SOCHARA

Understanding and Addressing Environmental Health Challenges

An Aid for Learning Facilitators

Compiled by Adithya Pradyumna

2018

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Thanking you,

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ABBREVIATIONS

CHESS	Community Health and Environmental Survey Skill-share
CHLP	Community Health Learning Programme
CSE	Centre for Science and Environment
DDT	Dichloro Diphenyl Trichloro-ethane
IITR	Indian Institute of Toxicology Research
IQ	Intelligence Quotient
Mfc	Medico Friend Circle
NIMHANS	National Institute of Mental Health and Neuro Sciences
NIOH	National Institute of Occupational Health
NGO	Non-governmental organisation
SDG	Sustainable Development Goals
SEPCE	Socio-economic-political-cultural-environmental
SOCHARA	Society for Community Health Awareness, Research and Action
US	United States
VHAI	Voluntary Health Association of India
WHO	World Health Organization

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PREFACE – ABOUT THIS DOCUMENT

The Society for Community Health Awareness, Research and Action (SOCHARA), and its precursor the Community Health Cell, has long believed in the power of informed communities in bringing change through collective action to improve health conditions. Since 1984 a range of different activities and strategies have been used at community and larger levels to address health issues: to create awareness about community health, to strengthen health policy processes and the public health system, and to revitalise teaching learning programmes in community health and public health. Our response to the Bhopal gas disaster as part of the medico friend circle from 1984 sparked the development of a critical understanding about environmental issues, their deeper determinants as well as the consequences. Thus began a long journey of engaging with the complexities of environmental health. Through the community health learning programme (CHLP) a series of teaching modules and learning aides have been developed and are available at www.sochara.org and www.communityhealth.in. This booklet is a compilation of case studies in environmental health from India and abroad. It provides the reader with information on some well-known cases on the environmental determinants of health, from pollution to environmental degradation.

As mentioned SOCHARA has had a long history of addressing environmental health problems (1). The focus of work has been on empowering impacted communities in understanding and addressing the problem, and creating sustainable solutions with local leadership. Most of the cases in this document have been used over a period of 5 years (until 2017) at SOCHARA as part of the Masters level one-year Community Health Learning Programme (CHLP). Participants are called ‘fellows’ in the spirit of being fellow travellers in the journey towards Health for ALL. Our fellows have used these cases to facilitate reflection and discussion. As the cases are quite short, they are not time consuming, and also add a good variety to the pedagogy. In addition, it has been easy to translate them to other languages as was necessary (Hindi versions were produced for our Madhya Pradesh fellowship programme). At the end of the compilation, we have added a brief analysis of each case using a community health lens. This will help the learner build a community health perspective, and also understand the “how” of addressing these problems. Based on our experience of using these cases with diverse groups of students (at SOCHARA, University of Pune, Rajiv Gandhi

Institute of Public Health, Azim Premji University etc), we recommend faculty of environmental health and environmental studies to use this compilation as a supplement to existing approaches used in classrooms. We await your comments and experiences with this compilation! Feel free to use, edit and share this for non-commercial purposes, with appropriate credits to this compilation.

1. **Objectives of this compilation**
    a. To demonstrate the linkages between environment and health
    b. To support environmental health education for students of social work, public health, and development studies, in conjunction with lectures, multimedia and fieldwork
    c. To illustrate the diversity and complexity of environmental health issues in India and elsewhere
    d. To provide examples of solutions for complex environmental problems, highlighting the role of community action.
    e. To facilitate critical reflection on environmental health problems and solutions
2. **Audience**
    a. Teachers at departments of social work, community health, public health, development studies, and community medicine
    b. Students of social work, community health, public health, development studies, and community medicine
3. **How to use this teaching aid**
    a. Sections and cases: Each section identifies with a broader theme or challenge in environmental health.
        - The cases have been divided into sections mainly to help with organising sessions. Issues in environmental health are cross-cutting between sections.
        - Some cases include more details: case history and epidemiological data, whereas most other cases provide brief overviews and perspectives
        - An effort has been made to include problems and efforts towards solutions in each section.
        - Students can be asked to read a particular case individually following which discussions or activities can be held (as suggested later)

b. Questions and discussions

Sample discussion and enquiry questions have been included in each teaching case. These can be addressed

- individually or
- in groups.

Additional questions can be evolved for each case, as needed.

Authors in some of the included cases have already concluded about what they feel about the issue and its cause, and it is up to the learning facilitator to encourage students to challenge the perspectives of those authors.

The questions are designed to facilitate reflection from a technical and ethical perspective, but these can be omitted or edited based on the needs of the facilitator.

Some questions may require the learner to read additional literature for arriving at a deeper understanding.

c. Group activities through problem tree analysis

To understand “issues”, group exercises such as “problem trees” could be used, where students can brainstorm about

- causes,
- problems and
- effects.

Another approach to help understand about the root causes of any environmental health problem is use the “But why?” line of questioning. This has been illustrated well in the Hesparian Health Guides, which are accessible online.

Students can also be encouraged to illustrate their understanding through causal loop diagrams which can also help demonstrate the “systems” nature of environmental health problems.

d. Other uses

Cases can be used to assess data analysis skills or causal inferences

INTRODUCTION

In the era of the Sustainable Development Goals (SDG) with the 2030 Agenda for Sustainable Development (2), environmental health plays a central role in protecting and securing our planet as well as human health. SDG 13 on Climate Action also specifically emphasises education and capacity building. Climate change currently affects all continents with rising sea levels, extreme weather conditions affecting lives and health of people.

The environment and the ecological system is one of the basic determinants of human health (and also of other living organisms), with environmentally mediated illnesses accounting for over 25% of deaths worldwide (3). This figure is likely to be higher. Based on estimates, around 24% of deaths in India may be due to (indoor and outdoor) air pollution alone (4,5). Climate change has been recognised as the greatest global health challenge of the 21st Century (6).

People are exposed to a variety of potentially harmful environmental agents, which are paradoxically caused largely by human interventions such as pollution and environmental degradation (Figure 1). Reducing environmental health impacts requires the coordinated efforts of various departments and disciplines. Public health has an important role to play in bringing people from diverse backgrounds and institutions together to help mitigate pollution and degradation and improve health.

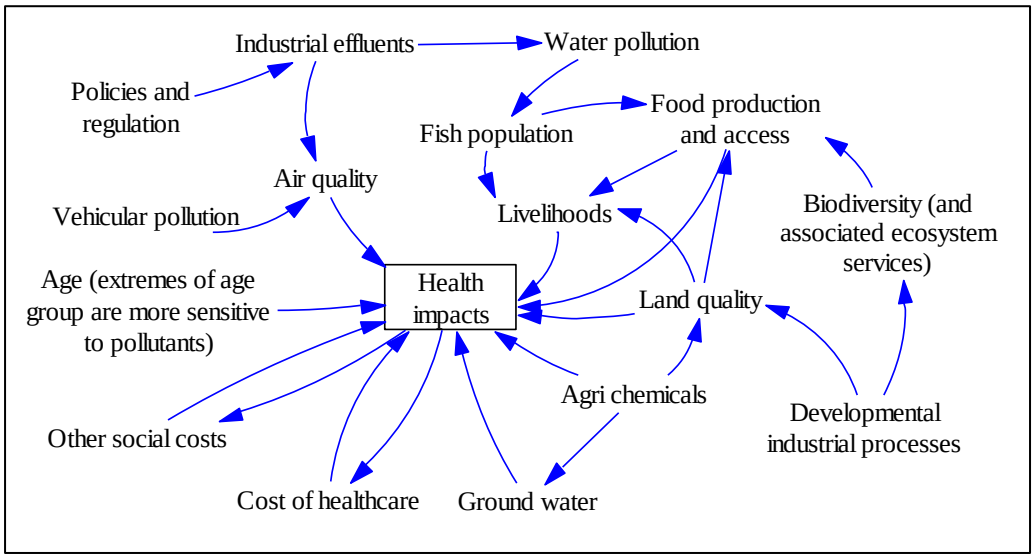

Figure 1: Environmental degradation and health

From "From Crisis to Cure", by R Rajagopalan (7)

The amount of water, trees, minerals, and other natural resources on Earth is limited and finite, while the number of people using these resources is growing rapidly, with exponential utilisation by some. But the number of people is not the real problem. The problem is how these natural resources are distributed and used. Any time one person or a group of people uses more than their fair share of resources, or causes an excess of pollution, this imbalance can lead to environmental health problems for others.

The rich man's explanation of poverty and environmental destruction: Too many people, too little land and resources. The poor people's explanation of poverty and environmental destruction: Unfair distribution of land and resources, too much in the hands of too few.

Some people believe the best way to prevent harm to our environment is to reduce the number of people. This way of thinking leads to 'population control' programs. These programs have failed to improve the lives of people anywhere because they do not address the root causes of environmental destruction, poverty, and poor health. When families have the resources they need to live with health and dignity, many choose to have fewer children. Only when communities, governments, and development programs plan for the survival of children, and the improvement of the social, political, and economic status of women, will the so-called "population problem" be solved.

But reducing the number of people in the world will not address the problem of the unequal use of resources. The best way to reduce the harmful effect people have on the environment is for the rich to use fewer resources, and to use them in a way that conserves resources for the future and does not create an excess of pollution. By first changing the behaviour of those who use the most, we can begin to make sure there will be enough for a healthy life for everyone.

Who should be responsible for encouraging the rich to use fewer resources? How could it be done?

The drivers of environmental degradation are complex and interlinked. We hope that discussions around this collection of case studies will aid in understanding and responding to their complexity.

SECTION 1: AGRICULTURE, BIODIVERSITY AND HEALTH

1. The Endosulfan Tragedy of Kasargod

Kasargod is a hilly area in the northern part of Kerala, India, where cashew plantations are a prominent feature due to an environment conducive for their growth. On the recommendation of an agricultural scientist, the Plantation Corporation of Kerala initiated application of a pesticide called endosulfan aerially (by helicopter) in 1978 (and previously in 1976-77 on a pilot basis) to protect cashew trees against the tea mosquito pest (8).

Figure 2: Helicopter used for spraying (Photo credit: Thanal)

a. Why do you think aerial spraying was chosen as the approach to apply pesticide?

There were several villages located within and around the plantations, within the aerial spraying operation area. Initially, local people and especially children came out of their houses to see the helicopters fly by and spray the plantations. Local residents were not provided any information on precautionary measures when spraying operations were being conducted.

b. Whose responsibility should it be to ensure that concerns on exposure to the pesticide are communicated and reduced?

In the years after the initiation of spraying, the local people noticed several changes occurring one after the other in the area. The bees were the first to get affected, and the entire bee

population was wiped out in the same year when spraying was initiated. Farmers who would rear bees earlier had to abandon the practice as they was not successful despite efforts. In a few years, a decline in several species of birds, frogs and foxes was noted.

Figure 3: Deformities among domestic animals (Taken from a Thanal document)

c. In what ways would the disappearance of bees, birds, frogs and small mammals affect the local people?

Within a year domestic animals began to give birth to offspring with unusually frequent physical deformities. By 1979, local people including a local doctor were concerned. Dr Mohan Kumar a general practitioner saw several patients with birth deformities and mental retardation. He wrote about it in the local newspapers stimulating local and regional debates about the safety of endosulfan. In addition to birth anomalies, health workers noted an increased rate of abortions, gynecological disorders and cancers in the area. Such problems, which are normally rare, began to be reported from every other household in the sprayed villages.

Figure 4: Birth defects in the exposed areas of Kasargod (Photo credit: Thanal)

d. Which sections of the population are most sensitive to the toxic impacts of chemicals? Why?

Activists supported local residents to initiate a movement against the spraying of endosulfan in the 1980s. The battle continued until 1999, when formal studies on the health situation of Kasargod and its causes were taken up by research institutions and public interest groups.

Studies conducted by NGOs, international experts and those commissioned by the state government linked the health problems to endosulfan spraying. SOCHARA's team member, Dr Rajkumar, produced a documentary titled '*Sprays of Misery'* which chronicled the spraying operations, the health impacts and people's advocacy efforts towards banning of endosulfan spraying. A report by the National Institute of Occupational Health (NIOH) was cited by the Centre for Science and the Environment:

The report showed presence of endosulfan residues in water samples as well as in blood samples from Padre Village. *The second part of the report was released in July 2002 (9).*

*Table 1: Level of endosulfan in water sources in Kasargod**

Source	Well	Suranga	Stream	Pond
Level (in parts per billion)	0.029	0.0087	0.0204	0.0667

*Reproduced from a report by National Institute of Occupational Health in July, 2002 (10)

e. What is the point of testing environmental samples for any chemical or plausible pollutant while investigating a public health problem?

*Table 2: Learning disability prevalence as reported by class teachers and annual exams**

Parameter	Reference population (n=416)	Study population (n=619)	P value of difference in proportion	Relative risk (95% Confidence Interval)
Learning disability	11 (2.6%)	66 (10.7%)	P<0.001	4.03 (2.16 – 7.54)
Retained in the same class	56 (13.50%)	126 (20.40%)	P=0.0055	1.51 (1.13 – 2.02)

*Reproduced from a report by National Institute of Occupational Health in July, 2002 (10)

The report concluded that there was a higher prevalence of congenital malformations in exposed groups, lower IQ (intelligence quotient), scholastic backwardness, learning disability, early menarche in girls and delayed puberty in boys (9).

f. What may be the value of these prevalence statistics and tests for statistical associations? Comment on the quality of evidence.
g. How can "high" prevalence of a health problem be ascertained?
h. What were the factors that helped identify endosulfan as the reason for the various unusual health problems in the area?

The NIOH study additionally revealed several other disproportionate impacts on development of reproductive organs, other endocrine disorders, and neuro-developmental disorders.

In 2001, the government suspended the use of endosulfan, and this later led to a ban after a High Court order in 2002. As of 2012, there were plans to make Kasargod an organic district. Since the ban on pesticides, the situation has been improving. A farmer interviewed stated that the bees had returned to the district in 2008 after many years.

Figure 5: Bee-keeping has made a return at Kasargod (Photo credit: Adithya Pradyumna)

i. What can local species tell us about chemical pollution?

The disease profile of Kasargod district has also changed. There are fewer abortions, and virtually no new cases of birth deformities or cancers have been recorded in these areas in recent times. The Kasargod Endosulfan Relief and Remediation Cell, located in the district *panchayat* (local body) office, worked with civil society groups and concerned individuals to provide healthcare and special educational support for the affected population. A list of victims was prepared and continues to be updated based on new information and advocacy. Support from local medical colleges has been taken. Special schools for children in the affected villages have also been opened by the government. Private philanthropic groups have pitched in to provide financial and medical support to affected families.

j. Reflect on the impacts of the illnesses on the families in the area. How could these be addressed through the relief processes?
k. What would be the role of public health professionals in the relief and remediation process? What technical and ethical challenges might they face?

The campaign to ban endosulfan spraying and to provide relief for the affected can be considered successful, though there are some aspects which could still be improved upon.

l. In your opinion, was the campaign successful? How should we determine the success of a social justice campaign?
m. Can it be said that the impacts achieved are a result of community action? Who were all the stakeholders involved?

There are several factors underlying the success in achieving a ban on aerial application of endosulfan:

- the technically straightforward nature of the case
- a strong people's movement
- good quality health research – overwhelming evidence
- a sympathetic judge
- a supportive government

More details are available at: http://www.cseindia.org/node/1927

2. Developmental interventions and biodiversity

[Based on an article by P Sainath in "*Everybody loves a good drought"(11)]*

Each successive government has tried its hand at using quick measures to reduce poverty, using expert driven technology in various parts of India. This case, based in Nuapada in Orissa, is about the support and promotion of high yielding variety livestock to increase dairy yields.

The local population was informed of a "miracle cow" which would help increase dairy yields and add to income. The idea was to use semen from a high yielding Jersey variety through artificial insemination into local cows. The overall goal of the project was poverty reduction.

a. What are the various strategies used towards poverty reduction?

One worry among the officials was the possibility of the cows mating with the local bulls. To address this, interventions were made to prevent the breeding of cows with local bulls. A castration drive was made in the whole region.

A lot of money was spent for this dairy development scheme over a couple of years in the area, but at the end of it, the result was not what was expected. In the entire region, only 8 cross-bred calves were born. Also within the next 10 years, not a single local stud bull was to be seen – because of the castration drive that was conducted earlier. The Khariar bull was all but extinct.

b. Why do you think there were such a small number of cross-bred calves, and did they survive?
c. Is there any way through which the Khariar bull can be brought back?

On reflection, the locals mentioned that the local Khariar breed would produce 4-5 litres of milk each day, and so they wonder why such a scheme was instituted in the first place. The people were never consulted on the need for such a project – they were only seen as passive beneficiaries rather than active participants in the programme.

d. Is a good intention good enough? What more could have been done by the government towards making the programme useful and not disastrous?

Biodiversity is now receiving the attention it deserves as a key determinant of environmental health (10). Efforts are underway the world over to conserve native varieties of plants and domestic animals. Poverty reduction strategies, especially in the context of climate change adaptation, are looking to strengthen the local varieties rather than introduce foreign varieties.

3. Watershed damage in the Aguan River Valley

[From "A Community Guide to Environmental Health", by Conant and Fadem, Hesparian (12)]

Forty years ago the hills above the Aguan River were forested. The valley was one of the most fertile regions in all of Honduras, and provided a good livelihood for people in many villages and farms. Many small, clear streams flowed down from the hills into the blue Aguan River. The river flowed through the heart of the valley and into the Caribbean Sea.
Then people started cutting down trees to use more land for farming and cattle grazing. Big fruit companies came in and cut down more trees to grow banana plantations. Families started moving into the hills because the best valley land had been taken by rich landowners. Finally, most of the trees were cut down and there were many more people living on the hillsides. There was less water in the river and streams, and the water was no longer clear.
The people of the Aguan Valley knew things had changed, but it took a hurricane to make them understand how much their watershed had been damaged. Heavy rains caused landslides in the hills. Many homes and entire villages were washed away. Many people died and many more became ill.

a. Why did the rains cause landslides in the Aguan Valley?
b. If people were better off economically after clearing the forests, why were they not able to protect themselves?

As they worked together to recover from the storm, people began to see that the loss of trees on the hillsides, the landslides, and their health problems were all related. Cattle polluted their drinking water, causing diarrhoea and other illness in their children.

Harvests got worse. Because the soil no longer held water from the rainy season, the fields dried out quickly. Then when the winter rain came, it washed the soil away. Harvests were so poor that people were always hungry, and hunger made their health problems worse. The villagers began to understand that to improve their health, they had to protect their watershed.

c. Discuss the acute and chronic health challenges that resulted in the Aguan Valley after the forests were cleared.

Improving health in the Aguan River Valley

The hurricane that hit Honduras affected everyone in the Aguan River watershed, so everyone was willing to work together to recover. People from towns and villages all over the valley began to meet. There had been landslides everywhere and many people were without homes. With help from local religious institutions, they began talking about how to fix their problems in a lasting way.

As they rebuilt their communities, they learned that the way they farmed could either damage or protect the land. Farmers could improve the soil and prevent erosion by planting in rows across the hillsides instead of up and down. And drainage ditches, stone walls, and other barriers they made could protect their hillsides. The farmers were glad to learn new ways to protect their lands. But they also knew that the people doing the most harm were the cattle ranchers and plantation owners. Villagers and farmers began visiting families who had large banana plantations or ranches with many cattle. The villagers spoke with the large landowners about the importance of protecting the water for everyone. “It is not only the poor who suffer from the effects of damaged land and contaminated water,” they said. “It is all of us.”

d. Were the solutions that emerged from group meetings expensive or technically complex?
e. In what ways might the cattle have been affecting local ecology?

Over time, even the richest landowners in the valley began to help in the recovery effort. Some agreed to fence the creeks and springs to keep cattle out. Others, who owned land in the hills, let the villagers who had land below plant trees on their hillsides. Farmers from the valley approached landowners near the hilltops and offered to trade some of their land for permission to fence and protect the lands above. It was better for ranchers to have valley land for their cattle and better for the whole community to keep cattle off the hilltops, so the plan helped everyone.

f. What made possible the emergence of these solutions?

After the hurricane, villagers in the Aguan River Valley began to have good relations among people who once had rarely spoken to each other. They learned that by protecting their watershed, they and their children would have cleaner water and safer homes. This is good for the watershed and good for the community.

Aguan River Valley Watershed Action Plan

1. Do not cut vegetation near water sources.
2. Help young trees grow, and reforest areas that have few trees, especially close to water sources.
3. Start community nurseries to grow plants for reforestation.
4. Organize groups to prevent and fight forest fires. Educate local farmers not to burn their fields, or how to do safe, controlled fires.
5. Fence the area around water sources and post "Protected Area" signs.
6. Encourage farmers to conserve soil by using green manures, recycling crop wastes, building retaining walls, and planting on contour lines.
7. Discourage the use of chemical pesticides and fertilizers.
8. Work with the local government and water commissions to move toilets, sewer systems, and washing areas away from water sources.
9. Organize community trash collection, and prevent trash from washing into streams and rivers.
10. Move cattle away from water sources, and mark areas where no cattle should graze.
11. Make sure people who have just moved to the community and new businesses learn about the watershed and how they can help care for it.

4. Changes in farming: Green Revolution in Cambodia

[From "A Community Guide to Environmental Health", by Conant and Fadem, Hesparian (12)]

In Prey Veng, Cambodia, people have grown enough rice to feed themselves for as long as anyone can remember. Along with rice, they traditionally ate wild greens, fish, eels, snakes and other animals from the rice paddy, as well as fruits, nuts, and roots from the forest, and meat from animals they hunt. This diet gave them good health all year round, except in times of war or flooding.

More than 40 years ago, the government began to promote new farming methods to increase production of a few main crops, like rice, for export. These new methods were part of a worldwide change in agriculture, the deceptively named Green Revolution. The Green Revolution encouraged the use of chemical pesticides and fertilizers to produce more rice than traditional methods. It also used large irrigation systems and machinery to plant and harvest.

When they started using these new farming methods, the people of Prey Veng were able to produce large amounts of rice to sell. They used the money to improve their houses, build roads, and buy personal goods like clothes and radios. The villagers stopped using animal manure, stopped rotating rice with dry season crops, and stopped using other traditional farming methods as well.

The new methods worked very well for growing large areas of a single crop, and increased the amount of rice they had. But over time, they discovered that their land and the way they ate had changed. Herbicides killed the wild greens the villagers had eaten before. Fish and other wild foods grew scarce. Year by year they spent more money on chemicals and had nothing but rice to eat. Before long, the soil in their fields no longer supported healthy crops, and rice yields began to go down.

a. How might have the new changes affected nutrition?
b. What other new health concerns may have arisen through the Green Revolution approach?

Coming together to discuss the growing hunger, the villagers recalled the old ways of farming that used mixed crops, field rotations, and natural fertilizers to grow crops all year

round. They saw many advantages to the traditional methods, and decided to change back. They also began trying new methods like planting rice plants closer together and growing different crops in the same field.

There were hungry years while their soil recovered fertility after heavy chemical use, but now the villagers of Prey Veng have more food. They have less rice to sell, but more variety of foods to eat. As Meas Nee, one of the village elders, said, "Because we grow food in the ways of our ancestors, the ancestors are happier, the fields are happier, and we are healthier."

c. How could the people of Prey Veng be happier if they were producing less rice through the traditional methods?

5. The People's Grocery

[From "A Community Guide to Environmental Health", by Conant and Fadem, Hesparian (12)]

Like many urban areas in the United States, West Oakland (in California) has more stores that sell alcohol and junk food than ones that offer healthy, fresh food. With stores that do sell healthy food setting prices too high for most people in the community, many people in West Oakland are malnourished or overweight. Problems of alcoholism, drug abuse, and violence make the community a dangerous place to live. Almost 1 of every 4 people in West Oakland depends on emergency food programs.

a. Why are healthy foods expensive and unhealthy foods cheap?

Seeing this problem, some people got together to bring healthy food to the community at prices people could afford. They began by raising money to buy a truck. They painted the truck in bright colours and put in a stereo system that played popular music. Every week they drove to farmers' markets in other parts of the city and brought back vegetables and fruit. They parked on street corners where people gathered, played music to attract more people, and sold the fresh food at low prices. As they sold food, they talked to people about the importance of a healthy diet.

They called their mobile market The People's Grocery and invited people from the community to join them. Some people decided to start a community garden to grow fresh

produce that could be sold by the People's Grocery truck. Young and old people worked together and learned how to grow food. Other people planted gardens of their own. Soon a nearby school and community centre also planted gardens. Most of the food from these gardens was sold by the People's Grocery truck.

b. Why do you think this initiative became popular with local people?
c. What did the people have to do to transform their locally available spaces to grow gardens?

After success in the community, the People's Grocery asked the city government for land, funds, and advertising. With some government support, they thought their project could feed many more people. People's Grocery continues to build the local food system and economy, improving food security for everyone in West Oakland. People's Grocery says no one should live without healthy food just because they are poor or live in the city. They say: In order to have food security, we need food justice!

d. Why did they call this a matter of "food justice"?

6. The Green Belt Movement

From "A Community Guide to Environmental Health", by Conant and Fadem, Hesparian (12).

Wangari Maathai, a woman from the East African country of Kenya, says Mount Kenya used to be a shy mountain always hidden behind clouds. This mountain is sacred to her people because many rivers flow from the forests that once covered the mountain's slopes. Now, Mount Kenya is no longer shy. The clouds that covered it are gone, and so are the forests. And with the loss of the forests and clouds, the rivers also have begun to dry up. As she grew up, Wangari saw how deforestation led to soil erosion, loss of water sources, and a scarcity of firewood. She began to understand that deforestation caused poverty and drought. So Wangari began planting trees. Wangari organized a group of women to plant trees around their homes and fields. Because they planted trees in rows or "belts," they became known as the Green Belt Movement. The women of the Green Belt Movement began to teach other people how their lives were affected by deforestation and to plant trees with them. They

brought fruit trees to farmers, and planted them on hillsides to prevent erosion. By planting trees in both cities and villages to create green spaces, give shade, and to provide firewood, they showed how planting trees could solve many problems. The Green Belt Movement also planted vegetable gardens, built small dams to capture rainwater, and held workshops to help people understand the need for healthy forests.

a. Are you aware about any community led movement in India which protected forests in the Himalayas?
b. How could forests help local communities?

In taking responsibility for their environment, the Green Belt Movement realized they needed the support of their government to care for the environment for the good of all Kenyans. Planting trees became an expression of a movement for peace and democracy in Kenya. When conflicts arose between different communities, the Green Belt Movement used "peace trees" to help bring them together.

c. Why is the role of government always important in solving major social challenges?

Figure 6: The Green Belt Movement (Courtesy: Peter Ndunda; http://www.imagingnotes.com/go/article_freeJ.php?mp_id=310)

As a woman who planted trees, Wangari became a hero in her country. But she also faced many hardships. Unable to live with such a strong woman, her husband left her. Because she organized among the poor, her government arrested her. But because of her bravery, and the work of thousands of Kenyans, the Green Belt Movement succeeded in planting millions of trees.

d. Why did the government arrest her for organising the poor?

In 2004, Wangari Maathai won the Nobel Peace Prize, one of the most honoured awards in the world. The prize was given to her' for promoting peace through sustainable development that includes democracy, human rights, and equality for women. And it all started with planting trees.

Figure 7: Wangari Maathai (Picture Credit: Oregon State University)

e. What is sustainable development? What are the pillars of sustainable development?
f. How may have planting trees benefited women?

7. Managing natural resources collectively

[From “From Crisis to Cure”, by R Rajagopalan (7)]

'If you provide food and water security to rural people, they will never leave their villages,' he

used to say. In fact, his watershed development and water conservation project at Ambegaon in Pune district succeeded in reducing the migration of rural people to urban areas by 80 per cent.

a. Why might water security reduce rural to urban migration?
b. What is meant by water security and food security?

Vilasrao Salunkhe was an electrical engineer and for many years worked for the Maharashtra State Government. The severe drought of 1972 in Maharashtra was a turning point in Salunkhe's life. It was then that he started working for the drought-affected people of Purandar Taluka. Salunkhe realized that watershed development with the full participation of the community was the only solution. He initially tried his ideas on a 16-hectare plot on a hillside in Naigaon vilIage. He got the barren and uncultivable land from a trust on a 50-year lease and built a hut where he and his family lived and worked with the community. He raised a series of contour bunds to trap water and check soil erosion. At the base of the hill slope, a percolation tank was constructed. A well was dug below it and water pumped from there up the hill slope for irrigating the fields. Trees were planted in the rocky areas. Slowly production from the land increased.

c. What is drought?

Meanwhile, Salunkhe developed his idea of a *Pani Panchayat*. The basic philosophy of the *Pani Panchayat* was to share the water that was available. Salunkhe believed that without a system of equitable distribution of water, watershed development would remain lopsided, benefitting only those who could afford to transport water to their fields. He evolved five basic principles of the *Pani Panchayat*:

• Irrigation schemes are undertaken for groups of farmers, rather than for individuals.
• Cropping is restricted to seasonal crops with low water requirement. Crops like sugarcane, bananas, and turmeric cannot be cultivated.
• Water rights are not attached to land rights. If land is sold, the water rights revert back to the farmers' collective.
• All members of the community, including the landless have the right to water.
• The beneficiaries of the *Panchayat* have to bear 20 per cent of the cost of the scheme. They

have to plan, administer, and manage the scheme and distribute water in an equitable manner.

Salunkhe relentlessly fought for the equitable distribution of water, irrespective of landholding and advocated an 800 cu. m quota of water per capita per year. He forced the government to include the principle of equitable distribution in its water programme. However, the government and vested interests somehow managed to defeat him when it came to the actual implementation.

d. Why might people want to control the water for personal gains?

In later years, Salunkhe was active in the tribal belts of Maharashtra. He also took a keen interest in organic farming. At the time of his death, he was engaged in spearheading the Chikotra Valley agitation in Kolhapur to secure an equal share of water for residents of 52 villages in the valley. Salunkhe's Naigaon pattern of watershed development on wasteland won him international recognition and the Swedish International Inventor Award in 1985 and also the Jamnalal Bajaj Award for meritorious social service in 1986. He passed away in 2002 at the age of 65.

8. How to manage a natural resource crisis

[From “From Crisis to Cure”, by R Rajagopalan (7)]

Imagine a country that suddenly finds itself with no fertilizer or pesticide for its fields and all imports of meat, grains, and processed foods gone. Most countries would not be able to recover from such a crisis, but this is the story of one country that did. The small island of Cuba has for long been under severe economic sanctions imposed by its neighbour, the US. It had depended on the Soviet Union and the Eastern Bloc, with which it exchanged its sugar for fertilizers, oil, and grains.

a. Why did Cuba exchange sugar for various other goods with the Soviet Union?

When the Soviet Union collapsed in 1989, Cuba's economy and food security were seriously threatened. The people were facing starvation. The Cuban government's answer was a major

shift to organic farming. Today, the country is hailed as a success story in organic farming. The strategy was to transform derelict city plots into well-funded vegetable gardens under the supervision of organic farming associations. Today thousands of gardens across Cuba produce organic vegetables and many other crops. Organic farming on small family plots (as of 2007-08) provided employment to 326,000 people out of a population of 12 million.

b. By shifting to organic farming, the dependence on what kind of imports reduced for Cuba?

The gardens use organic compost and mulch instead of chemical fertilizers, biological pest control methods instead of chemical pesticides, and other eco-friendly techniques. Giant greenhouses produce vegetables in all seasons. Organic sugar and coffee are now being produced. The organic gardening associations bring together farmers, farm managers, field experts, researchers, and government officials to develop and promote organic farming methods. Its aim is to convince Cuban farmers and policy-makers that the country's previous high-input farming model was too import-dependent and environmentally damaging to be sustainable, and that the organic alternative has the potential to achieve equally good yields.
In recognition of the remarkable transformation of Cuban agriculture, the apex Cuban Organic Farming Association was awarded the Right Livelihood Award in 1999. The Cuban success in shifting to organic farming points the way to the rest of the world.

c. The import of oil also affected the transport sector? How did the Cubans respond? What impacts on health did the response have?

A very good account of Cuba's response to the challenges in the transport sector are available in "The Energy Glut" by Ian Roberts (13).

SECTION 2: INDUSTRY AND ENVIRONMENTAL HEALTH

9. The Kodaikanal mercury pollution case study

The company Ponds India Ltd. set up a thermometer factory at Kodaikanal in Tamil Nadu in 1984. This was done as the colder temperature reduces the evaporation of mercury (which is used in making the thermometers), which is a liquid at room temperature. It was eventually taken over by Hindustan Lever Limited (a part of Unilever). Local people were employed in the factory.

It has been known for centuries that mercury is highly poisonous, but its properties make it a good material for measuring small changes in temperature. The factory employees later reported that over the 20 years of its operations, the management never informed the workers about the toxic nature of mercury, the dangers of exposure, and also the personal protection measures to safeguard from exposure.

a. Whose responsibility is it to prevent exposure of workers to hazardous chemicals at workplace?

It was also found subsequently that the factory had dumped several tons of mercury-contaminated glass at a local scrap yard, which sold the glass to a bangle manufacturer. It was also reported that several tons of mercury was illegally dumped in the forests and watersheds around the factory. These watersheds drain into the Pambar River which is utilised for fishing and for domestic water requirements.

The issues were taken up by a public interest group, and studies were conducted in the area. The soil, the water in the streams, and the local plants showed levels of mercury which were much higher than the permissible limits.

b. What is the purpose of permissible limits of pollutants issued by authorities such as the Pollution Control Board?
c. If mercury was found in the soil, water and plants, why is it of concern to people?

There were incidents of workers of the factory dying of kidney failure. Following a national-level workshop in 2002 (the Community Health and Environmental Survey Skill-share), team members from SOCHARA contributed by conducting health surveys and studies among the workers.

d. What is the point in training local leaders and grassroots organisations about the health impacts of pollution, and in conducting health surveys?

An important point in the campaign came when Dr Mohan Isaac, a senior psychiatrist associated with NIMHANS and SOCHARA visited Kodaikanal and conducted medical examination of 30 workers. The survey showed that some cases had symptoms that could be due to mercury poisoning (especially gum problems and skin allergies). In addition, health was given as a reason by 12 of 30 examined persons for leaving the job prematurely. The conclusion was that there was a need for a detailed examination of all workers (14).

Table 3: Health problems identified among few workers

Health problems	**Numbers**
Gum and teeth problems	9
Non-specific functional (psychiatric) symptoms	9
Skin problems of lower and upper extremities	5
Gastrointestinal tract disorders	3
Renal problems	2
Infertility	2
Recurrent depression	1
White discharge	1

The results were also discussed with concerned public interest groups who also shared it with the workers.

e. All the health problems listed here are non-specific symptoms and syndromes. So what value does it add? How to interpret findings from such a rapid survey?

f. Do you think these people who were included in the survey were exposed? How can that be ascertained?
g. How can a health survey strengthen a local campaign for social justice?

The factory was closed in 2001 due to public protests, and the company has since been instructed to clean the premises. The Indian Peoples Tribunal reviewed all the evidence of the case and gave a strong verdict against the company. This included a critique by SOCHARA members on a health study presented by the company.

h. Why is it important to critique studies conducted by companies produced in their defence?

The campaign has empowered the workers and the public of Kodaikanal with information on the effects of mercury. A legal approach was taken towards addressing the issue – which included compensation for health damages and the clean-up of all contaminated areas including the factory site. While some reports by reputed institutions showed that health effects were not related to exposure to mercury in the factory, others stated that impacts were faced by the workers and their children.

Eventually, the company was ordered to clean up the site, but a lower standard was adopted, potentially to reduce costs. Clean ups are often expensive as large areas can be contaminated.

i. Why was it important to clean up the mercury contamination to the best possible degree?
j. How could the company have managed the situation better from the start?

Until 2015, no compensation was paid or any health relief provided. Later, due to the creative use of social media (https://www.youtube.com/watch?v=nSal-ms0vcI) , the workers campaign took an upward turn. The issue of social injustice was brought to international limelight which received attention from global celebrities, forcing Unilever to enter into negotiations with the workers.

k. The comments by celebrities on social media platforms have forced a response from

the company. Why is that the case?

In March, 2016, it was reported that the company has entered into a settlement with the workers, and will benefit 591 families – with the package including healthcare and livelihood support. However, as of the time of publication of this compilation, it remained unclear whether the clean-up of the contaminated area will be taken up.

For further information on the processes and reports: http://kodaimercury.org/

10. Energy and health – unaccounted health costs

There has been a thrust towards production of energy to support the "growing economy" and also provide improved quality of life for people. Singrauli region of Madhya Pradesh and adjoining part of Uttar Pradesh is the "Energy Capital of India", producing over 10% of India's electricity. However, several local communities around Singrauli didn't have access to power as of 2013.

a. Is it a matter of concern that Singrauli's communities don't have access to power? Why do you think so?

Figure 8: Thermal power production in Singrauli

In addition, various studies showed that the local air was polluted, and that the local water

was contaminated with mercury and other heavy metals (15).

"In 1998, Indian Institute of Toxicology Research (IITR), Lucknow, conducted an environmental epidemiological study in the Singrauli region. During the study, over 1,200 people were examined and it was found the mean mercury level in their blood was significantly high. Sixty-six per cent of the people examined had more than 5 ppb mercury in their blood. Mean mercury in hair was also significantly high. The study also tested vegetables, drinking water and fish in the area." (15)

Hair samples are commonly tested for detecting heavy metal exposure.

b. What was the potential source of mercury found in the people of Singrauli?
c. What are the routes through which exposure to mercury can happen?

"After CSE's laboratory tests on mercury, the non-profit surveyed 64 people between two and 70 years from Sonbhadra. The survey found high incidence of vitiligo, or skin discolouration, shivers, respiratory illnesses, joint or abdominal pain, reduced vision, burning sensation in the limbs and impaired language skills. All these are known to be symptoms of mercury exposure."(15)

d. What additional information would you like to have about these people who were surveyed for health problems?
e. Does the information shared here warrant urgent attention by the regulatory authorities?

Thermal power is associated with a host of harmful pollutants, most importantly – particulate matter and heavy metals. Local people also mentioned about the impact of blasting (through damage to houses), noise, pollution of water bodies and soil, dust, and road traffic accidents.

Figure 9: Mixing of ash from the ash pond into the reservoir

Coal mining requires large tracts of land, and so communities living in such areas are threatened with displacement. However, there is some scope for rehabilitation. For those impacted by thermal power, it is a great challenge to access clean water and air.
It is interesting to note that local people are no longer eating local fish, but eat those imported from Kolkata. Fish from here is sold in other areas.

f. Why might eating fish from this area be a cause for concern?

In India, air pollution due to thermal plants alone might be responsible for the deaths of approximately 100,000 people and 20 million cases of acute exacerbation of asthma each year (16). Emission standards in India are as follows (as compared to some other countries) [cited in (16)]:

Country	**PM Standard/s**	**Standards for Mercury, sulphur oxides, nitrogen oxides**
India	350mg/Nm3 for plants <210MW 150mg/Nm3 for plants >210MW	Created in 2016 and are yet to become active
China	30mg/Nm3 20mg/Nm3 for key regions	Available even as of 2013 for all, except mercury
USA	37mg/nM3 for older plants 6mg/Nm3 for new plants	Available even in 2013

g. Should the disease burden associated with air pollution from thermal power plants be a matter of public health concern? Why?

h. Why do you think there are different standards across countries?
i. The cost of pollution (in terms of loss of health, and money for treatment) is huge. Who is paying for it?

Environmental Impact Assessment is conducted before setting up thermal plants (or other large projects) to ensure that the suggested site is appropriate for the project and addressing any concerns for health and wellbeing of the surrounding population and environment. An assessment of the policy and practice of Environmental Impact Assessment in India showed huge deficiencies (17).

j. Are there alternatives to coal-based energy?
k. Will these alternatives adequately support local needs?
l. Are the alternatives economically feasible?

11. The Bhopal Gas Tragedy and civil society response

The gas leak at the Union Carbide plant in Bhopal occurred on the night of 2nd December 1984. The disaster was unprecedented, killing thousands of people overnight and permanently injuring several thousand more. Deaths due to chronic health conditions that resulted from the disaster and its aftermath continue to occur.

a. Why did the gas leak occur?
b. Why were those who got affected primarily from lower socio-economic families?

While the local residents and the rest of the world were still coming to terms with the disaster, the medico friend circle (mfc), a group of health workers and professionals concerned about social justice, received requests from local groups and civil society organisations for their involvement with the relief efforts. They decided to get involved, and the reasons for their involvement were many and urgent.

At Bhopal, confusion was aplenty. Doctors had various theories on how the affected should be treated. The guilty company, Union Carbide, had refused to share information on the nature of the gas that had leaked, and there was inadequate effort from the authorities towards

this. Without this information, whatever treatment regimes had been initiated was based on guesswork, and several lives which potentially could have been saved were being lost due to inappropriate treatment. Groups from the affected community and the several other concerned citizens and groups questioned the stance taken by the government and the company.

c. What was the reason for the company not to share information on the composition of the leaked gas?
d. Why did the authorities not demand for this information?

Members of mfc initiated a process of research, communication and rehabilitation of the victims of the disaster. mfc was also one of the first civil society groups to initiate a detailed research exercise at Bhopal. This study systematically revealed the health impact on the exposed communities. The nature of these health effects suggested a chronic cyanide or cyanogenic poisoning like mechanism, which added evidence to the existing controversy about how the health effects were caused. Several recommendations were given to the government and other groups based on this study, and a call was made for the use of evidence-based sensitive action. One recommendation was the use of a compound called 'sodium thiosulphate' to detoxify the victims, which generated debate in the medical circles. Later on, the results of a detailed study by the Indian Council of Medical Research supported the use of thiosulphate for the treatment and rehabilitation of victims.

e. What was the main product being manufactured at the Union Carbide plant?
f. Why was the use of sodium thiosulphate initially a matter of controversy?

Findings from the mfc Bhopal study, which was conducted almost 4 months after the disaster, have been shared in Table 4.

*Table 4: Comparison of symptoms in JP Nagar (exposed) and Anna Nagar (unexposed)**

Symptom	**JP Nagar in % (n)**	**Anna Nagar in % (n)**	**P value**
Breathless on usual exertion	87.16 (129)	35.5 (49)	<0.001
Chest pain/tightness	50.0 (74)	26.08 (36)	<0.001
Weakness in extremities	65.54 (97)	36.95 (51)	<0.001
Fatigue	81.08 (120)	39.85 (55)	<0.001
Anorexia	66.21 (98)	28.26 (39)	<0.001

Nausea	58.10 (86)	16.66 (23)	<0.001
Abdominal pain	53.37 (79)	25.39 (35)	<0.001
Flatulence	68.91 (102)	25.36 (35)	<0.001
Blurred Vision/Photophobia	77.02 (114)	38.40 (53)	<0.001
Abnormal distant vision	42.0 (65/141)	21.88 (21.96)	<0.001
Loss of memory for recent events	45.27 (67)	11.59 (16)	<0.001
Tingling & Numbness	54.72 (81)	20.28 (28)	<0.001
Headache	66.89 (99)	42.02 (58)	<0.001
Muscle ache	72.97 (108)	36.23 (50)	<0.001
Anxiety/depression	43.92 (65)	10.14 (14)	<0.001
Impotence	8.10 (12)	0.72 (1)	<0.05
Haemoglobin (male) (mean gm%, with standard deviation)	14.68 (1.79)	12.70 (1.35)	<0.01
Haemoglobin (female) (mean gm% with standard deviation)	12.7 (1.46)	10.79 (1.34)	<0.001

*Taken from the 1985 publication by medico friend circle (18)

g. How may have the “exposed” and “unexposed” areas been defined for the study?
h. What kind of statistical test has been performed here?
i. What do you feel about the list of symptoms included in the table?
j. What is your interpretation of the data?

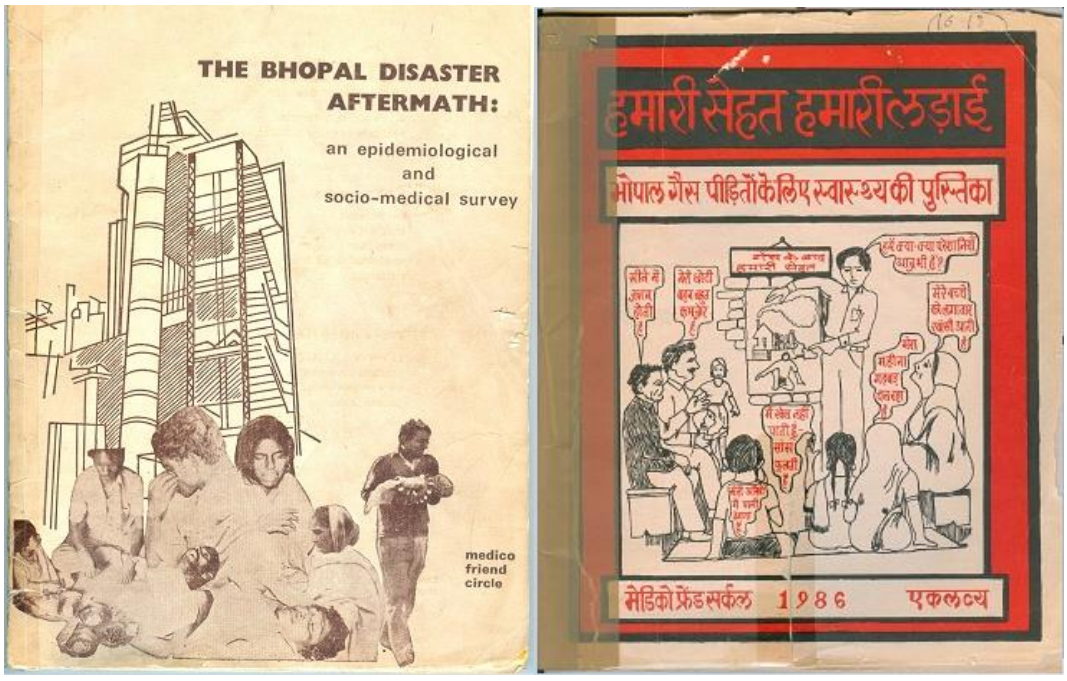

Figure 10: Publications released by civil society groups in the context of the Gas Tragedy

The monthly mfc bulletin carried updates of these activities from the field. The priority was

to identify and address the gaps in the ongoing process of relief and rehabilitation. In an effort to empower the affected communities and the local physicians with the necessary information, a unique and innovative communication effort was made in the form of an informative illustrated manual called '*Hamari Sehat Hamari Ladai'* was also drafted with the Ekalavya trust.

k. Why was it important to demystify information for the community?
l. Whose responsibility should this be to make this communication?

An epidemiological review paper was also published with the available evidence on mortality and morbidity due to Bhopal tragedy (19). The evidence generated through these processes was continuously updated and presented at international conferences including the Permanent Peoples Tribunal. Later that year, mfc also organised a meeting on Pesticides and Health where the health impacts of the production and use of chemicals in agriculture was discussed.

It was written later that mfc's scientific report on the health situation in Bhopal was "probably the most sane, compassionate piece of scholarship on the problem of relief in Bhopal". It highlighted the paradigm shift in the approach used (20):

Patient as an analytical grid --> patient as a person
Clinical gaze of the doctors --> victim's speech aids diagnosis
Focus of diagnosis is the hospital --> focus of diagnosis is the community
Diagnoses as mechanics of cause and effect --> diagnosis as an analysis of inter-relationships
Pulmonary Model --> Cyanogen Pool Model
Anti Thiosulphate --> Use of Sodium Thiosulphate as a critical tool

m. Why was mfc's work described as "compassionate"?

12. Development Induced Displacement

Adapted from two articles by P Sainath in "Everybody loves a good drought" (Pg. 71 and Pg. 104 (11))

While we reflect on the process of "development", it is also important to reflect on "development for whom?" Between 1951 and 1990, over 2 crore (20 million) people have been displaced by dams and canals alone in India. Even the governmental draft rehabilitation policy states that nearly 75% of those displaced since 1951 "are still awaiting rehabilitation". In addition, these estimates do not include the affected families that do not own land.
There is a gross inequality in those who are routinely displaced involuntarily, which is exemplified by this statistic: Tribals constitute just 8% of India's population, but they account for more than 40% of displaced persons from all projects. So it would appear that the poorest continue to sacrifice for the development of the well to do.

a. Explain how the statistics reveal that tribal populations have been disproportionately impacted by developmental projects.
b. Why might tribal communities be the most vulnerable to large developmental projects?

Residents of Jhabua district of Madhya Pradesh expressed concerns: *"There are innumerable things that we get from the forests here which we have to pay for in Gujarat. Who will compensate us for that?"* They also stated their lack of experience of dealing with traders for procuring basic necessities and the possibility of getting cheated.

c. What needs of the community may have been met in the local forest?

SECTION 3: CHEMICAL AGENTS AND ENVIRONMENTAL HEALTH

13. Pharmacological agents as environmental toxins

Vultures are an important part of the ecosystem, and serve as scavengers – feeding on carcasses and wastes from meat processing. As recent as a few decades ago, their population was in the millions in India. But it was noticed that suddenly, over a period of few years, their numbers declined to a few thousands. In addition, the drastic reduction in their population led to a great increase in the population of rats and wild dogs due to increase in food available to them. The increase of the latter species has also increased the risk of spread of diseases such as plague and rabies – which are significant public health problems. In a situation where the public health system is already weak and without adequate resources, such new burdens may further weaken systems.

Figure 11: Indian vultures (Source: Wikipedia)

a. Vultures, to the average person, are not related in any way to human health. What is your opinion on the matter?

When the cause of the sudden reduction in vulture population was explored, it was found that the drug diclofenac was responsible. This drug is an anti-inflammatory chemical which is used both in human and veterinary medicine. It is a very popular pain relief tablet sold illegally over the counter across pharmacies in India. The practice that led to the exposure of vultures to diclofenac was the regular addition of the drug to cattle feed, which was done in the 1990s. In confined settings, cattle are prone for infections and inflammations such as mastitis (inflammation of the nipples and breast due to trauma or infection) and drugs such as

diclofenac can help with controlling such inflammation and associated symptoms such as pain. When cattle die, their bodies are discarded. However, some amount of diclofenac remains in the body. When vultures feed on these discarded bodies, they get exposed to diclofenac.

b. What other drugs are mixed with animal feed? Are you aware of any concerns in relation to that?

Vultures do not have the physiological mechanisms in their bodies to metabolise diclofenac. Even the smallest exposure to diclofenac can lead to immediate kidney failure in the vultures, which succumb in a day or two. Such high sensitivity to diclofenac has led to quick and alarming decline in the population.

c. The decline of vultures has occurred in a matter of few years.

Diclofenac was banned for use in India and in surrounding countries in the early 2000s, but is still available in pharmacies. Currently other alternatives are being used in veterinary practice, and those alternatives have been shown to be safe for vultures.

d. Which community is dependent on vultures from a cultural perspective?
e. How might the decline in vulture population affect them?

14. Malaria and bio-environmental control

Malaria and other vector borne diseases contribute heavily to ill health in developing countries, including several areas in India. The central government's programme for control of malaria has seen many phases, but it still continues to be a major threat. As the conventional techniques used by the government were not leading to effective control of vector and transmission of disease, there was a need to relook and reflect on the effectiveness and appropriateness of those strategies (which include use of DDT[1], bed nets and a

[1] DDT stands for dichloro diphenyl trichloroethane. It is a pesticide used mainly for malaria control in developing countries. It is banned in most developing countries as it is a persistent chemical with impacts on ecosystem and human health.

management protocol for cases with fever).

A report on the appropriate strategy for malaria control was prepared by SOCHARA and VHAI in 1996. The report demonstrated connections between mosquitoes and large developmental projects. Reminding that malaria is actually an environmental problem, it was recommended that each area should plan and employ locally relevant control strategies, along with the application of bio-environmental control methods using larvivorous fish (such as gambusia and guppy species) that eat mosquito larvae which, though difficult to maintain, are effective and non-hazardous.

a. You may be aware that pesticides are hazardous to human health too. Is it acceptable to use pesticides in the control of malaria?
b. Malaria was nearly eradicated during the initial years of application of DDT. But it bounced back later. Why was that the case?

To further strengthen the evidence in the use of bio-environmental methods, studies were conducted to test effectiveness of larvivorous fish in community settings. Efforts were also made to popularize these methods in the community using local traditional communication methods like folk theatre (*kala-jatha*), and communities themselves were involved in the implementation and maintenance of these methods.

c. What is the importance of testing a new approach in the community if it has already been proven to be effective in laboratory studies?
d. What may be the benefits of empowering the community to implement and maintain the control strategies themselves?

Having recognized malaria as an environmental problem, the interventions for control also needed to be environmental, and be implemented at the community level. For this, capacity building efforts of communities were made, with the drafting of training modules for women's empowerment and participation in mosquito control at community and district level. An innovative module was also written on malaria and malaria control for high school students studying with Central Board of Secondary Education as a part of their curriculum in Environmental Studies.

e. In what ways could children help with malaria control?

Collaborations with several local citizens' action groups and municipal bodies in Bangalore and Mangalore were undertaken to improve mosquito control. Both the cities were home to malaria, where control of mosquito breeding was proving to be a difficult task. SOCHARA along with other researchers from National Institute of Malaria Research identified that inappropriate urban planning and construction design was leading to widespread stagnant water pools where mosquitoes were breeding. The importance of each stakeholder was emphasized for the control efforts, and suggestions were made to the respective local governmental bodies to act as per the recommendations given. Improvement in the design of storm drains and roofs of homes, along with the use of bio-environmental control methods were some of the specific suggestions given (1).

f. Why is involvement of the community important in malaria (or vector) control?

15. Connections: Get rid of malaria, but invite the plague!

[Literature taken from "From Crisis to Cure", by R Rajagopalan (7)]

In the mid-twentieth century, malaria was rampant in the Indonesian island of Sabah, earlier known as North Borneo. In 1955, the World Health Organization (WHO) began spraying the island with dieldrin (a chemical related to DDT) to kill mosquitoes. The attempt was successful and malaria was almost eradicated.

Dieldrin, however, did other things too. It killed many other insects including flies and cockroaches. The lizards ate these insects and they died too. So did the cats that ate the lizards. Once the cats declined, rats proliferated in huge numbers and there was the threat of plague. The WHO then dropped healthy cats on the island by parachute.

a. How did other creatures get affected by dieldrin if it was for mosquitoes?

Dieldrin had also killed wasps and other insects, and the disruption of the food chain led to

proliferation of a particular caterpillar, which was somehow not affected by the chemical. They ate away all the leaves in the thatched roofs of the houses and the roofs started caving in.

Ultimately the situation was brought under control. However, the unexpected chain of events showed the importance of asking at every stage the question: 'And then what?'

b. While there may be immediate benefits of technology, there may be unforeseen and devastating negative impacts too. Can you provide one other example for this statement?

16. Doctors do not always have the answers

[Taken from "A Community Guide to Environmental Health", by Conant and Fadem, Hesparian. (12)]

Carolina worked on a large strawberry farm. One day her stomach hurt and her eyes burned. She stopped working and went to talk to her boss. Her boss told her to go see the company doctor.

When she got to the doctor's office, he was not very friendly or helpful. Carolina thought pesticides might have made her sick, but she was too shy to say this to the doctor. The doctor did not ask her about her work or why she thought she was sick.

The doctor asked Carolina questions that made her feel like being sick was her fault: What did you eat today? Do you smoke cigarettes or drink a lot of alcohol? What did you do after work yesterday? Did you sleep enough?

In the end the doctor told her she was just lazy and only wanted a note to get out of work. He even said she might be sick from being drunk! Finally the doctor gave her some pills for headaches. She was not sure the pills would help, but she took them anyway. As she went home, she wondered about going back to work the next day. She felt worse after seeing the doctor than she did before.

a. What do you think caused Carolina's problems?
b. Why did the doctor not ask Carolina about her work?
c. Why do you think the doctor did not handle the situation well?

How could Carolina have gotten better care?

Perhaps if she brought the label of the pesticide she worked with and told the doctor it was what made her sick, he would have considered pesticide poisoning as a cause for her illness. But even if she had done this, it might not have helped. The doctor worked for the company that owned the strawberry farm. Often company doctors will not admit that pesticides make farm workers sick. Pesticide illness can be difficult and expensive to treat. The company may prefer to hire new workers rather than treat their sick workers.

Perhaps Carolina could have gone to another doctor. But this would have been expensive, and she would have to take more time off from work. And most doctors do not know much about pesticides.

d. Did Carolina use safety precautions to protect herself from exposure to pesticides?
e. Why would the company doctor not want to admit that pesticides made the farm workers sick?

This is a very difficult problem for Carolina, and for all farm workers. The best way for farm workers like Carolina to take care of their health is to work together to change the conditions that make them sick in the first place. There is also a need for alliances to support workers in their efforts and struggles for health and access to health care.

17. A health clinic designed to protect the environment

[From "A Community Guide to Environmental Health", by Conant and Fadem, Hesparian (12)]

People in Bhopal are fighting for environmental justice. At the same time, they are working to heal from the disaster. Survivors and other volunteers started the Sambhavna Clinic to provide health care to the whole community, regardless of ability to pay, or religious or caste

differences. *Sambhavna* means “possibility” in the Sanskrit and Hindi languages.

The Sambhavna Clinic is a model of environmental health. It was built and operates as safely and sustainably as possible. For example:

- Only hot water and soap are used to clean the clinic, to make sure that no one is harmed by toxic cleaning products.
- Clinic workers started a garden to grow plant medicines. No chemicals are used in the garden. People treated at the clinic work in the garden and collect their own herbs for treatment.
- When new clinic buildings are needed, only nontoxic building materials are used. The buildings use local materials, and are designed to allow natural light and air to pass through.
- Rainwater is collected from tiled roofs during the wet season and stored in underground tanks, providing water for the dry season.
- After water is used for washing, it is piped into a pond and then irrigates the grounds and the herb garden.
- Electricity is made by **solar panels,** which cause very little pollution.

a. In what ways can healthcare centres impact their local environments?
b. Who is responsible for the biomedical waste that is generated in healthcare centres?
c. What building materials have hazardous properties?
d. How do cleaning agents affect health?

The Sambhavna Clinic shows how achieving health for all means not only treating the sick, but preventing illness in the first place. Their example of reducing harm from toxics can be followed in schools, businesses, government offices, and our homes. But even if we change our homes and institutions to make them healthier and more sustainable, all of us, especially the most vulnerable, are still at risk, as long as industries continue to produce and use toxic substances.

e. Why should healthcare institutions aim at having a minimum environmental impact?
f. What is NIMBY? How does such an attitude translate to toxic contamination of areas near poorer settlements?

SECTION 4: SANITATION AND HEALTH

18. Sangu's story

[From "A Community Guide to Environmental Health", by Conant and Fadem, Hesparian (12)]

Sangu was born in a small village in India. After years of drought and crop failure, she and her mother and baby brother moved to the city in search of a better life. They lived with her mother's family on a steep hill over a dump site. Other children showed Sangu how to pick out things to sell from the dump site. Before school every morning, she collected scraps of tin, glass bottles, plastic bags, and other things. Sangu used the money she made to buy lunch and hot tea after school.

a. How could Sangu and her family have been helped to remain resilient in the face of drought in their village?

Life was hard in the city, and Sangu's mother was soon working away from the house all day. Sangu had to take care of her baby brother and could no longer go to school. Every day she spent many hours sorting through garbage at the dump with her brother in a sling on her back. Sometimes Sangu found bloody bandages, needles, and other hospital waste mixed in with the rest of the trash. Sangu's thin sandals did not protect her from sharp things in the trash. Broken glass and rusted metal would sometimes cut her feet and ankles. One day a syringe needle pierced her sandal and went right into her foot. Soon after, Sangu got very sick with fever, tiredness, and a swollen sore throat.

b. How was medical waste found in the municipal waste dump?

Sangu felt better after some weeks. But several months later she began to feel sick again. She was tired all the time, had fevers and sores in her mouth, lost her appetite, and grew very thin. Her mother and family worried about her, but they had no money to take her to a doctor. Finally, her mother borrowed money from a cousin and took Sangu to the health centre. The doctor listened to Sangu's story, examined her, and then took some blood for a blood test.

The next day, they returned to the clinic and the doctor told Sangu's mother that Sangu had HIV. She needed medicine, but her family had no money to take her to the hospital where she could get it and the attention she needed. With great sadness, Sangu's mother took her home. Sangu rested in bed, but everyone knew she would not recover. A few months later, Sangu died.

c. Who do you think was responsible for Sangu's death? Why?

19. How Eseng gained better health and respect

[From "A Community Guide to Environmental Health", by Conant and Fadem, Hesparian (12)]

Every day, Eseng went around the city of Bandung, Indonesia, to collect trash. Because his house was far from the neighborhoods with the best trash, he spent almost all his time walking back and forth carrying heavy bags. Each night, Eseng sorted the trash to sell to dealers the next morning. Some dealers bought glass, others bought scrap metal, and others bought paper. But the things no dealer would buy piled up around Eseng's house. His yard became a messy, dangerous garbage dump, but there was nowhere for Eseng to get rid of the trash. Sometimes he got infections that lasted for months and made it difficult to work. Now and again he got a bad fever and chills from malaria because mosquitoes bred in the tires in his yard. And, despite his hard work, the police often bothered him when they found him sorting through trash in front of shops or in the street.

a. Why did the people who created the trash not sort it themselves?
b. What kind of infections is Eseng at risk for because of his job?
c. Why did the police harass Eseng?

Eseng and some other waste collectors decided to organize a centre to help them sell what they collected, and to provide other benefits by sharing knowledge, tools, and information. They visited a local organization that worked for the environment and workers' rights, and together they came up with the idea to develop a more complete resource recovery program. People from the environmental organization asked the city government to support the resource recovery program, and to make the police and shop owners treat the waste collectors

better. The city government agreed, and a centre was set up where Eseng and the others could sort the waste they collected. Each of the waste collectors was given a cart with wheels, making it easier to collect waste and bring it to the centre for sorting or take it directly to junk dealers.

d. Do waste collectors perform an important service? Why?
e. Why was waste management called a “resource recovery programme”?

The resource recovery centre provided gloves and boots to protect the workers from sharp objects and contaminated trash. When the people from the environmental organization learned that Eseng had malaria, they helped him get care and medicine at a health clinic. Eseng still works hard collecting waste, but his health has improved and his house no longer looks like a garbage dump. The police and shop owners give him and the other waste collectors the respect they deserve for helping to keep the community clean. And the city is proud of the resource recovery centre and their cleaner city.

f. What more could be done to improve the health of Eseng and his friends?
g. How could the risks of his job be reduced?

SECTION 5: EMERGING THREATS

20. Golden rice in Asia

[From "A Community Guide to Environmental Health", by Conant and Fadem, Hesparian (12)]

Around the world, millions of people suffer from blindness caused by a lack of Vitamin A in their diets. As a "solution" to this problem, a new kind of genetically engineered rice containing Vitamin A was developed and named Golden Rice. The company that makes Golden Rice plans to sell it to farmers all over Asia where rice is the main food, and where blindness from a lack of Vitamin A is a serious problem.

The company hopes farmers will grow Golden Rice instead of traditional varieties of rice.

However, Golden Rice will not prevent people from going blind. The blindness Golden Rice is trying to cure is not caused only by a lack of Vitamin A. It is caused by the lack of a sufficient variety of healthy foods that naturally contain Vitamin A.

a. Why would a technology like Golden Rice appear more attractive than enabling the access to healthy and diverse food?

Even if a person eats Golden Rice, the Vitamin A will not nourish them unless there are enough nutrients from other foods eaten at the same time. Instead of trying technical solutions like GE (genetically engineered) rice to prevent blindness and other problems of widespread hunger, it would be better to improve food security. Because the inventors of Golden Rice did not challenge the real problems of poverty and malnutrition, they will not prevent people from going blind.

b. What strategies could you think about to improve food security?

21. Health impacts of climate change in the Indian Sundarbans

[by Lalitha Vadrevu]

Indian Sundarbans is in the southern part of the state of West Bengal. Often cited for its famous mangrove forests, rich flora and fauna, and the Royal Bengal Tiger, the islands have of late come in to limelight for an unsettling reason – climate change. Over the past few decades this large archipelago of forest islands has witnessed a steady increase in extreme weather patterns and subsequent effects. Climate change has resulted in an increase in surface temperatures and rainfalls. It is estimated that from 1990 to 2000 the average temperature over sea and land has increased at the rate of 0.019 degrees centigrade per year while the rainfalls over sea are increasing at the rate of 0.0041 mm/hr. The rise in sea surface temperatures have led to increase in sea levels at ranging from 5.7mm/year to 17.8mm/year; a significantly high increase compared to the global average of 3.27mm/year. Climate change has also led to a slow erosion of land. The rate of land erosion has increased from 2.85 sq kms/year till 2000 to 5.5 sq kms/year in 2008. These climatic changes have a direct impact on the livelihood of the population and a significant indirect impact on their health.

Climatic variations have affected the livelihoods of the predominantly agrarian population of the region. An average household in the Sundarbans depends on agriculture, fishing and livestock rearing for their subsistence. Many households are damaged and flooded every year during monsoons leaving women, children and the old hapless without shelter. Rising sea levels are gradually displacing populations from the periphery to the central regions of the Sundarbans. The uncertain weather conditions leave many households in a perpetual state of risk and economic vulnerability. The loss is not limited to just shelter; seasonal floods and cyclones damage crops, flood agricultural lands, breach embankments, and result in loss of agricultural produce and catch for fishermen. Climatic adversities affect the ability of households to economically sustain themselves pushing them in to a viscous cycle of poverty and depravation. This affects the health and healthcare of the population, especially vulnerable groups like women and children.

Recent reports show that the general population of the Sundarbans faces a double burden of both communicable and non-communicable diseases. Coronary heart diseases (CHD) affect 6

percent of population aged 40 years or more. Similarly, about 2.4 percent of adult population (>40 years) indicated high risk of arthritis while 42.4 percent were already diagnosed which was higher than the corresponding state average (35.3%). Bronchial Asthma chronically affects the elderly population at 8 percent prevalence rate. Women and poor are more vulnerable to chronic ailments such as Arthritis and Asthma. There are other chronic problems, such as vision problems (farsightedness)(21).

Studies by IIHMR University over the past few years in this region have shown that the children are the worst sufferers with a high prevalence of child malnutrition and morbidity. According to reports, the prevalence of malnutrition (underweight) is 38.6% while 35.2% of under five children suffer from chronic malnutrition (stunting). It is found that the prevalence of diarrhoea and fever is 7.8% and 38.6% among children, respectively (22). The dire status of the health condition can be explained by the wider socio-economic context and the lack of access to health services in the region. On one hand, the volatile climate in the region disparages houses and livelihood creating a perpetual cycle of poverty and vulnerability. On the other hand, the climatic conditions make access and provision of health care extremely difficult.

Due to climatic adversities, households have gradually begun to shift towards non-agricultural forms of labour in neighbouring regions or states. Outmigration to neighbouring regions for non-agricultural forms of labour creates a complex and vulnerable social and economic situation with intermittent incomes in a climatically volatile location. This shift coupled with the fast changing ecological landscape, has changed the food patterns and food security of the households in the Sundarbans. Households in the coastal regions facing recurrent climatic adversities face fewer food choices compared to their counterparts closer to cities. The population, understandably, faces chronic malnutrition and illness in the face of acute food shortage and poverty.

Impacts of climatic adversities on physical infrastructure of the communities in the Sundarbans plays an important role in providing and sustaining health services. Frequent floods and extreme rainfalls make many areas in the region inaccessible for both the providers and the community members. Accessibility is an important issue. Transport from periphery to the towns and the city requires travel on river and land for many hours. On an average a household member travels for hours before he/she reaches the nearest primary

health facility for treatment. Long hours of travel for healthcare for a poor family in the hour of need is both unaffordable and inaccessible. From the health systems' standpoint, there are systemic issues of attracting and retaining human resource, logistics and infrastructure of health facilities in such regions that face constant climatic threats. Sustenance of health services and improvement of health of the population is influenced by a multitude of factors, the most critical of them being, climate!

Questions

a. What is the difference between climate change and climatic variations?
b. How have climatic extremities affected agriculture in the Sundarbans?
c. How have climatic affects caused demographic shifts in the population?
d. What are the implications of changes in occupational patterns on livelihood and poverty?
e. What are the various factors that affect health services provision in the region?
f. What are the probable solutions to ensure that the population has access to adequate health care and nutrition?
g. What are the community based strategies that can lead to a sustainable livelihood and healthy environments?

SECTION 6: A COMMUNITY HEALTH PERSPECTIVE – Summary of messages

We conclude this case series with some reflection on community health principles and a socio-economic-political-cultural analysis from various case studies:

Environment is linked to health, livelihoods and quality of life. However, disproportionate costs of environmental degradation are borne by the poor, and disproportionate benefits are received by the rich. The so-called benefits are not sustainable. Several jobs, especially in the unorganised sector (or contractual jobs), have higher health risks and are often taken up by the poor. Business benefits (often short-term) should be assessed alongside long term local environmental and health impacts. Laws often exist, but implementation and regulation are poor. Natural resources in a geographical area can be well managed by local groups directly dependent on those resources through participatory community-led management and action.

Local people and local professionals have important roles to play in understanding and addressing local environmental health problems. Indeed, the felt need of local people drives sustained local campaigns towards protection or remediation. Professionals such as doctors, researchers and lawyers can be of great technical support towards efforts in improving local environmental health. Journalists can help increase awareness about local problems, and have played important roles in various environmental health campaigns. Scientific information needs to be communicated in a way that local people can understand. Reproductive and child health problems have been found to have higher priority among local people and in the court of law. In the situation of local environmental degradation or pollution in an area, solidarity from outside the community can help the struggle for social and environmental justice. Campaigns are usually long drawn, and therefore solidarity has an important value. Religious institutions can also play a role in bringing people together to protect and improve local environment.

When problems become widespread and acute, with potentially irreversible impacts, there is a need for policy and stringent implementation to control and reverse the situation. There may be a need for inter-sectoral planning and action. Local people should be actively involved in planning and implementing relief and remediation efforts. Quick fix solutions may provide only temporary relief and may increase other local problems. There is a need for

great insight about the local context, the challenge, and the technical solution being offered. There is always a tendency towards offering technological fixes for environmental health problems, which again excludes local community involvement.

Crisis situations can present opportunities for systemic changes which can lead to several co-benefits for local health and environment. These opportunities have been taken in some cases, and not in the others. Healthcare institutions can play a leadership role to highlight issues of environmental degradation by improving their own institutional practices. There are several sporadic examples in India about this, especially among hospitals catering to remote populations. More recently some mainstream medical colleges have been showing leadership in sustainable healthcare. But there is more to be done. Many of the environmental health challenges are not direct impact, but rather ecosystem-mediated and indirect impacts, and also related to underlying drivers of economic growth-oriented development model and corporatization of the economy. Health professionals have an obligation to examine these trends and contribute analysis and opinion to safeguard health and environmental determinants of health.

Conclusion

Community health is a process of enabling people to exercise collectively their responsibilities to maintain their health, and to demand health as their right (23).

A community health approach involves various aspects: using democratic and participatory community based processes, keeping local context in mind, integrating health and development, preventive-promotive-rehabilitative orientation, use of appropriate technology, utilisation of local health resources, supporting the development of village health cadres, community participation and organisation, financial self-sufficiency, education for health, and conscientization and political action (23).

There is a need to understand the underlying determinants of environmental health. Any health concern can be analysed for its deeper determinants using the socio-economic-political-economic-environmental (SEPCE) analysis. The cases presented in this compilation repeatedly show that the causes of environmentally-mediated diseases are primarily linked

with inequity, power differentials, inadequate information, mis-information, and lack of accountability.

Another effort here was to bring case studies from several states and countries – to show that challenges are being faced all over the world, and efforts to address these are also being made all over the world. Impacted communities are helped through international solidarity, and also approaches to solving problems can be learned from communities across the world.

In addition, there is a cross-cutting emphasis on "action". Deliberation without action will not mitigate health problems. This compilation of brief environmental health cases has attempted to highlight issues, but has also included efforts towards addressing existing problems and preventing future problems – all of which have come by concerned individuals acting collectively. While there is always a challenge in change and in bringing people together towards common goals, there is also support to be received. These processes can be slow, but they may be more sustainable. However, it is important to evaluate any potential solution for potential negative impacts in the short and long term through evidence-based and ethical deliberation. Several solutions being proposed, especially short term technological fixes, to address environmental health problems could themselves create problems in future. Examples of these include geo-engineering (24) and genetically modified food crops (25). The various cases discuss facets of these points. These learning can be taken forward towards addressing local and regional environmental health challenge.

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