COMMUNITIES & CLIMATE CHANGE: THE CLEAN DEVELOPMENT MECHANISM AND VILLAGE-BASED FOREST RESTORATION IN CENTRAL INDIA

A Case Study from Harda Forest Division, Madhya Pradesh, India

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EXECUTIVE SUMMARY

The objective of this study is to explore the feasibility of a new environmental service financing initiative in India using carbon-offset credit programs that are being developed through ongoing international climate change negotiations. This report is a summary of the first phase of the study. While the United Nations Framework Convention on Climate Change Convention seeks to forge a global mechanism for ensuring Green House Gas reductions, millions of forest dependent peoples, some of the world's poorest, are already reducing atmospheric carbon levels on their own by protecting their local forests under their own initiative. This report documents preliminary findings from Harda District, Madhya Pradesh in central India to demonstrate how the Clean Development Mechanism could be utilized as compensation to spread forest stewardship by increasing economic incentives for sustainable forestry.

During the first project phase, from June 2000 through May 2001 a collaborative research project was undertaken by researchers from four different organizations: Community Forestry International, the Indian Institute of Forest Management, the Center for Ecological Sciences, and the Ministry of Environment and Forests in Harda District, Madhya Pradesh. The project poised several broad research questions: 1) How much carbon do regenerating forests under community protection store and sequester? 2) What volume and type of external subsidy is required to sustain and expand village-based forest protection activities? 3) What institutions are best positioned to manage carbon credit transfers? and, 4) What type of monitoring and verification system could be established in rural India to document forest protection committee impact on carbon sequestration and storage?

The researchers found that teak and dry deciduous forests in Harda Division that were under community protection sequestered between 1 to 3 metric tons of carbon per hectare each year. External support, both from the routine Forest Department budget as well as under a special World Bank financed project, have been important factors in initiating and sustaining forest protection committees (FPCs) in Harda Division. While many FPCs in Harda Division are functioning effectively, especially those in the teak-rich forests of Rahatgaon Range, others are struggling to sustain protection activities. Inadequate forest department financing in some areas is related to the poor performance of some FPCs, however social group conflicts, exclusion of some forest dependent communities, and the degraded state of some forests, especially those in Handia Range, are also factors affecting community conservation behavior.

The study found that degraded forests, where community forest management has yet to be established, offer the greatest potential for future carbon sequestration and seem the best positioned to receive financing through carbon offset credit programs. These areas are typically protected forests, rather than reserves, with crown cover of less than 40 percent. The researchers concluded that Handia Forest Range could be formally proposed as a carbon credit pilot project, provided a broad-based process of consultation was carried out with all resident communities and a hamlet-based management network was established to implement the project.

-Dr. Mark Poffenberger, Project Director

FOREWORD

Rural communities that sustainably manage the natural environment provide important services to downstream villages, farming areas, urban centers and the larger global society. By stabilizing upland soils, improving hydrological functions, conserving biodiversity, providing recreational areas, and capturing greenhouse gases, community forest protection benefits many, while imposing costs on some of the world's lowest income groups. Compensating local people for the environmental services flowing from the resources they manage is being recognized as a necessary and important investment in the future. Mechanisms to channel environmental service payments to community resource managers are just beginning to be explored. Carbon offset credits schemes that finance community forest restoration efforts are currently being developed through ongoing international climate change negotiations leading to operational mechanisms for environmental service compensation. This project is the first effort of its type to explore the feasibility of using carbon credit-based financing mechanisms to support Indian community forest restoration initiatives.

The intent of this research is to provide information regarding the role forests and communities play in sequestering and storing carbon in India. The study bears no reflection on the Government of India's policies regarding forests and the Clean Development Mechanism as outlined in the Kyoto Protocol. Rather, it is a scientific program intended to provide information for future policy dialogue. In this project, CFI is grateful to the Indian Ministry of Environment and Forests for their encouragement in exploring the possibility of using carbon offset credits to finance the promising national JFM strategy over the next fifty years. The research team is particularly grateful to the Office of the Inspector General of Forests. Dr. V.K. Bahuguna, the Deputy Inspector General of Forests, played an instrumental role in guiding the concept and design of the program and acted as one of the senior reviewers. The project design benefited from a workshop held in February 2000, which was organized by the Center for International Forestry Research (CIFOR) entitled Capturing the Value of Forest Carbon for Local Livelihoods: Opportunities Under the Clean Development Mechanism of the Kyoto Protocol. We are grateful to Dr. Ken MacDickens and Dr. Joyotee Smith of CIFOR, and Ms. Tia Nelson of The Nature Conservancy, for their interest and input into the project.

The International Programs branch of the USDA Forest Service and the Global Bureau of the United States Agency for International Development provided financing for the project. We are grateful to Dr. Alex Moad, Dr. Gary Mann, Dr. Jean Brennan, and Mr. Mike Benge for their encouragement during the development of the project. Implementation of the program was greatly facilitated by the support of the Indian Institute of Forests at Bhopal. Dr. Ram Prasad, Director of IIFM took personal interest in the research and acted as a senior reviewer. The project also benefited immensely from the ecological research of the Centre for Ecological Sciences at the Indian Institute of Science (CES-IIS) at Bangalore. The project also benefited greatly from the efforts of Dr. Kathryn Smith-Hanssen, CFI Administrative Director, for guiding the development of the project report, editorial guidance and organization, and layout. To all of those mentioned here, as well as the many others that helped make this project possible, we are indebted. The opinions and conclusions presented here, however, reflect only those of the research team members.

- Dr. Mark Poffenberger, Project Director

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If we leave our children with good forests, they will say their parents left them with something of value. Where the forests are now sparse, they shall be dense; with more species diversity, and healthy trees, water shall be found in abundance.

-Amsagar Villager

PART I

THE ROLE OF INDIA'S FORESTS IN CARBON MANAGEMENT

The deterioration of India's natural forests has led to a decline in environmental service functions at the local, watershed, river basin, and global level. The removal of trees from the land and the loss of surface soils, rich in humus, has resulted in the release of carbon into the atmosphere contributing to greenhouse gases and accelerated global warming. The carbon sequestration value of community-based forest protection is certainly substantial. A recent study in India found that carbon sequestration rates in regenerating forests under community and joint management systems ranged from 3.5 metric tons of carbon per hectare per year in the Western Ghats to 5.4 mt C per hectare annually in southwest Bengal.[1] Even relying on more conservative valuations of carbon sequestration rates for dominant Indian forest ecosystems, JFM initiatives may already be capturing 5 to 10 million tons of carbon annually.[2]

Currently the environmental services that communities provide to offset greenhouse gas emissions are not formally calculated nor are any compensation mechanisms operating. With additional external financing, national JFM strategies, relying on low cost natural regeneration, could be expanded three to four fold to encompass much of the degraded wastelands and threatened forests of India, presenting tremendous carbon sequestration potential. Although the European Union, the World Bank, USAID, DFID, SIDA, the ADB, and other international development agencies have invested hundreds of millions of dollars to support state-level JFM initiatives, time-bound projects financed through external loans will not respond to the long term need investment requirements of India's forestry sector. Foreign assistance loans to state forest departments are typically made for five-year periods and carry donor imposed conditions that may or may not reflect needs for restructuring and policy

[1] Ravindranath, N.H., K.S. Murali, and K.C. Malhotra, Joint Forest Management and Community Forestry in India: An Ecological and Institutional Assessment. (New Delhi: Oxford & IBH Publishing Co. Pvt. Ltd., 2000), pp.294-295.

[2] This estimate is based on an average carbon sequestration value of 0.5 to 1 tC/ha each year for the 10 million hectares.

change. Project financing often creates distortions in field programs, with some districts and communities receiving substantial benefits while others are entirely by-passed. Forest departments may be overwhelmed with substantial funds for a five-year project period, only to have the budgets drastically cut when the project terminates.

Due to the nature of foreign assistance loans, financial justification for investments in the forestry sector is usually based on calculating returns from timber sales, rather than the valuation of environmental services and subsistence goods. Loan funded forestry projects often require felling and other activities that may be at odds with environmental goals, including carbon sequestration and storage. Multi-lateral and bi-lateral projects frequently reinforce traditional forest department management paradigms that assume that commercial timber harvesting would be the primary outcome. Perhaps, most importantly, huge investments in state forestry agencies tend to further empower archaic institutions and perpetuate them, rather than facilitating bureaucratic reform and a transfer of authority to forest dependent communities, as envisioned under current JFM national policies. Asia Forest Network case studies from South and Southeast Asia from the last ten years have documented that donor financed social forestry projects that emphasized commercial timber extraction were frequently incompatible with the management goals of community groups engaged in forest protection.[3]

While India generated substantial timber revenues before and after independence, investment in the forestry sector by the Government of India over the past fifty years has been low. *The First Five-Year Plan* (1951-56) allocated only Rs.76 million ($17 million)[4] for the national Forestry and Wildlife Sector, reflecting just 0.39 percent of the total public sector outlay. While this has increased to nearly Rs.41 billion ($1 billion) during *The Eighth Five-Year Plan* (1992-1997), it is still less than 1 percent of public sector financing.[5] At this funding level, government financing of the public forest domain during *The Eighth Five-Year Plan* would average Rs.106 ($2.50) per hectare each year, however the majority of the financial allocation for the sector goes towards the recurring operating costs of the state Forest Departments. Over the past two decades, much of the financing for social forestry and JFM projects has

[3] See Asia Forest Network monograph series, Volumes 1-10. Also Mark Poffenberger (ed.) *Community Involvement in Forest Management in Southeast Asia*. (Berkeley, CA: AFN Publishing, 1999).
[4] The exchange rate during the period was approximately Rs. 4.5 equals U.S. $1.
[5] A.K.Mukerji, "India's Forests: A Status Report," paper prepared for the International Workshop on India's Forest Management and Ecological Revival, (New Delhi: Tata Energy Research Institute and the University of Florida) 10-12 February, 1994, p. 18.

come not from GOI or state forestry sector plan allocations, but from bi-lateral and multi-lateral development agencies or from other special GOI project funds. Despite the importance of external funding to India's forest sector, it accounts for only a small proportion of foreign development investments. For example, from 1984 to 1991, the forestry sector received only 1 percent of total World Bank commitments to India for the period, increasing to 3 percent between 1992-1999.[6]

The environmental and social costs of deforestation in India are high. Forest loss is directly linked with declining hydrological performance in critical watersheds across the country including poor rates of aquifer recharge, uneven surface water run-off, downstream flooding, and tank and reservoir siltation. Deforested lands experience accelerated topsoil erosion, reducing ecological resilience and opportunities for forest restoration. Loss of forests has caused micro-climatic changes including drying of the local environment after windbreaks and forest patches are removed and humidity levels fall. Loss of forest habitat has also negatively impacted biodiversity in many rural areas. Finally, forest loss has directly affected forest dependent peoples by upsetting linkages between those natural ecosystems and agricultural systems.

A wide range of forest products that have historically met diverse subsistence needs of India's rural people are also disappearing, further eroding the quality of life for forest-dependent communities, and in turn increasing their dependence on state financed social services for housing, livelihood, nutritional support, and medical services. At present, 100 million people reside within or around India's public forestlands. Of these, there are 60 million tribal peoples and 275 million non-tribals who are economically dependent on forest products to varying degrees.[7] As deforestation progresses, forest dependent households are forced to migrate to urban slums and agricultural centers in search of employment. Restoring India's natural forests will generate not only important environmental benefits, but highly significant social returns as well.

A BRIEF HISTORY OF JOINT FOREST MANAGEMENT IN INDIA

Deforestation in India has been attributed to a combination of factors including the alienation of resident forest users from involvement in management, expanding rural populations

[6] Kumar et. al. *India: Alleviating Povertry Through Forest Development.* (Washington, D.C.: The World Bank , 2000) pp.136-137.

dependent on forest products and land, poorly controlled industrial exploitation, and inadequate investment in management. The nationalization of much of India's forest land in the later part of the 19th century initiated a process of alienation of forest dependent communities from the management of designated public lands. Over the past one hundred and fifty years, combined pressures from industrial utilization and subsistence use by expanding rural populations led to a steady depletion of natural forest ecosystems across much of the sub-continent. In India, approximately 23 percent of the land area is under the jurisdiction of state Forest Departments, however, only 14.5 percent of the country retains some forest cover, with 9 to 10 percent of India's territory still possessing good forest vegetation. By the early 1990s, an estimated 67 million hectares of land were classified as degraded.

Community-based forest protection and management systems have existed in India for thousands of years and were shaped by distinctive biophysical conditions, land use systems, and local cultures. For centuries, rulers and governments have also played important roles in dictating and controlling forest use. During the British colonial period, an extensive national system of forest management was established, frequently displacing existing community and feudal systems and structures. In recent decades, however, community forest management has begun to reassert itself. During the 1980s, villages in eastern India began forming forest protection groups in response to the rapidly deteriorating condition of their local forests. Initially, this grassroots environmental movement began informally, aided only by local NGOs and forestry field staff. The Government of India passed a formal notification in 1990, encouraging Forest Protection Committees (FPCs) to extend their work. Virtually every state in India passed Joint Forest Management (JFM) resolutions in the following five years, providing forest-dependent communities with limited rights and responsibilities over state lands.

In some states, community forest protection activities spread from village to village, evolving into a broad-based peoples' movement covering much of the natural forests in Orissa, southwest Bengal, southern Rajasthan, and south Bihar. By 1999, between 25,000 and 40,000 villages across India possessed FPCs, controlling access to between eight to ten million hectares of degraded natural forest. The expansion of FPCs, especially in central India, has been accelerated, not only by the recognition and support granted by the national

[7] N.C. Saxena, *Forest Policy in India*. (New Delhi: WWFN-India and IIED, 1999).

and state governments, but through external financial support supplied by bi-lateral and multi-lateral agencies. Major donors have included the World Bank (Andra Pradesh, West Bengal, and Madhya Pradesh), British DFID (Karnataka), Swedish SIDA (Orissa and Tamil Nadu), and the Japanese OECF (Rajasthan, Karnatka, Haryana, and Gujarat).

Once under community stewardship, with self-imposed moratoria on cutting and grazing, resilient Indian forest ecosystems began regenerating. *Sal* and teak forests on the verge of total elimination began sending up shoots from their remaining rootstock at a rate of one to two meters each year. Within four or five years, the canopies of the young, secondary coppice growth saplings began to merge and close, covering the landscape in patches of dense forest. The restoration of forest cover in many districts in eastern India is clearly visible in changes apparent in satellite images for the period 1980 to 1999. On the ground, the impact on environmental service delivery at local levels was correspondingly dramatic.

The Indian forestry sector continues to devolve authority and seek new and innovative ways to address the consequences of deforestation and its effects on economic well-being, health, and the environment. Because of this, it is essential that research and policy discussions give priority to developing financing modalities consistent with new directions in forest management. Creating methods for financing JFM based on local livelihood and environmental service considerations provide new opportunities to fund local efforts in ways that are consistent with the management goals of community stewards. Water and fuelwood shortages, lack of routine and famine food supplies, flooding, and other problems related to deforestation have direct costs for local, state, and national governments.

Carbon emissions have immense costs for India as well as the larger, global society. For centuries, human societies around the world have drawn resources from the forest with minimal reinvestment in the forest's health or function. As global climate change negotiators explore financing mechanisms to promote reforestation, India provides an excellent setting to examine the delivery of credits to communities for restoring the functions of natural forests. India's JFM is in the forefront of innovation and multi-stakeholder collaboration, with the Government of India issuing new guidelines in Feb 2000 that have expanded the original JFM mandate while addressing a number of critical issues (see Box 1).

Box 1 NEW GUIDELINES FOR INDIA'S JFM STRATEGY

On February 4th, 2000, almost ten years after the original Joint Forest Management (JFM) guidelines were passed, the Ministry of Environment and Forests (MOEF) issued a new set of policy instructions that both expanded the national strategy and addressed a number of critical issues. Since a circular was issued on 1st June, 1990 forest-dependent peoples rights and responsibilities for public forests have been limited to degraded ecosystems, while only registered groups have had access to government project support. The new guidelines for strengthening JFM allows the strategy to be implemented in India's dense forests with over 40 percent crown cover, as well as responding to important questions regarding legal, gender, and operational concerns. The new JFM policy was developed by a standing committee comprised of senior government officials, foresters, scientists, and NGO leaders. The approved recommendations included the following:

- **Rights to Good Forests** - Allows forest-dependent communities to co-manage productive, well-stocked forests and have a 20 percent share in timber production. Initially, forests available for JFM will be limited to those areas within 2 km. of the village boundary.
- **Recognition of Self-initiated Groups**. Acknowledges informal village-based forest protection groups that have not been recognized by the Forest Department in the past because they fail to conform to state guidelines for JFM committees (JFMCs). Under the new guidelines, non-conforming JFMCs are to be recognized and derive benefits from JFM support programs.
- **Legal Identity** - Provides a legal identity to FPCs. New guidelines urge state Forest Departments and NGOs to assist FPCs to register under the Societies Registration Act.
- **Conflict Resolution Mechanisms** - To resolve conflicts related to Joint Forest Management initiatives, state governments are directed to form working groups at the state and divisional levels to be comprised of different stakeholders participating in JFM projects.
- **Women's Involvement** - To encourage the involvement of women in JFM, women should constitute at least 50% of the JFM general body and 33% of the membership in the Executive committee.
- **Investments in Forestry** - A joint contribution of 25 percent of timber revenues from the JFMCs and the Forest Departments should be reinvested for the conservation and development needs of the forest.
- **Integrated Planning** - The creation of a new JFM working circle to facilitate the integration of village-based micro management plans with Forest Department working plans, and initiatives by other development agencies.
- **JFM Monitoring and Evaluation** - JFM progress should be monitored and evaluated at intervals of 3 years and 5 years at the state and divisional level.

CLIMATE CHANGE, FORESTRY, AND THE CLEAN DEVELOPMENT MECHANISM

There is worldwide concern over the growing body of scientific evidence that points to global warming trends. Carbon gases emissions are one of the primary contributors to the increase in greenhouse gases (GHG) levels. Under the auspices of the United Nations, a global dialogue is in progress seeking to find ways to reduce GHG emissions, and create incentives for the storage and sequestration of carbon. A great institutional challenge facing the world is the need for a system of regimes to control and ultimately reduce emissions of GHGs. Since the beginning of the industrial revolution, human activities have substantially increased the

concentration of greenhouse gases in the atmosphere. Scientists expect that the resulting "enhanced greenhouse effect" will warm the Earth's climate by as much as 5 degrees Celsius over the next century.[8] This warming could lead to a number of adverse impacts, including rising sea levels, changes in rainfall and evaporation patterns, and an increase in the melting of snow and glaciers in mountainous and polar regions. The international community has embarked on an effort to develop a global regime that will address the climate change problem.

Climate change is identified as one of the important global environmental problems. The global community is developing technical, institutional, legal and financial strategies to combat climate change, particularly since the United Nations Conference on Environment and Development (UNCED) meeting in 1992. The United National Framework on Climate Change Convention (UNFCCC) was born out of this concern to reduce GHG emissions. Article 2 of UNFCCC aims to stabilize GHG concentrations in the atmosphere. The UNFCCC and particularly Agenda 21 is also committed to the path of sustainable development. The carbon dioxide (CO_2) concentration in atmosphere has increased from 280 ppm at the beginning of the industrial revolution to 368 by 2000. CO_2 concentration is projected to increase to, 540 to 970 ppm, according to different scenarios, by 2100.[9] According to the latest assessment of IPCC, global mean temperature is projected to increase by 1.4 to 6.8 C by 2100, with land surface experiencing higher warming than the global mean. The sea level is projected to rise by 8 to 90 cms. This level of warming is projected to have adverse impacts on food production and security, fresh water supply, biodiversity, forest fires, health, coastal settlements and so on. The developing countries are more vulnerable to the adverse impacts of climate change as they do not have the technical, institutional and financial capacity to adapt and cope with the adverse impacts of climate change.

The industrialized countries have contributed most to the increases in GHG concentration, since the industrial revolution. Thus, the UNFCCC has recognized the common but differentiated responsibility of industrialized countries in sharing the burden of addressing climate change. The Kyoto Protocol was negotiated during 1987, under which the industrialized (Annex-B) countries are expected to reduce the GHG emissions by 5.5 % by 2008 to 2012, over the 1990 level. The Annex-B countries (with GHG emissions reduction

[8] See Houghton, Filho, et al., 1996.

commitment) are expected to achieve this by domestic actions as well as through Kyoto mechanisms such as the Clean Development Mechanism (CDM), Joint Implementation (JI) and Emissions Trade (ET).

CDM is the only mechanism, relevant to the discussion on developing countries. Article 12 of the Kyoto Protocol states that the purpose of the CDM is to "assist Parties not included in Annex-B in achieving sustainable development and in contributing to the ultimate objective of the Framework Convention on Climate Change and to assist Parties included in Annex-B in achieving compliance with their quantified emission limitation and reduction commitments under Article 3 of the Kyoto Protocol." Thus CDM has twin goals: 1) promoting sustainable development in developing countries and, 2) assisting Annex-B countries in meeting the GHG emission reduction targets. Global negotiations are currently progressing for operationalizing the CDM mechanism. The CDM, Article 12.5 of the Kyoto Protocol states that "emissions reductions resulting from each project activity shall be certified… ." Thus, CDM focuses on "Certified Emissions Reductions" (CERs). For example, an Annex-B party (country with emissions reductions target) could use CERs for compliance with its emission limitation or reduction commitment for the first commitment period (2008 to 2012).

One of the contentious issues is the inclusion of Land Use Change and Forestry (LUCF) sector activities under CDM. Article 12 only mentions GHG emissions reduction activities and not carbon sink enhancement options. Further, global negotiators wanted clarifications on various aspects of LUCF activities such as definitions, accounting methods and rules, permanence of sinks created, leakage in LUCF activities, monitoring and measurement of carbon stocks and flows, uncertainty involved in obtaining carbon credits under CDM, and sustainable development implications of LUCF activities. The Special Report of IPCC has addressed all such issues.[10] There are diverse views on the global negotiations on inclusion of LUCF activities and modes of operationalizing the CDM. Discussion of these contentious issues is beyond the scope of this report. However, it should be noted that as of July 2001 the inclusion of afforestation and reforestation activities under CDM was ratified. Forest conservation activities are likely to be considered under adaptation measures.

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[9] Nakicenovic, N., (2000) Greenhouse gas emissions scenarios. Technological Forecasting and Social Change, Vol. 65(3). (In Press).

[10] Watson, R, T., Noble, I, R., Bolin, B., Ravindranath, N, H., Verada, D, J., and Dokken, D, J., 2000. Land Use, Land-Use Change, and Forestry, A special report of the IPCC, Cambridge University Press.

Developing countries are experiencing deforestation, degradation of existing forests, pasture and crop lands, decline in biodiversity, biomass shortages, and loss of livelihoods to forest dependent communities. Many developing countries are implementing forest conservation, afforestation, and reforestation programs, but inadequate financing for the restoration of degraded forest is often a problem. Thus, CDM could provide an opportunity for implementing innovative technical, institutional and financial interventions to promote forest regeneration, biodiversity conservation, increase biomass supply, to adopt participatory approaches to forest conservation and development, and ultimately contributing to enhancing the carbon sinks. The carbon sinks created due to the CDM project activities should be "additional" to what otherwise would have occurred in a baseline scenario or under a "without" project scenario. Such additional carbon sink created should be measured, monitored, verified and certified to qualify as CERs.

Global climate change agreements and financing systems could further support and accelerate local initiatives that are recreating millions of hectares of carbon sinks. Forest-dependent peoples in many parts of India have begun taking action to restore forest ecosystems near their communities in an effort to sustain their livelihood. Vigorous natural regeneration frequently occurs once grazing and cutting pressures cease, halting and reversing patterns of soil and biomass erosion. New government policies empowering communities as forest stewards have accelerated the spread of Forest Protection Committees (FPCs), as have the investments of development agencies in support projects.

The challenge for carbon credit financing is the interfacing of distinctly different mechanisms. The future CDM, which will manage carbon-offset credits, will likely be a mix of international organizations, government bureaucratic agencies and private sector market mechanisms. The FPCs that are doing the work of sequestering carbon are small, informal community organizations scattered across rural India, with limited experience dealing with local bureaucracies and the urban private sector, let alone international agencies and global markets. Further challenges include providing empirical evidence of the rates of carbon sequestration, storage, and leakage, with a verifiable calculation of the carbon additionality achieved through carbon credit investments. This presents an important opportunity to forge linkages between some of the world's poorest people who are struggling to restore India's forests and a global effort to slow the process of climate change.

PART II

EXPERIENCES WITH JFM IN HARDA DIVISION: SOCIAL IMPLICATIONS FOR CARBON CREDIT PROJECTS

Harda Forest Division was selected as the site for this exploratory study of the viability of financing community-based forest restoration utilizing carbon offset credit funds that may be available in the future through the CDM. Harda was considered an appropriate location for this investigation for a number of social and ecological reasons. First, the strategy of community closure of degraded or threatened forests had been implemented in Harda since 1990, providing a ten year time period to assess the impact of JFM on carbon stocks in community-protected forest areas. Second, a number of external investment strategies had been used by the Madhya Pradesh Forest Department to create incentives for forest restoration and conservation behavior among local forest-dependent communities offering a wealth of experience regarding support strategies. Finally, while some forests in Harda Division were being successfully protected by communities and appeared to be functioning effectively as carbon sinks, other forests in the territory were reported to be under heavy pressure and degrading. As a consequence, it appeared Harda possessed potential areas where additional inputs might result in additional carbon sequestered, a fundamental requirement for CDM projects.

The researchers were aware that the dry, deciduous forests of Harda Division do not reflect the immense diversity of forest ecosystems found in India, nor does the experiences of the local communities anticipate the behaviors of other rural villages in India in relation to forest protection. Nonetheless, Harda Division is fairly representative of the dry teak and mixed forests that characterize western and central India, extending from eastern Gujarat to the middle of Madhya Pradesh. This region possesses significant tribal populations, as well as forested upper watersheds that supply water to important downstream agricultural areas.

While Harda Division contains forests that are already regenerating under community protection under existing government and external financing, and as a consequence that do

not qualify for carbon-offset credit support. The division also possesses forest areas where carbon is being lost through illegal felling, fuelwood collection, and fires and could potentially qualify for afforestation projects supported with carbon-offset credit financing. The researchers assumed that by examining the carbon sequestration values in areas with effective forest regeneration under community management, it would be possible to project those values as potential carbon additionalities in areas where JFM strategies have not taken off for lack of institutional, technical, or financial support. Through this analysis it was proposed that potential forest carbon projects could be identified.

CONTEXT AND HISTORY

Harda Division is located in the upper watershed of the Narmada River (See Figure 1). Situated 150 kilometers southwest of Bhopal, the capital of Madhya Pradesh, Harda has historically possessed extensive forest cover, much of which is valuable commercial teak reserves. The total area under Harda Forest Division is 1122 sq. kms., with 741 sq. kms. of Reserved Forest and 381 sq. kms. of Protected Forest. Situated on the northern slopes of the Satpura mountain range, the elevation of the area varies from 250m along the banks of the Narmada River, up to 730m along the teak covered ridge tops. The climate of the region is generally warm, with four distinct seasons including a hot spring, a rainy summer, a post-rainy fall, and a cool winter. Average yearly rainfall is about 1210 mm. The temperature ranges from 3.3°c to 46.4°c. Average maximum temperature is 32.6°c and average minimum temperature is 19.5°c.

Most of the forests in Harda Division are classified as Tropical Dry Deciduous Teak (type 5A/C1 b), according to Champion and Seth's revised classification system. Teak is the principal species, which tends to be pure in the drier localities. The dry deciduous teak (*Tectona grandis*) forests of Rahatgaon have been managed since 1877, following a system of selective felling. This has affected the species composition of the forests of the area, resulting in a greater dominance of teak. In sample quadrates of Amsagar forest, 70 per cent of all trees over 10 cm DBH were found to be teak. *Diospyros melanoxylon* and *Butea monosperma* were the second and third most common tree species, both pioneering species often associated with areas of moderate disturbance.

The average size of the teak in the sample plot was 51 cm diameter at breast height (dbh, approximately 1.5 meters), though one individual was 152 cm dbh. Teak forests occupy 90

percent of the area, while Mixed Dry Deciduous forests cover the remaining 10 percent. In the mixed forests, the most common tree species in the region are *Tendu* (*Diospyros melanoxylon), Lendia (Lagerstromia parviflora*), *Dhaora* (*Anogeisus latifolia*), *Biijasal* (*Pterocarpus marsupium*), *Mahua* (*Madhuca latifolia*),and Rose wood (*Dalbergia latifolia)*. Consistent with Indian Forest Service practices, the teak dominant forests of southern Harda Division, due to their high commercial timber value, were classified as "Reserve Forests" when the area was originally demarcated in the late 19th century. The mixed forests of the north were designated "Protected Forests," due to the absence of high value timber trees. While the Reserve Forests of Harda Division are largely categorized as "Dense Forests" with over 40 percent canopy closure, the Protected Forests are mostly "Open Forests" with between 10 to 40 percent canopy closure.

Prior to independence in 1947, control over Harda's forest was divided between the Central Province and Berar Province of British India, and the Gond tribal rulers of Makrai. The most valuable teak forests were designated as reserve forests under colonial Forest Department management and were exploited for timber under working plans first formulated in 1877.[11] The teak forests have been managed under an 80-year selective felling cycle. Teak was broken into four size classes (PB1 through PB4). Trees ready for final harvest (PB1) would average 90 to 120 centimeters girth at breast height. Since 1996, when the Indian Supreme Court placed a nationwide felling ban on commercial timber extraction from government forests, the selective felling cycle was halted in production teak areas in Harda Division.

Harda Division is divided into six ranges, varying in size from 12,700 to 22,800 hectares of forest land (see Table 1). In 1989, the Divisional Forest Officer initiated a campaign to engage local communities in forest protection activities. A decade later, of the 400 hamlets in the division, 145 had formed either FPCs (FPCs) in Reserve areas with good teak forests, or Village Forest Committees (VFCs) in Protected areas where mixed, dry deciduous forests were usually degraded. Forest protection groups in Harda Division are currently operating with varying degrees of effectiveness across the division. Most FPCs/VFCs are located within or in close proximity to reserve or protected forest areas.

[11] Archana Sharma and Ramanathan B. *Joint Forest Management in Harda: A Status Study* (New Delhi: WWFN-India, 1998) p. 14.

TABLE 1 FOREST PROTECTION GROUPS AND MANAGEMENT AREA IN HARDA DIVISION BY RANGE							
S. No	Range name	No. of FPCs	Area (ha)	No. of VFCs	Area (ha)	Total	Total Area (ha)
1	Rahatgaon	13	17,108	-	-	13	17,108
2	Magardha	11	22,800	-	-	11	22,800
3	Temagaon	15	19,415	-	-	15	19,415
4	Makdai	28	15,550	9	2,649	37	18,199
5	Handia	5	1,261	47	11,709	52	12,970
6	Borpani	17	21,737	-	-	17	21,737
TOTAL		89	97,871	56	14,358	145	112,229

Source: Harda Forest Department, 2000

The valuable reserve forests that extend across the southern portion of the division have for the most part been sustainably managed under 80-year rotation selective felling regimes. Growing pressures on the forests including illegal logging and subsistence use have gradually eroded the stocking levels, while grazing and fires have undermined natural regrowth. The use of the forests as cattle grazing camps (*gowadis)* resulted in continuing disruption of both seed and coppice growth through trampling and grazing, inhibiting the establishment of new generations of trees to replace those felled. In some areas, landless families maintained the g*owadis* for their landlord's cattle. Fires that were set by local villagers in the dry season to clear the forest floor just before the *mahua* trees began flowering also inhibited forest regeneration. While not affecting mature trees, ground fires were instrumental in repressing the growth of seedling and saplings.

Protected forests largely include mixed, dry deciduous forests located in the northern portions of the division. Possessing few teak trees, these forests were of less commercial value and consequently not classified as reserves. Nonetheless, during the decade leading up to their transfer to the Forest Department in 1954, they were heavily exploited for timber. Over the past century, they have also experienced heavy pressure from local communities that utilized them for fuelwood collection, both for subsistence and cash purposes. As a consequence, by the time of this study, the biomass and carbon levels of the sample plots in the protected forests were far lower than those of the reserve forests.

Despite its valuable forest resources, the economy of Harda District has developed slowly. Outside government investments in the district's infrastructure have been marginal, reflected in the poor condition of road networks, schools, clinics, and other public facilities. Natural population growth and migration from other regions has expanded the population of the division dramatically, placing additional pressures on forestlands and timber resources. Once a predominantly tribal area, tribal communities have been socially marginalized as higher caste groups have moved into the region, often capturing the better agricultural land. As in many parts of India, agriculture is in a process of intensification and commercialization throughout the division, as electricity and tube wells have allowed the expansion of irrigated lands and new cash crops have been introduced. Nonetheless, inadequate road and market infrastructure and erratic electrical supplies have constrained this transition.

Social Context

The total population of Harda Division is approximately 600,000, of which about 100,000 reside in Harda town. Tribal populations dominate many of the forest areas in Harda Division. The principal tribes include Gond, Korku, Thatia, Gwalbansi and Golan. Most forest villages are connected to other areas only by unpaved (*kachha*) roads that are often impassible during the monsoon season. There are usually no public or private transportation services and villagers generally travel on foot, in bullock carts, or by bicycle. The distance that villagers walk to reach the nearest market can vary from 5 to 30 kms., depending on the remoteness of the village. Most of the villages do have primary schools and hand pumps for water. But, other facilities like health centers and electricity are still not available to all villages, particularly the interior ones. Further, budgets for school and health programs are low.

Forest communities are heavily dependent on the Forest Department in the Harda area. Historically, the Forest Department has acted as "state landlord," hiring village labor for forest management activities including thinning and felling operations. For many households, forest labor presents the primary source of cash income. Reflecting the inflated status of the Forest Department in rural areas of Harda Division, even the forest beat officer is addressed by community memebers as "Maharaj" (Great King).

Most village families in the forest areas of Rahatgaon Range have access to some agricultural land. Often it is areas that were cleared of forest within the past century, some of it old encroachments on Protected Forest land, and in other cases degraded forestlands provided to villagers on a usufruct basis (*patta*) by the Forest Department. Until the past decade, most of this land was exclusively dependent on rainfall with the major crops cultivated by season including soybeans, maize, paddy, and millet in the spring, and wheat and gram in the fall. In the past, during the summer season, nothing was grown. This pattern has begun to change as the farmers have started to bore tube wells to provide supplemental irrigation.

Tube wells are only one component of a broader transition that is occurring as the local agricultural sector commercializes. Government is currently providing loans and subsidies to farmers for procuring seeds and fertilizers. Technological changes in agriculture enhanced the productivity and profitability of the sector for families who have access to water and green revolution inputs. Tube wells are also placing increasing pressure on ground water supplies, a factor of which local communities are well aware. During individual and group interviews, villagers repeatedly commented that an important reason for forest protection was to maintain dense vegetation on the watershed to improve aquifer recharge and enhance groundwater levels.

By contrast, there are many landless families in the study hamlets (Nayapura and Manrul) in the Handia Range. The collection of *tendu* leaves (*patta)*, used in the wrapping of Indian cheroots (*bidis)* is one of the major sources of income for most of the villagers, especially the landless. *Mahua* flowers, mushrooms, grasses, fuelwood, medicinal plants, and other forest products are also collected for subsistence use.

History of JFM in Harda

The initiative to involve communities in the management of forests in Harda Division began in 1989, when a young Divisional Forest Officer (DFO) was assigned to the territory. During his early months in the position, the new DFO recognized that a significant level of conflict existed between local communities and the forest staff. Tension between the Forest Department and villages bordering the forest area was reflected in numerous illegal logging operations, unauthorized and heavy grazing, and uncontrolled ground fires. Due to the high commercial value of mature teak stands within the Harda Division, illegal logging was a major problem. Driven by poverty, some communities worked as fellers and haulers for timber mafias based in neighboring towns. The DFO realized that without the cooperation of

villages located within and along the boundary of the reserve forests, it would be difficult to reduce the operation of timber smuggling gangs operating in the area.

While there were no JFM guidelines in 1989, the DFO anticipated that cooperative initiatives would receive support from his FD superiors as well as from political representatives. A charismatic and enthusiastic young man, the DFO began meeting with his divisional field staff to develop a strategy to reduce conflicts with forest communities and initiate collaborative management. The field staff was impressed by his rejection of traditional hierarchical protocols governing staff interactions, especially his willingness to listen to their concerns and ideas. In return, most staff were extremely loyal to the DFO and worked hard to make his vision of participatory forest management a success. According to one deputy range officer who served during the DFOs tenure:

> *What days those were! (sahib, who bhi kyaa din the!) He was always accessible. He would listen to whatever we had to say. It was not that he was always able to help, but he definitely would help if he could. He visited and chatted with villagers and foresters extensively, and went even to the most remote spots.*

The DFO's energy and openness not only impressed his own field staff, but local communities as well. After a series of meetings during 1990, the first forest protection committee was formed in March 1991 in the village of Badwani in Rahatgaon Range. Part of the challenge was to control the influx of nomadic peoples from Rajasthan who came with their herds during the rainy season and after the harvest, as well as the cattle from surrounding farms that had customarily been taken to the forests. "Painted belts" were made around the perimeter trees to announce bans on cutting and grazing. Another goal was to limit the damage caused by ground fires that affected approximately 50 percent of the teak forests in Rahatgaon Range in the late 1980s. While ground fires only scorched the trunks of mature trees, fire resulted in a 90 percent mortality rate among seedlings according to estimates of forestry field staff.

At the inception of JFM in 1991, the Forest Department offered participating communities a 10 percent share of the timber income generated by the forests under their protection. A share in valuable teak revenues was an attractive incentive for the tribal people of the area, and as news of the program traveled, a number of villages in the area expressed interest in forming FPCs. By 2000, 145 FPCs had been formed covering virtually all of the reserve and protected forest land in Harda Division, a total of 112,000 hectares.

In developing a JFM strategy for Harda Division, the DFO at that time had to address two distinctly different ecological contexts: one characterized by high value mature teak with good stocking levels in the Reserve Forest areas and, the other, more degraded mixed forests that were designated Protected Forests. The DFO decided to form two types of community forest protection groups. These were FPCs in the reserve forest areas, largely in the hilly southern parts of the division, and VFCs in the protected forest areas characterized by more degraded, mixed forests. Table 2 indicates the distribution of reserve and protected forests in Harda Division as a whole and in the two study ranges of Rahatgaon and Handia.

Table 2 RESERVE AND PROTECTED FORESTS IN RAHATGAON AND HANDIA RANGES

RANGE	RF (ha)	PF (ha)	TOTAL (ha)
Rahatgaon	26,930	983	27,913
Handia	580	10,543	11,123
Total for Harda Division (includes 6 Ranges)	**98,317**	**44,218**	**142,535**

Source: Harda Forest Department

While a 10 percent share in timber harvests was later raised to 50 percent under the revised Madhya Pradesh Governments JFM Resolution, approved January 4, 2000, up to the present, most FPCs have not received any direct cash payments for their share in timber sales. In part this maybe due to temporary felling bans that have restricted exploitation of timber reserves, as well as the lack of protocols for timber sharing. Nonetheless, FPCs have benefited from participating in the JFM program in other ways. The Forest Department has invested in a variety of village development activities, including the construction of stop dams, and providing micro-credit loans to villagers in need at nominal interest. Closure of the forests to grazing in Rahatgaon has allowed grass productivity to increase dramatically, and village FPCs have sold their grass harvests to local Army camps for the past two years.

Many villages in the region have been attracted to the concept of JFM, as it has provided an opportunity for them to gain a formal role in the management of local forests upon which they depend for subsistence goods as well as employment. At the same time, external investments by the Forest Department, both in building institutional capacity in the village through the establishment of management committees and credit institutions, as well as physical development projects, have been well-received by many communities. Since 1991,

there has been a significant decrease in the number of reported cases of illegal activities associated with forests (see Table 3), and a marked increase in community-oriented development activities implemented in villages participating in the JFM program.

The declining incidence of illegal felling after the initiation of JFM in the early 1990s is evident, declining from 600 to 700 cases per year in the late 1980s, to 300 to 400 in the 1990s. While illegal logging was reduced by approximately 50 percent, much of the remaining felling continued to be in areas like Handia Range where JFM has not been as effective. While Forest Protection Committee actions have generally facilitated the regeneration of forests in much of Harda Division, it is also apparent that some ranges are better protected than others, likely reflecting the effectiveness of community stewardship in different areas (see Table 4). The better protection found in Rahatgaon was achieved despite the higher value of its teak forests, which had previously been prime targets for illegal felling. Forest Department statistics for 1998 indicate that 95 percent of Rahatgaon Ranges rich teak forests were safe from illegal felling, while in Handia 87 percent of forests were classified as being subject to medium or high impact felling. Based on these statistics, in terms of forest carbon stocks, it appeared management systems were resulting in the storage and sequestering of carbon in Rahatgaon, while carbon stores were likely eroding in Handia. Forest Department data indicates that Rahatgaon Range experienced a significantly lower rate of illicit felling between 1987 and 1997. In 1987, for example 83 illegal logging offences were recorded for Rahatgaon Range versus 812 in Handia Range, over ten times as many. While JFM initiatives contributed to the reduction in the number of incidents, illegal logging by 63 percent and 56 percent respectively, Handia still had 356 cases recorded between 1992 and 1997 versus only 31 in Rahatgaon over the same period.[12]

[12] See Archana Sharma and Ramanathan B., p. 72

Table 3 ILLEGAL ACTIVITIES IN HARDA FOREST DIVISION, 1985-1998						
	NUMBER OF ILLEGAL ACTIVITIES BY TYPE					
YEAR	FELLING	GRAZING	POACHING	ENCROACHMENTS	FIRE	OTHERS
1985	404	8	1	-	5	3
1986	624	5	3	-	-	-
1987	575	14	3	-	-	2
1988	672	18	1	-	3	26
1989	758	26	4	-	1	23
1990	536	19	1	-	22	13
1991	419	17	3	-	25	31
1992	487	60	6	-	71	34
1993	294	40	3	-	41	11
1994	306	16	1	-	15	6
1995	433	14	4	-	16	8
1996	372	17	2	-	34	18
1997	442	14	7	-	24	46
1998	313	18	2	1	14	68

Source: Forest Department

Table 4 PERCENTAGE OF FOREST AREA AFFECTED BY ILLEGAL FELLING BY RANGE, 1998			
RANGE And DIVISION	NO IMPACT % OF AREA AFFECTED (ha)	MEDIUM IMPACT % OF AREA AFFECTED (ha)	HIGH IMPACT % OF AREA AFFECTED (ha)
Rahatgaon	95 (16,439)	3 (426)	2 (348)
Handia	13 (1,667)	40 (5,253)	47 (6,110)
HARDA DIVISION TOTAL	66 (69,578)	14 (14,354)	20 (22,038)

Source: Forest Department

Investing in FPCs

Today, while some of the villages studied have seen the construction of check dams, irrigation facilities, wells, schools or clinics in their area, others have not benefited to the same extent. In communities where forestry funds have contributed to the development of tube wells, a growing number of farmers have been able to shift from subsistence farming systems to growing cash crops as well. Interviews with community leaders and members indicate that development projects financed by the Forest Department have helped motivate villagers to carry out forest protection efforts. According to one recent study of Harda Division, JFM support programs have led to an increase in the standard of living, which is indicated by simple indicators like food habits. For example, many families are now able to afford wheat, rice and sugar compared to their previous diets, which were comprised of other types of grains like millet (*kodo kuttu*) and unrefined sugar (*gur*).[13]

A distinctive characteristic of Harda Division's JFM strategy is to assist each FPC to establish a village fund. Originally, the Forest Department financed the fund from revenues generated from *tendu* pruning and grass cutting royalties. Also, since communities were taking over many of these roles on a voluntary basis, funds reserved for these activities were transferred to the village fund. Village funds may be used for a variety of activities including payment of forest watchers and school teachers, financing small, short-term loans, community infrastructure projects including tube wells, pipelines, and road improvements, and the acquisition of productive assets such as fish fry, tractors, threshers, winnowing machines, and spray pumps.

With the initiation of the World Bank funded MP Forestry Project, additional financial resources in the form of the Village Resource Development Program (VRDP) became available for community development activities and the financing of village funds. The VRDP project design reflected many of the strategies that had been utilized to initiate JFM in the Harda Division. The contribution of the project was the creation of a new source of FPC financing. The weakness was that the VRDP finances were largely restricted to a limited number of FPCs and tended to focus more on capital investments and physical developments, and less on institution building. A recent review of the impact of the MP Forestry Project on Harda Division noted:

[13] *Ibid.*

> *Being part of an externally-aided project, which has strict time bound evaluations, there is a tendency to ignore stable institutional development and stress on physical targets and time frames…the pressure to display the quantifiable outputs is so high that the staff tend to take an approach that prop up JFM through non-sustainable means.*[14]

The distribution of funds from Forest Department routine budgets, as well as from the World Bank financed project, reflects disparities both in terms of total contribution to village funds as well as in actual expenditures. The average FPC in Rahatgaon Range had received Rs. 85,063 by the end of 1997, while the average for Handia Range was only Rs. 7,833. Further, while FPCs in Rahatgaon had expended 95 percent, only 16 percent of village fund contributions had been expended in the average FPC in Handia Range.[15] This dramatically skewed distribution of contributions to the FPCs and their expenditure levels raises a number of questions. Why did the FPCs in Rahatgaon receive nearly ten fold greater investments than those in Handia up to 1997? Once the funds were transferred to FPCs, why has the Forest Department, who is a mandatory signatory on any major expenditure, allowed FPCs in Rahatgaon to utilize their financial resources, while in Handia funds are not being dispersed? According to one study of Harda District:

> *Village funds occupy an important position in sustaining the JFM process in Harda…the committees often complained about the tight control and influence exercised by the department in deciding the utilization of the fund, especially on asset purchases. The Forest Department justifies the strict control saying the mismanagement of the funds have been the cause of more than one committee breaking up or becoming defunct.*[16]

The hamlet-based FPCs, that are functioning effectively, have grown to be important institutions for village development activities, both on their own, as well as by working collaboratively. In one case in Rahatgaon Range, 16 FPCs, sharing a common road, worked for one week providing voluntary labor (one person from each household) to construct a culvert that would allow the road to be used during the rainy season. Each community contributed Rs.10,000 from their FPC funds, to cover the costs of materials. One FPC that did not have sufficient finances in its account was allowed to substitute additional labor. FPC cooperation allows hamlets to coordinate fire-fighting activities.

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[14] *Ibid,* p. 66.
[15] *Ibid*, p.71
[16] *Ibid*, p. 63.

Active FPCs in Harda Division hold monthly meeting to discuss issues related to forest protection and village development. Beat officer participation in these meetings is variable, often reflecting the level of interest of the Forest Department personnel. Apart from these monthly meetings, joint workshops for all FPCs within each beat are conducted three to four times each year with the range officer present. In these workshops FPCs and the Forest Department discuss management activities and future plans.

While FPCs have been formed for all ranges within the division, some are clearly more effective than others in implementing forest protection strategies and development activities. Many of the FPCs in Handia and Makdai Range have had mixed results. In part, this may be due to the condition of the forests in those ranges, which were more degraded than those in other parts of the division. Also, given the small amount of valuable teak in these forests, potential revenues from sharing were not nearly as high as in other, teak-rich ranges. It may also reflect the interest and investment levels provided by the Forest Department. The Forest Department has an incentive to invest in those communities near to the high-value teak forests, since it is this asset they are most interested in protecting, in contrast to the poorer and more degraded mixed forests in the northern section of the Division. Investment patterns also appear to reflect these preferences, with a nearly ten-fold difference in FPC financing levels.

From a social standpoint, in Handia range a number of forest dependent hamlets were not contacted by the Forest Department and encouraged to develop FPCs. In some cases, these hamlets were composed of tribal and landless households, whose traditional income source of fuelwood head loading has been disrupted with the initiation of JFM activities. As a result, they were left outside the program, yet they continue to put pressure on neighboring forests and challenge the authority of the FPCs who manage them. Social conflicts in Handia appear to have intimidated the Forest Department who regard Handia as a difficult context for JFM. As a consequence, there has been a tendency to minimize investments in that area, especially World Bank financed projects. In selection of FPCs for the externally funded project, the Divisional Forest Officer commented, "We needed to choose the best performing FPCs in order to ensure high quality results."[17]

[17] Personal communication from Mr. Chaudhury, DFO Harda Division, November 7, 2000.

While it is understandable that the Forest Department sought to implement successful projects with its external funds, it has also led to an imbalance in the quality and performance of FPCs across the Division. For this reason, the study design included the selection of an area with highly successful FPCs in Rahatgaon Range, as well as Handia Range that had encountered more difficulties in establishing effective FPCs.

SUMMARY

In Harda Division, the development and effectiveness of operations of Forest Protection Committees is variable. Part of this unevenness in performance maybe related to the different leadership styles of the DFOs who are replaced every two to three years. The initiating DFO, was very enthusiastic and committed to establishing a Joint Forest Management system in the Division and considerable progress was made in the early 1990s in mobilizing community forest protection. This transition in management appears to have slowed in recent years. After a long history of forest department control, most communities involved in forest protection remain uncertain of their rights under new JFM policies and continue to view the forest department as the dominant authority and primary source of resources. As the experiences in Harda demonstrate, the attitude of the DFO and his interpretation of the program, as it is echoed down through the ranks, has a profound influence on how JFM is implemented.

The World Bank forestry project loan to the state of Madhya Pradesh has also influenced the orientation of the transition. While providing new resources to the Forest Department, the project has often focused on a limited number of communities, emphasizing discrete development activities. Although this approach has created centers of strength in a few communities, it has also by-passed most hamlets in the Division. While encouraging the Forest Department staff to support JFM, the project has contributed little to the process of redistributing forest management authority from the Forest Department to the community, nor in creating a financial and institutional framework to sustain the new management paradigm.

PART III

ASSESSING CARBON, BIOMASS, AND BIODIVERSITY VALUES, HARDA DIVISION

The first phase of this research study was designed to determine the ecological changes occurring in forests under community-based forest management. To assess the feasibility of financing community-based afforestation in Harda through the CDM, it was necessary to establish how carbon stock levels are changing in Harda forests, and how community protection may be affecting these shifts.

CARBON ASSESSMENT METHODOLOGY

There are uncertainties regarding what category of project activities would be eligible for CDM support from the LUCF sector. There is general agreement, however, that the following seven elements would be part of any CDM criteria for operationalizing CDM. Preparation for an LUCF Project activity requires the following 1) determining compatibility with sustainable development, 2) defining the project boundary, 3) assessing the carbon stock baseline at the time the proposed project is to be initiated, 4) estimating the additional carbon stock projected to accrue as a result of the project technical, institutional, or financial inputs, 5) determining the permanence of carbon stocks in the project area, 6) estimating the carbon leakage that may also occur during the project, and 7) developing a system to measure, monitor, and verify changes in carbon stocks.

The exploratory study of the potential in Harda Division to formulate a CDM project attempted to establish a carbon baseline, estimate rates of carbon sequestration, and design methods for measurement, monitoring, and verification. The researchers sought to identify degraded forest areas with a low carbon baseline, but with good potential for carbon sequestration through natural regeneration. In the Harda context, an optimal site for a future CDM project was considered to be a reasonably contiguous area of 5000 to 10,000 hectares, with a moderate density of rural communities within the boundaries that could protect and manage the site. Project boundaries would be demarcated on maps using physical

features, through meetings and ground surveys involving community leaders, community members, and forest department staff. Field mapping and boundary demarcation would be cross-referenced through GPS readings.

Carbon Baseline

This component of the study measured the level of carbon stored in the forests of Harda Division that were under the protection of rural communities as well as forestlands where little or no community or Forest Department control was in place. Carbon stocks were calculated for two different forest types, including Dry Deciduous Teak and Dry Deciduous Mixed Forests. Carbon values were estimated on the basis of equations that converted biomass to carbon. For this exploratory study, due to limitations of time and resources, only above ground biomass stock was considered. The researchers felt it was unlikely that soil carbon levels would change significantly during the course of the project as no alterations inland use or topsoil disturbance was anticipated.

Carbon Additionality

A CDM project should lead to real, additional, measurable and verifiable carbon benefit, compared to the "with-out" project scenario. Estimating additionality requires developing the projected baseline carbon stock in the "with-out" project scenario and projecting the carbon stock changes in the Handia project scenario. To qualify as a forest-based carbon credit project, it must be demonstrated that the additionality is a direct result of project activities, in this case, community-based forest protection. To establish the impact of forest protection committee activities on carbon stocking levels, the research design called for samples from three types of forests, 1) unprotected areas, 2) FPC protected forests, and 3) protected old growth forests. In each context, the researchers attempted to assess the carbon stock per hectare. The difference in carbon stocking levels between unprotected, protected, and old growth protected forests was divided by the time under protection to provide an estimate of annual sequestration rates. Carbon leakage from the project areas was calculated in two ways. The first involved an assessment of removals from the forest reflected by the presence of stumps in the sample plots. The second method required sample surveys of fuelwood consumption in the participating management communities. Carbon leakage was then deducted from gross sequestration rates to provide estimates of the annual carbon additionalities generated per year on a per hectare basis in the study forest areas.

Sampling Framework

To better understand the process and carbon values in regenerating forests in Harda Division, a sampling framework was developed to represent different stages and rates of growth as forests come under protection. Two ranges were selected for sampling: Handia and Rahatgaon, as they possessed two distinctive forest types. In Handia Range, a diverse mix of dry deciduous species comprised most forests. The forests of Rahatgaon Range were also dry deciduous, dominated by teak after over a century of selective felling and thinning to transform the ecosystem towards a more uniform composition, a process known as "high grading." Within each range three broad sampling contexts were sought:

- **Unprotected Forests (Control Plots):** These forests were subject to unregulated use for grazing and fuelwood collection, providing a baseline scenario for the study. Both community members and local forestry field staff reported that there was no or minimal effort to control use of the resources on these lands. As a consequence, these were "open access" resources; either located on *panchayat* land or degraded protected forests under nominal Forest Department jurisdiction. For the purpose of the research, the control plots of unprotected forests represented either 1) the condition of forests at the start of community protection, or 2) the level of degradation community forests might have achieved, had they not come under protection in the early 1990s. In areas adjacent to the six study communities with FPCs, a total of 18 quadrates were sampled to establish a control baseline of ecological indicators.

- **Community Protected Forests (Treatment Plots):** In these forests, community-imposed use controls were established in 1991 providing a scenario of potential carbon stock changes under a project over a ten-year period. Community management included efforts to restrict fires, impose bans on tree felling and grazing, and control the extraction of green fuelwood. Grasscutting and the gathering of dead and dry wood were permitted by regulation from the FPC controlling each area. The researchers assumed that most of the trees and larger saplings (11 cm DBH or greater) were present at the time of protection, while much of the younger trees, shrubs, and herbs were added as a result of community management activities. A total of nineteen quadrates were sampled in forest areas protected by the six study communities.

- **Protected Old Growth Forests (Site Potential Plots):** In order to establish some estimates of the long-term biomass, carbon, and biodiversity potential of the two forest

types, four sample plots were selected in old growth forests that had been under the Forest Department for at least 50 years. Joga is a dense forest in Handia Range on the banks of the Narmada River, with high species diversity. Joga old growth forest was characterized by the presence of larger, older trees. The old growth protected forest in Rahatgaon, from which sample plots were established, largely reflected the conditions in the community-protected forests.

The sample framework was established by laying 50 by 50-meter plots, from which ecological data was recorded. All the trees above 1.5 meters of height were enumerated. For each tree, height, species, and tree girth at breast height (GBH), was recorded. Within these larger plots, smaller quadrates of 5 meters square were delineated to enumerate seedlings and shrubs fewer than 1.5 meters in height, for which species name and number of individuals were recorded. This data was collected to provide an indication of regeneration status.

The locations of the three types of sample forest plots are indicated in Figures 2 and 3. All sample plot locations were determined with the use of a global positioning system (GPS) unit, which provide detailed data on the latitude, longitude, and elevation of the site. Data from GPS readings will be used to monitor sample sites over time as part of the future carbon monitoring exercise. The breakdown of sample forest plots is presented in Table 5.

Table 5 SAMPLE FOREST PLOTS IN HARDA DIVISION (50m x 50m)

AREA	UNPROTECTED	PROTECTED	OLD GROWTH	TOTAL
RAHATGAON RANGE	No. of Plots	No. of Plots	No. of Plots	Total No. of Plots
Rasalpur	3	3		6
Aamsagar	3	3		6
Singhanpur	3	3		6
Aamsagar			2	2
HANDIA RANGE				
Malpon	3	3		6
Mangrul	3	3		6
Nayapura	2	3		5
Joga			2	2
TOTAL	17	18	4	39

Analytic Indexes

The data from the field were analyzed to calculate the total basal area and biomass on a per hectare basis. Utilizing conversion equations developed by the Centre for Ecological Sciences (CES), Bangalore, biomass levels and above ground carbon stored per hectare were calculated. To calculate biomass the following equation was used relying on basal area and height measurements take in field sample plots: 11.27 + (6.03 * basal area) + (1.83 * average height).

Data on tree diameter at breast height (DBH) was divided into seven categories.

0-5cms. 6-10cms. 11-16cms. 16-20cms. 21-25cms. 26-30cms. >30cms.

Frequency distribution tables were generated to find the number of trees and their species in each DBH class. Age distribution data provided insights into regeneration patterns and past extraction levels. Biodiversity of the forests was also calculated using the Simpson index that provides an indication not only of species diversity, but representation within the forest.

RESEARCH FINDINGS

The ecological study was concerned with identifying patterns of forest regeneration and carbon storage and sequestration in areas under varying levels and periods of forest protection. The researchers were also interested in examining the impact of forest protection on biodiversity. This section will describe the major findings in each of these areas.

Forest Regeneration

The ecological study was concerned with identifying patterns of forest regeneration and carbon storage and sequestration in areas under varying levels and periods of forest protection. The researchers were also interested in examining the impact of forest protection on biodiversity. This section will describe the major findings in each of these areas.

In studying patterns of forest regeneration in Harda Division, it is useful to first examine the age-class distributions of trees in areas under different periods of protection. As Table 6 indicates, in Handia Range's sample plots, unprotected areas had low tree populations in all age categories, while FPC protected areas had high populations, with a total of 49 individuals between 1 to 15 cm DBH. These categories reflect seedlings and saplings that would have emerged since the JFM program began. In FPC protected sample plots, however, the number of individuals in the same age cohorts increases to 232, while in the Protected Old Growth sites there were 298 individuals in those age classes.

As a consequence, natural regeneration in Handia appears strongly related to changes in community forest use behaviors and their involvement in protection related activities including fire control and patrolling. This is also reflected in the older age cohorts with diameters of 16 centimeters and above, reflecting protection periods of more than 10 years, prior to the initiation of JFM. In this case, the unprotected and FPC/VFC protected forests sampled in Handia had populations of only 13 and 22 individuals respectively, while the protected old growth forest in Joga had 219 larger trees. The protected old growth forest at Joga in Handia Range provides a useful baseline reflecting the ecological potential of mature dry deciduous mixed forests. By comparing the data from sample sites that were unprotected or protected for 8 to 10 years, it is evident that both areas had likely experienced past deforestation and were in the process of regeneration.

Table 6 NUMBER OF TREES PER HECTARE BY PERIOD OF PROTECTION IN HANDIA RANGE SAMPLE PLOTS (trees with height greater than 1.5 meters)

LENGTH OF PROTECTION	DBH DISTRIBUTION (cm.)							
	0-5	6-10	11-15	16-20	21-25	26-30	30+	TOTAL
Unprotected (0 years)	6	27	16	4	3	1	5	62
FPC Protected (8-10 years)	33	148	51	8	4	2	8	254
Protected Old Growth (50 years)	80	119	97	128	51	18	22	515

An analysis of dominant tree species in the sample plots indicated considerable diversity, though species most resistant to grazing, fire, and cutting were most prevalent, primarily pioneering trees that do well in disturbed conditions. These include *Wrightia tinctoria, Diospyros melanoxylon, Terminalia tomentosa, Lagerstromia parviflora, Madhuca indica, Butea monosperma, and Anogeissus latifolia*. In only one of the three sample plots in Handia Range, was teak (*Tectona grandis*) a prominent species among regenerating saplings and seedlings. While the common regenerating species in Handia Range did not include a large percentage of commercially valuable teak, many of the species were considered valuable for multiple products used by local communities to meet subsistence needs and local market requirements.

The unprotected forests in Rahatgaon Range (see Table 7) are characterized by a lower population of trees in most DBH classes. A study of shrubs and seedlings below 1.5 meters

in height gathered from 5 x 5 meter plots in the FPC/VFC protected sample forests shows a higher population of regenerating plants in Handia forests than in Rahatgaon (see Table 8). This may be because of the influence of the teak as a dominant species in Rahatgaon, as well as the impact of denser canopy closure there.

Table 7 NUMBER OF TREES PER HECTARE BY PERIOD OF PROTECTION IN RAHATGAON RANGE SAMPLE PLOTS (trees with height greater than 1.5 meters)

LENGTH OF PROTECTION	DBH DISTRIBUTION (cm.)							
	0-5	6-10	11-15	16-20	21-25	26-30	30+	Total
Unprotected (0 years)	8	13	18	9	4	1	4	57
FPC Protected (8-10 years)	112	37	66	45	8	1	2	271
Protected Old Growth (50 years)	140	19	38	35	4	0	1	237

Table 8 NUMBER OF REGENERATING TREE SPECIES AND SAPLINGS PER HECTARE BY PERIOD OF PROTECTION (trees with height greater than 1.5 meters)

	HANDIA FPC/VFC Protected				RAHATGAON FPC/VFC Protected			
Villages	Old Growth	Malpon	Mangrul	Nayapura	Old Growth	Aamsagar	Rasalpur	Singhanpur
No. of tree species present	8	11	10	7	6	17	10	12
Total no. of individual plants	140	143	129	42	31	71	61	62

Source: Primary Data

Comparison of Basal Area and Biomass

This report compares the status of forests in Rahatgaon Range where forest protection has been strongly adopted by local communities and in Handia Range where FPCs have struggled to initiate management, and have achieved mixed results in terms of regeneration and carbon sequestration. The results show that there is a marked difference in the vegetative condition of the two forest areas. In part this distinction in the quality and volume of vegetation reflects the conditions of the natural forests prior to the initiation of community protection in the early 1990s.

In contrasting the vegetation in Handia Forest with that of Rahatgaon it is helpful to examine differences in basal area and biomass forests under different periods of protection. As indicated in Table 9, in Handia both the unprotected and FPC/VFC protected sample forest plots had low levels of biomass and basal area in contrast with Rahatgaon forests. Handia Range has a mix of flat and hilly areas. It was found that the forests on the hills are highly degraded, whereas in the foots the forests were in better condition. This reflects the impact of erosion, especially after deforestation occurred in recent decades. The entire range was marked by trees with low heights of around 3 to 4 mts., multiple shoots and 12 cms to 20 cms, GBH.

This would indicate that despite regeneration taking place that was indicated by the earlier table, it has not yet translated into meaningful gains in these vegetative indices. The forests sampled in Rahatgaon Range showed substantially higher biomass and basal area levels than those in Handia, with the exception of Handia's old growth forest that had the highest vegetation values in the entire study.

Table 9 BASAL AREA AND BIOMASS OF SAMPLE FOREST PLOTS IN RAHATGAON AND HANDIA RANGES BY PERIOD OF PROTECTION

LENGTH OF PROTECTION	BASAL AREA (cubic meters/hectares)		BIOMASS (metric tons per hectare)	
	RAHATGAON	HANDIA	RAHATGAON	HANDIA
Unprotected (0 years)	7.5	3.0	54.6	37.6
FPC Protected (10 years)	14.6	3.7	110.4	41.9
Protected Old Growth (50 years)	14.0	24.7	112.4	177.4

The biomass values were estimated using data on basal area (m^2/ha), estimated using DBH in sample quadrates. The biomass estimation equation used for mixed forests as follows: Biomass (air dry t/ha) = 50.66 + 6.52 (Basal Area in m^2): where R^2 = 0.7111 and SE = 94.1.

Carbon Storage and Sequestration

A primary goal of the project was to assess carbon stocks and sequestration rates in the forest of Harda Division. Carbon calculations were based on conversion equations from basal area and biomass. It is apparent from the study that above-ground carbon stocks in unprotected forests in both Handia and Rahatgaon Range are relatively low at 18.8 and 27.3 metric tons per hectare respectively. In Handia Range, there is a marginal increase in carbon stocks in FPC forests after ten years, indicating ineffective protection, however in the protected old

growth forest in Joga, carbon stocks jump dramatically to 88.7 metric tons per hectare reflecting the carbon storage potential of these ecosystems (see Table 9). While vigorous seedling and sapling growth are good indicators of regeneration, this early restoration does not translate quickly into large increases in carbon. Sequestration levels in Handia could be estimated at around 0.5 metric tons per year. The carbon accumulation rate could increase substantially with better protection, up to an estimated 3 metric tons per year if better closure techniques and assisted natural regeneration (ANR) methods were implemented.

In Rahatgaon sample plots, the evidence indicates a different situation in terms of carbon stocks and sequestration rates. Forests under FPC protection have almost twice as much carbon as those unprotected sites. If the difference is accounted for only by better fire prevents, grazing controls, and closure to illegal felling, the FPC forests would have averaged carbon sequestration levels of 3.4 metric tons annually. In these forests, the research team felt such estimates are excessive and that the protected sites were already better stocked at the time when controls were instituted in 1991. Nonetheless, it is likely that these well-stocked, maturing teak forests are probably sequestering around 1 to 1.5 metric tons of carbon annually. As they mature, however, the potential for future carbon sequestration may not be as great as that in Handia Range.

Table 10 CARBON VALUES OF SAMPLE FOREST PLOTS IN RAHATGAON AND HANDIA RANGES BY PERIOD OF PROTECTION

	CARBON VALUES (metric tons per hectare)	
LENGTH OF PROTECTION	**RAHATGAON**	**HANDIA**
Unprotected (0 years)	**27.3**	**18.8**
FPC Protected (10 years)	**55.2**	**21.0**
Protected Old Growth (50 years)	**56.2**	**88.7**

Biodiversity

The biodiversity indices of Handia reveal lower levels of plant diversity in the mature teak forests in contrast to the mature mixed forest. The study identified 24 tree species in the old growth forests of Handia, and 12 in Rahatgaon is old growth forest (see Table 11). At the same time, the Shannon Index that includes species frequency shows that as the forests of Rahatgaon mature, they become more homogenous, while those in Handia become more species diverse. This, in part, reflects the management prescriptions of the Forest Department over the past century.

Table 11 PLANT BIODIVERSITY VALUES OF SAMPLE FOREST PLOTS IN RAHATGAON AND HANDIA RANGES BY PERIOD OF PROTECTION

	NUMBER OF SPECIES		SHANNON INDEX	
LENGTH OF PROTECTION	RAHATGAON	HANDIA	RAHATGAON	HANDIA
Unprotected (0 years)	15	16	-1.53	-1.29
FPC Protected (10 years)	14.3	11.3	-1.26	-1.72
Protected Old Growth (50 years)	12	24	-1.073	-2.273

The diversity of fauna has increased according to forest officials and villagers throughout Harda Division. Most of the respondents in our study stated that over the last 10 years the number of wild animals in the forests has increased, including and expansion of populations of wild boar, tigers, leopards, monkey, *cheetal*, and *sambhar*. Wild boar, red and white-faced macaques, and *hanuman langur* apes present increasing problems for local farmers.

Community forestry groups in Harda Division are now confronted by a substantial increase in the number of feral mammals, yet they do not have the technical knowledge, fiscal resources, or authority to develop or implement a wildlife management program. Managing wildlife will be an important element for community-based environmental stewardship systems in Harda Division, where almost 50 percent of the land area is under natural forest cover. Large monkey troops of *Hanuman langurs* browse extensively in agricultural fields, while tigers and leopard numbers are growing as they access increasing populations of deer and domestic livestock. Because Lord Hanuman is a primary deity in hamlets throughout the area, primate hunting is strictly forbidden. Approaches to wildlife management will need to reflect local knowledge and value systems, and at the same time, conserving biodiversity comes with costs. Harda's FPCs/VFCs will require external support in developing strategies to manage wildlife populations sustainably.

SUMMARY

Carbon credits provide an attractive financing alternative for JFM strategies as CDM provides a longer time frame of 50 to 100 years, and can be packaged as smaller project activities that could be channeled more directly to community forest protection groups, while allowing comprehensive coverage in participating areas. The research findings indicate that joint forest management is resulting in substantial carbon sequestration in Rahatgaon Range

where hamlet-based groups are operating effectively. In other ranges, such as Handia, potential for carbon sequestration over the next fifty years is substantial, and is projected at 3.4 tons of carbon per hectare per year, provided carbon projects are effective in supporting communities to regulate forest use.

Part IV will review the socio-institutional and investment findings from the research project to examine their implications for developing a carbon credit forestry project within Harda Division. Drawing on India's extensive history with social forestry schemes, the analysis seeks to identify cost effective measures that can create an institutional framework and economic incentives for conservation-oriented management that will lead to the achievement of carbon sequestration goals over the fifty-year life of the project.

PART IV

FINANCING JFM WITH CARBON CREDITS

Measuring the impact of community-based forest protection on carbon sequestration additionalities is only part of the challenge in designing a community forestry carbon project. Identifying and evaluating the capacity of management institutions and cost-effective investment strategies for carbon credit transfers is another important aspect in project development. For the success of a forest-based carbon project, it is important to identify appropriate institutions to manage, monitor, and implement project financing in ways that sustain carbon sequestration. It is also important to reduce the transaction costs of forestry projects, particularly those involving local communities, to increase the flow of benefits from carbon sequestration projects to village forest management groups.

Case studies of community-based forest management in Nepal and India frequently find that many villagers are motivated to protect and regenerate degraded forests in order to restore their productivity and important environmental services. Subsistence goods from forests are often important contributions to the household economy. The hydrological and microclimatic functions of forests are well recognized in rural areas of South Asia, as is the relationship of forests to the maintenance of local biodiversity. While communities possess a variety of internal incentives to conserve their forests, they also confront a variety of costs in establishing forest protection.

PAST INVESTMENT STRATEGIES

Over the past decade, the spread and effectiveness of FPCs has been accelerated and enhanced through outside investments by Forest Departments, NGOs, and development agencies. Forest-dependent peoples often face economic hardships when initiating forest conservation activities related both to the opportunity costs involved in deferring forest use, as well as the labor costs involved in protection activities. Frequently, costs of forest closure or restrictions disproportionately impact certain segments of the community, often women and landless families. External investments in the community help to offset these costs, reinforcing conservation behavior. External investments in FPCs can take a wide variety of

forms and magnitudes. The impact of the investment in creating incentives for conservation behaviors and sustaining forests over a longer period of time may not be directly correlated with the size of the investments.

Over the past thirty years, the Government of India (GoI) and some NGOs have adopted a variety of strategies to enhance various forms of community-based forest management. An underlying assumption in most of the programs was that some economic incentives were required to engage the community in forest protection. Much can be observed regarding the comparative cost-effectiveness and sustainability of different types and magnitudes of external assistance, both in terms of its impact on the local forest ecology and village economy. Selected strategies are briefly reviewed in the following pages.

Social Forestry Projects – Wage Employment as an Incentive

Some of the earliest experiences come from the social forestry projects of the 1970s and 1980s, when the GoI, often with financing from bi-lateral and multi-lateral agencies, invested hundreds of millions of dollars in an attempt to cover India's degraded lands with fast-growing, short-rotation, monoculture plantations. These projects specifically avoided working on reserve or protected forests, focusing on other categories of degraded lands. In the end, only 3.7 million hectares of land was reforested between 1950 to 1980, while 1 to 1.5 million hectares was being degraded annually until the late 1980s. Social Forestry Projects were largely implemented through Forest Departments, though some funds were passed on to village *panchayats*. Forest-dependent families usually had little formal involvement in the planning or management of the social forestry projects of the 1970s and 1980s, and rarely received any external financial support, except as individual wage laborers.

Forest-user households frequently expressed dissatisfaction with the uniform species composition of the plantations, noting they had little utility in terms of the diverse needs of rural communities. Given the absence of support to build hamlet-based management capacity, create useful assets, or extend greater resource control, villagers often found little benefit in externally financed social forestry schemes beyond the immediate and temporary wage employment the projects provided. Ultimately, community woodlots financed under this project turned out to be poorly managed and sustained, and had limited economic impact on user communities, despite relatively high costs per hectare of plantation established. The social forestry program did catalyze the development of highly successful farm forestry initiatives in many parts of India.

Hill Watershed Management – Agricultural Water and Grass Leases as Incentives

During the 1980s, a new generation of rural resource projects began emerging in India. One of the most famous was the Sukomajri Project implemented in the Shivalik Hill region of northern Haryana. The Sukomajri Project's goal was to arrest soil erosion above the town of Chandigarh by engaging Gujar, Jat, and Bhanjara communities in watershed restoration. The watershed had been badly defoliated by the presence of large populations of free grazing goats and cattle. The project encouraged communities to form Hill Resource Management Societies (HRMS) in order to close the watershed to grazing and shift to stall-feeding. In return, the local soil and water conservation office promised to build a series of small water reservoirs formed by the construction of earthen retaining walls, with piped irrigation lines. The reservoirs allowed the expansion of small areas of irrigated cropland.

The project was extremely popular among the farmers who benefited the most. But, it by-passed the landless population, and the farmers and herders who were outside of the designated area. Also, the project often added to the chores of women who were now going to the forest to "cut and carry" fodder for their livestock. The cost of the reservoirs was also high, and required unique topographic features that limited the number of communities that could participate. After the project ended, the support to maintain and repair the reservoirs declined, and many fell into disuse or were not completed, ending the period where reservoirs were the key incentive and component of the collaborative management strategy for the area. With the end of the project, the Haryana Forest Department, which holds administrative responsibility for watershed, offered communities access to commercial fodder and grass cutting leases previously leased to private companies. Grasses on forest land had grown abundant under community imposed use restrictions.

The Forest Department hoped that by providing greater access to subsistence and commercial grasses, local communities would have stronger economic incentives to maintain social fencing policies in the area. The opportunity to seek grass leases was well-received, as most communities with HRMS were eager to gain a greater share of the fiber and fodder resources. Grass leases also responded to the needs of the most forest-dependent segments of the community, women and landless involved in fodder and fuelwood collection, and rope making. As primary forest users, it was the behavior of these groups that most impacted the forest, either as forces of degradation or as stewards. Rather than expending funds on reservoir building, the Forest Department actually received funds from the community for the

leases, often bidding against private paper companies and local entrepreneurs. The program later ran into problems when the Forest Department raised lease rates to levels the community could not afford.

Arabari, West Bengal - Timber and Forest Product Sharing as Incentives

Arabari, a forest research station in southwest Bengal, was one of the early experiments where a share in timber and non-timber forest products was offered as an incentive for forest protection. Local foresters were unable to control grazing, fuelwood collection, and illegal felling by surrounding communities. They had no funding for special projects, so they offered the villages a 25 percent share of the timber as well as shares of non-timber forest products (NTFPs). This was one of the first sharing agreements of this type for state forestlands and set a precedent that would be widely followed by the national government and Indian states as they formulated the terms for joint forest management agreements.

The 25 percent share, however, assumed the Forest Department would continue to make the important management decisions about operating costs, goals of management, harvesting cycles, etc. The community would receive their share of the harvest after all costs were deducted. The strength of this approach was that it created an incentive for the communities and Forest Department to work together. The limitation was that it did not go far in empowering the communities as joint managers and therefore did little to build their capacity. Further, many of the tribal and lower income communities did not perceive cash returns from timber harvests as a primary management objective. Instead, their heavy dependence on the forests required a sustainable flow of subsistence goods and NTFPs used as raw materials for cottage industries.

VSS and FPCs in Orissa – Formal Recognition and Forest Demarcation

While the Orissa Forest Department received significant external assistance for its social forestry program in the 1980s, since its formal acceptance as a state strategy, community forestry has received little outside help. With limited funds to initiate "hardware" projects as inducements to participate in forest protection, the Orissa Forest Department has, instead, adopted a "software" approach. This has involved training field staff to support community FPCs. Forestry staff organize meetings for and between villages, mediate conflict, register FPCs, supervise boundary demarcation activities, and coordinate with NGOs and other local government agencies. The Orissa Forest Department has benefited from strong grassroots leadership from the communities themselves, supported by NGOs and state political leaders.

While not all foresters have been reoriented and retrained for their new roles, many have and the results are often dramatic. Foresters and communities often commented on the marked reduction in social conflict between the Department and local villages. FPCs that request recognition and have demonstrated a capacity to manage local forests are formally registered as the official management bodies. Increased forest tenure security and recognition legitimizes community attempts to implement management activities on lands previous viewed as open-access government territory. Not relying on budget allocations for hardware incentives, FPCs are able to form and spread at their own pace.

In the cases described above, it is apparent that a variety of investment strategies have been used as incentives to engage communities in forest management. Wage-based employment, infrastructural investments, block grants, product sharing, institution building, and certification have all been tried in a variety of contexts, often in conjunction with each other. Experiences from the projects described above indicate that lower cost approaches that build community institutions, create formal agreements with government, and strengthen forest resource access and tenure security may have greater impact on sustaining forest regeneration than higher cost hardware and time-bound project employment options.

LEVELS OF INVESTMENT

In the case of Harda Division, it is helpful to examine external investments in community forest protection in terms of the magnitude and type of input. The cost level can be broadly divided into low, moderate, and high cost interventions, considered either in terms of the amount per FPC or per hectare under FPC management. The type of investment can be characterized as human resource capacity building investments (software), financial investments (capital), and physical investments (hardware).

Low Cost - ($500 to $1,000 per FPC per year or $1 to $2 per hectare)

In Harda, low-cost investments in JFM were usually "software" type inputs including meetings, mediation, training, registration, and related activities that facilitate social interactions and action. Some external inputs came with no costs, such as an attitudinal shift among forestry field staff. Other software costs were incurred in the form of increased staff time, transportation, food, entertainment, publications, and communications. While capacity and institution building activities are among the lowest cost external inputs, they often have high impact as they can defuse social conflicts that carry high costs.

The initiation of forest protection activities in Harda Division, for example, was catalyzed by a change in local policy towards forest-dependent communities from one of exclusion in management to one of inclusion. The DFO, urged his staff to engage communities as partners in forest management and assist them in forming FPCs. By holding a regular series of meetings between foresters and neighboring villages, new management agreements were formulated that provided communities with new rights and incentives to protect local forests. The new management paradigm resulted in a rapid reduction in the incidence of conflicts, fire, and theft, a trend well-received by communities and foresters alike.

Not only were the communities' forest usufruct and tenure security greatly strengthened under the new JFM program, the Forest Department also recognized the land-use rights of families that had been using farmlands at the boundary of the forest area. This provided them with important collateral in access credit from banks in order to invest in tube-well irrigation, paving the way for commercializing their farming systems. The DFO dramatically improved community-Forest Department interactions during a four-year period (1989-1993), resulting in a rapid decline in illegal logging, grazing, and forest fires. Community-based forest protection accelerated natural regeneration by reducing behaviors that had suppressed it in the past. All of this was achieved within the routine Madhya Pradesh Forest Department budget for Harda Division. Other low-cost components might include the following:

- Holding regular meetings for FPCs and Forest Department staff to get together,
- Sponsoring boundary demarcation activities,
- Holding management planning workshop,
- Training communities in forest management techniques, FPC administration, micro credit institution operations, etc.,
- Issuing Certificates of Land Use Rights,
- Registering FPCs.

Moderate Cost ($1000 to $5000 per FPC per year or $2 to $10 per hectare)

Within the Harda Context, moderate cost investments in FPCs often took a financial form as in the case of small block grants. Over the past decade, since JFM was initiated in 1991, DFOs have utilized their forest fire protection line item in the divisional budget to make block grants to FPCs. During the first year, the rate is Rs. 250 ($6) per hectare, increasing to Rs. 500 ($12) per hectare in subsequent years. Block grants were used to establish "Social Funds" that in turn operated as community-run micro-credit banks. These small capital investments in the FPC were also administered by the FPC, under the supervision of the

Forest Department. FD officers were responsible for signing off on loans and expenditures above a certain level. The establishment of village administered micro-credit institutions was well received in the villages. Moderate cost investments were financed by transferring Forest Department budget line items for forest protection activities directly to FPC groups in cases where they had taken over that activity from forestry field staff. Moderate cost investments also included the creation of employment opportunities for community members in small silvicultural operations including nurserying, watchmen supplements, biodiversity surveys, etc. Finally, small block grants were made to FPCs for the purchase of equipment and materials, especially those that would enhance the productivity of agricultural and forestry related activities.

Moderate costs projects can also include Forest Department administered Human Resource Development packages. Such packages include the costs of specially trained community organizers, training programs, meetings and workshops, and transportation. A recent budget for proposed for GoI funding under *The Tenth Five-Year Plan* estimated the annual costs of a village level Capacity Building Team at Rs.100,000 ($2500).[18]

High Cost - ($5,000 to $15,000 per FPC per year or $100 to $800 per hectare)

High-cost investments usually include intensive silvicultural treatments such as plantations, fencing, and nurseries, or physical infrastructure projects like irrigation facilities, tube wells, roads, school buildings, and clinics. High-cost inputs into the Harda District largely occurred after the initiation of the World Bank's Madhya Pradesh JFM support project in 1995. It is likely that transaction costs are higher than with other types and levels of investments that are easier for local communities to manage. Silvicultural Treatment Packages (based on 5-year project time frame on 50 hectares):

- Assisted Natural Regeneration treatment = Rs. 12,000 per ha.[19] ($267)
- Plantation treatment under NAEB Scheme = Rs. 17,000 per ha.[20] ($378)

[18] ICFRE, "Project Document and JFM Scheme: For the Xth Five Year Plan," Dehra Dun: Directorate of Extension, JFM Division (Draft Document: October 2000), p.10.
[19] Estimate by Prof. D.N. Pandey, IIFM, January 2001.
[20] NAEB Scheme Cost Norms for Grants-in-Aid for Plantation establishment, all-inclusive.

TRANSACTION COSTS

There are legitimate expenses involved in managing investments for community forestry projects beyond the direct costs of program-related goods and services. Within the context of a carbon-credit based financing program, transaction costs are likely to be higher than in conventional programs due to the stringent reporting requirements and the additional costs of dealing with international mechanisms and markets. Transaction costs will increase as the role of the third party "manager" increases, whether it be a Forest Department, NGO, or other outside institution. Giving communities greater authority and control over funds for project management and operations would likely reduce transaction costs as a percentage of total budgets.

At present, forest carbon is valued at only $10 to $20 per ton on global markets. Given the relatively modest carbon sequestration rates in many types of regenerating forests in India (1 to 3cmt/ha/year) high institutional overheads and transaction costs imposed by intermediary organizations could reduce the level of direct assistance to forest protection groups to insignificant and ineffective levels. In designing carbon credit financing for community-based forest management in India, it will be important to identify and develop low transaction cost mechanisms that more directly route external investments to forest protection groups. Reducing transaction costs may best be achieved by increasing the capacity and authority of the FPCs in managing project funding and carbon monitoring tasks, while reducing the role of third parties, whether they are NGOs or Forest Departments. Decentralizing the flow of funds to the district level will also decrease transaction costs incurred at the state and circle level.

INVESTING IN COMMUNITY-BASED FOREST MANAGEMENT

Authority and equity concerns include both the balance of power within JFM areas, as well as the division of resources and investments flowing from and into the area. One principle of JFM policy revisions has been to move from a situation where the Forest Departments had full legal control over both resources and revenues, to a situation in which new management partnerships allow an equitable sharing of both resources and revenues. A major beneficiary of much of the external investment flowing into India's community forestry programs at the present time are the state Forest Departments, raising serious equity concerns regarding the management of outside funding for the sector.

The strategic decision to rely on Forest Departments as the institutional mechanism to transfer investments to community groups also has implications for the equitable distribution of power and authority over resource management. While national and state JFM policies require some transfer of authority from Forest Departments to communities, utilizing Forest Departments at the management institution for community forestry funds actually further empowers the Forest Department, requiring the community to remain in a position of dependency. As one analyst notes,

> *Instead of local institutions being accountable to their general body members to assure democratic and responsive functioning, they are, instead, accountable to FD officers. This defeats the very purpose of 'participatory' forest management.*[21]

While a top-down, paternalistic relationship between Forest Departments and FPCs dominates most JFM areas in India, some areas are clearly more progressive than others. In Harda Division, for example, past DFOs have empowered local FPCs to fine Forest Department field staff if they were found to be involved in illegal logging. However, this reflected some forest officers' beliefs that communities needed authority to manage effectively, rather than any state or national policy.[22]

Equity concerns also arise both between communities and within them. In forest areas, some communities are unable to gain access to forest areas to manage, fail to form FPCs, or for other reasons are not included in Forest Department support programs. In the case of special projects, like that of the World Bank in Madhya Pradesh, only some villages have been chosen to participate. In the case of Harda District, only 9 of the 145 FPCs (and 400 total villages) were selected as World Bank project villages. When asked how these were chosen, one DFO replied "we took only the best functioning committees for the World Bank project." There is certainly a tendency for the wealthier villages that are better organized, more influential, and possess stronger political leadership, to capture external investments, leaving behind the more remote, poorer, and disadvantaged communities. While this may result in better functioning projects, it can by-pass those villages with heavier forest-dependent populations and consequently those whom have greater impact on the forest conditions.

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[21] see Madhu Sarin, *Policy Goals and JFM Practice: An Analysis of Institutional Arrangements and Outcomes* (New Delhi: IIED and WWFN-India, 1999) Policy and Joint Forest Management Series 3: p. 42-43.

[22] *Ibid*, p. 43.

Finally, there are equity and authority issues within the community. Women are often primary forest users, visiting the forest frequently to collect fuelwood, NTFPs, water, and to graze their livestock. In Harda District, and many other parts of India, women have little input into the forest protection committee decision-making. Field research indicates that women's forest management priorities are usually distinctly different from those of male members of the same communities, not to mention those of the male dominated Forest Departments. If investments in forest regeneration are to respond to the needs of rural women in India, often the major forest user group, women will need institutional mechanisms that effectively represent their needs. Women managed FPCs and micro-credit associations are beginning to emerge and are often extremely effective, though they have not spread rapidly due to a lack of support. Nonetheless, given the culturally embedded constraints to women's participation in mixed gender meetings, it will be necessary for women's organizations to be actively supported if a more equitable distribution of forest management investments is to take place.

Communities in Harda District, like many parts of India, are often comprised of a mixture of castes and tribes. Better off families with farmland and other business activities are often less dependent on forests than landless households which may rely heavily on forests for subsistence goods, fuelwood, and other forest products for sale. Social conflicts unrelated to forest management may also constrain cooperation. In the research communities in Harda Division, it was found that villages with poorly functioning FPCs often experienced disputes between the socio-economic groups comprising the hamlet. Low-status or economically weak segments of the village may be poorly represented on FPCs, even if they have greater forest dependence. Some communities have resolved this problem by sub-dividing their protected forest areas along group lines.

SUMMARY

Part IV reviewed both past investment strategies and institutional experiences in developing community-based forest management systems in India. Learning drawn from over thirty years of external financing of successive generations of community oriented forestry projects suggests that cost levels have little relationship to the establishment of locally effective systems of forest use control. Arguably, what has worked most successfully in India has been the change in government policies and forest department attitudes concerning the role of communities in forest stewardship. Within a context of greater democratization and growing

forest resource scarcities, communities are increasingly taking a leadership role in the protection of threatened forest environments. Forest Department recognition that these initiatives were occurring and functioning most effectively at a hamlet-level rather than through larger, multi-village *panchayats*, was an important step towards finding appropriate social institutions to act as management partners.

Externally financed projects have enhanced the attractiveness of forest management devolution processes for the Forest Department, but incur high transaction costs for local communities, who as a consequence, receive a smaller proportion of the total budget. For long term, sustainable management, communities need stronger institutional capacities, greater independence from forest department fiscal and legal control, and a larger stake in future timber revenues. Carbon offset credits provide an opportunity to shift the emphasis of external financial payments to more directly benefit community management groups, offering long term contracts that provide greater stability, while further empowering village households. This implies that forest departments will play a greater role in providing support for technical guidance, conflict mediation, and monitoring and verification.

PART V

PROSPECTUS FOR A FOREST CARBON PROJECT IN HANDIA RANGE

The CDM provides an opportunity to finance community-based afforestation in India through natural regeneration and planting. Under CDM, innovative technical, institutional, and financial interventions could be adopted to promote enhanced biodiversity and biomass growth rate as well as strengthen the capacity of people's institutions. The modalities and guidelines for operationalizing CDM are being discussed and formalized in the COP. The development, implementation, monitoring, and verification of CDM projects are unique and complex, particularly as there is only limited experience available, particularly in the forestry sector. Part V outlines a pilot carbon credit project for Handia forest range, Harda forest division, Madhya Pradesh, India. The project concept, including the institutional arrangement options, is suggestive at this stage and will require further development. This project concept, however, is based on real data and a specific location. As a consequence the concept could potentially be used to develop a full CDM project proposal, using the guidelines to be suggested by the COP and through a participatory process.

PROJECT COMPONENTS

In selecting appropriate sites for the project, the project design team specified a number of criteria for selection. The first was the need to identify forest areas with high potential for carbon sequestration over the life of a project, in this case 50 years. The long timeframe required by carbon projects make them unusual in the development sector, but also provide attractive opportunities to sustain institution-building strategies. A second unique aspect of carbon projects is they must demonstrate that carbon credit investments will result in additional carbon capture that would not occur in the absence of the project. It is also necessary to show that a proposed project can contribute to the sustainable development of the communities in the area. There is general agreement that the following elements would be part of any CDM criteria or modality for operationalizing a CDM project:

1) Compatibility with sustainable development
2) Defining a project boundary
3) Baseline for assessing additionality
4) Projected carbon additionality
5) Permanence of carbon stocks
6) Leakage
7) Monitoring, verifying, and reporting

Compatibility with Sustainable Development

Although there is no specific set of indicators for evaluating how CDM projects affect the sustainable development of an area, the following criteria could be adopted in the case of the Handia project. Participating communities in Handia would be responsible for collecting data on the indicators of sustainable development, under the guidance of research institutions.

- **Biodiversity**

  Biodiversity in the area is already quite high due to the high proportion of land cover still under forest vegetation. Large wild mammals could be used as indicator species including leopards, primates, and wild boar.

- **Land reclamation or watershed protection.**

  Perhaps no indicator of sustainable development is as powerful as water availability. This project would monitor well levels in sample sites throughout the project area, as well as in outside control sites. Watershed cover would also be monitored through field checks and remotely sensed data.

- **Flow of benefits (household income, community micro-credit fund, employment and flow of forest products).**

  Economic indicators reflecting changes in household and community financial status would be used to reflect changes in the local economy. Periodic samples taken by the participating research institutions, as well as community micro credit fund financial data would be used to monitor economic development.

- **Enabling, empowering and participation of local communities.**

  The development of organizational capacity at the community level to manage forest resources would be reflected in the level of participation of community members, and the types and frequency of management and development activities undertaken.

Defining the Project Boundary

The research team determined that Handia Range met these criteria and could be delineated as a carbon catchment unit with substantial potential for carbon additionality through community forest protection. For the purpose of this pilot project, the Carbon Catchment Area (CCA) is a precisely defined territory where carbon is stored and sequestered through forest regeneration and tree plantations. The CCA boundaries should encompass coherent social and economic units characterized by routine community and market-based interactions.

For the purposes of the project, the CCA covering the majority of Handia's forests is defined by clear territorial boundaries including the Narmada River to the north, the Machak River to the west, national Highway Number 8 to the south, and the Harda to Handia road on the east (see Figure 4). Handia range has an area of 12,971 hectares, with a forest area of 11,123 hectares. Of the forested area in Handia Range, 10,543 hectares is designated Protected Forest and 580 hectares is demarcated Reserved Forest. The project CCA covers approximately 11,000 hectares of predominantly degraded, mixed deciduous forest. There are 95 hamlets in the CCA, all of which would be eligible to participate in the proposed project.

Baseline Scenario and Carbon Stock

Developing a baseline scenario and projecting carbon (C) stock at different periods in the baseline scenario is critical for estimating the additionality of C stock due to the CDM project. The baseline scenario for Handia range indicates that the investment from the forest department as well as initiatives for FPC/VFC formation were minimal. The forest department records and plans show no additional investment or institutional or social development over the current level. Thus, the 11,000 ha considered for the CDM project will be subjected to biomass extraction and degradation with marginal annual increment in carbon. The control plot with no protection had an above ground biomass of 19.6 tC/ha. In the FPC protected forests, with minimal technical and institutional investment or interventions, over 8 years (1992 to 2000), the C stock increased marginally to 21.8 tC/ha, with an annual C stock enhancement of 0.3tC/ha. In the absence of additional technical institutional interventions, which require additional investment, the C stock may stabilize at current levels (at 19 to 21 tC/ha) or may marginally increase (at 0.3 tC/ha/yr) or may even decline with increase in biotic pressure. Control plots could be laid in the neighboring village where the project is not implemented for monitoring baseline C stock changes. Alternatively 4 plots of size 50m x 50m could be excluded from protection and management effort in the

CDM project villages. The C stocks in above ground vegetation and soils need to be estimated through measurements at different periods such as 2000, 2008, 2012, etc.

Projected Carbon Additionality

For Handia Range to qualify as a CDM project, to real additional, measurable, and verifiable carbon benefits, compared to the "without" project scenario. In the Handia project scenario, the additional carbon mitigation projected, due to the proposed CDM project, is given in the Table 3.1 At a mean annual carbon stock growth rate of 3.4 tC/ha/yr under the project scenario, the additional carbon stock created in above ground vegetation is 25.4 tC/ha by 8 years and 41.2 tC/ha by 12 years, with carbon stock accumulation projected to continue up to 50 years and beyond. It is important to note that additional carbon stock will be created in soil and litter, which is not included in the estimates given in Table 1. Further the carbon accumulation rates could also be increased though technical interventions. Thus, the additionality of carbon estimated in Table 12 for Handia project is conservative.

Table 12 CARBON ADDITIONALITY IN HANDIA UNDER PROJECT SCENARIO

	C stock (tC/ha)			
	0 Year 2000	8 Years 2008	12 Years 2012	50 yrs
Baseline Scenario [1] (Carbon increment at 0.3 tC/yr)	19.6	21.8	23.0	34.4
Project scenario [2] (Carbon increment estimation at 3.4tC/yr)	19.6	47.2	64.2	92.4
Additional Carbon-stock projected	--	25.4	41.2	58.8

[1] Baseline scenario Carbon growth rate = (21.8tC- 19.6tC)/8 yr
=0.3tC/ha/yr

[2] Projected scenario Carbon growth rate =(56tC at 8 yrs - 28.4tC at 0 yr) /8yr
=3.4tC/ha/yr estimated from Rahatgaon data

Handia Range was selected as a good candidate for a carbon credit pilot project because it met important social, economic, and ecological criteria. Current carbon stocks in the regenerating forests were low, while field measurements indicated high potential for carbon sequestration over the next 25 to 50 years, with estimated annual carbon accumulation projected at 3.4 tC/ha/yr. At the present time, this project proposes to adopt a method referred to as *stock change method* to handle the task of carbon accounting. A number of additional methods for carbon accounting will also be considered for inclusion in the project's future carbon accounting system.[23]

[23] Pedro Moura Costa, *Carbon Accounting Methods*, Ecosecurities Ltd., June 2000.

Handia Range was selected for the carbon pilot project due to its potential for additional carbon sequestration. Ecological conditions in Handia Range are dramatically different from those in Rahatgaon Range, where carbon stocks are already quite high, with only modest growth potential. FPC effectiveness also varied markedly between the two Ranges. While FPC initiatives in Rahatgaon are effectively protecting local forests, the FPCs of Handia Range were struggling with their forest protection efforts resulting in uneven forest regeneration and in some cases, continued degradation. The team concluded that the full carbon sequestration potential of forests in Handia Range would not be achieved under existing levels of external support and institutional interventions. At the same time, analysis of primary and secondary data indicated that a different approach to external support investments among communities within the range could dramatically improve the effectiveness of forest protection efforts, if carbon credit financing could be arranged. While forest regeneration has not increased in Handia Range, due to an absence of institutional, technical, and financial investment, communities are showing a willingness to organize forest management activities, provided external support is available to assist them. The range has many degraded sites that require financial, technical and institutional interventions and with the growing interest in community-based programs, it is an opportune time for initiating a pilot project in the area (see Table 13).

Institutional Investments

A primary reason for the poor performance of the FPCs of Handia Range is its institutional problems. Strengthening institutional capacity to manage local forests is likely the single most important investment required to facilitate their restoration. The following are suggestions for strengthening institutional capacity:

- Include villages that have previously been excluded. Project research indicates that one cause of institutional weakness has been the exclusion of a number of villages in the range, especially those populated by 'Vishnois' and the 'Jats' households, from participation in forest department support programs.
- Fully vest FPCs with financial management responsibilities over their own village-based micro-credit institutions.
- Mediate conflicts between groups living in multi-caste communities. Strengthening the institutional capacity of the FPCs of Handia will likely require the inclusion of all member hamlets within the carbon-credit financed initiative.

- Establish a range level FPC Federation that may take on or share fiscal supervision with the forest department.
- Provide technical extension information, training in management and accounting, and environmental awareness campaigns.

Financial Investments

Financial investments in the forest-dependent communities of Handia Range are important elements in contributing to their socio-economic development. Out of the economic mainstream, households in this area have immense problems accessing capital, and are often forced to rely on moneylenders at usurious rates. The following are suggestions to strengthen financial additionality in the area:

- Establish community management micro-credit facilities with seed grants to allow access to low-cost capital for developing forest-based industries, investing in agricultural transitions, education, and health care.
- Link forest protection to the financing of popular revolving micro-credit schemes through long-term carbon credit payments into village funds. This would establish incentives for sustained forest conservation and social development.

Technical Investments

Because of poor management, much of the forestland in Handia Range has lost vegetation cover and top soil. Forest regeneration could be accelerated through the implementation of a variety of technical inputs:

- Implement soil conservation structures in the hilly region to slow run-off and reduce erosion.
- Encourage enrichment planting after periods of advance forest closure to add to the growth stock and species diversity.
- Support the construction of small check dams and tanks to enhance local hydrology.

Link the regeneration of the forests with soil and water conservation to strengthen community capacity to manage their natural resources sustainably. Improving the forest stocking levels and restoring hydrological function would contribute significantly to the rate of carbon sequestration in the proposed carbon catchment area.

Table 13 FINANCIAL, TECHNICAL, AND INSTITUTIONAL ADDITIONALITY ACTIVITIES		
FINANCIAL ADDITIONALITY	**TECHNICAL ADDITIONALITY**	**INSTITUTIONAL ADDITIONALITY**
Under the current level of funding (from national or external sources) the proposed area will not be regenerated	Under the current level of investment per hectare, technical inputs include protection, partial trenching, enrichment planting, assisted natural regeneration, fire protection etc	Under the current JFM program, the institutional activities are limited and Only some communities are allowed to participate.
Additional financial inputs would include: - finances to establish village funds in each community across the range, - funds to regenerate the proposed area, - funding to support the Block Councils and the Handia Federation, - financing for support services from the MP Forest Department, IIFM, and CES. - establishment of micro-credit institutions	Additional technical inputs include: - implementation of necessary soil, water conservation measures, thinning and cultural operations - improved use of technology for production of quality seedlings - introduction of improved sustainable harvest techniques for non-wood forest products, - assisted natural regeneration, - dissemination of fuel-efficient devices.	The additional institutional inputs would cover all communities in the range and include: - Training FPCs in forest management planning and monitoring, - finance management, - training women to participate in JFM decision-making process, - formation of federations - infrastructure and capacity building for federations.
This additional investment will create incentives among communities in the range to institute better forest protection over the entire range territory resulting in additional hectares sequestering carbon.	These additional technical activities will accelerate forest growth rates and increased carbon sequestration levels per hectare.	Additional institutional interventions will build community capacity to sustain forest protection over the next 25 to 50 years. These interventions will lead to sustainable management of forests, while reducing the transaction cost of managing forest, benefits.

Permanence of Carbon Stocks

Unplanned harvesting of woody biomass and disturbance of topsoil could lead to C emission from burning or decomposition. Permanence is an issue unique to land use change and forestry sector activities. In Handia, the proposed CDM project would overcome the issue of permanence and ensure no unplanned wood extraction or soil disturbance occurs through following measures:

- Local community institution development, capacity building and participation of local community in all decisions, including the modes and rates of planned extraction and sharing of benefits would stop unplanned disturbance.

- Community institutions will prevent any unplanned extraction, as observed in Rahatgoan, where a C accumulation rate of 3.4 tC/ha/yr has been recorded during 1992 to 2000.
- The fuelwood needs of local communities will be met by permitting collection dry twigs. The installation of fuel-efficient cook stoves and biogas plants, financed through CDM payments, would lead to reduce the fuelwood demand.
- Higher fuelwood supply, compared to a baseline scenario would be insured from the project area under the CDM project situation.

Leakage

Leakage is defined as the unanticipated decrease or increase in C benefits, outside the project accounting boundary, due to CDM project activities. Leakage could be a serious issue if fuelwood extraction is reduced or banned in the CD project area, focusing on dependent households to shift extraction to neighboring village forests or pastureland. In the proposed project, it is very important to insure that the biomass, particularly fuelwood, needs are considered while planning the project and the following measures would minimize or avoid leakage leading to C emission.

- Efficient fuelwood stoves would be incorporated into the project to reduce the demand for fuelwood.
- Community participation at all stages of project planning and implementation would avoid shifting of pressure.
- The lands considered for forest regeneration under the CDM project are in a degraded state, with only 19 tC stock/ha
- A landscape approach would be adopted for monitoring C stock changes in the forestlands of adjacent villages. Further a periodic household survey would be carried out in the project villages to assess the source of fuelwood extraction and quantity extracted. Thus, the leakage, if any, could be considered while estimating the CERs.

It is important to note that a successful protection, regeneration and enhanced flow of benefits could lead to a "demonstration effect" on neighboring villages and forest ranges with a resulting multiplier effect that might bring more degraded forest area under protection and management, ultimately contributing to higher C mitigation benefits.

Levels of carbon leakage through fire and illicit felling have declined dramatically in Rahatgaon Range, while this has not been the case in Handia. In Rahatgaon, prior to the formation of FPCs, commercial head loading of fuelwood was uncontrolled. By the end of 2000, the FPCs studied in Rahatgaon Range allowed only 2 head loads of fuelwood (18 to 22 kg. each) per week for each household. The area impacted by ground fire has also been reduced from an estimated 50 percent of the range to only 5 percent. Illegal logging that averaged 10-15 trees (20-30 GBH) per hectare annually before protection is now insignificant. Such a scenario is possible for Handia CCA under the proposed project.

Monitoring, Verifying, and Reporting

In order for a CDM project to claim CERs it must demonstrate that the C benefits are real, measurable, and long-term. This requires that the C benefits are measured, monitored, verified and reported. A CDM project requires monitoring not only C stock changes but also socio-economic and local environmental impacts contributing to sustainable development. The COP has yet to give guidance on what C pools to be monitored, what level of accuracy is acceptable, and what institutional arrangements and verification procedure to be adopted. The C pools to be monitored, the monitoring domain (project boundary), methods to be adopted, institutional arrangements, and capacity development needed and the transaction costs would be assessed for the project in detail, based on the guidelines suggested by UNFCC. However, a few critical parameters to be monitored in the Handia project include the following:

- Carbon pools; above ground vegetation C and soil organic carbon.
- Socio-economic parameters; employment generated, flow of forest products, participation of women etc.
- Local environmental parameters; biodiversity, water level in water bodies, etc.

Monitoring

Standard textbook methods and sampling procedures would be adopted for measurement and monitoring. The cost of estimating and monitoring a project GHG benefits have been estimated to be between 5 to 10% of total project costs. It may be possible to reduce the cost of monitoring further by existing institutions and infrastructure. At the initiation of the Handia Carbon Credit Pilot Project, baseline data would be collected from all plots including information on the following parameters:

- Enumeration of shrub and tree population
- Identification of species composition

- DBH measurements for all trees over 1.5 meters
- Height measurements for all trees over 1.5 meters
- Annual fixed point photographs of forest profile in sample plots

The proposed carbon credit pilot project would develop such an information system by assessing changes across uniform blocks of landscape with sample measurement sites. Remotely sensed data would be used to verify field level findings. Sample plot data would be undated on an annual basis by a sample survey team comprised of members of the FPC/VFC.

Verifying

Verification of field data collection would be conducted every five years by research institutions under contract with the project. The Verification Team would re-survey all monitoring plots maintained by the FPC/VFC Federation. The Verification Team would analyze their own as well as the Federation findings to ensure consistency.

Reporting

FPC/VFC Handia Federation would prepare annual reports describing changes in biophysical indicators. Reports would be sent to the Madhya Pradesh Forest Department, the Ministry of Environment and Forests, and the research institutions contracted to verify community monitoring of carbon stock changes and sustainable development indicators. Reports would be forwarded to each of the financing partners.

CDM PROJECT MANAGEMENT INSTITUTIONS: ROLES AND RESPONSIBILITIES

Under the proposed pilot project, a number of institutions will have strategic roles to play, and some new organizations will need to be created to coordinate the program. In line with the strategy of empowering local communities as forest managers, the FPCs and VFCs of Handia Range will need to act as the primary implementers of the project.

FPCs/VFCs, Cluster Group Councils, and Range Federation Committees

In order to build long-term management capacity among forest dependent communities it is important that they be vested with the authority and responsibilities to manage and direct the proposed pilot project, with outside agencies playing supportive roles. While the institutional mechanisms and organizational capacity will require continuing external support to develop, it is important that communities are given the authority to make important resource management decisions as well as controlling their finances.

FPCs/VFCs

It is also important that all communities in the CCA be eligible to participate in the project, since they are all likely to have some linkages to the utilization of forest resources in the area. There are currently 5 FPCs and 47 VFCs registered in Handia Range, ranging from nonfunctional groups to very active ones. In addition, there are approximately 50 additional hamlets that were not included in JFM initiatives. Some of these villages, such as Siraliya and Sontatali, possess families dependent on commercial fuelwood head loading, bringing them into conflict with some Handia FPCs/VFCs. Unlike Rahatgaon, many of the hamlets in Handia reflect greater caste diversity, often with power dynamics that reflect the inequities of landlord – peasant relationships. In some cases, committees failed to form due to inter-group tensions. But, according to one report regarding Handia, Forest Department intervention helped mediate disputes over forest management issues:

> *In cases where the department strongly stood by the people and supported their attempts the problem* (of inter-group conflict) *was solved and strong and successful committees established.*[24]

The project scenario would encourage all community members to participate in FPC meetings, rather than relying on executive committee structures to make resource management decisions. Each FPC would be comprised of the members drawn from a single hamlet. In some cases, FPCs could facilitate the involvement of women and land poor families in management by allowing lower income hamlets to control their own forest management groups. This approach would be followed as part of the carbon pilot strategy in supporting the development of FPCs in Handia Range.[25]

In order to facilitate project activities and communication, this project proposes organizing communities located within the CCA in Handia Range be divided into 10 to 20 Cluster Groups (CG). Under this scenario each CG would provide an intermediate level of organization between the individual FPCs/VFCs and the Range Federation that coordinates the overall project. Each CG would be comprised of 5 to 10 hamlets that have historically shared forest resources and routinely communicate regarding management issues and protection duties. In some cases, CG members may reflect the hamlets included within the

[24] See Archana Sharma and Ramanthan B., 1999, p. 61.
[25] Ajit Banerjee, "Community Forest Management is the Future," *Down to Earth*, October 31, 2000.

panchayat territory, in other situations hamlets from more than one *panchayat* may be involved. Each CG would form a council of FPCs/VFCs.

Cluster Group Councils and Range Federation Committees

Cluster Group Councils (CGC) would be comprised of one male and one female representative from each VFC/FPC who would be elected by their membership. Each CGC would elect one man and one woman to represent them on the Range Federation Committee (RFC). In both the CGC and RFC, male and female subcommittees would be formed to allow for independent discussions among gender groups, prior to full body meetings. This should allow a better formulation of each gender group's positions and policies prior to their articulation at federation meetings. CGCs would be responsible for coordinating village forest protection activities, arbitrating local disputes, setting fines, organizing fire control, and facilitating special joint village development projects. CGCs would also be responsible for developing field level nurseries. CGCs would be responsible for assisting each FPC/VFC in their area in the development of forest management plans that would be consolidated at the CG level and presented to the RFC.

The RFC would provide overall coordination for the entire territory. It would provide a formal point of contact for outside organizations working in the area. The RFC would also provide an appeal forum and act as an arbitrator for disputes not resolved by CGC. FPCs/VFCs would meet on a monthly basis, CGCs on a quarterly basis, and the RFC on a semi-annual basis or as needed. Each VFC/FPC would be assisted to develop a Village Fund. Both the CGC and RFC would maintain funds to finance meetings, training activities and related development projects approved by their members. Account books would be opened for member review during each meeting and fiscal reports provided at that time.

Madhya Pradesh Forest Department

The Harda Forest Division staff will need to continue to play an important role in facilitating FPC/VFC development and in mediating disputes. This will need to be undertaken with considerable flexibility. In some cases, multi-caste communities may wish to handle day-to-day management tasks on a group basis, dividing territorial responsibilities. In other cases, the most dependent groups, such as women or landless tribal families, may best assume forest management responsibilities. It is important that those most directly affected by changes in forest management have a direct role in emerging institutions.

Under earlier JFM projects financed by the Government of India and the World Bank, the role of the Madhya Pradesh Forest Department has been one of financial manager or project implementer. Under the proposed carbon pilot project, the FPCs and their apex bodies would primarily undertake these tasks. The objective of shifting these responsibilities would include both reducing transaction costs while building community management capacity.

The Harda divisional forestry staffs' immediate task upon the initiation of the pilot project would be completing the process of FPC/VFC formation throughout Handia Range. This would include the establishment of additional 50-plus hamlet-based organizations in order to cover all communities within the range, as well as providing institutional support to existing groups. Over the life of the project, forest department staff will need to emphasize assistance in institutional building, conflict resolution, and coordination with outside agencies. It is suggested that a Divisional Working Group (DWG) be formed to better coordinate the roles of external agencies in the carbon credit pilot project.

The DFO could convene the DWG on a quarterly basis. The DWG would oversee the management of funds flowing into the carbon credit Pilot Project in Handia Range. Ten percent of the total carbon offset credit would be retained by the DWG to cover management costs. Important participants would include IIFM and CES, other participating NGOs, Handia Range Federation representatives, as well as representatives from the relevant *panchayats*, and government sectoral agencies.

Third Party Institutions

Research institutions will need to take primary responsibility in designing the implementation guidelines for the carbon credit pilot project in Handia Range, in consultation with local communities and the Harda Forest Division staff. Research institutions, in conjunction with local FPC/VFCs, would prepare a detailed design of the carbon monitoring, verifying, and reporting system, training village monitors in the methodologies and data analysis procedures and would also be responsible for verification of the findings.

Panchayat and Government Technical Agencies

Local *panchayat* and government technical agencies would work with the Handia Range Federation to provide additional financial and technical support to participating communities. Elected *panchayat* representatives and line agency staff will work together with the Federation to find opportunities to support the development of the rural communities in Handia.

TRANSACTION COSTS

Any long term financing strategy for JFM in India will need to be cost effective to be sustainable. There is a need to maintain low transaction costs to ensure that a large share of income from CERs would flow to the VFC/FPC. Transaction cost levels will also need to reflect external funding levels that are likely to be available. This project scenario requires 70 percent of all CERs to be transferred to community-run micro-credit institutions. The remaining 30 percent is divided between the community-administered apex bodies (Cluster Group Council and Range Federation – 10%), research institutions playing monitoring and verification roles (10%), and the Forest Department in its technical assistance capacity (10%). Additional funding required for planning, research, and training will need to be secured as additional grants rather than drawn from CDM funds.

TERMS OF CARBON MANAGEMENT CONTRACT

It is proposed that a 50-year contract be entered into by the FPC/VFC Handia Federation and outside financing agencies. The financing agencies may include a consortium of private sector utility companies, development agencies, or other interested organizations. Each participating agency would contribute to a corpus fund established to finance the project over its term of operation. Each year the participating financing organizations would meet to review the data demonstrating the delivery of the environmental services contracted, in this case, carbon storage and sequestration. The financing organizations would agree to finance carbon sequestered at a fixed rate of $10 per ton per year during the first 25 years of operation, after which the rate would increase to $20 per ton per year.

During the first four years of operation of this contract, the financing consortium would commit to a payment based on a sequestration of 3.4 metric tons per hectare for the entire 11,000 hectares of afforestation area in the CCA located in Handia Range. At $10 per ton of carbon sequestered the gross annual payment to FPC/VFCs in Handia Federation would total $375,000. After five years, an analysis of the sample plot monitoring data and verification data would determine actual carbon sequestration levels and a new annual payment would be set on that basis. Table 14 projects the net income that could flow to each forest protection group based on different assumptions of carbon credit rates and sequestration levels.

Table 14 AVERAGE PROJECTED NET ANNUAL PAYMENT FOR EACH FPC MICRO-CREDIT INSTITUTION IN THE CARBON CATCHMENT AREA, HANDIA RANGE			
Rate per Ton	**Carbon Sequestration Rates in Metric Tons per Hectare**		
	2tC/year	3.4tC/year	5tC/year
$10	$1540	$2625	$3850
$20	$3080	$5250	$7,700

Of the total gross annual payment, 70 percent would be divided among all participating VFC/FPCs in the Federation as a contribution to their Revolving Micro-credit institution. Another 5 percent of the carbon income would flow into the account of each CGC, with another 5 percent to the joint account of the FPC/VFC Handia Federation. Ten percent of the carbon credit revenues would be shared by third party institutions to provide support in training, monitoring, verification, and reporting activities. Finally, an additional 10 percent of the carbon credit revenues would be managed by the Harda Forest Division for the operation of the DWG that would oversee the allocation of carbon credit resources and coordinate the overall program technical assistance program.

SUMMARY

The Handia Range Carbon Credit Area Pilot Project addresses some of the key components required by future forestry sink initiatives qualifying under the CDM of the Kyoto Protocol. They will require further elaboration in the development of a project proposal. Those negotiations will likely involve a number of key stakeholders including the communities of Handia Range, the Madhya Pradesh Forest Department, the carbon credit purchasing institutions, and the managers of the CDM. This brief project description indicates that many important elements of carbon credit forestry projects can be addressed in the Harda context. These include demonstrating carbon additionality that could be monitored and verified by the community, as well as through third party audits, and fostering a process of institutional capacity building, social development, and livelihood improvement. The next step is to initiate detailed project design activities, beginning with community level dialogues, while identifying potential funding sources within and outside India.

PART VI

CONCLUSION

India has a large population that depends directly or indirectly on forests, degraded forests, and pastures for biomass (fuelwood, timber and non-timber products including grass). In India, the biomass resources are subjected to degeneration. Realizing the need for participatory approach to protection and regeneration of degraded forests and pastures, India has launched the JFM program on a large scale. Even though the JFM program is over 10 years old, there have been no systematic national studies assessing the number of forest protection groups, their performance, impacts and barriers to large scale spread of FPCs, and their impact on enhanced biodiversity and biomass growth rate. Based on a few case studies in several states and preliminary assessment of JFM at the national level, Ravindranath et al (2000) have identified a few barriers:

- Technical barriers: Inadequate information on village forest or location specific vegetation regeneration, replanting, protection, extraction, grazing and management practices. Absence of cost effective revegetation techniques under participatory forestry.
- Institutional barriers: Village level institutions such as VFC/FPC have inadequate decision making power, information and capacity to participate effectively in protection, management and sharing of benefits.
- Financial barriers: Lack of funding for innovative technical and institutional interventions. State forest department funds only conventional afforestation activities. Even the external funds are largely spent on conventional afforestation activities. To enhance the spread of JFM and effective participation of local communities, there is a need to adopt innovative and cost-effective technical and institutional interventions, which require innovative financing arrangements.

CDM: AN OPPORTUNITY TO PROMOTE JFM IN INDIA

CDM provides an opportunity to obtain funding in the form of payment for "C" credits (CERs), to finance innovative and cost-effective technical and institutional interventions, needed to enhance the rate of spread, improve regeneration and enable effective participatory forestry in India. CDM also provides opportunities to enable the flow of financial incentives directly to households or communities protecting and managing the forest. Participating communities would receive double benefits: 1) they would get access to increased production of NTFPs and even woody biomass and, 2) financial rewards for every ton of carbon sequestered in the above ground biomass and soil. Effective CDM implementation requires awareness, information flow and capacity building among rural communities to ensure efficient transfer of information, adequate decision-making power and most importantly financial rewards. CDM provides opportunity to reward poorer local communities for providing global environmental services.

Research in Harda division confirms the findings of earlier studies that indicate that the initiation of JFM has contributed to improved forest protection and reduced forest department community conflict.[26] Ecological results from sampled forest plots demonstrate that better forest protection, especially the control of illegal felling, grazing, and fire has allowed natural regeneration to take place. In all forest sample plots protected by communities, vigorous seedling and coppice growth had been established over the past 8 to10 years, while in unprotected control plots new growth has been minimal. Community forest protection appears to be a key element in ensuring the new age cohorts are present to replace maturing trees and ultimately to sustain natural forests in the range.

LESSONS FROM HARDA FOREST DIVISION

Harda Forest Division initiated an important shift in the relationships between forestry field staff and forest-dependent communities, from one of antagonism to one of cooperation, in the early 1990s. The formalization of JFM as a state and national program, combined with the influx of external support in the form of the World Bank, has contributed to the further extension of the project across the Division. In examining the roles played by different institutions and the investments made in the program, it is apparent that some have been more effective than others.

[26] See Archana Sharma and Ramanthan B., 1999 and Vinod Kumar Bahuguna, Vinay Luthra and Brij McMan Singh Rathor, "Collective Forest Management in India," *Ambio*, Vol. 23, No. 4-5, July 1994.

A reconstruction of the historical development of community-based forest protection in Harda Division indicates that the attitudinal changes within the Forest Department were likely among the most critical elements in defusing tensions with local groups. The willingness of some forest officers in Harda Division to empower the communities with new rights and responsibilities created novel opportunities for forest-dependent hamlets to exercise management controls over forests for the first time in over a century. In some cases, the authority structure between the forest department and the communities was even reversed:

> *On many occasions the committees have acted as pressure groups on government functionaries…. a forest guard, who acted as a member secretary, was fined by the committee for wrongs committed while discharging his duties.*[27]

By late 1993, prior to the initiation of external support, 155 FPCs/VFCs had been formed covering most of Harda Forest Division.[28] Further, most of the declines in illegal felling, grazing, and fire incidence had also taken place. The additional impact of the World Bank financed project is less visible. Also, a different investment strategy utilized by the special project that relied more on high-cost technical interventions was limited to a small percentage of "project villages." According to the results of an expert review of JFM in Madhya Pradesh, one discussant noted:

> *The Harda Model of JFM has serious flaws. Pumping money into a few villages at the cost of others is not the solution. It creates disparities.*[29]

The current DFO in Harda Division also reflects this philosophy, preferring to focus on low-cost institution building activities to support JFM, both within the Forest Department as well as with the communities. He states:

> *It is important to shift the orientation of the staff. Through meetings with villagers and field staff we build trust and can convince them that the forest department is here to serve, not to demonstrate power. The response to this message among the villagers has been tremendous.*[30]

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[27] V.K. Bahuguna et. al. 1994, p. 273.
[28] V.K. Bahuguna et. al. 1994, p. 271.
[29] M.P.Forest Department, "A Brainstorming Sesson on Issues in Participatory Forestry, July 6, 2000," in Project Proposal for M.P. Forestry Project (Phase-II) Annex IIB, p.7.
[30] Personal Communication with DFO, Harda Division, November 7, 2000.

The DFO has also noted that cash investments from World Bank financed projects ranging from Rs. 50,000 to Rs. 200,000 are excessive.

> *I have tried to show that small money works and that we do not need to invest too much. If we give the village Rs. 10,000 to fix up a temple, it will strengthen village commitment to forest protection. Small contributions to Village Micro-Credit Funds are also important, as they bring everyone together and push the organization forward.*[31]

According to the current DFO, only 9 of the 147 FPC/VFC currently operating in Harda Division were selected as World Bank forestry project sites, a disappointingly narrow coverage for a project whose budget exceeded $60 million during its five-year tenure (1995-2000). While some of the FPCs have benefited from alternative government schemes, it is also apparent that considerable inequities are present within and between villages in the way these allocations were made. Some FPCs/VFCs have enjoyed large infrastructural investments in their communities, while others have received no assistance. Further, approximately 50 to 60 percent of the rural hamlets within the division have been excluded from the JFM program entirely.

Larger capital investments have often favored better-off segments of the community, as in the case of tube wells that disproportionately benefit the landowners whose farms are irrigated by the water. Finally, since the Forest Department manages funding for high-cost projects, transaction costs are relatively high resulting in a lower percentage of total available resources for JFM flowing to the community. Even in Divisions where DFOs push for a cleaner department, petty corruption not only results in added costs, but in time delays, and the undermining of authority structures. As member secretaries of FPCs/VFCs in Harda, forestry field staff must deal with departmental clerks to secure the release of funds. In some cases, clerks or field staff may "impose" fees for releasing funds to FPCs/VFCs. To reduce these problems it is necessary to scale back the size of funds, while empowering the beneficiaries to manage them directly.

Interviews with community members indicate that many infrastructural projects have been helpful in facilitating community development in the participating villages. Nonetheless, in terms of the internal and external financing likely available for JFM support strategies over the next 50 years, funds will not be available to provide most communities with high-cost

projects. Further, these types of initiatives are not particularly beneficial in building institutional capacity to manage forest resources sustainably. Nor, once completed, do they provide a future incentive for continued forest protection. As a consequence, given the low financing available under carbon credit schemes, great emphasis will need to be placed on providing communities with institutional support and direct access to capital for financing village funds, with annual contributions based on performance. Over the long term, the goal of external support to the forestry sector, whether carbon oriented or otherwise, should be to facilitate the ongoing shift in the management paradigm.

SUMMARY

This report suggests that JFM in India could be effectively financed over the long term through carbon credit offset schemes currently under international discussions. An analysis of the Harda Forest Division context indicates that there are opportunities to sequester carbon and to mitigate climate change patterns through forest regeneration in central Indian dry deciduous forest ecosystems. At the same time, 50-year carbon contracts between outside purchasers and community forest protection groups offers an entirely different mechanism for financing grassroots conservation efforts in rural India.

This opportunity comes at a time when India's forest management transition from a state-run, technical agency to local governance is encumbered by a reliance on conventional development assistance modalities that constrain its evolution. A recent study of 40 forest protection groups sampled in Madhya Pradesh found that only 17 percent maintained their own administration and accounting records, relying on the forest department staff and local school teachers to manage their accounts.[32] The scale and the relatively short five-year time frame of the World Bank financed project required that it rely on the Madhya Pradesh Forest Department to implement JFM support activities. As a consequence, steps to build community management capacity to administer and monitor their activities are not given priority.

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[31] *Ibid*.

[32] The Indian Institute of Forest Management conducted process documentation of JFM projects in 40 villages between 1998 and 1998, cited in the document of The World Bank entitled "Supplemental Documents to the Implementation Report . June 26, 2000, p.14.

Using CDM Projects to Facilitate Forest Management Paradigm Shifts

In Harda, as in many parts of India, JFM initiatives readily take root in some communities, while others have problems sustaining forest management, or even initiating it. Social homogeneity, resource use practices and dependencies, forest department staff characteristics, investment levels, forest condition, and many other factors may influence the outcome of internal and external efforts to engage communities in management. JFM has spread with great rapidity, especially in eastern India, however many hamlets and regions have been left behind. While perhaps five to ten million hectares of forest land have come under community stewardship during the 1990s, this represents only ten to twenty percent of the forests that would benefit from better protection by local communities.

Facilitating the extension of JFM to more of India's forest land is both desirable and necessary, given prevailing demographic, socio-political, and economic environment. The transition requires a paradigm shift from a reliance on techno-bureaucratic institutional modalities, characterized by forest departments, to those based on local, participatory governance mechanisms, in this case informal hamlet-based forest protection groups. The process challenges the Indian Forest Service and its century old traditions and management styles, requiring the IFS to transfer significant authority to its new partners in the village, while it is gradually reborn as a training and technical extension agency.

In terms of the future sustainability of JFM, self-sufficient institutions will need to be developed that can deal directly with the outside world, rather than through high transaction cost intermediaries like state forest departments. Forest protection groups will need to develop the capacity to monitor the effectiveness of their management, both in terms of its ecological impacts, as well as its social and economic responsiveness to local needs. Fiscal management skills will need to be developed, together with processes that ensure transparency and equity. The CDM provides an opportunity to finance the extension of a new forestry paradigm in India to begin to systematically address these needs, allowing community forest protection groups to take still another step towards independence.

LIST OF ACRONYMS

ANR	Assisted Natural Regeneration
C	Carbon
CCA	Carbon Catchment Area
CER(s)	Certified Emissions Reduction(s)
CES	Centre for Ecological Science at the Indian Institute of Science, Bangalore
CF	Community Forestry
CFM	Community Forest Management
CG	Cluster Group
CGC(s)	Cluster Group Council(s)
COP	Conference of Parties
DBH	Diameter at Breast Height
DFO	Divisional Forest Officer
DWG	Divisional Working Group
ET	Emissions Trade
FPC	Forest Protection Committee
GBH	Girth at Breast Height
GoI	Government of India
GPS	Global Positioning System
HRMS	Hill Resources Management Societies
ICFRE	Indian Centre for Forestry Research and Education
IIFM	Indian Institute of Forest Management, Bhopal
IIS	Indian Institute of Science, Bangalore
JFM	Joint Forest Management
JI	Joint Implementation
LUCF	Land Use Change & Forestry
MP	Madhya Pradesh
MOEF	Ministry of Environment and Forests
NAEB	National Afforestation and Environmental Board
NGO	Non-government Organization
NTFPs	Non-timber Forest Products
RFC(s)	Range Federation Committee(s)
VFC	Village Forest Committee

VPC	Village Protection Committee
VRDP	Village Resource Development Program
WG	Working Group

GLOSSARY OF TERMS[33]

Additionality – environmental or emission additionality refers to the carbon accounting procedures being established under the Kyoto Protocol, whereby projects must demonstrate, real, measurable, and long-term results in reducing or preventing carbon emissions that would not have occurred in the absence of CDM activities. Proof of additionality is critical because developing countries do not have legally binding reduction commitments by which to judge changes in national baselines. This makes project baselines essential, as well as the ability for independent verification of a project's real, measurable results.

AIJ – Activities Implemented Jointly – a voluntary, participatory program initiated by the UNFCC in 1993 as a pilot phase for bilateral agreements between industrial country investors and project hosts in developing countries who potentially could provide projects for carbon emissions reductions to investors at a lower cost than domestic abatement.

Annex I countries – the list of industrialized countries agreeing to legally binding reductions of GHG emissions below 1990 levels, under the "Berlin Mandate," adopted by the UNFCCC in 1995.

Annex B countries – the list of countries that can participate in emissions trading under Article 17 of the Kyoto Protocol, and their specific reduction commitments, or QELRCs.

Carbon sequestration – the incremental addition to a carbon stock. Sequestration and stocks are often confused. An old growth forest may possess very large accumulations of carbon, but sequester it at a lower rate than a young regenerating forest.

Carbon stocks, sinks, and sources – a stock that is absorbing carbon is called a "sink" and a stock that is releasing carbon is known as a "source." The global carbon cycle continually experiences fluxes, or flows, between the carbon stocks stored in oceans, land, and the atmosphere. It is estimated that changes in carbon stocks from 1850 to 1995 have added some 160 billion tons of carbon (gigatons, GtC) into the atmosphere: 368 GtC were released form industrial emissions and land-use changes, while 206 GtC have been absorbed by ocean and terrestrial sinks.

CDM – Clean Development Mechanism – defined in article 12 of the Kyoto Protocol, the CDM is a project- based mechanism whereby Annex I (industrialized) countries can accrue "certified emission reduction units" (CERs) in return for financing carbon reduction project activities in non-Annex I (developing countries) that help further their sustainable development.

CERs – Certified Emission Reduction units – the tradable unit in a Clean Development Mechanism project, as defined in Article 12 of the Kyoto Protocol.

Cubic meter (m3) – a common measure used in forestry. One m3 of wood contains roughly half a ton of carbon.

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[33] *This glossary draws on Michael Totten,* Getting it Right: Emerging Markets for Storing Carbon in Forests*, (Washington D.C.: World Resources Institute, 1999) p.41-44.*

ERU – Emission Reduction Units -- the tradable unit in a Joint Implementation (JI) project, as defined in Article 6 of the Kyoto Protocol.

FCCC – United Nations Framework Convention on Climate Change – the FCCC, along with the Convention on Biological Diversity (CBD), were two agreements to emerge from the 1992 U.N. Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil. The FCCC established a voluntary multilateral agreement to reduce industrialized nations' emissions of GHGs to 1990 levels by the year 2000, which has been ratified by 170 countries.

FPCs -- Forest Protection Committees -- are one of several terms used to refer to the hamlet-based groups responsible for protecting local forests. Generally possessing 50 to 200 member households, these groups usually rely on voluntary patrols to close community forests to grazing and cutting. In Harda Forest Division, FPCs were formed in areas with Reserve Forests.

GHG – Greenhouse Gases – are radiatively active trace gases in the atmosphere that trap infrared heat. The earth absorbs the sun's shortwave, ultraviolet radiation and emits long-wave, infrared radiation to outer space. The absorption of radiation causes warming. Clouds (H20) and accumulating gases in the atmosphere, such as carbon dioxide (CO2), methane (CH2), nitrous Oxides (N2O), and chlorofluorocarbons (CFCs) absorb some of this outgoing infrared radiation.

IPCC –Intergovernmental Panel on Climate Change -- established as a special body by the UN Environment Program and the World Meteorological Organization to provide assessments to policymakers of the results of ongoing climate change research.

JFM -- Joint Forest Management -- was adopted as a national strategy for community involvement in Indian forest management. The approach seeks to create partnerships between state forest departments and forest-dependent communities through the formation of management groups and the provision of sharing arrangements for forest products.

Leakage – refers to unexpected carbon losses related to a particular carbon offset project. The leakage may be due to unforeseen circumstances that were beyond the control of a forest conservation or sequestration project. Unforeseen events include extreme weather, political instability, climate change, pests, disease, fire, or cancellation of contracts that lead to logging. Research on leakage suggests that it can be anticipated and avoided through good project design. Where leakage is unavoidable, net carbon estimates can be revised, incorporating leakage effects.

Panchayats – represent the lowest level of local governance in India. Village panchayats typically cover 3 to 20 hamlets and are led by elected representatives.

Village Forest Committees –(VFCs) -- in Harda Division VFCs were formed to at the hamlet-level to involved local households in the management of Protected Forests.

CONTRIBUTORS

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Dr. Mark Poffenberger is the Director of Community Forestry International and the Asia Forest Network. Over the past thirty years he has worked throughout the Asia region as a researcher, Ford Foundation program officer, and consultant to development agencies. During the last decade, he has assisted the evolution of JFM programs in India. In search of long term financing sources for community-based forest management, Dr. Poffenberger began exploring carbon credit schemes leading to the development of this exploratory study.

Dr. N.H. Ravindranath is a senior scientist at the Centre for Ecological Studies at Indian Institute of Forest Management, Bangalore. He is a coordinator of the Government of India's Committee on Forests and Climate Change and a scientific advisor to the Intergovernmental Panel on Climate Change. Dr. Ravindranath and his colleagues were instrumental in the design of methodologies to monitor changes in Indian forest ecosystems and in the formulation of models to assess changing carbon values. Dr. Ravindranath guided the research design for assessing carbon stocks in sample sites in Harda Division.