WASTE WATER MANAGEMENT IN LAKE TOBA:
Social Marketing of the Existing Waste Water Treatment Plant and Community-Based Sewer System

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EXECUTIVE SUMMARY

Water quality in Lake Toba in North Sumatra, Indonesia is negatively impacted by the discharge of untreated sewage from virtually every household in the basin. The social understanding and acceptance of waste water treatment in the Lake Toba region has not been addressed in previous construction improvement projects. This has resulted in infrastructure improvements that have not been accepted and utilized by the community. Two projects have been identified to bridge the gap between the science of wastewater treatment and the social acceptance and implementation of the technology: 1) social marketing of utilization of a new wastewater treatment plant; and 2) building community consensus by constructing a low cost community-based sewer system as a demonstration of appropriate technology for the region.

The first project relates to a Waste Water Treatment Plant (WWTP) constructed in 1996 to serve the town of Parapat, one of the largest settlements on the lake. The first phases of construction of the collection and treatment facilities have been completed. However, no connections have been made to this facility. Developed through discussions with relevant governmental parties, a program of social marketing of this facility directly to the households, hotels, and other businesses is proposed. This program includes the hiring and training of local Environmental Non-Governmental Organization (NGO) staff members to implement the program.

The NGO’s will organize and conduct workshops at the provincial, kabupaten (district), and community level. These workshops are aimed at building community understanding and consensus, and at identifying community members willing to serve as environmental cadres to conduct door-to-door visits. The environmental cadres will receive training on environmental conservation related to sanitation and household waste, the technical aspects and management of the WWTP, how to market it to the community with materials to support their contacts. This project will be pivotal in the success of the WWTP utilization, which ultimately leads to improved health and water quality in Lake Toba.

The second project focuses on community awareness leading to community participation in dealing with pollution from untreated waste water. Learning from past failures of projects aimed at changing people’s habits through external public awareness campaigns, this project is geared towards utilizing experiences learned within another community in Indonesia. A neighborhood located in Malang, Indonesia, motivated by illnesses and deaths related to poor sanitation, installed a simple inexpensive collection and treatment system. This direct approach of motivating and working with the community succeeded where more advanced technologies have failed.

Using Malang as an example, this project proposes to identify and work with one of the five settlement areas on Samosir Island in Lake Toba and develop a locally acceptable solution to waste disposal. The project includes establishment of a core team; an in-country study tour of three example projects; and community consensus and participation in all aspects of decision-making, design, construction and management of the infrastructure and facilities. Successful completion of this project will allow it to serve as a model for future similar projects in the Lake Toba area and throughout Indonesia.
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Dissemination of LCBSS

Community mobilization

Study Tour – Stage 2

Detail Engineering Design

Training for DED; construction; technical and financial management

Construction Work

Supervision

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I. Introduction

The area of Lake Toba is one of nine priority areas in the Province of North Sumatra, where growth in the tourism industry and protection of the diversity of its flora, fauna and culture are encouraged.

With an area of about 369,854 Ha comprising 259,594 Ha of land (70%) – including the land of Samosir Island and 110,260 Ha of the lake (30%) - the administrative area of Lake Toba includes five Kabupatens: North Tapanuli, Simalungun, Dairi, Karo and Toba Samosir. Among the five kabupatens, the Kabupatens of North Tapanuli and Simalungun have been selected as development priority areas. One of the reasons is that both areas are pollution to Lake Toba.

The concentration of population settlement forming the towns around Lake Toba in both territories has an intensity of socioeconomic activities higher than those in other territories and is dominated by activities in the tourism sector.
In Indonesia, since 1980 the proportion of the urban population served by sewer systems has stagnated, despite a steady increase in private on-site sanitation. A study conducted by the World Bank\(^1\) stated that up to 80% of the urban households used on-site sanitation system. However, the partially treated or untreated effluent from these facilities typically flows into open drains or directly into water bodies.

Particularly in the area of Lake Toba, almost all of the household waste in communities is disposed of directly into the Lake especially at the settlements along the shoreline or is channeled into open conduit and is finally also disposed of into Lake Toba.

\(^1\) The complex range of social, economic and institutional issues related to the advantages and disadvantages of centralized and decentralized sanitation system, and the advantages of “unbundling” sanitation services is fully explored and discussed in Wright (1997)

*Stone Environmental, Inc.*
II. Social Marketing of the Parapat-Ajibata Waste Water Treatment Plant

In 1996, the Directorate General of Human Settlements, Ministry of Public Works, prepared a Medium Term Program for the urban infrastructures development in five towns situated at the shore of Lake Toba. Two of these are located in Samosir Island, namely in Tomok-Tuktuk and Pangururan, and the other three towns in the land of Sumatra Island, namely in Parapat-Ajibata, Porsea and Balige. See Figure 1.

One of the Medium Term Programs (PJM) in the five towns being implemented is the construction of Waste Water Treatment Plant (WWTP) in Parapat-Ajibata to solve the problem of pollution in Lake Toba. Until the end of 1996, the construction of Parapat-Ajibata WWTP had reached the second stage of the planned five stages, with a loan from Japan (OECF) in the amount of 7.3 billion rupiahs equal to 3.2 million US $. The implementation stages for the construction of Parapat-Ajibata WWTP can be seen in Figure 2.

The main and secondary pipe network already constructed reaches a length of 15,126 meters most of which situated in the Kecamatan of Parapat, Kabupaten of Simalungun, while the Waste Water Treatment Plant itself with a capacity of 2,010 m³ per day with an aerated lagoon system is situated in the Kecamatan of Ajibata, Kabupaten of North Tapanuli. The already constructed WWTP is equipped with pump lifts at three sites each with a capacity of 60 l/second and 5.3-m head, and with a pressure pump in one site with a capacity of 60 l/second and 41.94 m head.

This infrastructure is aimed at serving about 17,400 people with a service area of 70 Ha, comprising a residential area of 27 Ha, hotel and restaurant area of 20.5 Ha and trade and office area of 22.5 Ha. The targeted connection units comprise 1,595 household connections and 530 non-household connections.

In early 1997, the Governor of North Sumatra Province appointed Tirtanadi Drinking Water Regional Enterprise as the managing agency, and the operation of Parapat-Ajibata WWTP was planned to begin at the end of 1997.

In fact, by mid 1999 Parapat-Ajibata WWTP had still not begun to operate for many reasons, such as the institution being unprepared, the infrastructure being out of order even lost, and the absence of Local Government Regulation that should obligates hotel operators, restaurants and population to become customers of Parapat-Ajibata WWTP.

However, of all the reasons mentioned above, the most important is the lack of socialization of the infrastructure itself to the consumer target, namely the households, shops, hotels, etc. The same is also true with most infrastructure construction in Indonesia.

- Rehabilitation and Socialization of Parapat-Ajibata WWTP by the Directorate General of Human Settlements

The quite large investment in Parapat-Ajibata WWTP will become redundant if it is not followed up soon by socializing the system itself, and this has been realized by the Directorate General of Human Settlements, Ministry of Public Works.

Based on the latest discussion in the third week of August 1999, the Directorate General of Human Settlements is preparing the Terms of Reference for the work of “Socializing Parapat-Ajibata Waste Water System”. This work has the duration of three months and will be put out for tender soon after the Terms of Reference have been finalized. The scope of socialization work for the Parapat-Ajibata waste water system will include: 1) the preparation of a corporate plan; and
IMPLEMENTATION STAGES OF WASTE WATER TREATMENT PLANT AT PARAPAT-AJIBATA

Legend:
- Lake
- Existing Road
- District Boundary
- Village Boundary
- Future Road
- Pipeline
- Wastewater Treatment Plant
- Pump
- Ferry Terminal
- Stage I
- Stage II
- Stage III
- Stage IV
- Stage V
- Residential Area
- Hotel/ Guest House/Cottage/Tm
- Restaurant
- Office

Source: Directorate General of Human Settlement, Ministry of Public Works
an operating and maintenance manual; 2) implementation of training for managing staff; and 3) preparation of a work mechanism and system for collecting retribution.

In addition, the Directorate General of Human Settlements will also rehabilitate Parapat-Ajibata WWTP, which is planned to begin in September this year so that it may function before this infrastructure is offered to the public.

It can be concluded from the above discussion that the Directorate General of Human Settlements will take an accommodative position on other activities in the interest of Parapat-Ajibata WWTP as long as they are coordinated with all relevant parties. The parties related to Parapat-Ajibata WWTP include:

- Directorate General of Human Settlements;
- North Sumatra Provincial Office of Public Works;
- Provincial Government of North Sumatra;
- Tirtanadi Local Drinking Water Company in Medan;
- The Tourism Office of the Kabupaten of Simalungun; and
- The Tourism Office of the Kabupaten of North Tapanuli

**Social marketing of Parapat-Ajibata WWTP by Local Environmental NGO**

In the TOR for this project the consultant was asked to design the message, slogan and media to be used for a public awareness campaign. It turned that this was not feasible in the short time available namely three workdays in the field, particularly because the contents of the message should be the result of consensus of the above various related parties. Some information such as the type of available services, tariff of service, cost of connection and so forth are still pending at this time. Also, no decision has been made on the institution that will be responsible for the daily operation of Parapat-Ajibata WWTP and controversy exists between Tirtanadi Drinking Water Enterprise located in Medan and the branch office of Tirtanadi Drinking Water Enterprise located in Parapat.

However, the consultant has proposed some ideas for the promotion of Parapat-Ajibata WWTP with the assumption that the infrastructure is functioning. Due to the lack of citizen and community acceptance of the waste water system before the development activities, were implemented, it must now be offered to the public in an effective manner.

In the plan for socializing the Parapat-Ajibata Waste water system to be implemented by the Directorate General of Human Settlements, there is seemingly no activity directly related to the people as prospective consumers.

Experience shows that the most effective way to socially market a service resulted from the WWTP type of infrastructure is a direct contact with target consumer or door-to-door marketing, combined with focus group discussions at the community level, such as with hotel owners, business people, tourism related activities, shop owners, etc. Therefore, the consultant has proposed the use of local Environmental NGO as the party executing the work of “social marketing of Parapat-Ajibata Waste Water System.” In North Sumatra, there are about 6 NGOs active in the field of environment.

The proposed activity will require the equivalent effort of three NGO staff members having a capacity for planning, design, training and implementation of social marketing who are assigned to work fully for one year. These three NGO staff members must be capable of selecting, training and cooperating with the environment cadres taken from among the community within the scope of Parapat-Ajibata WWTP service.
The components of basic activities to be carried out by the selected NGO in the effort to market the Parapat-Ajibata WWTP are:

**Workshops at provincial, kabupaten and community levels**

The workshops at Provincial and Kabupaten levels are designed to get support from local government and agencies related to the construction and management of Parapat-Ajibata WWTP. The workshop at community level is aimed more at identifying the dynamics of the community concerned particularly whoever is regarded as a community figure, the amount of his/her influence, whether there is any conflict among community figures and so forth. All these matters can be used for preparing an optimal marketing strategy for Parapat-Ajibata WWTP.

**Training for environmental cadres**

Workshops at the community level should be conducted in a flexible manner, normally on Rukun Warga or RW (group of neighborhood unit) scale or may also be on Rukun Tetangga or RT neighborhood unit scale, depending on the number of households within. Based on the workshop at community level, the NGO should be able to detect and select several community members who are interested in or concerned about the conservation of Lake Toba environment to be recruited as environmental cadres. To handle 3,500 families will require about 7 to 10 cadres.

The environment cadres have the task of motivating the public to be concerned about the conservation of Lake Toba and to try not to pollute Lake Toba through handling household waste in the right manner. This task will be accomplished by home visits and at the same time such opportunities should be used to encourage the community to use the available infrastructure. In this case, the community must be given accurate information on the economic benefit if they use the Waste Water Treatment Plant even though it can only be measured in the long term.

Before the environment cadres are sent to have face-to-face dialogs with the community, they need to be equipped with knowledge on environmental conservation related to sanitation and household waste, the technical aspects and management of Parapat-Ajibata WWTP, and how to market it to the community.

**Design and production of waste water system marketing material**

The marketing material that is commonly used and quite cheap is a brochure, although the effectiveness is quite hard to measure. The message to be featured in the brochure should certainly be discussed and decided together by the parties related to Parapat-Ajibata WWTP. Various interests must be accommodated in the message, and it should be made as interesting as possible so as to attract attention. It is best to avoid the conveyance of message of a sloganized nature, because such a message has been circulating too much in the community and has proved to be less effective in other communities. Presentation of the costs and benefits to the community if no measure was taken against the pollution of Lake Toba would be more interesting for use in the contents of the message.

Regarding the brochure on marketing, the truthfulness of information presented should be justifiable so as not to disappoint the prospective consumer. If necessary, some research may need to be done beforehand on the correlation between the drop in tourist visits and the pollution level at this time, for example.

Also, marketing of the waste water system can be done in connection with local cultural programs. Some information has been obtained from the discussion with the Hotel Association in Parapat that in a year there are about 100 cultural festivals in the area of Lake Toba during the year. There are some alternatives being proposed, such as organizing an entertainment for the community in the form of a band or traditional theater. But of course such a thing cannot be formulated in a few days, either the format or schedule as well as the party that should carry it.
out. It takes a larger forum and more integrated coordination, because the WWTP service area covers two kabupaten territories respectively with its own Tourism Office.

**Home visits and focus group discussions**

Home visits are done by selected environment cadres assisted by NGO staff members. Through direct face-to-face dialogs, the message will be conveyed more effectively because the cadres may have a direct discussion with respondents. The cadres are responsible for handling at least 30 households, and this figure may increase depending on local condition. Some households may need more than one visit.

Focus group discussions are aimed more at the owners or operators of businesses, hotels, shops, etc., although there is still a chance that households could be included too. The goal of these focus group discussions is to seek commitment of the participants to utilize the Parapat-Ajibata WWTP in handling waste water.

**Estimated Costs of the Social Marketing of Parapat-Ajibata WWTP**

The estimated cost of the project is calculated on the basis of the local price standard in North Sumatra, as being the minimum cost needed for implementing the basic component of the waste water system marketing activities.

The total cost is approximately Rp 150,700,000 or about 18,838 US$ with the assumption that 1 US$ is equal to Rp 8,000. It should be noted that the estimated cost is the actual cost of implementation excluding the fee for consultation from the person responsible for the work as well as the process of NGO’s tender. In terms of the component, the largest cost is found in the NGO staff’s honorarium (35%). Since influencing people’s behavior is not easy and takes time, the service of specialists in community development is a high priority. The summary of cost for each component of activity is as follows:

- Provincial and Kabupaten Workshops Rp.18.000.000 (12%)
- Community’s Workshop Rp.24.900.000 (17%)
- Training of environmental cadres Rp. 600.000 (0.4%)
- Production of social marketing materials Rp.21.000.000 (14%)
- Transport allowance for cadres and focused group discussion Rp.12.500.000 (8%)
- Honorarium for NGO staffs Rp.54.000.000 (35%)
- Reporting Rp. 6.000.000 (4%)
- Contingencies Rp.13.700.000 (± 10%)

**Implementation Schedule of the Parapat-Ajibata WWTP Social Marketing**

It is estimated that one year is needed to carry out the project of marketing of Parapat-Ajibata WWTP to the community. Such a period should be enough for the people to absorb the information, to think it and make a decision. The party providing the service will also have enough time to monitor, process the feedback from the community and prepare the optimal marketing strategy in order to achieve the project goals. The detail of implementation schedule based on the main component of activity can be seen in diagram 1.

While it is very hard to ensure the result of this marketing activity, particularly in the present political and economic situation in Indonesia, it is worth trying so that the large investment already made would not be wasted. Because this same situation exists in many other parts of Indonesia, the project could serve as a case study and model of sustainable development for other Indonesian communities.
### Diagram 1:
**SCHEDULE OF SOCIAL MARKETING ACTIVITY OF PARAPAT-AJIBATA WWTP**

<table>
<thead>
<tr>
<th>No.</th>
<th>Activity</th>
<th>Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Recruitment of the NGO</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Provincial Workshop</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Kabupaten Workshop</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Community Workshop</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Training of Environmental Cadres</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Design and production of the marketing material</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Home visits</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Focused Group Discussion</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Monitoring of the result</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Reporting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Inception Report</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Interim Report</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Progress Report</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Final Report</td>
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</tbody>
</table>
III. Low Cost Community-Based Sewer System (LCBSS) Pilot Project in Lake Toba Area

The proposal presented below shows a deviation from the consultant’s TOR. In the TOR, the consultant is asked to design the material and schedule for community awareness in regard to the disposal of simple waste water on a small scale. Based on consultant’s experience in Indonesian communities with quite pluralistic cultures and characteristics, and from the experience in Indonesia that most community awareness activities in various sectors are not quite effective, it is a tremendous challenge to change people’s behavior, let alone to activate the community to do something in the interest of the environment.

The simplest example is the community’s awareness in the sector of health, particularly in regard to hygiene behavior whose benefit should have been directly felt by the people. The concept being implemented by the Ministry of Health through the Service of Health in the regions and by the world organization of UNICEF, turned out to be less efficient for changing the people’s behavior. Especially when the awareness material is in the interest of the environment, the people cannot see the benefit for them.

Besides, it is public opinion that Indonesian society has been given too much educational information and influence from various agencies and organizations without any concrete benefit for them, so now it is very difficult to get their attention. Thus, it is necessary to use a specific approach to introduce an activity to the community, particularly if the goal is to get people involved in doing it. The most difficult part is how to convince the people of a good concept that will give them benefits, and even more so if the goal is to encourage the community to get involved in doing it.

Until a real example was available to demonstrate it was possible, people in East Java were unwilling to try something that they could not see operating. Once there was a practical demonstration in a local community (Tlogomas), other neighborhood groups were much more open to taking action by themselves.

Passing on the capability and success from a community group directly to another is the most effective medium for introducing an innovative idea and for motivating the people to try carrying out the concept other than the conventional manners such as public awareness campaigns or urging from the local government to the community.

Where a large investment in the construction of a centralized waste system tends to be redundant, a small investment in the construction of simple and inexpensive waste disposal system can be very “cost effective” and provides concrete benefits for the users in the community. The construction of such a simple waste disposal system has taken place sporadically in Indonesia, such as in Yogyakarta, Bandung and Malang.

The simple waste disposal system in the latest mentioned town – Malang – is an example of success worth careful notice and replication. Due to its success, the lessons learned can be applied in other places. This success story has been recognized by several institutions and organizations related to water supply and sanitation at national and international levels. Recently, UNDP/WORLD BANK Regional Water Supply and Sanitation for East Asia & the Pacific has adapted this success story in an international forum of the World Bank, Washington DC attended by about 30 people representing various organizations related to the issues of water supply and sanitation, such as in Brazil, Thailand, etc.
In 1985, one man, named Mr. Agus Gunarto, took the initiative to develop a community sewerage system. Since then he has received many requests from other communities to assist them in developing a similar sewerage system. In Malang this system has been replicated in four other locations with different capacity designs and number of population served.

· Background and the chronology of the LCBSS development in the city of Malang

Agus Gunarto is a member of urban kampong community named Tlogomas in the city of Malang, located on the banks of a river. Similar to the other kampongs in Indonesia, Tlogomas is a typical low-income kampong with a high housing density.

In general, the riverside location of Tlogomas makes disposal of waste – solid and liquid – physically easier than on the ridges, but not healthier or more environmentally responsible. Most of the families still used the river as their washing, bathing and defecating facility. Until recently, children still defecated in the open drains that bordered the laneways, making living conditions both unpleasant and unhygienic.

A localized diarrhea epidemic in part of Tlogomas in 1985, led to the death of five children from poor families. This was the catalyst for women in the community to start advocating for improvements in drainage and sanitation. The openly expressed concern by the women led to a group of six families deciding to initiate community action to overcome the problem. Mr. Gunarto, newly appointed to the position of neighborhood (RT) head, became the facilitator and leader of this group. He searched out information on sanitation systems from friends and colleagues in Malang. The solution chosen was to build a community sewerage system. The group of families began by pooling their own limited funds and then organizing with neighbors to collect more funds, acquire materials and begin construction of the system.

Over a period of more than a year Agus worked to convince other members of his neighborhood to contribute to the construction of the system. Despite significant community support, it took nearly two years of focused work before the system was operational. And although the six initiating households started using the system in 1987, it was almost 10 years before all members of the community were connected to the system.

· Technical aspects of the Tlogomas LCBSS

The Tlogomas LCBSS was based on a network of 100 mm (4”) plastic collecting pipes laid beneath footpaths or below existing drains running along walkways through the communities. Flow is entirely dependent on gravity. The treatment plant is located at the lowest point in the system, and discharges into the river. Treatment plants are constructed from concrete and plastered brick tanks and chambers; some of the facilities are covered with light sheet metal shutters.

The treatment process used in all locations is Anaerobic-Suspended Biomass, often referred to internationally as communal septic tank. Locally this has come to be known as the “AG Tank” – from the initials of Agus Gunarto, who popularized it in Malang.

The treatment system consists of the following main components: 1) Grit Chamber – a concrete cylinder with a wall/baffle in the middle – to prevent solid material from entering the next processing chamber; Control Box; Treatment Chambers 1 and 2; 2) Settling Chambers (three small) – between chamber 1 and 2 – to reduce the amount of suspended solid entering chamber 2; and 3) Treatment Chamber 3 and Fish Pond. The plan and cross section of the Tlogomas LCBSS is shown in the Figure 3.

2) UNDP-World Bank/Water and Sanitation program 1999, Learning Note, Community-Based Sewer Systems in Indonesia: A Case Study in the City of Malang.
The currently established LCBSS in Malang has basically been designed using “folk technology.” Such technologies are based on a pre-scientific understanding and explanation of the biological processes occurring. Despite this, Tlogomas meets the Class C standard and is, indeed, just short of meeting the Class B standard. It can be seen in the following table:

**Table 1: Tlogomas LCBSS Treatment Effectiveness**

<table>
<thead>
<tr>
<th></th>
<th>Influent (mg/l)</th>
<th>Effluent (mg/l)</th>
<th>% Reduction</th>
<th>National Water Discharges Standards (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BOD</td>
<td>COD</td>
<td>TSS</td>
<td>Class B</td>
</tr>
<tr>
<td></td>
<td>202</td>
<td>331</td>
<td>58</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>121</td>
<td>23</td>
<td>100</td>
</tr>
</tbody>
</table>

BOD = Biological Oxygen Demand (5 Day); COD = Chemical Oxygen Demand; TSS = Total Suspended Solids; pH and turbidity were also determined, pH for both influent and effluent was consistently in the range of 6-7

Despite technical shortcomings, the physical basis (piping, house connections, treatment structures) for relatively inexpensive upgrading exists and is functioning, where nothing at all existed previously. The example of Tlogomas offered concrete proof that LCBSS can be built by the community.

The Tlogomas systems are slowly but systematically being improved. As a result the same structures, sometimes with additional treatment tanks and filters, can be made more effective while keeping the technology suitable for local operation and maintenance.

· **Financial aspects of the Tlogomas LCBSS**

The system initiated by Mr. Gunarto in Tlogomas was completely self-financed by the community. However, the four subsequent systems studied all received outside financial support in one way or another at different stages in their evolution. The results of the case study conducted by the UNDP/World Bank RWSG EAP concerning the financial aspects of the five LCBSS in Malang are summarized in *Attachment 1*.

Total investment for the Tlogomas LCBSS - completely community financed - was Rp. 6,000,000. It should be noted that these costs are all at the time of construction. High inflation and the drastic devaluation of the Indonesian rupiah over 1997 and 1998 have radically increased the cost of construction materials in local currency, especially those with a large imported content. If similar systems were constructed in 1999 the amounts required for the investment of Tlogomas LCBSS would be much greater, i.e. Rp.12.6 million.
The study of the five LCBSS in Malang conducted by the World Bank in March 1999 concluded that total investments required per household are about Rp.285,000 (Rp.135,000 for public plus Rp.150,000 for semi-public) or US$ 33 (with the exchange rate of Rp.8,900/US $), this does not include private investments in building a toilet or bathroom. The comparative costs of building an individual septic tank are currently about RP.300,000-400,000; and maintenance costs (desludging) about Rp.50,000-100,000/year.

Assuming that payment could be spread over 20 equal monthly installments – as appears to be the current pattern – this is equivalent to about Rp.14,000/month/household or about US$ 1.70.

- **Operation and Maintenance Costs**

In each community all of the households connected to the system are required to pay a small monthly service charge amounted Rp.750, and most communities have engaged one or two local people who are paid an honorarium for maintaining the treatment plant. Community arrangements for funding major repairs and longer-term maintenance are still being discussed.

Based on the World Bank study, all families connected to LCBSS in Malang spent significantly less than one percent of total monthly expenditures on operation and maintenance of sewerage. Compared with findings of the ADB (1999) study, which found people paying or willing to pay 2-4% of their income for combined solid waste and sanitation services. Actual operation and maintenance expenditure data from the current study are much lower. The reasons for this include the possibility that these systems are relativity inexpensive to operate as compared to the average costs of on/off-site sanitation in Indonesia.

- **Institutional Aspects of the LCBSS in Malang**

It is common knowledge that various investments in the construction of infrastructure and facilities for use by the community without involving the community from the beginning will not only become an un-sustainable development, many of these do not even have a chance to operate and have become proof of redundant investment.

A lesson to take from successful community-based development is the need for a solid effort to mobilize and activate the community's participation in all the aspects of decision-making, construction and management of infrastructure and facilities to be built. As acknowledged in the TOR, this is also the most difficult part.

From several examples of successful community-based developments, it is evident that there is a strong and direct relationship between the extent or level of community participation and successful management.

From the Tlogomas experience it is not at all obvious that local governments need to or should be in a position to dominate organizational arrangements. In fact, it may be preferable for the local government to be one stakeholder among equals. It is also unrealistic to expect that local governments will be capable of delivering all of the needed support to communities, hence there is a need to identify other institutions that can fill this role effectively. The role of the local government should be to act as an umbrella organization for channeling broader public funds and technical backstopping, ensuring adherence to national standards and regulations.

The most positive learning from all the systems studied is that they clearly demonstrate adequate capacity by poor urban communities in Indonesia to initiate, organize, design, finance, construct and operate their own sewer systems. As noted, the success of the systems appears to be directly related to the depth of community engagement. It is also fairly clear that an “animator” is often necessary - in this case, Mr. Gunarto – to get social processes moving.
For the LCBSS with limited service coverage, **decision-making authority should be located where consumer services and those responsible for operation and maintenance are located.**

- **Site Selection of the LCBSS Pilot Project in Lake Toba Area**

Based on the discussion with various parties related to the development of Lake Toba area as well as observation in the field, the area of **Tomok-Tuktuk on Samosir Island** is a site included in the five settlement areas in Lake Toba Area Medium Term Programs selected for the LCBSS pilot project. There have been discussions with related parties both in Jakarta and Medan. The agencies and organizations involved in the discussions include:

- The Directorate General of Human Settlements comprising West Region Programming Directorate of Western Region, Technical Directorate of Western Region, and Implementation Directorate of Western Region;
- Public Works Provincial Office in Medan;
- Branch Office of Tirtanadi Drinking Water Company in Parapat;
- Lake Toba Heritage Foundation

The various factors in determining Tomok-Tuktuk area as the site of LCBSS pilot project are:

- It is an area included in Lake Toba area Medium Term Programs (PJM);
- It has a sufficient concentration of population;
- It has a land inclination of 8-25% as a technical requirement for constructing an LCBSS with a gravity system;
- It has a sufficient water supply available on a continual basis;
- It is a source of pollution of Lake Toba because it has not had adequate waste disposal facilities;
- It is a location of destination for foreign and domestic tourists, with quite a lot of houses that are made to function as lodging;
- It is appropriate for development of LCBSS with a modular system.

Tomok-Tuktuk is situated northeast of Samosir Island covering an area of 1,720 Ha, being the site easiest to reach from the land of Sumatra Island (Parapat). The busiest traffic of ships as facilities in support of the community’s socioeconomic activities in Lake Toba area is between Parapat and Tuktuk-Tomok. With a population of about 3,325 people, the use of land is still dominated by farming activities. The area of built up territory used for tourism mixed with settlement covers about 74 Ha. Thus, the population density in the built up area is 45 people/Ha. The population settlements have a group pattern along the road in parallel with the shoreline encircling Samosir Island. Besides the existing hotels, there are quite a lot of their houses arranged by the population to serve as lodging for tourists or as restaurants. Tourists are attracted to Tomok-Tuktuk, for the beauty of Lake Toba. Another tourist attraction is the grave of King Sidabutar. In administrative terms, Tomok-Tuktuk is part of the Kabupaten of Toba Samosir.

The varied inclinations of land between 8 and 25% make it easier for the population to dispose of household waste directly to Lake Toba. While there has been no survey conducted, interviews and field observation indicate that almost all of the wastes form households and hotels are channeled directly to Lake Toba. The Medium Term Programs for Lake Toba Area detects that household waste is really the chief problem in the territory of Tomok-Tuktuk. The use of septic tank is still very rare, even solid wastes from settlement mixed with those from hotels are disposed of directly to Lake Toba and the level of pollution caused by the total e.coli has exceeded the standard of waste water quality.
This Tomok-Tuktuk is included in the Parapat Branch of Tirtanadi Drinking Water Enterprise with the service coverage of about 39% of the population. The population that are not customers of the Drinking Water Regional Enterprise use Lake Toba as their source of water resources taken through the help of solar energy.

- **The Activities Components of the LCBSS Pilot Project**

  **Establishment of a Core Team**

  Persuading and getting the support of the community, motivating and consolidating them to be willing to work together so as to realize a good concept is the most important part of the process of LCBSS pilot project development. Therefore, there is a need for an experienced Community Development Specialist (CDS).

  This CDS should be assisted by one or two of the local community members as a Community Development Coordinator (CDC) interested in and having a readiness to try this concept, being liked and respected by members of the community. With this system, it is expected that the CDS would be able to transfer his/her knowledge and skill to the CDC in mobilizing the people so as to produce CDCs from the local community members.

  **Study Tour - Stage 1**

  In order to introduce Tlogomas LCBSS to the community of Tomok-Tuktuk, the community development specialist (CDS) and the selected coordinator of the community (CDC) should first be introduced to Tlogomas LCBSS. They should see for themselves the technology and mechanism of Tlogomas LCBSS managing system in Malang in order to have a proper understanding.

  Thus, in this stage 1 study tour, at least 4 people should make a trip to Malang. They will comprise one responsible person for LCBSS pilot project, one as a CDS, and two CDCs selected from the pilot project’s site in Tomok-Tuktuk.

  **Dissemination of Information about LCBSS**

  The core team comprising one CDS and two CDCs will begin their work by disseminating information about the LCBSS to the community at the project site. Dissemination will be carried out by various means, such as focus group discussions and door-to-door visits, the latter being the most effective manner. The time required for dissemination will be about two months.

  **Community mobilization**

  The core team will collect data on and gather families interested in and willing to construct an LCBSS for a discussion to address the following: the amount of funds to be provided by the community, the amount of contribution by each family; if necessary, where and how to find external financial support - this will include the selection of a person to be responsible for the project finances during and after the construction work; establishment of the managing board, both for the construction and post-construction stages, and a schedule for the project implementation.

  Community mobilization will be a component of activities that requires high flexibility in the given time. The local community’s characteristics and culture, the habits, occupations and physical conditions of the local territory will have a lot of bearing on the effort to influence the people’s interest in the LCBSS construction. Experiences in several sites in Java indicate that the time required to mobilize people will take about 6 months. The entire time required for the implementation of LCBSS will be around one year.
**Study Tour – Stage 2**

The main reason for the “unrevealed demand” of the sewer system are that many people in Indonesia do not really know what “sewers” are, nor are they fully aware of the benefits of sewers and that there are innovative, low cost ways to build them. The example of Tlogomas offered proof that they could be built by the community. Until this system was available, local people had no knowledge of what might be possible. Nor because of the “big and expensive” mind set, had the government been active in informing people that they were low cost options available, let alone constructing demonstration systems.

If the community has made a commitment to the amount of funds, a plan and the schedule of project implementation, then at least 15 people, or a third of the number of families, should be given an opportunity to have a look at Tlogomas LCBSS in Malang so that they may have an optimal understanding of the LCBSS and be capable of carrying out the construction in a better manner in their own community.

If covered through a land route, the distance from Lake Toba to the town of Malang would be over 2,000 Km and take 5 days. It would be more efficient if such a long distance with quite an extended time and such an amount of travel expenses could be utilized also to have a look at the examples of successful LCBSS in other cities on the way namely in Yogyakarta and Bandung.  

*See Figure 4*

**Detail Engineering Design**

Tlogomas LCBSS constructed on the basis of a design of a “folks technology” has proved to be functioning and operating properly, but it would be better if improvement was made in technical aspect both of the design and operation of the facility.

An appropriate adaptation of the technical standard to the physical reality of an environment and economy of a community group, provided from the beginning to the community that has reached an understanding to construct an LCBBS will enable a greater guarantee for a successful construction and operation of the facility to be realized.

**Training for DED; construction; technical and financial management**

The community’s sense of ownership in a facility will be greater if they are directly involved in every aspect of the construction. Therefore, a design using “folk technology” - simple and easy to perceive - will be very appropriate for an LCBSS. However, it would even be more beneficial if there was adequate technical advice at the early stage of construction particularly for the DED so as to ensure that the LCBSS to be constructed will be functioning immediately.

Early provision of low key, hands-on technical advice and training should be given to the community that has made a commitment to construct a LCBSS. The training should also include the transparent institutional mechanisms for providing, managing and accounting for funds, so as to minimize corruption.

**Construction Work**

A high rate of the community involvement in all aspects of an LCBSS construction will be a determining factor in its success. Nevertheless, it would be very inefficient if all members of the community group were involved in construction activities. The construction activities should consist of two experienced workmen who will be assisted by four or five members of the community group.
**Supervision**

Despite the provision of facilities including some training for the community group in agreement to construct an LCBSS, supervision will be needed until the facility has been completed and is functioning and operating properly. The project supervisor is the most appropriate one to be assigned to the supervision task and to provide technical assistance if required during the planning, construction and initial operation.

**Figure 4: Indonesia – showing the East Java and North Sumatera regions in which Malang and Lake Toba are located**

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**Estimated Costs of Tomok-Tuktuk LCBSS Pilot Project**

It is widely recognized that communities, even relatively wealthy ones, are not capable of wholly self-financing sewer systems if they are to begin operating within a fairly short time span and be technically effective. A further challenge is in deciding on the most appropriate means for channeling financial support to communities, without tying them up in red tape and while preventing large losses due to corruption.

Without moderate but consistent financial support – for technical advice and in some cases construction costs – it is unlikely that technically successful LCBSS will be widely adopted. The issue is how can external support be made to stimulate community-based financing without negatively distorting community expectations or “ownership”. For example by making available minor amounts of “stimulant” funds fairly soon after the community commits itself to establish a LCBSS. How much funding is required should be carefully estimated to avoid undermining local fund raising efforts.
In terms of amount, the funds required to carry out the LCBBS pilot project in Tomok-Tuktuk is quite large, namely about Rp 183,573,610 or US$22,947, while the cost needed for the construction of the infrastructure itself is only Rp 32,000,000 (17%). Most of the funding (36%) will be spent on travel expenses for the comparative studies being an important part of the community’s mobilization. The next largest part (22%) will be spent on the fee for the community development specialist (CDS) and the community development coordinator working for one year long. Nevertheless, if this pilot project should be a success and could be replicated in other sites in the area of Lake Toba, the initial cost would be very small compared with the benefits for the community and local surroundings. The detail of estimated cost of each component in the Tomok-Tuktuk LCBBS Pilot Project activities would be as follows:

- Establishment of a Core Team Rp.12,755,000 (7%)
- Study Tour – Stage 1 Rp.10,716,400 (6%)
- Dissemination of LCBSS Rp.2,250,000 (1%)
- Community Mobilization Rp.7,900,000 (4%)
- Study Tour – Stage 2 Rp.41,413,700 (23%)
- Detail Engineering Design Rp.8,000,000 (4%)
- Training for DED, construction, management Rp.11,050,000 (6%)
- Construction Works Rp.32,000,000 (17%)
- Honorarium for CDS & CDC Rp.40,800,000 (22%)
- Contingencies Rp.16,688,510 (10%)

The assumption used in calculating those costs were based on the local standards, especially for the costs of construction, therefore construction costs standard of US$ 33 become US$ 50. The concerned factors are:

- a far lower population density, thus the distance from a house to another is quite large; as a consequence the dismantling of existing waste water pipes and reinstallation for connection to the main pipe will be much more expensive;
- the needed building materials will require an extra cost for transporting them to Samosir Island;
- the evidently smaller number of families to be involved in this initial stage;
- the local standard wage, particularly for quite skilled labor to ensure the quality of work; and
- rupiah’s rate of exchange to dollar with much fluctuation

Another assumption used in calculating the travel expenses for the study tour for economizing is the use of combination of ship for Medan-Jakarta trip and the other way around plus train and car for Jakarta-Malang-Jakarta trip. It is worth noting that in the above estimated cost does not include the cost to be incurred for releasing the needed land of about 100 m2 and the consultant fee as the responsible person for the work.

**Implementation Schedule of the Tomok-Tuktuk LCBSS Pilot Project**

The minimum time required for implementing the LCBSS pilot project until the facility has been built and functioning will be around one year. The community’s preparation will take a 6 months’ period before the construction activities can get started. The detail on the LCBSS pilot project implementation is based on the component of activities can be seen in Diagram 2.
## Diagram 2:
**IMPLEMENTATION SCHEDULE FOR LCBSS PILOT PROJECT**

<table>
<thead>
<tr>
<th>No.</th>
<th>Activity</th>
<th>Month</th>
</tr>
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<tbody>
<tr>
<td>1.</td>
<td>Establishment of a Core Team</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>Study Tour - Stage 1</td>
<td>2</td>
</tr>
<tr>
<td>3.</td>
<td>Dissemination of LCBSS</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>Community Mobilization</td>
<td>4</td>
</tr>
<tr>
<td>5.</td>
<td>Study Tour - Stage 2</td>
<td>5</td>
</tr>
<tr>
<td>6.</td>
<td>Detail Engineering Design</td>
<td>6</td>
</tr>
<tr>
<td>8.</td>
<td>Construction Works</td>
<td>8</td>
</tr>
<tr>
<td>9.</td>
<td>Supervision</td>
<td>9</td>
</tr>
</tbody>
</table>

Note: The diagram shows the planned schedule with specific months indicated for each activity.
References


Information on the financial aspects of five LCBSS in Malang was collected through sample surveys of 10%-50% of the households connected to each LCBSS. Information on the history and involvement of third (external) parties was collected through informal discussions in each community.

Several types of investments are required to establish a system; (i) public investments for the construction of the treatment plant and main pipe network; (ii) semi-public investments for the connection from individual households to the main pipe; and (iii) private investments for the construction of household WCs, etc. The chronology of system development and the sources of different public investments are summarized in the table below.

Table 2: LCBSS Chronology and Sources of Finance for Public Investment

<table>
<thead>
<tr>
<th>Locations</th>
<th>Tlogomas</th>
<th>Watugong</th>
<th>Mergosono</th>
<th>Bareng</th>
<th>Samaan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Public &amp; Semi-public Investment</td>
<td>6,000,000</td>
<td>17,000,000</td>
<td>18,500,000</td>
<td>4,295,000</td>
<td>6,100,000</td>
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<tr>
<td>From Community</td>
<td>6,000,000</td>
<td>8,800,000</td>
<td>16,000,000</td>
<td>2,045,000</td>
<td>600,000</td>
</tr>
<tr>
<td>From Government</td>
<td>-</td>
<td>1,000,000</td>
<td>2,500,000</td>
<td>2,250,000</td>
<td>5,500,000</td>
</tr>
<tr>
<td>From Other Sources</td>
<td>-</td>
<td>7,200,000</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Contribution per Household</td>
<td>95,000</td>
<td>75,000</td>
<td>100,000</td>
<td>50,000</td>
<td>20,000</td>
</tr>
</tbody>
</table>
Notes: All amounts in Indonesia Rupiah (IDR) at time of construction. The last row is the average amount each household had to contribute.

- In Tlogomas, poorer households only had to contribute Rp. 75,000, while other households contributed more.
- Watugong received a total of Rp. 17,200,000 for a variety of local improvements (mainly roads and sanitation). Of this amount, about Rp. 7,200,000 was used for sewerage.
- In Bareng, accumulated community savings was actually only Rp. 450,000 and the remainder was pre-financed by one wealthy family; conditions attached to this pre-financing were not clear, and as a result it has become a source of serious conflict in the community.
- In Bareng, only Rp. 22,000 has so far been collected from each household.
- In Samaan, includes a large amount of funds from the special government program called the "social safety net" (JPS). In other words, the LCBSS was driven by this government projects in that community.

**Tlogomas LCBSS in Pictures**

- Under this lane ways laid the main pipe of the community sewer system.
- Treatment Chamber number 1 & 2 (above) and the fishpond (below).

*Photographs by Haryatiningsih
July 8, 1999*
### Attachment 2

#### List of People Met

<table>
<thead>
<tr>
<th>Name</th>
<th>Position and Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjar Prajudi</td>
<td>Implementation Directorate of Western Region,</td>
</tr>
<tr>
<td></td>
<td>Directorate General of Human Settlements</td>
</tr>
<tr>
<td>Amiruddin</td>
<td>Programming Directorate of Western Region,</td>
</tr>
<tr>
<td></td>
<td>Directorate General of Human Settlements</td>
</tr>
<tr>
<td>Bebas Gurusinga</td>
<td>Head of Tourism Office of the Simalungun Regency</td>
</tr>
<tr>
<td>Binsar P. Situmorang</td>
<td>Head of Planning Board of North Tapanuli Regency</td>
</tr>
<tr>
<td>Bernand Sidabutar</td>
<td>Secretary of North Tapanuli Hotel Association</td>
</tr>
<tr>
<td>Desrah Sibarani</td>
<td>Programming Directorate of Western Region,</td>
</tr>
<tr>
<td></td>
<td>Directorate General of Human Settlements</td>
</tr>
<tr>
<td>Guratno</td>
<td>Implementation Directorate of Western Region,</td>
</tr>
<tr>
<td></td>
<td>Directorate General of Human Settlements</td>
</tr>
<tr>
<td>Henry Hurabarat</td>
<td>President of North Sumatera Tourism Board</td>
</tr>
<tr>
<td>Husin Tony</td>
<td>Chief of the Parapat Hotel Association</td>
</tr>
<tr>
<td>Harsono Gunawan</td>
<td>Secretary of the Parapat Hotel association</td>
</tr>
<tr>
<td>Komang Raka</td>
<td>Chief of Sanitation Division of Provincial Public Work of North</td>
</tr>
<tr>
<td></td>
<td>Sumatera</td>
</tr>
<tr>
<td>M. Sinaga</td>
<td>Chief of the North Tapanuli Hotel Association</td>
</tr>
<tr>
<td>Mangoloi Sidabukke</td>
<td>Priest of the Batak Protestan Church at Tomok</td>
</tr>
<tr>
<td>Mulyani</td>
<td>Technical Directorate of Western Region,</td>
</tr>
<tr>
<td></td>
<td>Directorate General of Human Settlements</td>
</tr>
<tr>
<td>Sihaloho</td>
<td>Chief of the Local Water Enterprise of Parapat</td>
</tr>
<tr>
<td>Syaiful</td>
<td>Programming Directorate of Western Region,</td>
</tr>
<tr>
<td></td>
<td>Directorate General of Human Settlements</td>
</tr>
<tr>
<td>Vera Situmorang</td>
<td>Member of the Parapat Hotel Association</td>
</tr>
<tr>
<td>W.P. Simarmata</td>
<td>Member of North Tapanuli Hotel Association</td>
</tr>
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