URBAN EXAMPLE
PROSPECTIVE
FOR THE FUTURE
Water Supply and Sanitation
to Urban Marginal Areas
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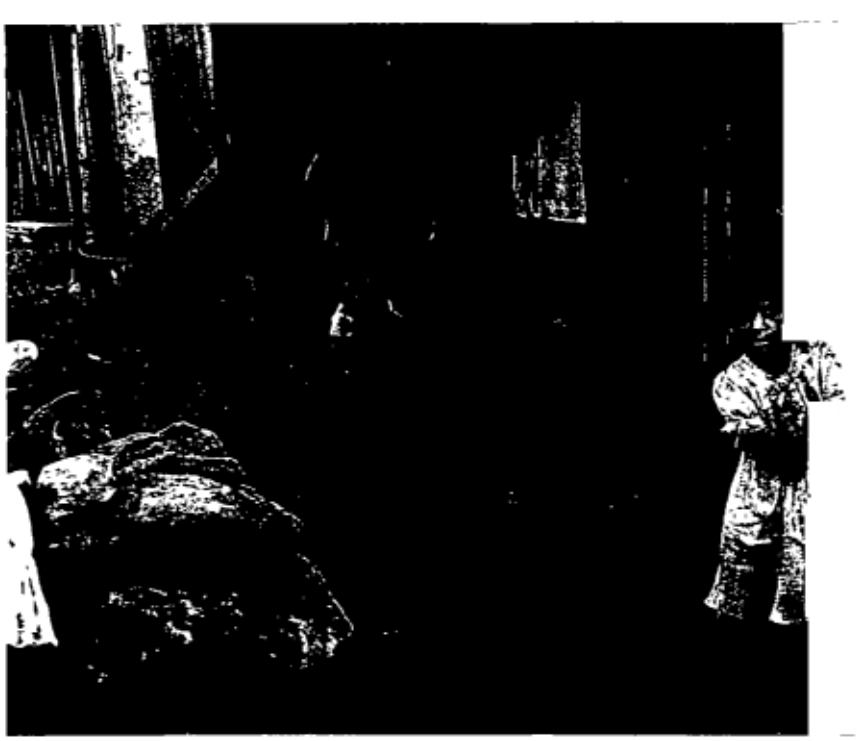
THE URBAN GROWTH PHENOMENON

Reina Isabel Figueroa Argeñal lives in a wooden shack perched on the edge of a steep hillside overlooking Tegucigalpa, Honduras. From her front door she can see the sweeping city below her... but mainly she sees the rusty tin roofs of the other poor neighborhoods like her own. Life isn't easy for Reina and her family of five, they have no running water and have to go down to the public taps several blocks away every day to cart back precious water for drinking, cooking, bathing, or washing clothes. But this 36-year-old woman has it better than many of the other impoverished city dwellers who live in the marginal areas of Tegucigalpa... many have to go even farther to get their water, and pay a lot more for it.

Reina and her family are among the burgeoning population now surrounding the capital of Honduras. They live in rapidly- constructed neighborhoods called barrios marginales, that provide no basic services for their inhabitants, other than those that the residents demand or supply for themselves. These barrios develop in exactly the opposite way from how most established neighborhoods are formed.

In typical upper- and middle-class communities, a developer buys land, installs the infrastructure for water, electricity, and sanitation, builds the houses connected to these services, and includes in the selling price the cost of constructing this infrastructure. In contrast, these barrios marginales take root on land that's either invaded by squatters, sold by the government, or taken over without permission of the owner. For the residents, the importance of owning their own home on a piece of land the government most likely will never evict them from far outweighs the disadvantage of not having basic services. At least in the beginning.



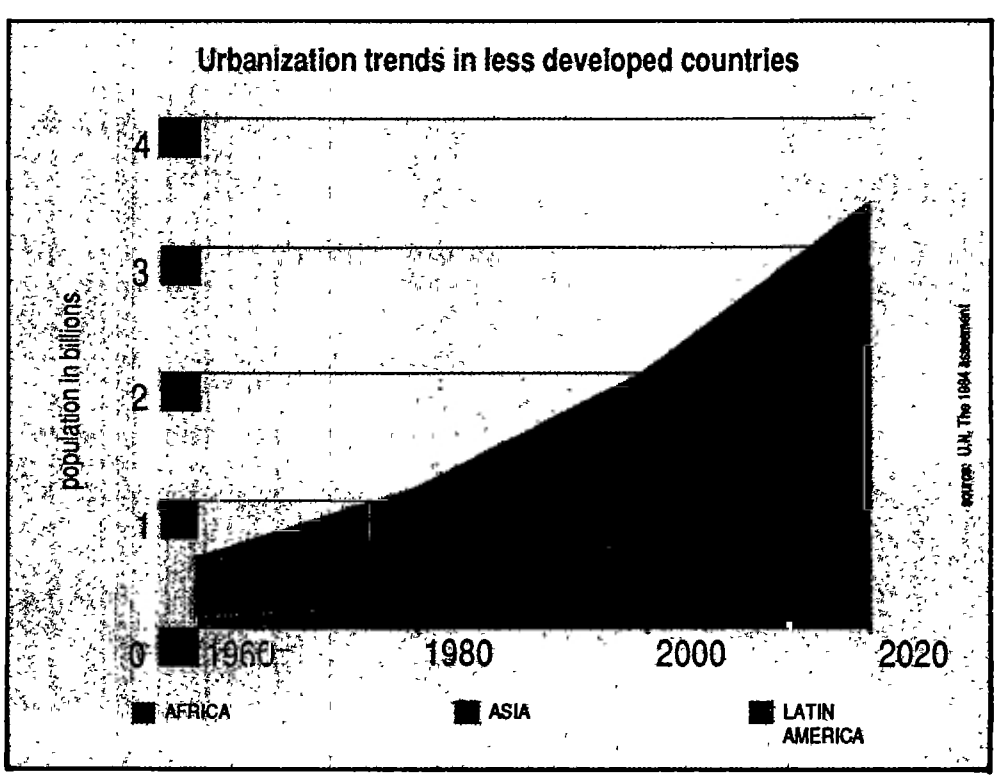
The majority of these squatter communities are located on the city's periphery, either in the steep hillsides which surround Tegucigalpa, or along unstable river embankments and highways. Much of this land is considered uninhabitable, unsafe, and ill-suited to permanent settlement. During the five-month rainy season every year, the very foundations on which these houses are built crumble away due to erosion, and every year lives are lost when houses tumble down off their precarious perches.

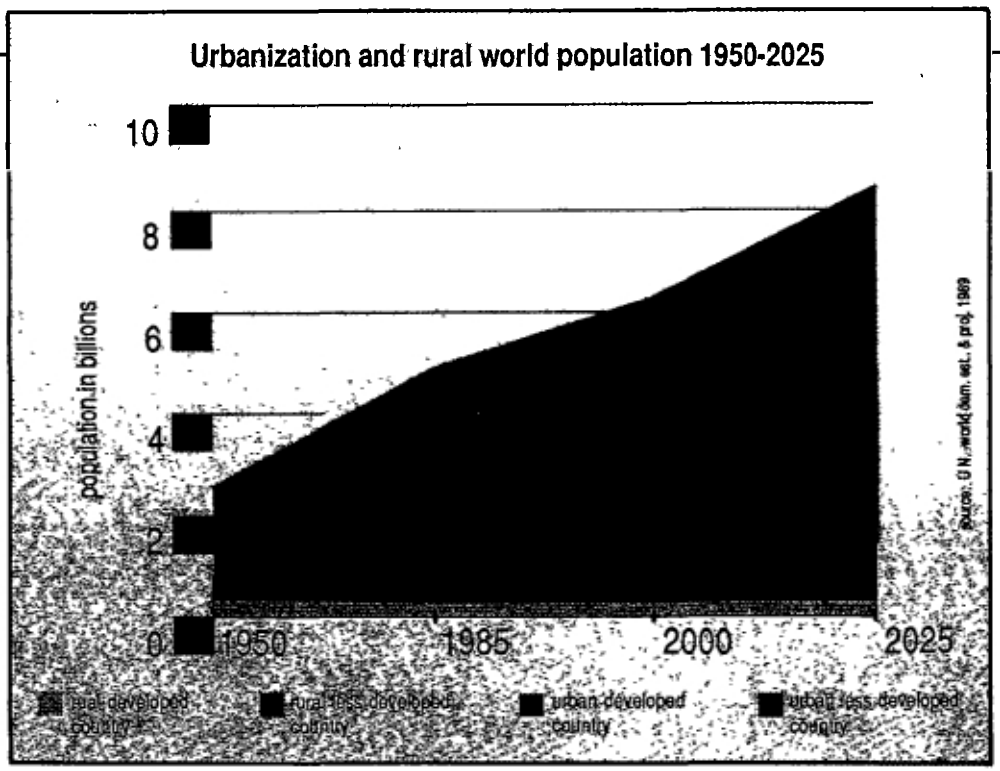
In 1970, Tegucigalpa had a population of less than 250,000, twenty years later it's estimated that 660,000 people live in and around the city. Some 60 percent of these inhabit the barrios marginales and each year more people move here. The city is growing at a rate of 5.2 percent; of the approximately 35,000 new inhabitants the city gains every year, two-thirds are migrants from rural areas of Honduras who settle in these marginal areas. Demographic forecasts predict the population of Tegucigalpa will more than double within the next 15 years. The needs of this burgeoning population for basic services are already stretching the city's scarce resources beyond their capacity. Continued explosive growth will only strain the system further.

This phenomenon of rapid urban migration is taking place not only in Honduras, but all over Latin America, and throughout the rest of the world as well. In Mexico City, the world's largest city with more than 20 million people, a large percentage of the population lives in the squatter communities and shanty towns that surround the city, and this is virtually the only form of housing available for new arrivals to the city. In several other major cities around the world the story is the same. In Bogota', Bangkok and Bombay, in Delhi, Cairo, Lagos and Manila, more than a million people live in illegally developed settlements. Smaller cities are no better off. In Lima and Nairobi, in Port- au-Prince and Karachi, in cities in countries on every continent, slums and shanties house 30 to 75 percent of the urban population. And these urban areas are growing three times as fast as rural areas in the developing world. These means that by the year 2025, 56 percent of the Third World's population will be urban.

Why are the poor flooding the cities in such numbers? The reasons are numerous, but usually based on economics. They come in search of a better life, seeking services not available in rural regions They come because they hear that there are more jobs, higher pay, and better educational opportunities for their children. And sometimes they leave the countryside because the land they farm becomes fallow, robbing them of their livelihood.

In recent years many development organizations have focused their efforts in rural areas to stem the tide of people streaming to the cities. But it isn't working. Even with improved services in rural areas, the influx from the countryside to the city continues.





For development organizations, city planners and governments, this means rethinking how and where services are provided. Even with the swell of migration already squeezing cities' resources—and money is generally the scarcest resource of all—only a fraction of development aid is currently directed to urban marginal areas.

Governments have tried to ignore these impoverished marginal populations for years, and have been reluctant to provide improved services for fear that better services would only encourage the acceleration of urbanization. But now that it's clear that neither the problems nor the people will go away on their own, an effort must be made to deal with the issue. Foremost of which is providing basic services to as many people as possible, especially safe and dependable drinking water, sanitation disposal, and electricity.

This effort provides challenges of its own for a city such as Tegucigalpa, which already faces a dire water shortage. There's not even enough water to supply the customers already connected to the municipal system, much less those who are outside the distribution network. Sanitation services are even more costly to provide than water. The only bright light for Tegucigalpa—electricity is abundant and available to anyone who can afford it.

Inadequate water supply and sanitation disposal systems are problems endemic to the Third World. Contaminated water is the principle cause of sickness worldwide, and according to the World Health Organization, 80 percent of all illnesses could be avoided if everyone in the world had access to a safe water supply. But today that is just a goal, not a reality. In 1990, 80 percent of the developing world's urban population has access to a safe water supply, but still a staggering 218 million persons make up the 20 percent of those who do not. More urban growth has yet to take place—the peak for rural-to-urban migration will come after the year 2000—and most of it will be in the barrios marginales. The level of investment is by no means keeping pace with this population growth, so the number of people without water will continue to grow unless alternative solutions are found.

In Latin America and the Caribbean a slightly higher percentage of the overall population has access to safe water in urban areas—87 percent. Honduras, despite being Central America's poorest country per capita until recently, falls into the same range as the continent as a whole in water supply coverage. In urban areas 85 percent of the population has access to water, while in rural areas less than 50 percent do. Logic may sway some to say that more emphasis should be put on rural areas to lessen this imbalance, but demographic trends show that urban areas are growing at three times the rate of rural areas, due to both rural-to-urban migration and the natural increase that results from babies born to those people already living in the cities. Therefore the emphasis on urban needs is not only warranted, it's essential.

Due to the massive migration to the capital, Tegucigalpa has less coverage of water services than urban areas of Honduras as a whole. According to a recent report prepared for the country's **National Water and Sanitation Agency (SANAA)**, 68 percent of the population of Tegucigalpa has access to a safe water supply either through house connections or public taps, while the other 32 percent are outside the coverage system and must get their water from other sources. As is to be expected, the populations least likely to have access to potable water are those living in the barrios marginales. Nearly 55 percent of all people in these marginal neighborhoods get potable water from SANAA, but that leaves the remaining population, some 200,000 persons, to fend for themselves in acquiring safe water for drinking, cooking, bathing and washing. Often they're unable to find an adequate and sufficient supply, so they have no other alternative than to use contaminated water, or too little water to ensure a decent standard of personal and household cleanliness. As a result, diseases find a fertile breeding ground, and children inevitably suffer most from the effects of this unhealthy environment.

Several private water vending operations have sprung up to meet this water supply need of barrio dwellers. Unregulated water vendors truck 55-gallon (208 liter) barrels of water up to the barrios, and sell each drum of water for $US1.75. Depending on family size, water use, and income, a household may go through one barrel a day, one a week, or somewhere in between. **It is estimated, however, that in early 1990 the total cost to all households in the barrios marginales who buy water from water vendors is collectively between $US11 to $US13 million dollars a year.** If government agencies could attract even 15 or 20 per cent of the outlay that now goes to water vendors, they could provide a lower-cost, permanent or interim service to the barrios marginales through independent, non-conventional water supply systems, that would pay for themselves within the course of a few short years. Since this money is already being spent, the question is how to get a hold of it up-front, in one lump sum, to install systems that continuously supply water, instead of having impoverished residents see their hard-earned money go down the drain along with their waste water.

[redacted] According to the Regional Health Authorities in Tegucigalpa, diarrhoea diseases rank first among health problems in the marginal neighborhoods. National government research shows that one-fourth to one-third of all infant and child deaths in Tegucigalpa are caused by dysenteries or diarrhoea-related diseases. Other diseases commonly found in these populations are intestinal parasites, acute respiratory infections and malnutrition. These diseases are all caused or aggravated by using contaminated water, or too little water. At present, Honduras loses 96 of every one-thousand of its children under five each year. That means a full 10 percent of the infants born in Honduras die before they reach their fifth birthday.

[redacted] Though such statistics may be depressing, government planners cannot just throw up their hands and retreat from the problem. In Honduras, they didn't. Instead they took direct and positive action. Recognizing that alone it could never meet the needs of this fastest-growing segment of its population, the government of Honduras solicited the aid of foreign governments and development organizations.

[redacted] Since city planners have few provisions in their Master Plan for water supply to reach these ever-expanding marginal populations, they have turned, alternatively, to innovative and non-conventional solutions, rather than adhering stubbornly to plans that exclude the urban poor, planners in Tegucigalpa looked for ways to expand city services, often while leaving the plans intact. One promising alternative is an interim approach. Acknowledging that the areas not covered in the long-term plans should not have to suffer a lack of services in the short-term, planners are instituting programmes that will fill in the gaps until such a time when the Master Plan can include all the population.

[redacted] Honduras' National Water and Sanitation Agency (SANAA) recognized the enormous potential that exists to both recapture the investment that residents of barrio marginales are making for water and assure a safe, dependable water supply to the city's growing population. **It set up a special office, the Unit for Barrios Marginales (UEBM), which is perhaps the only government agency of its kind in Latin America established specifically to address the needs of the residents of the barrios marginales.** Its purpose is to construct and administer self-contained water supply systems that generally do not tap into the municipality's scarce water sources. An additional advantage of these systems is that they obviate the often-prohibitive costs of connecting the far-flung barrios marginales to the city's system, barrios that often sit high above the city's existing pipelines.

This non-conventional and innovative solution is a model that can be adopted by other Latin American cities, and cities all around the globe facing the same explosive growth, to save money, and more importantly, save lives.

OF THE PROJE

When the Ramirez family moved to a small plot of land in Altos de San Francisco three years ago, they did so to fulfill a long-held dream of owning their own house, of having a piece of land to call their own. That same desire is what motivates thousands of families to move into barrios marginales in the crowded hillsides surrounding Tegucigalpa, the capital of Honduras. Now the Ramirezes do own their home, a small 4-room wooden shack, and a patch of land, albeit a modest one. Their dirt yard is just big enough for a washtub and a barrel of water, with a little space left over where their four children, all under the age of six, can play. Their neighbors' houses are just a few meters away on either side, and all the houses overlook a rutted, unpaved, dry dirt road.

When the Ramirezes came to this marginal urban neighborhood on the edge of Tegucigalpa, they knew there were no basic services—no water, no electricity, no sanitation facilities. But they were young and couldn't afford anything better. So they found the best lot they could, built their modest home, and started making do. That's what families do by the thousands in the impoverished neighborhoods that surround downtown Tegucigalpa.

These marginal residents can do without electricity—they use candles for light and wood or gas for cooking. They can get by without sanitation disposal systems—they use the great outdoors as their bathroom, even though this is inconvenient and uncomfortable, especially for women, and poses a health risk. But they can't live without water—they need it for drinking and cooking, bathing, cleaning house, and washing clothes.

To meet the needs of this population, a water vending business quickly sprang up. Vendors carting truckloads of water barrels or large tanks brought water to these neighborhoods and sold it door-to-door, at a price far higher than the municipal rate. With many households earning less than US$150.00 a month, the price of water can swallow up 20 percent of the monthly household budget. Residents have to scrimp on their water use, which means they cut back on personal and household cleanliness, thus running the risk of inviting diseases that thrive in unsanitary conditions. Even worse, they have less money left for other necessities, which often means families buy less food for their children, further endangering their children survival.

Depending on their water usage, households, predominantly those in the higher income ranges that are connected to the municipal water system, pay US$ 3.10 or US$ 4.10 a month for water. Based on **the price residents pay to water vendors in barrios marginales, it's been estimated that the cost of water per liter to these residents is 34 times higher than the official government rate.**

Recognizing the difficulties this method of water supply places on 30 percent of the city's residents and the potential dangers of disease transmission for the rest of the city's inhabitants as well, the Government of Honduras is attempting to meet the needs of this previously-ignored population, trying to extend their already-limited resources to encompass a population that keeps growing larger every year. This would put a strain on any government's budget, but for financially-strapped cities of the Third World, the money is just not available.

Like most other major cities, Tegucigalpa has a Master Plan for water supply, which includes plans for a phased water development programme from 1980 to the year 2015. The current Master Plan is limited in scope, and excludes many of the barrio marginales, including all of those above elevations of 1150 meters. In addition, it's behind schedule, so barrios that currently should have service do not, and there's an ever-growing number of new barrios outside of range of the Plan. **Urban growth is not expected to peak until somewhere between 2010 and 2020, so the need is getting greater. It's estimated that by 2015, the city will have a population of 2,200,000 persons. Based on current projections, the city's water shortage will almost triple by that time.**

This water shortage is compounded by inequitable distribution, so that those in the barrios marginales end up with a much smaller percentage of the total scarce supply. The National Water and Sanitation Agency, SANAA, estimated in 1984 that 50 percent of the municipality's water is consumed by only 18 percent of the users, while the 60 percent of the population who live in the marginal areas consume just six percent of the total supply. And this marginal population continues to grow twice as fast as the rest of the city's population. As space runs out at lower elevations, newer barrios marginales are built higher in the hills of Tegucigalpa, and the cost of pumping water up to these higher elevations is exorbitant.

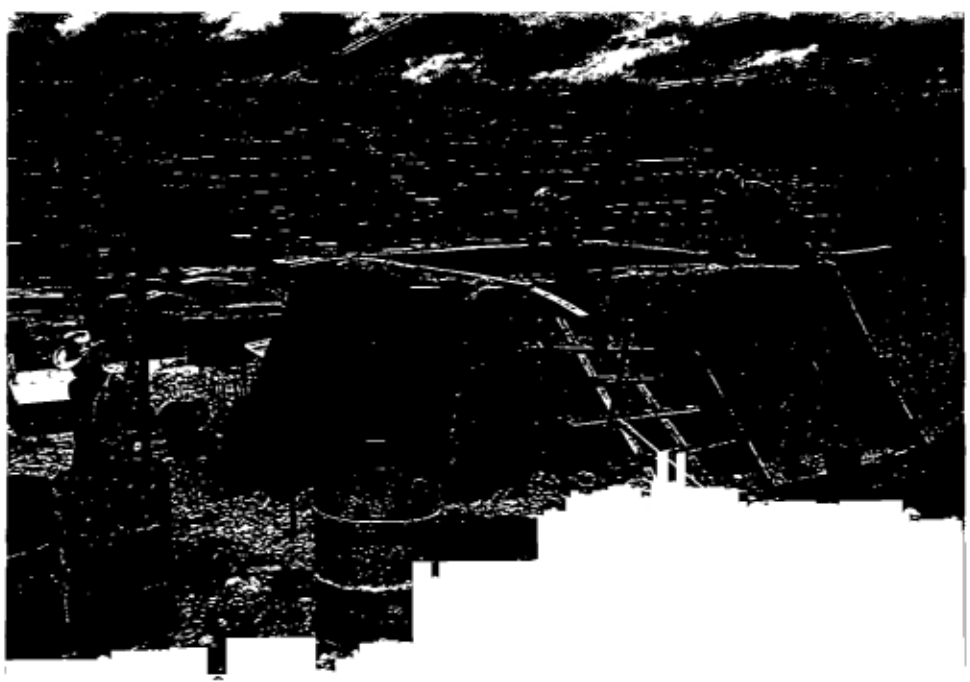
How can city planners ever hope to meet the needs of all residents for a safe water supply? That's an unresolved dilemma facing cities large and small all over the globe. In Honduras, the government saw that a problem existed that had to be dealt with, but knew that it couldn't be done within the framework of the conventional systems they had at their disposal. **Through SANAA, the government looked for alternative methods of water supply, and came up with a revolutionary solution. An interim service to supply barrios marginales with water anywhere from 30 to 60 years, until the Master Plan could catch up with the city's reality.** Once the decision was made to serve this long-neglected population, SANAA established a separate agency within its purview to administer water projects for these barrios marginales, the **Unit for Barrios Marginales or UEBM.** Various non-conventional approaches were proposed, and some are currently being implemented in Tegucigalpa to determine their long-term feasibility. So far it's been a great success, and may prove to be a model for other Third World countries that face a similar dilemma of population needs that outstrip city resources.

If it weren't for this innovative program, most of the residents of the barrios marginales would have no city-supplied water service, and would be forced to pay exorbitant rates for the water that they can't live without.

Because of the city's water shortage, SANAA already faces on the average a 25 percent shortfall in providing for customers currently connected to the municipal system. So in developing an alternative system it had to be one that would not aggravate this already-existing water shortage. This shortage is especially acute during the country's seven-month dry season.

Following a study of the city's water sources and the barrios' requirements, four types of non-conventional systems were recommended—self-contained systems supplied by wells, trucking water to a storage tank then pumping it to public taps, connection to the main city grid, and rainwater catchment.

The independent wells have the lowest cost and are preferable whenever sufficient groundwater sources are available. For this system, a borehole well is drilled, then the water is pumped up to a storage tank on the hillside, and supplied to households in the community by gravity, either at public taps or yard taps. The start-up costs of this system involve the drilling of a 90-foot well, and providing a pump, a water storage tank, and piping. The main shortcoming of this option is that it cannot be used too widely, because of the limited amount of groundwater in Tegucigalpa. The advantage of this system is that since it's not connected to the city-wide distribution network, it does not create a strain on the scarce city water supply. The system is designed in such a way that it **can easily be upgraded and integrated into the municipal system** if and when the city has sufficent water to connect these barrios to its main grid.



Another self-contained option is **wholesale vending of water**. The community builds a cistern and SANAA regularly fills it with water from the municipal system, which is then pumped to smaller storage tanks above the community and fed by gravity to public standpipes. The water is sold at public taps at various locations throughout the neighborhood, at a rate far below that charged by the unregulated water vendors. Here the start-up costs include the cost of trucks to transport the water from a SANAA source to the community, a large cistern, small storage tanks and piping. This option is expensive but the best alternative in communities that are located at high elevations and do not have sufficient groundwater for a drilled well. SANAA's purpose in selling water in this manner is not to take over the role of the water vendors, but to bring the price of water sold by vendors into line with the official government rates for water, and to ensure that the water sold is clean and safe. SANAA sells its water for about half the price vendors charge, and still make a modest profit but with this competition water vendors are gradually dropping their water prices.

A similar system already in place involves **connecting the main city grid to a community storage tank, then charging the community "in block" for the water used.** In this system water is sold at public taps located at several sites throughout the community. Start-up costs include constructing a storage tank, and laying pipes. As this system draws from the city water supply it cannot be used in all communities, but for those neighborhoods closest to the municipal network, it is currently the best option.

The rainwater catchment option is still in the study stage, though individual households often use this method on a small scale to supplement their water supply during the 5-month rainy season. The way households currently do this—collecting rainwater that rolls off the roof—presents a high risk of contamination. Providing a method to exploit this natural water source sanitarily would ease Tegucigalpa's water shortage for a significant part of the year.

Every community would prefer yard taps to public taps, and from a health standpoint yard taps are better because they contribute to greater overall water use, which leads to improved food and personal hygiene. Public taps, however, cost less to construct because the distribution network is smaller, and people generally use less water when they get it from public taps, so more people can

benefit overall. The amount of water available from the source is taken into consideration when the decision is made on whether to install public or yard taps.

In all of these systems, a crucial element in the water supply process is community participation and cooperation with the Unit for Barrios Marginales. **A community must request help from the UEBM with the construction and funding of a system**, at which time a study is done to determine which system will best serve the community, and if the community is sufficiently organized and enthused to construct and administer such a system. Requiring the community to participate in the supply of its own water is an unconventional idea in its own right, and this is the first time SANAA has made the attempt to harness community action to such an end. Nor are the communities accustomed to such a cooperative effort, but the alternative is paying a lot more to the water vendors for their water supply. So both parties have a role to play—with the ultimate goal of improving both the lives of the citizens, and city services.

In much the same way as a city is responsible for the operation and maintenance of its water pipes and sewage systems and a homeowner must take care of the plumbing needs within his own house, these systems are designed based on the concept of the community as a house. **The water source belongs to SANAA** because there's such a limited amount of groundwater in the city, and subsequently the Government has the need to control the use of ground-water resources, but the community is responsible for operating and maintaining the system, and the community must provide all necessary repairs. SANAA designs the system, covers the initial cost of drilling the well, and provides technical assistance. **The community forms a water association**, then supplies the manpower to construct the facilities, purchases some of the materials, and is responsible for the administration of the system upon completion. **United Nations Children Fund (UNICEF)**, which has donated funds for several of the projects, provides technical assistance to the UEBM, and underwrites the cost of construction equipment and supplies.

Before any work is undertaken, the parties involved agree upon terms and sign a contract spelling out specific roles and expectations. This heightens community awareness of the importance of its contribution to the final outcome of the project, and demonstrates to community members the level of support they're entitled to from the government. This type of communication and understanding between urban marginal communities and the government is vital. It can lend as well to further cooperative efforts on such issues as environmental conservation and health education.

Educational programmes are integrated into the community participation element of the project, including those on personal hygiene, environmental sanitation, and conservation. All community members are encouraged to participate in classes to enhance their own knowledge of health and sanitation issues, and to engage in community outreach to teach their neighbors what they have learned.

Women and children are the targets of this special outreach effort made in the educational programmes, because of the recognition that children are most affected when disease strikes, since their small bodies are less able to fend off germs and illnesses. As mothers are generally their primary caretakers, it's important that they know how to protect this resource. And since children will one day inherit the earth, it's essential that they learn early how to care for it.

COMMUNITY PARTICIPATION AND SOCIAL MOBILIZATION

Norma Marina Rodriguez never aspired to be the part owner of a borehole well. But she did want to have easier access to a clean and safe water supply, without having to go each day to a public tap, stand in line for hours with her neighbors, then cart back several 6-liter containers of water to her home, only to do the same again the next day. So when the community leaders of Villa Los Laureles told her and her neighbors the only way to get a better system was to pay for it themselves, they were only too glad to pitch in. This same reasoning is motivating thousands of residents in marginal neighborhoods surrounding Tegucigalpa, Honduras to form community water associations and buy into water supply systems that benefit only their neighborhoods. Although this collective activity designed to reach community goals is a new experience for many of these residents, it's proven to be something they want to do more. Based on their success in obtaining a better water supply the residents of Villa Los Laureles are hoping to construct a sanitation disposal system, and pave their rutted dirt roads. They have great plans and hopes to improve their impoverished marginal barrio, now that they've taken the first step. The water supply project is clearly proving to be an entry point for a whole range of other community services. And what does 39-year-old Norma Marina think about having water right in her back yard as she tries to keep up with her active, bare-bottomed one-year-old son? "Es distinto," she says. What she means, in her own quiet way, is that it's made a real difference in her life.

When the marginal community of Villa Los Laureles formed some ten years ago, the people who settled there, some from other barrios around Tegucigalpa, others from rural areas in Honduras, didn't know each other, and weren't used to working together. Many of them didn't have much education, were new to the city, and spent much of their time just learning how to get around and take care of their basic needs, none of which were provided by the city. There was no electricity, no water, no sanitation system, no transportation, and in the beginning, there were no houses either. So they built from the ground up, struggling alone, with their families, to set down roots in the unwelcoming rocky terrain around Tegucigalpa.

Since these communities had no one to look out for their interests in the government, early on they formed their own **independent governments, called patronatos,** to organize the community into a vocal force to petition services from the government. In the beginning patronatos developed when barrio residents elected their own representatives, over time political parties recognized that residents of the barrios marginales could form a powerful voting bloc, and couldn't be ignored. Today politicians seek out the residents of the barrios, promising to provide basic services. These patronatos, still the basic building blocks of the barrios marginales, have to be legally recognized by the Ministry of Government by proving they have community support and have elected members. The patronato then has the power to negotiate for services with various government agencies.

In many of these barrios marginales that spring up as quickly as people can haul wooden boards to unoccupied land surrounding Tegucigalpa, asking for services and getting them are two different things altogether. The city is hard-pressed, because of a scarcity of water, to connect additional customers to its existing municipal water system. And because so many of these neighborhoods are located outside of the city, often in hills far above existing pipelines, even if the city had the water, it couldn't afford to hook up more customers anytime soon. The city is not even considering supplying water to the barrios above 1150 meters in its current Master Plan that runs through the year 2015, because the cost of pumping water up to these high elevations is prohibitive. And it's exactly in these areas where the greatest population growth is expected, in part because the lower elevations are already occupied. It's estimated that more than 50,000 people will live at those higher elevations by 2015, just 25 years down the road.

Since many of these communities on the periphery have no expectation of being served by the municipal water system for at least the next 30 years, they recognize that the best chance they have to get water services is through an interim arrangement provided by the Government of Honduras.

When the Government of Honduras made the commitment to provide water to the urban marginal neighborhoods surrounding Tegucigalpa, it created a special office to oversee the programme, the Unit for Barrios Marginales (UEBM). This office, in concert with its parent office, **Servicio Autónomo Nacional de Acueductos y Alcantarillados (SANAA),** has defined the responsibilities for each of the participating interests in the programme.

Before approving a water project for a community, the Unit for Barrios Marginales considers community organization and participation, and requires the barrios to demonstrate a certain level of interest and motivation. If the community is committed and energetic about the project from the start, there's a much better chance they'll stay enthusiastic and involved once the system is in place.

In addition to its role in determining the best water system for the community, and supplying materials and technical advice, the **UEBM helps the community set up a framework for administering the water project in their community. Once a committee is selected, promoters from the UEBM's community liaison section meet with community leaders to**

assist in organizing a Junta de Agua, or **water board**, and in conducting a socio-economic survey, including practices related to water and sanitation.

Working through the patronato system, and sometimes through other community organizations, community residents democratically elect a Junta de Agua, which serves as the water association directorate to administer the water project in each individual neighborhood. This body is made up of a president, a secretary, a treasurer, an accountant, and additional board members, as needed. **Though this is a new approach for Latin America, water associations are common in the United States and Europe, where they cooperate to provide semi-urban and rural areas with water. More than 55,000 such water cooperatives exist in the U.S. alone.** Now that these water associations are proving to be successful in Tegucigalpa as well, the potential exists to replicate the experiences of the barrios marginales to other cities in the developing world.

Once organized, the Junta de Agua is responsible for administering all aspects of the water project, including apportioning the resources and materials for constructing the system, planning, managing and evaluating community participation in the project, maintaing a rigorous accounting of the assets and expenses of the project, and keeping the National Water and Sanitation Agency (SANAA) informed monthly on the progress and pitfalls of the project.

Providing water for a community is just the first step, teaching them to use it well is sometimes the most difficult component in improving the sanitary practices of the populace. To educate people in correct sanitary practices one must dispel incorrect beliefs, substitute unhealthy customs with healthy ones, and finally make these new practices second-nature. This requires a long-term commitment because attitudes are difficult to change, and actions even more so.

In addition, the project provides curriculum training in environmental education for teachers in the barrios marginales, so that they can reach children at the pre-school and primary level. One very personal approach is being taken to appeal to these young minds. **Each school child is given a small tree (in cooperation with the Honduran Forestry Agency) to plant in his or her own yard.** The children are taught the importance of trees to the community and the environment, and are told how to preserve their own small piece of forest. This hands-on approach gives the children deeper appreciation for environmental conservation and preservation. Already more than 40,000 tree seedlings have been planted, and the community mobilization generated by this project shows great potential for other collective actions. This educational effort is being carried out in same barrios where the water projects are in place to provide an integrated understanding of sanitation and conservation. In addition, the project is attempting reforestation education, in an effort to stop the rampant destruction of woodlands around Tegucigalpa, much of it by households who use the wood as their energy source.

All members of the community are taught how to best use and maintain the new water supply systems, but since women are most often in charge of the household chores that involve the use of water—cooking, washing, bathing children—it's essential that they are thoroughly knowledgeable about how to keep their water supply clean and dispose of waste water safely.

A special effort to reach the women of each community is done through "Clubs de Amas de Casa", or Housewives Clubs. This well-developed institution in the barrios marginales, started up by the women themselves, has as its primary purpose providing services for children, including schooling and health care. Working with these already-established clubs, the UEBM enlists an active base of women, and then encourages outreach efforts to generate even greater participation. This is undertaken by an interactive approach—the health promoters are not just telling community members what they need to know, they're also finding out the specific community needs and interests.

In the communities where there are water projects **women are also trained as health volunteers**, to be able to teach other women in the community better health practices for themselves and their children. Volunteers are chosen by the patronato or Club de Amas de Casa or are self-selected. They attend 40 hours of training over the course of five weeks, and learn about child immunization, malnutrition, diarrhoea diseases, family planning, the care of pregnant and lactating women, sexually transmitted diseases, and mental health. At the end of the training seminars, the volunteers make a commitment to their fellow participants and seminar leaders, specifying what efforts they'll make in the following four weeks to spread their health knowledge to other community members. These volunteers are required to go house to house to try to teach what they've learned, as well as demonstrate changes in their own health habits, to teach by example and not only through words. An effort is made through this community outreach to get all members who benefit from a water project to also participate in health education, because those who remain uninformed can pose a health risk to others attempting to substitute bad health practices for good ones.

Not only has this health education programme proven to provide concrete health benefits to the community, it has also fostered in the health volunteers a sense of accomplishment and self confidence. With this enhanced sense of empowerment, the women often take a lead in other community betterment projects, and work toward an overall improvement in community life.

Community participation in the installation and maintenance of the independent water systems has to date been an unexpected success. Involving the communities in each stage of the process has awakened in them a sense of confidence, responsibility, and interest in the development of the water supply systems. Once the systems are installed, community members continue to demonstrate an interest in maintaining the systems, and are more conscientious about water use. In addition, now that the communities are organized and making permanent investments in their barrios, they are also working with the government to get land titles for their property. The water project has proven to be an **entry point** for community cooperation—now residents are working together to plan, pay for, and install other basic services. **With this community mobilization, the potential exists to promote a whole range of other services to these barrios marginales.**

COST RECOVERY

Until a few months ago, Evilda Funes and her husband paid US$ 6.00 for water every three days or so. Now they pay that same amount for a month's worth of water... water that runs from a tap in their backyard. Their saving in dollars terms is significant, but what's more important is they don't have to skimp on the water they use. And that makes a difference in a family where there are four active children, all between the ages of five and nine. Now every time Evilda bathes one child or cleans the cut of another when he falls down she doesn't have to worry that there's that much less water for drinking, or washing. Evilda can now keep her children and her house clean, and know when she needs water, all she has to do is turn on the spigot.

Before her community of Brisas del Norte, an urban marginal neighborhood on the edge of Tegucigalpa, Honduras, had their water system installed recently, Evilda and her neighbors bought their water from water vendors who came to their barrio daily and sold water by the 55-gallon (208 liter) drum. Each barrel cost US$ 1.75, and the Funes household generally used a barrel a day. Over the course of a month, that added up to a good deal of money, roughly US$ 52.50).

Meanwhile, Tegucigalpans connected to the municipal system generally pay less than US$ 4.10 per month. Evilda's husband makes a decent living with the various small business interests that he has, so they at least could afford to buy the water they needed, but many other families cannot.

Governments in developing countries have historically subsidized water, believing that people shouldn't be deprived of such a basic necessity of life simply because they can not afford to pay for it. But if water is subsidized, or "free" for customers, someone has to pay for it, the government has to cover the cost somehow. What this usually has meant for the residents of marginal neighborhoods springing up around cities all over the world is that those who are not already hooked up to the municipal system are not able to get connected. When a government subsidizes water, payments generally cover only the cost of the water itself, but not the infrastructure that gets the water to the customers. Not only does that mean there's not enough money to expand the system, generally it also means there's not even enough money to keep the existing system well- maintained. So the pipes deteriorate more quickly than they otherwise would, and when repairs are finally made, the costs are greater than they would have if taken care of sooner. The end result of subsidization then, is that instead of providing low-cost or no-cost water for all, those at the bottom of society are excluded from the service altogether.

In Tegucigalpa, where water is already in scarce supply, adding more customers to an already-strained system is almost impossible. But fortunately for the numerous impoverished residents that live in the marginal neighborhoods, that doesn't mean they have to do without. **The National Water and Sanitation Agency (SANAA) has come up with an innovative alternative— helping these marginal neighborhoods set up water associations.** These associations, with the help of SANAA, then 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. In addition to providing water for a previously-unserved population, this is a first step toward having communities take a larger role in paying for their water supply, instead of having the government underwrite the cost.

There are three types of independent systems currently in use in the barrios marginales, and the initial investment and operation costs for each one varies. But in every one of these systems, the potential for cost recovery has been proven, and the cost of the self-contained system is less than that of paying water vendors. In addition to being high-priced, the water sold by the vendors is often of questionable origen and quality. Though it's sold as potable, quite often it comes from contaminated sources and can present a serious health risk for those who depend on it as their only source of drinking water.

The high cost of purchasing water from such vendors makes up a substantial part of a household's total monthly expenditure. As a result of the high price, families often economize on their water use, cutting back on personal hygiene, washing, and laundry, which are all of vital importance to good health. And since water is essential, even skimping a family of six uses around a barrel every two days. This implies a per capita use of 17 liters per day. The minimum supply for good health is estimated to be on the order of 50 liters per day, and preferably up to 100 liters per person to ensure adequate supplies for washing, cooking, bathing and laundry. Average daily consumption in Western countries exceeds 220 liters.

Assuming a family uses four barrels of water a week, and many families use more, they will pay water vendors US$ 7.00 a week, or US$ 28.00 per month. Many families have only one wage earner, and often that person is sporadically employed. **For a family making US$ 100.00 a month, the cost of water represents 28 percent of the monthly household expenditure.** Quite often these households use less than four barrels a week because they simply cannot afford more. At four barrels a week, a family earning home US$ 175.00 a month spends 16 percent of their monthly income on water, and a family earning US$ 250.00 pays out 11 percent of their income each month on water. Most of the households in the barrios marginales earn salaries falling within these ranges, though in some of the older, more established barrios average incomes fall in the higher range. In all of the barrios currently served by a water project, the majority of households earn less than US$ 150.00 per month. **According to the World Health Organization, normal rates for water and sewerage should not exceed five percent of the monthly income.** It's apparent from the above calculations that many families in the barrios marginales are spending a disproportionate percentage of their take home pay on water alone.

The amount paid for water, defined as a household's "willingness to pay" is by no means a measure of their ability to pay. When a family pays these inflated prices for water they do so at the expense of other basic needs. The household income pie can only be sliced in so many pieces, and when the slivers all run out, the family has no other option but to go hungry.

With the amount that individual households pay for their water supply every month, if they all contributed toward purchasing an independent system they'd pay much less in the long-run, though as

for all projects of this nature, start-up costs are high, and often out of reach for residents of the barrios marginales. With the aid of international organizations and development banks, this initial hurdle can be cleared, and a payment plan arranged that would allow for partial or full recovery of costs, as well as covering the monthly cost of water.

Cost recovery is essential to make new investments and expand water supply systems to other barrio marginales. Since every system costs a different amount, and some of the less expensive systems are not feasible in certain barrios, the water fee for community members must be determined based on the cost of the system to be repaid, the price of the water, and ongoing operating costs, as well as the incomes of community members. **When additional funds can be raised through this water tariff, they are earmarked for other community projects.** Of highest priority is a sanitation system. A detailed cost analysis and projected operating costs form the basis of determining cost recovery.

Of the twenty barrios marginales that currently have such a water project operating in their neighborhoods, nine communities have water taps in their yards, the other eleven buy their water at public taps located at various sites in the neighborhood. Though all communities would rather have yard connections because of the convenience, the costs and the volume of water available to each house often make public taps the more feasible option. Of the systems now in place, eight supply water from an independent well drilled for use only by that community. One system is supplied by tanker trucks that haul water from a SANAA source, that then fill storage tanks that pump the water to community public taps, ten are supplied by extensions from the municipal system, and the remaining one uses a gravity system. The start-up costs of each of these systems varies, thus the repayment period of each is determined taking these cost factors into account. **Reimbursement of the initial investment generally stretches over a two or five year period.**

Customers who currently have yard connections pay US$ 6.00 per month for water, and have running water anywhere from five to twelve hours per day. Over the course of a month it's estimated that each household receives 30 to 60 barrels of water. At the US$ 6.00 rate they pay US$ 0.10 to US$ 0.20 per barrel of water, as opposed to US$ 1.75 when they buy from the water vendors. Customers in neighborhoods with public taps buy water in 4.6 gallon (17.4 liter) containers, and usually pay US$ 0.01 for each. These customers thus pay about US$ 0.30 per barrel, though with the added effort of going to the public taps, waiting in line for water and carrying it home, less water is generally used in these households, which leads to a smaller monthly water cost than these figures would indicate. **These savings benefiting all customers participating in the water projects enable them to put their money toward other basic needs that they otherwise would have forgone.** For those families that are better off, this money allows them the opportunity to open small businesses, further augmenting their monthly income.

The US$ 6.00 monthly water charge paid to the water association by customers of the barrios marginales is more than other customers connected to the municipal system pay, but that's because these barrio residents are making an investment into a system that they own, that will increase their property values, and ultimately improve their lives. City residents connected to the main city grid pay only for the water that comes through the tap. But even with this US$ 6.00 fee, the cost savings each household in the barrio realizes every month compared to what they'd pay to water vendors is significant. Included in this tariff are operation and maintenance fees as well as additional funds for other projects. **The opportunity for complete cost recovery exists for all of these systems.** A loan provided by an international lending agency could be fully repaid within two to five years, according to preliminary calculations. Money "left over" could then be put into a revolving fund to help start up other water supply projects in other barrio marginales.

A cost recovery pie would include the following portions: operation and maintenance, long-term repair, and repayment of initial investment. Operation and maintenance costs include salaries for public tap attendants, administration costs, electricity to run the water pumps, and routine repairs. The community is responsible for administering these tasks, UEBM provides an advisory role. Long-term repair costs involve repair and replacement of major system components, such as trucks, pumps and piping, and in the longer term, tanks and wells. Once the initial investment has been repaid by the community, funds from the third slice of the pie can be put toward other projects in the community, or put in a revolving fund to provide water systems for other communities, or they can be returned to community members in the form of a fee reduction.

Another option that the government can consider when setting water rates in these barrio marginales is the possibility for cross subsidization of systems. The government must determine whether each community should pay the actual cost for its water supply system, or whether it should pay a flat fee which would allow for funds from the cheaper systems to help pay for those of the more expensive ones. Since this type of independent water supply system is relatively new for governments, there remain various unresolved issues in managing cost recovery for such projects. Governments will have the opportunity to break new ground in determining policies that best manage costs and the reimbursement of loans to provide these services to all their citizens.

In Honduras, SANAA is currently able to charge for metered water, but the legal mechanisms have not yet been put in place for cost recovery from the independent water projects. The Honduran Congress must pass legislation both to collect these costs, and to create a revolving fund that will enable funds collected from existing barrio water projects to be put toward new water supply systems in other barrios marginales. The revolving fund is one of the underlying precepts of this water project that cannot be fully implemented until the Congress acts to put it into law. Funds are now building up in water association bank accounts, and once legislation is passed, the mechanism will exist to expand the water projects to several other unserved communities.

Such an innovative and non-conventional alternative— providing interim or even permanent independent water supply systems that pay for themselves—presents an exciting opportunity for governments all over the globe facing similar stresses. The success of these systems has been shown, now other governments can borrow the model, and adapt it to their own particular needs and circumstances. The programme is a winner for the governments, who can provide a healthier environment for all their citizens without picking up the tab, and a real boon for barrio residents, who both improve their health and well-being and save time, labor and money, while having easy access to water they know is clean and safe.

Ana Maria Urbina de Aguilera has running water flowing from a tap in her dirt backyard. Up to her elbows in suds, she's doing the Saturday wash, two of her children gathered 'round her. She would not have this easy access to water if it were not for an innovative programme of water supply provided by the National Water and Sewage Agency and its Unit for Barrio Marginales. But now, she, and thousands of other residents of marginal neighborhoods around Tegucigalpa, have found a way to better lives and better health—through better services.

Some 45,200 people have benefitted to date from the water supply project now being implemented in Tegucigalpa, Honduras, in a remarkably short period of two-and-a-half years. But these are not just statistics, they are individuals—with faces and hopes and dreams. Mothers who hope for better lives for their children, fathers who struggle to feed and care for their families on their limited incomes, children who work at a young age, and play as well, not realizing that life is not like this for every child. It may not be possible to measure how these lives are changed by having easier access to a safe water supply system. Whether one child, or many, might live longer because their environment is cleaner than it used to be. Whether some children may stay in school longer because they're not needed at home now to help their mothers fetch and carry water. Or if parents who now have more free time and money and self-respect might teach their children how to achieve goals they never even knew existed. These results may be difficult to measure, but they are not hard to see.

Rural-to-urban migration is a growing phenomenon in developing countries all over the world. As long as cities offer the hope of better opportunities, or rural residents think that they do, the steady stream from country to city will continue. Since many of the rural residents flooding the cities have little education and few job skills, their money-making potential is limited. As a result, they settle on the fringes of cities in make-shift shanties, the only housing they can afford. There are no quick-fix solutions to meet the needs of this ever-expanding population. How to serve this growing population with resources that remain the same or are shrinking is an issue that faces governments from India to Sudan, as rural residents fill city slums, seeking a better life, better jobs, better education, but living in poorer conditions while hoping for a better future.

Historically, governments have tried to ignore these marginal populations, hoping if they turned their backs long enough, the problem would go away. But, instead, it's getting worse. Though the extent of the problem may seem overwhelming, solutions of some sort must be sought, even temporary, make-shift ones to make life more bearable until permanent solutions can be developed. The burden, then, falls on policy makers, city planners, and the marginal residents themselves to find ways to improve the standards of living on the periphery.

In Tegucigalpa, the capital of Honduras, the government has joined with residents of the marginal neighborhoods, in a project to supply potable water to the inhabitants of neighborhoods that otherwise would have to buy water of questionable quality at a price of up to 34 times what the city charges. Because there is a water scarcity in Tegucigalpa, and few sources of groundwater, the city cannot afford to supply water to the thousands of residents who live in these barrios not already connected to the municipal system. And since many of the barrios marginales are built in the hills surrounding the city, they sit far outside and above the existing water pipelines.

The Master Plan for the city that runs through the year 2015 has no provision for supplying barrios marginales above 1150 meters with water and is far behind schedule in connecting other marginal neighborhoods to the municipal system. With more of these barrios springing up every year, there's little likelihood the city will be able to meet its water supply goals in the next 30 to 50 years. So city planners worked out an innovative solution to provide an interim service of water supply, one which involves the residents of the barrios marginales as partners in the project. The Government of Honduras, through its National Water and Sanitation Agency, SANAA, is helping residents of the urban marginal areas develop and administer self-contained water systems. **The members of these peripheral communities form water associations,** then set about deciding on and constructing an independent system that they own themselves. **The government owns the water source while the residents own the distribution system and are responsible for the operation and upkeep of the systems, collecting water fees and bookkeeping, and deciding how to use the profits generated to develop other community projects. Once unified in this effort, the community learns the value of cooperative action, and continues to work together to meet other neighborhood needs.**

The interim service, implemented as a measure to meet the needs of a population that would not otherwise have access to the city's municipal water service, is proving so successful that it could well become the permanent solution to supplying water to the barrios marginales that lie far from or above the city's existing pipelines.

With water in such scarce supply in so many marginal areas in cities all over the globe, similar solutions could be implemented at a low cost and with a high return—in health, in quality of life, and in extending the lives of those who might otherwise die young from diarrhoea diseases and malnutrition caused or aggravated by poor water supply. There's no need for planners to reinvent the wheel in every city—borrowing proven programmes such as this one can save time, money, and ultimately lives.

Development banks and the international community can join with developing countries in their efforts of to provide more and better basic services for their impoverished masses. **Responsible countries are not asking for hand-outs, but as in the case of Honduras, proving that there are effective, innovative methods that can benefit thousands of people, and still allow for cost recovery.**

By determining the monthly water tariff bases on the cost of the water and also the cost of installing the independent water system, community members can pay back in full start-up costs loaned by international organizations. This monthly fee always represents a significant savings over what barrio residents pay to water vendors, and usually is not much more than other city residents pay. **In the end, these systems are owned by the community water associations, and therefore represent an investment for the future**, as well as an immediate source of water supply.

The new Government of Honduras has already expressed its interest in expanding similar water projects to additional barrios marginales, but has at the same time been forced to devalue its currency by half to meet its current debts. So though there is the will, there may not be a way unless to supply more communities with water without help from outside.

UNICEF sees this urban project of water supply for marginal neighborhoods as one of its most successful assisted programmes, one that merits widespread attention and implementation. With the contributions of interested donor organizations everywhere, a success in one country can become a success worldwide—an a lease on life for the millions who now suffer from insufficient and unsafe water.

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