



SHARP*Results*

MARCH 2006

ENVIRONMENTAL MANAGEMENT

RECOMMENDATIONS

- ✓ A sustainable development strategy is required. Stakeholders indicate a preference for sustainable development over various development scenarios.
- ✓ Access to micro-credit for alternative income generation is an important opportunity, rated highly by all local stakeholders. There is need for incentives to help local stakeholders generate income from alternative sources. This finding is especially important for fry collectors since they face the highest burden if the ban on fry collection is enforced. One approach might be to establish a Sundarbans Development Fund to finance various development activities, including micro-credit and mangrove conservation.
- ✓ Agricultural land conversion needs to be better managed in terms of regulations on the extent (zoning, etc.) and intensity (stocking density, chemical inputs, etc.).
- ✓ At present there are low levels of conflict among stakeholders despite shrimp farming's substantial impacts on their livelihoods. This offers opportunities to initiate dialogue and improved management before more serious environmental problems and conflicts arise.
- ✓ Planning must commence to deal with the eradication of White Spot disease together with encouraging a shift to hatchery-produced shrimp fry.

Assessing Environmental Management Options to Achieve Sustainability in the Shrimp-Mangrove System in the Indian Coastal Zone of Bay of Bengal



INDIA has a biologically rich and diverse coastline spreading across more than 6,000 km. Around 400 million people live along the coastline, many of whom rely on the natural productivity of the ocean and its coastal zone for their livelihoods. Before the advent of commercial aquaculture, Indian shrimp culture was limited to traditional methods of production, primarily in the states of West Bengal and Kerala. Since 1980, however, cultivation of brackish water shrimp has increased from 3,868 metric tonnes (MT) to 114,970 MT valued at US \$715.4 million in

2002. India is now the world's fourth largest producer of shrimp.

However, only 13% of India's total land area suitable for shrimp aquaculture is currently under cultivation. West Bengal, Orissa, Andhra Pradesh and Tamil Nadu account for approximately 90% of total shrimp aquaculture production. Approximately 90% of shrimp farms in India are less than two hectares, which is why the Government of India (GOI) and industry players favour intensification of shrimp culture.

The GOI has a number of

specific objectives to increase shrimp production, and many of these objectives rely on the recent (June 2005) passing of the Coastal Aquaculture Authority Bill in India's Parliament. These objectives are to:

- Increase the area under shrimp cultivation;
- Increase investment in the sector;
- Intensify production through the introduction of commercial shrimp aquaculture techniques, and new technologies;
- Minimise disease outbreaks, and
- Increase hatchery production of shrimp fry for stocking shrimp ponds.

The rapid growth of the shrimp aquaculture industry has generated a debate between proponents and detractors of this industry. However, both groups recognise that shrimp aquaculture raises a number of important questions regarding its contribution to economic growth, distribution of its benefits and costs, the environmental and ecological impacts, and the extent of public participation. This research project examined these issues in the context of the Sundarbans area of eastern India.

Tiger Country

THE Sundarbans is the largest contiguous area of mangrove forest in the world, forming an integral part of the delta region at the mouth of Ganga, Brahmaputra and Meghna rivers along the Bay of Bengal. It covers approximately 10,000 km of forest and water, which is shared between India (40%) and Bangladesh (60%). The Indian share comprises 4,260 sq km of reserved forest, which are managed by the Sundarbans Tiger Reserve (2,600 sq km) and the Forest Division (1,660 sq km) of the South 24 Parganas district of West Bengal. An additional 5,400 sq km of inhabited, non-forest area exists on the north and northwestern fringe of the mangrove forest in India.

The entire Indian Sundarbans lies within West Bengal, primarily in South 24 Parganas. For shrimp farm survey, the team identified Kakdwip, Namkhana, Sagar Kultali, Basanti and Patharpratima blocks in South 24

Parganas. It also surveyed a few farms in the Dhamara region, not far from Bhitarkanika mangrove forest in Orissa to compare the position of the Sundarbans with that of other locations in India. Altogether the team surveyed 165 aquaculture shrimp farms in the Sundarbans and 15 aquaculture shrimp farms in Dhamara.

The project focus included determining paths for sustainable development of the shrimp-mangrove system; ways to avoid environmental calamities that have occurred elsewhere, and ways to ensure that marginal stakeholders are not further marginalised.

The mangrove-shrimp linkage in the Sundarbans is different from that of other locations. There is little encroachment of shrimp farms into mangrove forests. However,

shrimp cultivation. Increased intensification, feed supplements and other external inputs, and export-oriented production became the norm.

Findings and Implications

THE study has found that the linkages between shrimp farming, fry collection and capture shrimp fishery are strong. As a result, shrimp farming via the collection of fry has a significantly negative impact on shrimp fishery.

The dependence of shrimp farmers in West Bengal, unlike other states, on collection of shrimp fry is due to a lack of hatcheries in this state. Despite the ban on fry collection in the coastal zone of India, it is not enforced in West Bengal, as there may be as many as 50,000 fry collectors in the Sundarbans.

The government finds it diffi-



the shrimp farmers are dependent on mangrove forests for collection of shrimp fry. This reduces the availability of shrimp fry to replenish wild shrimp stocks targeted by the capture shrimp fishery.

Farmers have traditionally practiced low-intensity shrimp rotation culture with rice in *bheries* (shallow water bodies). This practice provided farmers with an alternative source of food using environmentally benign techniques and shrimp was an inexpensive product sold to local residents. The advent of more intensive shrimp aquaculture in the 1980s significantly altered the nature of

cult to introduce any drastic measure like a ban on shrimp fry in this region as such a measure may face opposition. The survey among representative shrimp farms, however, indicates that shrimp farmers are inefficient in using shrimp fry and chemicals (including feed) as inputs, perhaps due to a widespread lack of information on efficient practices. The amount of loss, however, is lowest for shrimp farmers using the purely traditional technology.

Locally, the perception of shrimp farming is still positive. All stakeholder groups expressed a preference for more shrimp farms,

assuming other factors are held constant. Overall, shrimp farming is perceived as having a positive impact on the economic development of the area, especially since shrimp farmers are predominantly local. Potential expansion in the number of non-local commercial shrimp farms in the area is a concern, with negative implications for local shrimp farmers and other local stakeholders.

The location of shrimp farms in the Sundarbans on agricultural land shifts the burden of conversion onto this type of land (versus mangroves). Since this locates shrimp farming on private land, it might be argued that the costs associated with shrimp farming are sufficiently internalised. But conversion of private farmland is associated with pollution, land degradation, land and water salinisation and food insecurity. Agricultural land conversion needs to be better managed in terms of regulations on the extent (zoning, etc.) and intensity (stocking density, chemical inputs, etc.) of shrimp farming.

Along with the Supreme Court Ruling on expansion of shrimp farming in the coastal zone, the White Spot disease has limited expansion of the sector. The Aquaculture Act reduces the controlling effects of the Supreme Court Ruling. But there are concerns if the White Spot disease is brought under control. The team learned that research into White Spot eradication is underway and may prove a success. How much this will spur unplanned development remains to be seen.

Fry collectors express concern about the number of fry collection jobs, as they perceive it as a job of last resort. Many fry collectors, predominantly women and children, suffer from health problems. Fry col-



lectors are a marginal group, and hence are vulnerable to further marginalisation if the ban on fry collection is enforced. If collectors are going to be persuaded to abandon fry collection, finding alternative income generating opportunities for them will have to take priority.

Contextual Issues

THERE are also larger contextual issues affecting the evolution of the shrimp-farming sector in the Sundarbans. For example, water diversion upstream from the Sundarbans is affecting the integrity of the mangrove-shrimp system separately from any direct policy actions, such as those modelled in the policy analysis of the project.

There is also the broader issue of population growth as a driving force in the regional economy that must be taken into account. Finally, the dramatic decline in international shrimp prices serves to dampen the incentives to enter shrimp farming in the region, regardless of other considerations.

Potential Strategies

ACHIEVING the goal of sustainable development in the shrimp-mangrove system of the Sundarbans requires a number of specific actions. At present, it appears that the Sundarbans Development Board, which has the primary responsibility for development efforts in the Sundarbans region, has limited resources for providing extension and training for the farmers.

However, encouraging a private sector role in input supply and marketing of output presents challenges. They have the resources and interest to support input supply, technical improvements and expansion but there may be social costs. At the minimum, feed and seed suppliers could be educated about best management practices for avoiding White Spot and other viruses, and could play an important role in spreading these techniques among aquaculture operators.

Access to micro-credit for alternative income generating opportunities is an important opportunity, one that was rated highly by all local stakeholders. This finding reinforces the need for incentives to help local stakeholders generate income from alternative sources. This finding is especially important for fry collectors since they face the highest burden if the ban on fry collection is enforced. One approach might be to establish a Sundarbans Development Fund to finance various development activities, including micro-credit and mangrove conservation.

Hatchery-produced fry could replace collected fry if physical constraints for fry hatchery production can be overcome. Aquaculture operators prefer hatchery fry since they can be certified as disease free, are



The Shastri Applied Research Project seeks to address urgent issues in social development and health, economic reform and environmental management. Canadian and Indian researchers are collaborating on 19 studies on various topics. SHARP is implemented by the Shastri Indo-Canadian Institute and funded by the Canadian International Development Agency.

RESEARCH TEAM

School Of Resource And Environmental Management,
Simon Fraser University, Burnaby,
British Columbia, Canada
DUNCAN KNOWLER
(Principal Investigator)
WOLFGANG HAIDER
WILLIAM K DE LA MARE
SARAH ALICE NATHAN
NEIL BERNARD PHILCOX

Global Change Programme,
Jadavpur University, Kolkata, India
JOYASHREE ROY (Co-Investigator)
KAUSIK GUPTA
ANITA CHATTOPADHYAY GUPTA
JOY CHOWDHURY
RAMAN KHADDARIA

For further details

visit: www.sici.org

email: djk@sfu.ca

jroy@cal2.vsnl.net.in

kausik2k1@rediffmail.com

Written by **Ranjita Biswas**. Edited & Produced by **Soumya Sarkar**. Design by **Rupak Goswami**. Co-ordination by **Kaberi Nandy and Indranil Mukhopadhyay**.

Published by
SICI INDIA OFFICE
5 Bhai Vir Singh Marg,
New Delhi 110 001, India.

more homogenous and ready for harvest at the same time, making production easier. However, the shift of supply from wild shrimp fry collected by fry collectors to hatchery-produced fry is likely to result in social and economic costs to fry collectors. Appropriate policies will have to be introduced to mitigate this.

One shrimp farming approach being promoted in some circles is organic shrimp farming. This technique is similar in concept to organic agriculture and has the merit of few environmental impacts and high potential financial returns. With the advent of eco-labelling and certification mechanisms in fisheries, the prospects for obtaining premium prices for organic shrimp products may exist in specific locales such as the Sundarbans.

Fees and taxes on shrimp farming and fry collection would be possible solutions to internalise the external problems cited earlier. But how realistic are these approaches? One advantage is that funds collected could be used to retrain and support alternative opportunities for fry collectors. A permit or licensing system for shrimp farming is being suggested in countries like Thailand but circumstances may differ in the Sundarbans. Perhaps a simpler zoning system based on land use capability or a similar criterion could be developed for this purpose. After all, the Supreme Court moratorium amounted to a zoning policy of sorts so there is a precedent, but perhaps an approach that is less draconian would work better.

Shrimp farming in the Sundarbans does not seem to generate the animosities and conflict seen elsewhere. Even relatively poor and marginalized local stakeholders expressed interest in shrimp farming on a small scale. However, their access to the capital and land needed to farm on their own is severely limited. In addition, the risks of undertaking such a high investment livelihood would seem prohibitive for all but the better off. One approach to overcoming this constraint is to pool resources and risk by undertaking group shrimp farm-

ing. A precedent for such activity exists with the leasing of village tanks to co-operatives or informal groups of fishermen wishing to generate income on a group basis. Group shrimp farming has been attempted elsewhere in India and has potential in the Sundarbans.

The importance of mangroves should be promoted through economic valuation of mangroves, leading to increased levels of reforestation. Conservation of mangroves can be instituted more directly through the adoption of joint mangrove management schemes, such as those initiated by the M S Swaminathan Foundation.

There is a good case for education of the participants in the capture fishery, as few fishers were



aware of the linkages between fry collection, shrimp farming and their own fishery. The capture fishery is a legitimate stakeholder in the shrimp-mangrove system of the Sundarbans but has no stake in management right now. The capture fishery could be a more powerful voice in raising the concerns and pushing for change and improvement in management. A first place to start would be improved management of the capture fishery itself. There will be few long-term benefits gained from reducing fry collection for the marine sector if it remains dominated by open access and foreign vessels.

Finally, evidence shows that the farmers are looking for a balanced, sustainable and diversified development approach, and that they are willing to contribute towards achieving this goal. By sharing information about the agreement among various stakeholders with decision-makers, future decisions about policies, regulations and land use management can be less controversial. ■



SHARP *Results*

MARCH 2006

ENVIRONMENTAL MANAGEMENT

Making Shrimp Culture Sustainable in Orissa

AQUACULTURE is one of the fastest growing food production sectors in the world, as demand for seafood grows worldwide. This has attracted investment by local and foreign investors in the production of high value species such as shrimp. Liberalisation of national economic policies in the past two decades has made it possible for producers in developing countries to gain access to international markets.

Trade liberalisation, however, has had a mixed impact on local communities that practice traditional shrimp culture. Fishing communities residing on India's long coastline have been involved in aquaculture for many years. To keep pace with rising global demand, however, modern and capital intensive production technologies have been introduced, which has changed the indigenous system of aquaculture.

In many areas, the rural economy has been transformed from a subsistence agro-based production system into a highly industrialised export-driven production system. This has raised serious concerns about environmental degradation and the displacement of local people by commercial interests, resulting in increased marginalization, exclusion, and pauperisation of already disadvantaged groups.

RECOMMENDATIONS	
Community ✓ Formation of fishery clubs as association or registered bodies for shrimp farmers who operate in clusters. This will help attract more resources to the areas for improvement in infrastructure for expansion of sustainable shrimp farming. ✓ More emphasis on increasing the participation of women, particularly in shrimp farming. The Gram Panchayats (village self-governing bodies) should take the initiative on developing ways for engaging women. ✓ Villagers should take initiative to monitor the conversion of common property resources to shrimp ponds, and inform the authorities of encroachment.	camps and demonstration farms. ✓ Facilities should be created for research to identify causes and remedial measures of shrimp disease, particularly the White Spot disease.
Planners ✓ Dissemination of scientific knowledge regarding shrimp culture is needed to benefit shrimp farmers through seminars, workshops, training	Policy ✓ Simplification of laws associated with aquaculture for easy implementation will benefit farmers. ✓ Credit from financial institutions, co-operative societies and scheduled commercial banks to reduce the exploitation of small-scale farmers by local moneylenders. ✓ No shrimp culture inside Chilika Lake should be allowed. Strict demarcation of eco-sensitive areas particularly in Chilika area should be done to prohibit capture and culture of shrimp activities. Proper identification of land can be made in the periphery areas of Chilika for shrimp culture.

It is understandable that the underlying conditions of poverty, rapid population growth, and food insecurity intensify the pressure to choose short-term exploitation over long-term management. On the positive side, increased shrimp farming holds the promise of improved wel-

fare through direct participation or employment.

The mixed impact of shrimp farming on coastal communities has prompted a heated debate over the role of aquaculture in coastal ecosystems. Is it sustainable in the long run? Does it create social and



economic impacts that are being passed on to the rural poor leading to greater inequality?

This research project examined the diverse impacts of aquaculture in Orissa where shrimp culture is a leading economic activity. The goal was to contribute to the development of India's coastal aquaculture policy instruments that are socially and environmentally responsible, and which would help to ensure long-term economic viability. The findings can be valuable to long-term policy planning. Both government agencies and NGOs working on aquaculture and coastal resource conservation can draw on the experience for further work.

Project Area

FOR this project, the districts of Bhadrak in the north, Jagatsinghpur in the central part, and Puri in the south, including Chilika Lake were chosen. Over 5,000 farmers currently practice some form of aquaculture in these three districts. There are noticeable differences in the ecology of coastal areas within and between the coastal districts, which have a direct bearing on the type of aquaculture that exists or which could be introduced into local communities.

The three sites are microcosms of these differences helping to facilitate the analysis of distinctly different social, economic and ecological settings. About 42.5% of the shrimp farmers interviewed in Dhamara block practice shrimp culture on leased land. Shrimp farmers do not have suitable land, near river, sea or creek with necessary saline water; and do not want to degrade

their own land as repeated use of lime and other chemicals impoverishes and hardens the soil. Some of the shrimp farmers are outsiders, who have no land in the locality.

In Ersama block, many people take up shrimp culture because they have no other choice. After the 1999 Super Cyclone, agricultural areas became extremely saline after being inundated by tidal water. Although shrimp ponds existed in this area prior to the cyclone, their numbers were limited. Growing international demand for shrimp, combined with the perceived potential of earning large profits within a short time encouraged many people to become involved in shrimp farming.

Fishing is the main source of livelihood for the people living in and around Chilika Lake. The non-fisher communities living there have also taken up fishing, as their land is not suitable for paddy cultivation. Various parts of Chilika Lake's area are leased to Primary Fishermen Co-operative Societies (PFCS) for capture fisheries. Some of the societies have become involved in shrimp farming.

In 2001, the Government of Orissa banned shrimp culture in Chilika Lake for environmental preservation. However, people continue to practice shrimp culture in the allotted



areas to earn higher incomes. This has caused a continuous conflict between fisher and non-fisher communities.

For the study, 100 households in Dhamara (Bhadrak district) and Ersama (Jagatsinghpur district) and 11 primary fishermen's co-operative societies in Satpada-Chilika area (Puri district) were selected randomly for in-depth interviews. Women were interviewed separately to gauge their reaction to the questions. The project also worked closely with PREPARE, an NGO, Chilika Matsyajibi Mahasanga and the Department of Economics, North Orissa University, Baripada, Orissa.

Main Findings

■ *Shift in occupations:* Rice farmers and fishers have adopted shrimp farming in order to increase their income. In many places, rice farmers have converted their paddy fields into shrimp ponds due to an increase in soil salinity. This was particularly evident in Ersama block. The conversion of land from rice farming to shrimp farming has led to a decrease in the paddy production in the study areas.

■ *Employment generation:* Shrimp farming has played an important role in employment generation. Coastal land unsuitable for paddy is utilised for shrimp culture and has generated employment. Besides, in the non-agricultural season, labourers without work are employed in the shrimp farms. The growth of shrimp farming in the study areas has also led to the opening of subsidiary businesses such as feed and medicine companies, which has further increased the scope of employment for local people.

■ *Better standard of living:* The people who have successfully adopted shrimp farming have experienced a significant improvement in their standard of living. They can now afford luxury household items, holiday trips, etc. Overall, household expenditures have increased.

■ *Large-scale borrowing:* As shrimp farming is capital intensive, it has led to increased borrowing by the shrimp farmers from formal and informal sources. Since formal sources such as commercial banks do not have specific loans for aquaculture, some farm-

COMMON PROBLEMS FACED BY SHRIMP FARMERS	
Problems	Suggested Solutions
Absence of a hatchery with the facility of Polymerised Chain Reaction (PCR) test for the post-larvae shrimp seeds in the nearby area.	Establishment of a hatchery in the area.
Local stakeholders lack scientific knowledge base on shrimp culture. Most farmers culture shrimp on a trial and error method.	Provision of technical knowledge to the shrimp farmers through seminars, workshops etc. by government agencies or feed and medicine companies.
Cold storage facility is inadequate.	It is essential to develop adequate cold storage facilities in the area by the government or feed and medicine companies as shrimp are highly perishable.
No laboratory to conduct the salinity test of shrimp pond water, soil etc.	Establishment of a lab in the area by the government or the private companies involved in shrimp culture.
No insurance facility is available for shrimp farming.	Shrimp farmers' demand for a shrimp insurance policy should be implemented.
Exploitation of the shrimp farmers by the feed and marketing agents. Shrimp markets are characterised by a system of credit called <i>dadān</i> . This involves a cash advance by commercial agents to shrimp farmers on condition that the entire catch is given to them, often at a reduced price.	Credit from government organisations, financial institutions, scheduled commercial banks and co-operative societies is needed so that the farmers do not need to borrow from the agents and abide by their unfavourable terms and conditions.
The dominance of private sector companies restricts the resurgence of small shrimp farmers.	Provide seed facilities, bank finance and technical training to safeguard the interests of small-scale farmers.
Recently, restriction on export of shrimp under a sanitary clause and cartelisation of exporters has resulted in a continuous decrease in prices. Farmers are unable to cover even the cost of production during a bad harvest.	The cartelisation of exporters should be checked by the government.
The White Spot Virus is affecting the shrimp. Farmers lack knowledge of preventive measures and water treatment methods that could stop the spread of the virus.	Farmers want accurate information and more effective medicines and diagnostic tests for the virus from a competent biologist or technician appointed by the government.
Lack of competent technicians to guide the shrimp farmers.	Shrimp farmers would like access to experts who can give accurate advice and information about shrimp farming.
Non-availability of transport facilities.	Efficient transport facilities needed.

ers borrow under the pretext of investing in agriculture or house building, and instead use the funds to develop shrimp farms. Repeated crop failure due to disease outbreaks, however, have led to high levels of indebtedness for many shrimp farmers.

■ **Women's participation:** Women's role is insignificant in shrimp farming in the study areas. Upper caste women do not participate in shrimp culture due to social stigma. Only some lower caste women are engaged by export companies to de-shell shrimp heads. A few lower caste women collect post-larvae shrimp.

■ **Environmental degradation:** Water pollution, soil degradation and habitat destruction have been detected in the study areas.

■ **Market power dominates:** Private companies are heavily involved in shrimp culture through the sale of feed and medicines, as well as by acting as agents for international export. As there are only a few companies operating in the study areas, they use their market power to exploit small-scale shrimp farmers. This is done by charging high prices for their products and by paying farmers, who have no other way of accessing the international marketplace, less than market price for their shrimp. Farmers also report that export companies manipulate the recorded weight of the shrimp crop to their advantage. Larger scale shrimp farmers have more options.

■ **Flouted regulations:** An important finding is that the institutional arrange-

ments that have been set up to regulate the shrimp culture industry are not stringently followed in the study areas.

■ **Human development quality:** In terms of community-scale human development parameters, shrimp farming has not brought any significant improvements. Education, health, sanitation, drinking water supplies and electricity supply continue to need attention. Unsocial activities such as drinking and disregarding financially worse-off people have increased due to the flow of abundant money amongst a small number of people who are directly engaged in shrimp farming. There has not been much improvement in transportation and communication facilities.

■ **Increased social conflict:** Conflicts

The Shastri Applied Research Project seeks to address urgent issues in social development and health, economic reform and environmental management. Canadian and Indian researchers are collaborating on 19 studies on various topics. SHARP is implemented by the Shastri Indo-Canadian Institute and funded by the Canadian International Development Agency.

RESEARCH TEAM

Department of Geography,
University of Victoria, Victoria,
Canada
MARK FLAHERTY
(Principal Investigator)
JUTTA GUTBERLET
DOLAGOBINDA PRADHAN
MICHELE -LEE MOORE

Nabakrushna Choudhry Centre
for Development Studies,
Bhubaneswar, Orissa, India
KISHOR SAMAL
(Co-Investigator)
SHIBALAL MEHER
SUBRATA RAY
AMRITA RAY
BIBHUTI BHUSAN DORA
KATHLEEN PERKIN

For further details

visit: www.sici.org

email: flaherty@mail.geog.uvic.ca

ncdsvc@sancharnet.in

Written by **Ranjita Biswas**. Edited & Produced by
Soumya Sarkar. Design by **Rupak Goswami**. Co-ordina-
tion by **Kaberi Nandy** and **Indranil Mukhopadhyay**.

Published by
SICI INDIA OFFICE
5 Bhai Vir Singh Marg,
New Delhi 110 001, India.

between shrimp farmers and rice farmers, fishermen and non-fishermen and various groups of fishermen have emerged. There has been a reduction in grazing land for domestic animals due to shrimp farming. Income disparity between poor fishermen and rich non-fishermen has risen because the latter have more financial resources to invest and are able to sustain loss due to crop failure.

Looking Ahead

THE study has also identified areas



WOMEN'S PARTICIPATION

WOMEN here have fewer resources of their own and lack a voice in their community. They do not have any role in decision-making and suffer from traditional, routine and gratuitous gender-biased oppression. More participation in aquaculture will help to ensure economic independence and a better quality of life for them.

Women's participation in shrimp culture varies from district to district. Upper caste women do not usually work at shrimp farms. Even if additional labour is required in shrimp ponds, the farmers prefer hiring than letting their women work in the ponds. However, Ersama in the Jagatsinghpur district is an exception. Women actively participate in paddy cultivation and shrimp culture. They belong to both fishermen and non-fishermen communities.

Women from the fishermen community go out for fishing, collection of post-larvae seeds for their own shrimp pond (if they have any) and for selling. At times, women even go to shrimp ponds to give feed and also safeguard it during the night along with their spouses. Thus women lend a helping hand to their spouses in income generating activities.

In Chilika, while women recognise the potential value of aquaculture in providing income and independence, social constraints prevent most of them from active participation.

for future research. These include full cost-benefit analysis of the environmental, social and economic impacts of shrimp culture and alternative land uses. Research should also be done on the potential and cost of large-scale habitat restoration of abandoned shrimp ponds. New market opportunities should be explored and demand points within the country should be created and linked to the shrimp farmers' societies directly.

Small-scale shrimp farmers should be encouraged to apply for a license to grow shrimp from the Aquaculture Authority to avail themselves of available benefits such as training and farm subsidies. Villagers and local authorities should take adequate measures to ensure that effluents from shrimp ponds are properly treated before discharging

into local water bodies.

The study's findings have drawn the attention of concerned authorities. Policymakers are willing to share some of the recommendations and UNDP is utilising the findings for the development of a Fishery Policy. The full report will also be published in Oriya.

The researchers believe that timely implementation of these recommendations by the Orissa Government through its revenue, fishery, forest and environment departments will help shrimp farming to develop in a sustainable manner. This would help to provide a more stable source of income and employment to the coastal communities, and help reduce hunger and poverty in the coastal areas of the state. ■



SHARP*Results*

MARCH 2006

ENVIRONMENTAL MANAGEMENT

Engaging Communities in Waste Management: A Policy Oriented Study of Delhi, Toronto and Silchar

MANY cities in the developing countries are growing rapidly, faster than the cities in developed nations. The World Bank estimates that cities in the developing world are growing by 3.61% every year compared with 0.8% in the industrialised nations. It is estimated that by 2025 more than 60% of the global population will live in cities. This growth is not without its downside. Large cities in particular face three broad environmental challenges: air and water pollution, solid waste management, and declining quality and availability of water.

Urbanisation and changes in lifestyle, coupled with increasing industrial, commercial and economic development, have given rise to an increase in volumes of various types of waste. Waste generation rates are affected by socio-economic development, degree of industrialisation and climate. Generally, the greater the economic prosperity and higher the percentage of urban population, the greater the amount of solid waste

produced. Low-income countries have the lowest percentage of urban populations and the lowest waste generation rates, ranging between 0.4 to 0.9 kg per capita per day. High-income countries show the greatest waste generation rates, which vary from 1.1 kg to 5.07 kg per capita per day. In developing countries the amount of solid waste generation has almost doubled, from 160 million tonnes in 1990 to 332 million

RECOMMENDATIONS

Community

- ✓ The current policy of community participation in Delhi through Bhagidari needs to be institutionalised and given legal sanction. Community representatives need to be given multiple opportunities for participation including at the early stages of policymaking.
- ✓ The study indicates a readiness by citizens to abide by stricter regulations and penalties to deal with problems of littering and management. The government therefore must show political will to frame appropriate laws and regulations and enforce them strictly.

NGO and Private Participation

- ✓ Local bodies need to involve NGOs, voluntary organisations, and resident welfare associations (RWAs) in the task of door-to-door collection, creating awareness and implementation monitoring.
- ✓ There is currently great interest in involving private companies in solid waste management. This is

also a way to reduce the financial burden of government. The private sector has to be given some incentives by way of long term contracts, assured supply of waste for composting, lease of land at nominal lease rent, etc.

Policy

- ✓ Urban planners, municipal agencies, policy framers, and NGOs need to develop a variety of responses which are rooted in local dynamics, rather than borrowing non-contextual solutions from elsewhere. Local governments must honestly gauge public willingness and ability to participate in programme design and implementation.
- ✓ A vigorous public awareness campaign is required about proper disposal of waste. Information and education are needed to allay the fears that people have with regard to waste management and to encourage them to take responsibility for the waste they generate.

State Support

- ✓ Composting is an important and useful technique in the Indian context. It is therefore important that necessary technical know how is provided either free or at very low rates and organic fertilisers from composting plants is sold at subsidised rates. There also is need to encourage composting at the community level, particularly in the parks.
- ✓ The schemes of recycling and composting through segregation are quite relevant and useful for Indian cities. Recycling in India is viable because it is market oriented and cost of labour involved in various activities is very low.
- ✓ Even after implementing policies for maximum reduction of waste through composting and recycling, there would be a huge residue of waste needing disposal. There is urgent need for building engineered landfills for long term use. Private entrepreneurs can also be brought in this regard.

tonnes in 2000. By 2025 it is estimated that cities would generate five times the waste they generate today.

Given these realities, one of the major concerns for city governments worldwide is waste management in a way that protects the environment and human health. Municipal solid waste management activities have a potential to cause air, water, land and noise pollution, thus creating health hazards for citizens. Yet the issue of solid waste management, especially in the developing world, has remained neglected for the past several decades.

Indian Reality

INDIA'S rapidly growing cities and towns on an average generate about 80,000 metric tonnes of solid waste every day. That is a humongous 25 million tonnes annually. Like most other developing countries, in India, too, solid waste management has remained a low priority area in terms of policy formulation and implementation.

However, many governments have begun to develop comprehensive framework for waste management. Cities like Toronto in Canada have seen new initiatives formulated and implemented based on appropriate technical solutions and new forms of partnership between government agencies, user communities and private sector enterprises.

In India it is the capital New Delhi that has the distinction of introducing new methods of solid waste management. It is perhaps only appropriate since Delhi has the dubi-



ous distinction of being one of the highest waste generating cities in India. This research study chose Delhi to explore the issue of solid waste management, focusing its study on the municipal area of the city.

The town of Silchar in the eastern state of Assam was also chosen as a counterbalance to study the waste management techniques in a developing town. Silchar is the second largest city in the state of Assam. The municipal area of Silchar comprises 15.75 sq km with a population of 142,393 (2001 census).

The study also sought to understand if a waste management plan could be drawn up, especially for Delhi, which goes beyond landfills to a future where recycle, reuse or compost solid waste are the main pillars of solid waste management. The research was mainly supported by an extensive survey of 1,740

respondents in Delhi and 300 respondents in Silchar.

Waste Management in Delhi

DELHI generates 6,000 metric tonnes of solid waste every day. The generation rate is about 500 gm per person per day, which is almost 5 times the national average. The garbage generation is likely to increase to 18,000 metric tonnes per year by 2021. The main waste generated in Delhi is from the markets for agricultural products, retail and commercial markets, hospital and nursing homes, slaughterhouses, industries and construction and demolition activities.

The task for solid waste management in Delhi is vested with three nodal agencies: Municipal Corporation of Delhi (MCD), New Delhi Municipal Committee (NDMC) and the Cantonment Board (CB). The Conservancy and Sanitation Engineering (CSE) Department of the MCD is responsible for solid waste management within the jurisdiction of the MCD including rural and urban villages, slum clusters, regularised (previously) unauthorised colonies, roads, streets and public conveniences.

NDMC carries out sanitation operations including primary collection, transportation and disposal of municipal solid waste in the centrally administered areas of the city. The CB looks after the areas of Delhi



Cantonment. MCD, NDMC and CB are helped by various agents in the private sector such as private sweepers and garbage collectors employed by residents to clean private premises, rag pickers, junk dealers and industries that use scrap to produce recycled products.

However there are virtually no arrangements for waste management in squatter settlements, slums and illegal colonies, which comprise around 50% of the urban population in Delhi. As a result, waste is also littered in open spaces and drains.

Solid waste management in Delhi is mainly based on the disposal of the waste through the three operational landfills located at Bhalswa (north), Okhla (south) and Gazipur (east). The total waste deposited in the landfills is estimated at 3.95 million cubic metres. Composting is a preferred method and for conversion of biodegradable components of solid waste, the MCD has set up anaerobic, semi-mechanical compost plant near Okhla in 1980.

Recycling of solid waste is a widely prevalent activity in Delhi, though it is generally done in a dirty and unhygienic manner. Treatment of waste using incineration technology was used by the Delhi state, at 3.7 MW capacity plant in Timarpur in 1989, yet operation had to be discontinued within a short time due to the low calorific value of the waste received at the plant. The solid waste management costs the MCD Rs. 3.9 billion per annum. Yet the system remains inefficient and as the survey shows, majority of citizens are not satisfied with the services provided by local urban bodies.

Delhi municipal authorities have come up with a new set of initiatives for waste segregation, composting, incineration, power generation, engineered landfills, sanitary liners, leachate collection and treatment and disposal system. There was also more involvement of the private sector in collection and transportation of solid wastes.

To assess the merits of these measures, the project team conducted a household survey with the help of an interview schedule in Delhi

NOT WASTING AWAY

A CITY like Toronto has a lot of lessons for India. The City Council of Toronto faced a severe problem managing about 920,000 metric tonnes (almost one tonne per household) of waste per year. Of this, 76% was disposed in landfills and the rest was either recycled or composted. Since there was no approved landfill site in Toronto, the solid waste was transported to the state of Michigan in the US, 700 km away.

To find a solution to this, the Council on January 29, 2001 created the Waste Diversion Task Force 2010. The Task Force presented a report entitled 'Beyond Landfill: A Diverting Future' in June 2001. The report outlined 47 steps that the city and people of Toronto could take to better



manage waste. It outlined a new 'three-stream' system to divert 60% of Toronto's household solid resources from landfill to composting and recycling by the end of 2006. In 2000, 27% of solid waste was being diverted.

The first target, a commitment that by the end of 2003 the city would reduce and divert the waste it sends to the Michigan landfill by 30%, was overachieved.

Encouraged by the success the Council in May 2004 submitted another report entitled 'Getting to 60% Diversion and Beyond', which it is slated to achieve by 2006.

and Silchar regarding the nature and extension of residential waste. The survey recorded the perception of residents regarding the prevalent waste collection and transportation system. Data on public opinion about the role of civic authorities, NGOs and other concerned organisations were also gathered.

According to the survey, the contents of the biodegradable waste appear to be high (38.6%) followed by very high contents of inert waste (34.7%) mainly consisting of street sweeping and construction waste.

In Silchar the amount of waste generated is around 75 metric tonnes per day. The major category of waste generated here is food wastes (93.7%). This is followed by rags, plastic, paper, garden waste, glass, metal, wood pesticide etc.

The Bhagidari System

A SPECIFIC study was made of the Bhagidari system of community involvement introduced in Delhi. The Bhagidari concept envisages mobilisation of government-public-business partnership and was launched in the area of waste management in Delhi in 2003.

The survey showed some disappointing results as far as the Bhagidari system is concerned. It emerged that only about 46% of the citizens are aware of Bhagidari system. This awareness is higher among high-income groups and those who are educated (graduate and above).

The survey pinpointed the shortcomings of the Bhagidari system, which had been launched with so much fanfare. The system present-

The Shastri Applied Research Project seeks to address urgent issues in social development and health, economic reform and environmental management. Canadian and Indian researchers are collaborating on 19 studies on various topics. SHARP is implemented by the Shastri Indo-Canadian Institute and funded by the Canadian International Development Agency.

RESEARCH TEAM

Indira Gandhi National Open University, New Delhi, India
A S NARANG
(Principal Investigator)
SUNIL SONDHI
CHANDRA MOHAN
AMRIT KAUR BASANA
SANJAY K AGRAWAL
DIPANJAN SAHA

Ryerson University, Toronto, Canada
M A WARITH
(Co-Investigator)
LETA FERNANDES
ENTEHABU BARHE
RODRIGO DIAZ
G METTI
M MAQSUD

For further details

visit: www.sici.org

email:

amrjitnarang@hotmail.com

mwarith@ryerson.ca

Written by Vijayalakshmi Ekkanath. Edited & Produced by Soumya Sarkar. Design by Rupak Goswami. Co-ordination by Kaberi Nandy and Indranil Mukhopadhyay.

Published by
SICI INDIA OFFICE
5 Bhai Vir Singh Marg,
New Delhi 110 001, India.



ly covers only the resident welfare associations (RWAs) and traders associations, leaving out a large section of the population of Delhi who live in shantytowns or in unauthorised colonies and on pavements. In Silchar, too, the research team found a similar problem being posed by the large groups of migrant population who come into the city from adjoining areas every day.

Secondly, this system does not have a constitutional basis. The Bhagidari scheme has given responsibilities and powers to the RWAs who in some cases are using it to cater to their activities. For example, in the Vasant Kunj area of Delhi, 35 bore wells have been dug in the name of Bhagidari. The research team also found that this system was serving to mask government inefficiency.

The system also lacks proper follow up. The Bhagidari meetings between government officials and RWA representatives are organised occasionally as large interactive sessions. After the meetings, there is little follow up either by the participants or the authorities. This does not lead to developing a civic sense in the citizens. Many resident welfare association office bearers say that their complaints are just filed away and forgotten.

Segregation of Waste

THE survey also sought to understand the public acceptance and understanding of the concept of segregation of waste. It was found that only 34.5% know about this,

while only an insignificant percentage (10.9%) of the waste collectors practice separation or segregation of garbage.

It may be mentioned here that the Supreme Court of India in some public interest litigation had issued directives to take effective steps to manage solid waste. It had also given January 2004 as the deadline for ensuring segregation of dry and wet waste from residents. The Delhi Government and MCD



have jointly initiated the process of source segregation from that day.

The public response to it has been insignificant. Citizens, however, are willing to segregate garbage, provided the civic authorities provide separate bins and make arrangements for easy collection. A significant section of citizens is prepared to pay more for the safe disposal of the solid waste though this is more so in case of higher income and middle income group localities.



SHARP *Results*

MARCH 2006

ENVIRONMENTAL MANAGEMENT



A VAILABILITY of water for an ever-increasing population and the projected gap between demand and supply of drinking water is a major concern for planners and policy-makers today. Water management has become a major component in any country's economic mapping, especially in the developing countries with their large populations and less than ideal infrastructures. With the world's second largest population, India, too, faces similar problems. Among many suggestions to meet the growing need for water in the country is to re-examine available water resources and their potential.

For example, in the state of Uttaranchal, which lies in the Western Himalayas, over 30% of rural habitation receives less than the Government of India's (GOI) prescribed basic service level of 40 litres per capita daily (lpcd). Paucity of water is common in many hilly regions of India, as in Uttaranchal. Villagers in this region, mainly women and children, have to spend more than five hours a day collecting water for domestic consumption.

This project studied the envi-

Environmental Impact Assessment of Community Based Water Resource Management Projects in Uttaranchal

RECOMMENDATIONS

Community

✓ The quantified information base for available resources such as water can prove to be a powerful tool for ensuring full community involvement in the planning and use of natural resources. Although the community is fully aware of the factors that cause their problems, they lack information on spatial and temporal availability of water resources. Providing them with relevant information will strengthen the community's collective wisdom and interest towards the proper management of water resources for their own benefit.

Programme Providers and Planners

✓ The development strategy should, therefore, follow a watershed approach, which ensures sustainable utilisation of natural resources of water, land, vegetation and livestock. The information base on available water resources also ensures willingness of the people to take informed decisions and draw exigency plans during the situations of drought or excessive environmental degradation.

Policy

For an effective implementation of the water policy:

✓ A database on quantification of water availability and characterisation of water sources, vital

for rural livelihood, should be considered as a national asset. This information should be compiled in the manner of other statistics such as population, land, crops and animal resources.

✓ Any watershed area should also be a part of the overall development plan for the block or mandal in a district. It should be ensured that there is no duplication of funds in the watershed area. This area development approach must also ensure that environmental security, so essential to bring about sustainable economic development, is progressively promoted.

✓ The Water User's Association, like the Village Water and Sanitation Committee, should be made an autonomous sub-committee of the Gram Panchayat (village self-governing bodies) so that utility of development programmes could be optimised. Also, all the institutions in the village need to be integrated for systematic implementation of the development programmes.

✓ The cost-sharing arrangement should be an essential and integral component of the development programmes so that the beneficiaries may own them and maintain them efficiently during the withdrawal phase. The cost sharing may be rationalised and enforced based on the direct benefits derived by the users, taking into account their paying capacity.

ronmental impact assessment (EIA) of community based water resource management projects in Uttarakhand. The study highlighted the problem of water shortage vis-à-vis technical, social and environmental dimensions. The team also found that a hydrologic analysis covering both the supply and demand factors is essential for planning and decision-making.

The present system for rural water supply in Uttarakhand is mainly supply driven. Drinking water systems are installed by the Uttar Pradesh Jal Nigam and are maintained by organisations called Jal Sansthan (water institutions). The involvement of the beneficiaries in either the installation or the management of these systems is minimal. As regards drinking water, lack of accountability of service providers to the users has resulted in poor design, substandard construction and costly service delivery.

Single Sector Approach

THE project adopted a single-sector approach and studied rural water supply. The main objectives of the study were:

- To quantify hydrological behaviour and availability of water from commonly used water sources in rural areas.
- To identify environmental factors that may govern the sustainable use of water resources and their relevance to existing and improved technologies of water extraction.
- To develop an information base on water resources development strategies in the hill region.
- To identify socio-economic and legislative factors that may govern the community participation in the management of water resources.

The findings of the project would help generate technically feasible and socially acceptable plans for community based water resources development schemes. The approach adhered to was EIA norm that examined, in a holistic manner, aspects including economic, ecological and sociological effects of the developmental schemes on water resources.

Project Area

THE team selected nine watersheds in Tehri Garhwal, Dehradun, Almora and Nainital districts. It conducted household surveys to collect primary data on water resources and socio-economic status of the watersheds. Geo-morphological and socio-economic characterisation of the watersheds was carried out by employing GIS.

The information was generated under the following categories:

- **Water availability:** For the sources which have the potential use for rural populations. It was not in the scope of this project to account for all terrestrial water available in the region.
- **Water Demands:** For domestic, animals and agricultural use.
- **Institutional and governance issues.**



Denuded slopes aggravate water scarcity

Findings

TO ensure an adequate supply of water throughout the year in Uttarakhand, management of natural water sources on a small-scale and community basis is the only viable option. For that, an information base is required which can help proper planning and development of informed decision-making process. The project thus concentrated on building an information base.

The Uttarakhand government has implemented a large-scale water supply scheme in rural areas of Kumaon and Garhwal hills under the Swajal project. Since 1996, 857 villages have been covered in four phases. Although most of the rural population and habitations have come under the umbrella of a drink-

ing water scheme, their efficacy leaves much to be desired.

The official data shows that state agencies have succeeded in laying a network of rural water supply schemes covering almost all the habitations in Uttarakhand. But the crucial question is whether it is able to provide a minimum of 40 lpcd of safe water every day. The Tenth Plan (2002-2007) document highlights the fact that coverage data hide more than what they reveal. The issues that interest common citizens and policy makers are the amount of water supply, its regularity, seasonal variation, potability and cost. Hence, there is a need for reviewing the issues related to management of water resource and water supply for domestic as well as

agricultural use in the water policy.

The project examined villages where community drinking water supply schemes have been implemented through the Swajal project. The main endeavour was not to evaluate the performance of schemes installed under the project, but to develop an information base for decision-making.

As a case study, the current water utilisation pattern in the Tehri district was assessed based on the quantity of water being used from different types of water sources. The water sources were grouped into man-made (deep and shallow hand pumps, surface water and tube well power pumps) and natural (infiltration gallery, infiltration wells, water springs and traditional sources) sys-

tems based on the skills required in their installation, cost of operation and maintenance and system's proximity to natural and social settings. It was found that more than 86% of the water demand of human population is met by natural resources, 8% by power pumps and the rest by hand pumps.

Data on defunct systems indicated that more than 99% of defunct services are under natural system category. Although natural resources serve the majority of the population and their water demand, they are the most mis-managed systems.

Stakeholders' Views

PRIMARY data collected from the watershed indicated that local stakeholders identified reduced or insufficient water availability during the dry season as a serious problem. They expressed concern about the negative effects of certain land use changes (in particular, deforestation) and lack of adequate soil and water conservation techniques on the hydrological response of the watershed.

They were also concerned about the consequences of decreasing water yield and unregulated water extraction on water availability. Local farmers argued that stream flow has generally become less predictable and that higher peak flows occur. This also increases the risk of flooding of riverbanks, erosion, crop losses and possible damage to the landscape due to landslides. Most water problems occur in the upper

CAUSES FOR DYSFUNCTIONAL WATER SCHEMES

The causes of water schemes not working properly are a mix of natural and human factors including:

- Declining trend of water availability at the source due to land degradation and deforestation
- Non-involvement of local community
- No specific mechanism for operation and maintenance of schemes by government agencies
- Non-availability of local services and lack of technical know-how for maintenance initiatives by local people or Gram Sabhas (village councils)

A choked stream



and middle parts of the watershed.

It is, therefore, important to provide quantitative information about the state of water resources, and how demand and supply of water resources could change over space and time as a result of changes in land use, population growth and demographic shifts within the watershed. One way to provide such information is through scenario analysis. Various scenarios were considered

for assessing the water situation in the watershed.

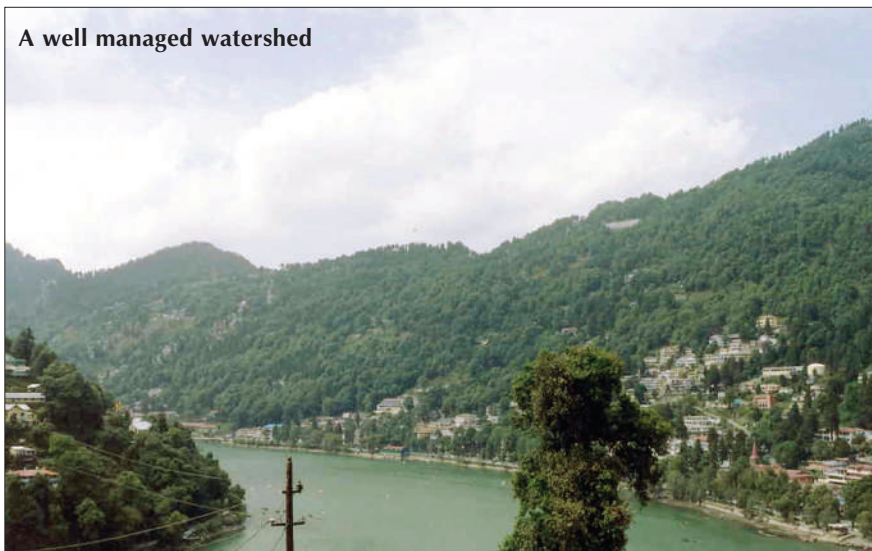
In the *existing scenario* (year 2005), the economy and land use are closest to the present situation. Small-scale subsistence farming remains the major activity. In the *environmental watershed scenario* (year 2025), it is assumed that regional authorities and local communities have a strong mandate to conserve forest and water resources, regulate stream flows and avoid destructive agricultural practices.

The *degraded watershed scenario* (year 2025) describes a bleak future dominated by large-scale deforestation and land degradation. The *low intensity drought scenario* is where the rainfall is below 20% of normal rainfall. The *moderate intensity drought scenario* is where the rainfall is below 40% of normal rainfall. The *severe intensity drought scenario* is where the rainfall is below 60% of normal rainfall. However, no change in daily distribution of rainfall was considered in three drought scenarios.

The project's framework for characterising water availability and assessing water security was planned in such a way as to assess various aspects following a five-step approach:

- Identifying appropriate measures of water availability and indicators of water security where local stakeholders indicate what issues are important to them.
- Quantification of relevant watershed characteristics and potential factors of changes in water supply and demand for the present and different paths of development.
- Simulation of water supply and water use in the watershed using the hydrologic water budget model and artificial intelligence techniques.
- Analysis and discussion of simulation results with stakeholders from various organisational levels.
- Support water resources negotiations and formulate implications for policymaking and local communities that would help develop rules and norms for water use, initiate water conservation activities, identify better

A well managed watershed



The Shastri Applied Research Project seeks to address urgent issues in social development and health, economic reform and environmental management. Canadian and Indian researchers are collaborating on 19 studies on various topics. SHARP is implemented by the Shastri Indo-Canadian Institute and funded by the Canadian International Development Agency.

RESEARCH TEAM

Central Soil and Water
Conservation Research and
Training Institute, Dehradun,
India

VISHWANATH SHARDA
(Principal Investigator)
P R OJASVI
P DOGRA
VIMAL KUMAR

Department of Bioresource
Engineering, McGill University,
Montreal, Canada
SHIV PRASHER
(Co-Investigator)
R M PATEL

For further details

visit: www.sici.org

email: vnsharda1@rediffmail.com

shiv.prasher@mcgill.ca

Written by **Vijayalakshmi Ekkanath**. Edited & Produced by
Soumya Sarkar. Design by **Rupak Goswami**. Co-ordina-
tion by **Kaberi Nandy and Indranil Mukhopadhyay**.

Published by
SICI INDIA OFFICE
5 Bhai Vir Singh Marg,
New Delhi 110 001, India.

water allocation techniques, and formulate specific needs for community participation.

Study Results

THE research methodology in this project was applied to the mid-Himalayan Dagar Daunr Watershed situated in Tehri district of Uttaranchal. Scenarios based on the present situation and future projections for 2025 and 2050 were also analysed. The spring flow and stream flows, before water use under various scenarios were quantified through simulation using the watershed-scale water balance model.

Percent increase or decrease in water availability during different times of the year due to land-use changes and under the deficit rainfall conditions during low, moderate

a finite resource that needs to be judiciously and optimally used taking into consideration the future projected demands from different sectors.

The scope of the project does not end with its wrapping-up. The findings and recommendations have the potential to enhance the planning process on water resource management of the region.

Keeping in view the recommendations of the National Water Policy 2002, the Uttaranchal government has taken the initiative to frame a State Water Policy. The project heads had facilitated direct communication with the policy makers and assessment of needs of the government, the people and the developmental agencies at the beginning of the project. The findings of the project can also be used

Water collection tank



and severe droughts were quantified. The water utilisation plans of the watershed, considering the environmental human, livestock, agricultural, and other demands were decided using the optimisation techniques for developing sound water management strategies. The water allocation can be prioritised and resources use can be maximised with such an approach while ensuring environmental security.

The analysis clearly showed that in the case of Dagar, the water scarcity is critical as within a few years, the population is going to face a water crisis in the critical third and fourth quarters of the year. In the case of Daunr, the situation is better off than Dagar but it is clear that water is

for capacity building of field functionaries and farmers through training programmes.

The methodology can be further refined to make it more compatible to the local environmental, socio-economic and policy conditions prevailing in different agro-ecological regions of the country.

However, technical information alone does not ensure proper management of natural resources. Socio-economic factors and political will also govern the success of community-based development activities, especially in the cases where conflicts, resource sharing, inter-basin transfer and upstream-downstream interactions are to be addressed. ■■



SHARP *Results*

MARCH 2006

ENVIRONMENTAL MANAGEMENT

Livestock and Environment Sustainability: Experience of the Indian Punjab

PUNJAB is one of the richest states in India, having experienced the highest rates of economic growth in the country until recently. Agriculture in the State has experienced phenomenal growth since the introduction of the Green Revolution in the mid 1960s. However, Punjab's economic growth rate has started decelerating, mainly due to the declining rates of agricultural production (from 5.0% per annum in the 1980s to 2.5% per annum in the 1990s), partly because of deteriorating environmental conditions.

The Punjab government has taken a series of policy initiatives to diversify the economy, particularly by encouraging dairy farming on the recommendations of the Johl Committee Report. As a result, Punjab ushered in the White Revolution, recording the highest per capita availability of milk in India under Operation Flood. In 2002-2003, Punjab produced 890 gm of milk per capita per day compared to the Indian average of 226 gm. Animal husbandry is already the second most important income and employment generating activity in rural Punjab, accounting for 14.25% of state income in 2003-04.

It is feared that Punjab's new livestock policy, like the Green Revolution, is likely to result in serious environmental degradation. The livestock policy needs to be seriously re-examined and redesigned to make it a win-win policy. Failing to do so could push Punjab into an acute environmental crisis. This present



Congested shed

project was conceived in this context. As dairy cattle constitute 93% of total livestock population in Punjab, the project focused on dairy farming and environmental sustainability.

The project was undertaken with a view to identifying the existing linkages between dairy farming and environment sustainability in Punjab and to suggest recasting of dairy farming policy aimed at promoting an economically efficient and environmentally sustainable dairy farming system in the state.

Methodology

THE study is based on both primary and secondary data. The sources of secondary data include reports of central, state and local governments; reports of national and international agencies; published literature; and the Internet. The project used quantitative and qualitative approaches to collect

primary data. The first included structured questionnaires, interviews and observations while the second included informal interviews, oral history and participatory workshops.

The project administered a structured questionnaire to 90 dairy farmers (32 urban, 38 rural, 20 women dairy farmers from self-help groups) followed by a participatory approach in collecting data. The project organised two participatory workshops for inputs on dairy farming practices. Dairy farmers as well as government officials attended the workshops. It also organised participatory workshops to validate findings by stakeholders. Finally, it held a round table dissemination conference in New Delhi with representations from the government, media and academics. More than 100 (66 men and 41 women) participants, including policymakers and influencers partici-



pated in formal and informal workshops and project meetings.

The research team also interacted with officials of the Department of Animal Husbandry, Government of Punjab; officials of Development Blocks in the study area; bank managers; the Federation of Cooperative Societies of Dairy Farmers (MILK-FED), and media.

Notable Findings

■ Environment: Nobody's Concern

THE major stakeholders and policy influencers in dairy farming comprise commercial dairy farmers, women self-help groups (SHGs), civil society organisations, and media. It was found that none of them addressed environmental issues. Environmental issues have, by and large, not been perceived to be a cause for concern by any of the stakeholders. However, small dairy farmers from self-help groups showed some concerns for environmental resources. This was mainly because of their dependence on natural water bodies, grazing and wild green fodder. While the media has occasionally drawn attention to the issue looming large on the horizon, there has been no systematic endeavour to tackle it.

Dairy farming has been found to have far reaching impacts on ecosystem services. These include: pond water contamination due to drainage of animal waste, residuals and chemical and medicine containers in ponds; ground water depletion due to excessive withdrawal to irrigate green fodder, water and bathe animals, and flush out animal waste from sheds. This

has contributed to a lowering of the water table over the years.

Cow dung and other animal wastes provide a breeding ground for harmful insects like houseflies, mosquitoes, maggots, etc. Soil quality has also deteriorated mainly because of indiscriminate use of chemical fertilisers and pesticides to produce fodder and other crops. Emission of harmful gases from animal waste, burning of cow dung cakes and diesel fumes from generators on the farmstead contributes to air pollution. Excessive use of pesticides, chemicals and medicines has led to loss of biodiversity. Certain species of plant and animal life have been severely affected.

■ Health and Hygiene

BARRING a few farmhouses, the study found the animal sheds to be very congested and extremely unsanitary. The congestion in sheds results in the spread of infectious diseases, suffocation and a build-up of animal odour and moisture that results in irritation to the lungs, pneumonia and, in some cases, death among animals.

The use of medicines was also found to be alarming. Most of the dairy farmers administer the medicines themselves, including antibiotics and hormones (Schedule H drugs) like Oxytocin for stimulating lactation. According to veterinary doctors, self-medication threatens the

health of the animals and humans in various ways. Oxytocin, for example, adversely affects conception and increases the chances of miscarriage among the animals. There is also excessive use of medicines in such cases. Accumulation of residuals of medicines like diclophenac sodium in dairy cattle is so high that the vultures that feed on their carcasses are nearing extinction in Punjab and adjoining areas.

The study also found the ill effects of excessive use of chemical fertilisers, pesticides and slurry for green fodder. Most farmers agree that the consumption of fertilisers per acre has increased over time to get the same or a higher yield of fodder. More than half the respondents opined that chemicals (fertilisers and pesticides) affect the quality of milk, besides affecting health of the cattle and the workers. It was reported that animals, particularly buffaloes, fed on sprayed fodder suffer fevers. The animals also suffer from delayed conception, miscarriage and abortions.

Experts suggest that green fodder should not be used for at least a week after the spraying of chemical fertilisers, pesticides and excessive use of slurry. Farmers normally do not adhere to this norm; animal deaths resulting from nitrate poisoning caused by excessive use of urea and slurry have been reported. The survey showed poor adherence to safety norms by farmers and workers while using chemical fertilisers and pesticides. Hardly anybody read the instructions on the containers.

■ Adulterated Feed

IT was reported that the readymade feed purchased from the market was adulterated with limestone, urea and salt mixed with cardboard, straw, crushed stone, etc. More than 50% of the feed samples tested by the Punjab Dairy Development Department found limestone powder and urea above permissible levels. Excessive use of these components causes fat dissolution in cattle, which results in increased milk yield for a short while and makes farmers believe that the feed is very effective. But in the long



RESULTS AND RECOMMENDATIONS			
Impact	Sources	Implications	Recommendations
Contaminated pond water	Animal waste, medicine and chemical residue	Loss of biodiversity; water unfit for drinking and bathing	Cleaning pond water through low-cost options like Duckweed-cum-Pisciculture Technology
Depletion of groundwater	Excessive withdrawal of underground water for irrigation (fodder), drinking, bathing of animals and flushing	Alarming fall of water table, rise in cost of groundwater for small and marginal dairy farmers	Promoting rainwater harvesting and drip irrigation, withdrawing free electricity to the farm sector including dairy farms
Soil degradation	Excessive use of chemical fertilisers, pesticides, excessive cutting of wild grass, etc.	Increased use of chemical fertilisers to get same yields	Promoting balanced use of organic fertilisers, rational use of chemical inputs, encouraging cultivation of organic fodder by government
Air pollution	Emission of harmful gases from cow dung and other animal waste; excessive use of diesel for generators; burning of cow dung cakes	Effect on human health (nausea; headache; eye, nose and throat irritation; lung diseases; and skin allergies)	Encouraging proper cow dung and other animal waste management practices (like biogas plants)
Breeding ground for harmful insects	Disposal of cow dung and other waste in the open or along water bodies or pits adjacent to animal sheds	Spread of deadly gastrointestinal and other diseases like diarrhoea, cholera, malaria, dengue	Providing incentives to set up biogas plants among groups of dairy farmers
Animal health	Excessive use of medicines, particularly through self-prescription; feeding chemically infected green fodder; unsanitary conditions in sheds	Reduced chances of conception; increase in miscarriages and abortion; death of animals; residuals adversely affecting eco-system	Training and education on healthcare and sanitary practices in sheds
Human health	Consuming milk containing chemical and medical residues; infection from animals while handling	Increased incidence of diseases; fertility related problems for women	Provision of economical milk testing facilities; vigilant and strict regulatory regime against adulterated milk

run, animals are often rendered infertile and there is a decrease in the lactation period apart from reducing the life span of the animals.

Reports suggest that milk coming from commercial dairies contains residues of urea, pesticides, sodium bicarbonate, formalin, ammonia, hydrogen peroxide, starch, water and salt neutraliser, and edible cream. Doctors opine that some of these residuals have disastrous effects on human health in the long run.

■ Relocation of Dairy Farmers

THE study found that relocation of urban dairy farms resulting from increasing urban sprawl is likely to gain momentum. In one of the participatory workshops, dairy farmers

were open to the idea of relocating provided they were allotted land at a concessional rate and provided quality infrastructure and other facilities. However, the experience of Jalandhar, where more than 100 dairy farms have been relocated to one agglomeration outside city limits, is a total environmental disaster. Observation and interaction with the dairy farmers showed the consequences of a poorly designed relocation policy, including no sewerage system, bad roads, poor supply of water and electricity, lack of space, and no common space for cow dung collection and garbage dumping.

The dairy farmers dump cow dung and other animal waste on the

side of a rivulet where the water has turned black and is of no use except in spreading its ill effects in the neighbourhood. The rivulet's contaminated water is being used to irrigate the adjoining fields. It is opined that vegetables grown here contain chemical residues that are extremely harmful to human health.

■ Benefits of Dairy Farming

THE most important positive impact of dairy farming on environment is the use of cow dung manure for crops. This organic manure not only maintains fertility of the soil but also enhances it. In some cases it was found that cow dung and other liquid waste of animals is used for the production of biogas.

The Shastri Applied Research Project seeks to address urgent issues in social development and health, economic reform and environmental management. Canadian and Indian researchers are collaborating on 19 studies on various topics. SHARP is implemented by the Shastri Indo-Canadian Institute and funded by the Canadian International Development Agency.

RESEARCH TEAM

Panjab University
B S GHUMAN
(Principal Investigator)
DHIAN KAUR
RAMANJIT KAUR JOHAL
RAJNEET KAUR
BHAWNA GUPTA
GURPINDER CHIMA

International Institute for
Sustainable Development,
Winnipeg, Canada
ANANTHA DURAIAPPAH
(Co-Investigator)
JO-ELLEN PARRY
PUMULO RODDY

For further details

visit: www.sici.org

email: ghumanbs@pu.ac.in

akduraiappah@iisd.ca

Written, Edited & Produced by **Soumya Sarkar**.
Design by **Rupak Goswami**. Co-ordination by **Kaberi Nandy** and **Indranil Mukhopadhyay**.

Published by
SICI INDIA OFFICE
5 Bhai Vir Singh Marg,
New Delhi 110 001, India.



Polluted Stream

Recommendations

THE negative externalities of dairy farming affect the community at large and hence a proactive role of the community becomes absolutely imperative. The community, in partnership with researchers, government officials, NGOs and media, should sensitise dairy farmers about the harmful effects on soil, underground water and air; contamination of village ponds; excessive withdrawal of underground water for irrigation; over-use of chemical fertilisers and pesticides and dumping of cow dung and other animal waste in the open or alongside water bodies.

The training programmes conducted by the Animal Husbandry Department need to educate dairy farmers about the environmental dimensions of dairy farming. Local elected bodies such as the Gram Panchayat (village councils) and municipal bodies should allocate some funds for cleaning drains carrying liquid animal waste and contaminated village ponds. A part of the funds can be raised by imposing taxes on rich dairy farmers (who are also high polluters).

Licensing and inspection authorities also must ensure adherence of standard norms (space, fans, lights, ventilators, etc.) in the animal sheds. Farmers should be advised against self-medication, particularly oxytocin and diclophenac sodium medicines,

during training programmes. A regular weekly visit by a veterinary doctor to the livestock units will help in reducing the practice of self-medication. With a view to checking adulteration of feed, all animal feed manufacturing units in the state should be registered. It is also suggested that more cattle feed units be set up in the co-operative sector.

The study also strongly recommends that livestock policy, and dairy farming policy in particular, must address environmental issues for making dairy farming a sustainable and viable alternative to crop husbandry in the state. SHGs should be encouraged to further strengthen their environment-friendly practices by being granted an additional subsidy exclusively for the purpose of conservation of environmental resources.

The study also recommends that the government should systematically design relocation plans ensuring proper sewerage systems, good roads, adequate water and power supply, milk chilling centres, biogas plants, management and discharge of slurry, and vermi-composting facilities.

Other recommendations of the study include identification and replication of best practices, and identification and penalisation of high polluters. It also suggests that the unholy nexus between officials and high polluters needs to be identified and broken. ■



SHARP *Results*

MARCH 2006

ENVIRONMENTAL MANAGEMENT

WATER is the biggest problem facing India today. Parched earth, failed monsoons, plunging water tables, soaring thirst and frayed tempers: the crisis mounts each year in both rural and urban India. Rapid population growth, urbanisation and industrialisation result in a greater demand for an increasingly shrinking supply of water resources. It is estimated that lives and livelihoods of one third of the country's population are at a high risk as several parts of the country are water deficit.

Rivers sustain both human population and natural biodiversity. They are dynamic ecosystems influenced by hydrological and biological processes. Human interventions have led to a significant degradation of our rivers over a period of time. The Yamuna River, lifeline of India's Capital, is dubbed as the country's

Managing Water Resources: Socio-Economic and Policy Implications of Restoration in the Yamuna River Basin



most degraded river. It arises from Yamunotri glacier (at 6,320 m) in Uttarkashi district of Uttaranchal. About 100 km downstream, at Dak Patthar, it is joined by its largest tributary, the Tons River, which also has most of its watershed in Uttarkashi district. Along most of its length, the Tons forms the boundary between Uttaranchal and Himachal Pradesh.

Yamuna then flows southwards to Delhi and on its way forms the border between Uttar Pradesh and Haryana until it enters Delhi. A few km downstream of Dak Patthar, at Hatnikund (earlier at Tajewala), practically all of the river flow is diverted into the Eastern and the Western Yamuna Canals for irrigation in the states of Haryana and Uttar Pradesh.

RECOMMENDATIONS

Community

✓ On the floodplain of Yamuna, agriculture based on excessive use of groundwater, agrochemicals and organic manures, is NOT sustainable. The revival of earlier water bodies along with creation of new water bodies to 'harvest' floodwaters during the monsoon, and the accompanying change in land use from agriculture to semi-intensive aquaculture and pasture land are expected to bring greater economic returns per unit of land area.

✓ In the mountainous areas of the Tons River upper watershed, intensive grazing is NOT sustain-

able and all efforts must be made to reduce the number of grazing animals. Once lands that are currently degraded are restored and identified as being suitable for grazing, communities will have to take an active role in regulating access to those sites so that grazing that provides sustainable incomes can be ensured.

Programme Providers and Planners

✓ Habitat restoration should be accorded high priority. The restoration efforts should consider the economic dislocation and loss of livelihood for communities that have been dependent on the

use of riparian resources.

Appropriate compensation should be provided to affected people and local communities should be involved in planning and implementation of restoration projects.

Policy

✓ Restoration of river habitats provides opportunities for poverty reduction and generation of more valuable resources. Measures for mitigating immediate and short-term adverse socio-economic impacts of river restoration must therefore be integrated within the policies of all concerned departments.

The increasing anthropogenic pressure (deforestation, agriculture and grazing) in the upper catchments and the lack of flow in the river downstream coupled with intensive agriculture on the floodplain and even the riverbed, have resulted in a high level of degradation of the riparian habitats and water quality, and loss of natural biodiversity. These changes call for an ecological restoration of both the catchments and floodplains.

While the proposals for restoration of River Yamuna are under consideration by the Ministry of Environment and Forests, there arise issues of the likely socio-economic implications of any such effort because sizeable populations of local communities are currently dependent upon the floodplains and catchments for their livelihood.

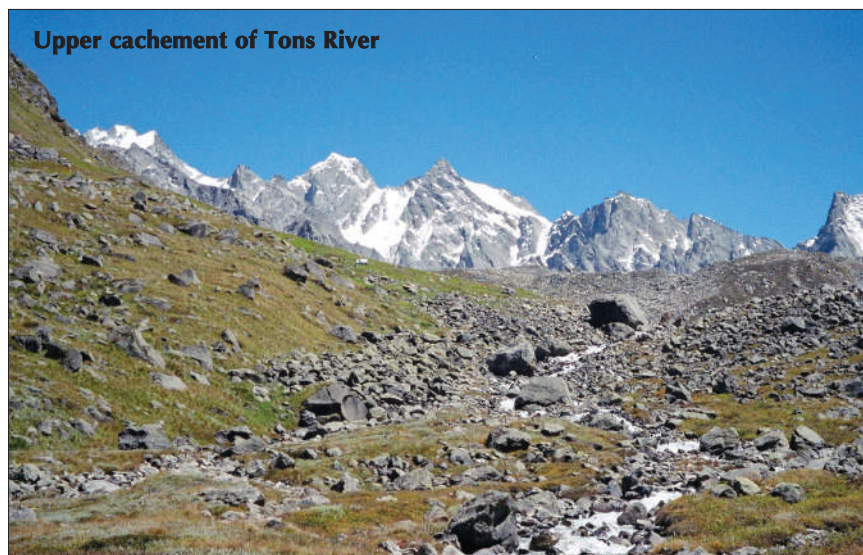
The purpose of the projects was to influence the direction that river restoration will take. The project provided an opportunity to collect more data and information to support and strengthen the Ministry's resolve and efforts. Among its objectives were to suggest alternatives and mitigation strategies to compensate the loss of incomes and livelihoods and to ensure equity and sustainability.

Notable Findings

THE Tons watershed covers about 2,500 sq km, of which more than one third at the higher elevations is designated as the Govind Pashu Vihar (wildlife sanctuary). This is also one of the worst affected areas. The terrain is highly rugged and mountainous, widely intersected by rivers, streams and seasonal rivulets. Whereas higher elevations of the sanctuary are perpetually snow covered, the lower elevations support a variety of vegetation including medicinal plants and are also rich in wildlife.

The area is under intense human pressure with most local communities depending heavily on natural resources. As a result, the threat of deforestation, forest fires, intensive terrace farming, herb gathering, overgrazing, poaching, and construction activity is growing rapidly.

Although socio-economic



and scientific information is scarce, it is evident that the watershed is highly degraded due to overexploitation of resources. Grazing by cattle, sheep and goats is intensive. Steepness of the hill slopes promotes erosion and landslides and makes natural regeneration very difficult. Increasingly high silt load in the river has also been a matter of serious concern.

The project team conducted two 3-week surveys, in September 2004 and September 2005, within the Govind Pashu Vihar. The survey teams trekked the route from Naitwar to Har-ki-Dun in 2004 and interviewed villagers along the trek. During 2005, the survey was extended to Ruinsara beyond Har-ki-Dun and to Jhakhol and Dhara that are approached by trekking westwards from Sankri into the valley of Supingad.

The team's survey in eight major villages showed a significant growth in population since the 2001 Census. With low literacy levels and poor healthcare, agriculture and animal husbandry remain the main occupations. Cultivation occurs up to 3,000 m in Har-ki-Dun valley with little increase in agricultural land over time given the difficult climate, terrain and irrigation as major constraints.

The Government of Uttarakhand is currently preparing a notification that will delineate the boundaries of the wildlife sanctuary in a manner so that local communities are not dislocated. Appropriate buffer areas are being identified. The team felt such delineation alone would not reduce

pressure on the limited mountain resources. Rather, the intensity of various anthropogenic activities may increase in areas outside the revised boundaries of the sanctuary leading to an accelerated rate of degradation.

Based on its limited surveys, the team suggested a two-pronged strategy. First, all possible avenues for generation of natural resources and incomes should be provided. Medicinal plants and eco-tourism hold considerable potential and should be promoted taking care to prevent the loss of biodiversity and other adverse environmental impacts. The team recommends the training of local communities in the cultivation of medicinal plants and providing processing and marketing support.

There is a need to reduce the number of grazing animals and improve livestock quality. A reduction in grazing pressure would result in an increased productivity in areas currently used for grazing and should permit increased yields on a sustainable basis from smaller numbers of animals. A reduction in grazing pressure can be achieved if fodder can be found elsewhere. Though a complex issue, the team recommends the reduction in the number of livestock holdings of each family.

Yamuna Floodplains

THE floodplain of Yamuna in Haryana presents a totally different situation. The river is canalised extensively by embankments, most of which were constructed, on both sides, before 1970s to prevent flood-

ing of villages and fields. Now the river remains practically dry except for a short period during the rainy season when the river discharge is high. It causes a temporary flood that rapidly passes downstream.

Consequently, the absence of flow accompanied by the discharge of large amounts of partly treated domestic wastewater has resulted in severe degradation of the river habitat, high levels of pollution and loss of most of the biodiversity. The entire floodplain within the embankments and also the riverbed are intensively cultivated for most of the year. Groundwater is extracted for irrigation of crops. The lack of recharge coupled with excessive abstraction has resulted in a rapid fall in the groundwater level by 6-12 m in the adjacent areas.

The complete depletion of natural vegetation along the riverbanks and on the floodplain has further increased erosion, frequent shifting of the river channel and redistribution of the sediments. Use of large amounts of organic manure, grasses, fertilisers and pesticides has increased, causing pollution of both surface and groundwater. There are no grazing resources on the floodplain except for crop residues. Traditional religious rituals continue along the shallow water. The wastes do not get decomposed. Fish catch has declined greatly, causing the loss of livelihoods dependent on the fishery. Boats are no longer required for crossing the river in the months leading up to the monsoons.

In this context, the restoration of river habitat, particularly the floodplain, envisages revival of old river channels and water bodies on the floodplain within the embankments and creating new water storages where feasible, for harvesting the 'flood' waters during the rainy season. Converting land currently used for agriculture to wetland, re-establishing oxbow lakes and re-meandering the river, and creating artificial water bodies, are expected to recharge the groundwater and raise the water table and in time subsequently increase the river flow during the dry season.

The project focused on two

aspects: the current land use and its economics, and the household surveys to gauge the response of the villagers, farmers and other stakeholders to the proposed restoration project. Several sets of surveys were undertaken by both the Canadian and Indian teams in the villages adjacent to the Yamuna in Sonipat district of Haryana.

The survey exposed that cultivation within embankments was less profitable than outside because summer monsoon flooding reduced the number of harvests that could be realised. Sand mining also occurs within the embankments and many farmers owning land with sand deposits opt for leasing out their land at substantially higher amounts to mining operators than



they could obtain from leasing their land for cultivation.

Aquaculture in the newly created or revived water bodies is certainly possible and substantial efforts have been made by the project team to verify its feasibility. The government currently promotes aquaculture by offering subsidies and some technical support though only a few farmers have taken advantage of this program so far. It is reported that currently shrimp farming is less profitable while fish production benefits the farmer substantially. Although some people do not like to work with fisheries, most are willing to take them up if they are remunerative. The project team recommends that aquaculture subsidies be targeted to areas where the problem of water consumption is not exacerbated.

The study concluded if the water bodies are unable to retain water for a longer period or do not receive enough water during the floods, the short duration can be profitably used for raising fingerlings from the spawn released into them. The fingerlings are in great demand for stocking in large reservoirs throughout the country. Similarly prawns (shrimps) can also be raised over a relatively short period.

For the Tons upper watershed, the Ministry has already undertaken baseline studies together with detailed GIS-based mapping, through the National Institute of Ecology (NIE) and the Indian Institute of Remote Sensing. These studies will provide necessary inputs for preparing the restoration project in

the area. The socio-economic data obtained under the SHARP project will help the project preparation.

For the proposed floodplain restoration in Haryana, the project helped in clearer understanding of the issues and in bringing the local communities and the government officials together.

Processes Involved

THE studies in both areas included biophysical and socio-economic surveys. The study participants included inhabitants from several villages in the research areas. They were farmers, farm labourers, landowners and fishers in Haryana, whereas in Uttaranchal the villagers were mostly farmers, herders and porters. The research team conducted structured questionnaire surveys as well as

The Shastri Applied Research Project seeks to address urgent issues in social development and health, economic reform and environmental management. Canadian and Indian researchers are collaborating on 19 studies on various topics. SHARP is implemented by the Shastri Indo-Canadian Institute and funded by the Canadian International Development Agency.

RESEARCH TEAM

Department of Economics,
University of Guelph, Guelph,
Canada
CLIVE SOUTHEY
(Principal Investigator till
December 31, 2004)
PATRICK MARTIN
(Principal Investigator since
January 1, 2005)
ASHA SADANAND
O P DWIVEDI
NARINDER KAUSHIK

School of Environmental
Sciences, Jawaharlal Nehru
University, New Delhi, India
BRIJ GOPAL (Co-Investigator)
MALAVIKA CHAUHAN
INDRANI GHOSH
Y SARAT C KHUMAN
RADHA RAMAN

For further details

visit: www.sici.org

email: pmartin@uoguelph.ca

brij0400@mail.jnu.ac.in

Written by **Soma Basu**. Edited & Produced by **Soumya Sarkar**. Design by **Rupak Goswami**. Co-ordination by **Kaberi Nandy and Indranil Mukhopadhyay**.

Published by
SICI INDIA OFFICE
5 Bhai Vir Singh Marg,
New Delhi 110 001, India.

engaged local people in informal discussions. In both cases, about half of the individuals interviewed were women, although they did not participate in the stakeholder meetings.

A large group of scientists and government officials from several departments were closely involved. The officials of the State Forest Department provided permission and logistic help during the field surveys in the Tons River Watershed. The team also interacted with state officials, including the Chief Secretary, and scientists of several national institutes such as Botanical Survey of India, Zoological Survey of India, Forest Research Institute, and Dehradun-based Central Soil and Water Conservation Research and

respective state governments come forward with a Detailed Project Report (DPR) - a plan and a budget. While the project has definitely helped move a step forward, it was a major link in the chain of efforts towards influencing the course of river conservation programmes in India. The lessons learned during the project should be applicable to other water projects being contemplated throughout India.

The team is confident that in Haryana, the dialogue with local communities on the issue of conversion of land use from agriculture to aquaculture will continue. Fishery Institutes and the state fisheries department are interested in pursuing this further.

ENCOURAGE AQUACULTURE

THE team is of the opinion that excessive use of groundwater for floodplain agriculture is not sustainable and will cause environmental degradation that will lead to more poverty in the long-term. The team strongly feels that development of semi-intensive aquaculture by harvesting floodwaters on the floodplain within the embankments would reduce poverty in the long-term despite economic dislocation initially. The team also recommends that consideration be given to the proposal that farmers receive an income from those communities, either local or downstream, that benefit from their conversion of land from harvesting agricultural crops to harvesting water. In this way the interests of the local communities and those downstream can be made to coincide with one another.



Training Institute.

In Haryana, surveys of the floodplain brought the team in close interaction with the officials of the State fisheries department. They were very helpful during the field surveys and local stakeholder meetings, and assisted considerably in the Awareness and Dissemination workshop at the end of the project. There was also close interaction with several senior officials of the Ministry of Environment and Forests and the Indian Council of Agricultural Research.

Areas of Further Study

THE Ministry of Environment and Forests has evinced interest if

The Ministry of Environment & Forests has funded the NIE for conducting baseline studies in the Tons River upper watershed. Funds are likely to be available for a pilot scale implementation project in Haryana. The NIE will continue with its efforts for implementation of restoration projects that give due consideration to the findings of the project.

The team feels information collected during field surveys will be of considerable use in further deliberations on the issues of restoration in the region. The data collected on the social and economic conditions of the region is the first of its kind and will be used as a reference for policy discussions on the region. ■



SHARP*Results*

MARCH 2006

ENVIRONMENTAL MANAGEMENT

Policy Development to Support Biodiversity within Agricultural Systems of Hilly Regions of North & South India

INCREASING population and growing consumption of resources have led to a rapid loss of biodiversity, eroding the capacity of the Earth's natural systems to provide the essential goods and services necessary for human survival. It is estimated

that human activities have raised the rate of extinction of species to 1,000 times its normal pre-human rates. Already the populations of an estimated two of every three bird species are in decline worldwide, one in every eight plant species is

endangered or threatened, and one-quarter of mammals, one-quarter of amphibians and one-fifth of reptiles are endangered or vulnerable.

The World Resource Institute estimates that only one-fifth of the Earth's original forest cover survives

RECOMMENDATIONS

Community

- ✓ Appropriate measures are required to prevent further degradation of soil quality for better yield.
- ✓ The exploitation of organic potential through composting including vermicompost is essential to increase farm productivity using organic farming practices.
- ✓ Establish initiatives for community seed banks to promote growing and conserving traditional crops especially millets, which are major crops in both in the north and the south.
- ✓ Develop value-added technologies for traditional crops and other produce (NTFP). Production and marketing of lantana-based furniture products is one example that is currently being exploited in two communities in the southern study sites. This can be expanded.
- ✓ Establish linkages for procurement and marketing of non-timber forest products.
- ✓ Promote environmental education at all levels within and beyond the communities.

Programme Providers & Planners

- ✓ Strengthening of intra-state and inter-state commercial nodes along with marketing networks

are essential to improve the micro- and macro-economies related to products of traditional agro-biodiversity. This will in turn boost the on-farm conservation of agro biodiversity of traditional varieties and landraces.

- ✓ Understanding the geographical complexities of the regions, especially the more remote areas of Uttaranchal, will necessitate the development of private and public administrative arrangements such as Local Citizen Forces (LCF), other cooperative systems and government structures in order to mobilise and maintain the marketing networks.

- ✓ Some agriculture products (various refined and processed food-stuffs) and by-products from these regions could be certified as organic through registered eco-marks for value addition to enable competition in national and international markets.

Policy

- ✓ Create an integrated Forest and Hill Region Development Agency that looks into all activities of the hill areas.
- ✓ Since per capita landholding and annual income is very low in

these areas, the conservation of traditional agro-biodiversity may not be effective up to desired limits unless it is encouraged, compensated and promoted.

- ✓ Recognise hill regions as special ecological zones. This will enable establishment of special provisions for conserving local and traditional crops and varieties, and for protecting the communities from exploitation.

- ✓ The state governments should directly purchase food grains of traditional crops produced.
- ✓ Restructure the public distribution system to include at least some millets such as ragi (mandua) and foxtail millet.
- ✓ Initiate programmes to link academic and research institutions with community knowledge and vice versa.

Others

- ✓ Provide opportunities for eco-tourism involving an integrated understanding of the landscape and the communities of these regions
- ✓ Promote the unique regional cuisines based on foodstuffs and recipes prepared from different traditional food grains.

unfragmented; yet deforestation continues, with 180 million hectares in low-income countries deforested between 1980 and 1995. In many parts of the tropics and semi-tropics, thousands of acres of virgin forest are being cut before there is time to document or study what was there.

Forests are home to 50-90% of terrestrial species, provide ecosystem services such as carbon storage and flood prevention, and are the source of critical resources for many linguistically and culturally diverse societies and millions of indigenous people. But in many forest areas, we are replacing naturally diverse vegetation with artificial monocultures. In

Eastern Ghats of Tamil Nadu in southern India. However, the natural vegetation, varieties of crops and associated agricultural systems are vastly different from those in the northern mountains. Pressures of population, shortage of water and rapid urbanisation have added stress to the need to maintain high productivity while protecting the integrity of the ecosystems.

Through extensive fieldwork, this research studied factors affecting the diversity of cultivated and native vegetation in agro-ecosystems within selected hill regions in northern and southern India. The research team has been able to develop models directed toward support of bio-diverse, pro-

aspects of agro-biodiversity policy issues in 2004-2005. The study area in the Kumaon hills was Tarikhet block of Almora and Ukhimath block of Rudraprayag. The survey covered 349 households in 28 villages in Almora and 243 households in 15 villages of Rudraprayag. The team compared cash income generated and energy status (surplus or deficits) associated with traditional coarse grains, local landraces, and high yielding crops in the region. Further analysis was carried out using standard agro-biodiversity indicators such as Shannon and Berger-Parker diversity indicators.

In the south, detailed agricultural, biodiversity and social surveys were carried out in three hill regions of Karandai Malai (119 households), Peru Malai (17 households) and Kolli Malai (49 households). Besides the statistical survey of households, over 40 group meetings were held for both collection and dissemination of data in which both women and men participated in the ratio of 3:2. Treatment of the data included evaluation of agricultural, horticultural and animal husbandry management patterns, with a focus on biodiversity and other sustainability issues.



the process, we are polluting the environment and changing background environmental conditions faster than nature can respond.

The Himalayas within Uttaranchal in north India are an area of rich and unique biological and cultural diversity. This is also an area that is facing a deep ecological crisis and many of its social, economic, and environmental values are in danger of being lost.

In the terraced fields of the Garhwal and Kumaon Hills, over 40 crop species are grown, a diversity which has been maintained through varied cropping patterns that have evolved due to wide variation in edaphic, topographic and climatic conditions, coupled with careful selection by farmers.

A similar situation prevails in the richly endowed Western and

ductive, and sustainable agricultural practices in these regions.

Processes Involved

THE northern team regularly interacted with senior officials of the Uttaranchal Government Agriculture Department, Watershed Directorate, and with the Uttaranchal Organic Commodity Board in Dehradun. In the south, the team held regular meetings with officials of the State Forestry Department.

In both the north and the south, the project organised interactive meetings that included both officials and representatives of the local communities. These resulted in a positive outlook towards understanding the needs of the community by policymakers.

The study undertook two surveys in the north covering various

Potential End Users

THE team feels there are a wide variety of potential end users of the information derived from this study. Of prime importance are the farmers and others who live within the areas under study. The team made every effort to develop a partnership with the local populations. This was done in the initial stages by discussing the purpose of the research and seeking the peoples' input in the detailed design of issues and questions to be studied. Local workshops were also held for this purpose. Later, periodic public meetings were conducted to discuss progress and seek inputs.

In both the north and the south, project activities and dissemination workshops have generated better awareness among local farmers and also among state officials engaged in policymaking and policy implementation. Findings provide



data for various development agencies that can be used to develop appropriate community programs.

The project encourages the communities to come forward to organise themselves into groups such as village forest committees and other self-help groups. They also established opportunities for linkages between the communities and different field based organizations for further action. The project has generated interest in activities that hold potential for improving livelihoods through value-addition of crop and non-timber forest produce. They have also generated interest among students to carry out field research and link their learning experiences with that of the local communities.

The North

IN Uttaranchal, traditional crops have been on the decline, replaced by newer varieties of cash crops. The reasons for this are complex. The popular notion that access to roads in the hills reduces agro-biodiversity is not supported by initial analysis of data for most villages. The study also found that the thrust of government policy instruments such as credit, subsidy and the public distribution system has been directed towards promoting high productivity monocultures.

It found that during the past 10 years, the area under traditional crops declined by between 10% and 100% for various crops. Farmers indicated that special incentives and ecological

compensation are necessary to promote profitable conservation of local and traditional crop and varieties.

Agriculture in Uttaranchal hills is largely organic. The expenditure on inorganic chemical inputs is limited 1% to 2% of the total value of crops in each household. In this context, promotion of improved land management through wider use of compost produced from plant and animal wastes is an imperative as a support for high productivity organic agriculture.

As a complement to field crops, horticulture and animal husbandry need to be promoted to boost farmers' incomes. Off-farm income typically provides about 50% of family incomes in the study area. Measures to promote opportunities for non-agricultural work in the local areas would be socially beneficial.



The South

IN the hills of Tamil Nadu, a considerable diversity in cultivated traditional (mostly food grain) crops persists despite economic pressures. Diversity in terms of stored landraces was found to be even greater than that in the field in any one year. Here food grain production is mostly organic and is sufficient for local food security. But wherever there is road accessibility, there are pressures to cultivate commercially lucrative cash crops, principally tapioca and pineapple.

There are several unique and high-quality species of horticultural crops that grow in these areas, including varieties of banana, tamarind, mango and jackfruit. In addition, non-timber forest products (NTFP) provide an important supplement to livelihoods. Promotion of equitable and sustainable access to these resources is essential and for this, infrastructure improvements are required. However, these should be provided in a way that continues to support biodiversity in agriculture and forestry. An integrated development approach including focus on agriculture, agro-forestry, horticulture, animal husbandry and NTFP procurement is therefore required to improve livelihoods.

In all the study sites, the team found a large measure of gender equality in most agricultural and other livelihood activities. In most survey activities and in discussion groups, both men and women (and also children) were present. Many of the survey activities were led by

The Shastri Applied Research Project seeks to address urgent issues in social development and health, economic reform and environmental management. Canadian and Indian researchers are collaborating on 19 studies on various topics. SHARP is implemented by the Shastri Indo-Canadian Institute and funded by the Canadian International Development Agency.

RESEARCH TEAM

Department of Chemistry, Queen's University, Kingston, Ontario, Canada
GARY W VANLOON
 (Principal Investigator)
BO PAZDERKA
JOSHUA RUBENSTEIN

National Institute of Science, Technology and Development Studies, New Delhi, India
MOHAMMAD RAIS (Co-Investigator)
AVINASH PRASAD
KIRAN ARYA
PRABHA BISHT

Centre for Plants, People and Ecosystems, Chennai, India
D NARSIMHAN (Co-Investigator)
LAWRENCE SURENDRA
P DAYANANDAN
INDIRA KALYANASUNDARAM
P SARAVANAN
MANJULA
A K RATHNKKUMARI
C CHADRAKALA

For further details

visit: www.sici.org

email: rais@nistads.res.in
vanloon@chem.queensu.ca
narasimhand@usa.net

Written by **Soma Basu**. Edited & Produced by **Soumya Sarkar**. Design by **Rupak Goswami**. Co-ordination by **Kaberi Nandy and Indranil Mukhopadhyay**.

Published by
SICI INDIA OFFICE
 5 Bhai Vir Singh Marg,
 New Delhi 110 001, India.

female interviewers in order to ensure a level of comfort for women participants. The team is confident that the study recommendations apply equally to all and will provide benefit for both genders.

The study generated awareness among various participants about the importance of traditional crops and varieties through the project dissemination workshops. The challenge now is to convert this awareness into definite policy initiatives.

The Uttaranchal Organic Commodity Board (UOCB) has started promoting the production and marketing of local traditional grain crops. This is a result of the impact of several local efforts including the SHARP project. The local group of Appropriate Technology India (ATI) in Ukhimath has also shown a keen interest in following up on proposals that promote traditional grain based agro-processing industries.

In the south also, several commitments and actions have emerged out of the SHARP initiatives. The Forest Department is now willing to provide help in the formation of village forest committees, and is providing tree saplings for agro-forestry needs. A community partnership public concern, the Gram Mooligai Corporation, has come forward to receive medicinal plants procured by the local community and to train the community in sustainable harvesting methods. A local field organisation, Covenant Centre for Development (CCD), is providing training to community members for production of furniture using the ubiquitous invasive plant, lantana.

The team has also identified 'project champions' in the community and government who will advocate for the implementation of findings beyond the project team. They include the Executive Director of Appropriate Technology India (ATI Ukhimath), Mukul Prakash, in the north, and C K Sreedharan, Additional Chief Conservator of Forests, Tamil Nadu Forest Department, Chennai and R Pon Alagan, Community Member, Malayur, Perumalai.

Looking Ahead

OVERALL, good awareness has been generated among local stakeholders, including the farming community, government officials, and other local institutions. The project findings could pave the way for taking concrete steps towards enhancement of livelihoods of hill communities.

Despite successes, there are also certain barriers identified to sustainability of the project.

For instance, different government departments pursue different policies, and there is a challenge in bringing them to understand the



need for a single coordinated policy.

The farming communities in the study areas are already engaged in cultivating local traditional crops and varieties. This is an advantage in pursuing the recommended policies. However, hill farmers operate in a larger context where most of the environment and agriculture policies are strongly influenced by large farmers in the Indian plains. Small farmers of the hills are often ignored, as appropriate policies require special initiatives including financial investments for ecological benefits.

The complex, overlapping and bureaucratic administrative structures of various involved departments - agriculture, horticulture, animal husbandry, forestry, education etc., also makes an integrated approach a major challenge.

The positive aspect, however, is that the project at both sites have generated interest among the communities, government and NGO officials. Even now, some follow-up practical work is underway. ■



SHARP *Results*

MARCH 2006

ENVIRONMENTAL MANAGEMENT

TROPICAL estuaries and wetlands have long provided an alternative or additional livelihood to agrarian communities in India. In south India, fishing, prawn filtration, coir fibre processing, lime shell collection, along with agriculture, have been major activities in many estuarine regions. But the demands of a global economy, which entails introduction of new technologies to increase production to cater to wider markets, have seen some drastic changes in the traditional balance between ecological arrangement of production and livelihood delivery.

It is the reason why management of estuarine resources in transitional economies is a challenge to policymakers. In India, management of natural resources was the domain of the government. In recent years, however, the policies have been changed a great deal though they vary from state to state.

In Kerala, the state government has adopted decentralised planning. This initiative has given local communities an opportunity to wield more control over their resources and environment. In this context, it is interesting to examine the effectiveness of different modes of management in operation in the estuarine region of Kerala.

This study examines the effects of different modes of management in the use of estuarine resources and environment in the Cochin estuary of Kerala. The estuary is one of the largest brackish water bodies in India and extends between Azhikode and Thaneernukkam in the state.

Role of Public and Private Sector Cooperation in the Management of Estuaries in South India



RECOMMENDATIONS

Community

Need for setting up of a 'learning community' programme at local levels where different groups and agencies can

- ✓ Exchange knowledge
- ✓ Negotiate alternative resources uses
- ✓ Develop a vision for common objectives that safeguard livelihoods
- ✓ Reconcile conflicting objectives

Programme Providers and Planners

- ✓ Cooperative partnership arrangements between different state and producer groups to protect traditional sustainable practices and their diversity
- ✓ Traditional knowledge systems and practices should

be recognised as baseline information for crafting policy and institutions

- ✓ The long awaited wetland policy for the state must be released soon

Policymakers

- ✓ Top-down resource management approach should be restructured to an ecosystem-based approach
- ✓ Need to update existing fisheries policies, including provision for cooperative problem solving and partnerships
- ✓ Empowering self-governing bodies to maintain biodiversity, and to monitor and report biodiversity losses
- ✓ Strengthening the decentralisation process



The study suggests that an alternate management regime that incorporates local communities and the state is better equipped to shoulder the responsibility of resource management under the given circumstances. Decentralised governance of natural resources which is carefully planned, effectively implemented and appropriately managed, could significantly improve the welfare of local people, the study opines.

For research on how a co-management solution can be evolved, the team surveyed literature on co-management, decentralised planning, good governance, stakeholder analysis and sustainable livelihood. Besides, the research team worked closely with non-governmental organisations (NGOs) and members of the civil society, who have been working in these areas. Restructuring the traditional modes of managing the estuaries, and consequent change in people's livelihoods has created conflicts in many areas, sometimes violent.

Before commencing the project activities, researchers fanned out to all the panchayats (local self-governing bodies) around Cochin estuary to study the various issues faced by the communities and panchayats for the management of estuaries. After studying these issues, four case studies were undertaken to demonstrate the weaknesses of the present system of management, and to argue that cooperative partnership arrangements with local communities, state and the private sector is an alternative mode of resource governance.

Case Studies

THE first case study concerns an isolated island community in Perumbalam, whose main livelihood is live clam fishing. The conflict started when the state decided to lease out these clam beds to a public sector industrial enterprise. The industrial dredging that followed caused livelihood vulnerability and ecological degradation. Local communities opposed these initiatives with various protests and struggles.

The second case study was on stake fishing communities of Aroor and Arookutty villages. It demonstrates processes under which both local communities and state fail to manage resources. Although traditional Dheevera communities had exclusive customary rights over stake-net fishing grounds and were managing their fisheries reasonably well before the prawn boom, their capacity to regulate access and to ensure a fair distribution of resources reduced

substantially due to the development of international markets.

The objective of the third case study was to examine how local communities take up the challenge of competing in international markets by effecting changes in the cropping patterns. The area chosen was Kuzhuppilly village, which has been experiencing a shift from age-old traditional rice-prawn multi crop rotational cropping to shrimp monoculture. Global markets for high-value large shrimps have triggered these conversions, and many landowners have converted their paddy fields to aquaculture ponds.

The fourth case study highlighted the structure and functioning of an ongoing partnership arrangement having a long tradition in the management of estuarine fisheries at the Cherai region of Cochin estuary. Here, the local fishing communities and gram panchayat together manage local fisheries using a combination of formal and informal institutions collectively. This system of partnership, which had a long tradition in this region, appears to function well even today.

Working with the People

THE study team worked closely with people of 30 panchayats around the Cochin estuary and various institutes. Moreover, the participatory approach adopted in the GIS mapping provided an opportunity to both the researchers and the communities to interact intensively during fieldwork,



and made the process of dissemination much easier for policymakers and administrators.

Stakeholders involved in the policymaking process, including local heads and elected people's representatives to various legislative bodies, were involved at various stages of the project activities. This helped them to arrive at a consensus on the nature of fundamental issues of the sector and create motivations to undertake actions towards policy changes.

Findings

THE recommendations of the study are borne out of the findings during the study and the interaction with the local people. In the first case, it has been observed that communities protect their common property resources from external forces and guarantee equitable sharing. When the state proposes alternate uses of resources neglecting customary rights, livelihood and ecological functions, they object to development strategies and also, oppose development programmes that do not include them as beneficiaries. This case study is a clear example that shows how state-sponsored activities and modern development programmes fail if local communities do not benefit.

In the second case in Aroor and Arookutty villages, the study revealed that although the state is the formal authority to manage resources, the state fisheries department has failed to regulate access to fishing grounds. Such failures explained the existing resource degradation and livelihood vulnerabilities of local fishers in this region. The findings from this area call for some serious attention.

In Kuzhuppilly village, the third case study area, the shift in cropping pattern was objected to by a section of local communities, as such shifts caused wetland degradation, spreading shrimp diseases and loss of livelihoods of poor agricultural labours. A dilemma arises when individual farmers try to increase their income and the government tries to manage the situation. Participatory processes between communities and the state have not



been effective. Farming communities, through their producer organisations (samajams), organise collective action to address pressing local problems, but what they failed to address is problems like labour shortage, high wages, and ecological degradation.

The fourth case study in the Cherai area examines how local communities resolve conflicts, achieve livelihood security and sustain resources through partnership arrangements.

The study also suggests that current development policies should consider such partnerships, and promote decentralised public-private arrangements

Potential Impact

DEVIATING from a bio-centric approach, this study has provided an alternate paradigm to examine the complex process of how local communities achieved the primary concerns for making their livelihoods secure, how such communitarian

arrangements degenerated due to post colonial state interventions and liberalisation, and how they reorganised their activities. The study is capable of producing a number of potential impacts at different levels.

- Enforce alternate guidelines for policymaking processes.
- Highlight the possibility of co-management of estuarine resources.
- Need to strengthen decentralisation processes for better governance and conflict resolution.

The study enhances the learning process of local communities through interactive knowledge sharing. It reinforces the need for a gender sensitive development strategy of resource governance.

Policymakers, influential sections of the society and the local communities could use the findings from this research. As the study observes, crafting people-oriented coastal zone resource management plans has been the primary agenda of all political parties in Kerala. However, serious primary studies advising how to involve coastal communities in resource management do not exist till date. Therefore, the study can be of immense help to policymakers, local communities and civil societies at large. The findings will throw light on the impact of liberalisation and privatisation of coastal resources and guide alternate policies that sustain resource diversity, livelihoods, equity and gender sensitivity in coastal resource uses. The recommendation to decentralise and devolve management functions to local panchayats and communi-



The Shastri Applied Research Project seeks to address urgent issues in social development and health, economic reform and environmental management. Canadian and Indian researchers are collaborating on 19 studies on various topics. SHARP is implemented by the Shastri Indo-Canadian Institute and funded by the Canadian International Development Agency.

RESEARCH TEAM

School of Industrial Fisheries,
Cochin University of Science and
Technology, India
K T THOMSON
(Principal Investigator)
M A GEORGE
ROSEWINE JOY
M JAYESH

Natural Resource Institute,
University of Manitoba, Canada
FIKRET BERKES
(Co-Investigator)
MANJUNATH RANGA

For further details

visit: www.sici.org

email:

thomsonkt@rediffmail.com

berkes@cc.umanitoba.ca

Written by **Ranjita Biswas**. Edited & Produced by **Soumya Sarkar**. Design by **Rupak Goswami**. Co-ordination by **Kaberi Nandy** and **Indranil Mukhopadhyay**.

Published by
SICI INDIA OFFICE
5 Bhai Vir Singh Marg,
New Delhi 110 001, India.

ADDITIONAL RECOMMENDATIONS

The study makes some additional suggestions for the sustainability of the region's economic goals:

- ✓ Overall environmental degeneration must be regulated in terms of scale (ecological, geographical and economic) and linkages (state, community, private sector, civil society)
- ✓ Economic valuation of estuarine resources must be undertaken to ensure efficient uses of estuarine resources.
- ✓ As Vembanad Lake is a Ramsar site, the government is responsible to maintain existing levels of biodiversity

ties are in tune with the overall planning strategy of the state. Moreover, the state government should easily accept the recommendations of the study.

The project has already made some positive impact on the community. The Matsyathozilali Congress has committed itself to demanding collective problem solving institutional alternatives for the management of the inland fisheries sector of Kerala.

Champions

THE project has also identified 'champions' in the community or government who will advocate for the implementation of the findings. Among them are academicians, social activists, politicians and lawyers involved in the policymaking process. They have promised to be the champions for granting more space to local communities in the management of resources.

A brochure in Malayalam is being prepared for the beneficiary population (for both women and men). Women councillors in local panchayats will be involved in issues related to workingwomen. A number of NGOs and political

organisations are involved in the overall development of coastal communities, and these organisations are already involved in our project activities. A guide for policy-makers on 'good governance for sustainable livelihoods of estuarine communities' is also under preparation.

Conclusion

THE project has set path to an alternate approach towards the management of estuaries, which is used by economically weaker and vulnerable sections of the Indian society. The process of privatising these rural commons, especially through modern economic activities and neo-liberal forces has been the prime reason for the existence of poverty.

Poverty reduction and sustainable development therefore depend on how fast we adopt policies that sustain community livelihoods. It is believed, and proved beyond doubt in our case studies, that decentralised community-based resource management and control certainly delivers sustainable and equitable sharing of resources for the livelihood security of local communities. ■■





SHARP*Results*

MARCH 2006

ENVIRONMENTAL MANAGEMENT

RECOMMENDATIONS

Community

✓ Continue to work with public and private sector agencies to ensure that meaningful engagement in development decisions becomes commonplace.

✓ Some private agencies are already using basic tools of engagement, such as open houses and should be encouraged to do more of this type of work in the community.

✓ Agitation continues to be an effective tool when the voice of the community is not included or heard.

Programme Providers and Planners

✓ Meaningful civic engagement is central to planning and decision making for projects with significant potential impacts on environmental and human systems (such as many hydroelectric projects) and should be incorporated into planning.

✓ In doing so, it is critical that procedural and substantive equity be basic considerations in planning, reviewing and approving projects.

✓ Further key characteristics of meaningful civic involvement, such as decentralisation, multi-sector partnerships, participatory governance, access to information, and open public hearings should all be explicitly adopted in the overall participatory framework.

The Roles of the Public, Private and Civic Sectors in Sustainable Environmental Management: A Search for Balance in Uttaranchal



THIS research project focused on the roles of the public, private and civic sectors in environmental management and sustainable development in Uttaranchal. The team examined management processes that included environmental assessment (EA) and land use planning. EA and planning are excellent processes for investigation because they are inherently anticipatory and preventative, and thus have significant potential for assisting in societal transitions to sustainable development.

The study considered how Uttaranchal can avoid common pitfalls in multi-sectoral decision making while implementing more equitable and effective decision making processes aimed at ensuring local, regional, and as a consequence, national and international sustainability. For example, recent EA experiences in Canada and other countries suggest that devolution of responsibility to the private sector and exclusion of civil society typically leads to man-

agement uncertainty, conflict and resource exploitation. Similarly, centralised land use planning by public sector agencies often leads to conflict and has tended to result in inefficient development decisions, particularly when it fails to adequately accommodate civic and private sector interests (including market incentives).

Why Uttaranchal?

THE area chosen for study "was mainly in the Garhwal Himalayas in Uttaranchal, with Joshimath as the base station. The study took place in the 3 main districts of Uttarkashi, Dehradun and Chamoli. These regions were highly suitable for study because they are mountainous and particularly vulnerable to degradation from unsustainable resource development. Each of these regions is also facing intense development pressures, including tourism, hydro development, urbanisation, road construction and agricultural expansion (including horticulture).

Specific examples of develop-

ment initiatives in the study area include large projects like the Tehri hydroelectric dam, diffused development of tourism infrastructure in places like Auli and the Valley of Flowers and agricultural expansion in the Udham Singh Nagar district. Further, the types of adverse effects associated with pressures of the kind seen in Uttarakhand include significant impacts such as deforestation, loss of biodiversity, increased climate variability, extreme weather events, displacement of human populations and loss of traditional ecological knowledge. All of these are critically important in a state that has such culturally and environmentally important resources as the headwaters of the Ganga and the Yamuna rivers.

Uttarakhand also provided an excellent setting for the study because of its needs to fill gaps in EA and planning policy, and to develop organisational experience in implementing national, state and local policy instruments. In particular, the state needs to find ways to encourage developers to work with local people that are often viewed as being backward and not capable of participating in development decision making.

Objectives

GIVEN the purpose of the research, the objectives set included the following:

- Investigate links among the roles of the private, public and civic sectors in EA and land use planning.
- Learn how the role of the private sector can be enhanced, while at the same time ensuring that key social and ecological gains are made.
- Identify ways to improve the role of civil society to better achieve community empowerment, local participation, and social equity.



■ Identify ways to improve the role of the public sector in bringing resources, legitimacy and equity to development decisions.

■ Strengthen existing partnerships, and forge new ones, among scholars, agencies and civic organisations in Canada and India.

■ Interact with policy makers and local communities so that policy implications are communicated to the appropriate agencies and people.

These objectives were addressed by looking at projects relating to watershed management and other development issues central to the sustainability of the state.

This study's approach to sampling allowed for a diverse body of participants to emerge. Respondents included state officials, community leaders and women, among others.

Findings

THE research team found well-developed communicative and instrumental relationships between the public and private sectors. This was particularly evident with respect to national firms proposing capital-intensive development initiatives that were subject to formal environmental impact assessment. In such cases, the interests of developers and the state coalesced around encouraging and streamlining development decisions. However, the study revealed at least one example of very poor communicative linkages between two key state actors - the forest and tourism departments. The civic sector was largely excluded

from EA, planning and other pre-development activities.

The researchers found much strength within the local private sector that was not being appropriately utilised when considering how to enhance the role of the private sector. For example, a small but vibrant tourism industry has built up in and around Joshimath. Yet, this industry has not been involved in trying to develop and promote tourism within the state and district. Clearly, new arrangements need to be sought that ensure the utilisation and development of local private sector capacity.

In considering the role of civil society in development and planning, the team spent a lot of time documenting how marginalized the civic sector is in such activities. Until very recently there has been almost no involvement of the civic sector in the development decisions that have been made through EA and planning that affect local communities. This needs to be corrected.

The participants themselves have suggested a number of ways this can be done, such as through early disclosure of information, participant funding and resources, fair hearing processes, and negotiated compensation. The result of not taking such action will likely be more agitation in the way of roadblocks, demonstrations, hunger strikes, etc.

The study also found that people are actively participating in the decision-making processes when opportunities are provided. However, the role of women is far from satisfactory. By and large, women were not participating in the village meetings, unless village women have their own separate organisations where they hold regular meetings. It was also found that NGOs are working effi-



ciently in most parts of the study region but are confined to education and awareness programs and are not actively involved in EA or other development planning.

The research indicates there is an urgent need to involve local people in all government programmes like JFM (joint forest management), construction of rainwater harvesting structures, construction of check walls to prevent landslides,

50% of the villagers in the 30 villages studied face water shortages, both for irrigation and drinking purposes, for more than a month in any given year. However, distance to water is not a major problem in this region. Only 16% of the villagers reported that they had to bring water from more than 1 km away.

It was also found that many villagers depend heavily on the forest within watershed boundaries. For

pate in decision-making processes as well as implementation of these programmes.

The research also found that JFM is the major activity being taken up under the Uppalgaon Jalagam watershed management programmes. Netted check wall construction is the main activity being taken up by the public, private and civic sectors. The experiment beneficiaries are of the view that productivity has increased and there is more employment and availability of water and increasing forest cover. The results of the Uppalgaon Jalagam experiment clearly reflect that the IWM is the most suitable way for development in this hilly region.

HYDRO DEVELOPMENT IN VISHNUPRAYAG AND TAPOVAN

UTTARANCHAL has great potential for hydro development due to its mountainous environment and fast flowing rivers. The state has an estimated 20,000 MW of potential power, of which only 1,120 MW are currently harnessed. While growth in the hydro sector could improve social well being in the state, it could also have severe negative impacts on environmental and human systems (deforestation, loss of water supply, loss of biodiversity, social displacement, noise pollution, etc.). The study considered how the private, public and civic sectors could work together to reduce negative impacts and amplify direct local benefits.

Using a qualitative approach, the research focused on two large hydro projects: the Rs 19,011 million 400 MW Vishnuprayag project, and the Rs 30,120 million 520 MW Tapovan Vishnugad development. The research results suggest that civic involvement in the Vishnuprayag and Tapovan Vishnugad projects did not exemplify the characteristics of meaningful engagement.

Formal notice of major steps in planning and decision-making was non-existent or inadequate. The problem was particularly acute in Vishnuprayag but was also an issue in Tapovan, where public protests were organised to force disclosure of the Detailed Project Report (DPR). Despite considerable conflict and controversy associated with the project, public hearings were not held in the case of Vishnuprayag. A hearing was held in Tapovan, but it was not part of a public decision process, and most people did not know about it. Some who attended were quite critical of the hearing.

Based on these findings, the team recommends that proponents and regulators should take immediate steps to publish the contents of crucial reports, such as the DPR for Tapovan and the remediation plan for Vishnuprayag. In addition, financial assistance should be provided to community groups so they can retain expertise to help them represent their interests.

construction of large infrastructure projects such as dams and so on.

Watershed Management

THIS study explored the roles of various sectors in integrated watershed management (IWM) in Upper Yamuna-Tons basin in the Dehradun and Uttarkashi districts. The team examined eight sub-watersheds by interviewing people of 30 villages and consulting various institutes like the Directorate of Watershed, Forest Resource Institute and NGOs.

It was found that more than

example, 60% of the villagers are dependent on nearby forests for firewood and fodder and 32% are dependent on forests for timber.

During the study it was found that out of these eight sub-watersheds, IWM is going on only in one. In Amlawaseli Gad the IWM programme is proceeding under the name of Uppalgaon Jalagam and the panchayat, though not implementing it, plays a key role. More than half the villagers revealed that their views about the programmes under IWM are duly respected and they partici-

Tourism Development

LIKE many parts of mountainous India, tourism in Uttaranchal is recognised as an industry with dramatic growth potential. The state already hosts millions of pilgrims and other tourists in locales such as Haridwar, Rishikesh and Uttarkashi, more and more of whom are interested in visiting other destinations in the state. The new high altitude tourism destinations are the focus of tourism development and have already drawn attention in terms of the potential impact that such development could have on the environment.

In considering adventure tourism development, the team found that Uttaranchal is a virtual playground for adventure enthusiasts. With advances in technology bringing more and more people to the remote regions of the world, communities in areas such as the Nanda Devi Biosphere Reserve (NDBR) stand to benefit from an influx of adventure seeking tourists in the future. Given the desire for increased adventure tourism development and the need to minimise the potential adverse effects of such development, the study examined the roles of the public, private and civic sectors in the planning and implementation of adventure tourism activities in the NDBR.

The research found that

The Shastri Applied Research Project seeks to address urgent issues in social development and health, economic reform and environmental management. Canadian and Indian researchers are collaborating on 19 studies on various topics. SHARP is implemented by the Shastri Indo-Canadian Institute and funded by the Canadian International Development Agency.

RESEARCH TEAM

Natural Resources Institute,
University of Manitoba, Canada
JOHN SINCLAIR
(Principal Investigator)
KRISTEN KENT
NATALIE SEABA
MATT MCCANDLESS

Department of Geography, Delhi
School of Economics,
University of Delhi
R B SINGH
(Co-Investigator)
NAWAL PRAKASH
NITI BHUSHAN MISHRA
PRAVEEN MISHRA
SURAJ MAL

Collaborating Researchers
ALAN DIDUCK, University of Winnipeg
MOHAN PANWAR, Friends of the Trees
(India)

For further details

visit: www.sici.org

email: jsincia@ms.umanitoba.ca

rbsgeo@hotmail.com

Written by **Vijayalakshmi Ekkanath**. Edited & Produced by
Soumya Sarkar. Design by **Rupak Goswami**. Co-ordination by **Kaberi Nandy** and **Indranil Mukhopadhyay**.

Published by
SICI INDIA OFFICE
5 Bhai Vir Singh Marg,
New Delhi 110 001, India.

adventure tourism in the NDBR consists of various players who have multiple roles to play in order to provide an adventure experience for the tourist. Further, these roles exist in a complex web of relationships among the players. Within this web, a few key findings emerge.

First, the forest department acts as a lead agency, dominating the entire industry, especially in terms of regulations. The department has the greatest influence among the public sector, and therefore, the role of Uttarakhand Tourism in the NDBR is minimised.

In terms of the private sector, its activities are those most likely to interact with the tourist, although they are ultimately governed by the regulations set by the forest department. The civic sector, although active in various adventure tourism related activities, has little ability to direct and determine the extent of activities in their environs. This is a critical point, given that the ultimate success of a tourism destination requires the support and commitment of the host community. The web of roles and partnerships to support adventure tourism development relationships also suggests that there is a lack of linkages between the various players. Greater efforts need to be made to create the partnerships to support adventure tourism development.

Given the need to work with the various stakeholders' strengths and abilities, the first recommendation is to formally define the roles of both the forest department and Uttarakhand Tourism. The forest department should continue to fulfil certain major functions, especially in terms of conservation and the monitoring of activities. Meanwhile, greater authority should be given to Uttarakhand Tourism to implement its various plans at the ground level.

Both agencies need to combine forces to ensure that the NDBR is being developed in the best possible way. A collaborative approach needs to be delineated so as to ensure that roles are not being duplicated and that tourism development



is proceeding in such a manner that the benefits are emphasised and potential negative impacts minimised.

In order for adventure tourism to be successful in the long-term, capacity building in the host region needs to take place. While the current forest and tourism department policies suggest such action is necessary, greater emphasis needs to be placed on how to actually implement capacity-building activities. Additionally, it is recommended that government agencies remove themselves from being the direct providers of such initiatives. They should rather act as the agency to enable others, such as NGOs, to take responsibility for



capacity building. Several NGOs already have positive working relationships with some of the communities in the NDBR.

Conclusion

THE findings of this study have the potential to improve the way development decisions are made and enhance the information available to support those decisions. For example, the team has documented a lot of robust baseline data that could easily be incorporated into EA and planning decisions. It has also clearly documented ways in which public sector decisions could more effectively engage small-scale local private sector actors and accommodate the interests of community-based organisations in the civic sector. ■■



SHARP *Results*

MARCH 2006

ENVIRONMENTAL MANAGEMENT



DELUGES in most metros last monsoon and subsequent outbreak of epidemics brings to fore the issue of waste management in urban India. With a high growth rate predicted in coming years, urban public health is a matter of concern.

Implementation of the Supreme Court's ruling to frame Solid Waste Management Rules in 2000, and achieve appropriate waste management in all Class I cities (urban areas with population above 100,000) by 2003 is far from satisfactory. Only some cities have started to manage their solid wastes through community and private sector participation. In some cities, a private formal sector has come to the fore or has been brought in by the urban local governments, particularly in waste transportation, treatment and processing.

Urban Governance and Environmental Management: Action Oriented Policy Studies on Waste Management in Jabalpur and Raipur

RECOMMENDATIONS

Community

Neighbourhood groups, community-based organisations and local welfare associations need to

- ✓ Lobby for appropriate sanitary conditions and efficient waste collection and disposal
- ✓ Insist that they be involved in planning the system in their locality
- ✓ Work hard at teaching their members to separate garbage at source
- ✓ Monitor the activities of service providers
- ✓ Help identify space for on-site composting or vermiculture bio-degradation of organic materials

Programme Providers and Planners

Service providers and planners need to improve

- ✓ Public input and awareness about solid waste management
- ✓ Capabilities of urban local governments in financial management, taxation procedures

and user fees

- ✓ Processes of contracting out to ensure fairness, accountability and transparency

Policymakers

- ✓ Policy changes need to be introduced for the establishment of sanitary landfills. At the moment regulations stipulate that landfills may only be established at a certain distance from urban areas to avoid contamination of residential areas. Such spaces are hard to find in the vicinity of rapidly growing cities, besides which, neighbouring local government bodies do not want to receive the wastes of others. At the same time, a properly constructed and managed landfill does necessarily degrade a large area, and can sometimes be combined with other activities such as a composting centre, power plant or biogas facility. The present regulations need to be revised.

The local neighbourhood associations, local government's ward committees and informal sector waste collectors are engaged in separation, door-to-door collection and dumping of collected waste at a collection point. In some instances, decentralised waste recycling and reuse of non-decomposable materi-

als to reduce the need for waste dumping sites have also begun.

These new initiatives have been either at the enterprise of the local government itself or facilitated by the NGOs and development support organisations. Where the latter are involved, their role has been to encourage the local communities to



take up waste management practices, build local capacity and provide necessary support for the tasks.

In some cases, local governments have synergised waste collection with other existing government programs, particularly employment programmes. All these initiatives have the explicit aim of creating livelihoods and maintain a clean and healthy living environment.

Background

THE objective of this SHARP project was to examine urban governance in two mid-sized cities, Jabalpur and Raipur, in the context of decentralisation, with special reference to solid waste management. It aimed at tracing decision-making processes, evaluate effects of decentralisation and institutional capacity of local government, and means of improving service delivery through collaborative partnerships, in order to improve environmental conditions. The work was conducted in cooperation with two, non-governmental organizations, SAMVAD in Jabalpur, Madhya Pradesh, and LAHAR in Raipur, Chhattisgarh.

A secondary project was developed from the work undertaken in the first year and urged by the project's local partner in Jabalpur; successful practices in other urban centres in India were also documented. This, the team felt, would be useful in forming new initiatives in the focus towns and elsewhere.

The project provided an opportunity to examine the effectiveness of the 74th Constitutional

Amendment Act (CAA) of 1992, aimed at strengthening local government, devolving state government responsibilities, improving local democracy, ensuring representation, and putting urban management firmly into the hands of local people, especially in relation to waste management.



It is recognised that formal, local government institutions (the elected councils plus the civil service) are only one of the actors involved in urban management. The private sector and the third sector, civil society in all its manifestations, are also key players. Their importance is growing as downloading, outsourcing, alternative service delivery mechanisms, user-pay, and contracting out, become more common.

The challenge is to ensure both efficiency and equity in local

service delivery. The team examined the decision-making for basic infrastructure, with special attention to those services most directly affecting the environment: waste management and sanitation.

Processes Involved

A project steering committee advised on the proposed programme of work, monitoring and evaluating project results and policy proposals as they were generated. Research was carried out on current waste management practices and sanitation services in each city. Surveys of both the service providers and samples of the population were carried out to determine attitudes, willingness to participate, concerns and ideas.

By working through two city case studies with service-providing NGOs, the work was undertaken with local advice and cooperation and directly diffused into the communities concerned through NGO and local government networks. It helped to give legitimacy to local efforts and generate new ideas, fresh perspectives and better arguments and techniques to promote workable policies leading to sustainable environmental stewardship.

The study relied heavily on interviews, data and documentation collected from urban local bodies and other government agencies, and on workshops. The research interviews and discussions contributed to sensitisation of stakeholders. The level of cooperation has been extraordinarily high.

Two NGOs, SAMVAD in Jabalpur and LAHAR in Raipur, have been members of the team since the project proposal was prepared, and form part of the steering committee. The role of the NGOs was foreseen as publicising and propelling the work at the community level. In Raipur, after the first round of workshop meetings, the high interest waned.

SAMVAD, on the other hand, became more active as the project progressed. The executive director, Mr. Jayant Verma, devoted an issue of his influential journal of political comment on problems of waste management. He also pre-

pared a popular information pamphlet on waste management for use in schools, and another on regulations related to waste management for general use. SAMVAD has set up a resource centre on solid waste management, which includes a wide-ranging index to Internet sources of information. Funds are being sought to expand and maintain this centre.

Notable Findings

THE project findings reported serious problems in both Jabalpur and Raipur, which are detrimental to the environment and public health. The problems of solid waste management and the lack of appropriate sanitary sewer systems are intertwined.

Uncollected garbage, poorly managed transfer sites, open trucks, and a lack of sanitary landfills means that solid waste is scattered far and wide, often in open surface water drainage channels (*nallis*), which also serve as sewers for untreated sanitary wastes.

Solid waste requires the management of a series of activities: separation of waste at the household level, primary collection, composting of organic wastes, recycling plastics, paper, metal and glass, street sweeping and surface-water drain cleaning, transportation of residue to intermediate bins or depots, transportation to disposal sites, and safe disposal in managed sanitary landfills.

There are numerous stakeholders including individual households, rag pickers, day workers and street sweepers, truck operators, engineers, public health officials, elected decision-makers, and the city council.

Each case study was examined from the perspective of the scale of the project, target groups, institutional framework, actors involved, manpower, innovation in practice, technology, finance system, environmental impacts, conflicts, sustainability, and potential for up-scaling.

While some systems work well in small and circumscribed

neighbourhoods, they do not work well for the greater part of the city. In some, beginnings have been good but efforts have discontinued.

Households often seem to have little belief that conditions can be improved and are distrustful of proclaimed public policies. Public education is essential to make households more responsible, and confident that their efforts in sorting waste before collection will result in positive improvements to the environment.

The value of the informal sector in recycling waste materials is often unrecognised. Local authorities should be prepared, not only to deal with large contractual enterprises, but also with local informal traders and recyclers in order to maintain local employment levels. The role of rag pickers (mostly women and children) must be recognised.

Some contractors profit by

paying very low wages and provide no fringe benefits to their labourers, who thus suffer in comparison to their public sector counterparts. NGO involvement in some cases has ensured reasonable wages and social security for contract labourers. Clearly, mechanisms to write tender documents with built-in equity are needed.

Spreading Waste

METHODS of garbage collection and transport tend to spread wastes around the city. Local collection handcarts and collection points must have lidded receptacles to avoid the scattering of rubbish by stray dogs, birds and wandering livestock. Transportation to disposal sites must be by covered truck to avoid debris flying about.

Many urban local governments still rely heavily on state government grants. Systems of local taxation are often not robust, and col-

SANITATION STATUS IN JABALPUR & RAIPUR

- No underground sewer system or treatment in Jabalpur; in Raipur, unused
- Wastewater discharged through open surface drains (*nalas*) into water bodies or on land without treatment
- Drains poorly designed; erosion; high silt charge; weeds impede flow
- Encroachments; dumping of solid waste, night soil; uncontrolled connections - flow and cleaning implications
- In Jabalpur, 35% of the people have no latrine; 15% use pit latrines; 50% have septic tanks; Raipur only slightly better
- In Jabalpur, 123 public toilets for 4 lakh people
- Dry latrines banned but exist
- Households without latrines also have poor water supply - only 27% have direct connections in Jabalpur
- In Jabalpur, primary collection in 600 open space waste collection depots; severe shortage of waste bins. Only 60% of waste collected and transported in Jabalpur



The Shastri Applied Research Project seeks to address urgent issues in social development and health, economic reform and environmental management. Canadian and Indian researchers are collaborating on 19 studies on various topics. SHARP is implemented by the Shastri Indo-Canadian Institute and funded by the Canadian International Development Agency.

RESEARCH TEAM

School of Urban Planning,
McGill University, Canada
JEANNE M WOLFE
(Principal Investigator)
MADHAV BADAMI
DANIEL CASSEY
NATALIE KEHL

School of Planning, Centre for
Environmental Planning and
Technology, India
DARSHINI MAHADEVIA
(Co-investigator)
SHRAWAN ACHARYA
GAURAV JAIN
VIVEKANANDA GUPTA
NEHA RAI
APPEEJI PARASHER
BELA PHARATE
AMIT MISTRY

JAYANT VERMA, SAMVAD
R K SHUKLA, LAHAR

For further details

visit: www.sici.org

email: jeanne.wolfe@mcgill.ca

dmahaad1@sancharnet.in

Written by **Soma Basu**. Edited & Produced by **Soumya Sarkar**. Design by **Rupak Goswami**. Co-ordination by **Kaberi Nandy and Indranil Mukhopadhyay**.

Published by
SICI INDIA OFFICE
5 Bhai Vir Singh Marg,
New Delhi 110 001, India.

GOVERNANCE ISSUES

- Multiple demands on restricted resources; low priority for sanitation
- Multiplicity of jurisdictions at various levels - overlapping, conflicting roles
- Poor co-ordination between various agencies
- Low community involvement; Ward Committees play limited role; Mohalla Samitis (neighbourhood councils) yet to be formed
- Poor resource mobilisation; share of internal funds increasing, but heavy dependence on state government grants (60%); municipality acts as agent of government
- Poor tax coverage; only 40% of houses registered for self-assessment; water tax coverage 44% in Jabalpur
- Poor resource utilisation; allocations not clearly earmarked
- Development works only 16%; mainly recommended by ward councillors; localised, not integrated, cater for citywide needs

lection rates are low. The issue of 'user-pay' is contentious in some places, and the ability of local officials to cope is strained. The methods of contracting out are not always transparent.

In some cities, contractors are chosen by lottery, which though fair does not recognise contractors who did a good job in previous years, nor encourage efficient contractors to invest in modern equipment. Capacity building programmes, both for professionals working in waste management and for elected councillors are needed in many cities.

Disposal of wastes takes place in low-lying areas in conditions that do not comply with Ministry of the Environment and Forests regulations. Most city plans do not even indicate an official dumpsite. Almost no cities have sanitary landfills.

The urban local governments have a wide variety of management arrangements for solid waste collection, recycling, transportation and disposal. What has become clear is that the institutional structures are perhaps less important than the managerial leadership of the operation. A first-class dedi-

cated manager with the authority to take decisions quickly, and the flexibility to act on them seems to be a key to success.

Areas of Further Study

THE team is confident that project components will be continued beyond the end of the project. The research team will complete and edit a book of best and interesting waste management practices (a preliminary manuscript has been prepared). Academic papers are being prepared.

As noted, SAMVAD has set up a Solid Waste Management Resource Centre in Jabalpur. It is seeking further funding to expand and maintain the resource centre, likely from a foreign donor. The research team will help in any way it can.

The Government of India and the state governments are committed to sustainable policies of solid waste management. The problem is how to get sound programmes in place at the local level. The aim of this project was to help that process. Any positive impacts of the project will contribute to employment in and sustainable development of cities. ■

