of aquatic resources. A two days workshop has been arranged and concept of RSG project has been explained. The main objective behind its organization is to present our project in front of experts and to learn from them.

2. One day Workshop with the Fishermen people of Adan river basin(10 May 2008):

The fishermen community of the Adan river basin is not organized. The traditional system of decision making and conflict resolution has also broken down. To organize the people for the common cause to establish *Nadi Abhyas Gat* (River Study Group) and Self Help Group (SHG) one day workshop has been arranged at Karanja (Lad). 43 fishermen from the various places of the Adan river basin have been gathered.

3. Youth Gathering: (9 August 2008):

One-day workshop with youths of fishermen community has been arranged at Karanja Lad. About 30 youths from Adan river basin participated in the same. The main objective of this meeting was to understand perceptions of the youth of the fishermen community regarding development and to join them in the process of study, conservation and sustainable livelihood generation.

4. Exposure visit of River study group arranged at Mendha village (17 to 18 September 2008)

Two days workshop has been arranged at Mendha village of the Gadchiroli district regarding NREGA, Biodiversity law and Tribal Rights Act. The workshop has been arranged by Vrikshamitra, Chandrapur. Mr. Mohan Hirabai Hiralal, Devaji Tofa has initiated this process. 4 community members from Dhamani and Injori villages along with project staff present to workshop. Members of the society learned about the self rule and participatory natural resource management from Mendha village.

5. Fish culture capacity building workshop (21 to 23 September 2008)

3 days discussion and field visit arranged with principal consultant of project. On 21st September 08 one day discussion has been arranged focusing on holistic aquaculture at project office. Through discussion it has been resolved that, there is a need to create resource material on aquaculture. The resource material should focus on all possible components (Social, economical etc) of aquaculture. In this area the farmers are increasingly dependent on outside sources of seeds, fertilizers, pesticides etc. Same thing is happening with aquaculture of this area. Most of the aquarist depending on fish seeds from the outside sources. Due to this dependency people are facing problems like inadequate supply of fingerlings, faulty seeds and contaminated seed by invasive species. Thus, in order to achieve independency people have to move towards natural sources of the fish seeds.

On 22nd September 08, discussion and field visit has been arranged with members of *'Jaldoot Fish Cooperative society'*, Savali village of Yavatmal district. Many friends from Kapeshwar, a village of Yavatmal district, also participated in the same. Mismanagement in the aquaculture is an important factor which makes fish culture less productive. The mismanagement mainly involves, lack of scientific inputs, mismanagement during the introduction of fish seeds, inequitable sharing of the benefits from the profit of the fish culture and so on.

On 23rd September 2008, one day discussion workshop has been arranged with the fishermen of the Dhamani village. Dhamani people do not have their fish cooperative society thus unable to take fish ponds on leas and unable to take benefits from the government departments. Thus, discussion has done on the registration and future planning of fishermen's cooperative society.

6. Awareness rally of students arranged at Dhamani (27 September 2008)

Since many days we are having active dialogue with the students of K.N. College, Karanja through environmental education. The positive outcome of this association was the interest of the students increased in the environmental protection. As a result a rally has been arranged by the students of K.N. College in the Dhamani. In the rally 150 students has been participated.

Village head of the Dhamani Mr. Sunil Ghate has given green signal to the rally. *'River is our mother and we have lifelong relation with her'*, *'Save river save life,' 'make protected areas for sustainable life'* were some of slogan used by the students.

In this rally lot of local people and fishermen has been participated. This rally marches through village reached to Adan River where it has transferred in to a small program.

7. Maharashtra State River Summit (18th and 19th October 2008)

In ancient India there was a system of Kumbh Mela (Gathering along rivers) organized after every 12 years. The main reasons behind this gathering were to discuss about various issue regarding rivers and to devise actions to protect rivers. This system is still going on but the core objective of this gathering has been vanished completely. We were organized Maharashtra River Conference as *Jal Kumbh* to revive our traditions of river protection.

The main objectives of this summit was, to share experiences of people working for river conservation, to devise collaborative studies of rivers for Maharashtra, to devise effective strategy to work with the fishermen of various part of state for livelihood and river conservation issues, to create some examples of fresh water protected areas on various rivers and other water bodies and to create awareness in the main stream society and government departments about issues.

Raman Megesese winner Mr. Rajendra Singh from *Tarun Bharat Sangh*, Jaipur has chaired the summit along with notable social activist Mr. Mohan Hirabai Hiralal. Lot of people from throughout Maharashtra has participated in this mega event. The program has been arranged in collaboration with National Jal Biradari, Samvardhan, Samvedana and local K.N. College.

Before inauguration of the Jal Kumbh, a water rally has been arranged from the Karanja city in which lot of people from the Karanja along with hundreds of students from the schools and colleges has participated. The rally begin from local *Guru Mandir*, and ends at conference venue.

The first session of the river summit was about the *past, present and future of the National river* which was initiated by Mr. Rajendra Singh, Ms. Sumira Rasool from Kashmir University and Mr. Vikrant Aher from Agharkar Research Institute, Pune. From the discussion it was clear that all the river basins of the India are under severe threats.

Figure 25: A session at Maharashtra River conference.

The first session of the river summit was about the *past, present and future of the National river* which was initiated by Mr. Rajendra Singh, Ms. Sumira Rasool from Kashmir University and Mr. Vikrant Aher from Agharkar Research Institute, Pune. From the discussion it was clear that all the river basins of the India are under severe threats. According to Sumira Rasool the vital water resources of the Kashmir are under severe threat due to development activities and tourism. Mr. Aher is working on the fish kill issue, according to him the massive fish kill event increased in last decade in all the rivers of the Maharashtra state.

Second session was about river problems of Maharashtra state and Vidarbha region. The discussion has been initiated by Mr. Janak Daftari, Mumbai, who is working on the west water treatment for urban areas. He argued that, the industrialization has played an important role in the deterioration of rivers. Important problems our rivers facing are pollution due to industrial effluents and sewage. New biotechnology tools can play effective role in the sewage treatment, added Mr. Daftari. Mr. Pradumna Sahastrabhojani and Mr. Ramesh Ladkhedkar from the Vidarbha Nature and Human Science Centre (VNHS) Nagpur presented their work on the renovation of the Nag River from the Nagpur. Nag River is best example of the rivers of the city. VNHS is developing a model of Eco-city for Nagpur area.

Third session was about the People's participation in the conservation of the wetland resources. The session has been chaired by the notable social activist Mr. Mohan Hirabai Hiralal, Mr. Kaustubh Pandharipande and a member of fishermen community Mr. Vilas Malte. Local people are most important actors in the conservation Endeavour. Local Gramsabha (Village council) must be empowered to conserve the local resources. Main problem of the current management paradigm is control of the local resources from the other levels (other than village). Study groups at the local level can play an important role in the management of the local resources.

Second day of summit was started from the river march and visit to a fishermen village Dhamani. A meeting with the fishermen of the Dhamani village has been arranged and Rajendra Singh discussed various issue of problems of the fishermen.

After returning from the village a session has been arranged about the wet land problems of the Karanja city and around. The session has been initiated by Dr. Nilesh Heda and Mr. Subhash Sabu. Many people from the Karanja city have been participated in the discussion. Karanja city has 3 traditional tanks viz. *Rishi Talaw*, *Sarang Talaw* and *Chandra Talaw*. All these 3 tanks are deteriorating due to siltation, sewage and encroachment. There is need to renovate these traditional water bodies for the future of the Karanja city.
Last session was about final future planning. A network of the water conservationist has been created for the Maharashtra level.

8. Meeting of the local people regarding renovations of the traditional tanks has been arranged at K.N. College, Karanja (25 October 2008).
First discussion meeting of local people of Karanja and students of various schools has been arranged at K.N. College. Nilesh has presented present state of the traditional tanks in this meeting. Karanja city endowed with many traditional tanks viz. Rishi Talaw, Sarang Talaw and Chandra Talaw. Due to encroachment, use of these water bodies for dumping city west, destruction of the catchment, these water bodies were deteriorated. To review these water bodies there is need to unite all interested people of the city. All the angles of the revival of these water bodies have been discussed in the meeting and for direct intervention Sarang Talaw has been chosen.

9. Shodh Study Group Meeting (20-21-22 December 2008)
Shodh Study Group is an informal group of the people working in social sector in Maharashtra (*Shodh* means Search in Marathi language). The main mandate of the group is to share the experiences of the social work and other socially relevant studies. After every six months people from the all over Maharashtra unite and discuss for this cause. This time Shodh Study Group meeting has been arranged at Karanja.

10. Katepurna Study Group Meeting (14-15 January 2009)
Katepurna Abhyas Gat Meeting (*Katepurna* Study Group Meeting) has been arranged at Dhamani Village. Social activist Mr. Mohan Hirabai Hiralal was chief guest for the same. The

main objective of this gathering was to do capacity building of local people regarding NREGA and conservation of riverine resources.

11. Capacity building through the implementation of NREGA
Our movement of the proper implementation of the NREGA has been a breakthrough in the organizing people and their practical capacity building.

12. Formation and regular interactions with village level study groups
Regular meetings with the villagers in the form of *Abhyas Gat* (study groups) were effective and informal way of the capacity building.

13. World Environment day
World environment day program has been arranged at Karanja. It was a unique gathering of the fishermen, labourers, professors, policy makers, students, teachers, media people and common man.

14. Plantation along Adan river
Plantation program has been arranged along the bank of Adan River On the 15th August 2009. Adan River is major tributary of River Penganga. The river is facing problems of the eroding banks and siltation. In this situation plantation is ecologically meaningful activity to be perform along river. Dhamani village is situated at the bank of River Adan. Since many days we are involved with the fishermen and labourers of the village for the livelihood generation and river conservation. In this regard fishermen and labours from the Dhamani village have been gathered along with citizens of the Karanja city. About 500 plants of locally available plants have been planted along river. Block development officer Mr. Parhate from Karanja Panchayat Samiti and Extension officer of the same office along with lecturers and students of the local K.N. College has been participated in this endeavour.

9.2 Linkages with the other levels:
Close contacts has been maintained with following groups and networks.

1) **Vidarbha Pani Pariwar (Vidarbha Water Family):** Informal group of people working for the issues of water conservation.

2) **Maharashtra PBR group:** E-group of people working for environmental issues.

3) **NGOs:** Lot of NGOs throughout Maharashtra (e.g. Vidarbha Nature and Human Science Centre, Nagpur, Vrikshamitra, Chandrapur, Bhandara Nature Club, Bhandara, Aamhi Aamachya Aarogyasathi, Kurkheda etc).

4) **National level:** Jal Biradari, Tarun Bharat Sangh.

5) Association with Lower Penganga Dam Opposition Committee.

6) College: K.N. College, Karanja.

Association with above linkages is two way process of learning for us as well as for them. Thus, *'Vidarbha Pani Pariwar'* constitutes a group of various NGO doing substantial work related to water body conservation, sustainable livelihood of fishermen. Joint process of water body study and conservation is started with *Pani Pariwar*.

Chapter 10

Project Management Section

10.1 Information on the staff involved

10.1.1 Full time Staff

Full time staff is shown in following table where as voluntary members of the project shown in the table number 5.

Sr. No.	Name	Education	Age	Designation	Role in the Project
1	Dr. Nilesh K. Heda	M.Sc. PhD	32 Years	Project Director	Overall project Management.
2	Mr. Nilkanth Shinde	M.A.	26 Years	Project Assistant	Office maintenance. Accompany during field work. Program management.
3	Mr. Subhash Bavane	4th STD.	40 Years	Village coordinator	Coordination of activities at village level.
	Mr. Vilas Malte	4 12th	32 Years	Village coordinator	Coordination of activities at village level.

Table 4: Core project Team (Salaried)

1. Dr. Nilesh K. Heda

Completed his graduation (B.Sc. in Biology) and post graduation (M.Sc. in Zoology specialization fisheries) from Amravati University. Joined Indian Institute of Science (IISc) Bangalore in 2003. In IISc appointed as project coordinator on preparation of *People's Biodiversity Register* (PBR) under the leadership of notable ecologist Prof. Madhav Gadgil.

The project has been funded by Ministry of environment and forest (MOEF), Government of India and Millennium Ecosystem Assessment (ME). Mean time registered for PhD in Ecology. In 2004 appointed as project coordinator for preparation of PBR with students in the Maharashtra and Madhya Pradesh area. Awarded with PhD in 2007. PhD involves some studies on the ecology and diversity of fresh water fishes in the two rivers of North Eastern Godavari basin. In 2007 joined Agharkar Research Institute (ARI), Pune as research associate on Department of Science and Technology, Government of India funded project. From 2007 onward working as project director for the river and fish research project

funded by Sir Dorabaji Tata Trust, Mumbai. In 2008 received Rufford Small Grant from Rufford Maurice Foundation, London.

Books: 4. Co-authored 2 books. Individually 2 books. Published research papers in many scientific journals. Writing creative articles in news paper. Delivering popular lectures about environmental issues.

2. Mr. Nilkanth Shinde

He is from nomadic pastoral (Dhangar) community. Completed B.A. from Amravati University in 2006 and doing his M.A. in Marathi literature. Recently he has been selected at village fellow for the Village fellow for joint expedition by SNDT University and rural commune. Samvardhan is mentor organization for him.

3. Mr. Subhash Bavane

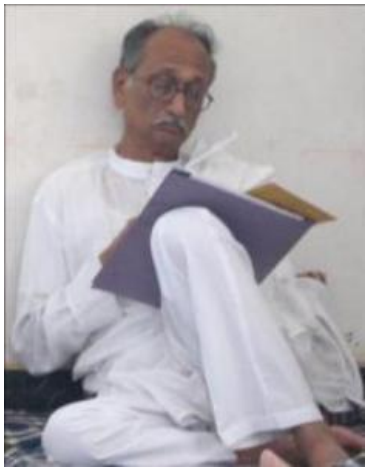
Mr. Bavane is from Fishermen community (*Bhoi*). Expert in fishing and traditional knowledge.

4. Mr. Vilas Malte

Mr. Malte is from Fishermen community (*Bhoi*). He is expert in fishing and traditional knowledge about fishes. Have leadership qualities. He has completed his education up to 12th unfortunately unable to go further due to weak financial condition. For news letter he write regular feature article in local language. He is becomes president of the Dhamani Khadi Labour union and skilfully organizes village level activities.

10.1.2 Consultant

- **Mr. Manoharrao Bhrushundi.**



In 1973 Mr. Bhrushundi joined Maharashtra Fisheries Department as assistant fisheries development officer. In 1973 he has promoted as assistant fisheries research officer. In 1979 he has completed special training at *Central Institute of fisheries education*, Mumbai (CIFE).

He has worked as district fisheries development officer at Bhandara, Dhulia, Jalgaon, Nagpur, and Gondia. From 1993 to 1995 he has appointed as chief executive officer of fish farmers development agency at Bhandara. Along with fresh water he has experience in the marine water fisheries too. In this regard he has worked as Assistant director of fisheries at Palghar in Thane district. He has retired as assistant director of fisheries at Pune in 1999.

10.1.3 Volunteer

Sr. No.	Name and address	Expertise
1	Dr. Subramanian K.A. Zoological Survey of India, Pune.	Ecology
2	Prof. K.C. Malhotra, Retired professor of anthropology, Noida	Anthropology
3	Mr. Mohan Hirabai Hiralal, Vrikshamitra, Chandrapur	Social Activist
4	Devaji Navalu Tofa, At. Mendha (Lekha), Post. Hetti, Ta. Dhanora, Dist. Gadchiroli Maharashtra	Community Leadership
5	Mr. Manoharrao Bhrushundi, Retired Fisheries officer Govt. Of Maharashtra, Hanuman Nagar, Nagpur	Culture fishery, laws, GRs, bureaucratic functioning.
6	Mr. Kaustubh Pandharipande, Samvedana, Karanja	Social Activist, conceptualization and implementation of social processes.
7	Adv. Sumant Bandale, Karanja (Lad), Dist. Washim	Law
8	Mr. Vipin Sone, Heda Junior College, Washim	Zoologist.
9	Mrs. Ruchita Heda, SAMVARDHAN, Karanja (Lad)	Computer
10	Dr. Diwakar Ingole, K.N. College, Karanja (Lad)	Social Scientist
11	Students of K.N. College, Karanja (Lad)	College Support

Table 5 Voluntary project Team

10.2 Reporting and interacting mechanism

Regular Monthly meetings has been arranged to take review of the process. After every important project event project director, project assistant and one village coordinator wrote a project report and submitted to Project director. *Jal-Samvardhan*, monthly news letter has been very good tool used for process documentation. Every month, project news has been published in *Jal-Samvardhan* which is used to write final project report and provide direction to other people too. Editorial section of the *Jal-Samvardhan* was written by project director provide first hand analysis of the gathered information. Principal consultant *Mr. Manoharrao Bhrushundi* also submitted their project report. Most of the reporting is in local Marathi language and as per need its English translation has been done. We built very good rapport

with editor and journalist of local news papers. The regularly appearing news in the local paper about project was used for reporting as well as created awareness among other sections of the society.

10.3 Planning aspects of the project

Although one time planning has been done for the period of a year but as per need monthly planning has also been done. At the conception of project a brainstorming meeting has been called with few fishermen, NGO head and project director in which future move was decided. After the appointment of project assistant and field coordinator second meeting was called to discuss the objectives of the project. Then objectives wise and considering season and people's suitable time, series of village meetings has been arranged. Activity wise capacity building events has been arranged, like exposure visit to Mendha village, study group meetings etc. Monthly meetings, as a part of staff planning, were important to discus and share field experiences. After the sufficient rapport building with the community members planning with community members through study group meetings has been done.

Chapter 11

Overall Assessment

Considering novel approach of work for this area and short span of the project, we believe that project completed its first phase successfully. During this project we find out few villages who are interested in doing positive changes. This discovery is important as in future other villages can learn lesson from these villages. Before the conception of this project we didn't knew much about the villages of these area and there was little rapport in this area.

After a yearlong project now a ground is made on which larger interventions can be possible. The objectives set forth in concept note were definitely addressed but most importantly new objectives have been searched and many new objectives have been completed during the project. Now there is a need to take benefit of this ground. Whatever investment we have made was fruitful.

The holistic approach is most important thing of this project. This was not only a project of conservation for the sake of conservation rather it has addressed many social, economical and ecological linkages of the conservation.

Time factor is essential when we deal with the complex systems. One year span is definitely very short span to address issues of such complex system. However, whatever time and financial resources was available, utilized completely and fruitfully.

Search for people from the community with leadership qualities and broader outlook should be an important objective of any project. This is very much important for the sustainability of the project. Through this project we searched people like Vilas Malte, Gulabrao Bavane, Rafik Sheikh and many more who themselves can keep this process running.

Chapter 12

Recommendations for Supporters

On the basis of lesson learnt from this project we would like to suggest that, trust may look in to following points while supporting any organization.

12.1 Societal Choice:

Still we have biomass based civilization. Large numbers of people depend on natural resources for their subsistence. While addressing any conservation issue local people should choose the same. These kinds of societal choice make conservation effort more meaningful, socially relevant and sustainable. Ecology is one of the most complicated sciences and need to understand and use people's knowledge.

Any project which increases the confidence and capacity of the local people is sustainable.
Thus, while funding any project, one important criterion should be considered that, if the project increases the capacity and do empowerment of the local people only then the project will be sustainable.

12.2 Holistic approach:

Every aspect of any conservation Endeavour or any social intervention links with various components. System approach is important while addressing any environmental or social issue. Dealing with the social or environmental problem is like dealing with complex systems. Complex systems are made of many components, it is difficult to understand such systems and these kinds of systems give surprises. Thus, there are great chances to deviate from the original objectives set at the time of the conception of the project. There needs to apply principals of adaptive management while working with such issues.

Thus, we started our project with basically conservation and livelihood of fishermen through aquaculture in mind but as project progresses there were substantial paradigm shift both conceptually as well as activity wise.

12.3 Fish culture:

12.3.1 Health of natural sources of the fishes should be improved
Considering limited availability of the wetlands suitable for fish culture and large number of fishermen depend on the natural watercourses for fishes, it is imperative to sustain the dependency of the people on the natural watercourses like rivers and traditional tanks. However, due to wide spread destruction in the natural water resources, livelihood of the fishermen is in danger. Thus, there is need to increase the sustainability of the natural resources. There will be many approaches needed to sustain the natural sources like checking pollution, establishment of People's Freshwater Protected Areas (FWPAs), awareness generation and so on.

12.3.2 Traditional fishing community members and aquaculture

As a priority, programs of the fish culture can be effectively carried out where there are traditional fishing community members, as they possess good deal of practical knowledge about the ecology of fishes.

12.3.3 Cooperative societies and aquaculture groups

Fishing is cooperative endeavour. Fish culture, similar to agriculture, is group activity. At least two people are needed to drop a net in the water to catch fishes. During leasing of the water bodies for aquaculture by state fisheries or irrigation department, as a rule, first preference is given to cooperative societies. However, it is our general observation that only wealthy and influential people hold these cooperative societies and poor people due to lack of funds and resources unable to register for the same. In addition, there is wide spread corruption in the department. Thus, help should be provided to the local people to set up the cooperative society.

12.3.4 Inequitable sharing of benefits

It is seen that, there is inequitable sharing of the benefits among the members of the cooperative society. Only president or secretary gets all the benefits of the cooperative society. Thus there is need to give emphasis on the empowerment of the other members of the society too. This can be possible by increasing transparency in the system.

12.3.5 Financial matters of aquaculture

Fish culture is funds incentives activity. Historically fishermen are economically backward and deprived class of the society. At the crucial time of the aquaculture like purchasing of the fish seeds there are seen acute lack of funds. Thus, there is need to introduce concept of Small Saving Groups (SSG) and banking among the anglers. All the transactions of the fish culture should be through bank. Wages, seed purchasing and other payments should be done through banks so that, in long run bank can provide lone to fish culture groups.

12.3.6 Scientific fish culture

Although people posses good deal of the traditional knowledge, there is a lack of knowledge about the scientific fish culture. Thus, there is need to empower the local people regarding scientific aquaculture. Many environmental factors like productivity of ponds dissolve oxygen, growth of hydrophytes, disease outbreak etc influence aquaculture to which aquaculture groups should monitor properly. In small ponds afore mentioned scientific manipulations are possible to ensure *Maximum Survival Potential* of the fingerlings released.

12.3.7 'Do not weigh, count' phenomenon. Poor management of aquaculture.

Aquaculture should not be considered as only release of the fingerlings in the pond water, rather it the matter of management of complex ecosystem of thousands of interlinked components. Overall management of aquaculture groups studied is not proper, as if people do not keep record of the fish culture (How many fingerlings released? How many fishes harvested etc). In addition, financial records of the cooperative society has not maintained

properly. It is interesting to note that fishermen talk in terms of the weight of the fishes and not the number of fingerlings released and harvested. Thus, suppose, 100,000 fingerlings released in the water, considering 50% survival rates, 50,000 fish numbers are expected. However, the situation is quite different.

12.3.8 Data base of water bodies

There are large numbers of water bodies largely in the possession of the state. Every year, state fisheries and irrigation department auction these water bodies to local people, but there is no mechanism of the information disbursement (How many water bodies? Distribution, their biological characteristics, auction value etc), because of this, those wealthy people who have access to information are benefited. Also, present state of these water bodies is unknown even to department people; as a result good management of these manmade water bodies is not possible. Thus, there is need to create a database of these water bodies and to distribute it among the people. Information for such kind of database can be gathered from the fisheries and irrigation departments using Right to Information Act (RTI) and fieldwork.

12.3.9 Introduction of invasive species

The introduction of invasive species is widely recognized as one of the most serious threats to local fish fauna. If the aquaculture project only focuses on the production-based aquaculture of invasive species, the project will not be sustainable as invasive species gives short term production but in long run make deleterious changes in the environment. Thus, along with the production of fishes there is needed to understand the effects of the production on environment. Thus, in Maharashtra and other parts of India, tilapia (*Oriochromis mossambica*), an invasive alien species has established in natural watercourses.

12.3.10 Self-sufficiency

All the aquaculture groups are depending on the outside sources of the fish seeds. In Maharashtra, state fisheries department almost stopped fish seed productions, as a result local fish culture groups have to import fish seeds from the other states like West Bengal. This involves high cost, some time inferior quality of seeds and contaminated seeds by invasive fishes. There is need to shift our attention on the natural sources of seed. It is proven fact that, important major carps like Catla, Rohu, Mrigal established in to the culture ponds in Maharashtra too. These species are breeding in the culture ponds and associated flowing water bodies like rivers. Local people can identify these sources. In monsoon, if we can able to collect these naturally occurred fish seeds then the system can be more sustainable. Former deputy director of state fisheries department, Mr. Pande, have completely banned import of the fish seeds from the outer states and successfully encouraged collection of fish seeds from the natural watercourses (Personal communication Mr. Manoharrao Bhrushundi). By providing incentive to local fishermen we can successfully identify breeding places of the major carp and collection of the same.

In addition, along with the fish culture there is needed to encourage local group to produce fish seeds at local level. Fishermen of about 10 villages can set up a hatchery cooperatively so

that good quality and cheap seeds can be supplied. Off course, this needs lot of scientific and financial resources.

12.3.11 Valuation of water bodies

Valuation of the water bodies by fisheries and irrigation department is not proper. Thus, while fixing auction value, department set criterion of area of pond only. But the productivity of the water body should also be considered while fixing the prize of the water body.

12.4 Long term commitment with the issue

Long term commitment with the issue is an important factor decides sustainability of the outcome. If the commitment with issue is project span oriented then that will waste the resources.

Chapter 13

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Chapter 14

Annex

14.1 Meetings and major events arranged during project period.

Sr. No.	Date	Name of meeting	Brief objectives
1	02-Feb-08	Injori Meeting	A meeting has been arranged at Injori village of Manora Taluka regarding the objectives of project.
2	13-Mar-08	Right to Information	Using Right to Information Act, information regarding water bodies of the Yavatmal district has been invited from Z.P. Irrigation and State Fisheries department from Yavatmal.
3	14-Mar-08	Right to Information	Using Right to Information Act, information regarding water bodies of the Washim district has been invited from Z.P. irrigation and State Fisheries department from Akola.
4	26-Mar-08	Meeting at Injori	A discussion meeting arranged at the Injori Village of Manora Taluka, regarding issues of the local people.
5	30-Mar-08	Meeting at Mhasani	A discussion meeting arranged at the Mhasani Village of Manora Taluka, regarding issues of the local people.
6	31-Mar-08	Meeting at Mhasani	A discussion meeting arranged in the Mhasani Village regarding issues of the local people. The village is situated near Adan dam and has been relocated in the past during dam construction.
7	04-Apr-08	Meeting at Ramgaon	A discussion meeting arranged at the Ramgaon Village of Darvah Taluka, regarding issues of the local people.
8	28-29-Apr-08	PANI PARIWAR Meeting.	A 2 day's workshop of VIDARBHA PANI PARIWAR (VIDARBHA WATER FAMILY) has been arranged at Karanja.
9	04-May-08	Meeting at Lohi	A discussion meeting arranged at the Lohi Village of Darvah Taluka, regarding issues of the local people.
10	10-May-08	Nadi Abhyas Gat (River Study Group) and Self Help Group (SHG)	Nadi Abhyas Gat (River Study Group) and Self Help Group (SHG) established for Dhamani (Khadi) village. The group is expected to work for sustainable livelihood, river conservation and other issues of the fishermen.
11	15-May-08	Fish consultant	Retired fisheries officer Mr. Manoharrao Bhrushundi, Nagpur, has been agreed to be principal consultant of the project.

12	30-May-08	Meeting at Mankopra	A discussion meeting arranged at the Mankopra Village of Darvah Taluka, regarding issues of the local people.
13	31-May-08	JAL - SAMVARDHAN Inauguration	A monthly news letter 'JAL SAMVARDHAN' (WATER CONSERVATION) has been started from May 2008. The first issue has been inaugurated at fishermen's village Injori.
14	14-Jun-08	Meeting at Manki	A discussion meeting arranged in the Manaki Village regarding issues of the local people.
15	20-Jun-08	Meeting at Shivani	A discussion meeting arranged in the Shivani Village regarding issues of the local people.
16	21-Jun-08	Meeting at Pimpri (Kharabi)	A discussion meeting arranged in the Pimpri (Kharabi) Village regarding issues of the local people.
17	27-Jun-08	Association with LOWER PAINGANGA DAM OPPOSITION COMMITTEE	A dam is proposed at the confluence of Adan and Penganga river in Yavatmal district. One day fieldwork and meeting with LOWER PAINGANGA DAM OPPOSITION COMMITTE has been arranged. We are providing technical help to anti dam movement
18	13-Jul-08	Discussion about fish kill	Mr. Vikrant Aher is working with Prof. Madhav Gadgil in Agharkar Research Institute, Pune on Fish Kill phenomenon. A discussion with Mr. Aher about fish kill has been arranged at project office.
19	15-Jul-08	Advocacy	A fax has been sent to Chief Minister, vice CM and animal husbandry and fisheries minister regarding discrimination with the fishermen of Upper Wardha dam.
20	20-Jul-08	Survey of pond	A pond survey has been carried out to take on leas for future fish culture. The pond is located near Dhamani village and under the management of the Z.P. Irrigation department.
21	25-Jul-08	Meeting at Haru	A discussion meeting arranged at the Haru Village of Darvah Taluka, regarding issues of the local people.
22	26-Jul-08	Registration of the Society	The registration process of the Fisheries cooperative society has been started at the Dhamani village.
23	26-Jul-08	Meeting at Bori Arab	A discussion meeting arranged at the Bori Arab Village of Darvah Taluka, regarding issues of the local people.
24	28-30-Jul-08	Participation in JAL BIRADARI Workshop.	Project director Dr. Nilesh Heda, has visited 3 days workshop at Delhi arranged by National JAL BIRADARI, Tarun Bharat Sangh.
25	09-Aug-08	Youth Gathering	One day Fishermen Youth gathering has been arranged to discuss the issues related to youths of fishermen community.

26	29-Aug-08	Fish Culture Started	Fish culture has been started with the fishermen of the SAVALI village. Through project grant 10000 Rs has been provided as a revolving fund to local people.
27	01-Sep-08	Discussion with SARPANCH	A field work and discussion with Dhamani village head has been arranged regarding identification of the suitable site for future protected area and role of the NREGA in the river conservation.
28	01-Sep-08	Habitat Inventory	Habitat inventory carried out for future FWPA. In this expedition BHAN DOH (Local name of a pool along Adan River) has been suggested by local people for future FWPA.
29	14-Sep-08	Discussion at MANGRULPIR	One day discussion has been arranged with the local people of the Mangrulpir regarding river conservation.
30	17-18-Sep -08	Exposure visit	Exposure visit of River study group arranged at Mendha village.
31	23-Sep-08	21 to 23 September 2008	3 days field work has been carried out with Retired fisheries officer Mr. Bhrushundi.
32	27-Sep-08	Awareness rally of students	Awareness rally of students arranged at Dhamani.
33	02-Oct-08	Construction of community meeting hall	Through voluntary labour and financial support from the project, fishermen of the Dhamani village constructed a community meeting hall for discussion meetings.
34	18-19-Oct-08	NADI SAMMELAN (MAHARSHTRA STATE RIVER SUMMIT).	Maharashtra State River Summit has been arranged on 18th and 19th October 2008.
35	19-Oct-08	Adan river visit with Rajendra Singh	Raman Megesese Award winner Mr. Rajendra Singh, along with many volunteer visited Adan River and participated in the field work.
36	25-Oct-08	Renovation of traditional water bodies	Meeting of the local people regarding renovations of the traditional tanks has been arranged at K.N. College, Karanja.
37	16-Nov-08	Voluntary labour	Voluntary labour arranged at SARANG TALAW, Karanja (Lad).
38	01-Dec-08	Meeting with proposed Fish society members	A discussion meeting has been arranged at Dhamani with Members of the proposed fishermen co society.
39	04-Dec-08	Involvement of Women of the fishermen community	A discussion meeting has been arranged at Dhamani with women of fishermen community. The main objective of the meeting was to discuss about the problem of the liquor and employment.
40	07-Dec-08	Participation in the SINCHAN SAMMELAN at Sindhkhed Raja	A SINCHAN SAMMELAN (Irrigation Summit) has been arranged at Sindhkhed Raja, dist. Buldhana.
41	14-Dec-08	Popular Lecture	A lecture has been given by Dr. Nilesh Heda at "Late Mrs. Tidke Vyakhyan Mala (A lecture series)" on

			environmental issues.
42	20 to 22-Dec-08	SHODH ABHYAS GAT meeting.	Two day's discussion meeting of SHODH ABHYAS GAT has been arranged at Karanja.
43	06-Jan-09	Popular Lecture	A lecture has been given by Dr. Nilesh Heda at Yeshwantrao Chawan college, Mangrulpir on environmental issues.
44	14-Jan-09	Katepurna Abhyas Gat Meeting (14-15 January 2009)	Two day's discussion meeting of KATEPURNA ABHYAS GAT has been arranged at Dhamani village.
45	18-19-Feb-08	Exposure visit	Exposure visit of study group member has been arranged on at Sevagram, Wardha (Mahatma Gandhi's Ashram).
46	22-Feb-09	One day workshop	To make partner in the fish culture program one day workshop arranged with the fishermen of Wai village of Akola district.
47	25-Feb-09	Popular speech	Popular speech delivered at Murtizapur.
48	27-Feb-09	Popular speech	Popular speech delivered at Kamargaon.
49	05-Jun-09	Popular program	On 5th Jun 09 (World Environment Day) a popular awareness program has been arranged at local K.N. college in which people from the all class of society, NREGA labours and fishermen from the various villages gathered.
50	15-Jun-09	SAKHALI river Encroachment matter.	Sakhli river, an important tributary of river Bembla (North-Eastern-Godavari basin) is originated at village Manbha (20030'35.66'' N 770.37'.52.01'' E) in Karanja taluka (Near our field station). The river has been encroached by a wealthy person of the area due to which, there is a danger of the flood to village. A social movement has been raised by our team with local villagers to save this river. On 23 Jun 09 local people with consensus removed encroachment.
51	24-25-26-Jun-08	Exposure visit	Exposure visit and field work arranged with notable Ecology Prof. Madhav Gadgil at Navegaon National Park. The main agenda of discussion was to show results and open discussion of the RSG grant with gathered people.
52	28-Jun-09	Meeting	Meeting arranged with local fishermen and labourers regarding establishment of the labour union for the river revival through NREGA work.
53	29-Jun-09	Field Work	Monsoon field work arranged with the local fishermen. Traditional fishing gadgets have been studied. Fish inventorying done.
54	01-Aug-09	Meeting with the chairman of tribal commission.	Our delegation meets chairmen of the tribal commission at Mumbai, India regarding Lower Penganga Dam. The dam is sanctioned on the point where river Adan meets Penganga. The proposed

			dam is not ecologically and economically viable.
55	5th August 2009 onward	Interaction with the K.N. college student.	Interaction with the K.N. college student made. Soon the new batch of the academic year 2009-2010 will engage in our riverine conservation work.
56	15-Aug-09	Plantation along Adan river.	On 15th August 2009 (Independence Day of India) plantation program has been organized at Adan River. About 200 people, including NREGA labour government officers, press reporters came on to Adan river and planted trees. The program inaugurated by block development office Mr. Parhate, extension officer Mr. Jadhav.
57	18-Aug-09	Demonstration	A peaceful demonstration made at regional agriculture department regarding delay in the payment of the NREGA labour.
58	24-Aug-09	Popular program	Meeting arranged with the students of B.Ed. College. This was essential interaction meeting for the future expansion of the project.
59	25-Aug-09	Popular program Dhanaj.	Dhanaj. Meeting arranged with the health officials of the primary health centre regarding conservation of the wetland resources.
60	29-Aug-09	Meeting with Prof. Madhav Gadgil.	Meeting arranged with the notable ecologist Prof. Madhav Gadgil regarding Lower Penganga Dam Construction.
61	30-Aug-09	Meeting with Prof. Madhav Gadgil.	Ralegan Siddhi. Meeting arranged with the notable social activist Anna Hajare regarding Lower Penganga Dam Construction.

Figure 26: Wardha river of Godavari basin.