

Closing the nutrient cycle: why and how

A way to reduce waste water problems

*Report of a Workshop on community management of waste water (treatment and disposal) in
low-income, semi-urban communities in the Kathmandu valley
Nepal, 2-13 November, 1998*

Illustration cover page:
How nature-society circulation is disrupted by uncontrolled disposal of waste water (source: Straskraba)

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Summary

For a large number of communities modern sewage systems are feasible nor desirable. Large quantities of water for flushing may not be available, laying sewer pipes may not be possible, the large treatment plants required may be too expensive to build and maintain. If they do not want to be left with hazardous and unpleasant situations communities and local authorities will have to look for alternative ways to treat and dispose of waste water in a safe and ecologically sound way, without having to rely on the central government for technology selection, implementation and maintenance.

In the valley of Nepal's capital city Kathmandu many of such communities exist. A workshop was held with representatives from four of these communities to map out their particular problems concerning waste water and taking the following principles into account a variety of possible solutions to solve these problems were discussed.

1. As much as possible separate collection and composting of dry, black waste, through toilets in the homes or toilet blocks with private or public double vault latrines and mixing it with cowdung, straw and ash. Composting of black waste can be made a profitable business.
2. Collect and treat of grey water.
3. Collect urine for mixing with ash as manure or simple treatment of urine with grey water.
4. Use white water for recharge of groundwater.
5. Take into account maintenance and management of whatever is opted for.
6. Work on public awareness and education.

Possible solutions included the use of toilets allowing composting of black waste, improvement of existing gutter systems for stormwater in order to recharge groundwater and constructed wetlands for treating grey water.

Acknowledging that effective management structures are as important as appropriate technical options, elements for a proposal for applied research were put together, which includes starting broad consultation processes, detailed investigation, participatory selection of the most appropriate technical and managerial solutions and experimenting with these solutions.

Introduction

This report reflects the proceedings and the outcome of a workshop of two weeks on waste water problems and potential solutions, held in Kathmandu, from 2-13 November 1998. The workshop resulted from discussions held between Mr. Roshan Shrestha of Environment and Public Health Organisation (ENPHO), Mr. Claassen of Waterschap Friesland and Mr. Jan Teun Visscher and Ms. Eveline Bolt, director and programme officer at IRC International Water and Sanitation Centre. They had in common a concern about health risks brought about by improper waste water disposal. A number of communities known to ENPHO were approached with the question whether they were interested to delegate some people to participate in the workshop. Using a number of criteria four communities were selected and a total of 14 people from those communities.

Since the workshop was meant to develop the elements of a proposal for applied research, rather than of a proposal for the construction of waste water treatment and disposal facilities, quite some effort has gone into providing the reader with an elaborate reflection of the workshop methodology and proceedings. Starting applied research implies the need for a general, but participatory assessment of the existing situation with relation to waste water and surface water quality and an exchange of knowledge and experiences. Hence the emphasis on a joint identification of information needs and information sources and on collection of information by the participants through field visits. Such a process is at the root of participatory project development and implementation and should this proposal be funded, we are sure to have a group of people committed to further investigation within their communities and to experimentation with technical and management options for improvement of the unhealthy and unpleasant situations found.

A research proposal has been formulated by workshop facilitators and participants and will be submitted to potential donors. Should the reader be interested in getting to know more about it, please contact IRC International Water and Sanitation Centre.

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Acknowledgements

This workshop for the development of a proposal for applied research on community management of waste water (treatment and disposal) in low-income, semi-urban communities in the Kathmandu valley was financed by the Dutch Ministry of Housing, Physical Planning and Environment. The workshop facilitators from IRC International Water and Sanitation Centre, ENPHO Environment and Public Health Organisation and NEWAH Nepal Water for Health Organisation and the participants are thankful for having been given the opportunity to exchange knowledge and experiences in the field of environmental sanitation in general and waste water treatment and disposal in particular.

They would also like to thank Mr. Theo Claassen and Mr. Ruud Kampf, staff members of the waterboards Waterschap Friesland and Hoogheemraadschap Uitwaterende Sluizen, for their interest in the subject and for their extremely useful inputs in the workshop. They made facilitators as well as participants look upon water treatment as a means to reduce health risks and nuisance as well as a means to restore the precious agricultural ecosystem still existing in semi-urban communities in Kathmandu valley.

A vote of thanks also goes to Mr. Tirtha Raj Paudel of the Nepal Water Supply Corporation and Mr. Rajendra B. Pradhanag of the GTZ/UDLE Urban Development through Local Efforts, who also acted as resource people, in particular during the visits to the various communities.

1. Justification, objectives and methodology of the workshop

1.1 Justification

The need for improvements in the field of environmental sanitation and treatment of waste water in Kathmandu valley is high. In small low-income settlements in the valley untreated waste water, which includes black waste, grey water and effluent from septic tanks, is disposed of in an uncontrolled manner, polluting surface water in streams, rivers and ponds and groundwater. These water sources are all used for household purposes like drinking, washing, bathing (human beings and cattle) and washing utensils. Uncontrolled disposal thus poses serious health hazards and nuisance. In addition, this uncontrolled disposal of waste water implies an enormous loss of nutrients that could otherwise be used for agricultural production.

The International Conference on Environment and Agriculture, which happened to be organised at the same time as the workshop and in which both resource people to the workshop presented a paper, also indicated the existing concern about the relation between ecology, environment and agriculture. Chief guest to this conference, the Minister of Agriculture underlined the need for making maximum use of the available means and resources for poverty alleviation sustainable agriculture development.

Preliminary investigations show that there is a great potential for small, community-managed methods for treatment and disposal of waste water and for facilities that could be put in place to prevent and/or reduce pollution of water sources. However, further insight is needed into the nature and the magnitude of the problem and into the necessary degree of upgrading water quality as indicated by the people and public health authorities.

The workshop, of which the proceedings and outcomes are reflected in this report, was a first step into obtaining further insight. In addition to a review of literature, this is now the basis for the development of (a) proposal(s) for applied research that will focus on detailed investigation and experimentation to find methods to improve the current situation.

1.2 Workshop objectives

Overall Objective

To create the conditions for sustainable improvement of the environmental sanitation and water supply situation, in particular of the surface and groundwater quality, in selected communities in Kathmandu valley.

Specific Objectives

- To carry out a participatory analysis on needs and demands for small scale waste water treatment and disposal facilities as a means to reduce health risks and to improve the quality of ground- and surface water.
- To provide information on small scale treatment and disposal techniques that may be sound (i.e. technically appropriate and manageable by the community) for semi-urban, hilly areas in Nepal.

- To develop elements of a proposal for applied research with potential managers of communities involved and potential support organisations.

1.3 Methodology

A first step in the workshop was focused participatory field analysis on needs and demands for small scale environmental measures like waste water treatment and disposal systems. Field visits to collect information were prepared, carried out and evaluated by the workshop participants. The field analysis was followed by knowledge exchange on small scale, community manageable disposal facilities and on possible measures for improvement of water quality, which includes simple methods for water quality assessment and monitoring. These two steps now lead to the development of a proposal for applied research through experimentation with small, community-managed waste water treatment options and disposal facilities and other possible measures and, at a later stage, implementation of the action research, evaluation of the results and scaling up.

2. Pooling ideas about waste water: people involved

2.1 Participants

As indicated earlier, four communities were selected using a number of criteria. These were: the community is a semi-urban area, it is located within Kathmandu valley, community people show an interest in the research project, there is an existing demand/need for sewer disposal and treatment in the community, the community is accessible, there are possibilities for community management/community management systems are existing, the community has a population of around 5000 people. The selected communities are:

Panga: Kirtipur Municipality

Maddhipur: Thimi Municipality

Siddhipur VDC

Kusunti: Lalitpur Municipality

With community leaders a number of criteria for selection of participants for the workshop were identified. They have to: be able to read and write, be able to speak the local language, be a member of the local community, show a willingness to learn and work with community people, be willing to work as a volunteer, be able to share ideas and motivate community people, be able to communicate and work as a bridge between community people and the partner organisation, be able to give time for the workshop and other social activities. It was also felt that some local leaders had to be included, that the people selected have to be accepted by the community people and that the selected group should have men as well as women.

A mix of school teachers, social workers, peasants, elected leaders and students were selected (for the names of the participants see Annex I).

2.2 Facilitators

In the workshop facilitators with a variety of skills and professional backgrounds were combined. The facilitators were Mr. Amresh Karmacharya: Environment and Public Health Organisation (ENPHO), Nepal; Mr. Homnath Acharya: Nepal Water for Health Organisation (NEWAH), Nepal; Ms. Eveline Bolt: IRC International Water and Sanitation Centre, The Netherlands.

2.3 Resource people

In order to ensure appropriate and effective exchange of knowledge four resource people (two from Nepal and two from The Netherlands) were involved: Mr. Theo Claassen, aquatic ecologist with Waterschap Friesland; Mr. Ruud Kampf, water management specialist with Hoogheemraadschap Uitwaterende Sluizen; Mr. Tirtha Raj Paudel, assistant manager at Nepal Water Supply Corporation; and Mr. Rajendra B. Pradhanag, civil engineer/infrastructure planner at GTZ/UDLE Urban Development through Local Efforts).

3. Programme and output of the workshop

3.1 Adaptation of the initial programme

In this chapter the programme elements and the outputs of the various exercises are described. The programme as described here slightly differs from the programme developed preparatory to the workshop (see Annex II). This is due to the fact that changes had to be made to suit the needs and the pace of participants and resource people. The paragraphs below reflect the sequence of the workshop activities and the outcomes.

3.2 Setting the scene and preparing for the field visits

November 2

During the opening of the workshop speeches were delivered by Mr. Umesh Panday (Director of NEWAH), Mr. Buddhi Raj Bajracharya (Mayor of Lalitpur Sub-metropolitan City), Mr. Gyanesh Nanda Bajracharya (Manager Nepal Water Supply Corporation) and Ms. Eveline Bolt (IRC International Water and Sanitation Centre). All stressed the need for improvements in the area of environmental sanitation and the necessity of using participatory methodologies to arrive at these improvements. Mr. Amresh Karmacharya facilitated this session and, while doing so, explained the objectives of the workshop.

After teabreak the guests left and participants went through an introduction game, after which the workshop objectives and programme were explained more in detail. Participants were then asked to write down workshop expectations on cards. These were collected and clustered while being discussed. One could tell that the scope of the workshop was well understood by most participants, the scope being the development of a proposal to implement activities to reduce the contamination of surface and groundwater. Only one participant thought drinking water treatment was also a workshop issue. It also appeared that waste water was interpreted in different ways; one being dirty water from kitchen and bathroom, the other being water running from taps and sources and being *wasted*. Waste water was defined to be dirty water from the toilet, the kitchen and bathing places. Treatment was considered to be any activity undertaken to make the waste water less harmful for people and the environment.

After lunch participants were asked to make a map of their community, indicating roads, housing, water sources, locations of waste water problems, sanitation facilities etc. These maps (see annex IV) were presented and participants and facilitators asked questions for clarification. Problems indicated include: i) discharge of sewage, collected through sewage pipes or drainage channels, on small rivers that also serve as intake for drinking water production, ii) open defecation, iii) dirty ponds, iv) discharge of acid waste for the production of 'rakshi'. Participants were asked to write a brief summary of their presentation that they could add on to throughout the workshop.

The fieldwork was briefly explained as being an opportunity to take a closer look at what was mentioned during the presentation and to gather information needed to discuss possible options for solving the waste water problems. A schedule for the field visit was also made.

November 3

The day started with a discussion about the need for a better understanding of the community to be able to make informed decisions. In order to identify information requirements we looked at the criteria that have to be in place if we want to ensure that the option selected can be labelled as “appropriate”. These criteria are: technical pre-conditions are in place, construction is financially feasible, management (O&M) is financially feasible, management capacity is present or can easily be built, the technology is culturally acceptable and acceptable to the general public, and no negative environmental impact is foreseen.

Starting from these criteria participants identified a number of information needs and in order to collect the information to fulfil these needs, questionnaires and an observation checklist were made for the following groups: local authorities, women, men and elder people. The questionnaires and observation checklist are added to the report as annex III.

Logistic arrangements were made for the field visit.

3.3 Visits to the communities; using ears and eyes

November 4

The resource people, Mr. Theo Claassen, Mr. Ruud Kampf, Mr. Tirtha Raj Paudel and Mr. Rajendra B. Pradhanag were welcomed and a brief presentation, using the community map, was given to prepare for the visit to **Kusunti**. Through the assistance of a local NGO a start has been made with laying sewage pipes. However, the last part of the pipes could not be connected to a main line, because the neighbouring community doesn't want the sewage to be discharged into the river. More details about the waste water situation and about related issues can be found in Annex IV, which gives a detailed description written by the participants.

Once back in the training venue, participants were asked to reflect on the data collection process and to suggest improvements for the next days' visits. They mentioned issues such as; the questionnaires do not have sufficient space to fill in all necessary details, the use of open questions provided a lot of information, the host-group should guide and facilitate the visit and not interview, we need to create a more conducive atmosphere for the interviews by allocating a timeslot after lunch and by building rapport.

All participants were also asked to mention one or two things that struck them most during the field visit. They mentioned: there are no municipal arrangements for drainage and road construction, the drainage programme started in an unplanned way and has technical weaknesses, open drainage is a big environmental problem and waste water badly affects agricultural land, community members, including the women, feel the waste water problem and seem helpful and interested to work with support organisation, there is a dispute among different parts of the municipality about disposing waste water in Nakhu river, whereby the local administration is used to solve it.

The participants from Kusunti very much appreciated the feed-back they received. They were given all data collections sheets in order to prepare a complete report for presentation the second week of the workshop.

November 5

After a brief presentation about **Siddhipur** VDC this second village was visited. A completely different situation from the situation in Kusunti. A more agricultural community, with a high population density. Open defecation, blocked drainage channels and bad drinking water quality from taps and wells, were the main problems. Some community members purchased

a double vault, poor flush latrine through a programme that installed demonstration latrines some eleven years ago. Details about the community and its environmental sanitation situation can again be found in Annex IV. Back in the training venue participants were again asked to provide a few headlines and they presented the following observations: information from the map very much reflected reality, environmental sanitation situation is poor; open defecation, poor management of garbage, waste and waste water, drinking water is sufficient but of poor quality, high risk of getting water born diseases, people's main occupation is agriculture, average income and savings are low, villagers are conscious about the drainage problem and consider it a major problem, the Village Development Committee has a proper plan, but no finances, people are ready to contribute labour, there are no NGO's active except for the Rotary club .

November 6

This day's visit was to **Panga**. First a visit was paid to the mayor and at his office an explanation as given about the sewage master plan that has been developed, but for which no funds are available as yet. However, part of Panga is not included in the master plan, since it finds itself on the other side of the local watershed. In Panga a network of sewage pipes is in place and discharge is the main problem. Much of it is discharged in agricultural land and in two big, leaking collection tanks. Open defecation is also practised. Asked to give their most important impressions participants mentioned the following: people lost faith in the government and like to work with NGO's, there are a number of community based organisations and people seem to be ready to contribute labour, the collection tank badly affects the environment, quite some sewage pipes are already in place. Again a full report is in Annex IV.

November 9

The last village visited was **Maddhipur**. A densely populated area on a ridge and waste water flows away easily. Within the village it is somehow controlled, with a sewer line running through the main street, but discharge is in small rivers. An INGO built a treatment plant, but part of the construction works were washed away during the last monsoon and no maintenance is carried out. The plant is not functional. A large part of the community is not connected to a sewer line and many households discharge toilet and kitchen waste on open drains. Open defecation is another major problem. Water supply is intermitted, leading to long waiting times.

Remarks made by visiting participants include; the Hanumante river is extremely polluted, the residential areas look quite OK, but the outskirts of the village are very dirty, people are ready to contribute to improvement of the situation, but they had a bad experience with the INGO leaving the work unfinished. See again Annex IV for the full report.

November 10

The community groups prepared and gave concise presentations, summarising the information laid down in the questionnaires. The criteria for technology selection as identified the second day of the workshop were used as a guideline for the presentation. Through question and answer participants and resource people tried to get a picture of the communities as clear as possible.

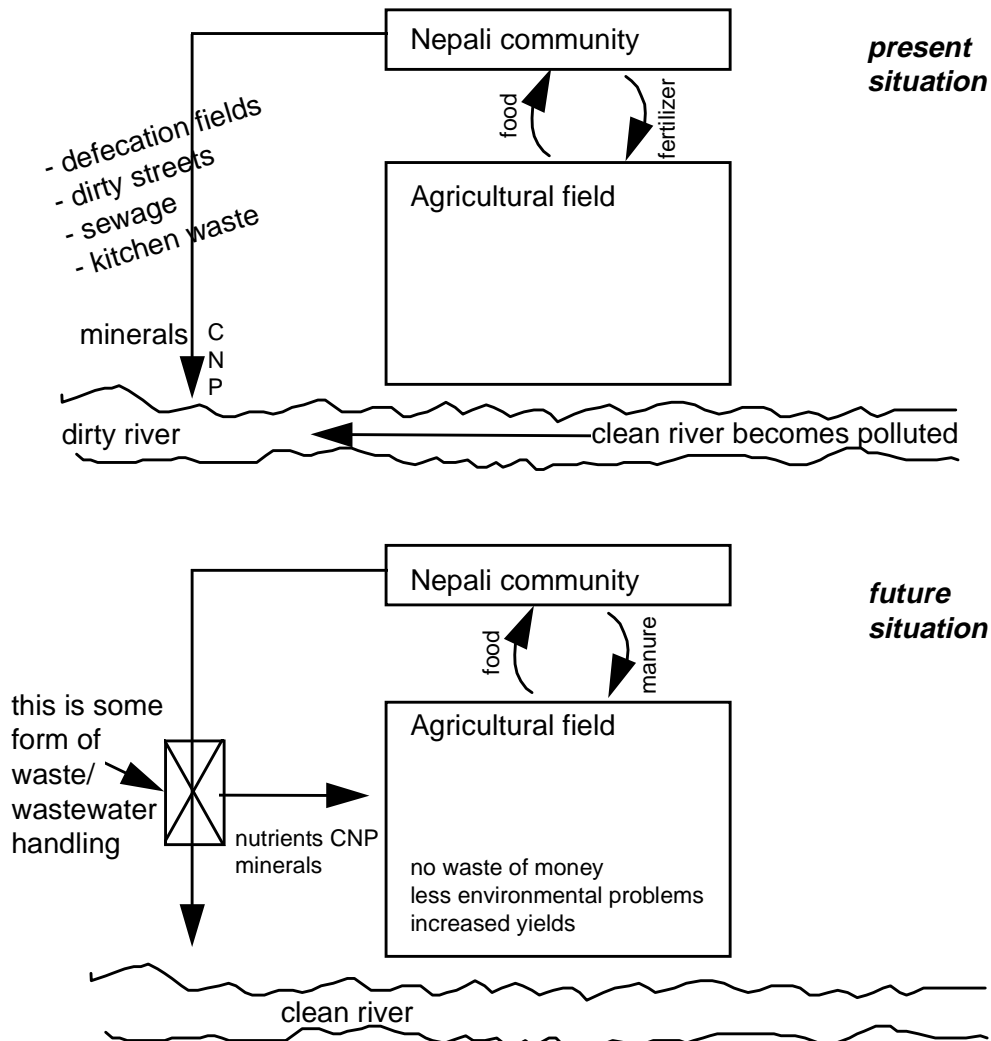
3.4 Health and economic benefits of a closed nutrient cycle

Preparatory to discussing possible options for improving environmental sanitation, the two resource people from The Netherlands presented a general introduction to water quality and waste water treatment, answering the questions "what happens if the environment gets polluted through uncontrolled discharge of waste water?" and "why would we need to do something about it?". Using slides it was stated that polluted water may contain pathogens

(like viruses, bacteria, protozoa and helminths), organic waste, nutrients, suspended solids. In principle waste water treatment is very simple and that economic benefit can be gained from treatment. Thermal pollution and acidification as were found in Kusunti and Maddhipur require different ways of treatment.

Showing the model of a Nepali Community and drawing upon the observations made during the field visits, the nutrient cycle was explained.

The nutrient cycle of a Nepali community



Solutions to solve the environmental and nuisance problems are based on the principle that mixing of black waste, grey-, and white water should be prevented as much as possible.

These three flows should be handled separately. If done properly a good ecological system will emerge and money can be saved or even earned, because:

- less expensive fertiliser is needed;
- less water is needed, because faeces do no longer have to be flushed away;
- expensive treatment can be avoided;
- manure can be sold.

About white water, black waste and grey water the following points were made:

White water

It is important to prevent that (white) rainwater mixes with waste. Rainfall is very unevenly distributed over the year, with high rainfall during the monsoon and no or hardly any rainfall in winter. Many villages have old discharge systems meant to carry monsoon water, but often poorly maintained and therefore less functional. These old systems of gutters and existing pipes can be upgraded for discharge of rainwater, which can be used for recharge of groundwater through ponds or for irrigating agricultural fields.

Black waste

Flush toilets are comfortable, but expensive in terms of capital costs and costs for water used for flushing. They induce an enormous amount of waste water; 15,000 l of water/capita/year is needed to flush away 50 l of faeces and 500 l of urine that is to be treated if we want to prevent a health hazard through uncontrolled discharge. Adopting a safe system of black waste collection is much wiser, whereby it is to be reminded that black waste should be kept as dry as possible (night soil), by using double vault private or public toilets. Mixed with cowdung, ash, straw and agricultural waste it can be composted. After some 6-9 months this mixture can be used as manure. If possible collect urine separately for reuse of nutrients in agriculture. Sustain the practice of mixing it with ash for use it as manure.

Grey water

Construct separate grey water lines for washing, bathing and kitchen water. The nutrient in this waste can be used for growing products in constructed wetland systems or (fish) ponds. Management of such treatment plants can be done by organisations or private persons deriving benefits from the products. Should waste water flows become too big or when insufficient space is available oxidation ditches can be considered. Treated water can be discharged into a river, to recharge groundwater or to irrigate land.

Mixed flows of waste water

When it is not possible to separate black- and grey water completely, separate the black waste and solid particles in the grey water as close to the production source as possible by using septic tanks. The sludge should be treated as black waste and the effluent of the septic tank as grey water.

Slowly the meaning became clear of statements presented at the start session, such as "Money doesn't stink" and "Don't throw money away".

General points

- a good design is important, based on detailed maps indicating pipes, gutters, wells, ponds etc.;
- local knowledge, traditional customs and uses need to be taken into account and built upon where possible;
- awareness raising and education are needed;
- people need to be informed about implications for capital costs, maintenance and management, they should be left the choice and be assisted in developing their own maintenance and management system!!
- Many improvements can be brought about through self-help.

The overhead sheets used during these presentations can be found as Annex V.

3.5 Possible short and long term solutions for the four communities

November 11

This day more detailed discussions took place about the various communities.

For each of the four communities directions for improvements were indicated, based on the principles outlined the day before:

1. As much as possible separate collection and composting of dry, black waste, through toilets in the homes or toilet blocks with private or public double vault latrines and mixing it with cowdung, straw and ash. Composting of black waste can be made a profitable business.
2. Collect and treat grey water.
3. Collect urine for mixing with ash as manure or simple treatment of urine with grey water.
4. Use white water for recharge of groundwater.
5. Take into account maintenance and management of whatever is opted for.
6. Work on public awareness and education.

For **Kusunti** the above principles imply that, unless huge amounts of money, land and water for flushing become available, the general use of sewage pipes and the construction of a big treatment plant are not encouraged. Kusunti is a growing community with more and more "outsiders" settling there in a seemingly uncontrolled manner. Proper town planning should be encouraged, so that infrastructure such as septic tanks connected to small bore sewers and drainage channels can be planned also. External finances will be needed to realise the infrastructure bringing waste from the houses to a place for treatment and disposal. The possibility of a sewer connection to the treatment plant in Dhobigath is to be explored. A dyeing factory causes quite some chemical and thermal pollution. Research on how to bring this under control is needed.

In **Thimi** two different problems can be distinguished: i) the environmental pollution as a result of open defecation and ii) the pollution caused by the industrial area (car-workshops) close to the main road. Thimi has a lot of tourist potential, which could serve a motivational factor for realisation of improvements. There is a big need for double vault toilets that allow for separation of black waste and subsequently for composting by mixing the black waste with other organic material. Oxidation ponds around the village could treat grey water. If black waste is mixed, a first pond should be a covered, anaerobic one. The existing treatment plant could possibly be used for treatment of grey water and black water. However, given the water scarcity, creating a black water flow to the treatment plant is discouraged. For the industrial area discussions could start about having polluters pay for treatment.

In **Panga**, the existing collection tanks could be improved and cleaned up for use as sedimentation tanks, to be followed by treatment facilities for the effluent. But also here it would be better not to create a black water flow and to have human excreta collected using dry latrines or septic tanks and to only have the effluent and grey water go into the tank. A wetland, possibly with reed, can be constructed for treatment of grey water. When properly cleaned, by diversion of waste inflow and removing water plants, the pond outside the village can be used for recharge of groundwater through rainwater collection. In particular in Panga many dead rats are seen. These rats, being sources of infection, should be removed.

The situation in **Siddhipur** seems least complicated. Existing gutter systems could be restored for discharge of stormwater, which could then be fed into a pond for recharge of groundwater. Composting and reuse of black waste could be encouraged and coupled to

wetland systems for the treatment of grey water. In order to improve drinking water quality a simple filter system can be built close to the storage tank.

Participants were asked to discuss them with some key-people in their own community.

November 12

Giving some feed-back about the meeting with key-people from their community, the participants from Kusunti indicated that the fellow-community members were somewhat disappointed, because they had expected more clear-cut solutions to the waste water problems they have. It was explained that providing clear-cut solutions at this stage is impossible, since much more information, amongst others about further development of Kusunti area, is required.

3.6 Technical options for safe excreta disposal

To a large extent this day was spent on answering questions related to what was discussed before and on discussing a variety of latrine options that allow for black waste to be separated from effluent and not to be mixed with water. Latrine options shown range from bucket latrines to latrines connected to septic tanks with the effluent being carried away through small sewers to a treatment plant. This allowed participants to see how the principles discussed the days before could be translated into reality. Drawings from the SANEX computer model, developed by T. Loetscher (<http://daisy.chegue.uq.edu.au/awm/manage/thomasl.htm>) were used as illustration. These illustrations can also be found in Annex V. Important elements of the discussion also included cultural acceptability of using human excreta, public versus private facilities, management and income generation.

Some time was then spent on explaining the set up of the proposal to be written and the writing procedure. It was clarified that the proposal will only indicate the above mentioned general directions and that it will include further (participatory) investigation, problem identification, selection of feasible solutions and planning as well as training and awareness-raising activities. A schedule was made indicating when the workshop report and the draft proposal would be circulated for comments.

3.7 There is more to it than technical options

Friday 13

The issue of awareness raising and motivating people came up regularly, for example to stop open defecation, to manage public facilities, to keep drainage channels clean. Therefore, Mr. Homnath Acharya, responsible for community mobilisation activities at NEWAH's office for the Central Region, facilitated a session on this issue. He discussed, among others, the need for transparency, the need for people's participation in decision making, the usefulness of organising exchange visits among communities, and how people can be motivated for self-help rather than waiting for 'the government' to solve their problems.

3.8 Workshop evaluation

As an evaluative exercise participants were given a case for which they were asked to suggest short and long term solutions. The case was about a hypothetical village where open defecation is common practice. People are predominately farmers and the village has a dairy factory discharging waste water without treatment and a hotel with flush toilets. The various groups were asked to present their thoughts and it was striking to see how much they had incorporated of what had been discussed the previous days. For details about the case and their ideas reference is made to Annex VI.

Participants were also asked to indicate in a few words how they appreciated the workshop. The main things mentioned were: I learned a lot about the management of waste water, it was good to exchange ideas and to see each other's situation, it's a pity that we were not given concrete solutions, there is still a gap between the workshop classroom situation and field reality.

Since some guests were expected for the afternoon session, participants prepared a brief presentation. Unfortunately, and probably as is often the case, the presentations only partially reflected what had been done and what had been discussed during the workshop. One of the resource persons therefore added on to it.

During a formal closing of the workshop participants were handed a certificate of attendance.

4. Summary of the research proposal

The workshop provided quite some ammunition for the development of a proposal for applied research. The proposal does not only focus on the testing technical options, but also on the testing of options for sustainable maintenance and management. In this respect it will also look into the interface between local authorities, the private sector and the community. The objectives of the research proposal have been defined as follows:

- To carry out broad based participation processes for further investigation: area consultations, community forums, etc.
- To plan and implement micro-projects to i) improve hazardous situations brought about by uncontrolled disposal of waste water, ii) help restore the ecological balance and iii) make profitable use of waste water.
- To find effective management models and partnerships between local authorities and community based organisations for sustained service levels (also in case of growing populations) and for ensuring that people continue to make effective use of the facilities.
- To develop monitoring capacity for sustained improvements.
- To disseminate experiences within the country.

The total duration on the project is estimated to be three years.

Annexes

ANNEX I Names of the workshop participants

Workshop participants

Thimi	Mr. Bal Krishna Shrestha, Mr. Madan Sundar Shrestha, Mr. Roshan Shrestha, Mr. Raj Sundar Shrestha.
Siddhipur	Mr. Laxmi Bahadur Maharjan, Ms. Sharada Shrestha, Mr. Balram Maharjan
Kusunti	Mr. Krishna P. Koirala, Mr. Gandhi Satyal, Mr. Krishna Narayan Koirala
Panga	Mr. Sunder Maharjan Mr. Shyam Maharjan, Ms. Sahendra Maharjan, Mr. Ravindra Maharjan

ANNEX II Workshop programme

ANNEX III Questionnaire and observation checklist

Questionnaire and observation checklist developed by participants preparatory to the field visit.

Questionnaire: general

- What is your name and age?
- Which water source do you use for drinking purposes?
- Does your village have a traditional stone tap? If yes, what is its present use?
- What is the oldest hand dug well?
- What do you do with the water?
- What do you do with waste water?
- Where was the waste disposal place 10 years ago?
- What is your present waste water drainage system?
- What should be done with the waste water?
- What is the effect of waste water for us?
- Do you have a latrine? If yes, did you construct a septic tank? If not, where do you go for defecation? If you do have a latrine, but not a septic tank, how is the toilet waste disposed of?
- Which are the main festivals you celebrate?
- What is your profession? What is the profession of most of the community members?
- How much is your monthly income as a family?
- What is your monthly saving?

Questionnaire: male group

- What is your name?
- What is your place of origin? If from outside, why did you migrate to this place?
- What are the main religions in this area?
- What is your educational qualification?
- How many members do you have in the family? How many are literate and what is the highest educational level?
- What is your profession?
- How many community members are involved in agricultural activities? and in service? Who are they?
- Where can waste water be found in your area?
- What is the effect of this waste water on your locality?
- What, in your opinion, is the best solution to the waste water problem? Who could manage the waste water and what should s/he do?
- How is your health condition? Are you suffering from any disease? If so, what do you do to fight it?
- What are development activities undertaken in this area? Who funded these activities?
- If any organisation would help manage waste water, how could you contribute to that activity?
- What was your contribution towards previous development activities?
- What are you doing nowadays? Are you involved in any occupation? In what range is your monthly income? How much out of that income can you save?
- How much do you contribute to social activities?
- Should development activities start in this community, would there be a chance of social conflict?

Questionnaire: female group

- What is your name?
- How many members do you have in your family?
- Which are the water sources you use? Which one is used for drinking purposes?
- How much water per day is needed for your family?
- What is the use of waste water? Do you re-use any water? If yes, for what purpose?
- What advantages and disadvantages do you see in the use of waste water?
- Do you have a latrine? If yes, what type of latrine? If no, where do you go for defecation?
- Do you have cattle? If yes, what do you do with the cowdung?
- What are the main festivals celebrated in your community?
- What is the educational level of your family members? Are there schools in the community?
- What are your main daily activities these days?
- What are the main sources of income in your family? How much is the monthly income? How much can be saved from this amount?
- What kind of development activities took place in the community? Did you contribute to it? If yes, how did you contribute?
- Should new development activities take place here, what kind of support could you give?
- Are you involved in any social organisation?
- What kind of diseases occurred in your family? What did you do for treatment?

Technical questions for local authority

- What is your name? What is your function?
- What is the approximate surface of the area we are looking at?
- How many people live in this area? How high is the population growth?
- What is, percentage wise, the use of the land? Public land, cultivated land, jungle, settlements?
- Which are the drinking water provision to your area and what percentage of the provision do they cover? How is the quality of the water of these different sources? For which purposes are they used?
- If there is piped water supply, where is the source?
- What is the average amount of water used by a household? Do you think this amount will increase if more water becomes available?
- What are the sources of waste water in your area?
- From which areas does waste water flow here?
- How much do you estimate the daily amount of waste water from the kitchen, the bathroom, the latrine to be in the rainy and in the dry season? Is there domestic or local industry producing waste water?
- What percentage of the people use a dry latrine? A flush latrine? The open field?
- Can you give some details about schools, hotels, offices, health posts etc. in your community? How many students, guests, staff do they have?
- Can organic waste be found in the waste water? Can chemical pollution be found in waste water? Can non-decomposable wastes be found in the waste water?
- Can you give details (length, diameter and condition) about pipes, open and covered drainage channels?
- What type of waste water is collected here? All types (black, grey and white water), only rain water, waste water of bathing places and kitchen, waste of domestic industries?
- How is waste water presently collected? How is collected waste water presently disposed of? In river, to open field, exposed to the sun, soak-pits, treatment plant or other?
- How do you rate the effects of the present waste water disposal scheme on public health, water pollution, air pollution, on religious or traditional belief, on economic activities?
- Are you satisfied with the present waste water disposal system? If not, what kind of ideas do you have for improvement of the situation?

- Was there a provision for waste water disposal in the past? if yes, could you describe it?
- Do general people complain about the present waste water collection and disposal system? If so, what kind of complaints do they voice?
- Which of the complaints could be dealt with according to you?
- Should a proposal for improved waste water management be developed, what inputs could be contributed? Land, financial resources, technical assistance, operation, maintenance and management responsibilities? If such inputs can be provided, can you give more details, for example about how they could be arranged?
- Is there anything you would like to add?

Observation checklist

- Geographic characteristics: steep, hilly, plain, percentage of gradient, soil type.
- Approximate area of public land, use of public land.
- Estimated water use for cottage industry, estimated water use for kitchen gardening.
- Nature of waste water: with human excreta, suspended and soluble waste from cleaning, (organic) garbage from kitchen, chemical waste from cottage industries, non-decomposable solid waste.
- Present rate of generation; time vs. amount of waste water being collected.
- Estimated public involvement in development activities.

ANNEX IV Summary reports about field visits

Reports on the four communities as presented by the participants (translated but unedited)

1. A Proposal for Kusunti Nayanagar

Since Ward no. 13 Kusunti Nayanagar is a low land it has been polluted by wastewater. During (Nov. 2-13, 1998) the workshop organised by IRC, ENPHO and NEWAH, the participants, facilitators and organisers visited Kusunti Nayanagar. During field visit observations were made and interviews were taken, the findings of which are presented below.

In Kusunti Nayanagar the wastewater of ward no. 13, 4, and 5 and Rana era is released. Tap water of city water supply and sometimes even water from stone taps have been used for washing and bathing. Since most of the people in the area have migrated from other parts, they have contributed a lot in uplift of the society. Each family has 5-7 members. Each family uses about 50 liters of water. Since land is fertile 50% of the area is used for agriculture. 48% of the total land is residential and 2% public. Wastewater is released in own agricultural land. Once the sewer line has been installed the wastewater has been released in the sewer line and it is not good to reuse the wastewater. Main water sources are city supply, stone tap, dugwell, and springs.

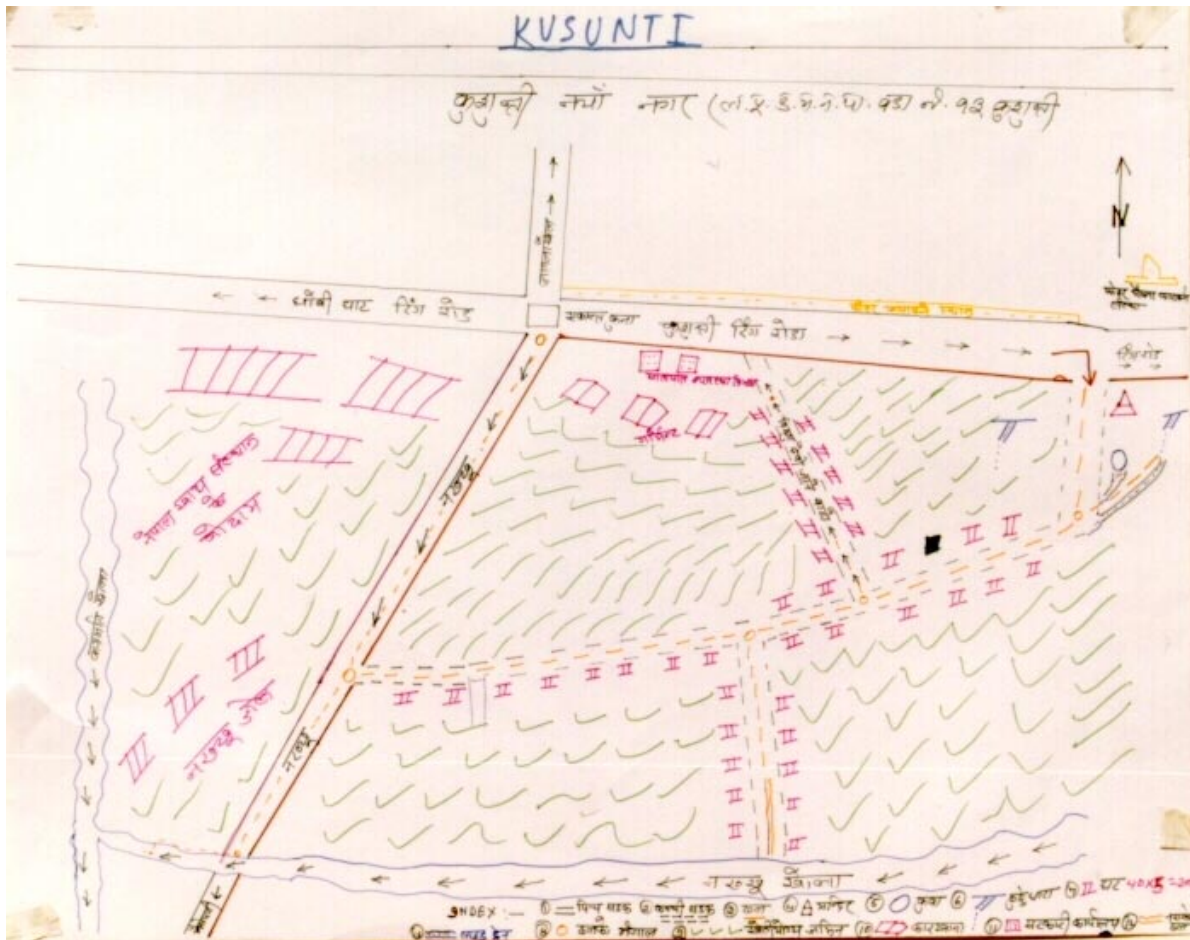
People of this area are aware of consequences of higher costs of having big families. People are of the opinion that it would be good to release waste water in the river only after treatment. There is a lot of wastewater generated in this area due to carpet and dyeing factories. Probably the wastewater has 95% of organic pollutants. The wastewater can be managed only through the combined effort of donor agency and the local people. Every household has its own toilet and the toilet wastes are disposed in pits. Since these pits are temporary, leakage from these pits is common. Income source of the local people are service and house rent. Due to lack of cleanliness, most of the people suffer from diarrhoeal diseases. Since the residents have emigrated from other areas they do not have arable land and most are service holders.

People are of the opinion that after the construction of sewer line side drain is needed for irrigation. The most polluting agents which has caused environmental problems in this area are wastewater and pollutant of dyeing effluent. Local people have shown interest in managing wastes and have contributed voluntarily and also by providing certain funds. About 5000 people live in this area and the population growth is 2.3%. Some technical assistance can be met locally for the implementation of any project and also operation and management of small projects can be done locally. However, for big projects nothing can be said now. Rajkulo, the wastewater sewerline has been converted to flat road. Income of this community is low. The wastewater collected in this community is released in the stream and ponds nearby. Main festivals are Dasain, Tihar, Tij, Machhindra Nath procession etc. Main schools are Mahendra Bhrikuti Secondary School, Ajaya, Future Star etc. About 10,000 liters of wastewater in the rainy season and about 15,000 liters of wastewater in the dry season is generated by small scale industries. This community is motivated and interested in development activities.

In Kusunti sewer line is being laid in the process of managing wastewater. The wastewater will be released in the Nakhukhola since there is no alternative. However, people have shown concern about mixing effluent in the stream, Nakhukhola. Due to this concern shown

and people's voice the construction of sewerline has been stopped for the time being. In order to overcome above mentioned problem, Kusunti community hereby requests to the donor agency to help them in accomplishing any of the following projects.

1. If the donor agency has enough grant construct a treatment plant in order to solve the wastewater disposal problem.
2. If the first one is not feasible then construct another treatment plant at Jor Khaamba.
3. If both the above projects are not feasible then lay a side drain since this may not need huge budget.



2. A report from Madhyapur (Thimi) community

Madhyapur Thimi which is one of the oldest communities of the Kathmandu Valley is situated in the middle of the historical city called Bhaktapur and the capital city Kathmandu. Like other old cities this city is also situated on elevated land and therefore one has to climb up to reach this city. Thimi occupies an area of 2 square kilometers and the area has been divided into 8 wards. This report has been prepared with special consideration to ward no. 11,12,13 and 14.

Although the area into consideration occupies an area of 1 sq. km., it has a population of about 1400 and it is a dense community. The community has a lot of problems. Problems of drinking water and wastewater management are the most critical ones. These two problems have caused other problems and therefore also these problems are serious. These frightening problems have inflicted negative impact on public health and environment and one can easily guess the kind of state the people of this community are living in. An effort of one single workshop can not analyse, identify and also solve the problems. Therefore, this report has been prepared with reference to wastewater management.

Major problems of wastewater management

In the community, in about 90% of the area sewer pipes have been laid for the collection of wastewater. It can be hoped that rest 10% area will also have sewerpipes. Therefore, there seems to be no major problem in conveyance and collection. Since there is no separate line for sanitary sewer and stormwater, there is very low flow in the dry season and very high flow in the rainy season in these sewer lines. Sometimes the flow in the sewer lines exceeds the capacity of the pipes and causes serious damage. The wastewater from the sewer lines is released in the open field. From the open field the wastewater joins gutters and small canals which finally merge into the Hanumante river. Because of lack of proper management of wastewater, following problems have been created.

1. The sewerline constructed in Hatimahankal, which collects wastewater from three directions, flows towards Siddhikali. This sewerline has made the area polluted and due to low capacity of the pipeline there occurs a lot of overflow. The wastewater is released untreated.
2. Problem caused by open toilet drain
3. Wastewater from Chodetol, Dui pokhari, Simatole and Dathutole is collected near Taha dugwell. The wastewater then flows to Lhabaha where also acidic waste mixes and the combined waste have severe adverse impact in the surrounding agricultural field.
4. Open drains from Bamune area flowing towards Bappa and wastewater from Chode mix in Bappa which has made the whole area polluted.
5. Wastewater collected from Inalachi passes through Balkumari China Road and merges into Hanumante River which has very much polluted Hanumante.
6. Wastewater collected from Sunkha and Dadhutole passes through Bishnukundal and mixes into Khucha

A field observation was done in order to know the gravity of the situation. Various types of information was collected by filling up questionnaires in order to find out the potential solutions. Some of the aforesaid things are also based on the information thus collected. After interaction with various groups of the community overall state of the community and possible solutions were identified. The various groups were of old people, women, local authorities, and men. The points identified to be considered after the interaction with these people are following.

Technical need

There seems to be no significant problems in getting technical aspects. Due to Thimi's geophysical feature wastewater can be transported via gravity flow. A lot of public land is available. Besides, local authorities have realised the local situation and therefore, are committed to solve the problems by providing technical human resource. As has been said before, the main need of the community is to manage the wastewater collected by the drainage pipes already laid in the 90% of the area of the community. On top of that most of the drainage pipes were laid within past few years only. They are in good condition and need to be maintained.

Before managing wastewater it is essential to know the nature of the wastewater. Local authorities do not seem to be much aware of the nature of wastewater. After field observation it is believed that the wastewater is mostly organic. However, the non-biodegradable component is gradually increasing. Hanumante river receives a lot of industrial wastes. At Lhabaha area the wastewater is acidic due to the acidic effluent from the production of alcohol in households. An appropriate method of treatment should be sought for such wastewater. Besides, analysis of the cause of the failure of the treatment plant constructed by Plan International can provide some insight into the technicalities of wastewater treatment. Although there is a big problem of wastewater management, there is not any significant plan and programme to overcome it and the problem is growing. The problem has been compounded by the lack of sufficient water supply.

Cost of construction

A huge amount of fund may be needed in order to manage wastewater. However, this cost is far outweighed by the benefit that can be reaped from it. Local community has opinion that it is possible to contribute partial fund which can be much less as compared to the total amount needed. However, the local authorities are willing to contribute some from their side and local people may also contribute some labour. These in total may be enough to bear a significant portion of the total cost. Therefore, it is almost certain that a donor agency is needed to meet the large part of the financial need. Since the sewer drain has been laid only a little cost is needed for maintenance of the lines. Availability of the public lands will also lessen the financial burden of construction.

Management and operational cost

Since the wastewater problem has caused a lot of discomfort local people are committed to solve it. People are also aware of the need of the proper operation and maintenance of any project after implementation. There are several NGOs and clubs which have shown interest and they can also help in operation and maintenance. Similarly, user groups can be formed in order to make the project sustainable. Donation can be collected from the households and also minimum fees can be collected to meet certain operation and maintenance cost. In a nutshell, the cost of maintenance and operation of a project can be met by the local community.

Technical capability to operate and maintain

The community should be technically capable to operate and maintain the projects related to wastewater management. If the community is not capable then all the effort could be wasted. Since the people of Thimi are educated they can understand simple technicalities about wastewater management. Technical human resource is also locally available in order to run a project sustainable. With some training local people can also operate different equipment's if needed. Therefore, this community is technically capable.

Social Acceptance

The community has suffered due to lack of wastewater management. Although the community is aware of adverse impact of unmanaged wastewater on health and

environment it has not been able to solve the problem due to its complex nature. However, any step taken towards solving the problem will be highly appreciated by the community. The community knows that it is their problem and they are the ones who should take initiative towards managing the wastewater. Somehow this is not happening. In case any external institution can take the initiative the local community is ready to help as much as possible. They are also committed to appropriately manage any project. They strongly believe the projects can be run smoothly without disturbance. However, due to some previous incomplete projects local people sometimes raise doubts about upcoming projects. For example, since the treatment plant constructed by the Plan International was left incomplete, local people have become not only unsatisfactory but also angry.

Environmental impact

It is undisputed that unmanaged wastewater has caused adverse environmental impact. The wastewater has made the canals and Hanumante river highly polluted. Since the wastewater also flows in open canals it has also caused a lot of nuisance. This pollution has imposed harmful effects on public health. All the people suffer from diarrhoeal diseases. All of this has resulted into decreased living standard because a major portion of their income is used for medical treatment. Besides, the wastewater has also been used for irrigation which has imposed negative impact on the health of farmers and the crops as well and this has affected the overall economy of the community. The acidic wastewater has further heightened the problem. Since the water in the canals and creeks are polluted due to wastewater, farmers use stone tap, wells and piped supply for washing their vegetables and therefore drinking water shortage has increased. Besides, the signs of soil erosion and landslides due to rain have emerged and the overall physical feature may be damaged ultimately.



3. A report from Panga

Panga occupies ward no. 9, 10, 11, and 12 of the Kirtipur Municipality. Panga's shape looks like the head of an elephant and Panga is a Newar community in the southern part of the Kathmandu Valley. 65% of the land is arable, 25% residential area and commercial area and 2% others. The length of Panga is 1500 m and breadth ranges from 300-800m. According 2048 BS census Panga has a total households of 970 and total population of 5,900. The rate of population growth is around 2%.

95% of drinking water in the community is supplied by pipes and the taps are public. 2% is supplied by wells and rest by brooks. Ponds like Dana Pukhu, Dev Pukhu and Tala Pukhu can be used for irrigation. Chikhu and Hanumanghat can be considered as rivulets. However in the absence of conservation these rivulets have been extremely polluted.

Water has been supplied in Panga by one source only which lies at Ddudhpokhari which is situated at about 1.5 km from Panga. 95% of thus supplied water in Panga has been used for domestic purposes including drinking, 20% for irrigation, 10% for cattle and cleaning and 5% for cottage industries. The wastewater from various uses have about 40% organic pollution and 30% chemical pollution. About 10% is non-biodegradable. Wastewater is disposed in rivulet through pipes. Most of the sewerage drains are closed in the residential areas. However, due to financial constraints the wastewater is disposed of untreated. Due to this the receiving streams and its surroundings have become unhealthy. The hume pipe which carries the wastewater has a diameter of 12 inch and a length of 5/600 meters and covered sewerline is about 300m and open drain is about 150m.

Of the wastewater generated, 60%, 15%, and 10% is released in streams, agriculture field and ponds respectively while rest is released in open public lands. Public complaint is that unhygienic disposal of wastewater has had negative impact on air, water and indirectly on financial activities. No one is satisfied by the way the wastewater is presently disposed of and the people are eager to implement an alternative way. The commitment of the community working towards treating wastewater is appreciable. People are interested in social activities and about 75% of the people have shown interest to contribute financially also as much as they can afford. Previously when Plan International run a project of brick soling on the roads, each household contributed some money. For successful completion of small projects this community has enough technical human resource. Similarly, for sustainable management and operation various clubs, guthis etc. are active. During Devpokhari cleaning local people provided labour. Thus, till today social activities have been successfully carried out without any disturbance.

For men

90% of the people of Panga are indigenous while 10% are emigrants. There are several monuments in this community, the major ones being Bishnudevi Vajangal, Balkumari, and Bihar at Dhusi.

In this community 40% women are literate, about 65% men are educated and therefore about 50% people are educated. There are also a lot of doctors. Since the number of boarding schools has increased, about 95% of the children go to school. Most of the people of this community are farmers. About 30% are business men and service holders and 10% are unemployed.

Farmers in this community believe that untreated wastewater is harmful to crops and if it can be used for irrigation after treatment this can boost production. People are unanimous in their hope that such social problems can be solved with the help of NGOs, and INGOs. Men had contributed a lot during brick soling done in the past by the Plan International. People have no faith in Government. The projects implemented by Government is rather incomplete. For example, at Dathal a health post was constructed but is still incomplete after four years.

Any work done by the Government is rather slow and social organisations do not misuse funds.

For women

Most of the women of Panga are involved in agriculture. More than 60% women do farming and household jobs. The major crops produced here are rice, wheat, mustard and beans. Food sufficient for a year is stored at home and some money earned through other works meet other expenses. This can save up to 20%.

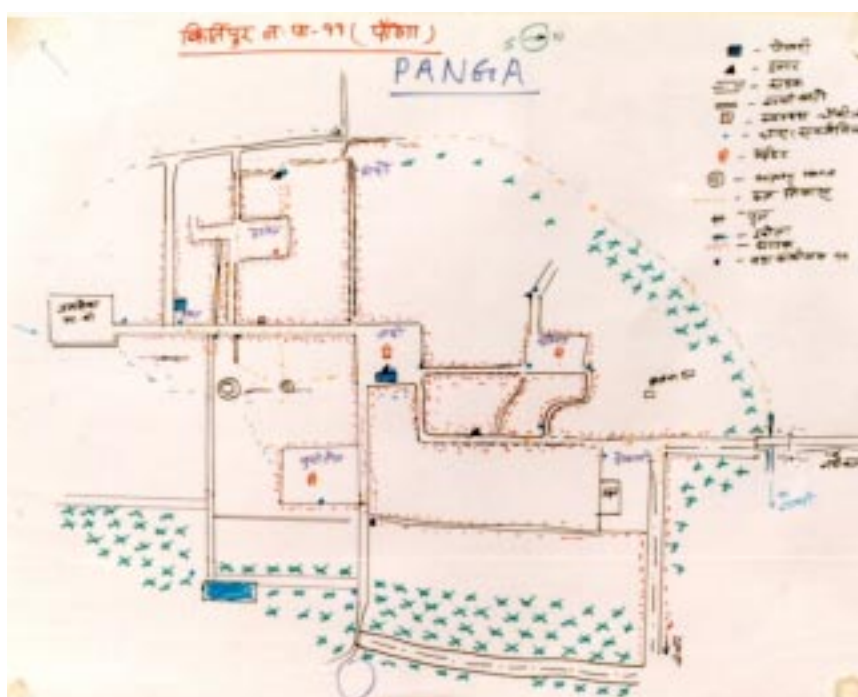
In Panga, about 65% people have their private latrines. Those who do not have private latrines use open areas for defecation. Among those who have private latrines 55% send the wastewater in the sewer lines whereas rest of them have septic tanks. About 50% of the women are literate since women have joined adult literacy classes run for old people. So they are also aware of waterborne diseases. Since they are busy in household works they are still unaware of many things. However, they have now realised that girls should be educated also.

The source of water supply is protected and therefore waterborne disease is not that high. However, daily 15-20 people still visit the health post. The women are not satisfied with disposal of untreated wastewater and they are of the opinion that it should be treated and used for agricultural purposes. The main concern of the women is the lack of water for irrigation. They are ready to join the effort made by the community.

For old people

20% of the people in Panga are more than 50 years of age who can be categorised as elderly people. We can get information about past activities from them and also we have talked to them about present situation. The elderly people are helpful and considerate to others. They are respected in various occasions and festivals and people obey them. Elderly people are also aware of the wastewater problem. According to them problem of wastewater was more acute 10 years ago and it has subsided at present and hope that it will minimise in the years to come. 60% of the elderly are still working. Rest can not work and advises in social activities.

People in this community suffer from diseases a few times and visit clinics for cure. In fact outbreak of communicable diseases is rare in this community.



4. A report submitted by the participants from the Siddhipur VDC.

A workshop about wastewater management was organised by ENPHO, NEWAH and IRC on Nov. 5, 1998. This report is based upon the field visit made by the whole workshop team Nov. 5, 1998 and is about the problems and issues of Siddhipur community.

Siddhipur VDC which has a dominant Newar population is one of the 41 VDCs of Lalitpur District. This VDC is connected by a pitched road and lies at about 4 km East of Lalitpur Municipality. This VDC is surrounded by other 4 VDCs i.e. Lubhu in the East, Imadol in the West, Tikathali in the North and Harisiddhi (Thaiba and Godamchaur) in the South. This VDC lies at an altitude of 1500 m from mean sea level. It occupies an area of 4.13 square kilometer of which 80% land is arable and rest 20 % has been used as public land and residential area.

There are about 1200 households in Siddhipur and it has got a population of about 7000. Ethnically, of the total population, 99.99% is Newar. Of them 85 % is Maharjan, and rests are Nemkul, Shrestha, Shakya, Amatya, Napit, Darshanadhari and Sahi. Their mother tongue is Newari. Since Siddhipur VDC is has dense Newar community following are the main problems:

1. Management of wastewater;
2. Provision of safe drinking water;
3. Open toilet used by the community and need of private and appropriate latrines;
4. For proper disposal of wastewater the drain should be established everywhere.

It is essential to overcome above mentioned problems. But due to lack of resources it has not been possible to solve the problems. If the problem of wastewater management and use of open toilet can be solved, the adverse impact on the human health by the polluted environment could be minimised.

Following are the things found during visit in Siddhipur.

- Wastewater coming from even 4 km far from the VDC flows in irrigation canals in Siddhipur VDC;
- 75% of the land is used for agriculture, 20% for residential and 5% for public purposes;
- Drinking water:
 - a. Water is abstracted from the Godavari River, the boundary between Thaiba and Godamchaur VDCs, and collected in an intake tank from where it is transported to a reservoir tank having a capacity of 50,000 liters. The water from the tank has been distributed in the Siddhipur community via 50 public taps.
 - b. About 8-10 dugwells and one spring has also been used for obtaining drinking water.
 - Among the ponds, at present, two, namely Nhu and Phongga, are in poor condition;
 - Following is the consumption of water in percentage by category:

Category	Percentage consumption
a. Drinking, kitchen and cleaning	23%
b. Irrigation	50%
c. Cattle	2%
d. Cottage industry	10%
e. washing and bathing	15%

- Only 20-25 percent people use private toilet whereas others use open spaces and river banks for defecation;
- There is enough land to feed 50% of the population in this VDC.;
- People mostly use dugwell water for drinking;
- There has not been acute shortage of drinking water so far. However safe drinking water is lacking;
- Unmanaged wastewater has adversely affected crops;

- Few percent of people use wastewater also;
- Average family size is 5/6 in this VDC;
- Dasain, local festivals (Baisakh 4 to Chaitra 5), Tihar, Dewali etc.;
- The emigrant population is insignificant in Siddhipur;
- People in this community mainly worship Ganesh, Vairab and Balkumari and the festival of chariot is celebrated by all;
- Men are more educated than women and there are only a few highly educated people;
- Main profession of people here is farming. However, some are service holder and some are involved in knitting;
- Due to pollution sometimes there have been epidemics;
- So far people have been involved in development of Siddhipur. For further development works people are committed to contribute if Government, NGOs or INGOs help them. Certain financial contribution can also be expected from people and local authorities;
- If any agency proposes for the management of wastewater and reduction of environmental pollution, local authorities and local people are willing to contribute some money. However, since there is lack of public lands, construction of treatment plant would be expensive;
- If any program is proposed, except the construction cost, local authorities and people will contribute in following ways:
 - a. By taking maintenance responsibility;
 - b. By taking management and operation responsibility.

In view of aforesaid facts it would be appropriate to develop a programme with the involvement of local people in order to construct latrines and a sewer system throughout the community. The community itself is ready to bear 25% of the total cost of latrine construction.



ANNEX V Overhead sheets used

Overhead sheets used during the technical presentations

Source: Sanex, T.Loetscher

ANNEX VI A case study; short and long term solutions

The case: A Newari community is situated some 20 km from Kathmandu. It has some 1000 houses and about 5000 inhabitants. About 80% of the families are farmers. The land is arable and 40 farms have a total of 200 cows. A dairy factory buys the milk. Close to the dairy we find the Top View hotel, which has 30 beds and flush toilets. The community has a well designed, but badly maintained stormwater discharge system. The general community people defecate on some fields just outside the community. Only the hotel guests use toilets. The sewer line, which is also used by the dairy factory, discharges into the river. Drinking water is available in sufficient quantity. However, its quality is below standards.

Participants were asked to give short and long term solutions to solve the waste water problems.

1. Participants from Kusunti

Short term solutions

Minimise water use in toilet. Do not mix black and grey water. Waste from the toilet should be collected in a septic tank. Liquid portion should be drained out of the septic tank and sludge should be used as manure after mixing with cattle dung and other agricultural wastes. Local people should be educated and motivated to discontinue the use of open toilets and make public toilets and wastes from the toilets should be used as manure. Rainwater should be collected in a big pond and due to evaporation and infiltration water in wells and springs will be increased.

In order to improve personal hygiene and awareness various activities should be launched. While doing aforesaid activities public should be involved in order to solve technical and financial problems.

Long term solutions

- There should be a cordial relationship between the donor agency and local people.
- Local authority should study and produce a report on industrial pollution and bring coordination between donor agencies.
- On the basis of social values and acceptance, problems of majority of the people should be articulated to the donor agencies.

2. Participants from Thimi

Short term Solutions

- Immediately provide trench facilities and teach the villagers to use it. Inform the villagers about the health-hazard and inconvenient situation of open defecation and promote them to stop using that.;
- Investigate in the community whether they want private or communal latrines (toilets). If they prefer both then emphasise on communal latrines as an effective alternative solution of shitting fields;
- If possible, motivate the villagers to construct two separate septic tanks which can be operated alternatively such that while using one tank, the another full of tank will be converting to valuable organic manure;
- Contact the authority of the hotel and dairy factory and tell them to make a provision of treated effluent to be discharged;
- Clean and improve the drinking water quality by chlorinating etc. immediately and find out the sources of drinking water;

- Protect the drinking water sources from the direct pollution sources like wastewater , solid wastes etc.;
- Form clean up parties and motivate people to protect the water resource;
- Make people aware by the following facts:
 - polluter pays
 - waste is our valuable manure
 - money does not stink
- Collect animal dung for making manure and let people do that work by convincing them.

Long term solutions

- Make separate sewerage lines for storm water, grey water and black water;
- After constructing three ponds for treatment, plant reed or amliso in one of them;
- Storm water should be collected in a pond at the outskirts of the village and be used that for recharging ground water;
- Drinking water should be treated by filtration;
- Collect fee every month from all those who have benefited from the treatment plant;
- For treating grey water make biological treatment plant, sedimentation, oxidation etc. ;
- For enough drinking water supply, campaigns should be launched to protect the sources;
- Black water should be used to make manure;
- Clean up parties should be executed for long term;
- Fee collection process should be transparent;
- Overall research of drinking water, rain water and wastewater should be continued;

3. Panga

This is a very beautiful place. Shitting fields are the main problems of this community. Open toilet has badly affected this community because there is a Top View Hotel where tourists stay. Community should be kept neat and clean in order to impress tourists. Since most of the people are farmers they badly need manure. Another problem of this place is the need of repair of drainage of rainwater.

First thing that we need to do to solve the problem of this community is to bring awareness in local people. People should be educated about grey water and black water and that this should be kept separate. People should be educated about the importance of appropriate toilets and the black water which can be used as manure and fertiliser so that black water and grey water do not mix with each other. Grey water can be treated by making two ponds and planting reed. In this village stormwater drainage should be properly maintained. People can also collect donation and maintain. For solving the problem of dairy factory effluent local people should be united and raise tax from the factory. As a result, wastewater generation will be less.

Polluter pays system can be implemented. Since there are sources of water and several wells ponds should be cleaned and water should be collected so that water does not dry in the wells.

Regarding large scale solutions: due to the lack of private toilets, public toilets should be constructed in different places. A manure enterprise can be developed here. Since this community has a population of 5000 and 80% of them are farmers the people will benefit from the manure industry. Raw materials needed for the industry can be obtained from wastes generated in the community. This helps in keeping the village clean and people will be affected too. For tourism also this place should be cleaned.

* Our guess is that the community is Dakshinkali

4. Siddhipur

The village is 20 km far to the East. It has got a population of 5000 and 1000 households. 80% of the people are farmers. There is a Top View Hotel with 30 beds and flush toilets. There is a lot of arable land and people have 200 cows and there is also a dairy factory. People do not have latrines.

The problems of the village can be solved in two ways.

Short term solutions

- For defecation, temporary pit should be used;
- The waste from the pits can be mixed with dung and other agricultural wastes for composting and use in agricultural fields;
- Grey water should be collected in a pit and treated or treated in a pond after collection through drainage pipe;
- Stormwater should be collected in ponds in order to recharge groundwater;
- Community should be motivated to clean the environment;
- Dung should be collected and composted in order to use in the fields so that it increases the fertility;
- Dairy factory effluent should be treated by collecting in a pond;
- Private appropriate toilets should be made;
- Peoples' participation in development works;
- Responsibility of operation and maintenance should be taken by the local people;
- The wastes from the toilets should be mixed with animal dung and other agricultural waste to make a compost;
- Composting for those also who do not have agricultural land;
- Dairy factory.

Long term solutions

- The local people and different institutions should collectively make plans
- A fund should be established with the people's participation
- For operation and maintenance of the projects form associations and funds
- Timely evaluation and observation
- Wastewater should be managed by sewerage systems
- Treat black water, grey water and storm water in the ponds

ANNEX VII Useful addresses and literature

Addresses

IRC International water and Sanitation Centre

P.O.Box 93190

2509 AD The Hague

(from April 1, 1999:

 P.O. Box 2869

 2601 CW Delft

 The Netherlands)

fax: (31) 70 35899 64

e-mail: general@irc.nl or bolt@irc.nl

website: <http://www.irc.nl/>

ENPHO Environment and Public Health Organisation

P.O. Box 4102

New Baneshwor, Kathmandu

Nepal

tel: 977-1-49052/491376

fax: 977-1 491376

e-mail: enpho@enviro.mos.com.np

NEWAH Water for Health

P.O.Box 4231

Thapathali, Kathmandu

Nepal

tel: 977-1- 227325

fax: 977-1- 227730

e-mail: newah@mos.com.np

Waterschap Friesland

P.O.Box 36

8900 AA Leeuwarden

tel: 31- (058) 2339933

fax: 31 (58) 2339966

Hoogheemraadschap Uitwaterende Sluizen

Postbus 15

1135 ZH Edam

tel: 31 (0)299 391377

fax: 31 (0) 299 391180

e-mail: wabr@ushn.nl

Literature

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