BEST PRACTICES

WATER SUPPLY, SANITATION AND SOLID WASTE COLLECTION SERVICES IN LOW INCOME URBAN AREAS

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Conventional Solid Waste Management and Alternative Approaches in Marginal, Urban Areas in Lima, Peru

by

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In 1990, the municipality of El-Agustino District, located in the Metropolitan area of greater Lima in Perú, asked the German Volunteer Service (DED) for technical assistance to ameliorate the burning problems of waste management within the district boundaries.
The accumulation of garbage, shortcomings in transport and storage facilities due to budget constraints, the proliferation of environmental diseases and the presence of informal pig breeders led to an unbearable situation.

Among other features, the social and economic environment shows levels of extreme poverty such as high rates of un- and underemployment, refugees swallowed to the cities from the civil war in the andean area and relatively large proportions of single income households, depicting women as the main suppliers.

The efforts of the local government in charge then focused on participatory approaches to improve the prevailing conditions, sharing decision making processes with neighbourhood groups, organizations on the grassroots level and other popular associations.

Summarizing the government's criteria, the policy to be applied required a comprehensive, integrated approach, where broad participation in the project starting right from the planning stage and decentralized strategies along with ecologic and economic feasibility have been the main guidelines.

During a previous pilot project in the surrounding of Lima, the author together with a group of local experts invented a recycling system for organic waste components implementing a series of productive processes in order to ensure first of all a stable economic platform.
In technical terms the process starts with the transformation of organic material using cost effective, intermediate technologies, into a highly digestive diet for pigs, ducks and chicken. The manure and non patable parts are used for rainworm pods, producing humus, appreciated as the best organic fertilizer and worms, containing all essential amino acids for livestock and aquaculture. Complementing activities have been the implementation of housegardens, nurseries and the production of ornamental plants.

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to reconsider their overall policy towards waste management.

The project offers excellent possibilities for public-private partnerships, increases participation on the local level, provides possibilities for cooperation between local authorities and foreign agencies and last but not least helps to spare limited natural resources and substantially reduce pollution within the urban environment.

The following are some of the main concrete results from the project:
Creation of 30 jobs/per plant and approximately 80 indirect employments/per plant
Approximately 5000 tons per year reduction in organic waste
55 tons of pork meat produced per year
5 tons of duck and chicken produced per year
1.23 tons of eggs 2 produced per year
7 tons of vegetable produced per year
100 m^3 of humus produced per year
Approximately US$ 450,000.- reduction in public expenditures:

Other results not yet assessed but already visible are the reduction in health expenditures; the improvement of ecological environment; the improvement of business environment; and implications for the political environment.

Residents are each time more aware of the need for public recreational facilities, clean air and water and the provision of a health environment. Improper waste management with its multiple repercussions and effects can hamper their efforts for a better living. The project can help the conscientization and awareness about environmental issues. It can also helped increase the responsibility and mutual confidence not only within the population and among decision- makers, but as well, and perhaps more important, between the latter and the residents

The replicability of the project is ensured by its flexibility and adaptability to a wide range of milieus as the productive chain can be adjusted to different conditions, although the full range of opportunities has not yet been tested in practice.

However, there are situations which can hamper the replicability of the project to other regions. The unavailability of skilled labour, familiarized with both the technical process and the indispensable knowledge about project management and administration can be a major obstacle for the project if not taken into consideration. Another obstacle might be the lack of a suitable locations within densely populated, urban areas. The project's alternative approach depends quit heavily on its proximity to the waste generation sites.

Also, El Agustino District has many favourable pre- conditions that may not be found everywhere else: no religious customs, taboos and traditional habits or regional particularities restricting the implementation of the programme; open mind and political willingness to accept radical changes; proper coordination between the public and private sector - local governments, entrepreneurs, financiers etc.

Maina Urban Village Community Water and Sanitation Project in Kenya, East Africa

by

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DANIDA, in collaboration with the Government of Kenya through the Ministry of Local Government, has been assisting in the construction of sewerage systems in four Kenyan towns, namely Homa Bay, Busia, Isiolo and Nyahururu. In 1986, an agreement was entered into for a sewerage project with private connections in these towns. Maina village was included to benefit from peri-urban upgrading in Nyahururu. Project components included sewer connected toilets, low cost roads, storm water drainage and solid waste management. Later, lined pit latrines and afforestation were included in the low laying parts of the community

KWAHO was invited during the in-depth-review mission in March 1989. It was at this time that it was realised that the community (project beneficiaries) was not involved in the programme activities. The NGO was therefore engaged by DANIDA to see to it that the community was approached and to involve the people in the planning, implementation and operation of all the project's components.

At the outset of the project in 1989, the population in Maina was estimated to be between 7,000 and 10,000 people. The figures were based on projections from the 1979 population census. There was a further influx of people in 1990 when the government evicted illegal settlements from the nearby forests. The current population is said to be about twelve to fifteen (12,000-15,000) thousand people.

The village is bisected by a main road. Feeder roads run through most parts of the village every two (2) rows of houses. Due to a high demand for rented housing and the close proximity of the area to the town centre, every available empty space has been utilised for building, encroaching on the road reserves and foot paths.

There is one dispensary serving the community of Maina village. The facility is staffed with 4 health workers who attend to health problems. There is also an administration post and a number of churches. Most of the houses have timber walls and roofs from galvanised iron sheets.

Due to the insanitary conditions in Maina, most diseases were water borne or related, such as:

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regularly collect the solid wastes from the containers. This has led to overflowing of the refuse and spilling all round the communal collection points. During the harvesting period, this litter accumulates in such big quantities that it blocks the roads. The community may need to burn the wastes so as to reduce its volume. The overspilling wastes at times blocks the storm water drains and culverts.

The community has been sensitized to participate in the upgrading of the environment. Provision of better methods of human waste disposal and keeping the environment clean have been the responsibility of the plot owners. Health cleaning days have been a popular activity among women groups, the village health committee and other self-help groups. The general improvement of environmental sanitation in Maina village is due to the efforts by these groups.

The Municipal Council has undertaken to manage the sewer connections in Maina village. It is also involved in the communal collection points and has promised to post some employees in the village on permanent basis.

The public health office and the social services have been instrumental in assisting and encouraging community participation for a clean environment.

A meeting comprising of landlords and the Municipal Council was held to iron out certain things. These included clearing the misunderstanding that the Council would take away plots from their present owners once the project was complete. They were informed that the project was merely intending to improve their sanitation standards. They indicated their willingness only on conditions that no evictions would take place.

During the course of the project implementation a lot of contacts had been established within the Community in Maina village, opinion leaders, Municipal Council and Government Departments Working in this area.

According to the data collected from the dispensary in Maina village, the number of cases for most of these diseases have shown a remarkable decline since the implementation of the project. This effect can be attributed to improved sanitation and health education messages during the project implementation. After the roads have been improved, one can drive or walk to any parts of the village without problem.

Piped supplies for small communities in Malawi urban areas: development and impact of a gender strategy

information compiled by

IRC International Water and Sanitation Centre

Malawi is a landlocked country in Southern Africa, covering an area of 118,400 km^2 , of which 80% is land area and the rest is under lakes. Lake Malawi is the third largest lake in Africa and provides a large reservoir of water for development of hydropower, fisheries, communications, irrigation and domestic water supply.

Malawi is still in an early stage of urbanization with 11% of the total population living in the urban centres. It is estimated that up to 60% of the urban population live in the fringes of the urban centres.

The project was carried out in the communities living in the peri-urban areas of the country, the so called Traditional Housing Areas - THAs. Before 1980, there was no regular water supply service in these communities. Some people got their water from various unreliable, contaminated open water sources; others got their water from vendors at very high costs. THAs often lack the most basic facilities, normally provided to urban communities.

In order to ensure that the people in the THAs were adequately supplied with potable water at a cost which they could easily afford, the government launched the Urban Communal Water Point Project in 1981, with financial and technical assistance from the United Nations Capital Development Fund (UNCDF) and WHO. The objective of this initial project was to construct 600 communal water points in 50 urban centres in Malawi, in order to provide affordable and safe drinking water to over 24,000 low income fringe-urban families. This aim was achieved in 1985, but over time problems with water-point management began to surface and people stopped paying the tariffs to the local tap committees.

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management organization is not sufficient. The degree and quality of participation of women and men during the whole process of a project are essential for a sustainable impact.

The intervention succeeded in raising the percentage of women in Tap Committees from 20 to 60% and later to over 90%. These committees became more active due to the women's constant presence and direct interest. With appropriate training, women gained self-confidence and became effective managers of the communal water points, including their operation and the maintenance.

Overall, the project succeeded in creating affordable and reliable paid water supply extensions to low-income peri-urban areas in the cities and towns in the country. Where a community organization and management programme was carried out, cost recovery improved and the neighbourhoods became to belong to the top 10% of locations with timely payments of their water bills.

In line with the project's objectives, its main achievements have been the improvement of methods of approach to small community water supplies which include: the integration of social, economic, cultural, organizational and technical issues in water projects; the coordinated development of piped water supplies, hygiene education and sanitation; community based approaches in planning and preparation, design, construction and management of local level water and sanitation services; institutional strengthening by the development of community management capacities; inter-agency coordination; improve community financial management; effective local organization, training for all groups involved with community water supply; the development of guidelines for various groups at all project levels; information exchange at both national and international levels; information application at both programme and national sector levels. The methods developed in the demonstration projects were replicated over the country.

One of the major factors contributing to the sustainability of the project is that the communities in the piped water supply demonstration schemes play a bigger role in the maintenance of the water supply system. These schemes have been successfully developed in nine urban centres in five regions of the country.

There has also been a remarkable improvement in community financial management with the result that all tap committees have big surpluses which are kept in bank accounts to be used for maintenance. The fact that there is not only cost recovery but the opportunity of new investments (for instance in maintenance) ensures the sustainability of the project.
An additional activity on awareness raising on cost recovery and resources coverage was taken up by the project: a guideline manual on these issues developed by the WHO in collaboration with IRC was revised and further utilized by the project when carrying out reviews and other baseline surveys.

An appropriate public standpost design has been developed locally through consultations with especially women to ensure its adequacy to meet people's needs and obtain sustained use of safe water in connected neighbourhoods. The modified design has been used in the demonstration centres and a completely new design, also incorporating suggestions and comments from communities was field tested in the new demonstration centres.

Manual Pit latrine Emptying Technology in Dar es Salaam, Tanzania : Service and Equipment

by

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Dar es Salaam, the largest city of Tanzania, has a population of about two million people. Eighty per cent of this population relies on on-site sanitation, in particular on pit latrines. The majority of them belongs to the low-income group. At the beginning of the pilot project in 1988, two types of services for the emptying of pit latrines existed. They were the traditional method and the service with vacuum tankers provided by the Dar es Salaam Sewerage and Sanitation Department.

The traditional method consists of scooping out (sometimes flushing out) the latrine sludge and burying it in a new hole on the residential plot. Although this service has some advantages (no bureaucracy and sludge disposal takes place on the residential plot itself by burying the sludge, which makes the operation independent from a centralised agency), the method involves a high lump sum expenditure for the customers and is unhygienic for the emptiers.

The service with vacuum tankers uses modern equipment. It is an hygienic service to both the emptying crews and the customers, and it disposes the sludge in a controlled manner in the central sewerage treatment plant. However, the tanker service also has its drawbacks in the conditions of Dar es Salaam: the tankers cannot provide service to many parts of the city, mainly because of inaccessibility of the roads (narrow, steep, muddy) inside the low-income areas; tankers are out of service for long periods due to maintenance and repair; the unit price of the service is the emptying load of one tanker i.e. 5000 litres. Although this price is subsidised, poor people cannot afford the lump sum of US$ 10.- per emptied pit.

At the start of the pilot project in the 1980's DSSD had reached a limit in employment creation for pit emptying labourers, and is at present even laying off staff. More generally, due to the structural adjustment programme the demand for employment in the informal and formal private sector is growing. Consequently, a steep rise in informal micro-enterprises has

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service with the MAPET team. And it is here that the MAPET equipment is guarded overnight. Approval of the neighbourhood leaders is therefore essential. The leaders assist also with identifying customers.

DSSD gives direct enabling support to the MAPET teams in leasing or lending the equipment to them, and in carrying out major repairs. For minor repairs, the MAPET teams return to the informal mechanical workshops in their neighbourhoods for which they pay themselves. Replacement of major components, such as a wheel, is, however, beyond the capacity of any MAPET team. In addition DSSD supports MAPET in the following ways:

- training and licensing of the MAPET emptiers
- promotion of MAPET in selected areas and public health education
- monitoring the pit emptying performance of the MAPET teams.

Residents in low-income areas mention several advantages of MAPET over the DSSD truck service. First, the booking office is at easy walking distance in the neighbourhood, in contrast to the central DSSD offices. Secondly, customers can have direct influence on service performance, through their own negotiations with the MAPET team, through supervision, and through involving the neighbourhood leaders in case of disagreement. Finally, the payment modality is consistent with the income and expenditure pattern of low-income households. The cost of the service is related to the 200-litre tank as unit of service. Customers and pit emptiers negotiate about the number of tank loads of sludge to be taken out. The price charged per 200-litre tank load is circa US$ 1.-. A survey in 1992 showed that 27% of the MAPET customers requested up to three tank loads of service, while another 27% of customers requested between three and five tank loads. Using the number of tanks as a unit of service fits into the buying behaviour of low-income customers, who buy other commodities in the same way (e.g. sugar by the cup). A household that has small amounts of cash available at any one time may prefer to pay removing only one tank of sludge in order to have its latrine functioning again.

Low-income households may be compelled to spend more on emptying of their pit latrines as compared with other households in the following situations: the households may not have the cash amount available to purchase a large 'amount' of tanker service, and the tanker service may not reach that particular low-income area at all.

To the MAPET teams themselves the great advantage is that the equipment enables them to earn an income that is, on average, larger than they would earn as unskilled labourers in the formal private or public sector. The MAPET equipment is sturdy and when in daily practice the teams can maintain it from their own earnings. The major repairs are beyond their capacity. Three years after the end of foreign project support, all the seven MAPET teams are still operating.

Questionnaire surveys, analyzed by gender, and discussions with women's groups confirmed that women are responsible for keeping the family latrine in a clean condition. This concerns in the first place the surroundings: the latrine slab, the floor, and the yard outside. Latrine pit emptying is not women's work, but they notice the need for emptying. The MAPET service makes it easier for women to make a booking for pit emptying, as the booking office is often located in the same building as the local clinic and is within walking distance. To go to the centrally located DSSD offices is for them a constraint.

Promotion of latrine construction by low-income urban households in Maputo, Mozambique

Information compiled by

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The urban population of Mozambique counts 3,000,000 people, of which 80% live in the peri-urban areas of cities with 30,000 to 300,000 inhabitants. In Maputo, the capital, the population is 1,500,000 and the peri-urban areas have increased mainly due to migration from rural areas affected by drought and the war. These peri-urban areas are known as the "bairros de caniço" or the "reed neighbourhoods" after the material used in the construction of most sheds and to differentiate them from the "cement city". Already in the colonial times (before 1974) many of these "caniço" areas sprang up on land which was unsuitable for housing and avoided by commercial developers.

Water supply coverage in urban areas in Mozambique is only 35%, including house and yard connections and public standposts. In the "caniço" areas there are practically no water and sanitation facilities. Houses are restricted to one room with no internal division and mostly without windows. Compounds can be shared by 4 to 80 families. Before independence in 1974, most compounds had a pit latrine, although of very poor quality. Water was bought in kiosks linked to the city water network.Kiosks in the caniço were provided with bore holes, pumps and reservoirs. Many women had to carry water for kilometres on sandy lanes. In the late 60's an upgrading project was launched to win political support among the caniço residents. Among other improvements, public taps with free water were installed and a garbage removal scheme was organized.

In Maputo's "bairros de caniço", as in other Mozambican cities, many men and women work in informal markets where they sell vegetables, fruits, other food-stuff, clothes, textiles. This work sometimes brings a higher income than working (as some do) in government departments. The minimum monthly salary in the country is $178,000 Meticais (August 1995), which is approximately US$17.- On average, those living in the Maputo peri-urban areas and working as public officers receive a monthly salary of US$20 to US$25 per month.

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"Animadores" or extension workers, mostly women (80%), are active in 16 units. Their task are promotion of latrines, education and mobilization of the community and training on latrine maintenance. The improved latrine is also promoted through theatre presentations in low income urban areas. Since the experimental phase of 1979, more than 147,000 latrines have been built and sold, involving 252 workers, from builders to technicians. In Maputo, 87,343 latrines have been built in 9 peri-urban districts. Supervision of projects in all the regions is undertaken centrally by a core group, with representatives from the National Institute of Physical Planning, the Ministry of Social Action, the National Directorate of Water and the Ministries of Health and Environment. The INPF has a representation at provincial level to ensure the decentralization of action.

The advantages of the improved latrine are low cost production, simple technology, easy to clean and maintain, durability, security of use by both adults and children, no contact between vectors and excreta due to the lid. The improved latrine system has been designed for households. Having a volume of $2m^3$, the improved latrine can serve a 6 people family for 8 to 10 years. When the first pit is full, the SAN-plat can be shifted to a new pit. The type of latrine can be adapted to the characteristic of the construction site, especially the stability of the ground and the depth of the water-table. The SAN-plat is carried from the construction unit to the construction site by the family or group of residents in a special cart.

Cement for the SAN-plat is the main contribution of the donors, who also contribute with raw material transport and until recently with technical assistance. The main donors are UNDP, UNICEF, the Dutch Government, DANIDA, SAH (from Switzerland) and NGOs of different origins: Spanish, Italian, Irish). Training is provided by the Government through the INPF. Since 1990 the government subsidizes 50% of this improved latrines programme. Residents pay approximately US$ 1 for each SAN-plat. The programme is successful but not sustainable financially without donor funding. Residents are too poor to afford the full costs of the SAN-plat. However, several measures to increase sustainability are being taken: decentralization of activities, private sector involvement, mobile production units, community promotion and education, training of residents for maintenance, and the stratification of subsidies.

The project is being carried out by the INPF with decentralization in the provinces. The units of production of the SAN-plats are being formed by recruiting workers locally and community promotion, education and training is being done mainly by government extension workers. It is envisaged that the private sector will gradually take over the units of production. In the near future, the low cost sanitation programme will be integrated in the National Directorate of Water to make the results more effective.

No study has been carried out for the identification of the impact on hygiene and health. Based on the philosophy that it is certainly better to have a latrine than not to have it, the core-group's interest is in producing and distributing more latrines rather than to spend a substantial amount on a health impact study. A review of hygienic use would however be valid. The project consciously involves women as paid workers in mobilization and construction. The project is replicated in 19 cities and has already benefitted 700,000 people in peri-urban areas of Mozambique. In Maputo, the project has benefitted 524,058 people.

The project is raising people's awareness regarding the possibility of improving environmental conditions and reducing environmental nuisance and health risks. The project has

Selective solid waste collection and recycling in Recife, Brazil

by

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Recife is the capital of the state of Pernambuco, in Northeast Brazil. It has a population of approximately 1,300,000 with an annual per capita income of US$3,089.-. Population in the Metropolitan, 3,000,000 in 1991, has a rate of increase of 1.81 (Table 1), which is low when compared to other Brazilian cities. Unemployment is the highest among the 6 main metropolitan areas of Brazil. The delivery of services, where women play an important role and commerce are the most important economic activity. Although Recife has an unequal distribution of wealth and a large proportion of poor families, creativity for survival is high. The informal sector employs 53.2% of the working population-and people undertake alternatives to formal development.

Drainage is an environmental problem related to a lack of infrastructure and tidal influence. The problem is aggravated by the limited collection and treatment of domestic sewage (79% of the poor have no sewerage system) and the high production and inadequate management of solid waste. Awareness of environmental problems is low. Contamination of water by waste and incidence of water related diseases are high, entailing high costs to the public sector.

Similar to most Brazilian cities Recife has serious financial problems. The municipal institutions therefore turn to social structures and community approaches as alternatives to public services. An integrated basic sanitation programme encompassing drainage, removal of sewage, urban cleaning and health promotion is implemented by a decentralized administration. The city is divided in 6 administrative sectors and sub-divided in three micro-regions each. Communities are represented on regional delegations; Sector Planning Councils and the Urban Development Council function at the sector and Municipal levels.

The Programme of Selective Collection and Recycling of Solid Waste, initiated in June 1993, is a basic instrument for city cleaning. The programme aims at behavioural change for reducing the production of solid waste, encourages and promotes the commercialization of recyclable material and stimulates the generation of income. The results in turn help reduce health risks and the municipal costs of urban cleaning.

The programme implements a low cost solid waste collection and recycling programme. It supports the informal collection and commercialization of recyclable products. Specific objectives are the upgrading of the dumping area and improving the treatment of urban solid waste in the Recife Metropolitan area, the reduction of waste production and the promotion

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The project 'Support to Selective Collection by the Informal Sector' is meant for two groups active in informal waste recycling: (1) street pickers and cart-pullers and (2) rag-pickers at the main city dump. CBOs helped to establish 4 pickers/pullers cooperatives (initiated in 1994), with on average 16 members each. The cooperatives got special carts with support from the Municipality, donors and the private sector. The project promotes more hygienic collection and sorting methods in the working places per sector. Thereafter, and depending on interest, the focus is on strengthening the associations and their contacts with the industries and liberating them from the middlemen.

At the main city dump site in the Municipality of Jaboatão dos Guararapes, the project aims at upgrading the surrounding area of 60 hectares. The garbage deposited on the site has already been treated by the Municipality of Recife and amounts to approximately 5,000,000 ton or 14,285,714m^3. Biological processing has been initiated in March 1994 to increase the lifetime of the dump by approximately 5 to 20 years.

Ragpickers are not allowed due to safety risks from heavy machines, deep trenching and the presence of toxic and hospital wastes. Initially they numbered 700; a new survey of April 95 shows a decrease to 555, 20% of them women and 10.1% children and youngsters, consisting of 2 sub-groups: ragpickers and vendors. As their work is their living and a benefit to the garbage treatment as it reduces the presence of recyclable solids in the cells, the solution is not to remove them but give social support and better working conditions to those who want to stay and not work sporadically in the site. Support consists of vaccination, hygiene guidance, access to legal documents, etc. The two groups are organizing themselves in cooperatives to improve their legal status and working conditions and have started a Screening/Sorting Centre in September 1994. All 52 children and youths who worked in the site for foodexchange have been given work in communal vegetable gardens with sharing of profits as from April 1994. Recreative-educational activities started in April 1995, including learning to read and handicrafts and involving already 30% of the children. For the short term sunflower planting and commercialization of seeds have been planned. For middle and long terms, planting of fruittrees and reforestation is proposed. The project is linked with the street pickers project: those working in the dump willing to go back to urban cleaning are assisted to join a cart-pullers cooperative and help expand the informal urban garbage collection system.

Concrete results of the various projects are:
- 73% increase in recycled materials in two years
- 62% annual increase in volume of material for recycling
- 482 ton/month reduction in of solid waste
- 56,5% reduction of special operations for waste collection and 285 dumpsites reduced to 124 (43.5%)
- 5,796 tons./month less garbage collected (Table 13)
- 5 to 20 years expansion of the life of the dump site. Upgrading of the dumping area and waste treatment
- food supply for approximately 2,040 recycling families

Positive effects of the dumppickers project are an increased number of project participants, reduced direct contacts with contaminated garbage, a reducing in number of dump sites and positive effects on the urban environment and expenditures related to waste collection.

The community as drinking water provider in a low income area : the La Sirena case in Cali, Colombia

by

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Most large cities in Latin America have to cope with high immigration of peasants who come to the cities to escape from rural violence, economic depression and the lack of educational and labour opportunities for their children.

Many of these migrants settle in the peri-urban areas. In Cali, as in urban other centres, part of them have settled in hilly areas. The pumping of water to those areas from the city plains is usually very expensive. This is also the case in the settlement La Sirena. The settlement began in 1960. Soon the population increased in size and developed a need for public services. A first water supply was constructed by the community itself. When the project for the improvement of this water supply was initiated in 1984, La Sirena had 300 houses and a population of 1300. In 1995 it had approximately 500 houses and 3500 inhabitants.

The population of La Sirena has scarce economic resources. Some 53.8% is engaged in the informal sector.

The settlement has a Programme for Community Mothers supported by the Colombian Institute of Family Welfare aiming at meeting the needs of children aged 1 to 6; a primary school which functions in two shifts (morning and afternoon), with an additional adult education course in the evenings. Youngsters willing to attend the secondary school have to go to Cali. The health centre provides primary health care for patients not requiring surgery.

The original water supply system consisted of a poor quality distribution network supply of untreated water. Half of the households have individual systems for waste water disposal, while 50% is connected to a sewerage system which will be improved in 1996 by the Municipal Enterprises of Cali. Part of this system has been constructed by the community itself, without further technical assistance.

The community asked the Inter-regional Centre for Water Supply and Drainage - CINARA, of the University of Valle, to assist in designing an improved water system. The objective was to develop a system which includes multistage filtration providing multi-barriers treatment to make the water fit for human consumption. Furthermore, a PVC distribution network replaced the plastic tubes and provided water through house connections.

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Resources received through tariffs cover all regular operation and maintenance costs of the water supply in La Sirena. Larger repairs and enlargement of the system require external financial support due to the precarious financial situation of the users. Nevertheless, the community has contributed to the investment costs of both slow sand filters and the gravel filters and has on its own raised the funds needed to finish the sewerage-drainage system.

The project in La Sirena is part of a Participatory Action-Research Project aiming at the Strengthening of Community Management of Water Supply and Sanitation coordinated by the IRC International Water Supply and Sanitation Centre in the Netherlands. The project has helped community members to master the techniques of participatory diagnosis, to collect information, define community priorities and solve conflicts. The research has permitted to recuperate the history of the settlement, the community organizations and the water supply.

New users regulations are under preparation. Organization and management skills have been strengthened. Gender equality is strived for by the women, but has not been fully achieved.

The provision of good quality and low cost water directly to the houses has liberated women and children from investing time in fetching water. Especially women have benefited as they no longer have to go to the rivers to wash clothes. Furthermore, the availability of drinking water in the households has increased domestic businesses, as such as the sales of ice-creams and refreshments. The community entrepreneurial spirit has been consolidated in March 1995 with the setting up of the 'La Sirena Labour Entrepreneurial Association', formed by 17 members, 16 women and 1 man.

This Entrepreneurial Association offers cleaning services to offices, schools and public departments. It also provides services of maintenance and recuperation of green areas. The members construct the utensils they use to undertake this labour such as brooms and cleaning rags. The enterprise has raised the income of female households heads, but has increased the workload of those who do not have help for the domestic work.

The experience of La Sirena showed to the institutions which manage the water and sanitation sector in the city of Santiago de Cali that organized communities, using technologies which they are able to understand, operate, maintain and sustain, are capable of assuming the autonomous management of their systems once institutional support is provided.

This experience has served as an example, based on which the Municipal Enterprises of Cali, in coordination with other city institutions, now undertakes a series of actions in other peri-urban communities of the city to find a solution to the problems of the sector with community support.

Upgrading and rehabilitation of the water supply systems in Nyala and El Geneina, Sudan

Information compiled by

IRC International Water and Sanitation Centre*

The towns of Nyala and El Geneina have experienced a considerable inflow of rural people from the Darfur region and beyond, who fled due to drought, political disturbances and tribal unrest. In 1990 Nyala had a population of approximately 300,000 and El Geneina had a population of approximately 100,000. Most dwellings in the outskirts were temporary shelters, mainly traditional mud huts with grass roofing. Although plans for the resettlement of migrants existed, spontaneous settlements took place on such a large scale that regulation was impossible. In the late 80s more houses of brickwork and similar materials have been built and the fringe settlements have gradually assumed a more permanent character.

Nyala is located at an altitude of 650m above sea level and annual rain fall amounts to 465mm on average, but varies considerably. El Geneina's surroundings are semi-arid with an average annual rainfall of 530mm. Its mean altitude is about 800m above sealevel, but several low hills rise higher. During the 80s, both cities already had a piped water system which served the older town centre (around 9% of houses in both of Nyala and El Geneina had water connections) and some local institutions. The settlements formed by the migrants were not reached by the water supply. People then relied on water vendors, who sell a poor quality water at high prices, or on their own efforts to get water. During the 1984-1985 drought even the vendors with animal-drawn carts could not supply enough and some of the consumers who depended on them were forced to walk long distances to reach dug wells with water of a similar poor quality.

In Nyala, rain-fed agriculture and animal husbandry are the main economic activities. There is also a considerable amount of light industry including a weaving factory, a tannery and a number of groundnut processing and soap factories. El Geneina used to be an important commercial trading centre on the caravan route from West Africa to the north. This function

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was changed to once a week. The funds serve to pay for the water production, the attendant and the repairs carried out by her. The water is sold to the users per unit of two jerry-cans.

Before entering the kiosk, people pay £S 2.00 per unit to the kiosk caretaker. Although this amount is higher than for private connections, the price is still very low compared to prices charged by vendors and consumption has been good. A survey carried out in Nyala in 1991 revealed that the families which collect water either from kiosks and/or from vendors consume on average 21 litres per day per person. The same survey also revealed that those who collect water from vendors use 15% more water than those who only collect water from kiosks because the latter are closed on Fridays.

With the project, the NUWC in Nyala has turned from a subsidy-dependent branch into a provider of subsidy to other towns. In El Geneina, however, there are higher costs which cannot be met. One of the problems is its remote location and bad road connections, which make fuel prices extremely high and supplies irregular and erratic.

The National Urban Water Corporation (NUWC) had the responsibility for the project management, and for its planning, design and construction work. The NUWC and its organizations and authorities involved at national, regional and local levels provided the institutional framework for the project. The community participated in the siting of the water kiosks and managed the kiosks on a day-to-day basis.

During the Water Supply Extension Project, a rehabilitation programme was carried out for the town networks which resulted in more water and more frequently available water supply to house connections. Nyala has now 5,538 house connections which serve about 50,000 people. Also, 143 government institutions (schools, a hospital, the military and the town council) are served by the piped water supply. In El Geneina, there are 1,226 house connections. However, many problems still persist as pipelines have not been well maintained. In Nyala there is now one tanker filling point, connected to the town network which supplies water to reservoirs in some institutions. Twelve kiosks in Nyala are operated by concessionaires.

During the organizational project (ISMDP), water meters were installed and now official tariffs are applied which results in more accurate billing. The community operated kiosks serve 50,000 people living in the northern and southern parts of Nyala and new kiosks for the eastern and western parts will provide another 50,000 people with water. In El Geneina, the community operated kiosks serve 16,000 inhabitants. Although people are generally happy with the provision through the kiosks, there are still some problems. Fridays the kiosks are closed and when the fuel for the generators supplying the electricity to the pumps is finished, which occurs regularly due to fuel shortage at the NUWC, the supply also stops, necessitating water collection from the traditional wells. The restricted opening hours result in long waiting lines at the kiosk and people going back to the traditional wells to avoid the hours of waiting. There is also a lack of regular support services from the NUWC for breakdowns which can not be repaired by the pump attendant.

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Empowering poor urban communities in Tegucigalpa, Honduras, through water supply management.

Information compiled by

IRC International Water and Sanitation Centre*

The capital of Honduras, Tegucigalpa, is located in a steep hilly area. It has a population of approximately 800,000 inhabitants and grows at a rhythm of 5.2% per year. The population influx through large movements has stimulated the development of poor urban settlements or 'barrios en desarrollo', where 60% of the population of the city area now lives, which means 480,000 inhabitants. The population living in the project area has no formal education and unemployment is high. Work mainly is found in the informal sector.

Tegucigalpa's piped water supply and sewerage system does not reach the densely populated communities on the steep hillsides around the city. Sprawling across hills and mountainsides, the rapidly growing squatter population lives in communities above 1,150 metres in elevation, where it is not economical to extend the main city networks.

The lack of basic infrastructure (water supply, sanitation system, rainwater drains, garbage collection) makes that waste water runs loose in the streets in front of houses and that the standard of the environment is low. Forty percent of the population living in this peri-urban area has no access to piped water, even public standpipes and depends mainly on buying water from private providers visiting the 'barrios' with water trucks. To 80 percent of the families, the costs of water represent 11% to 20% of their monthly salary. Sellers and buyers are very concerned about selling and having water, respectively. Despite the enormous amount of money handled by the private water-providers (UNICEF estimated the total cost for those who buy water from water vendors in 1990 at US$ 11 to US$ 13 million) there is no water quality control.

The National Water and Sewerage Service (SANAA) has implemented an innovative alternative to water supply: it helps the barrios en desarrollo set up their own water service associations. With the help of SANAA, these associations install independent water supply systems, which the residents pay for and own, and which in the long run cost less than continued buying from unregulated water vendors. Water source options promoted by UEBD (Unidad Ejecutora de Barrios en Desarrollo)/SANAA are: direct sale of water from the main SANAA network to the communities through a master-meter; construction of community wells provided with electric pumps, leading the water to a communal tank for further distribution; and water trucks from the SANAA distribution centres fill up the communal tanks. The community distributes the water further and pays for the bulk delivery. The communities take part in the construction of the local distribution system by contributing non-skilled labour and local materials. They also take part in investment costs and run the

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used for other community development projects, such as sewerage or roadwork. The community of *21 de Febrero* intends to use nearly $43,000 it has banked to build its first drainage system.

The US$ 6.- monthly water charge paid to the local water associations by the customers in the barrios is more than other customers connected to the municipal system pay, but ensures them of a service that they otherwise would not have got and which they now own, leading to increased property values and better environmental and living conditions. The opportunity for complete cost recovery exists for all of these systems. A loan provided by an international lending agency can be fully repaid within two to five years, according to preliminary calculations. Money 'left over' will then be put into a revolving fund to help start up other water supply project in other barrios en desarrollo.

The savings on water payments from which all customers participating in the water projects benefit enable them to use this money toward for other basic needs that they otherwise would have forgone. For those families which are better off, this money allows them the opportunity to open small businesses, further augmenting their monthly income. In 1993, 37,000 households were regularly supplied with water.

The positive results as expressed by communities were: economic benefits (money and time gaining, more water at a lower price), health benefits (less stomach and skin diseases, more water, better hygiene in the households, people feel less tired), social benefits (all have access to same quantity of water and for the same price; better conditions for the improvement of housing facilities; water in greater quantity and with a higher quality; better relationship among neighbours; people are certain of having water regularly), personal benefits (improved self-esteem once there is water for personal hygiene, women and children do not leave their homes very early in the morning and/or later in the evening avoiding risks of assaults and violations).

Factors which limit impact and extension are that the UEBD has a sectorial nature; the UEBD has only three promoters who are in charge of guiding the community in the process of project implementation and promotion, organization, construction and monitoring; the UEBD does not have autonomous funds and depends on governmental and it is necessary to ask other institutions and external agencies for support.

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