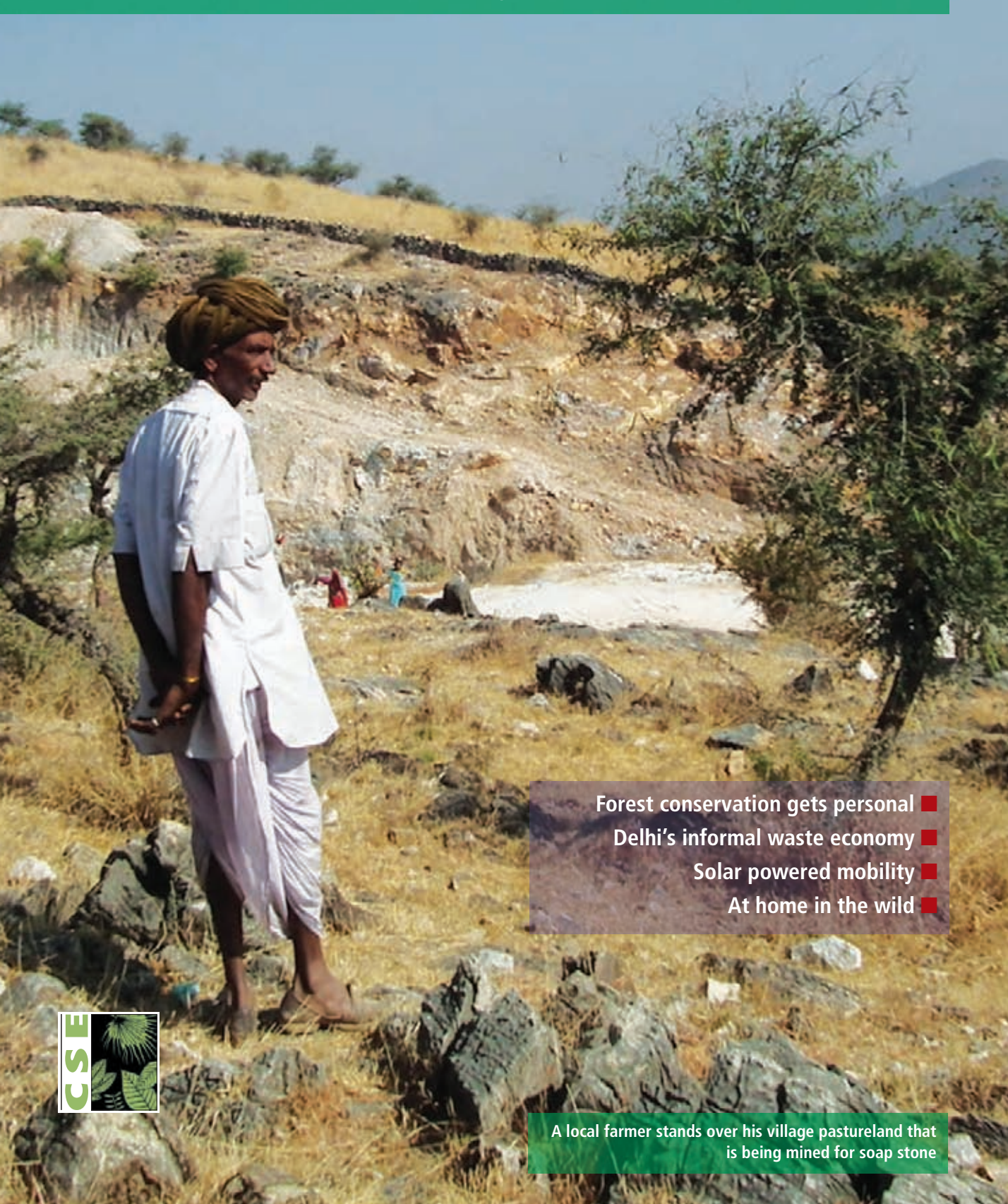


INSIGHT

GREAT DIVIDE

Resource conflicts, local resilience and innovation in the desert



Forest conservation gets personal ■

Delhi's informal waste economy ■

Solar powered mobility ■

At home in the wild ■



A local farmer stands over his village pastureland that is being mined for soap stone



Editorial

Editors:

Alice Hubbard
Kamal Thapa

Copy Editors:

Alice Hubbard
Pragya Krishna

Design:

Amruta Chaudhari

Photographer:

Pallab Regmi

Reporters:

Alice Hubbard
Amruta Chaudhari
Kamal Thapa
Manoharan Saravanan
Natasha Israt Kabir
Om Katel
Owasim Akram
Pallab Regmi
Pragya Krishna
Rabi Wenju
Rajkumar Nagarajah
Sarfaraz Banda
Umesh Khanal
Upeksha Tuladhar

The environment-development nexus presents a great challenge: how economic and social progress can be made without causing negative environmental impacts. As students and young professionals from Bangladesh, Bhutan, India, Nepal, Sri Lanka and the UK, we have attended the “Challenge of the Balance” course in order to understand these challenges from a South Asian perspective. Over three weeks at Centre for Science and Environment (CSE) we attended lectures, discussions and a field trip to Rajasthan, which provided us with hands on experience of a variety of different environment and development issues.

Often, there is a clear divide between those who over-exploit natural resources for personal gain and those who depend heavily on the same resources for their livelihoods. Rapid growth in the tourism, mining and smelter industries cause land use conflicts and result in severe environmental and social degradation. Boundaries can be geographical, social or economic but ultimately the great divide occurs between those who have and those who have not.

From our combined experience on the “Challenge of the Balance” course we have gained valuable insights into many environment and development issues. Here we present our insights into some of them.

Special thanks to:

Aditya Batra
Sharmila Sinha
D S Bains
Surender Singh and
Down to Earth team

Content



4 – 5 Other side of the fence

6

**Stemming
the flow**



18 – 20

**Childhood
wasted**

**Delhi's silent
workforce**

24 – 25

**At home in
the wild**



26 Understanding the challenge
of the balance



8 – 17 Great divide

- Effluent of the affluent
- Land wars
- White slurry, black future
- Reviving Udai Sagar
- 'Pollution control board has been bought'
- Digging deep



21 – 23 Driven by the sun

7 'Not allowed a voice'

Other side of the fence

Conservation hits close to home for forest officer

Pragya Krishna

"Forests are for people, people are not for forests!"

Anand Deval is an agricultural engineer from the Udaipur area of Rajasthan, India, who loves to plant trees. Years ago, he planted a variety of trees and plants in his sizeable backyard including teak and bamboo. Over time, and under his expert care, his backyard turned into a forest.

When he set out to cut some trees for maintenance and to make space to build a house for his daughter, however, he was informed that doing so was illegal now. His backyard had been classified as a forest which, as per the amended 1996 version of India's 1980 Forest Conservation Act (FCA), meant that he needed permission to carry out any felling.

The 1980 version of the act only covered the conservation of areas the government allocated as forest land, regardless of whether there was tree cover or not. Not only did this lead to areas that were not actually forests coming under the purview of the act, it also left other sensitive areas unprotected.

To protect real forests being degraded due to lack of regulation, the Supreme Court of India passed a decision in 1996 stating that the FCA of 1980 would also include all areas that are forests in the dictionary meaning of the term, defined by tree density.

Thus, Mr. Deval's backyard fell into this category, rendering it protected under law. He could not fell any trees without getting a working plan for how he would go about it approved by the Central government.

Obviously, he was indignant at first, and he lodged a case in court in 2003, arguing for his rights over the forest he had grown himself.

Imagine his surprise and amusement then, when in

2004, his daughter Shailaja Deval passed the Indian Civil Services exam and was accepted into the Indian Forest Services, and posted in Rajasthan.

"It was April 1st" says Shailaja with a laugh, "He kept saying that I was making an April fool out of him. But he was also very proud of me."

As for the case: "My father and I don't talk about it, ever. He has never informed anyone, in his many visits to the department, that he's my father, and I don't deal with his case."

The problem with the case, she says, is that "it had no precedent. It was a completely unintended consequence of a well-meaning act, and no one quite knew what to do. Eventually, my father came to see that it was actually a beneficial situation."

Mr. Deval got a working plan approved by the government that allows him to harvest 25% of the trees every year. This is more than enough to meet his needs and results in the protection of his much-loved forest-garden under FCA guidelines. His land is located on hilly, undulating terrain, which best serves as a forest as it is not good for any other uses. He withdrew the case in 2008.

Shailaja Deval, meanwhile, is well known for her pro-people over pro-forest approach. When asked about it, she readily admits, "Yes I am." This is not to be confused with her being pro-exploitation and environ-

mental degradation, however.

"There are misconceptions about the Forest department from all sides. We are not here to mark out all the forestland for exploitation. But we are not here to stand in front of the forests and refuse to allow development to happen either."

"We are facilitators and speed breakers. The Forest



Rights Act is there to facilitate developmental works. I look at them as top priority. But the forest department is also there to slow down the process of unregulated and ill-planned development. We make the time it takes to plan and execute a project longer, so that the agents can be forced to think long-term in terms of the implications their projects will have on the environment, and what else it will take."

On the subject of unintended consequences of forest laws such as in her father's case, she states, "In my tenure, I have realized our system is not foolproof. While we make good legislations, we miss out on certain things. In my father's case, things fell into place very nicely, but that is not always the case."

"Our land records system is very faulty. Land that was marked as reserved forest as long ago as 1964 is still under that name, no matter how much it has changed since then."

"A bigger problem occurs when the same piece of land, marked ages ago under someone's name and forgotten, is allotted to somebody else. Then the people who it has been allotted to discover when they start using it that they are in conflict with someone else who it turns out, also owns the land."

"It's a horrible situation, and very agonizing for the people. It's like a huge system failure. Someone's mistake in the 70s or 80s, demarcation of the wrong land that the villagers need now and which takes a lengthy and difficult process to de-reserve. Such errors do exist. We do not have efficient answers for them. And it's not an intentional problem. The District Forest Officer who marked my father's backyard as forest, for example, did not have bad intentions. The only thing is, lands that were with the revenue department, and marked as government reserved forest land should have been explicitly classified. I think there should be another comprehensive and revised central list."

In a refresher course for the forest officers, officer Deval advocated for emphasis on the Tribal Forest Rights Act, which enshrines the rights of tribal communities to forestland.

"Everyone was up in arms against me about that, but I said those communities are already sitting there. Act or no act, you can't find another place for them to go. They're tilling literally tiny pieces of land, smaller than that of most small farmers, eking something out of them. What's the harm in it? They're not murdering anybody!"

"There are immense amounts of forestland where these tribes do not live. I think we should take care of them, and prevent the mass industrial exploitation of those areas, rather than stop the tiny bit these communities are doing."

She argues that these communities especially are the responsibility of the government. "The role of the government is to ensure the protection of the poor and the weak. If you see the level of poverty these people endure, your

heart will come out of your mouth. The children sit around the fire in the winter, not sleeping, singing songs and prayers to the sun god so that the sun will come up and bring heat and take the cold away. It's been 50 years of independence, and we haven't succeeded in providing them with education, health, insurance or shelter. Yes, I am very pro-people, and I think it is a joint responsibility to be shared by more than just the forest department. It is the responsibility of the health, education, animal welfare and others departments as well."

"The whole world is after conservation, but what do they mean by it? You have to consume to survive – conservation should mean ensuring that the resources will always be around for use."

"For example, in Rajasthan especially – one of our biggest characteristics is that we are fuel wood providers. No program has ever been devised to ensure fuel wood to anybody till date. I don't think we'll be able to give all the people gas stoves for at least the next 50 years. How do you think they're staying hale and hearty? It is because they have enough fuel wood to cook their food and keep them healthy."

"Rules and acts are for regulatory purposes. I remember when we were in a village to talk to the locals about avoiding using timber for fuel, the women asked me: 'Do you eat raw food? You must cook it too, right? You tell us where to cook if we are not to use wood as fuel, and we will.' That is the role of the forest department – to provide answers to questions such as

this. Sometimes we forget that. We forget that we have to go into the spirit, not the letter of the act."

Officer Deval also has ideas for long-term solutions to the problems faced during forest management and conservation. "We must promote private industries to get into timber production".

"The pressure on forests is too high already. We are seeing too many barren areas with degraded microclimates. We should work on creating shelterbelts around villages, which satisfy villagers' fuelwood needs and can take pressure off the denser forests."

"Village forestry should be developed with gusto. It's a pretty systematic process. Calculate how many households there are in each village, how much timber and forest produce they need and then grow however much they need. They can use what is grown and no one will mind it."

"Our problem is that we are very poor at planning – we love the ad hoc approach. But that does not always work. For village forestry, each village should have 50 hectares of its own marked out, and cyclic plantation should be undertaken through NREGA. We'll have to amend a lot of the rules of NREGA, and we'll have to work through a coordinated, integrated approach if we want to make something that big happen." ■

"Everyone was up in arms against me about that, but I said 'those communities are already sitting there. Act or no act, you can't find another place for them to go. They're tilling literally tiny pieces of land, smaller than that of most small farmers, eking something out of them. What's the harm in it? They're not murdering anybody!'"

Stemming the flow

An introduction to watershed management

Upeksha Tuladhar

A watershed is an area of land from which all water drains into the same larger water body.

Why is watershed management important?

- It controls runoff and soil degradation in order to conserve soil and water.
- It manages and utilizes the runoff water for useful purposes.
- It protects, conserves and improves the watershed land and soil for more efficient and sustained production.
- It increases the production of timber, fodder and wild life resource.

Watershed management in action

Pipad village under the Kadiya zone and the Badgaun block falls under the Udaipur district of Rajasthan. Since 1994 watershed development and management programs have been initiated in this village. A formal proposal was developed in 2005 and work started from 2008. Under this project, a total of 150 hectares has been demarcated. Among these, watershed management activities have been completed in 100 hectares, while work 50 hectares is in progress. The development has been implemented by Sewa Mandir, under the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), one of the largest of its kind in India in the rural development sector.

For the purpose of watershed management and pastureland rejuvenation, several projects have been carried out in the hills surrounding the village.

One important project has been the building of loose stone check dams to reduce the water flow velocity, helping to prevent gully formation in the land while reducing top soil erosion and increasing its productivity. Several water trenches have been constructed to hold the water, to work as speed breakers for the water running down the hill and to collect the sediment and keep it on the hill. The typical size of trenches in the pastureland is 1.5 ft wide, 1.5 ft deep and the appropriate length according to the location of the trench. On one hand, this contributes to the ground water recharge and reduces soil erosion, and on the other hand it encourages the natural succession and regeneration of vegetation.

The village groups also organize fund raising activities through user fees. Rs. 50 are charged to each household for the resources they extract from the watershed area. The amount collected is made into a deposit, to lend to the villagers themselves at a cheap interest rate, if needed in the future. This has helped the villagers in times of emergency.

Pasture resources are usually in the form of grasses, fodder, dead twigs and leaves. The cutting of healthy and live trees however is not permitted and the open grazing of livestock such as cattle and goats are prohibited. Livestock are either stall-fed or taken for grazing in another pastureland.

Plantation is planned for next summer to increase the vegetation cover and to meet the increasing demand for fodder and fuel wood. Pastureland (fodder), forestry, agriculture and livestock are integral parts of rural livelihoods, and therefore integration of these components helps to achieve the overall improvement in income.

Pastureland rejuvenation

Rajasthan has the largest number of cattle of any state in India. Dingabari Kalla, a village in Udaipur is rich in pastureland. An ongoing project 'Pastureland Rejuvenation and Development Programme' is running under the assistance of Sewa Mandir through MGNREGA. Fodder deficiency for cattle is the key issue in this village along with the maintenance of ecological integrity.

As the first step to pastureland management, construction of enclosing stone walls is running with MGNREGA funding of 60:40 (wage:material) ratio. Altogether, 27 hectares of land is to be enclosed under this project and the total perimeter (length) of the wall is to be 7000 feet. After the completion of wall construction, plantation of several types of trees and fodder species will be carried out and the restriction on grazing of livestock will be imposed.

Water trenches have been dug to restore water and to reduce the runoff. Plantation will be underway this summer. Construction of stone walls also offers cash payment to the villagers according to the 100 Days Labour Enforcement Act. The act says, for every 20.6 m³ of wall constructed Rs. 119 should be paid, thus this programme is not only pastureland development but also an employment opportunity for villagers.

The land is the common property under the ownership of the government. However, it is leased by the state to the local people on a lease basis for 20 years, (unlike Nepal where the leasing of degraded forest, under leasehold forestry, for the poor group of villagers can be for 40 years). At the end of the term, government may hand over the ownership to the local people themselves.

The pastureland rejuvenation started in Dingabari Kalla is an exceptional example of rural development. It helped villagers to meet the fodder requirements of the cattle and at the same time, it has enriched soil nutrients and encourages vegetation to regenerate naturally. Soil and water conservation and the maintenance of ecological equilibrium are other aspects of pastureland development while increasing rural income from livestock is the main focus of this program. This program has raised awareness among the villagers in watershed management and has made people skilled in construction work which ensures gender balance as well. ■

'Not allowed a voice'

Microfinance's struggle in Rajasthan

Natasha Israt Kabir

Ajeevika Bureau is an NGO that provides services and security to rural seasonal migrants who leave their villages to find work in cities, factories and farms.

Established in 2005, the charity specializes in offering a wide range of solutions to migrant workers both at their homes and their work destinations. It works also works in close partnership with other organizations concerned with migrant's well being and rights.

Financial services are mainly offered by the Rajasthan Shram Sarathi Association, a company promoted by the Ajeevika Bureau. It provides micro credit loans, assistance in opening bank accounts, insurance products and pension schemes specifically for migrant workers and their families. It also undertakes financial literacy and counselling for migrant workers.

Collectives promoted by the bureau provide an organized, occupation-based forum that allows workers to come together for increased visibility, self-regulation, better bargaining and dispute resolution. The collectives also act as vehicles of association, advocacy and services.

The bureau's many services aim to reduce the hardship's associated with seasonal migration. Registration, ID cards, knowledge generation and research, skills training, legal education and aid are also provided by the organisation.

A meeting with Mukesh Kumar Verma the general manager of the organisation in Udaipur provided answers to some important questions regarding the success of micro-finance initiatives Rajasthan.

What do you think about the main barriers for women in social entrepreneurship here?

Mostly, the women in this particular case are not even an active part of

decision making in their families. They are not allowed to have their own opinion, or be vocal. The illiteracy rate is also higher.

It's the culture – women are not allowed to be heard in front of others, especially not in front of the male members.

Why is microfinance successful in South India but not here?

If you compare, you can see the literacy rate of women in southern India is higher than here. Those women at least participate in income generation activities. The ratio of their male partners' migration is not as high as this part. Women here are much more dependent on their husbands for decision making.

So what do you think about the long term vision of microfinance here?

Our self-help group is functioning. The most important thing is we cannot ignore the social factors and other perspectives. We are trying to make the potential social entrepreneurs more aware. But the problem

now is the idea of "Mahajani System" - they immediately want to have money, so convincing them of the long-term benefits is really time consuming. Because the microfinance idea is more organization, collective action-based, which takes time, people are not interested. So our goal is to make them more aware about this. Right now we are providing small-scale credit without high interest rates, so they can depend on us. We would not like to represent our organization as a target based N.G.O, like we have seen in other parts, which later failed due to high interests. Right now we, under the project name of "Udaipur Sahayata" (literal meaning: Udaipur Aid), are promoting the idea of self- help groups.

How do you compare the model of Bangladesh with India?

Bangladesh is a model of women empowerment, especially in the rural areas, but I think the social sphere of Bangladesh is totally different from India. The societal structure is almost homogenous, whereas here it is very heterogeneous. ■



Great divide

Om Katel and Pallab Regmi



This is the little known story of the great watershed divide in the state of Rajasthan, an area that also suffers from many conflicts over natural resources. The great Indian watershed passes through the Udaipur region which is divided by the Aravalli hilly range. A major portion of this mountain range is located in the state of Rajasthan, stretching diagonally from Kotra in the northeast to Khetri in the south west direction.

The catchment areas of the hills drain water into rivers that flow east towards the Bay of Bengal while water falling on the western catchment drains towards the water to Arabian Sea. Geographically, therefore, the Aravalli range is the great divide between the western desert and the

eastern plains and plateaus. The hills receive high rainfall during monsoon serving as the life blood for peoples livelihoods all over Rajasthan.

Grazing sedentary and migratory herds are a common site around the Aravalli range. Rajasthan has the highest number of livestock of all the states in India. Rural populations of the region are completely dependent on a subsistence economy, livestock rearing and farming. Pasturelands therefore play a crucial role in the livelihoods of local farmers.

The city of Udaipur is located in the eastern part of the Aravalli hills and is often called the “Venice of the East.” Udaipur is the administrative headquarter of Rajasthan and was the historic capital of the former kingdom of Mewar. The lake palace, located at the center of Lake Pichola is a major tourist attraction in the city. Udaipur is inhabited by approximately 0.5 million people and receives over one million tourist visitors every year. “The number of tourist visiting Udaipur is increasing every year and with this the number of hotels and restaurants are also increasing,” says Dr. Anil Mehta, Principal of Vidya Bhawan Polytechnic College, Udaipur.

He further highlighted that increasing tourist numbers means that increasing amounts of waste and sewerage will be released into the lakes without proper treatment polluting the water in the lake. Often poor people depending on the lakes to water their livestock are blamed for this pollution. In addition when one moves away from the





in water availability. The structures are constructed that run under the National Rural Employment Guarantee Act (NREGA).

“Building these structures has created awareness among the villagers about water conservation and harvesting,” says Adithi, of Seva Mandir, a local NGO based in Kotra. There are however, no official reports regarding the impacts of such programs. Building these structures can also help to recharge ground water. For example, “owning a well is one of the dreams of the villagers as it actually costs less than getting water from well owned by neighbor” says a villager at Patherpadi village.

Conflicts have arisen between these programs and commercial mining activities which encroach on pasturelands and in many cases lead to severe environmental degradation. The areas taken over by the mining companies are often not made public leaving local residents unsure about how much land is actually allocated for mining purposes. “Mining activities have depleted forest cover” says Dr. Sailendra Tiwari, head of the natural resources management of a local NGO, Seva Mandir.

Mining also affects water resources in various ways. Digging the land creates depression that sucks water from the surrounding areas lowering water table. This lowering contributes to the drying up of wells and has serious effects on local livelihoods. In addition, the effluents coming from mining areas can affect water quality, making unsuitable for agriculture and drinking. “Mining is not always bad and it can be a source of livelihoods that provide jobs to poor communities,” says Aditya Batra, coordinator at CSE, “any mining must be done under strict regulation with minimum effect to the environment”.

The mines located in the Aravalli hills contain immense mineral wealth that produces about 70% of the India's total production. The hills were the target of the miners who started exploiting the natural resources started over

center and towards rural areas there is little harmony between the owners of factories and mining companies and local people.

In India the divide between rural and urban continues to increase. Today rural India comprises approximately three fourths of the country's population and about one third of the national revenue comes from these areas. Currently 27.5% of the total populations in India live on less than \$1US a day. “There are around 150 million people who will never be able to reach above the poverty line,” says Joe Athialey, from the Bank Information Centre.

For many years Aravalli village lands were divided into two broad categories: Private land and the common land. The remaining common lands still play an important role for local communities today, especially those dependent on the subsistence farming.

While acknowledging the water scarcity and the decreasing revenue from the agricultural sectors has become a national problem, the government of India ventured to create a program that promotes the building of traditional water conservation structures. These structures provide two main benefits: cash as a wage to rural people and increase in agricultural yields due to increase

Interests of different parties over the limited resources have further aggravated the geographical divide leading to a social divide in terms of resource use.

40 years ago. Although the state government issued a notification stating the ban of mining and other activities without the environment ministry's permission, the *de facto* activities are not aligned with the *de jure* course of action. “The min-

ing activities in Rajasthan evolved because of the distinct political economy that lasted several hundred years” says Dr. Minoti Chakravarty-Kaul, an economics professor at Delhi University. “In India the majority of poor people live in areas rich in natural resources,” explains Richard Mahapatra, senior editor of Down to Earth magazine. This is certainly true for Udaipur too.

The Aravalli range itself is a great geographical divide between western India creating divisions over water and land resources. In addition the interests of different parties over the limited resources have further aggravated the geographical divide leading to social divides in terms of resources use. This great divide leaves us with a great challenge - to achieve social and economic equity in the future. ■

Effluent of the affluent

Tourism's steep toll on Udaipur

Owasim Akram

The placid beauty of the lakes, nature and the historical palaces of Udaipur, Rajasthan has always attracted both domestic and foreign tourists. At present Udaipur has been entertaining around one million tourists every year. Thus tourism has become the backbone of the city's economy but very few people seem to be concerned about the environmental degradation that Udaipur is going through. With the uncontrolled increase in the number of hotels, resorts and habitation around the city, Udaipur is gradually becoming environmentally vulnerable in many ways.

According to Anil Mehta, principal of Vidya Bhawan Ploytechnic College, Udaipur, unsound environmental practices in solid waste and sewage disposal pose the most serious threat generated from tourist hotel operation. Plastics are also among the serious problems littering all the tourist spots. The most worrying truth is that Udaipur lacks a good waste treatment and disposal systems for both sewage and garbage.

The water quality of the different water bodies is reducing through construction of hotels and resorts, recreational boating, and certain activities instigated by the cruise industry. Motor



boats and other water vehicles used in shallow lake waters are disturbing the habitats of lake. Moreover, these vehicles are degrading the water quality by discharging oil, grease and toxic chemicals into the water bodies.

The growing numbers of vehicles meeting the demands of tourists are causing air pollution by releasing uncontrolled exhaust fumes. Most tourism-related air pollution comes from automobiles which emit by far the most carbon monoxide of all transportation modes. Charter-tour buses and trips have also been increasing rapidly, having an adverse impact on air quality. While there is no

specific data available on tour bus emissions, most of them are heavy-duty diesel vehicles which are known to be highly polluting.

The rapid pace of development of the tourism industry in Udaipur is also intensifying competition for land resources and initiating unsustainable uses. Intensive tourism development is also threatening natural landscapes, notably though soil erosion and the loss of agricultural lands and wetland areas.

The expansion of the tourism industry is extremely water-intensive and therefore puts considerable pressure on surface and ground water resources. Hotels are expected to provide guests with unlimited running water for bathing and sanitation. Some hotels even have swimming pools and fountains, despite the water shortages faced by local people.

In addition, relatively high levels of energy consumption in hotels— including energy for air-conditioning, heating and cooking — is contributing significantly to local air pollution.

While tourism provides considerable economic benefits to the city, its rapid expansion is also responsible for many adverse environmental and socio-cultural impacts, including the increase of the floating population in the city. Relevant measures need to be taken in order to make the tourism industry in Udaipur more sustainable. ■



Land wars

Conflict between pasture and mining

Kamal Thapa and Umesh Khanal



Pipad village in Losingh panchyat, Udaipur district, Rajasthan is an impoverished community with farming and livestock herding as its main occupation. Any kind of development intervention with close links to these activities therefore is of great concern to the villagers.

Pastureland development and forestry activities in the form of watershed management are a major part of the villagers' daily lives. The NGO Sewa Mandir, is implementing the natural resources development programme under the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) in the village. The major works happening around this area are watershed management, enhancing agricultural productivity and pastureland rejuvenation in an integrated way. Out of a total of 150 hectares of land allocated for pastureland development, 100 hectare has been developed and rest of the land is work in progress.

The watershed area of the village contains soap stone resources, which are very attractive for mining companies. 24 hectares of common land under the revenue department have

been leased to the Khetan mining company 25 years ago. The mining lease is to be renewed every 5 years but the villagers have not been notified and are not made aware of how long the area is going to be leased. "The land registration record is in the Panchyat but not made public and the area of 24 hectare has not been clearly demarcated yet. The Panchyat is going to demarcate the mining area soon," says Shahid Sheikh, of Sewa Mandir.

Allocation of same area for the dual purposes of mining and pastureland for villagers has brought about conflicts. "The running perimeter of 6000 feet has been allocated for mining purposes but has never been confirmed," said another villager. Pipad village alone has three different mining operations, with two more in the adjacent areas. The village is rich in resources but is economically poor. There is a clear divide between the business group and the villagers

regarding ownership over the same resources. People never knew when the Panchayat issued No Objection Certificate (NOC) to the mining company. This issue has been raised in front of the Tahasildar, the revenue administrative officer above the Panchayat, and he is in favor of helping the villagers.

The villagers do not have off-farm employment opportunities for extra income. The agricultural occupation is seasonal, leaving them economically backward. However, mining operation in the area is providing employment to 40-45 persons in semi skilled and unskilled jobs category.

Mining and mineral industries are causing land degradation, disturbance in the nearby geological settings and bringing unhealthy competition. But these industries are of economic significance to the local residents as industry provides employment. The benefits arising out of them cannot be ignored. Many people from all economic strata are associated with these industries and if the industry is banned and compelled to shut down then many of them will lose their bread winning jobs. As long as it keeps on providing employment to local people the industry will survive and so will the people.

Mining activities have visible ill effects on the local environment. Exploitation of mineral resources from the land causes environmental and ecological instability, severe land degradation as well as biological, physical and socio-economic imbalance. Clearly, mining in this eco-sensitive landscape needs adequate mitigating measures in place.

The clear divide between the for-profit business firm and the local people relying entirely on the natural resources base (land, water and forest) has to be addressed in an appropriate manner. Neither of the parties should be ignored and the sustainability can only be achieved when harmony has been achieved. ■



Interests of different parties over the limited resources have further aggravated the divide

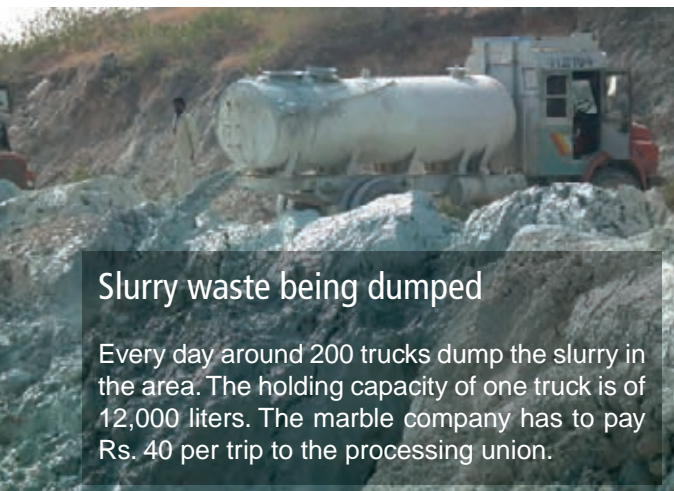
White slurry, black future

Rabi Wenju and Upeksha Tuladhar



Lake of slurry

The Chitrakut Nagar area of Udaipur has been used as the mere dumping site for marble slurry. This was started in 2005 and the activity is still going on despite the government terming it as illegal in 2002.



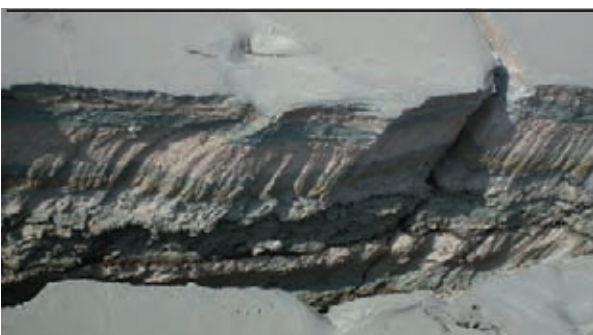
Slurry waste being dumped

Every day around 200 trucks dump the slurry in the area. The holding capacity of one truck is of 12,000 liters. The marble company has to pay Rs. 40 per trip to the processing union.



Layers of slurry

As the city's upper catchment is used as the dumping site, it has various impacts on people and on the local environment. During the monsoons, the slurry gets mixed with the water and eventually flows to the Roop Sagar lake, following its route to Udai Sagar lake and then on to the Ahar river. The calcium carbonate-rich slurry affects aquatic life that naturally affects people. In addition, when the deposited slurry dries, the fine dust is carried by the wind to the nearby villages, creating respiratory problems.





The watershed is enroached by the slurry dumping activity

At first, the marble association leased 18 hectares of land; today more land has been encroached.

Local villagers have no choice but to carry out daily activities along side the slurry



What could be done?

The slurry that is dumped recklessly could be used in a better way. Research shows that bricks can be made out of the slurry which can be of good quality. The slurry can also be used in construction of roads. Furthermore, the slurry material can be made into roofing and floor tiles as well as many other useful products including channels and wall panels.



Reviving Uda Sagar

Greening the gap between industry and community

M. Saravanan, N. Rajkumar and S. Banda

Udaipur, the City of Lakes, is an oasis in the Rajasthan landscape; blue waters surrounded by lush green hills. The city has several lakes and has the Aravalli hills in the backdrop. Uda Sagar, one among five lakes of Udaipur, is located at a distance of about 13 km east of the city.

The lake's water is used by large industries such as Hindustan Zinc Limited (HZL), pharmaceutical companies and Udaipur cement works for the production of industrial goods. The community around the lake previously used the lake water for farming and drinking. The HZL factory is located 5 km away from the lake. It was established in 1970 by the Government of India to meet the national demand for Zinc (Zn) but the state owned company could not run as a profit making venture. Therefore, after a few years, the ownership of the company was shifted to a private enterprise under the privatization scheme. The company produces Zinc. However, Sulfuric acid (H_2SO_4) is produced as a bi-product. About 7.50 tons of freshwater of the lake is required in order to produce a ton of Zinc.

Uda Sagar Lake has been considered as the main source of freshwater until the 1970s when the HZL started its operation. About 35,000 people are dependent on the lake for their livelihoods and 100,000 people benefit from this freshwater source in various ways.

Currently the quality of the lake water is severely

A lake for Udaipur

The Uda Sagar lake was commissioned by Maharana Uda Singh in 1559 to ensure adequate supply of water for the city of Udaipur. The construction, carried out by the members of the local Bhil tribe and completed in 1565, consisted of damming the Berach River to create a lake. The dam at Uda Sagar Lake drains about 479 sq.km of the countryside and covers an area of 10.5 sq km. It has a storage capacity of 23.4 million cubic meters. The lake is 4 km long, 2.5 km wide, and 9 metres deep. To manage the overflowing lake during the monsoons, a channel was made draining the surplus water to the Berach river. The catchment areas of Uda Sagar are the Bari, Korana Ki Nal, and the Madar tanks, together with the Pichola and Fateh Sagar lakes.



degraded due to the disposal of various household and industrial wastes, dumping of waste materials and disposal of industrial effluents. The effluent from the HZL contains a large amount of H_2SO_4 and Zn which contaminates the freshwater ecosystem and aquatic life of the lake. The colour of the water has become greenish, odorous and turbid due to water contamination, rendering it unsuitable for drinking. Overall the ecosystem has been severely affected as a result of the water pollution.

Today, the water of this lake is being used in the zinc smelter close to Debari as the lake usually has plenty of water with the exception of lean years. The area is also emerging as a major centre of ecotourism.

The lake has been suffering from inflow of wastewater through the Ahar River. Toxicity from effluent discharges has classically been associated with chlorine, ammonia, heavy metals, and synthetic organic compounds. In recent years, the pharmaceutical and personal care products are emerging as hot spot pollutants which affect the aquatic ecosystem and organisms even at low concentrations. It has also been established that many other elements and compounds, including several ions commonly found in aquatic ecosystems, can also be toxic to aquatic organisms when present in concentrations above or below biologically tolerable levels.

In addition, soil erosion from the surrounding hills during rains has been adding silt into the lake meaning that its holding capacity has been reduced. Agricultural activities such as cultivation of vegetables and cereals and the production of crops has been severely affected. The same can be said about the freshwater fish, especially Indian major carps available in the lake. This, in turn, has affected the income of many communities who used to sell this fish outside the state of Rajasthan.

Now it has become an established fact that the Udai Sagar Lake is highly polluted; triggered by poor management and governance. A lake has three basic attributes: the basin, the water body and the community. Although consideration of these three basic attributes is

imperative, they to draw the attention of even the lake water management bodies in recent years.

There are several projects that are currently underway to rejuvenate the Udai Sagar. One such work is that of Anil Mehta and Dr. Tej Razdan of the Jheel Sanrakshan Samiti. They initiated a revival project in 2010 and can now feel proud as their initiative has come in for great appreciation by the Planning Commission as a perfect model of public private partnership.

Their Green Bridge technology, phytoremediation, uses natural bacteria, water purifying shrubs, plants, loose stones and sand, coconut coir and sunlight to help purify the water. The green bridge technology is an environmental friendly method and it does not require power, machinery or chemicals. In this innovative lake rejuvenation method, renewable energy such as sun and air is used and it synthesizes and assimilates its own chemicals. This is a cost effective method and requires a minimum level of resources. Moreover, communities actively participated in the effort.

According to Anil Mehta, the installation of the Green Bridges started in December 2009 at Sukha Naka area, Udaipur at the end of the Ahar river, the point from where the river enters into the Udai Sagar. Green bridge technology uses biologically originated fibrous material as a filter in combination with sand, gravel and root systems of green plants. Fibrous materials such as coconut coir, dried water hyacinth or aquatic grass are

compacted and woven to form a porous bridge-like structure strengthened by stones. These bridges act as filters, trapping all the suspended materials. The green plants help in the absorption of soluble substances, including

Green Bridges has shown impressive results; the stench has reduced, water is visibly cleaner, and birds and local wildlife has returned

heavy metals.

The river's treatment project consisted of six Green Bridges, varying from twelve to fourteen metres in length, depending on the width of river. The river banks have been strengthened by planting trees and shrubs that also help in treating waste water.

This eco-technological method of treating waste water has shown impressive results within one month of installation. The foul smell has all but disappeared as the oxygenated water, or aerobic conditions, began to clean the water. Birds started converging on the treatment location. Animal life regenerated and one could see fish, water snakes and tortoises. In addition the quality of water in the wells around the river began to improve. Even cattle started drinking the flowing waters of this once-dead stretch of this river.

The physical, chemical and biological parameters after the green bridge project was introduced showed great improvement within just one month. The project has been lauded as a model of Integrated Water Resources Management (IWRM) and Integrated Lake Basin Management (ILBM) in the country, and has been short-listed for the National Urban Water Awards this year. ■

'Pollution control board has been bought'

Meeting with local activists



Local activists Bhavar Singh and Chunnail Dangi

Amruta Chaudhari

Udaipur is a city of lakes, which makes it among India's main tourist attractions. Maharana Udai Singh built Udai Sagar lake in 1559 for drinking and agricultural use. The people of Udaipur have been using this lake's water for their daily needs from that time. However, because of extreme industrialization and urbanization in recent years, this picturesque lake is today a cesspool.

Residents of the area, particularly those from the surrounding villages, claim untreated or inadequately treated sewage and industrial waste water is being dumped in the lake, severely polluting this main source of drinking water and irrigation. Ground water in the surrounding villages is now contaminated. Local activists, such as Bhavar Singh and Chunnail Dagi, have started fighting back, demanding from the government and industry the right to clean water for local communities.

How was the quality of Udai Sagar's water before and after industrialization?

The water quality was very good before industrialization and urbanization. That water was used for drinking and agricultural use. Nowadays the water quality has become very poor because of the dumping of wastewater in the lake and as a side effect the ground water is also polluted. So now it is very difficult to pump ground water for drinking and agricultural use.

How many villages are affected by this problem?

Govla, Bisadi, Debari, Gudlli etc. So many villages are affected by this degraded water. In Govla, there are 100 families, which depend solely on this lake and ground water from this lake.

Which is the main factor causing this pollution?

The main factor for the polluted water is the zinc industry which is using this lake water and dumping untreated waste water into the lake and polluting the whole water body. It has damaged the aquatic life.

How has the aquatic life been affected?

Earlier there used to be so many types of fish found in this lake like Rava, Katla, Mrugla etc. But now, not only has the variety disappeared, but all the remaining fish are contaminated and people cannot consume them anymore.

How long has this polluting activity been going on and what effect has it had on the vegetation?

This polluting activity has been going on for the last 30-40 years. Farmers have no choice but to use that water used that water for irrigation, and it has changed the soil and the vegetation. The crops are contaminated and very few people want to buy them.

Has there been any help from the government?

We have presented our problems to the government but they are not responding and haven't taken any action against the zinc or hotel industries. The pollution control board comes and collects lake water samples and reports that the water quality isn't so bad. They've been bought.

Can you tell us more what problems are caused by the zinc industry?

Hindustan Zinc Limited is the one company that has polluted the lake in large amounts and because of this all the surrounding villages are affected. Earlier, this company worked under government authority, and at that time villagers were employed in that company and received income. But after liberalization and privatization, it was sold to a private company (Vedanta Enterprises) despite the fact that it wasn't running any losses under the government. Now the company does not allow villagers to work there because we oppose their polluting practices. Now there are only 2-3 people from the villages of the area working in that company.

What are the villager's demands from the company?

We want clean water at least for drinking! We don't even have that. They signed an agreement with us to provide us with tanks of clean water to compensate for the polluted lake. But the water which comes in those tanks is hardly treated and only marginally better than the lake water. Even animals won't drink it. It smells and tastes very bad. All of us villagers are upset by these conditions. ■

Digging deep

Rabi Wenju

High child mortality triggers a community water scheme in rural Rajasthan

A week's stay in Udaipur helped me to understand the different issues related to environment, development and society, especially the issues related to water. For me, the most striking issue was the renovation of the traditional well into the systematic recharge well in the village of Patharpadi, in the Udaipur area. I was totally impressed by the way the well was renovated and how the water was managed. The system demonstrates a good example of how development does not always have to involve huge cost and efforts. A simple idea can make a bigger change.

The renovation of the system has dramatically raised the health conditions of the people. This was made possible with the support from an NGO called Sewa Mandir. Sewa Mandir is a grassroots NGO based in Udaipur, in the Rajasthan state of India that works in natural resource development and sustainability, village development, women empowerment, early childhood education and health care.

Lack of safe water, sanitation and hygiene remains one of the world's most urgent health issues. According to the WHO 1.1 billion people lack clean drinking water in developing countries. Patharpadi is no exception. Until the renovation of this well the villagers used to take water directly from the well for drinking. As they used to

take water without treatment people used to suffer from various water borne diseases, especially children. According to the person in-charge of the well, Mr. Hakralal Grashiya, the village had one of the highest child mortality rates in Rajasthan.

As a solution to this problem of unsafe drinking water the Sewa Mandir took an initiative. The villagers dug the well and Sewa Mandir installed a diesel pump and constructed a tank so as to pump water from the well and collect it to the tank for drinking purposes. The water in the tank is purified through the process of chlorination.

There are four taps connected to the tank from where women can easily fetch water. This system has not only solved the problem of unsafe water but has also decreased the women's workload. Before the installation of the diesel pump and tank women had to fetch water manually and it took huge time and effort. But now they can just open the tap and fetch water without any hassle.

The system was constructed in 2010 and took six months to complete, including digging. The diesel pump alone cost between Rs. 35,000 to 40,000 with the total construction costs coming to around 1.7 Lakhs. 80% of the cost for the construction was borne by the Sewa Mandir and the remaining



Villagers share costs of diesel, maintenance for water pump

cost by the villagers in the form of labor so as to give them a feeling of ownership. The total capacity of the tank is 4000 liters it serves for 7 days. For now the tank is providing the drinking water to 26 families. For the maintenance of the system every household contributes Rs. 20 every month. The chlorine is provided by Sewa Mandir or sometimes through the community kitty. For now Sewa Mandir has appointed a trained person to look after the operation of the system. The organisation is also planning to provide training to other villagers on the amount of chlorine to be used which will ensure the sustainability of the system.

Patharpadi is far from the only case where people have been deprived from safe drinking water. There are many areas in India that suffer from such conditions. Hence the success of this system in Patharpadi is a good lesson for other areas also. ■





Childhood wasted

Meeting Delhi's rag pickers

Owasim Akram

Very few images would be able to capture the dreadful conditions of poverty more completely than that of the rag picker children. Yet, they are the epitome of the human spirit of survival, working against all odds to augment a living out of trash. We often say children are the future of a country. But our society hardly ensures a decent childhood to these children that can prepare them for the country's future. There is a yawning gap between what we say and what we offer to them.

A large number of children become trapped in poverty as soon as they are born. Eventually they are bound to contribute to their family income by working in an environmentally hazardous condition. Nonetheless, these children nourish dreams inside them to be doctors, teachers, engineers and many more.

An unknown number of children are engaged in rag picking in India. A study of the National Labour Institute (NLI) in 1997-1998 found waste picking to be the fourth largest occupation for street children in Delhi.

To get a picture of children's involvement in hazardous jobs, I visited the Pahari area of Tughlakabad extension and the Nizamuddin area in New Delhi where the NGO 'CHINTAN' interening. Nilima (name changed), 12, lives in a slum in Sundar Nagar, Nizamuddin. She is one of those many children who have to work to add to their family's income. Almost all of the children from this area are somehow in-

involved with sorting waste materials. They collect waste comprised of paper, cardboard, iron or iron scraps, glass pieces, polythene, hard plastics, boxes, footwear, rubber and many more things. In fact, anything that has a recyclable value is collected. They have to work in poor conditions without any protective measures. This can have severe consequences on their health. Runa, 10, says, "Often we cut our fingers and skin with the sharp stuffs. Sometimes they insert into our feet and we bleed a huge amount." Ten-year-old Rumisha showed her hand with such a deep cut. These kinds of incidents often result in infection. Moreover, the direct contact with garbage and wastages causes yeast infections on the children's skin. Dog bites is another one of the severe problems they have to face at regular intervals. While collecting wastage sometimes they have to fight with dogs which often results in biting, Nazin, 11, informs us.

Some of the children help their parents before and after school and sometimes they are also found working fulltime. These working hours not only deprive children of their required time for education, but also decrease their opportunity to play and have fun. It can put children in an isolated position with respect to other children. For many of them, the working hours have a negative impact on their school achievements. They are tired at school, skip a day or an entire period, or neglect their homework due to work. In many cases their parents do not allow them to go to

school when there is lots of work. Apart from this, when all the family members go out for work, children (girls especially) who work alone run the risk of abuse.

Ten-year-old Reshmina mentioned that some of their classmates make fun of her and her sisters because their classmates know about their work of waste picking, "Some of class friends laugh at me because I pick wastes. They call me 'kabari' or 'kacharawala' (who work to sort wastes)." Sitara, 11, who is also involved in waste picking, is unwilling to tell her classmates about her work because she is afraid of mockery. But despite all of that they have to continue with this job. Yet they have dreams like other children. Ayesha says she wants to be a doctor and Reshmina wants to be a good teacher. Why wouldn't they dream? Dreams cost nothing. Rather their work costs them their dreams. It is also evident that the dull monotonous work and extremely poor working conditions with no hope for a better future can make these waste picker children fall prey to drinking, smoking and drugs.

Children who work in hazardous conditions are often found living in poor housing conditions as well. They lack potable water and a hygienic sewage system. Required services are often found deficient and life is nothing but harsh to them. Ayesha shared that they do not have toilet of their own and they have to pay Rs. 50 per month to use the toilet of others.

With all those hardship, life becomes hardest for them when they are harassed by the police. Sometimes

**Ayesha says she wants to be a doctor
and Reshmina wants to be a good
teacher. Why wouldn't they dream?**

Dreams cost nothing.

they are not allowed to collect waste materials by the police and are even beaten up. Sometimes, the police charge tips for waste picking. When they can't collect waste materials they do not have any other income source and have to starve.

Countries that ratified ILO Convention 182 on the Worst Forms of Child Labour are assumed to actively participate in the termination of hazardous sectors and activities for children in their country. Working with waste materials should be considered as the worst case of child labour; and the government has a lot to be done in this regard. Here the focus of policy intervention could be on strictly regulating child labour and keeping the children out of hazardous jobs. An integrated program approach could be taken to deal with this issue so that the future of these children could be well established for the sake of country's future. ■

Children playing in the waste water



Delhi's silent workforce

Bangladeshi domestic workers in India

Natasha Israt Kabir

The International Labor Organization has 'decent work for all' as both one of its goals, and one of its major agendas. In promoting 'decent work for all', the plight and need for welfare of domestic workers should come close to our hearts.

A large percentage of the domestic workers in India are migrants. These include migrants from Bangladesh, though they do not always report themselves as such. Jagori, a Delhi based NGO has carried out a survey which finds that the majority of these people are illiterate or barely literate with no formal schooling.

In Gurgaon, most of the house maids (domestic workers), rickshaw-pullers and construction workers are illegal Muslim migrants from Bangladesh. The extent of the illegal aliens can be seen from the fact that every maid, rickshaw puller and labourer here speaks the Sylheti language or Chittagong language, both of which are native to Bangladesh, rather than India.

If one asks them, however, these immigrants simply lie that they are from West Bengal. These lies commonly go undetected by most Gurgaon residents who cannot tell the difference between the Bengali dialects. Many of these Bangladeshi Muslims are being employed as maid-servants by the wealthy expatriates and busy professionals because they ask for lesser wages than local Hindus.

Since these Bangladeshis look similar to Bengali Hindus (some even wear fake bindis and pretend to be Bengali Hindus), it is very hard to find out if they are Indians. When I visited the basti (slum areas) in Malviya Nagar Juggi Basti, I asked the people where they were from, but they could not give me the truthful answer.

Everyone introduced him or herself as an Indian citizen from different states of India. The Delhi police's target these



The 1st and 2nd generation Bangladeshi Migrant, from left Mohammad Suleiman (21), his mother Ayesha khatun (40), Nusrat Parveen (19)

illegal migrants as well as legal Bangladeshi muslim migrants.

Meanwhile, the legal migrant domestic workers also face trouble, as they do not have a common organisational forum. Sister Ranjeetha from the Domestic Workers Forum says that prior to the establishment of this forum workers did not have anywhere to discuss their rights or problems related to exploitation, low salary, ill-treatment, or lack of holiday, proper food and shelter.

Surprisingly it was not a South Asian who established this forum. It was a Belgian Nun who came to know about these issues directly from the suffering workers. Mostly the victims are the women. Sister Ranjeetha also stated that they are mostly working on the basis of 'National Workers Rights', as the Indian government has ratified the convention of ILO.

Very few case studies of Nepaleese and Bangladeshi migrant workers dealing with their rights are available, since they are either unaware of them or afraid to come forward. The forum is focusing, therefore, on an awareness campaign to make the families who employ these workers aware. Some of these families are cooperative, but some are exploitative and violate the rules and regulations even when they do know them.

Sister Ranjeetha hopes to change this attitude. She concluded, 'Behind every successful man, there is a woman; for every organized house there is a Domestic Worker.' ■



Activities for domestic workers

A large percentage of the domestic workers in India are migrants. These include migrants from Bangladesh, though they do not always report themselves as such...



Driven by the sun

Without help, Udaipur's solar vehicle programme may just languish in its museums

Alice Hubbard

The historic lake city of Udaipur in Rajasthan may seem like an unlikely setting for path-breaking technological research, but over the last two decades the city has become a hotbed for innovation in solar powered transport

The idea for the world's first solar powered boat was conceived here back in 1992 by Shriji Arvind Singh Mewar, chairman and managing trustee of the Maharana of Mewar Charitable Foundation (MMCF). "This has been my father's vision for many years now," says his son Lakshya Raj Singh Mewar. "He was thinking about solar energy even when it was practically unheard of."

The first solar powered boat was specially designed by Malcome Moss, an environmental scientist from the UK, and soon became a regular sight on Lake Pichola as early as 1995. This boat could seat up to five people and was named RA I. Following the success of this first solar water taxi, RA II was launched, with a seating capacity of up to 10 people. RA II was in fact converted to run on solar power from an existing diesel powered water taxi. According to the MMCF the design and construction of these solar boats cost around Rs. 30 million, a substantial amount for a charitable foundation to fund.

In 1999, the Mewar Solar Cell, was started to kickstart research in passive energy systems. In addition to the solar boats, by April 2003, seven prototype solar powered road vehicles

had been developed and built in the palace workshop. In order to demonstrate the viability of these vehicles and to draw attention to the benefits of this technology, a 10-day international solar rally for four, three and two-wheeled solar powered vehicles was held in Rajasthan the same year. A second rally followed in 2004, this time with seven additional solar vehicles.

These were the golden years for MMCF and their solar vision. The leading daily newspaper, *Hindustan Times* described the convoy of vehicles as Udaipur's "chariots of the sun". The solar rallies also attracted international media attention. Participants flew in from Europe and the USA; MMCF received letters of support from the Prince of Wales; as from India's President of the time, APJ Abdul Kalam, Prime Minister AB Vajpayee and several government ministers. In 2005, EUROSOLAR awarded MMCF the European Solar Prize in the category "one world co-operation" for the development of its solar transport projects.

MMCF's publicity documents from that time promised these solar rallies would become an annual event. However to date, only two such rallies have

been held in Rajasthan. So what has been the fate of these solar chariots? Are they still being used today or did the flame of innovation burn out just when the rest of the world had begun to take notice?

Today, there's only one solar vehicle, "Udaipur Solar No. 1" on public display in the city's popular Vintage Car Museum. It lies in the last section of the vintage car display, tucked behind some old horse drawn carriages. In its hey-day this vehicle could reach speeds of up to 35 km per hour and could operate over a distance of 100 km with a driver and three passengers. Today it looks like it has not moved an inch in years.

Museum staff were taken aback from a request to view other solar vehicles. They opened some garage doors and turned on flickering lights to reveal an even more sorry sight. Two more solar vehicles, Solar No. 5 and Solar No. 11, were nestled alongside old fuel tanks, batteries and haphazardly scattered mechanical tools, their once gleaming solar panels covered in a thick layer of reddish dust. The other twelve vehicles were nowhere to be seen.

Today, it's hard to spot the solar powered boats among the constant comings and goings of the 40 or so boats operated by MMCF around the lakes of Udaipur. One can only wonder: has the city's solar boat dream sunk?

According to Mayank Gupta, Deputy Secretary of MMCF, however, the two prototype boats built back in 1995 are still very much in use. "The first boat now operates on the lake of the HRH Group of hotels property in Gajner, in Bikaner" he says. "The second, larger boat is still used by MMCF on Lake Pichola and is hired by tourist groups on a daily basis."

A dusty Solar No. 5 at the Vintage Car Museum



Gupta explained the prototype was sent to Bikaner in order to disseminate the results of its research over a wider area, and to generate awareness about their efforts to develop solar powered mobility. "It is Arvind Singh Mewar's belief that if these concepts are accepted, it will be a major step forward in the development of eco-friendly transportation," he adds.

"These boats are still very popular with foreign tourists,"

**In its heyday, Udaipur's
"Solar No. 1" vehicle could cruise
at 35 km per hour and cover a
distance of 100 km. Today, it looks
like it has not moved an inch in years.**

says Gupta, adding that the revenue earned helps maintain the boats.

When RA II is finally spotted across the lake, it is easy to see where this popularity stems from. Without a sound the solar boat glides across the water towards the pontoon, its solar panels glistening in the midday sun. Once parked up and free from its latest load of tourists it is clear that, apart from its solar panels, this boat looks just like any other boat plying the lake -- its bank of batteries are hidden neatly under the seats.

"Of course, as this boat was built as a prototype the design is not perfect," says Mr. Anu Vikram Singh, another



employee of MMCF. "As it is very light, it is difficult to manoeuvre in windy conditions and the limited storage capacity of the batteries means that the boat can only be used for up to two hours after sunset," he adds. "Ideally we would like to convert our entire fleet of lake boats to solar power," says Gupta, "but the high costs of solar panels make this unlikely to happen in the near future".

Many tourists use the solar boats every day. MMCF wants to convert all boats to solar powered ones.

"As a charitable institution have financial limitations" adds Lakshya Raj Singh Mewar. MMCF is looking for additional funding and partners to expand and commercialise its solar fleet.

A funds crunch also explains the stalled development of the solar powered road vehicles. "These were all built as prototype vehicles," says Gupta. "In 2006 and 2007, we did use some of the larger prototype vehicles to transport people around the city palace complex," he adds. Today however, these vehicles have been replaced by 15 electric vehicles that can seat up to 8 people at a time. "The rest of the solar vehicles are also kept at the Vintage Car Museum," says Gupta, adding they are not well maintained and are not on public display anymore. "As with the boats we would like to find someone willing to propel this project into its next stage" says Gupta, "someone who shares our vision but who also has the funding and resources to produce these vehicles commercially".

Some point to the government's apathy as a stumbling block to the development of solar boats and vehicles. Mayank Gupta says the government should pass legislation to encourage the use of solar powered boats on city lakes. "So far, all the work has only been done by MMCF, but we need the help and support of government to promote the use of these boats. There is so much bureaucratic red tape involved in obtaining the necessary permits for new designs of road vehicles; we simply do not have the resources to do this by ourselves," he adds.

MMCF has an ambitious vision for the future of solar mobility. In addition to the solar boat and vehicle projects, ideas include solar powered battery exchange points for electric vehicles at petrol stations around the city, together with a tram network within the city palace complex. ■





At home in the wild

Prakriti Sadhana Kendra brings people back to nature

Kamal Thapa and Alice Hubbard

For people from rural areas struggling to eke out a living from the land, the lure of the bright lights and increased employment and education opportunities of the city can be highly attractive. With over 50% of the world's population now living in cities, rural to urban migration has become an increasing global trend.

The situation is particularly visible in developing countries such as India. This unplanned migration has put urban resources under extreme pressure. Migrants from rural areas often end up living a very low quality of life in the polluted city, while agricultural fields in the distant villages are left barren due to the absence of a suitable work force.

In addition, people's understanding and appreciation of nature is de-

creasing, leaving them feeling increasingly disconnected with the environment around them.

With the objective of addressing these problems, the Vidhya Bhawan Society in Udaipur, Rajasthan, started to sensitize its employees and students to the importance of nature and environmental issues as early as 1931. In 1956 the society purchased 400 acres of hilly terrain, situated among the Aravalli hills, close to Udaipur. Pressing problems of environmental degradation and worldwide awareness on environmental issues has encouraged Vidhya Bhawan to promote itself as the living laboratory for environmental and nature conservation studies.

2009 therefore marked a significant turning point in the society's history with the much anticipated completion of the purpose built Prakriti Sadhana Kendra environmental education centre within the boundaries of the original Vidhya Bhawan site. The centre was opened on 19th August 2009 by RK Pachauri, head of The Energy and Resources Institute (TERI) and 2007 Nobel peace prize winner for his work on climate change. The buildings were designed by celebrated eco-architect Shri Sanjeev Gupte. They comprise of



Bamboo roof as viewed from inside the eco-huts

two large classrooms and six dormitories or 'eco-huts' to house the numerous groups of students visiting the centre to embark upon environmental education programmes and nature camps throughout the year.

The 'eco-huts' at the center are deliberately basic, with no electricity except that generated by solar photovoltaic cells, and absolutely no luxurious amenities such as modern furniture, television, internet or computers. In addition, while rudimentary bathroom facilities are present at the center hot water has to be collected from the kitchen and carried up the hill by the students themselves. The absence of such simple luxuries compels visitors to appreciate their everyday energy expenditures and their subsequent impacts on the environment. These measures also help to keep the carbon footprint of the center very low.

The buildings themselves are designed to be a positive example of energy conservation and also of how to

Covered classroom with inspiring views





reside in harmony with the surrounding environment. The thick walls are built from local stone and are constructed in a way that enables them to maintain an even temperature throughout the day and across the year. Staying overnight in one of the eco-huts was a very comfortable experience, despite the low temperatures observed outside. In addition the roofs are constructed from lengths of local bamboo that had been grown just 100m from the site and have been covered with treated synthetic fibre sheets. These have been moulded closely to the bamboo, keeping the buildings watertight.

According to Shrimal, the project's co-ordinator, the tranquil setting of the centre enables visitors to come face to face with nature. In fact participants are actively encouraged to get out and about and investigate their surroundings.

"During our nature camps students are given worksheets and allowed to explore the grounds in order solve problems and answers questions," says Shrimal. Walking around the site it is clear that tagging of various trees has been done for identification purposes. Many floral species such as Acacia, Ziziphus, Ficus and Cactus were also seen to be present in the surrounding forest. Staff at the center also let slip that a leopard has been spotted in the local hills, adding to the sense of mystery and generating whispers of excitement among the students exploring the grounds.

Any activities that conflict with nature are not permitted when staying at the center. Even the forest trails up to the hilltops are left unpaved in order to lower their ecological disturbances.

All visitors are encouraged to participate in early morning hikes along these wild trails. Out of breath and scratched by acacia and cactus thorns the sleepy students emerge on the hilltops filled with a growing sense of achievement and heightened awareness of the environment around them. The fantastic far reaching views across the valleys make the early start and grueling climb well worth the effort. As they make their way back down to the center, hanging on the branches as they slip and stumble down the steep sandy paths, laughter rings out across the valleys. By the time breakfast is served they feel invigorated and ready to tackle all the challenges that the day has to bring.

While highly successful in enabling city dwelling students to engage with nature the center's sustainability goals have not been completely problem free. Soon after their initial installation all 8 solar PV panels were stolen from the site. According to Shrimal, the original panels were mounted on a sloping iron framework approximately 1.5 m from the ground.

"We took great care to make sure they were secure but never expected anyone to come and steal them." For now students have to make do with torches and solar lanterns for getting

around after nightfall. 'We are planning to replace the PV panels as soon as we have the funds' he says. This time they will put increased protection measures in place, including electric fencing, in order to stop the same thing happening again.

So what will the future bring for Vidhya Bhawan and Prakriti Sadhana Kendra? According to Shrimal, while the centre currently accommodates around 300 students each year there is plenty of scope to increase this number. "In addition to the work we are doing now we would like to organise many more workshops and seminars and open up the centre to a greater number of people."

Having said this staff are insistent that they do not want the centre to become a nature theme park. 'The last thing we want is to become a tourist picnic spot,' says Shrimal. "Education is our number one priority," he adds. "Under no circumstances do we want to spoil the natural beauty of the site".

Today many people and institutions are advocating environmental awareness but Prakriti Sadhana Kendra really has been successful in achieving its objective of bringing people back to nature.

With the widespread support from many well recognized personnel, including Jagat Singh Mehta, former foreign secretary of India, and Pachauri, the center really is a perfect example of the 'Thinking Globally to Act Locally' initiative. ■

Students enjoying a morning hike



Understanding the challenge of the balance

Umesh Khanal

Until I visited Pipad village in Rajasthan, I did not understand what the challenge of the balance really meant. Land around the village was given for pastureland development but was also being used by a mining company for extraction of soapstone. Some of the people working in the pasturelands were also facing pressure to work in the mines since they need to earn a living. Finding solution to this problem is complicated and that is what the challenge of the balance is all about.

Udaipur may be considered one of India's most beautiful cities but it too faces similar issues of balancing various challenges. There are many world-class hotels around the lakes as well as many industries operating in the area. As a result local people face a lot of difficulties due to industrial activities. The water is polluted and is unsuitable for domestic and irrigation use. What is worse is that they have nowhere to go or any mechanisms for solving these problems. Instead these industries threaten villagers whenever they raise their voices against the unregulated and even illegal industrial activities.

Some of the challenges have been solved and it was really inspirational to see the results. The cleaning of the Ahar River where it meets Udai Sagar lake, by Anil Meheta and Jheel Samrakshyan Samiti, is a good example of effectively treating a polluted water body with the aid of eco-

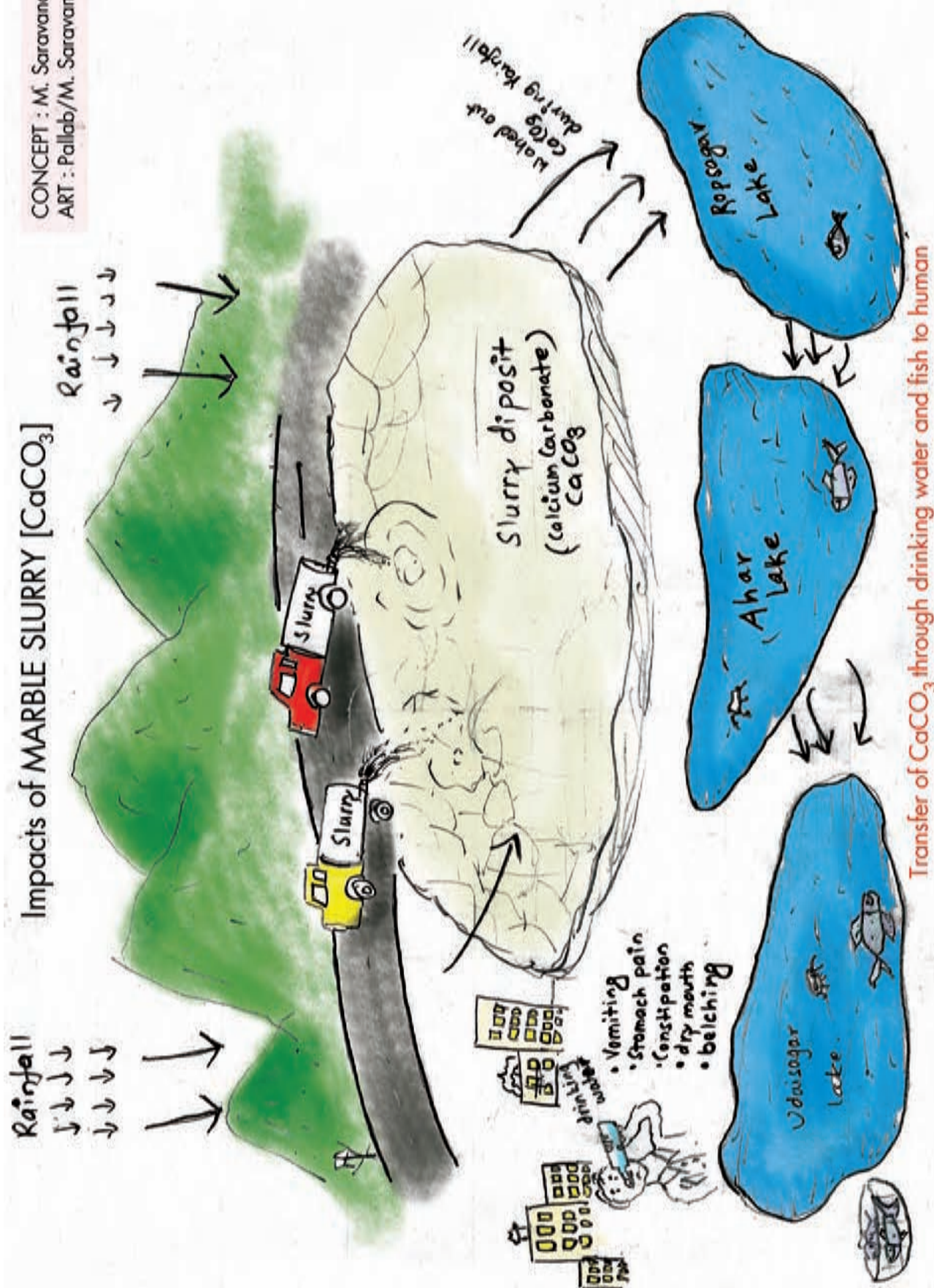
technology. Such works should be replicated across several other parts of the region. Villagers have solved the problems of water shortage and water induced diseases by working together at a community level rather than depending on the government to do the work. The rural development activities carried out by the NGO 'Sewa Mandir' have changed the lives of many people around Rajasthan. Sewa Mandir works for the benefit of the local people and is helping the government to implement the National Rural Employment Guarantee Act (NREGA) – an act that guarantees employment to villagers for 100 days a year and a wage rate of Rs. 100 for each day of work.

Apart from the field visit, the 15 days of lectures helped to increase the groups understanding of how India is facing the challenges for balancing development and environment simultaneously. As an economically emerging nation India needs to make sure that whatever it does, it addresses the concern of safeguarding the environment and maintaining economic progress. All of South Asia has similar issues to deal with and all countries should work collectively to address the challenges that the region face. As it is said "Winners don't do different things, they do the things differently." So, to solve the challenge of the balance, a new way of economic development and environmental protection should be implemented. ■



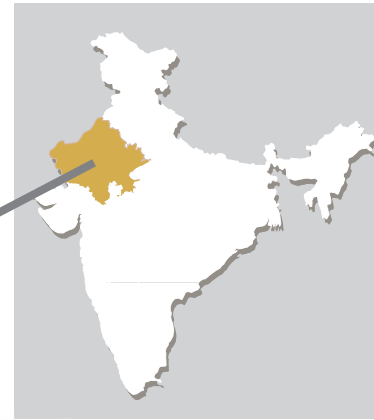
Impacts of MARBLE SLURRY [CaCO_3]

CONCEPT : M. Saravanan
ART : Pallab/M. Saravanan

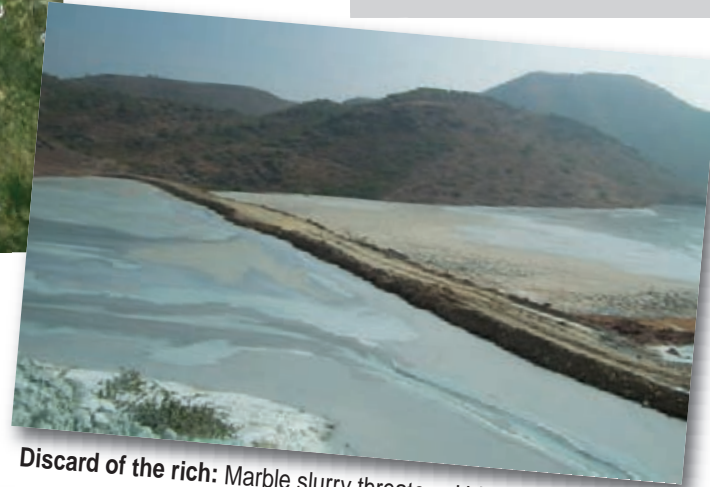


Transfer of CaCO_3 through drinking water and fish to human

Encounters in Udaipur



Lake Pichola: Concerns on carrying capacity



Discard of the rich: Marble slurry threatens Udaipur watershed



Right to work: A wall to protect common lands in Dingari Khala



Anatomy of a conflict: Mining vs. pasture



Discussion on lake pollution: Udaipur



Natural recharge well: Patharpadi