

# DRINKING WATER SUPPLY AND SANITARY DISPOSAL OF WASTE IN MARGINAL URBAN AREAS

PROCEEDINGS OF THE SYMPOSIUM HELD IN  
SANTIAGO, CHILE

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CEPIS 84

5 - 9 November 1984

ENVIRONMENTAL HEALTH PROGRAM

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PAN AMERICAN HEALTH ORGANIZATION  
Pan American Sanitary Bureau, Regional Office of the  
WORLD HEALTH ORGANIZATION

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WORLD HEALTH ORGANIZATION

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## FOREWORD

The International Drinking Water Supply and Sanitation Decade - IDWSSD, launched in 1980 by the United Nations General Assembly, is a result of deliberations held during two United Nations meetings: the Meeting on Human Settlements - HABITAT, which took place in 1976 in Vancouver, Canada; and the Meeting on Water, held in 1977 in Mar del Plata, Argentina.

The Working Plan adopted in Mar del Plata was aimed at orienting national action towards achieving by 1990, if possible, the universal extension goal of water supply and sanitation services. Emphasis was put on the need to reorient normal procedures used up to that time for extending coverage of such services, emphasizing, among others, the adoption of low-cost technologies socially more acceptable by beneficiaries, active participation of community in the whole process of developing services, improvement of institutional infrastructure, including human resources in order to perform pertaining tasks more efficiently and broadly, and the generation and channeling of additional financial resources, both internal or external.

The Decade, as a way of recognizing social implications involved under the current situation, assigned first priority of less-favored population groups, including rural population and dwellers of marginal urban areas, living in slums and shanty towns in the big cities and metropolitan areas of the Region.

Provision of water and sanitary services to such marginal or low-income urban population also involves very particular complexities related to legal and urbanization aspects, buildings quality and its tenure, institutional responsibility, among other facts surpassing traditional administrative and financial requirements which urban services demand. If it considered that 40% of urban population could be at present included under marginalization criteria, and that urbanization indexes in Latin American and Caribbean countries are high (it is estimated that by year 2000, 80% of Latin American population will be urban); then, the problem of providing adequate attention to this population group constitutes one of the most urgent needs.

Aiming at collaborating with the Governments and engineers of the Region, through AIDIS, to attend this important matter, the PAHO Environmental Health Program took the initiative to organize a Regional Symposium on Drinking Water Supply and Sanitary Disposal of Excreta in Marginal Urban Areas, which was held in November 1984, before the XIII AIDIS Congress. Collaboration was obtained from the International Association on Water Pollution Research and Control (IAWPRC), and support was received from the World Bank (WB), the International Reference Center for Public Water Supply and Sanitation (IRC), the U.S. International Development Agency (USAID), the Economic Commission for Latin America and the Caribbean (CEPALC), and the Inter-American Association of Sanitary

Environmental Engineering (AIDIS). This report summarizes papers discussed, deliberation results and formulated recommendations. It is grateful for PAHO to spread this experience in the hope that it draws the attention from those who are responsible, either politically or operationally, of improving health conditions through the most basic elements, i.e., extension of services for safe water supply and human wastes and wastewater disposal.

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I PART

DEVELOPMENT OF THE SYMPOSIUM





## 1. INTRODUCTION

In recent years, governments throughout the world have echoed, with greater emphasis than before, either individually or collectively, about health authorities' concern on the precarious state of water and sanitation services, mainly in rural and marginal urban areas, because of their importance towards health and the countries' economical development.

Drinking water supply, excreta and solid wastes disposal are also included within the strategies to achieve Health for All by Year 2000, as was agreed by governments of the world and the Region of the Americas, respectively, at the World Health Assembly of 1977, and the Directing Council of the Pan American Health Organization in 1981 (CD/28/14).

For Latin America and the Caribbean, the provision of drinking water and sanitation for all by 1990 constitutes one of the most serious challenges for governments involved, being a first priority for health authorities as well. Another significant fact is that population and urbanization growing rate among countries of this Region is one of the highest in the world; and, the goal recommended by the Water Conference commits that toward the end of 1990, most of the 338 million urban inhabitants and of the 147 million people living in rural areas are provided with such services. By year 2000, the total population could reach 600 millions with approximately 80 per cent living in urban communities.

The problem is even greater if we consider that many important cities, which already comprise 30-70 per cent of the population living in marginal areas, are still lacking water and sanitation services, or only have precarious ones, all of which are a health hazard. New human groups will certainly try to settle down in the urban areas, thus increasing the growth rate two or three times with respect to the national average.

Governments in the Region of the Americas have fortunately, been conscious since many years ago of the importance of water supply and sanitation and as early as in 1961 first regional goals were established. In 1972, Health' Ministers emphasized the significance of such services for human health, and new goals were recommended for the 70's. Progress achieved during the past two decades can be qualified as spectacular; nevertheless, there is a long way to be run, mainly in marginal urban areas and rural areas, in order to achieve goals set forth by DIAAPS and Health for All by Year 2000.

There are several factors hindering a faster progress, the most important one being financial support. According to CEPAL's estimates, from 40 to 50 thousand million dollars will need to be invested each year in the following decades in order to cover infrastructure expenses of human settlements. On the other hand, it is estimated that from 3,000 to 4,000 millions per year will be needed, only for water supply and sanitation.

In view of the difficult economical situation affecting these countries, which follow traditional development lines of the sector as far as technology to be used, administration and management, financial support, operation and maintenance, as well as other components are concerned, it is evident that it will not be feasible to achieve the goals proposed by DIAAPS. In other words, this means that the way and measures intended to provide water and sanitation ought to be revised, new approaches should be found, as well as a definition of changes and innovations should be included in the process, so as to achieve the proposed goal.

Due to the importance of the problem and in order to contribute to its solution, it was considered convenient to organize this Symposium, which was developed as indicated below.

The Regional Symposium on drinking water supply and sanitary disposal of excreta in marginal urban areas was held in Santiago, Chile, from 5 through 9 November 1984, the week before the 13th AIDIS Congress.

The meeting was attended by 105 people from 22 countries of the Region, and from 9 bilateral and international agencies. Most participants attended with national financial resources, while others were granted support from USAID and the Inter-American Development Bank (IADB).

The Symposium comprised five types of activities:

- Introductory session
- Orientation of the Symposium
- Technical sessions (three sessions)
- Working groups (five workshops)
- Political personalities' panel (one session).

During the introductory session the basic document on "services for drinking water supply and excreta disposal services for low-income human settlements in Latin America and the Caribbean" was presented, in order to offer to participants an overall view of the situation and its tendencies, and to facilitate them at the same time the identification of limits and restrictions which make difficult to find feasible solutions.

At the orientation session, the objectives of the Symposium were indicated as well as the expected way to achieve them, explaining the procedures to be followed during the meeting, which included the formation of working teams and its way of operation.

Technical sessions focused on technological, socio-cultural and institutional aspects of the problem based on documents duly prepared for the Symposium, which were presented by their authors. Items 6, 7, 8 and 9 of this Report include such documents.

There were six working groups, which held five sessions and worked taking as a basis two hypothetical cases referred to cities called Marina and Granada. Three groups worked trying to identify solutions to problems of supply and sanitation in marginal areas of Marina City, and the remaining three did the same with respect to Granada City.

During the last working session which consisted of a panel of political personalities, each working group presented its proposals for Marina and Granada. The panel members analyzed and discussed the results obtained by each group.

In the closing ceremony, a summary was read on activities performed and recommendations approved by participants.

A remarkable aspect of the Symposium was the common agreement on the fact that solutions to the problems of water supply and sanitation services in low-income human settlements, require an innovative socio-technical approach, wherein community participation should be understood in its broadest possible sense.

Another aspect which drew special attention during discussions held was that of institutional responsibility in providing drinking water and sanitation services to low-income human settlements. In this respect, conclusions and recommendations were very specific in assigning this responsibility to water and sanitation enterprises already existing in the cities.

2. PROGRAM

Monday, November 05

09:00 - 12:00

Registration

Opening Ceremony

- . Dr. Mario Muñoz  
Chief, Environmental Service,  
Ministry of Health - Chile
- . Dr. Miguel A. Aguilar  
Country Representative, PAHO/Chile
- . Mr. Norberto González  
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- . Eng. Guillermo Dávila  
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Program - PAHO

- . Eng. Anthony Milburn  
Executive Director - IAWPRC
- . Eng. Guillermo Cortez  
President of the Organizing Committee of the XIX AIDIS Congress

- 14:00 - 15:00            Keynote Paper  
"Water Supply and Waste Disposal to  
Low-Income Urban Settlements in Latin  
America and the Caribbean"  
. Tim Campbell - USA
- 15:00 - 15:30            Orientation of the Symposium  
. Horst Otterstetter - PAHO
- 15:30 - 18:00            Workshop 1 - "Analysis of the Problem"

Tuesday, November 06

- 09:00 - 11:00            Technical Session 1 - "Technological  
Aspects"

Wednesday, November 07

- 09:00 - 11:00            Technical Session 2 - "Socio-Cultural  
Aspects"  
. Ricardo Jordan - ECLA  
. Jorge Gavidia - CNUAH  
. Alastair White - IRC
- 11:00 - 12:00            Revision of the Document
- 14:00 - 18:00            Workshop 3 - "Institutional Aspects"

Thursday, November 08

- 09:00 - 11:00            Technical Session 3 - "Institutional  
Aspects"  
. Abrahao Fainzilber  
. Guillermo Ruiz
- 11:00 - 12:00            Revision of the Document
- 14:00 - 18:00            Workshop 4 - "Institutional Aspects"

Friday, November 09

- 09:00 - 12:00            Workshop 5 - Preparation for project  
proposal presentation

- 14:00 - 17:00                      Presentation of project proposal to panel
- . Eng. Odyer Sperandio - WHO
  - . Eng. Walter Soto - Chile
  - . Eco. José Pedro Algorta - IADB
  - . Eng. Luis Linares - IADB
  - . Eng. Marcelo Astoreca - Chile
  - . Eng. Juan Lobos - Chile
- 17:00 - 17:30                      General discussion and approval of the final conclusions and recommendations of the Symposium
- 17:30 - 18:30                      Closing Ceremony
- . Dr. Miguel A. Aguilar  
Country Representative - PAHO/Chile
  - . Eng. Guillermo Dávila  
Coordinator, Environmental Health Program - PAHO
  - . Eng. Anthony Milburn  
Executive Director - IAWPRC
  - . Eng. Carlos Solares  
Representative of the participants.

3.                      COORDINATION

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Eng. Guillermo Dávila  
Eng. Anthony Milburn  
Eng. Horst Otterstetter

3.2                    Coordination of the Project Groups

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Eng. Terence Lee  
Eng. Carlos Solares  
Eng. Nora Cabrera  
Eng. Odyer Sperandio

3.5 Secretariat

Eng. Walter Tabosa  
Eng. Nora Cabrera  
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4. CONCLUSIONS AND RECOMMENDATIONS

The participants in the Regional Symposium on Drinking Water Supply and Sanitary Disposal in Urban Slum Areas, CONSIDERING:

- That the regional goals and strategies adopted by all the governments to attain "Health for All by the Year 2000" call for the protection and promotion of the health of special groups more vulnerable and exposed to higher health risk, therefore assigning priorities to populations living in extreme poverty in urban areas;
- That the plan of action for "Health for All by the Year 2000" and the goals of the International Drinking Water and Sanitation Decade emphasize the importance of providing safe water and sanitation services to as many as possible by 1990 and to extend this coverage to the total population by the year 2000;
- That the growth of urban population is applying strong pressure upon the physical and social structure of the cities, specifically in relation to education, transport, housing, sanitation, nutrition and health;
- That the problems of unemployment and underemployment are becoming acute, both in the urban and in the rural areas, with an increasing repercussions in the rate of marginal growth of the marginal urban centers;
- That one of the most significant changes in the demographic evolution of the Region, and very specifically in Latin America, is the geographic distribution of its population. This is reflected in the fact that in 1970, 57.6% of the total population was urban; in 1980, it was 64.5% and for the year 2000 it is estimated that 76.9% of the total population will be urban, representing 435 million inhabitants;

- That the problems generated by this situation will be enormous and complex, requiring from the health sector, including the water and sanitation agencies, a more adequate coverage for a demand much higher than what is presently being served;
- That the low-income urban settlements, where about 40% of the urban population presently lives, are exposed to serious health risks;
- That a more realistic "socio-technical" approach will require new standards, a strategy of gradual improvements and a high level of community participation;
- That the low-income settlements are of several types, from slums and provisional settlements to quasi-legal quarters, with different degrees of complexity and history, and different socio-economic conditions. In these settlements, the common factors are precarious housing and public services, as well as intermittent, unequal and, above all, uncertain incomes.

RECOMMENDING:

- 4.1 That the Governments, conscious of the magnitude of the problem of urban low-income settlements, establish strategies to serve these areas with a more realistic social and technological approach, including:
- . The multisectorial approach to the problem, encompassing all aspects pertinent to the social and cultural situation of the population aiming at the improvement of its quality of life;
  - . the commitment of the community, using its organizational structures, aiming at active community participation in all phases of implementation of the services;
  - . the development of educational programs aiming at creating awareness among the population for the benefits to assure an adequate use of the services, and promoting sanitary habits;
  - . the link to the overall development of the economy, specially job creation, in order to make sure that the projects take into consideration the socio-economic and demographic growth of the target area,
  - . the political decision that these segments of the population are to be supplied with drinking water and excreta disposal services.
- 4.2 That the drinking water and sanitation institutions establish policies to serve the low-income settlements, including:

- . The coordination of actions between the institution and the other organizations responsible for planning, health, housing and urban development, whose occupations have something to do with the problematic of these areas;
- . the optimization of management, increasing substantially its efficacy and efficiency in order to improve the utilization of available resources;
- . the incorporation within the institution of the functions necessary to provide services to the low-income settlements, including well-defined policies, strategies and objectives, as well as more flexible standards;
- . the assignment within the budget of specific resources to provide services to low-income urban settlements;
- . the institutionalization of applied research aiming at the use of appropriate low-cost technology to optimize the use of local labor and materials without affecting the quality of the services;
- . the establishment of programs to reduce to acceptable levels unaccounted-for water in order to optimize the installed capacity.

#### 4.3

That the financial institutions, including the national and international donor agencies make positive contributions toward the attention to urban low-income settlements by:

- . The use of soft loans and grants for the financing of potable water and sanitation systems for these areas, speeding up the procedures to obtain loans and considering the economic and financial feasibility of these projects;
- . accepting more flexible criteria and standards for design, which are adaptable to the socio-economic conditions of urban low-income settlements;
- . the granting of nonreimbursable technical assistance for the development of water and sanitation institutions responsible for urban low-income areas and for institutions responsible for applied research.

#### 4.4

That PAHO/WHO and other international and bilateral institutions for technical cooperation grant support to the countries for the:

- . Study and development of solutions for low-income areas;
- . preparation of programs to develop the human resources necessary for these areas;



- production and dissemination of information, including bibliography, related to experiences and solutions developed in the countries of the Region;
- planning and development of programs for health education related to aspects of personal hygiene, and the sanitation of the housing environment;
- development and dissemination of appropriate technology.

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II PART

SYMPOSIUM DOCUMENTS



6. BASIC DOCUMENT

"WATER SUPPLY AND WASTE SERVICES AND EXCRETA DISPOSAL  
TO LOW-INCOME URBAN SETTLEMENTS IN LATIN AMERICA  
AND THE CARIBBEAN"

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The author is the only responsible for the opinions expressed in this paper,  
and its publication does not necessarily reflect PAHO/WHO's viewpoints.



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## 6.1 EXECUTIVE SUMMARY

The decreasing prospect for meeting water and basic sanitation goals for 1990 in Latin America and the Caribbean require major revisions in the conventional strategies for investment. The most recent projections of urbanization in the region reveal a burgeoning urban system of over 220 million people, in giant, intermediate, and small size cities, growing in step and outpacing national and international efforts to improve service levels. Low-income settlements, today representing perhaps 40 percent of this new urban growth, are subject to the most serious health risks. Under conventional approaches, extending water and waste facilities could cost \$40 billion US by 1990, \$50 billion more by the year 2000 (in 1980 prices, World Bank, 1983b). These resources are not likely to be available. A more realistic "socio-technical" approach could lower costs by half through revised standards, a strategy of phased upgrading, and extensive community participation.

Low-income settlements comprise a wide variety of settlement types ranging from slums to squatter settlements to quasi-legal real estate developments. They display various degrees of elaboration, differing background and history, and a range of socio-economic conditions. The common factor to these settlements is that shelter and services are substandard, and households have intermittent, uneven and uncertain incomes. But, low-income settlements may also be seen as "resource transforming systems" which refers to the proven ability of low-income residents to generate resources given the right conditions. Resource mobilizing is common in self-help housing improvement and in the "informal" employment sector. The conditions of wealth generation are sensitive to, and may be unleashed by, policy prerogatives open to local and national officials. The most important of these conditions is that of uncertainty. Perceptions of risk and uncertainty govern a household's use of time, acquisition of knowledge, creation of monetary and material resources, and commitment of investment.

A number of cases and criteria are described in this paper to suggest that a long range strategy of a socio-technical nature starting with community participation and self-reliance and incorporating revised standards, phased investments, and new technology, is a feasible way to significantly improve the health conditions of low-income settlements. Community participation is required because of the need to coordinate service changes and improvements with household economic and resource conditions. Local participation is also the best way to protect water and waste systems thereby allowing national investments to go further. Participation of low-income settlements is an opportunity which has only scarcely been tapped in Latin America. Many prevailing assumptions and standards are far too expensive, and technical solutions are already available. A first step in this socio-technical strategy, briefly explored later in this paper, is to understand the national and local contextual conditions which favor or threaten to defeat service strategies based on community participation.

## 6.2 DIMENSIONS OF THE CHALLENGE

### 6.2.1 PROJECTED POPULATION

Although population growth rates have fallen, in some cases dramatically, over the past intercensal period, the total urban population in Latin America by the turn of the century could be significantly larger than the entire Latin American population today (Fox, 1982). Three times as many urban residents will require water and waste disposal as are served today. The result of the 1980 census data obtained from eight Latin American countries now confirms a trend in which the broad urban base is consolidating and in which all cities are retaining their relative proportion to one another as the entire system expands. The consequences of this growth are profound. In the first place it means that the focus of policy and financial attention must be recentered on cities. Second, more attention must now go to medium sized cities. Third, strategies to keep rural populations in place and to forestall rural to urban migration have failed or at least are now moot. Migration accounts for far less than half of the urban growth in the past intercensal period and will continue to decline in next three decades. The challenge now for basic services in urban Latin America must clearly shift to the urban stage. Table 6.1 illustrates the rates of growth and absolute population sizes for Latin America.

### 6.2.2 SERVICE LEVELS

Nearly 61% of the overall population is served with water in the Region in 1980, 68% of the urban population, 46% of the rural. In some places these service levels represent dramatic improvements over the past ten years. Brazil, for instance, added millions of new users during the 1970s. But, as Table 6.1 shows, service levels are still far from the goals set for 1990 which are to serve 90% of the urban population with water, about 75% with waste disposal. By convention, nations can aim for these high service levels but in practice have agreed to achieve "as many as possible" by the turn of the century. In practical terms this means not only will the 90 and 75% service goals probably not be met by the year 2000, but it also means that the largest fraction of low-income populations in Latin American cities will be among those still unserved by the turn of the century. This conclusion is based on simple arithmetic and a logic of commercial operations to which water companies and agencies are progressively advancing throughout the hemisphere. As budgets are cut and financial resources constrained, service improvements, extensions, and expansion are directed to areas where business is best.

Table 6.2 indicates the net new urban populations to be added between now and the turn of the century. By 1990 over 130 million new urban residents will require water hookups, if the International Water

TABLE 6.1

POPULATION AND SERVICE LEVELS

	1980	1990	2000	2025
Population (Millions)				
Total Population	341	467	551	845
Urban	227	318	420	714
Rural	114	149	131	131
Service (Percent)				
Total	49	87	100?	100
Water	68	90	100?	100
Waste Disposal	56	75	100?	100

Source: World Bank and CELADE.

TABLE 6.2

NET NEW POPULATION AND IMPLIED INVESTMENT COSTS

	1980	1990	2000	2025
New Population (Millions)				
Water	154	132	134	
Waste Disposal	127	111	182	
Cost (US\$ Billions, 1980)				
Total (1970-1980)	20.7			
Water		16.8	17.3	
Waste Disposal		19.8	32.4	

Source: World Bank and author's estimates.

Decade goals are to be met. An additional 134 million will be added by the year 2000. A total of 293 million will require waste disposal. Calculated at long term average per capita investment cost in 1980 dollars, these incremental populations by 1990 alone could signify a 37 billion dollar expenditure, most of which would be required in the cities. An additional 50 billion must be added after 1990. These levels are from between two and five times the average annual level of investment carried out during the 1970s.

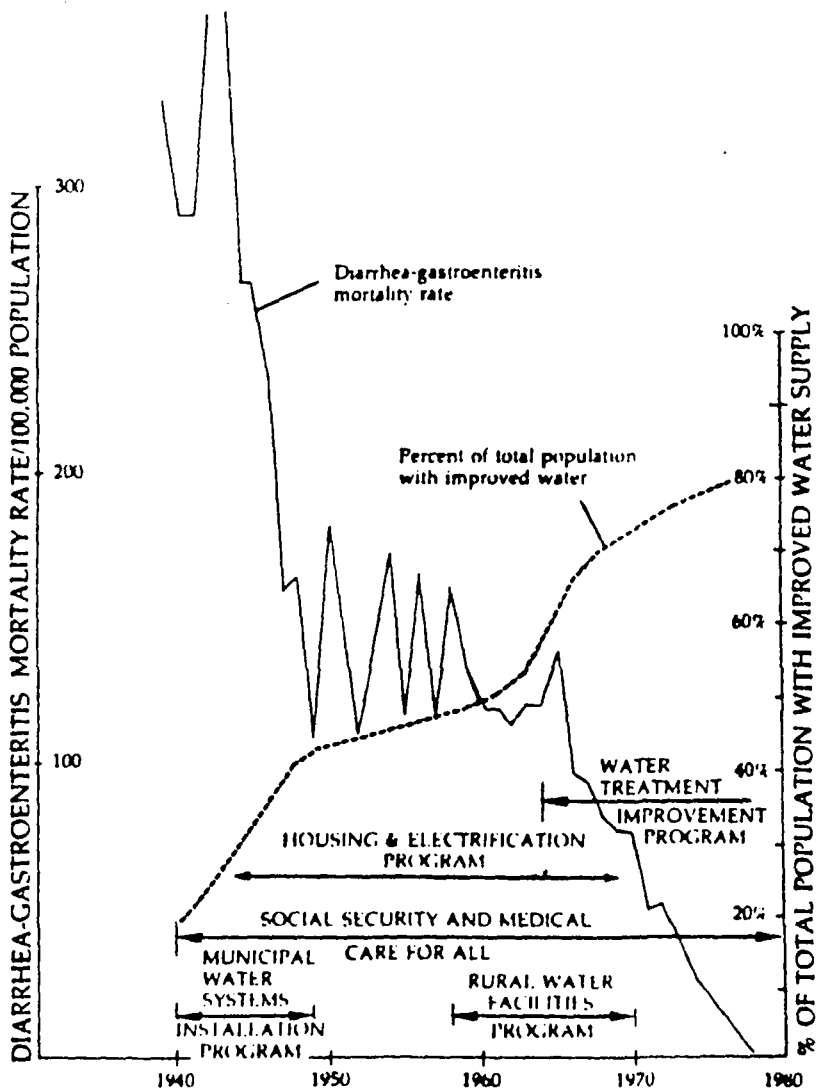
### 6.2.3 HEALTH PROSPECTS

The strong relationship between water facilities and health usually underpins investment decisions (see McJunkin, 1982 for a review of the evidence and Figure 6.1 for a graphic demonstration of the case of Costa Rica). This argument must now also be applied to the large concentration of urban poor still without water. In the general population, mortality rates due to gastrointestinal infection among children under the age of five have improved substantially over the past decade. Death rates for children (age 1-4) as reported or calculated for 1982 in Latin America range from above 15 per thousand in Haiti and Bolivia, to between 5 and 15 for all the rest of the countries in Latin America with the exception of Panama, Chile, Brazil, Mexico, Argentina, Uruguay, Venezuela and Trinidad Tobago, all of which are under 5 per thousand (World Bank, 1984). These rates are down by 50% and more from 1960. But health conditions depend also on morbidity. WHO figures suggest that about 130 cases of diarrhea are reported for each death. Conditions can be expected to deteriorate in large sections of cities as waterborne diseases increase due to the rising number of urban populations served with impure drinking water.

### 6.2.4 A SOCIO-TECHNICAL APPROACH

The conclusion of this brief review of numbers is clear. The Latin American nations are faced with a fiscal and health challenge of large proportions affecting vast numbers of urban populations over the next several decades. An increasing fraction of these populations will be living in low-income settlements. What strategic approach can be taken in order to improve the sanitary conditions of low-income settlements?

This paper argues that to meet water and health objectives, a "socio-technical" strategy is required involving a fundamental change in the approach normally taken by governments and water institutions. Appropriate technology itself is not enough. Rather, the "socio-technical" strategy must incorporate extensive community participation, reduced standards, and phased investments. Participation is required to help build, operate, and maintain neighborhood facilities. Reduced standards must be put in effect in order to increase local control in selected low-income areas. This approach is a logical extension of the self-help housing strategy. Resources are not available



Source: McJunkin, 1982

Figure 6.1 Water supply and health conditions in Costa Rica

to provide adequate housing and infrastructure. Standards and assumptions must be revised in accordance with individual and community ability to pay. The time frame for investments must be stretched out, at least as far as conventional service standards are concerned. At the same time, less elaborate services of low per capita cost may be installed much sooner. Experience with self-help housing provides a basis for understanding and assessing the key circumstances and conditions of low-income settlements.

### 6.3 LOW-INCOME AREAS--SIZE AND CHARACTERISTICS

Low-income areas may be defined in a variety of ways. The World Bank employs a definition based on the minimum income required to support a nutritionally adequate diet. Naturally, the number and location of people living below the poverty income varies from city to city, even within countries. A second definition is based on settlement types such as those provided by Leeds (1974 see below). Both definitional bases are adequate but, as we shall see, they lead to dramatically different operational and policy challenges. On the one hand, a large fraction of the absolutely poor urban residents are in practical terms difficult to reach with water and waste services; while on the other, targeting by housing types can make it easier to implement self-help and self-run programs but harder to extend service to all who need it.

#### 6.3.1 GROWTH AND DIVERSITY

Leeds has identified eight settlement types in Rio, Lima, Bogota, and other cities. These include, (a) squatter settlements, which everywhere share an ambiguous or outright illegal jural status; (b) rooming houses (cabeça de porco in Brazil, or casas subdivididas); (c) one and two room rental units with shared facilities (in Mexico, callejón; in Chile, conventillo); (d) temporary government housing; (e) multi-unit developments (unidades vecinales in Lima, and conjuntos in Rio); (f) proletarian or popular housing (vilas in Brazil and Ciudad Kennedy in Bogota); (g) suburbios, privately owned houses on official streets (the "quasi-legal"); and (h) slums proper (or tugurios). Taken together, these various settlement types in the early 1970s covered up to 25% of the Rio urban area, 40% of Lima, and nearly 50% of Caracas (see also Table 6.3 giving slum and squatter settlement populations for selected cities). Harth-Deneke (1981) estimates that quasi-legal housing in the decade of the seventies mushroomed to comprise between 30 and 70% of the major capitals. Quasi-legal housing results from the questionable or illegal acquisition of housing by land speculators and developers who then arrange contractual sale with buyers in lower and middle income brackets without proper inscription or registration with local authorities. Rather, title continues to be held with the developer.



Quasi-legal units, sometimes known as pirate settlements in El Salvador and Colombia, may or may not include water, sewerage, paved streets, lights, and the like, depending on the force of local government intervention.

By a poverty definition, low-income populations represent about 40% of the urban settlements in Latin America, and upwards of 50 to 60% in specific instances (e.g., see Mohar, 1984). Table 6.4 displays this data for 1981. Population data observed in the preceding chapter suggests that low-income settlements may be growing several percentage points faster than cities as a whole, even though migration is decreasing overall. This growth over the next ten years could swell low-income urban populations by more than 40 million.

The sheer magnitude of numbers presents only part of the policy challenge to this sector. The problem is made at once more simple and more complex by the qualitative differences in social, economic, political and legal aspects of various low-income settlement types. To simplify this variety, low-income settlements are collapsed into three clusters in Figure 6.2: (1) slums, including most rental units and those not exhibiting developmental features such as capital investments and substantial shelter improvements; (2) squatter settlements where some sort of monetary or exchange value of housing and land is maintained by occupants; and (3) quasi-legal settlements in which local governments lend a collaborating hand, by omission or commission, in the founding of settlements. Other major settlement clusters are also represented. These clusters are superimposed over a simplified grid showing approximate service and income levels for shelter types and households, respectively. Figure 6.2 is not a rigorous "mapping" of settlements. More detailed research would be required to produce such a breakdown.\* Rather the figure presents visually the policy challenge involved in attacking basic sanitation problems in low-income urban settlements.

Intuitively, it might appear that a strategy of attacking the "quasi-legal" cluster first might benefit from the leverage already available in the administrative and "police" powers of local government. Normally, local governments are empowered to set conditions on land developments or building permits regarding basic infrastructure such as sanitation facilities. Such a strategy might hope to reach maybe 10 to 15 million urban residents without indoor water or standpipe service. However, the "quasi-legal" first strategy will result in increased housing costs in monetary terms. An argument will be made later on to suggest that the organizing energies intrinsic to most squatter communities offers a more just, and possibly a more effective basis upon which to formulate a service strategy. A broader range of households in the squatter and quasi-legal clusters would benefit.

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\* Available census data frequently do not cover all the relevant parameters. Even the most recent data are now likely to be inaccurate by 40%.

TABLE 6.3

## GROWTH OF SLUMS AND SQUATTER SETTLEMENTS, SELECTED CITIES

Country or Area, Urban and Cities	Year	Urban Population		Population in Slums and Squatter Settlements		Population in Slums and Squatter Settlements as Percentage of City Population
		Inhabitants (in 1000s)	Annual Growth Rate	Inhabitants (in 1000s)	Annual Growth Rate	
BUENOS AIRES	1970	2,972	-	149	-	5
Belo Horizonte	1970	1,106	4.9	-	-	-
Rio de Janeiro	1970	4,855	4.4	1,456	5.5	30
BOGOTA	1969	2,294	7.3	1,376	-	60
Cali	1969	905	7.4	272	7.4	30
SANTO DOMINGO	1964	670	-	48	-	72
Guayaquil	1969	701	-	343	-	49
GUATEMALA CITY	1971	817	5.3	245	28.0	30
TEGUCIGALPA	1970	232	5.2	58	5.2	25
MEXICO, CIUDAD DE	1966	3,287	2.3	1,500	12.0	46
PANAMA CITY	1970	418	5.9	71	5.9	17

Source: U.N., 1976.

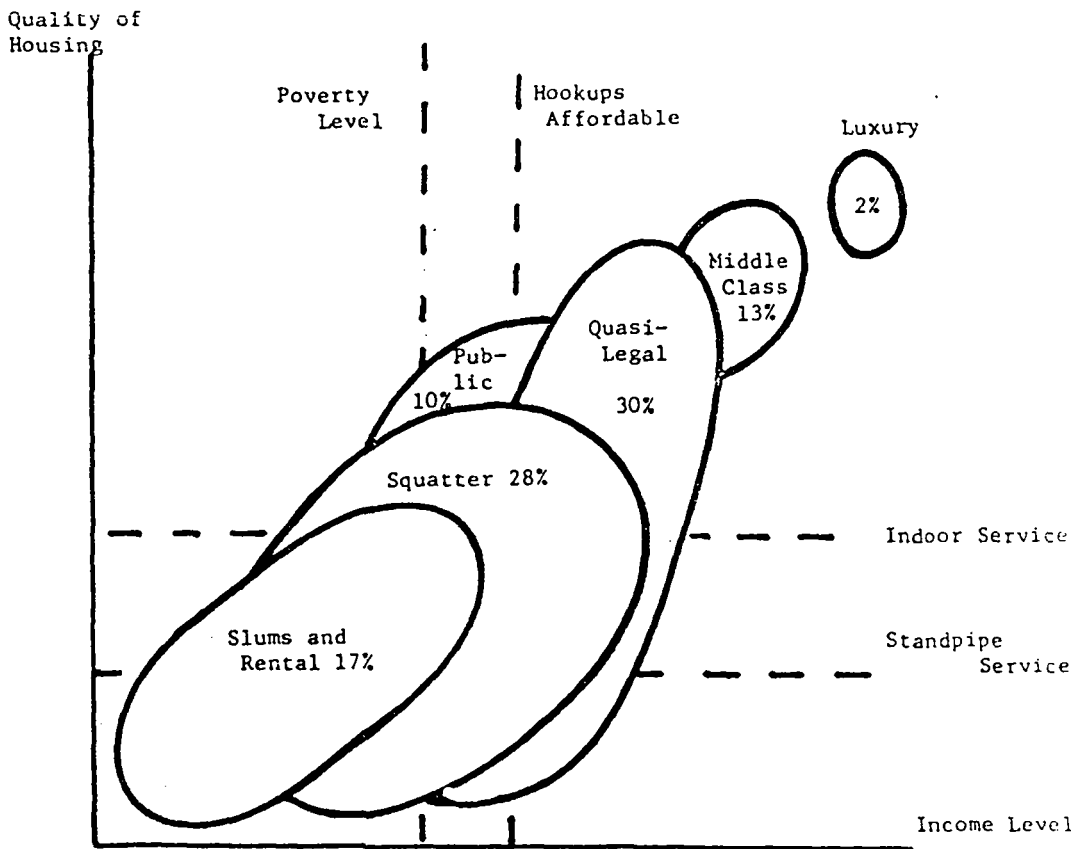
TABLE 6.4

POPULATION BY COUNTRY AND REGION  
Estimated Totals, Urban and Poverty Levels 1970, 1980

Country and Region	Totals		1980	1981 Urban Poverty <sup>c</sup>	Total
	1970	1980	Urban	%	
Bolivia	4.3	5.6	1.8	-60	1.1
Colombia	21.3	26.7	18.7	34	6.4
Chile	9.4	11.1	8.9	-35	3.1
Ecuador	6.0	8.0	4.0	40	1.6
Peru	13.5	17.4	11.7	49	5.7
Venezuela	14.0	15.6	13.1	-20	2.6
Argentina	23.2	27.2	22.8	-35	8.0
Brazil	95.3	118.7	80.2	55 <sup>d</sup>	44.1
Paraguay	2.3	3.2	1.3	19	0.2
Uruguay	2.8	2.9	2.4	30	0.7
Central America <sup>a</sup>	16.4	22.1	9.4	-40	3.8
Mexico	51.2	69.8	46.6	-45	21.0
Caribbean <sup>b</sup>	10.3	12.8	5.2	-50	2.6
Total Latin America	270.0	341.1	226.1	-45	100.9

(a) Includes Panama; excludes Belize. (b) Includes Bahamas, Dominican Republic, Haiti and Jamaica only. (c) Based on income needed to purchase a minimal nutritionally adequate diet plus nonfood requirements as calculated by the World Bank for 1981, except where " " appears, in which cases estimates are provided based on relative economic conditions. (d) Below three minimum salaries.

Source: World Bank and author.



Source: Author

Figure 6.2 Schematic map of housing and facilities by income level.

### 6.3.2 PLANNING, ENGINEERING, AND INVESTMENT PERSPECTIVES ON LOW-INCOME SETTLEMENTS

Water and waste disposal services to low-income urban settlements are usually the responsibility of state, county, or local water companies. The limited technical and financial resources available to these companies puts them in a position roughly analogous to housing agencies two and three decades ago, before self-help and upgrading strategies were formulated. For housing institutions then, and water companies now, low-income settlements are seen variously as urban cancers, "disordered", rapidly growing places of unfortunate, poor "marginal" populations, incapable or unwilling to pay for services. Frequently, low-income populations are seen as much as contributors to a poor sanitary environment--open drainage systems carrying human excreta and solid wastes--as victims of it. Occasionally, low-income residents are perceived as victims, the objects of political manipulations by local politicians seeking to perpetuate a problem that can be exploited for votes. Still, low-income settlements are the focus of lost water and revenues through clandestine connections. They are perceived as bad investment risks due to theft and the poor prospects of cost recovery, and the areas in which operations and maintenance are most difficult to carry out because of vandalism, difficulties of access, irregularity of layout, personal threats, and the like.

At the same time in a growing number of instances, innovative water supply and human waste disposal projects--either in upgrading, sites and services, or in integrated projects utilizing some form of citizen participation--have been successful. Many or all of the problems cited above in slightly exaggerated form, have been offset, overcome, or proven unfounded. The secrets for success in attacking head-on low-income, "marginal" settlements are beginning to be exposed after several decades of research, pilot projects, and experimentation. Self-help housing, sites and services, and upgrading schemes in Latin America and other parts of the world offer the main insights. In the next section we shall explore some of the contextual factors and conditions which have spelled the difference between success or failure in community participation in low-income areas.

### 6.3.3 LOW-INCOME SETTLEMENTS AS RESOURCE TRANSFORMING SYSTEMS

Perhaps the most important insight into low-income settlements in the past several decades is to see the range of settlement types as flexible socio-economic systems comprised of households capable of adapting to generally adverse economic, monetary, employment, and housing conditions. Academic and institutional research has covered many facets of low-income settlements--migration, dependence, adaptation, assimilation, integration, marginality, and mobility (see Campbell, 1980, for a review of this literature). A common theme in this research is the means by which housing, employment, and basic needs are secured or compromised in accordance with circumstances and opportunities particular

to individual locales, states, economic situations, and governmental conditions. Household, as the decision-making units in low-income settlements, may be seen as resource transformers similar to households in human settlements anywhere. The key distinguishing characteristics in low-income settlements are: (a) the variety of resources brought into the household economy, and (b) the uncertainty surrounding the household unit, especially in squatter settlements. Low-income households entrain a multiplicity of resources, but rely to a relatively high degree on nonmonetary resources such as kinship networks, goods, materials, information, and individual time and effort. Uncertainty refers to the unknown and unknowable aspects of resource flows such as the intermittent nature of income, vagaries of chance in health, welfare and natural catastrophes, and, in squatter settlements, the possibilities of losing house and home with eviction. Households transform monetary and nonmonetary resources to achieve many objectives, but stated succinctly, objectives are to create wealth and offset uncertainty (see Campbell, 1980 for a discussion of theory and data).

The history of low-income settlements in Latin America and the Caribbean proves that significant monetary and nonmonetary resources are mobilized over time. Experiments have shown that a burgeoning of effort, investment, and expenditure by households is released under the right circumstances, yielding higher property values, housing quality, and environmental health conditions. Upgrading of squatter settlements in Manila resulted in 60 to 85% increases in property values according to statistical calculations (Keare, 1983; see also Jimenez, 1982). By gradually refining its approach, World Bank participation in 36 projects between 1972 and 1981 led to a doubling of the average size of its projects during this time period (Cohen, 1983). Similar projects have been sponsored in urban and rural areas by the Inter-American Development Bank, and other multilateral and bilateral lending institutions, leading to significant improvements in environmental conditions and increased satisfaction (Burns, 1983).

The key to success in self-help projects is frequently obscured behind a knot of complex, interrelated contextual variables, often making it impossible to discern why one project succeeds and another fails. To untangle these variables it is useful to think of the household as a decision-making unit with a variety of instruments--number of members, kinship networks, expenditures--manipulable to achieve household needs. Households operate in an environment of uncertainty layered with immediate and less direct conditions and circumstances, such as other households, physical terrain, governmental and bureaucratic institutions and the local and national economies.

Viewing households as resource transforming systems, like small businesses or factories, makes it easier to discern policy and technology options which may be helpful to improve water and basic sanitation. With constraints on resources and information, the objectives of households may be synthesized as follows: transforms what resources are abundant, but of perhaps limited exchange or market value, into something more liquid or widely needed. The typical pattern in this transformation in

squatter households is to wait and watch for settlement and investment opportunities, learning by trial and error and the grapevine what is risky and what is sure, and then after establishing a settlement bridge head somewhere, gradually transforming one's personal effort and labor into shelter and facilities (or businesses or rental space), or some other capital goods with a market or at least an exchange value. Two variables are central to this process: personal time and knowledge or information. Ironically, materials and tools are not decisive in this wealth-creation process. Therefore new and appropriate technologies, even if cheap, do not normally trigger development, although lowering costs always helps. The decisive factors are: (a) the knowledge that whatever commitment of resources is made will not be lost, say, with malfunction, eviction, or worse and, (b) that the "cost" in terms of one's personal time and effort fits the household budget and organization. This fit means that the technology--cement floor, porcelain fixtures, zinc roofing etc.--constitutes an investment that does not strain normal household operations. Toilets that are capital intensive, or even do-it-yourself sanitation systems that require fastidious maintenance, will fail if they disrupt the internal allocations of tasks, jobs, money and time within a household.

Thus, households in low-income situations, as businesses, bureaucrats, and tycoons constantly adjust, activate, or withhold from expenditure their resources, job options, and investment decisions in accordance with uncertainties, perceptions of risk, and availability of time and resources to reduce risks or remove uncertainties. In this sense squatters may be said to be basically "conservative" (see Marris, 1974). A squatter's decision to illegally occupy inner-city land is predicated on a balance of knowledge and uncertainty as to whether the household will be forcibly removed and its material assets destroyed. Subsequent investments in finishing detail, cement floors, and the like are similarly subject to a perception of uncertainty and calculated risks (e.g., see Elmendorf, 1980: 41). These decisions must be made by households before the various moves through the domestic housing cycles are carried out as described by Turner (1968, see Figure 6.2) and modified by Edwards (1982) in the case of Bucaramanga.

Household decisions to move from the central city to the periphery, or to make improvements in housing or amenities, depend not only upon resources at hand, but also upon the householders' perceptions of the possible reactions by authorities and new resources potentially available in a new location, e.g., new job opportunities, or kin relations, among other things. A similar pattern of calculation, removal or offsetting of uncertainties is found in the informal labor market and small businesses. Sometimes by trial and error, sometimes by shrewd insight, individual entrepreneurs barter or trade resources, get them on credit, obtain raw materials through kin networks of exchange, and seek outlets and marketing niches subject to fewest controls either by informal competitors or local authorities (Peattie, 1980).

To repeat, the single most important conditioning factor at the local level governing the decision to mobilize resources dormant in the

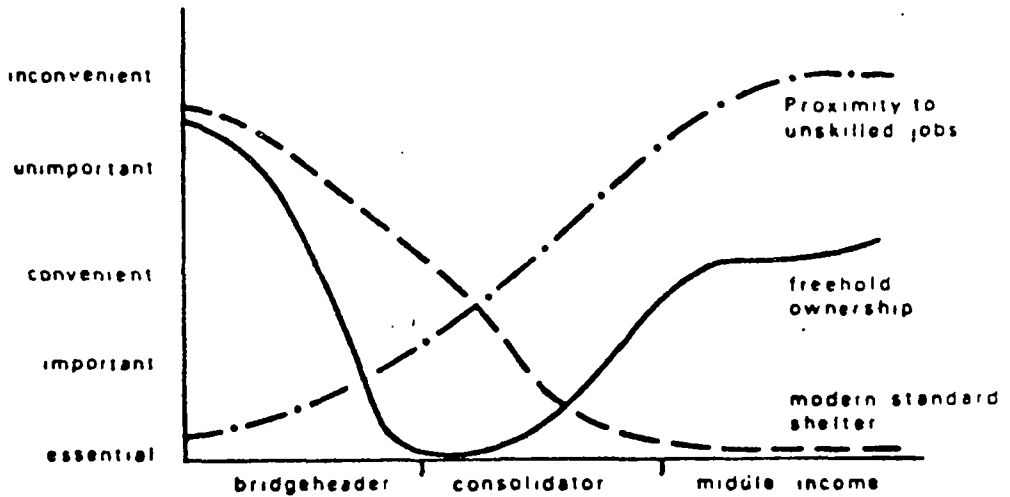


Figure 6.3 Changes in household priorities through the domestic cycle

Source: Turner, 1968.

household system is uncertainty and the risk of losing resources so committed. No stronger evidence may be presented for this assertion than the observed flourishing of household investments in housing and infrastructure once security of tenure has been obtained. This phenomenon has been observed over and over and now represents the single most important insight in improvement of housing and infrastructural conditions in low-income settlement areas (UN Habitat, 1981). Security of tenure is not the only policy variable open to authorities and sponsoring institutions to facilitate the mobilization of resources and investments. Numerous other policy variables are available including symbolic recognition of settlements, partial or wholesale investments in infrastructures, such as water, basic sanitation, power, and paved roads; and by the open engagement of officials or authorities with local settlements through meetings, letters of acknowledgement, and in the most diluted form, neglect or at least decisions by authorities not to remove settlements over a long period of time.

It is not surprising that squatters and official institutions which "sponsor" or program housing projects have divergent opinions about what is important in their investments. These two groups are engaged in an implicit dialogue concerning the conditions for acceptance or rejection of the settlement in the first place, and subsequent investments in housing and infrastructures. The monetary or exchange value created by self-help and household investments in housing and infrastructures are of course, highly valued by both sponsoring institutions and self-help households. On the one hand, cost recovery, construction speed, physical appearance, adherence to building codes and standards, and other factors are important for the sponsoring institution but of low priority for self-help households. On the other side, security of tenure, proximity to central city, and proximity to friends, family, and other networks of exchange are highly important to the self-help household, and not important at all to sponsoring institutions.\*

How can the substantial resources dormant in low-income settlements be liberated and guided into water and waste infrastructure? The relative success of self-help efforts in expanding housing quality and infrastructure in the past serves as a guide for extending this strategy in the water and waste sector. Experience of some self-help efforts suggests that water and waste investments are not among the most important for residents, and not realized to the extent expected, in sites and services and upgrading projects. However, Elmendorf (1980) found that urban residents are willing to work, even specifying with whom they would collaborate (networks of kin, friends, associates) specifically on sanitation facilities. A review of selected experiences in Latin America over the past ten years helps to illustrate the contextual conditions and circumstances around which the resources of low-income households can be and have been mobilized, and to identify for both the household and sponsoring organizations which conditions must be met for the transformation process to be set in motion.

#### 6.4 CASE STUDIES IN UPGRADING

Nine case studies have been compiled and summarized in Table 6.5 in order to illustrate the range of contextual issues in successful and unsuccessful experiences at upgrading in lower income settlements in Latin America. For each of the cases and places described, the kind of sponsorship or institutionalized authority, or backing, official or otherwise, at the national, state, or local levels are described briefly,

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\* This observation was developed by Campbell, et al. (1977) and cited by Perlman (1981).



together with the financial channels, resources, and, if appropriate, nonmonetary resources invested in the upgrading. Technical help and community participation are also described principally in terms of responsible agencies or individuals. The outcome of each experience is denoted and comments are also provided on the contextual history of each case. The cases illustrate that neither technical, financial, legal, institutional, products or outcomes per se is the important explanatory factor in success. Rather the character of sponsorship, the nature of policy regarding the backing for and support of strategies of improving housing or infrastructure are the critical variables in these representative cases. These cases illustrate the argument that backing at the local or national level are the decisive factors in success because they appear to have the greatest effects on reducing the uncertainties and therefore risk of loss governing investments by individual household investments.

#### 6.4.1 CASES OF NATIONAL AND LOCAL SPONSORSHIP

Cases in Peru and El Salvador both illustrate the ready mobilization of local institutional and squatter settlement resources to improve housing and infrastructure once national political and policy support is directed in its favor. The El Salvador project in Peru and the Foundation for the Promotion of Minimal Housing ("Fundación Pro-Vivienda Mínima" cited by Skinner and Rodell, 1983, pp. 125-150) provide the most robust examples of the opening of financial, technical, and other channels into which international as well as national resources could flow in support of squatter efforts. In both cases community participation was extensive from the outset, although in Lima participation carried far beyond housing and infrastructural improvements to include services, job creation, commerce, and even a local bank. The Lima project occurred in an era (c. 1971) in which a national campaign of participation and mobilization was fostered by the government. The same is true in the FPVM in San Salvador, although interestingly, the earliest stages of the FPVM, as with Codesco in Brazil in 1966, community participation was elicited by local, state, or private entities without support from the national level.

The Codesco project in Rio de Janeiro was fostered by a state agency with state financing and technical assistance. Moderate decision making and labor was provided by residents. This was a clear departure from accepted practice at the time. The same is true of the FPVM in San Salvador. Sponsored by the Mayor's office in San Salvador, the FPVM was elevated to high status and its efforts greatly magnified. Within a four year period, the FPVM grew from a local middle class voluntary organization to an official program executed by the Ministry of Housing with World Bank financing and government guarantees for the construction of thousands of housing units.

These cases illustrate the powerful effects of national backing in the form of sponsorship or support as a conditioning factor in the success or failure of community participation in self-help programs. Such

TABLE 6.5

## CASE STUDIES - SUMMARY DATA

Project Name/ Place	Sponsorship	Finance	Technical Support	Community Participation	Product/ Outcome	Context/ History
1. CODESCO/ Rio de Janeiro 1966	state agency	state	state	moderate, decision making	upgrading and expan- sion, basic facilities	supportive policy only at state level
2. FPWM/San Salvador 1967	community cooperative	private church	professional donated, Peace Corps	worker brigades	30 totally serviced units	Supportive policy only at city level
3. FPWM 1972	National Housing Ministry	government, IBRD	Housing Ministry	limited self-help	thousands of units	accommodating national government
4. Lima, (El Salvador) 1971	cooperative with support of state and national government	community resources, national treasury	local and state	extensive, open-ended	housing, services jobs, commerce	national ideology of participation and mobilization
5. COPASA/ Belo Horizonte	COPASA (state)	state	state	minimal	substitution of meters	state water company program to cut losses
6. Rural Basic Sanitation Program (RBSP)/ Colombia	National Health Institute	national	national and regional	moderate to extensive	rural water systems operated and maintained by communities	15 years experience organizing and supporting rural water systems
7. EMCALI Cali (Aguas- blanca)	EMCALI City water company	local, IBRD	EMCALI	moderate	upgrading of water facilities	extremely rapid growth of squatter settlement with extensive clandestine hookups
8. Quasi-Legal Bogota, also Mexico, San Salvador elsewhere	private developers, sometimes city inter- vention	private	private sometimes city	none, except for upgrading	services and housing	fantastic returns on investments, city of Bogota intervening with good results
9. Alto Solar & Ruth Ferreira/ Rio de Janeiro late 1960s	private (squatters)	local	local hired plumbers	total	irregular services, sometimes retailed	typical clandestine arrangements for house connections and sales to other squatters

backing is not necessary to launch a program but is necessary for it to continue or to grow. Of course, there are also cases in which national authorities come to play an overbearing role in the direction and efforts of local cooperatives or community organizations once they are formed, as Collier for instance has reported in the case of Peru (Collier, 1976).

#### 6.4.2 WATER AND WASTE: CASES OF OFFICIAL SPONSORSHIP

Cases from Brazil and Colombia illustrate entirely different characteristics of participation and sponsorship directed primarily at improvements in services for water and basic sanitation. In the first case the Rural Basic Sanitation Program (RBSP) in Colombia has been operating for 15 years successfully organizing over 2,000 rural water boards for the construction, operation and maintenance of local water systems in communities of 50 - 2,500. The RBSP is a dependency of the Ministry of Health, financed by treasury revenues and community participation. Technical support is provided to communities in the construction, operation and maintenance. The RBSP is a model effort mobilizing community resources to improve local infrastructure not otherwise attainable. RBSP water systems are built with an average community participation of 20% of the capital investment value. Up to 40% of the loans made during construction are paid back by the communities. Payments replenish a revolving fund set up by RBSP to help continue their operations. Local juntas maintain and operate water systems, set and collect their own tariffs, and except for the most complicated technical matters, maintain and repair their own equipment. Extensions and upgrading of services operate in the same fashion.

A state water company (COPASA) in Belo Horizonte functions with more passive community participation. COPASA replaced water meters with flow restriction devices in low-income areas in order to cut losses from defective meters and clandestine use. Participation is required on the part of the communities only in the organization of local juntas for supervision and vigilance of the systems. But this program involved 100,000 residents in Belo Horizonte and operated successfully to cut losses of both water and administrative costs in the system.

Still another instance of community participation is being organized in the low-income settlement of Aguablanca in Cali, Colombia a community of 250,000 low-income persons, 90% of whom have settled within the past six years. Clandestine connections, the laying of pipe, improvised standpipes and local water distribution lines are blatantly illegal but widely visible in the community. EMCALI (the city water authority) is attempting to bring these clandestine hookups into the commercial system and to upgrade service by providing low-cost credit, technical assistance, and materials for further installations of individual and public connections.

#### 6.4.3 CASES OF PARTIAL, AND SELF-SPONSORSHIP

Finally we have two cases of self-help that fall on either side of local or national sponsorship. first is the case of the quasi-legal housing settlements known as pirate colonies (in Colombia) or suburbios (in Brazil). In one study of pirate subdivisions in Bogota, Allen Carroll (1980) found a strict quantitative relationship between property value and water and sewage infrastructure (including standpipes) financed by the developer. Where city intervention has been attempted, water service in the form of standpipes increases the value of the lot by a factor of two or three (Carroll, 1980). Carroll also found that private subdividers uninfluenced by the policy interventions by the city enjoyed fantastic returns on investment. City control over such developments has proven that, in hundreds of cases, water and sewerage can be financed through a private market and meet the demands for a certain strata of the urban population. Data in the Carroll study suggest that up to three-quarters of the illicit buyers would be able to afford minimum standards imposed in city-regulated developments.

In several squatter settlements studied by the author in 1977, investments in housing, water, and sewerage were made entirely in the absence of any official local or national support. The sponsorship in these cases was on the part of the communities themselves having found various ways and means to reduce uncertainty or offset the risks of their investments. In one community (in the South zone of Rio) investments in water and sewerage were widespread. Even when taken clandestinely, water connections cost money to hire skilled pipeline tappers. Conduction mechanisms through pipes, cement works, and accessories also represented substantial monetary value. No such investments were visible in a parallel community in the North zone consisting of populations of equivalent size, background, and income. The conditions of the surrounding environment, both in the labor market as well as competition for land from a private bus company, were sufficient to forestall such investments.

Such institutionally unsponsored or self-help activities are by far the most widespread form of "participation" in low-income settlements in Latin America. These case illustrations suggest a variety of routes and mechanisms by which local or national sponsorship can accelerate and magnify community participation and self-help efforts to improve the sanitary environment in low-income communities.

The cases also expose a divergence of priorities between households and institutional sponsors in connection with infrastructure improvements. On the one hand, the households in making their decisions for investments look primarily to legal tenure, or some form of authorized or official approval, such as partial tenure, official infrastructure investments, engagements or ongoing dialogue with officials, or merely in the age of community. On the other hand, sponsors wishing to select target communities propitious for public sector investments would look first to local expressions of interest and

organization. Evidence of investments already made, the degree of finishing buildings, the amount of second stories and rental housing from primary owners, clandestine hookups, and finally, local businesses, cooperatives, or improvement associations are also important. Ironically, each side in a sense looks for similar conditions and assurances. But the uncertainties represented by the absence of these conditions are most easily removed by official act. In turn, official action is mainly dependent upon a dialogue and mutual willingness of local associations to participate with official institutions and vice versa, as well as to a secondary degree, upon the presence of technical, procedural, and technological devices to enable extensions of water and waste systems at a reasonable cost.

## 6.5 STANDARDS, TECHNICAL APPROACH, AND TECHNOLOGIES

Community participation is appropriate to coordinate service expansions as and when they are convenient for the community, but participation must go hand in hand with technological changes and revisions in standards.

### 6.5.1 REVISED STANDARDS

Standards of service and of hardware have been adopted largely from European and First World applications with modifications to suit cost and material constraints in Latin America. Although there is probably room for modifications in technical standards concerning design lifetime, capacities, and volume of water delivered, most of the standards in operation which require modification are unwritten. For instance, complete services and universal house connections from an unwritten and expensive standard of service in water and wastes. Similarly, waterborne sewerage, metered service for water, and even the delivery of water itself from captation to individual water tap by an authorized public agency implies high overhead and administrative costs. Increased conservation and reduced losses are two additional areas where, given the high cost of water (on the order of 2-3 U.S. cents/cubic meter) and high volume of losses (40-50 percent), water retained or conserved has a high value. Conservation and loss reduction in the city of Cali alone, for instance, could in a few short years yield a return of .75 to 1.0 million dollars (see Table 6.6). Much higher values would be available in such arid cities as Mexico City, Monterrey, Lima, and the like.

## 6.5.2 NEW APPROACHES AND TECHNOLOGIES

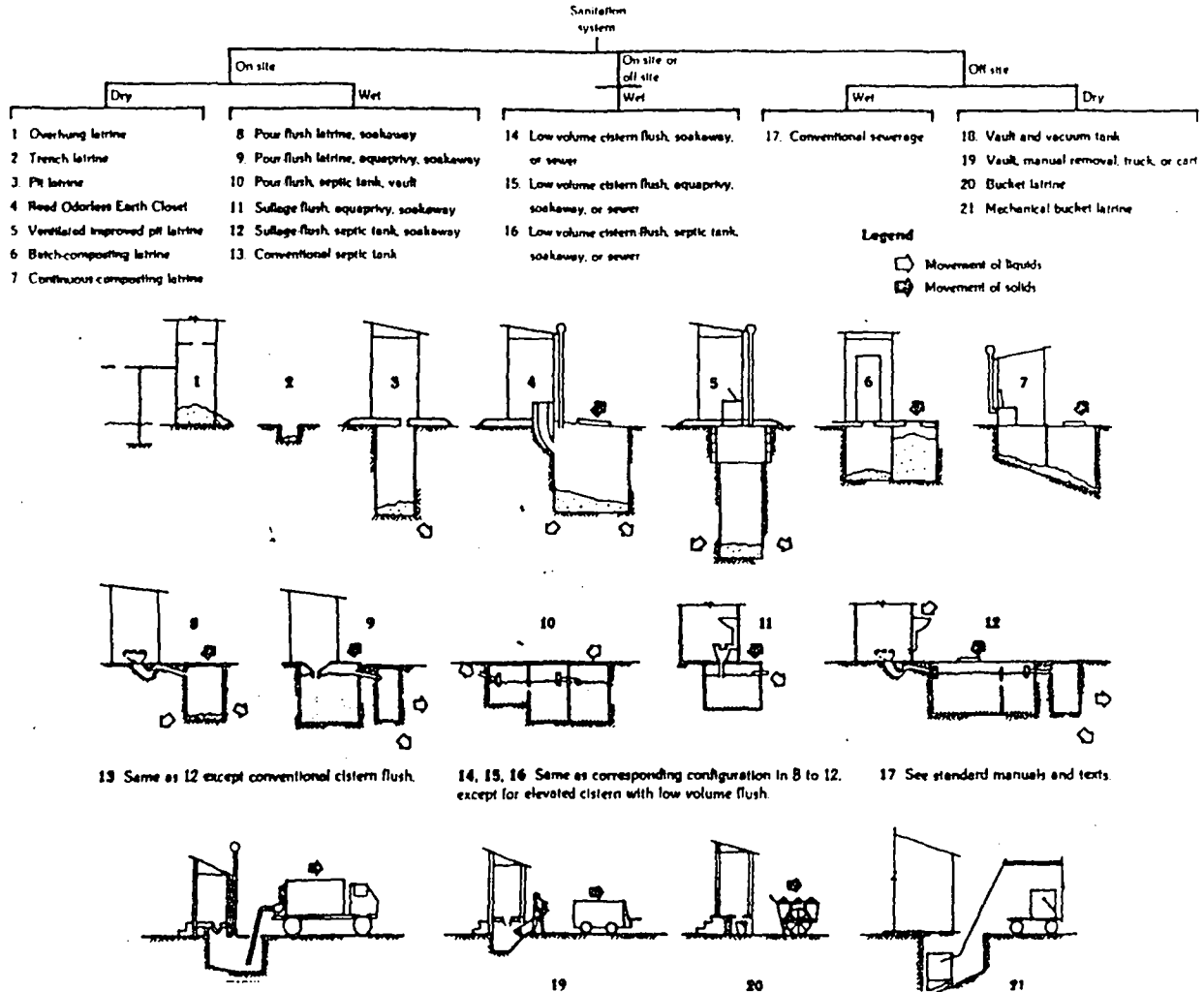
No new technological breakthrough is required to achieve water and waste goals by 1990. Many national and international institutions have combined their efforts to develop and perfect new or alternative low-cost technologies suitable for application in low-income urban areas. PAHO and the UNDP Technical Assistance Group are presently working to diffuse technologies. But perhaps with the exception of a vandal-proof spigot for public standpipes, no new technology is needed. Rather, more elaborate, refined, and practical configurations of present technologies are required. For instance, ablution blocks with facilities for drinking water, laundry, and personal hygiene can serve to focus facilities around community needs in a configuration which local communities can control, expand, and administer. Such a configuration, employing a "fontanero" to charge for water and maintain the facility, has been used successfully.

Along with these configurations, further work is required on low-flow facilities, particularly flush toilets, as well as flow restriction devices and biological waste disposal systems designed again for clustered use. The SIRDO is one such system which has been proven in several locations in Mexico (Schmink, 1984). The SIRDO system can serve the waste disposal requirements of between 50 and 150 persons in clusters of households for a cost 40% below standard, water-borne sewage systems. In addition, the SIRDO has the advantage of integrating organic wastes, thereby reducing solid waste collection and at the same time producing a high quality humus fertilizer for sale on local markets. Relatively intense organizational and educational efforts are required to launch this system, although these efforts may be expected to diminish as experience and knowledge are acquired.

Finally, up-graded approaches to water and waste disposal have demonstrated cost effectiveness. McJunkin (1982) reports operating cost differentials on the order of 1 to 6 for simple water and waste systems. The World Bank has amply diffused the schematic arrangements and economic financial arguments in support of this approach (see Figure 6.4). Community participation fits hand in glove with this approach to the extent that control over the decision of initial investment, extension, expansions, density of hookups, placement of facilities, setting of tariffs, operation and maintenance, can be left in the hands of the community.

Financial resources are not available to meet the water supply and waste disposal goals agreed by Member Countries for the year 1990, and probably neither for the year 2000. This paper has argued that revisions in standards, approaches, and technologies will help not only to cut the costs of water delivery and waste disposal systems. Hypothetical revisions for Cali are illustrated in Table 6.6, suggesting a 40% savings in cost, and potential for more extensive availability of services for water and waste. But technological, institutional, and administrative reforms and innovations may not be the most important priorities, as PAHO suggests (1983). Nor can cost-cutting measures alone be sufficient to reach the health objectives of the Member Countries. These strategies must also incorporate various forms of community participation. This is necessary to mobilize community resources, but also more importantly, to elicit community attention and resolve to handle the wide variety of decisions and staged investments that will be required to effect minimum basic service in the first place, and later, progressively more elaborate services as the communities are ready to take them.

In effect, this argument proposes that an important fraction of the administrative, operation, and maintenance aspects of local water supply and delivery tasks be shifted from the central authority to local communities, as has been done in the Rural Basic Sanitation Program in Colombia. Local revenue collection and maintenance and repair have been and can be carried out at the local level. But to successfully implement these notions a great deal more experimentation must be tried and the development of routine management and community organizational techniques refined for application to water and waste services. The groundwork for this socio-technical strategy has already be laid in self-help housing and to a lesser extent rural water and basic sanitation facilities.



Source: World Bank,

Figure 6.4 Upgrading approach to waste disposal



TABLE 6.6

## CALI: ALTERNATIVE STRATEGIES FOR 1990 GOALS

Strategy Component	Water				Sewerage				
	Pop. in 000's	Unit Cost	Total Cost	Net Change	Pop. in 000's	Unit Cost <sup>a</sup>	Total Cost	Net Change	Total
Standard Technology	338.9	115	3.897		240	130	3.170		7.067
Conservation @ .02 U.S.\$/m <sup>3</sup> 36.2 x 10 <sup>6</sup> m <sup>3</sup>	372.9		.724	-.724					-.724
Revised Standards									
1. 100 lcd	268.5	85	2.282	-.805					-.805
2. Ablution blocks					80	80	.640	-.400	-.400
3. Biological waste & pit latrines					80	50	.400	-.640	-.640
TOTALS									
Amount Saved				1.529				1.040	2.569
City Goals with Reductions			2.368				2.130		4.498

(a) Unit costs in U.S. dollars, totals in millions.

Source: author

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7. DOCUMENT ON TECHNOLOGICAL ASPECTS

"TECHNOLOGICAL ALTERNATIVES FOR DRINKING WATER SUPPLY AND  
SANITARY DISPOSAL OF EXCRETA IN URBAN SLUM AREAS"

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The author is the only responsible for the opinions expressed in this paper,  
and its publication does not necessarily reflect PAHO/WHO's viewpoints.

## 7.1 INTRODUCTION

Safe drinking water and sanitary disposal of excreta are not only important from a health point of view but are also essential components of general community development in urban slum areas. The quality of life in low-income urban settlements will be considerably influenced by the level of provision of these basic needs. In many countries, the standards of water supply and sanitation provided in urban slums have deteriorated over time and are now totally inadequate and squatter settlements have often not received any formal services. Too many people now live in such underserved areas for this problem to be neglected and Governments must accept the responsibility and take appropriate action. In view of the magnitude of the problem, it is essential that low-cost approaches be adopted for these communities so that the whole population in a country will receive a basic level of service in reasonable time. This will only be achieved if the costs of urban water supply and sanitation are equitably distributed and charges are applied in relation to the level of service received.

A wider range of technology exists for water supply and excreta disposal in urban areas but the selection must be made judiciously, taking account of cost, social and cultural suitability, location, operational requirements and local resources. It is now recognized that community participation and institutional organization are critical features of water supply and sanitation projects even where the technology chosen is appropriate. This paper will concentrate on reviewing the technological alternatives available for selection in the implementation of water supply and excreta disposal schemes for urban slum and squatter areas.

## 7.2 LOW-COST DRINKING WATER SUPPLY

### 7.2.1 DESIGN CRITERIA

It should be recognized that the choice of basic design criteria will largely control the total cost of a water supply project, so great care must be taken in deciding upon the level of service to be provided. The quantity of water supplied and the type of system installed must be consistent with the national situation in terms of existing conditions and community expectations but need not be based on international norms.

The amount of water required by low-income households is clearly greater than 5 litres/capita.day (lcd), the minimum to support human life, but to adopt an arbitrary water demand of 50,100 or more lcd for all communities is not in the interests of the majority of people.

If a conservative demand figure, say 15-30 lcd, can be applied a more rapid expansion of a basic service to the whole population can be achieved with the resources available. Any community with poor access to safe water will be satisfied with such a supply and will adjust to the constraints imposed by the designer in the interests of economy. Designers must not be influenced by conventional practice elsewhere but should conduct surveys of existing water use in urban slums and squatter settlements to assist in deciding upon a sensible initial design figure.

Water quality is not something that can be relaxed in supplying urban slums and squatter areas. With such high densities of population, the health risks associated with poor quality water are too great to allow any lower standard of water quality than would be supplied in any urban centre. However, the provision of a safe drinking water alone will not bring about the improved health benefits desired; sanitation and health education are equally essential components of community health upgrading.

Although it is acknowledged that the health benefits associated with water supply are related to the quantity of water consumed, it is unrealistic to think generally in terms of house connections for low-income communities unless private funds cover the marginal costs involved in particular cases. Communal water points will often be acceptable and, in addition to reducing the initial cost of a scheme, will encourage a lower water consumption than house connections. A supply point within 250 m of every dwelling would not be an unreasonable design criterion for initiating publicly-financed systems in many low-income communities, allowing for improved accessibility and upgrading with time. Intermittent supply of water at public standposts should also be considered as a temporary expedient because the high cost of storage tanks might be eliminated, perhaps at the expense of larger pumps, and water wastage might be significantly reduced. The sensitivity of system total cost to such variables should be evaluated during the early stages of project planning so that rational decisions on design criteria can be taken.

Standards for materials and workmanship in water supply schemes serving low-income communities in developing countries could be relaxed with advantage. This would result in a loss of systems reliability, but people who have had inferior or no service in the past are not so demanding of a new system, particularly if they have been intimately involved in its development. Strict building codes will only retard the rate at which complete water supply coverage can be achieved in poorer countries and greater flexibility in specifying quality requirements will allow more use to be made of indigenous resources, both men and materials. Designers should minimize the use of imported materials and equipment in water supply projects by taking advantage of local manufacturing capability and by encouraging Governments to sponsor selective industrial development. Standardization on as few models of any equipment used in water supply and sanitation projects as is feasible is always an essential feature from the point of view of maintenance.



### 7.2.2 SOURCE SELECTION

The selection of water supply source for urban slums and squatter settlements should be consistent with the low-cost approach, taking into account the basic service criteria chosen. Sometimes, extension of the existing urban water supply network to serve low-income communities will be the least cost solution. However, although the marginal costs associated with extending an existing distribution system might be low, the capacity of the system might not be adequate to provide the additional demand. To deny poor people a basic human need on this basis is particularly unjust because the interests of the higher-income consumer and industry would then be given preference. A better solution would be to charge realistically for water consumed by applying tariffs which increase with consumption.

However, local water sources might be developed as an alternative to extension of the urban network and where this is possible it might be the most cost-effective solution. In urban areas, springs and wells are sources which might be drawn upon for community water supply but surface waters will normally be too polluted to consider upgrading in small treatment plants, except perhaps on the periphery of built-up areas. Rainwater harvesting is another possibility but quality control will be a problem in urban areas and this source of water will normally only be a supplement to a more reliable form of supply.

### 7.2.3 RAINWATER HARVESTING

Harvesting of rainwater from roofs or ground catchments might find application in arid or semi-arid areas, especially as a supplement to other sources of water supply. The major problem with this apparently low-cost approach is the storage necessary to span periods of drought. A most useful summary of information on rainwater harvesting for drinking water supply has been prepared by the WHO International Reference Centre for Community Water Supply and Sanitation (IRC) as a training module<sup>1</sup>.

Rainfall records representative of the catchment are essential as a basis for reliable design of such a system. For a catchment of area  $A \text{ m}^2$  receiving rainfall  $R \text{ mm}$  in a month, the yield  $Y$  is calculated as follows:

$$Y = \frac{f \times A \times R}{1000} \text{ m}^3/\text{month} \quad (1)$$

where,  $f$  = catchment runoff coefficient, typical values of which are given in Table 7.I.

For a constant daily water demand, a large catchment area is required if available storage is small, and vice versa, but a large volume of storage will be required, irrespective of catchment area,

wherever the drought period is long. If N people are to be supplied with drinking water entirely from a rainwater system, the quantity of water to be supplied per month, Q, will be:

$$Q = \frac{N \times 30 \times C}{1000} \text{ m}^3/\text{month} \quad (2)$$

where, C = daily consumption per person, lcd.

Accepting an annual rainfall pattern and assuming adequate storage, the minimum catchment plan area,  $A_{\min} \text{m}^2$ , required to supply the population is given by:

$$\frac{N \times 30 \times C \times 12}{1000} = \frac{f \times A_{\min} \times (R_1 + R_2 + \dots + R_{12})}{1000} \quad (3)$$

where,  $R_1, R_2, \dots, R_{12}$  = monthly rainfalls during year of minimum recorded rainfall. So that,

$$A_{\min} = \frac{N \times 30 \times C \times 12}{f (R_1 + R_2 + \dots + R_{12})} \quad (4)$$

TABLE 7.1  
CATCHMENT RUNOFF COEFFICIENTS

Type of catchment	f
Uncovered Catchment Surface:	
completely flat terrain	0.3
sloping 0-5%	0.4
sloping 5-10%	0.5
sloping more than 10%	0.5 and more
Covered Catchment Surface:	
(roof) tiles	0.8 - 0.9
corrugated sheets	0.7 - 0.9
concreted bitumen	0.7 - 0.8
plastic sheets	0.7 - 0.8
Brick Pavement	0.5 - 0.6
Compacted Soil	0.4 - 0.5

Source: WHO-IRC, 1981, Training Module No.3, "Rainwater Harvesting for Drinking Water Supply"<sup>1</sup>

Thus, a corrugated iron roof plan area 6 m x 10 m is sufficient to provide 15 lcd of water for each of a family of six if the annual rainfall is 750 mm.

With a large variation in rainfall distribution, the more critical parameter is the minimum storage volume required. Selecting the critical or design drought period, T months, from rainfall records, the minimum storage volume,  $V_{\min}$ , is given by:

$$V_{\min} = \frac{N \times 30 \times C \times T}{1000} \text{ m}^3 \quad (5)$$

Hence, the aforementioned family of six will require a storage volume of 10.8 m<sup>3</sup> to span a four-month drought period.

#### 7.2.4 SPRING DEVELOPMENT

Wherever confined or unconfined aquifers have some form of surface outlet, normally in hilly regions, artesian or gravity springs will provide a safe water which can usually be transported by gravity to nearby communities. Artesian springs are generally more suitable for community water supply because their yield will be more reliable and their natural quality satisfactory. Different types of aquifer and patterns of seepage outflow require different collection approaches and some possibilities are illustrated in a WHO-IRC Handbook on Small Community Water Supplies<sup>2</sup>. Assessment of the reliability and yield of a spring must be carried out before its development is contemplated.

In all cases, the collected water should be protected from contamination by the construction of a storage chamber, commonly termed a "spring box". One form of chamber suitable for gravity overflow springs in granular ground formations is shown in Figure 7.1. Essential characteristics of a spring box are an entry, usually through placed rocks, for the spring water, screened scour and overflow pipes and a supply delivery pipe. An access cover must be provided and this should be locked but can also be covered with backfill for security. To prevent surface water entering the chamber, a diversion ditch should be cut into the slope above the location. The pipe delivering the spring supply to a community storage tank or standposts is a major expense in such a system and in some developing countries bamboo pipes have been used.

#### 7.2.5 WELLS AND HANDPUMPS

Ground water will often provide the lowest cost supply except where deep aquifers require hydrogeological prospecting and well-drilling equipment for their exploitation. Drilling through rock formations is particularly costly but is justified in some places where alternative

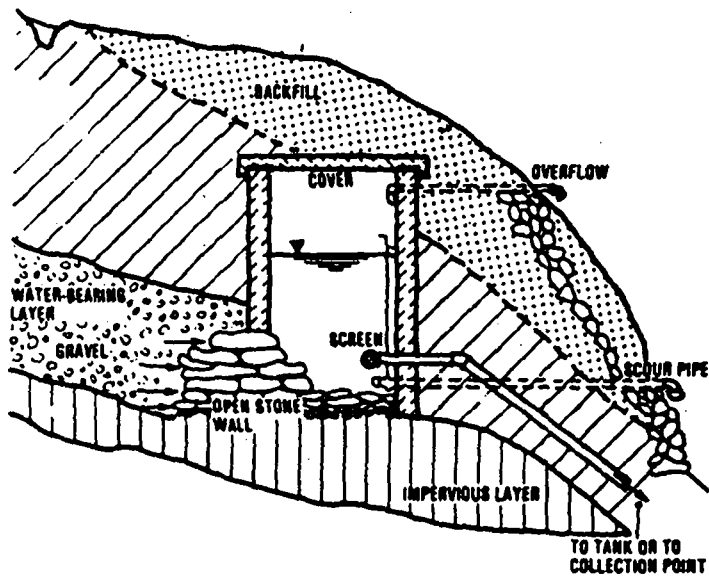


Figure 7.1 Spring water storage chamber ("spring box")

Source: WHO International Reference Centre for Community Water Supply and Sanitation, 1981, Technical Paper No.18, "Small community water supplies: technology of small water supply systems in developing countries". The Hague<sup>2</sup>.

sources of water are not available. Under softer ground conditions, and primarily when a shallow aquifer can be tapped, labour-intensive techniques such as hand digging, augering or the "sludger" method (used extensively for sinking tubewells in Bangladesh) often provide the least-cost solution to water supply. The WHO-IRC Technical Paper No. 18<sup>2</sup> gives the details on well-drilling and construction as well as a list of useful references on the subject.

The low-cost method of raising groundwater to the surface is by means of handpumps and these are commonly used on shallow wells sealed with a watertight slab which prevents surface contamination. Many developing countries are engaged in programmes to improve existing insanitary wells through substantially constructed of polyvinylchloride (PVC). The search for handpumps giving reliable performance in the field and 'value for money' has been going on for many years. Following up its Technical Paper No. 10 on Handpumps<sup>3</sup>, the WHO-IRC is now preparing a handpump catalogue<sup>4</sup> which will illustrate and describe a wide variety of types, shapes and sizes of pumps with varying degrees of complexity. The Consumer Association Testing and Research Laboratories at Harpenden, U.K. have been carrying out detailed assessments of hand- and foot-operated pumps since 1977 for the U.K. Government, the World Bank and the United Nations Development Programme (UNDP) and many other organizations and institutions have been conducting research on improved forms of handpump.

#### 7.2.6 WATER DISTRIBUTION

Public storage is not an essential feature of small community water supplies based on springs or ground water and is not required when shallow wells are fitted with handpumps. Ground water and surface water supplies dependent upon pumping can eliminate storage by accepting direct pumping into the distribution system. Overhead storage tanks are costly items in small schemes and should be eliminated, where this is feasible, or constructed from low-cost materials. Increased household storage as an alternative to public storage is not generally economic and can lead to high water wastage.

Where distribution of water to a low-income community is necessary, the basic level of service provided will normally be public standposts. This low-cost approach is justifiable where public funds for investment in a water supply system are severely limited and particularly where yard or house connections would require lengthy and expensive pipe runs. A WHO-IRC publication on "Public Standpost Water Supplies"<sup>5</sup> suggested that "reasonable access" to such systems would normally mean that not more than 250 people would have to walk a distance of not more than 20-60 m to be drawn by 25-125 users at any tap. Sturdy anti-waste taps are sometimes installed to prevent careless usage and vandalism but public education and community organization are the key factors in maintaining a satisfactory system. Desirable characteristics of a public standpost are indicated in Figure 7.2.

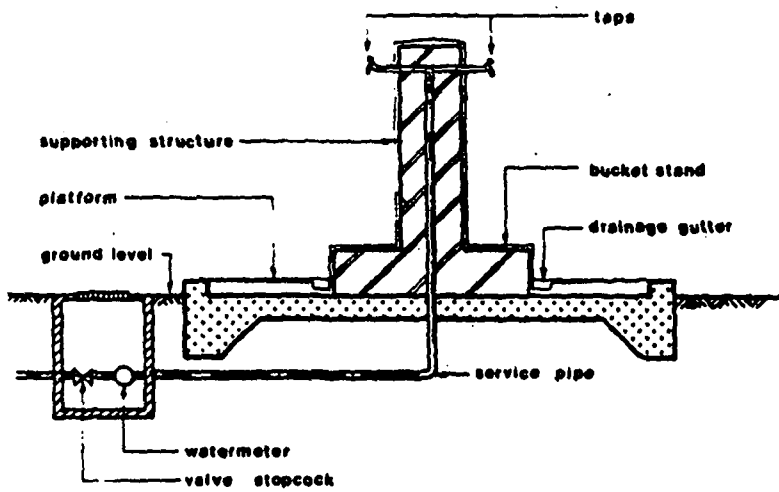


Figure 7.2 Cross-section of a public standpost

Source: WHO International Reference Centre for Community Water Supply, 1979, Technical Paper No. 14, "Public standpost water supplies: a design manual", The Hague<sup>6</sup>.

The maximum discharge capacity,  $Q_{\max}$ , per standpost is determined from the design population  $P$ , the per capita demand  $FQ$ , the peak factor  $p$ , the number of standposts  $N$ , the waste factor  $w$  and an efficiency factor  $f$ :

$$Q_{\max} = P \cdot \frac{1}{N} \cdot \frac{FQ}{24} \cdot p \cdot \frac{1}{1-w} \cdot \frac{1}{f} \quad (6)$$

A design procedure for standpost systems is provided in a WHO-IRC Design Manual<sup>6</sup> and typical design drawings and bills of quantities are given.

In its research programme on appropriate technology for water supply and sanitation, the World Bank has produced an interim report on "Water Distribution Systems for Developing Countries"<sup>7</sup> in which models are presented to assist in design of secondary distribution networks. Typical alternative basic designs for several urban areas in developing countries were analyzed to allow the prediction of total network pipe length  $L$ , mean pipe diameter  $\bar{D}$  and system cost based on the decision variables per capita flow  $FQ$ , number of standposts  $N$ , and maximum distance that water has to be carried  $R$ , as well as zone area  $A$  and population  $P$ . Two general expressions based on regression analysis were given for minimum pipe length:

$$L = 90 N^{0.4} A^{0.6} \quad (7)$$

and 
$$L = 2267 AR^{-0.8} \quad (8)$$

Eq. 7 was also presented in two modified forms applying to branched and looped network designs. Use of the latter expression (Eq. 8) allows pipe lengths to be computed for different values of maximum walking distance to a standpipe. Mean pipe diameter in the system was modelled in simplified form as:

$$\bar{D} = 2.93 (P/N)^{0.21} (FQ)^{0.39} \quad (9)$$

A network with average pipe diameter 50 mm will provide 150 lcd through house connections (eight consumers per connection) or 20 lcd through standpipes, each serving 350 people.

The total pipe cost  $C_p$  in, for example, a branched system can be estimated using the expression:

$$C_p = 82 k (2.93)^a A^{0.49} p^{0.21a} (FQ)^{0.39a} N^{0.55-0.21a} \quad (10)$$

where, pipe cost is given by the fixed charge function:

$$C/L = k + a D \quad (11)$$

To this pipe cost must be added the cost of standposts and house connections for total system cost. This could then be equated with total maximum permitted cost, to arrive at the number of standpipes possible and the number of people served at each standpipe for any particular design per capita daily flow.

A more recent draft report from the World Bank<sup>8</sup> reviewed guidelines for optimal staging and upgrading of community water supply systems and sanitation. This report considers such important issues as selection of appropriate service standards and effects on subsequent upgrading costs. It also highlights the interdependence of water supply and sanitation and stresses the need to consider sanitation and wastewater disposal at the time of planning water supply improvements for low-income communities. One conclusion was that if it was likely that upgrading water supply service from public standposts to yard taps was likely to be affordable within the system design period, then it would be best to provide the higher level of service at the outset because the cost savings of a delay are quite modest. Branched water supply networks, as opposed to loop systems, however, were suggested as providing significant cost savings as an initial design expedient.

### 7.3 LOW-COST SANITATION

#### 7.3.1 DESIGN CRITERIA

A major reason why sanitation has not been provided at the same rate as water supply in developing countries is because designers have tended to think in terms of conventional waterborne sewerage, which was not usually affordable. Many master plans for sewerage of major cities, prepared at great expense by international consulting firms of wide experience, languish on Government office shelves awaiting the necessary funding. As water supplies improve in urban areas, the need for proper wastewater disposal is becoming more critical and the advantages of planning both services at the same time are more apparent.

The choice of sanitation system will be limited by the availability of water and yet will also have an effect on water use. Sewerage will require greater per capita amounts of water for carriage of wastes and the cost of providing for this additional water demand should rightly be assigned to the cost of the sanitation system. Simpler forms of sanitation capable of operating with a low level of water supply service and not requiring expensive household plumbing will be less costly than conventional sewerage and yet can provide the same health benefits. Nevertheless, both waterborne sewerage and low-cost sanitation systems can be integrated in a basic needs approach for major urban centres by providing the appropriate form of technology for different areas of a city.



Local aspirations for the best available technology and a lack of information on successful experience with low-cost sanitation have militated against the incorporation of such an approach in past planning. Until quite recently, international funding agencies did nothing to encourage developing countries or their master planning consultants to introduce low-cost urban sanitation into their programmes. In some countries, building regulations and standards requiring high quality materials and workmanship, no longer affordable in the sanitation sector, have acted as a deterrent. Relaxation of quality standards together with community participation in the production of components for and in the implementation of sanitation programmes will allow low-cost solutions to be adopted wherever appropriate.

The World Bank research programme on "Appropriate Technology for Water Supply and Sanitation" has done much to promote the acceptance of low-cost sanitation systems as a means of providing satisfactory hygienic sanitation. Many useful publications have been produced in the course of the programme, identifying technical options and stressing the importance of social and economic criteria in the selection of sanitation systems. Volume I in the World Bank Report Series<sup>9</sup> presented the financial requirements for a range of sanitation technologies as in Table 7.2, illustrating the economic advantages of some of the simpler systems and the heavy financial burden which would be placed on low-income households by the provision of septic tanks and sewerage if no Government subsidy was available. International lending agencies, such as the World Bank, now have the policy that if the cost of minimal sanitation is more than 5-10% of the household income of the lower income consumer, then central or local government should attempt to subsidize its implementation.

Volume II in the World Bank Report Series<sup>10</sup> provides three algorithms for use as an initial guide to the selection of the most appropriate sanitation technology for a given community in a developing country. In the first algorithm, water supply, soil permeability, plot sizes and wastewater flow are important criteria for decisions on the suitability of sewerage, septic tanks and soakaways or sewered pour-flush toilets. The second-stage algorithm is for the selection of sanitation systems allowing recovery of compost or stabilized humus for reuse. Depth to the water table, plot size, water supply, soil permeability, anal cleansing materials and the availability of an organized system for emptying latrines are criteria involved in the third-stage algorithm for the selection of lower-cost sanitation technologies. All algorithms take account of social preferences and affordability in the selection process.

### 7.3.2 IMPROVED PIT LATRINES

Pit latrines are now the most common excreta disposal system in developing countries and ventilated improved pit (VIP) latrine designs have been developed which make this an odourless unit with minimal fly and mosquito nuisance. The main characteristic of these improved designs

TABLE 7.2

## FINANCIAL REQUIREMENTS FOR INVESTMENT AND RECURRENT COST PER HOUSEHOLD FOR SANITATION TECHNOLOGIES (1978 U.S. Dollars)

Technology	Total Investment cost	Monthly recurrent cost	Monthly water cost	Hypothetical total monthly cost*	Percentage of income of av. low-income household**
<u>Low-Cost'</u>					
Pour-flush (PF) toilet	70.7	0.2	0.3	2.0	2
Pit latrine	123.0	-	-	2.6	3
Communal septic tank	355.2	0.3	0.6	8.3	9
Vacuum-truck cartage	107.3	1.6	-	3.8	4
Low-cost septic tank	204.5	0.4	0.5	5.2	6
Composting toilet	397.7	0.4	-	8.7	10
Bucket cartage	192.2	2.3	-	5.0	6
<u>Medium-Cost'</u>					
Sewered aquaprivy	570.4	2.0	0.9	10.0	11
Aquaprivy	1,100.4	0.3	0.2	14.2	16
Japanese vacuum-truck cartage	709.9	5.0	-	13.8	15
<u>High-Cost'</u>					
Septic tank	1,645.0	5.9	5.9	46.2	51
Sewerage	1,478.6	5.1	5.7	41.7	46

\* Assumes investment cost is financed by loans at 8 percent over 5 years for low-cost systems, 10 years for medium-cost systems and 20 years for high-cost systems.

\*\* Assumes an average annual income of U.S.\$ 180 per capita with six persons per household.

Source: Kalbermatten, J.M., Julius, D.S. and Gunnerson, C.G., 1980, World Bank Report Series on Appropriate Technology for Water Supply and Sanitation, Volume I, "Technical and Economic Options", Washington, D.C.<sup>9</sup>

is a 1 m square, 3-8 m deep pit offset slightly from the squatting plate and superstructure to accommodate an external vent pipe, which should be at least 75 mm diameter, painted black and located on the sunny side of the superstructure. A ventilating air flow up the pipe is induced by convection and a gauze screen on the top of the vent prevents the emergence of flies and mosquitoes, which eventually fall back into the pit and die. The squatting plate is very simple in the basic system because no water is used; the most common form has simple foot rests for squatting use but pedestal seats can be provided if socially preferred. Superstructures, providing the necessary privacy, can be constructed in a variety of local materials.

The pit should be designed to provide a volume of 0.04-0.06 m<sup>3</sup> per person using it for each year of expected life. When the pit is filled to within about 1 m of the top, usually after about 5 years of use, the superstructure and squatting plate are removed to a newly-dug pit and the old pit filled up with soil. Thus, pit latrines can only be adopted in urban areas with low- or medium-density housing, preferably where the soil is permeable (to allow liquid waste to leach away) and groundwater is at least 1 m below the surface. No pit latrine accommodates household sullage, for the disposal of which separate arrangements must be made.

A space-minimizing variation is the ventilated improved double-pit (VIDP) latrine, which consists of two pits permanently covered by a single superstructure. The pits are used alternately and a full pit is emptied not less than 12 months after last use, to be ready for renewed use when the second pit is full. This system eliminates the need for deep pits and makes the constant shifting of latrine location unnecessary. Figure 7.3 shows one version of the VIDP latrine which is based on a design developed at the U.K. Building Research Establishment that has recently been adapted for use in high-density low-income urban areas in Botswana and the Sudan.

Another variation is the Reed odourless earth closet (ROEC) which has the pit completely offset and to which excreta is introduced by means of a sloping chute from the squatting plate. The pit in this case is larger and can be designed for a longer life, perhaps 15-20 years, and the superstructure and its location can be permanent. Although the chute is easily fouled and must be cleaned regularly it prevents seeing into the pit and this is an advantage with children, who have no fear of falling in.

### 7.3.3 POUR-FLUSH LATRINES

Where water is used for anal cleansing, pour-flush (PF) toilets are particularly appropriate. The basic feature of several modifications is a squatting plate incorporating a simple 25 mm water-seal bend which requires 1-2 l of water to flush excreta into the receiving unit. Different designs are associated with different forms of receiving unit,

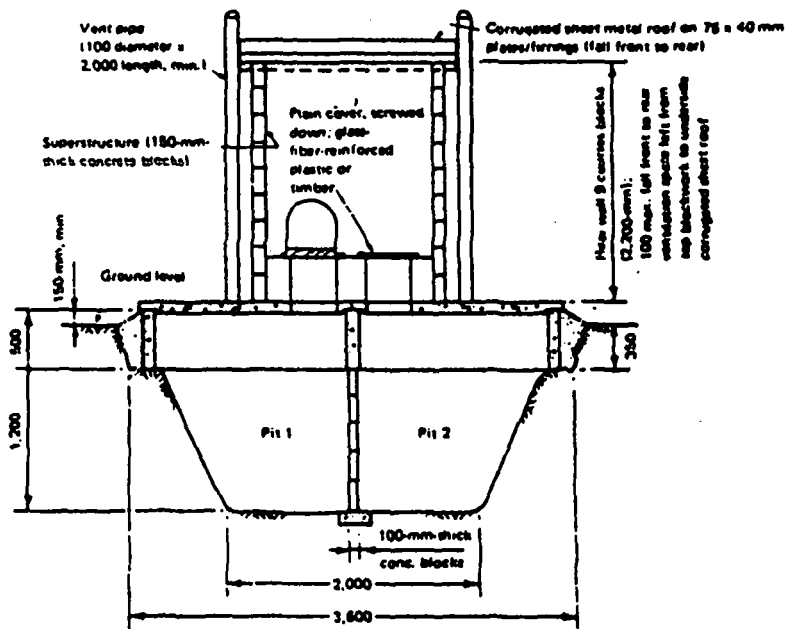


Figure 7.3 Ventiladed improved double-pit (VIDP) latrine

Source: Kalbermatten, J.M., Julius, D. S., and Gunnerson, C.G. 1980 World Bank Report Series on Appropriate Technology for Water Supply and Sanitation, Volume II, "A sanitation field manual", Washington D.C.<sup>10</sup>

ranging from a pit directly underneath to an offset pit or septic tank and soakaway. Figure 7.4 shows a section through an offset pit design produced by the Indian National Environmental Engineering Research Institute (NEERI) which is typical of the form used widely throughout Asia. The squatting plate and water-seal bowl are usually cast as one concrete unit in a standard mould and an important feature is the smooth surface finish in the bowl to prevent fouling. A pipe of not less than 100 mm diameter must be used to connect the bowl to the soakaway, which may be duplicated. Pour-flush toilets may be located in the house, dispensing with the need for a separate superstructure, but they require water to be supplied at a level of 3-6 l/person per day. A seweried pour-flush system is also possible where household wastewater discharges exceed the absorptive capacity of the soil.

Aquaprivies are slightly different from pour-flush toilets in that a water seal is maintained by means of a 100-150 mm diameter drop-pipe extending 10-15 cm below the liquid surface in a small septic tank located underneath. Sufficient water or sullage must be added to maintain the level in the tank and any overflow usually discharges to a soakaway. The septic tank must be desludged every 2-3 years or when it is two-thirds full of sludge. Practical difficulties in maintaining the water seal make this a less suitable arrangement than pour-flush toilets except where solid anal cleansing materials would tend to clog the waterseal bend.

#### 7.3.4 COMPOSTING TOILETS

Composting toilets are designed to produce a humus which can be used as a soil conditioner or poor fertilizer. The simplest type is a batch system called the double-vault composting (DVC) toilet in which one of two adjacent vaults is used until about three quarters full, when ash and organic matter are added to absorb odours and moisture before it is filled with earth and sealed. This form has been used successfully in Vietnam, with each vault having a capacity of about 300 litres and serving 5-10 people for about two months. As shown in Figure 7.5, it is built entirely above ground to avoid flooding. Urine is drained away from the squatting plate so only faeces, ashes and toilet paper enter the vault during use. Decomposition proceeds under anaerobic conditions and all pathogens and parasites are claimed to be killed and organic matter mineralized after being sealed for 45 days. Winblad and Kilama<sup>12</sup> have described this and other composting latrine systems and given details on how to build and operate them.

Continuous composters such as the "Multrum", use an aerobic process, unlike the anaerobic degradation of the batch DVC system, and grass, ash, sawdust and/or household refuse are added with excreta to a composting pit with a sloping floor. This system has been found to be too difficult to operate without a high degree of user care and is not recommended for use in developing countries. Excreta reuse must be socially acceptable and logistically feasible for any form of composting

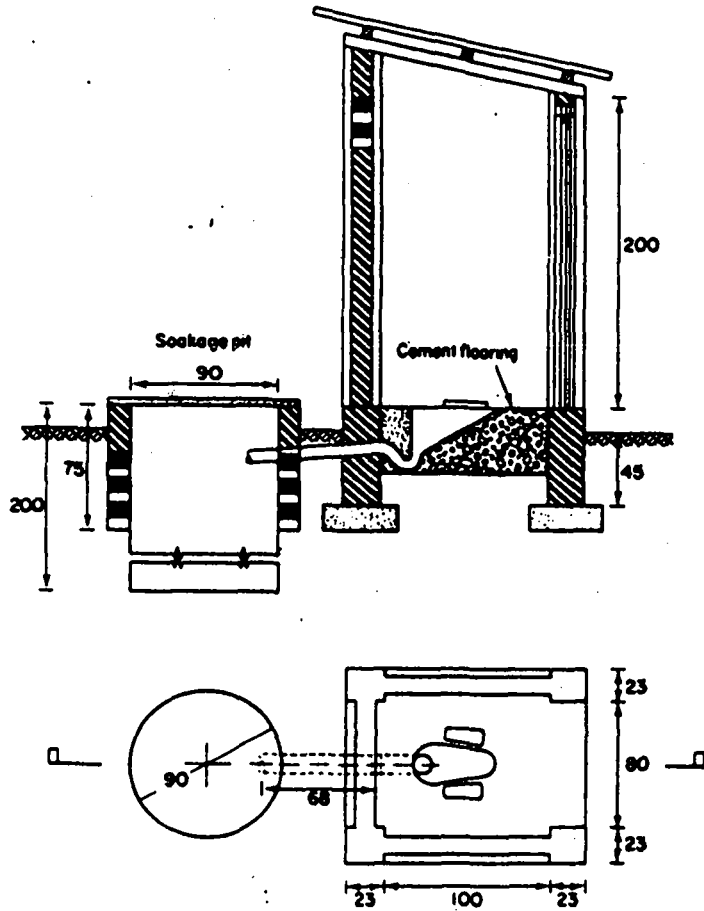


Figure 7.4 Water-seal latrine

Source: Pacey, A. (Ed.) 1979 "Sanitation in developing countries", John Wiley & Sons Ltd., Chichester (reprinted by permission)<sup>11</sup>

toilet to be applicable in urban areas, as well as on the reliability of the emptying service. In the World Bank Planner's Guide<sup>13</sup> it was estimated that a vault volume of only 1.68 m<sup>3</sup> was required for a family of six using a 10 lcd PF system if K was taken as 0.5 and the contents of the vault (0.84 m<sup>3</sup>) were removed every 2 weeks. A vault may be shared by adjacent households if offset from the squatting plate, thus further economizing on construction costs. This system can be well organized but there is some doubt about its application where institutional development is not advanced. The treatment of collected nightsoil can be carried out in stabilization ponds or there seems to be considerable promise in composting for reuse in agriculture<sup>14</sup>.

### 7.3.5 SEPTIC TANKS

Septic tanks have been mentioned in conjunction with pour-flush toilets (Figure 7.6) but are also widely used with cistern-flush toilets. Three-compartment tanks receive toilet effluent in the first compartment while sullage is discharged into the second compartment. Effluent from the third compartment is disposed of in subsurface drainfields or soakaways, or in evapotranspiration beds, and the tanks are desludged every 1-3 years. For houses with a water connection, septic tanks can provide a high level of service to those who can afford them, without the need for commitment of community funds for sewerage. Disposal of septic tank sludge is still a community responsibility with this system and creates problems in many developing countries. The same approach to collection and treatment can be taken as with nightsoil from cartage systems.

### 7.3.6 SMALL-BORE SEWERAGE

One possible application of small-bore sewerage is where an on-site disposal method is no longer effective, as a result of increased water use or unsatisfactory infiltration, and a partially-treated effluent must be collected and transported to a central disposal site. The preliminary settling of wastewater solids in a septic tank (Figure 7.7), soakage pit or vault is essential if small-bore sewers are to perform satisfactorily. They are less costly than conventional sewers because fewer manholes are necessary, pipe slopes can be flatter when solids scouring velocities are not necessary, and pipes can be laid at shallower depths because of the flatter grades and the fact that effluent is received from tank outlets near ground level.

The World Bank Planner's Guide<sup>13</sup> recommends design of small-bore sewers for a minimum velocity of 0.3 m/sec, compared with the normal 1 m/sec for ordinary sewers, and a minimum diameter of 75 mm for tank connections to mains not less than 100 mm in diameter. Minimum gradients for 75 and 100 mm, 150 mm and 200 mm pipes are suggested to be

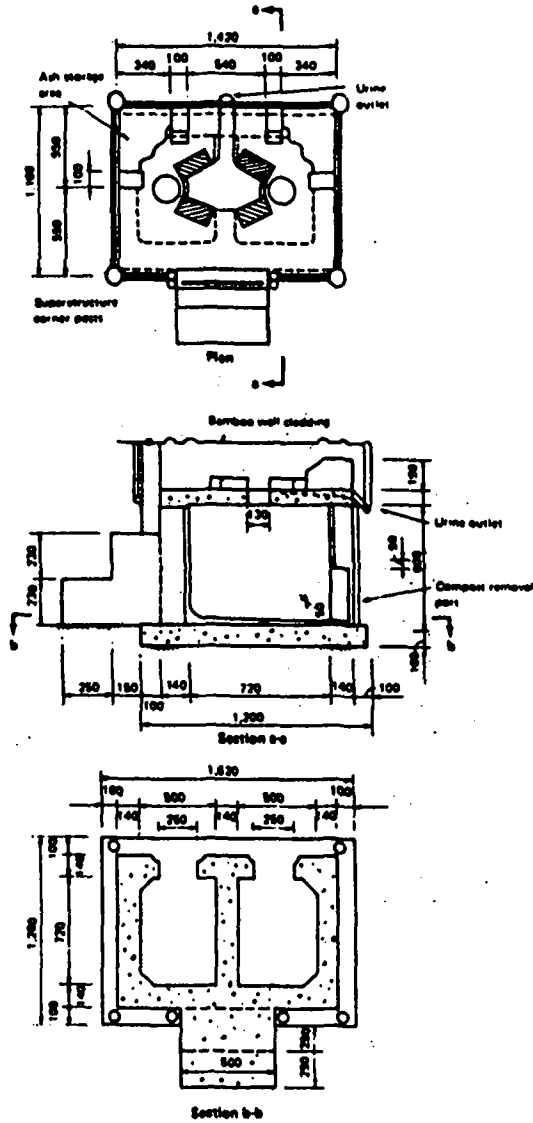


Figure 7.5 Double-vault composting toilet used in Vietnam

Source: Kalbermatten, J.M., Julius, D.S., and Gunnerson, C.G. 1980 World Bank Report Series on Appropriate Technology for Water Supply and Sanitation, Volume II, "A sanitation field manual", Washington D.C.<sup>10</sup>



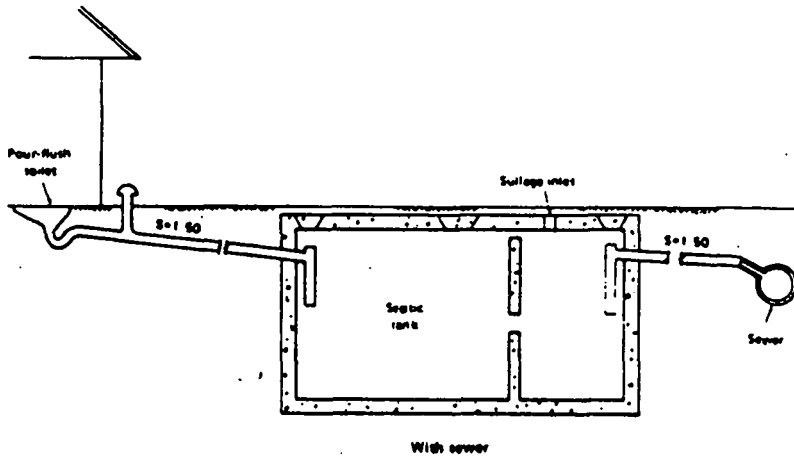


Figure 7.6 Septic tank system

Source: Kalbermatten, J.M., Julius, D.S., and Gunnerson, C.G. 1980 World Bank Report Series on Appropriate Technology for Water Supply and Sanitation, Volume II, "A sanitation field manual", Washington D.C.<sup>10</sup>

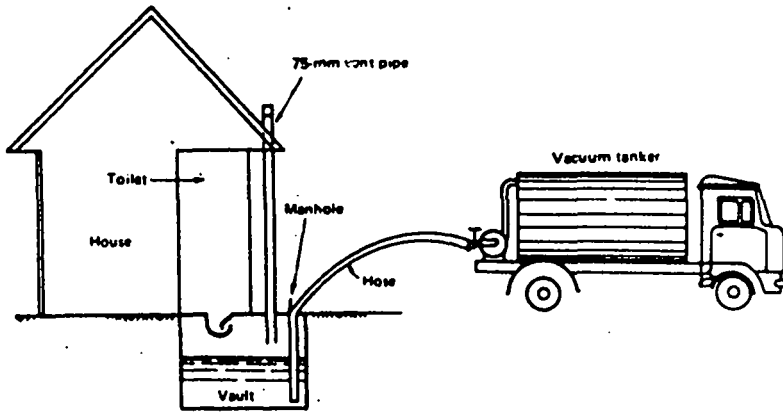


Figure 7.7 Vault below squatting plate

Source: Kalbermatten, J.M., Julius, D.S., Mara, D.D., and Gunnerson, C.G. 1980 World Bank Report Series on Appropriate Technology for Water Supply and Sanitation, Volume 2, "A planner's guide", Washington D.C.<sup>13</sup>

1/150, 1/250 and 1/300, respectively. Manning's roughness coefficients (n) of 0.013 and 0.011 are recommended for vitrified clay and PVC pipes.

Small-bore sewers can represent the last stage in system upgrading and this objective can even be considered during the initial planning of a sanitation scheme. Generally, however, if the ultimate goal is to progress to a conventional sewerage system, small-bore sewers will be an uneconomic intermediate stage. Some form of effluent treatment will still be necessary in the case of small-bore sewerage and this can be achieved at lowest cost in stabilization ponds, except where land values are high.

### 7.3.7 SULLAGE DISPOSAL

One disadvantage of low-cost on-site sanitation is that sullage from households (wastewater from bathroom, laundry and kitchen) is not accommodated and must be handled separately. The volume of sullage is related to water use and in communities where water is hand-carried would approximate to the water consumption (15-30 lcd), whereas in a household with a yard supply and PF toilets it could be expected to be 50-100 lcd<sup>13</sup>.

On-site disposal of sullage in soakage pits, designed for an infiltration rate of 30 l/m<sup>2</sup> of side wall area, is often a satisfactory method but one which low-income communities will rarely instal themselves. More common is the discharge of sullage into the yard or street, where it forms its own unsightly meandering channels, or into surface drains, where these exist. The design of surface drains to handle sullage as well as storm water should include a small triangular, semi-circular or trapezoidal channel along the invert of a larger trapezoidal or parabolic section, to minimize ponding of sullage and blockage with garbage. Regular cleaning and maintenance of such a system is essential. Ideally, surface water drains receiving sullage should discharge into a stabilization pond for treatment, because of the significant BOD content, but a stormwater overflow weir at the inlet should divert excessive storm flows.

### 7.3.8 BACK-SERVICE SEWERAGE

A recent development for low-income communities in Northeast Brazil has been termed "back-service sewerage" (Sinnatamby<sup>15</sup>). This consists of very shallow sewers laid through the back yards of blocks of houses following the natural fall of the land, which discharge into an external sewer. Connections to trunk sewers are shorter as a result of this approach and because they are not exposed to traffic loading, the back-service sewers could be installed with little cover. Although the

system is lower in cost than conventional sewerage it requires the active participation of the community.

The basic characteristics of the back-service sewers, which received sanitary wastewater and sillage but not stormwater, were:

- (i) 100 mm diameter sewers serving a maximum of 100 houses (5 persons per house),
- (ii) minimum sewer gradient of 0.6 percent,
- (iii) 0.4 m x 0.4 m inspection chamber at each house to allow maintenance by householder,
- (iv) training of householders to operate and maintain the system.

In addition to the back-service sewers, a separate sewerage system was provided with the following characteristics:

- (i) minimum sewer diameter 150 mm,
- (ii) minimum sewer gradient 0.6 percent for flows below 2.2 l/sec,
- (iii) manholes at not more than 100 m intervals.

This external sewerage was operated by the sewerage authority but the cost of operation and maintenance was reduced as a result of the community accepting responsibility for the back-service sewers.

The decision to adopt this system was influenced by the high density of population in the area concerned, the irregularity of housing plots and housing design, the soil conditions, the water supply situation and the community's attitude to sanitation alternatives.

#### 7.4 CONCLUSIONS

The necessity for community involvement in the operation and maintenance of water supply and sanitation systems is now accepted in developing countries. Low-cost technology will provide the means whereby this can be achieved with minimum involvement and support from responsible Government agencies. However, a continuing and increasing programme of public education in schools, at adult meetings, and through the media is essential if low-income communities are to understand the functioning and maintenance of their systems and realize the health and economic benefits to be gained from them.

Mention has been made of the opportunity for development of an "informal sector" in the implementation of a low-cost water supply and/or sanitation scheme. A group of individuals within the recipient community, obviously with the potential to develop necessary skills, could be selected, trained, and initially financed to produce essential components of a system. This will contribute to the general development

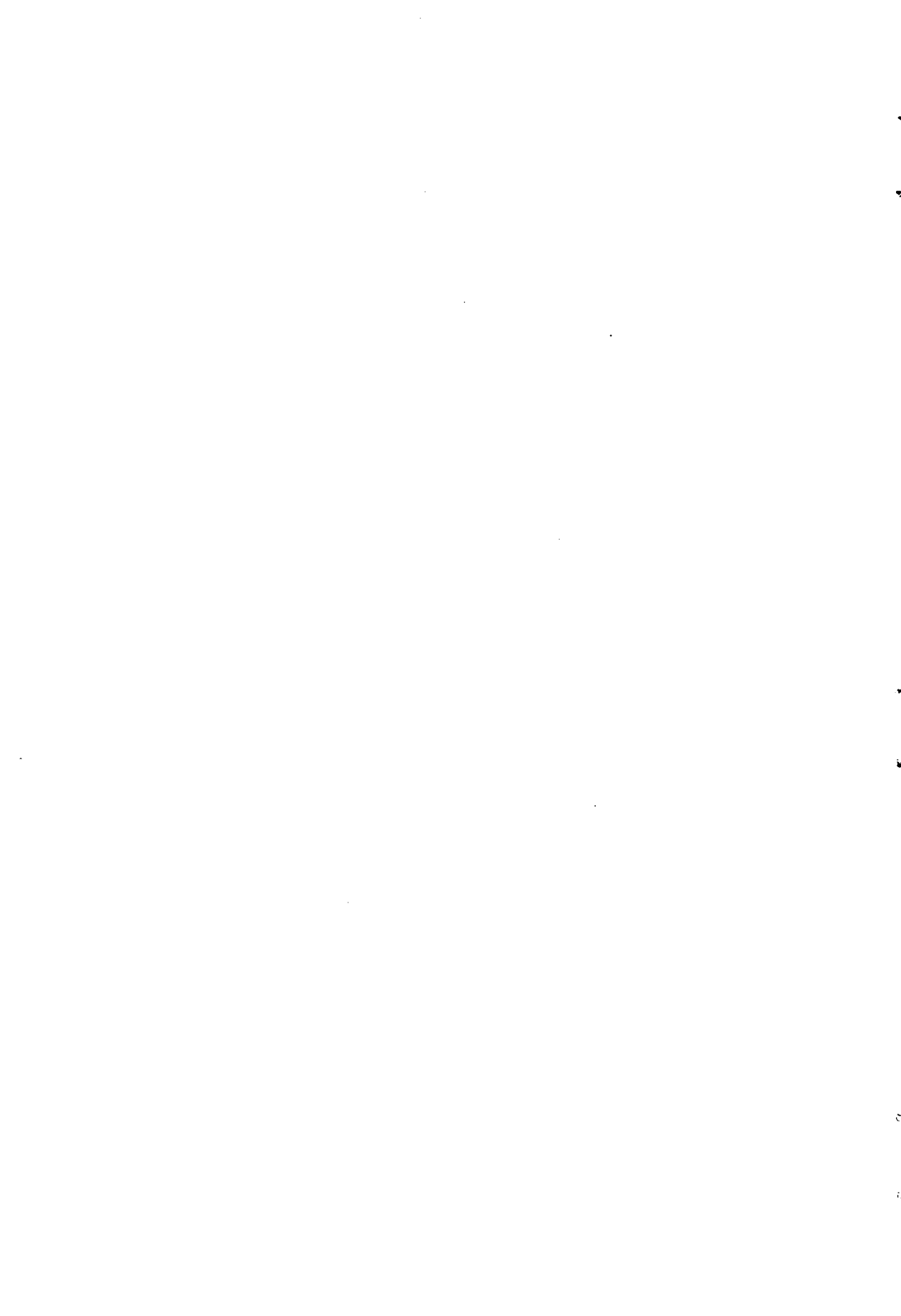
of the community and, if the acquired skills can be adapted to market needs, will result in long-term employment. Water supply and sanitation should always be considered as a part of integrated community development and sometimes, when other developmental activities have been sponsored by Government (for example, industrial development), the increased wealth in the community will foster the expansion and upgrading of water supply and sanitation services.

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8. DOCUMENTS ON SOCIO-CULTURAL ASPECTS





8.1 SOME DEFINING CHARACTERISTICS OF LOW-INCOME  
URBAN SETTLEMENTS IN LATIN AMERICA AND  
THE CARIBBEAN

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It seems necessary, at the beginning of these discussions and exchange of opinions and experiences, in relation to the provision of services and basic infrastructure for low-income urban settlements, organized by the World Health Organization and the Pan-American Health Organization, to refer to some general concepts regarding the defining characteristics of the above-mentioned settlements.

In the first place, without pretending to propose a rigorously scientific definition, it seems convenient to point out that by "low-income urban settlement", reference is being made to a group of buildings - mostly dwellings - built by their own occupants with non-conventional technologies and methods, on land generally illegally occupied; that show poor environmental conditions and lack basic infrastructure and community services, forming an urban population sub-group living under poverty conditions, with a high degree of insecurity and insatisfaction of their basic needs. The problem is one that concerns a complex socio-spatial phenomenon inscribed in a larger historical social process, under the generic denomination of social change.

It is from this integral perspective that the analysis of low-income urban settlements, and the search for solutions to the problems they present, should proceed.

In the second place, it is important to point out that, in general, the efforts already made in the search for solutions have been insufficient and that the problem not only persists, but as will be shown, is increasing.

The deficiency probably originates from the application of a sectorial approach to the various elements of human settlements which tends to ignore the integrality of the phenomenon.

It also seems necessary to emphasize that the so-called low-income urban settlements do not constitute a new phenomenon; in fact, the deficiency found in the standard of living, provision of services, environmental conditions, etc., seems to have been a constant characteristic affecting vast sectors of urban population throughout history.

Furthermore, if society is considered as a whole, it is certainly correct to sustain that the indicators of quality of life - according to present evaluation criteria universally accepted - show a clear and sustained improvement.

It can, therefore, be stated that the phenomenon is not new and that, in general terms, evident progress has taken place due in large part to scientific and technological advance.

What is new - expressed in perhaps oversimplified terms - is, on one hand, the accelerated widening of the gap between the quality of life of those who have more possibilities of access to the product of

scientific and technological advance, already mentioned, to knowledge and information, and of those constituting the second group, who could be called generically the urban poor.\*

In effect, while between 1950 and 1960 the gross internal product of Latin America grew at a 5% average annual rate and the income per capita at an annual 2.3%, and between 1960 and 1970 these rates were 5.6% and 2.6%, and finally, between 1970 and 1977 were 6.1% and 3.3% respectively, the distribution of income was regressive, at least for the poorest 20% of the population. The participation in the total income of the poorest 50% remained practically stable.

On the other hand, while it is true that between 1960 and 1970, in Latin America, the percentage of population living in poverty and indigence decreased - from 51% to 40% in the first instance and from 26% to 19% in the second one - it is estimated that in absolute terms the same population increased, during the same decade, from about 113 million to approximately 130 million or more, perhaps even to 140 million people.

As far as urban poverty in itself is concerned, some studies indicate that the population living under those conditions in the metropolitan areas of the Region amount to 40% of the total population of the same areas, and grows at a 10% annual rate; this means that if the same tendency is maintained, by around the year 2000, close to two-thirds of the inhabitants of the largest Latin American cities will be living in poverty.

But it is not only the economic and demographic conditionants implicit in the data just briefly mentioned, that influence the process of birth and growth of low-income urban settlements. This phenomenon is inserted within an accelerated process of urbanization, of both, population and economic activities, and as previously suggested, within a rapid growth of the metropolitan areas of the Region.

Studies made by several United Nations agencies show that while in 1850 a scant 4.3% of the world population dwelled in cities of 20,000 or more inhabitants, in 1950 the residents of those cities represented a fifth of the world population, and by 1970, 25% of the world's inhabitants lived in cities of the above indicated size.

Whereas in 1850 only three cities with a million people or more existed - London, Peking and Paris - in 1950 there were 77 cities that size, and in 1970 the number reached 160. According to projections made, it is estimated that by the year 2000 there will be about 250 of these cities and 90 of them will be over the four million mark.

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\* This terminology has been adopted in spite of its lack of precision and the fact that it does not take into account the important internal differences and those between countries, that this socio-economic group present.

Latin America differs from the rest of the developing regions, in so far as urbanization is concerned, because of its preeminence in the intensity, magnitude and socio-economic complexity of the process, and especially because of the birth and fast growth of large cities.

It is estimated that by the year 2000, more than half of the population of Latin America will live in some 600 cities of 100,000 or more inhabitants, with some outstanding human agglomerations, such as Mexico City, which by that time could become one of the largest in the world, with an estimated population of about 30 million.

At present, there are some 25 cities with one million or more inhabitants in the Region; in 1950, there were only 6. By the year 2000, according to estimates, the number of cities that size will reach 50.

The reasons behind the acceleration of the process of urbanization and metropolization are multiple; however, the following three can be pointed out as being the main ones:

- (a) The characteristics of the Region's agrarian structure, mainly the land tenure structure and the predominant agricultural technology, which in conjunction with labour relations generate, on one hand, a relatively small income for the great majority of the population related to agricultural activities, and on the other hand, a low capacity to absorb labour.
- (b) The intensification of industrial development oriented towards the substitution of imported products - at a time when world conditions were favourable to do so - which led to an increase in the flow of investments towards urban areas and to the concentration of administrative, financial, service and cultural activities, which in turn generated favourable conditions for a new cycle of concentration. The ensuing economies of scale and of agglomeration promoted a further concentration, and above all, the rural-urban migration of a population who believed it would find better living conditions in the city.
- (c) The technological changes of the last decades that have caused two further phenomena:
  - (i) in the agricultural sector, a decrease in labour absorption leading to an increase in population expulsion, and,
  - (ii) in the industrial activity, both an increase in productivity and the adoption of the so-called open policy and of transnational activities, leading to a relatively large expulsion of labour force from this sector.

The other important element to be found at the basis of the phenomenon under consideration, is the verification of the evident incapacity of the productive systems and the socio-cultural urban structures prevailing in the Region's countries, to integrate the whole population, both economically and socially.

While the growth of the labour force follows the growth of the population, which still remains above 4%, the increase in job creation remains quite inferior. Under these conditions, the unemployed labour force, which guarantees the provision of cheap labour, will keep on growing, as will the human contingent that nurtures the low-income settlements.

In fact, figures show that far from advancing towards the solution of the problems stated, life conditions of the Latin American poor majorities has deteriorated. This is largely due - apart from the insufficient growth of job opportunities, accelerated demographic growth and the rural-urban migration already noted - to the magnitude of the resources required to satisfy the minimum needs in this area; to the indiscriminate application of technology institutional organizations and finance models, designed for different realities than the one prevailing in the Region; and, to the existence of development plans that tend towards spatial and economic concentration.

The phenomenon briefly identified in the previous paragraphs has led, in conjunction with other socio-economic processes, to a situation of acute social and spatial stratification in the cities, that is manifest in the coexistence of entirely differentiated social, economic, cultural and physical urban situations.

In effect, the social space of Latin American cities, particularly of medium-size cities and metropolitan areas, conform, more than a unique cultural system, a series of differentiated sub-systems, whose integration is achieved through the operation of appropriation and coordination mechanisms. The marked stratification of the city, regarding the areas of settlement, the use of physical facilities, the provision of services, the distribution of income and of the benefits of development - in sum, the multiple dimensions of the quality of life and environment - define a heterogeneous context that puts in evidence the inequalities of the social structures within the different countries. In essence, it is a question of a particular process of the human establishment that requires profound interpretative analysis to allow the design of action strategies. It must be kept in mind that the noted process of inter-urban social differentiation, does not differ from the one shown in the rural areas of Latin American countries.

It becomes necessary, however, to point out that the situation described is not exclusive product of great urban concentrations. What occurs is that the inherent differences of the prevailing socio-economic structures become more evident in them, and means are offered to exert pressure in order to modify those structures.

Nevertheless, it is a fact that in cities of the Region, and especially in the larger ones, two parallel and interrelated systems of access, property, use and servicing of urban land appear.

One of these, at one extreme, is called the "formal" sector and in general: obtains access to the land by operating within the market and using private financial systems in which the State intervenes, sometimes with the only purpose of establishing general norms to regulate them; acquires, according to the laws in force in each case, the legal property on the land or the right to use it by means of rental payment; uses the land obeying - at least formally - the corresponding established regulations; and finally, improves it by normally acquiring third party services - specialized in the field - who apply modern building technologies, generally capital intensive and relying on the use of imported materials, or materials that utilize a high percentage of imported components in their manufacture.

The other sector, at the opposite extreme, the "informal" sector, in large proportion, acquires land through a de facto occupation or by means that leave it in a state of precarious legal possession; uses the land without observing technical regulations; and, improves it progressively, by applying labour-intensive techniques, appropriate to the local reality in respect to the use of building materials coming from the most diverse sources.

The importance of this last sector is firmly established when realizing - according to studies made in some of the Latin American metropolitan areas - that these "dwellings" built by the informal sector constitute 60% of the total urban construction of those cities.

Although it is true that the above-mentioned forms of access, property and use of urban land, constitute the main characteristics of the so-called low-income settlements, they must not be taken, however, as the determining factors of this phenomenon; its roots are to be found in the structural conditions inherent in the prevailing models of development.

Similarly, it becomes necessary to single out another element that must be considered in the analysis and in the proposals for alternative actions in this area. This other element is the extraordinary heterogeneity presented by the phenomenon, not only between countries and cities, but also within one same city.

Very often, low-income settlements have been defined and analyzed mainly considering characteristics similar to those already mentioned, or in reference to the high degree of poverty, density of population and unhealthy conditions they show, which has frequently led to the search for alternative actions, sectorial in type and palliative in character, that have not been as effective as was desired.

A more integral approach to the analysis of these settlements and to the formulation of solutions to the problems affecting their inhabitants, should take due note that essentially the matter involves a

specific modality - different from the traditional one - of occupying, conditioning and using the urban land; and a particular form of organization of the low-income groups who in order to satisfy their social and housing needs, cannot approach the formal market system nor the processes of political-administrative decisions.

The most important features of low-income settlements can be grouped according to those that refer to: (a) their location within the urban space; (b) their social organization; (c) their progressive improvement; (d) the de facto occupation of their land; and (e) the use of self-help labour and non-conventional technologies and materials in building their dwellings.

As far as its location is concerned, the low-income settlement is characterized by being located on land that, according to traditional criteria of housing, has been considered unsuitable for residential use, or has been estimated to possess a low profit value in the real estate market. Thus, this land normally lacks infrastructure and the minimum basic services required.

Regarding social organization, even though in this matter a vast heterogeneity is evident, it can be said, in general, that the low-income settlement differs from other forms of settlement, on its tendency towards the cohesion and solidarity of its inhabitants and to the existence of hierarchical and functional structures, whose defined job is to meet the objectives established by the community regarding the satisfaction of its needs. These social structures constitute, in the great majority of the cases, the so-called residents' associations or territorial communities which substitute a large part of local government action and handle the settlements' development.

Contrary to what may be supposed, the improvements to the settlements, the provision of basic services and the construction of the roads and pedestrian infrastructure, are generally executed in accordance to plans elaborated by the residents' association - very often with assistance of professionals - and contemplate a priority criteria, being carried out progressively, paying special attention to the availability of resources and labour and to the corresponding rhythm of construction.

One of the most important determining factors in the creation of low-income settlements is the practically absolute impossibility of low-income groups - given their scant income level and almost non-existent capacity to save - to have access to land operating within the existing real estate market and in accordance to the prevailing legal norms. Hence, the de facto occupation of land perhaps determines the characteristic of this type of settlement, that best reflects the socio-economic and legal situation that lies at the basis of the phenomenon.

It is necessary, however, to point out that the de facto occupation is not the only form of access to land of the referred group. Very often, a low-income settlement results from the participation of third parties, who act - often illegally - as salesmen of the land, with



the rarely kept promise of installing services. The so-called "pirate developments" are created this way and constitute a phenomenon that has reached an alarming magnitude, in many of the large cities of the Region.

There is still a third form of access to land, that may be defined as "progressive infiltration", which consists of a gradual invasion executed by small groups of persons, families or even individuals, who throughout the years, as the lack of reaction on the part of the State or owners is confirmed, settle on a piece of land frequently occupying it with an alarming density of population.

As may be appreciated, the subject of urban land and degree of access to it that poor urban groups possess, doubtlessly, constitutes a fundamental factor in the explanation given for the creation of low-income settlements and in the proposals formulated for alternative actions.

Finally, as key element in the definition of low-income settlements, that needs to be emphasized, is the type of technology applied in the construction of dwellings, community service buildings and infrastructure facilities, which is basically characterized by the use of local labour, on the part of the dwellers, and the use of non-conventional building materials and technologies. These construction processes are gradual and accumulative, allowing the slow use of free time and the very limited capacity of family savings.

It is not possible to end these notes without referring, at least in general terms, to low-income settlements, within their complex economic, social, cultural and spatial realities, as forms of survival strategy.

From this point of view, in a previous study made by ECLAC, a low-income settlement is considered a manifestation of survival strategy, developed by groups marginated from the processes of production and consumption, in order to ensure their subsistence under extremely adverse conditions. In this perspective, the human settlement may be seen as an answer to the unsatisfied demands for shelter and basic services of the rural migrants and the urban poor, for whom the real estate market offers no other alternative than a slum or squatter settlement.

The survival strategies applied to low-income settlements manifest themselves not only in new forms of association, land occupation, use of empirical technologies which utilize self-help labour and recycled building materials, but also in its economic organization, which has allowed the development of peculiar forms of home industry, personal services and mechanisms of exchange, that are used in substitution of the conventional market.

In a way, these strategies constitute the counterpart of those developed by sectors of the population fully incorporated to the urban economy. The different forms of land ownership, the speculative practices and the application of technologies that involve high capital

investments and centralized organization, are exclusive to the high-income groups and help preserve the spatial segregation that characterizes urban ecology.

The regulating function of the State, in this sense, does not have practical effects on the popular sector, defined as the urban poor and rural migrant. In reality, the usual forms in which the public sector intervenes are reduced to the assignment of subsidies and direct construction of homes for the permanently employed groups who can afford to save in relation to minimum cost dwellings, still conceived and built according to conventional standards. This type of offer, however, remains out of reach for the popular sector and, therefore, does not constitute an alternative for the low-income settlement. The lack of public transportation, basic services and social assistance, that result from regressive forms of distribution of basic social capital investments, complete the picture of marginalization that imposes self-reliance strategies as the only viable alternative of survival for the popular sector.

The de facto occupation of private or public land, the organization of residents' associations, the progressive improvement of the settlement and the building of homes by self-help activities, using gradual and accumulative methods are real examples of adaptation, that reflect the will to survive and a considerable creative capacity, that is not always utilized in all its potential. The mere fact that the popular sector, also called informal, contributes with the construction of 60% of the urban dwellings built annually in the Region, clearly shows the real capacity of this sector to change the relation of the factors of traditional systems of production and distribution of housing goods and services, in order to reduce their deficit and to utilize the potential elements at their disposal.

These are the conditions and capacities which should be taken into account more than the deficiencies observed in low-income settlements - to appreciate the potential of the phenomenon as a positive and useful social force.

The profitable use of this potential within a global social scheme, poses of the more political problems of importance for the future. To utilize the productive capacity created by low-income settlements, to maintain unfair practices of distribution of opportunities and social assistance, would be unacceptable from democratic point of view. On the other hand, the full incorporation of the potential of marginalized groups, requires a previous structural change that could not be limited to the slow process of evolution, without deteriorating the quality of the built environment and possibly increasing violence and other manifestations of social crisis.

From this perspective, some elements gain special relevance and require the adoption of more innovative attitude towards them, that would allow withdrawing from schemes proved inefficient, and go beyond the search for large financial resources, which are always insufficient, and

for palliative measures, which generally prove costly and, as stated before, are seldom successful.

Within these elements, special emphasis should be given to those which refer to a new concept and reactivation of the role corresponding to Municipal governments; to the mobilization of resources not fully utilized, a task in which the community plays an important role; to the problems linked to the access to land and services, on the part of the urban poor; and to the investigation and development of technologies that are more appropriate for the material and socio-cultural realities in each specific case.

These elements, briefly pointed out in the preceding notes, indicate the social, economic and political importance found in the phenomenon of low-income settlements, and the existent urgency to rigorously attack its study, as well as search for ways that may progressively allow, even though partially at the beginning, the fulfillment of legitimate aspirations and needs of these vast sectors of the Region's population.

CHART 1

PERCENTAGE OF POPULATION LIVING IN URBAN AREAS

	1950	1980	2000 (estimated)
Africa	14.8	28.8	42.3
Latin America	41.2	64.7	75.1
East Asia	16.7	32.7	45.1
South Asia	15.9	24.8	37.1

Source: Urban, rural and city population 1950-2000, as assessed in 1978; United Nations (ESA/P/WP.66).

CHART 2

PERCENTAGE OF POPULATION LIVING IN CITIES OF  
ONE MILLION OR MORE INHABITANTS

	1950	1980	2000 (estimated)
Africa	1.6	7.9	19.0
Latin America	9.7	27.3	37.5
East Asia	4.6	12.1	19.1
South Asia	2.6	7.4	14.5

Source: Urban, rural and city populations 1950-2000, as assessed in 1978; United Nations (ESA/P/WP.66).

CHART 3

THE FIFTEEN LARGEST URBAN AREAS  
(population in millions)

1950		2000 (estimated)	
1. New York - NE New Jersey	12.3	<u>Mexico City</u>	31.0
2. London	10.4	<u>Sao Paulo</u>	25.8
3. Rhine-Ruhr	6.9	Shanghai	23.7
4. Tokio-Yokohama	6.7	Tokio-Yokohama	23.7
5. Shanghai	5.8	New York - NE New Jersey	22.4
6. Paris	5.5	Peking	20.9
7. <u>Buenos Aires</u>	5.3	<u>Rio de Janeiro</u>	19.0
8. Chicago-NW Indiana	4.9	Bombay	16.8
9. Moscow	4.8	Calcutta	16.4
10. Calcutta	4.6	Jakarta	15.7
11. Los Angeles-Long Beach	4.0	Los Angeles-Long Beach	13.9
12. Osaka-Kobe	3.8	Seoul	13.7
13. Milan	3.6	Cairo	12.9
14. Bombay	3.0	Madras	12.7
15. <u>Mexico City</u>	3.0	<u>Buenos Aires</u>	12.1

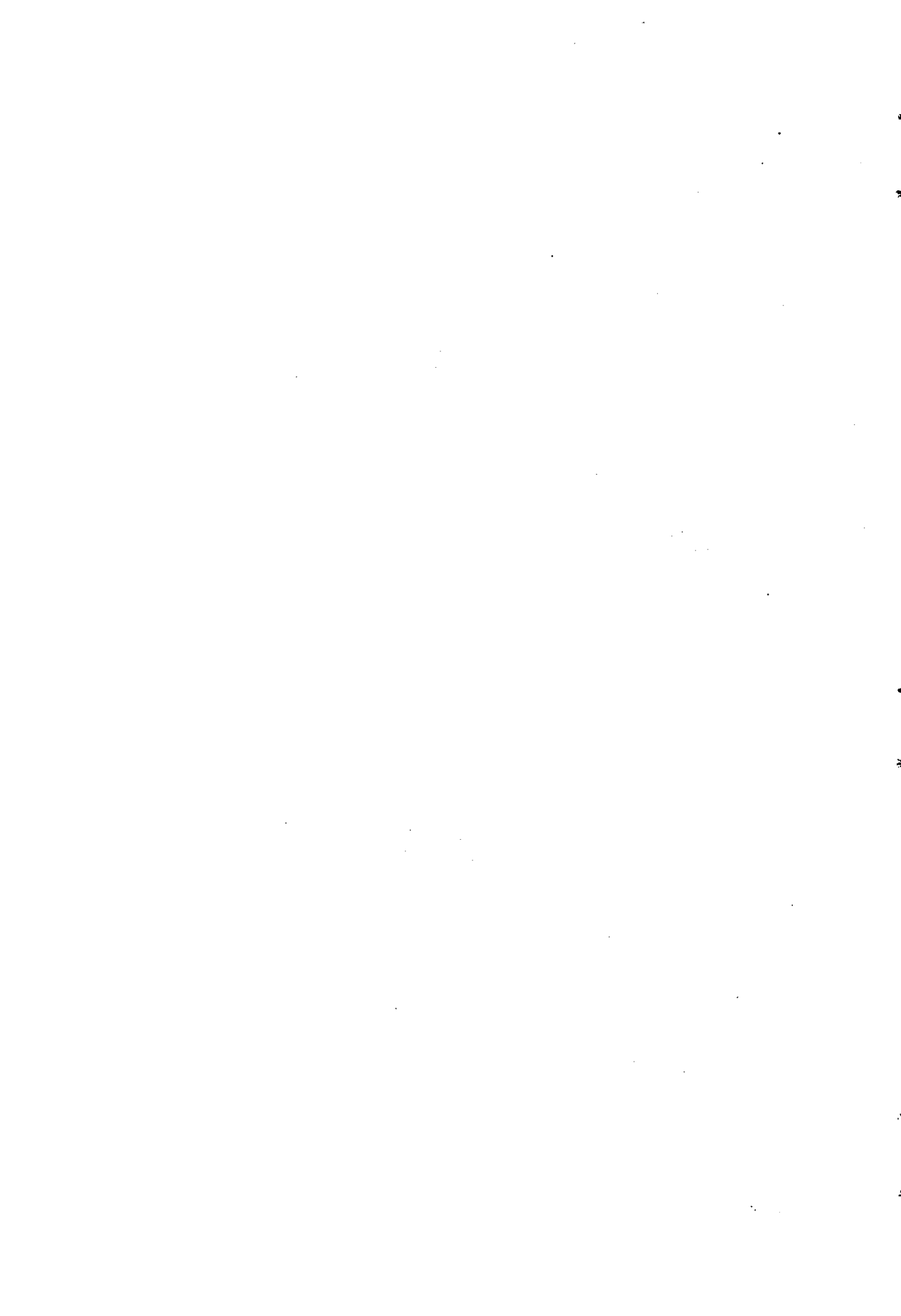
Source: Urban, rural and city population 1950-2000, as assessed in 1978; United Nations (ESA/P/WP.66).

CHART 4

ESTIMATED POPULATION GROWTH OF SELECTED CITIES OF LATIN AMERICA  
(population in millions)

	1950	Most recent estimated	2000 (estimated)
Mexico City	3.19	16.00 (1982)	31.0
Sao Paulo	2.45	12.49 (1980)	25.8
Bogota	0.61	3.50 (1977)	9.6

Source: Urban, rural and city population 1950-2000, as assessed in 1978; United Nations (ESA/P/WP/.66) and Hardoy, Jorge and Satterthwaite, David, Shelter: Need and Response; housing, land and settlement policies in 17 Third World Nations; John Wiley & Sons, 1981.



**8.2 MARGINAL QUARTERS AS A SOCIAL PHENOMENON, AND  
IMPLICATIONS FOR THE PROVISION OF SERVICES**

**Alastair White**

The author is the only responsible for the opinions expressed in this paper, and its publication does not necessarily reflect PAHO/WHO's viewpoint.



## BACKGROUND OF THE ECONOMICAL POLICY

Marginal quarter is the expression used in housing, to describe increasing polarization that in the last decades characterizes Latin American societies.

The argument that we will propose here is that this polarization results from the policy of industrialization based on imported intensive capital methods, instead of making the maximum use of manpower, an abundant factor in the continent. Redundant or displaced manpower resulting from this policy, has to look after its survival in the activities that are left open, where one competes against the other. Economy polarizes between an intensive capital sector and an absorbing manpower sector. Some intermediate activities are still left, in which the quantity of utilized capital to create each job is an appropriate media.

Polarization in the latter decades is not a simple continuation of the divisions between rich and poor that existed ever since the formation of Latin American societies during the Conquest. Before the Second World War, populous or proletarian areas existed in the cities but nobody ever thought of calling them "marginal". The quarters and the workers who lived there, formed an organic part of a somewhat balanced economy although with no equity in the possession of wealth or the distribution of income

The change appeared with the introduction of intensive capital techniques in industry which emerged encouraged and protected by the policy of substitution of imports during the post-war years. The state policies favored, and still do, the use of techniques and machinery coming from more developed countries where they have been designed to replace more expensive manpower. The use of these capital-intensive techniques responds not only to state policies, but also to other factors, as the preference for employment of few workers instead of risking that payment of salaries and wages be the major element in the costs of the enterprise, avoiding the effects of possible labor problems; the simple ideological identification of the most intensive technique in capital as the most modern one and thus the best; the major facility to adopt the international market technology offer instead of developing a technique adjusted to the local manpower cost. The determinant criteria should be that the enterprise, multinational or national, does not carry the social cost of the development pattern. The social cost is carried by those unemployed in the intensive capital sector of the economy. These form the other part of the economy, the absorbent manpower sector, where the opportunities are relatively few compared to the number of persons who seek for them. Consequently, the competence that one makes to the other reduces to a minimum what each one can earn; and the attempts that can be made to improve the situation through legislation of minimum salaries, etc. may only have isolated effects when the job market is depressed in this way.

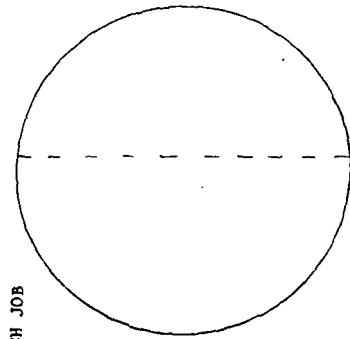
The same sector of the economy in the city has been called "informal sector", but it is not the most appropriate name because the requisites of the "formality" can be extended to parts of the absorbent manpower sector without altering the fundamental situation. The phrase "informal sector" corresponds to an emphasis on an administrative aspect of second order although it can also be a recognition that the sector in question may play a positive role in production and employment. The "informal sector" excludes subsistence agriculture, not admitting that it plays the same role. The absorbent manpower sector includes most of the agriculture, and this designation makes due emphasis in its relation with the other sector, the intensive capital one: which form the two parts of a distorted economy.

The historical change pointed out is graphically represented in Figure 1. An equilibrated economy is characterized by the fact that the major part of the laborers work with an amount of capital more or less similar to the media amount for the whole economy. Some processes utilize rather more and others rather less than this media amount, but the concentration of the bulk of the job posts is around the media availability.

For sure, no specific economy will conform exactly the ideal represented by the circle, but during the last decades Latin American economies are each time further away from this ideal. Whenever a new process is introduced to produce a benefit or service utilizing a great investment and little manpower (especially when the relation is extreme, in the cupola of the illustrated "onion"); it deprives of capital to a corresponding number of persons. Substitution in the market may be direct: the manufacturing, for example, of bread in factories with imported machinery, replacing a number of small bakeries. Sometimes it is indirect, with the introduction of new products which attract a part of the expenses of the consuming population in general: rich an poor intensive capital sector employees and manpower absorbent sector workers. There are not two separated sectors in which the purchases of the producers' families in each sector are exclusively the products from the same sector.

But there is a tendency to consider that products and services of the intensive capital sector as more "modern" having a major social value in terms of preferring consumption, and that the absorbent manpower sector may principally compete offering lower prices. The latter, and the geographical proximity of producer and consumer in the popular zones of the cities, involves a tendency of people in this sector to consume more products of the same sector. It is not surprising that the purchases and exchanges in the marginal quarters are described as an "internal economy" of their own, even a "parallel economy". Nevertheless, these exchanges continue the activities and economical relationships that in the past were considered a normal part of the national economy before the growth of the intensive capital sector. It can be said that they still do, and that the abnormal is the separated emergence of the intensive capital sector, instead of a development in which all workers would have received gradual increases because of a better productivity, with gradual rising of the available amount of capital for each post in the different parts of the economy.

Figure 1. (a) EQUILIBRATED ECONOMY

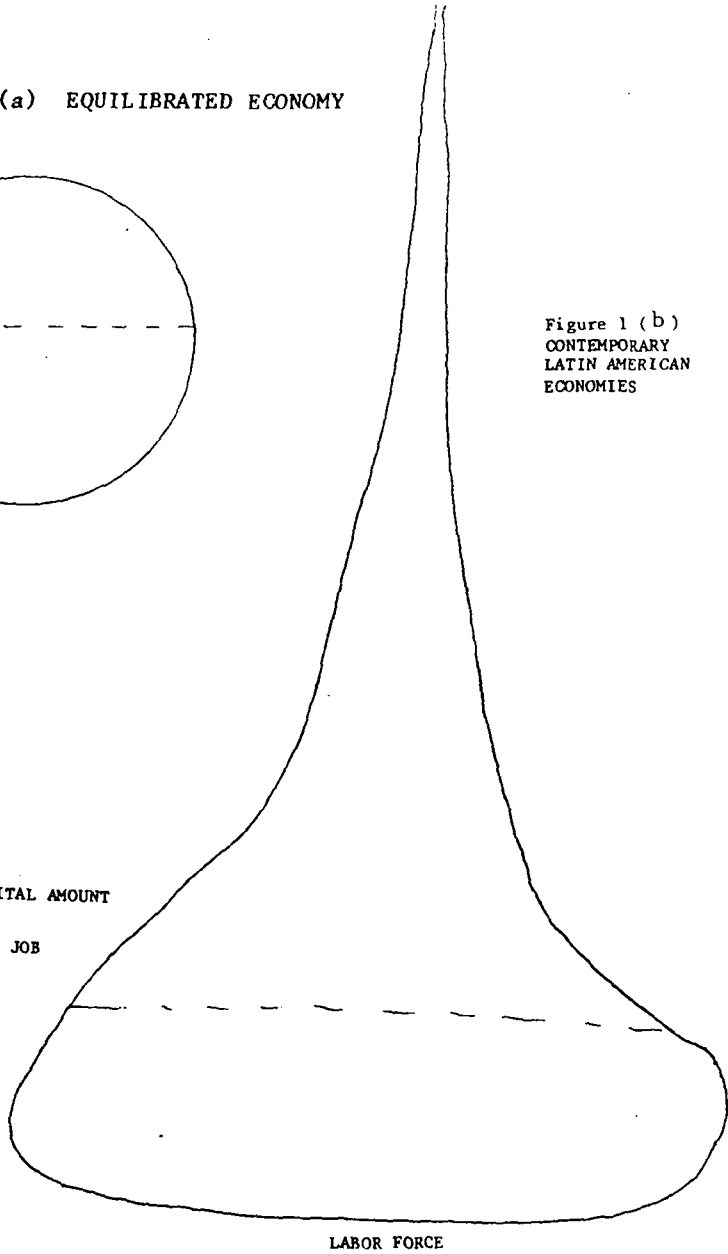


INVESTED CAPITAL TO CREATE EACH JOB

AVERAGED CAPITAL AMOUNT

PER WORKING JOB

Figure 1 (b)  
CONTEMPORARY  
LATIN AMERICAN  
ECONOMIES



LABOR FORCE

It is neither surprising that the location of the manpower absorbent sector activities may have involved a strong rural-urban migration and the formation of marginal quarters in the cities. An equilibrated economy will create working opportunities in all the popular places of the country: food producers, located in the fertile land, will create a demand for properties and services, and this demand will mean employment and almost a national level prosperity in the rural areas and small cities. But the economy distorted by the intensive capital sector growth undervalues the production of food: the demand stays relatively low because of the popular classes' low purchasing power while the agricultural production is one of the activities that absorbs manpower and is exposed to competition due to the resulting market opportunities. Consequently, peasant's purchasing power is minimum. Money is in the cities: intensive capital industries are concentrated there and above all, those who depend directly or indirectly of the intensive capital sector and who have the corresponding purchasing power, live there. Naturally, where the purchasing power stands the absorbent manpower must also concentrate, besides farmers themselves. Even an intensive capital industrial relocation policy in certain zones distant from the big cities could not make too much change in the crowding tendency in these cities, because the expenses of the relatively few workers of the intensive capital industries and the other local expenses, represent a relatively small part of the value that they produce.

Migration to the big cities can be even less discouraged with a non-provision of services policy, as water and sanitation, to the urban zones where migrants go. Such a policy would only produce an overcrowding of the city zones where water can be obtained. People has to concentrate where the economical opportunities exist, no matter how minimum they may be.

#### HYPOTHESIS ABOUT FORMATION AND CHARACTERISTICS OF MARGINAL QUARTERS IN LATIN AMERICA

The economy structure, as it has been described, explains the flow of population with scarce resources towards metropolitan cities, and explains the lack of opportunities for a great part of the population, except for the manpower absorbing sector, where they compete one against the other resulting in very low levels of income. When the purchasing power in the housing market is low, dwellings acquired in this market will be of bad quality, either rented, purchased or self-built. Thus, the existence of marginal quarters, i.e. "slums" of bad quality living groups, is already explained.

But there are different forms of bad quality dwellings in each city, and great differences between cities depending on the sizes of the different forms. It does not interest too much the old shape of the central parts of the cities, in which each family rents a room around a courtyard or in a building, without room services, having instead common ones. This type, that is called "vecindad" in Mexico, "palomar" in Guatemala, "mesón" in El Salvador, "inquilinato" in Colombia, "conventillo" in Chile, "cortiço" in Brasil, may have problems in the provision of services; for example, common sanitary services frequently deteriorate; owners sometimes limit the water service to

certain hours. This kind of dwelling may be illegal or almost legal (where it has been forbidden to be built or convert other properties for this purpose), and may be considered "informal" or "marginal". However, services generally exist.

We are mainly interested on slums and illegal colonies: all the areas where the houses have been built by their first dwellers without previous authorization of the urban authorities (without observing these official requisites about services provision). These areas may emerge:

1. Because of a slow settlement (family by family, not orderly), not opposed, in state land (national, municipal, or official institution) or in places where the owner is unconcerned. Occupation by force is accepted frequently by the responsible official institution of the property, and the person in need of dwelling is assigned the land where to build, without promising that eradication of the settlement will not be executed in the future. This consent is an acknowledgement of the need that people has to build somewhere in this way, and a desire to control somehow the siting; it can also be considered a political profit because of the gratitude for the permit.
2. By accepted slow settlement, in private areas, paying a rent for the land and having a provisional consent. Often, the owner waits for the opportunity to sell the land at a higher price in the future: he will oppose to the improvement of the settlement because removal will be more difficult. Maybe this is not frequent in countries where the owner is not sure to remove the residents whenever he decides, because of the legal, political and public opinion. This type of settlements may be initiated with the owner's consent to some friends or clients, and it extends afterwards to their relatives, or by independent attitudes of the persons in charge of the lands.
3. By organized invasion, of future dwellers in big groups. The main reason to operate in an organized way is because of the political backing of the invaders: it is difficult to remove such big groups under the political conditions of many countries; but not in all countries nor in all political occasions. In some countries invasion has seldom occurred or has never happened. Coordinated invasion also allows the regular layout of roads expecting the provision of future services.
4. By illegal division into lots: sale of lots or rent with a sale promise, so that buyers build their own dwellings, without the authorities' project approval. Illegality is relative: this modality could not work if authorities would not recognize or make effective the signed contract. There may be more problems in services' provision than in the case of organized invasions. While invaders, who will be the future residents, are interested in services the urbanizers prefer selling the maximum proportion of land, without leaving place for community activities.

These four processes that form marginal quarters (let us call this way such kind of slums and illegal colony groupings, as we do not have an appropriate name) do not simply result on four different types of zones related to physical and social aspects. It is a more complicated matter: factors which determine the evolution of each quarter include from local geography and the background of the land property, to the changes and turn outs in the economical and political situation of each country and city. The following is an intention to outline how these factors may "generally" have effect, though they are of different importance and vary their effects depending on the cities:

1. The first determinant is housing offer for popular sectors in the legal private market and in the "vicinities", etc. of the central areas, in relation to the total demand of the low-income sectors; and the offer structure in relation to incomes. Among the popular sectors, these are able to pay the rent and find that this type of dwelling is better for them, according to their possibilities, than the the "marginal" alternatives.

This offer will depend on:

- The existence of old houses in the central parts, mainly unoccupied dwellings of families who move to upper and medium-class suburbs, which are converted into "vicinities", boarding rooms, etc. In smaller cities which grow at a slower rate, the proportion of these houses is bigger compared to the housing demand in the popular classes.
- Profitability of these investment ways in comparison with others, and in particular with this land use, compared to the land value for other uses. The increasing value of land for commercial uses in the central parts of the big cities has a tendency toward discouraging construction of new "vicinities" and even the destruction of old ones. In some cities with strong modern industry, like Sao Paulo, the popular sectors' purchasing power has allowed that legal housing in the surroundings of the city be rentable for these sectors: here the "favelas" growth is lesser than in Rio de Janeiro for example.<sup>2</sup>
- The existence of a group of small contractors for whom this kind of investment is attractive (in San Salvador, for example, the owners of "mesones" are usually elder women, who are willing to watch personally over the property).<sup>3</sup>
- The (non) state intervention: offer will be reduced by any intervention for rent control of obligatory improvements, no matter how favorable interventions may be for present tenants. "Vicinity" and rented rooms with services meet all tenants' needs for commodity and economical possibilities, and become the permanent dwelling of many families, but there is a tendency to be used by small families (including singles and new couples), and in the central parts to those who need to live near casual work opportunities and contracts. This category includes newly arrived migrants.

2. The second factor is the existence of lands liable to slow settlement or invasion. These are lands without present use and include:

- Somewhat central ravines or built-up parts of the city; also lands susceptible to flooding, even swamps and some ports, like Guayaquil, areas which are covered by the sea during high tide, where thatched huts are built over pillars. Although these are central areas they have not been used for legal building because of its undesirability, urbanization cost and flood prevention. For these reasons urban authorities consider most of them not apt for housing. As they know there is little possibility for future legalization or regular urbanization, families whose economical condition allows buying better lands for permanent dwelling do not settle on these areas. Therefore, these areas, which are slowly occupied or invaded, will attract poor people amongst the popular levels, and will stay without modern "buildings": even though dwellers' economical situation improves they will not risk their savings to build in areas subject to eradication. These are the so-called "slums", a name that does not reflect the fact that the thatched huts may become more "decent" houses in many cases if there would not be an eradication menace.
- Hills and accidental lands on built parts of the city. Undesirability is not the fact here - frequently there are beautiful sightseeings - nor flooding, but there is a high-cost for regular urbanization. The most probable way would be a regular improvement, but it depends on other political factors and concurrence for land use.
- Flat and central lands where there are no buildings because they belong to official institutions and are not being used. For example, old road and train routes, not in use. Crowded slums are formed here because the land is good for building, its central siting, lack of flooding risk, etc. makes them attractive for provisional poor family dwellings.
- Uncultivated lands in the surroundings of the city. Semi-desertic lands, not too uneven, are the best for group invaders towards a definite settlement. Dwelling improvements can be made when their resources allow it and thus there is no removing threat: the land will be considered good for urbanization, but there will be neither competition for other uses or vested interests for the quarter's disappearance. The abundance of this kind of land in Lima's outskirts has been propitious for the formation of the big "barriadas" that exist there. It is doubtful if it is appropriate to call "squatters" those areas attracting people with plenty of resources, even people who might purchase land in other cities.

3. The third factor is land price. With a city rapid growth, there will be the corresponding inflation of the urban land price. Two effects can be foreseen: land speculation (its unuseful retention awaiting future higher prices); and the growing difficulty for certain social levels in buying land to build their house. Two motivations may produce an invasion: existence of vacant land and people who has no more resources to resolve the housing problem. But it is a complicated matter: it also happens that a land owner at the outskirts of the city could favor an invasion of another land nearby to take advantage of the higher prices of the land surrounding the new squatter. A marginal quarter may attract not only commerce activities but industries willing to use abundant manpower.<sup>4</sup>
4. The fourth factor is a political one.<sup>5</sup> First, which will be the authorities' reaction towards slow settlements and invasions, in particular:
- immediate reaction in case of invasions. In certain countries or in more authoritarian regimes, an expected hard reaction will make an invasion impossible; but in other cases it is a matter of political opportunity.
  - the possibility of using police force to remove private land settlers when the owners decide so; using the force may be quite a menace, if it is accepted by politicians.
  - authorities' policy towards national land settlements, whichever its background may be (invasion, slow surreptitious settlement or consented). That is, policy related to eventual eradication, tolerance, or legalization of the settlements in general, and in relation to its eradication in particular in cases of potential competitors of land: the existence of the settlement is taken into account when making urban projects, road traces, etc.

Secondly, the political factor includes official, legislative and judicial attitudes towards illegal division into lots, or other forms of non-fulfillment of legal norms. Illegal lotting depends on the lack of sanctions, but also on the positive judicial support of the signed contracts. This has allowed that in El Salvador a 20% of the city population lives in illegal lots, while there has been only one invasion case.<sup>6</sup> In other countries where there is no possibility for illegal lotting, families of medium resources who wish to strengthen their position by self-building their house, may appeal to invasion. The political question is to whom the law should be imposed: illegal lotting generates high profits - illegal - to them. Invasions generally represent a resource for poor families to acquire a property - although promoters, who build to sell or rent, sometimes take advantage of them.



Finally, the political factor includes urban and housing policy in a more ample sense:

- provision policy or support to housing provision. In the past, policies have favored basically medium class housing, with very little construction in the subsidiary sector with prices or rents within popular classes reach. But during the latter years there has been a certain change in many countries towards the provision of "minimum housing", at reasonable prices, the provision of "sites and services" and rehabilitation programs and improvement in the various types of bad quality housing areas.
- control policy of land use, and towards the possibility of capturing for public interest big profits that result from increasing land value when due to the city expansion it becomes an urban use. For example, a policy for acquiring land at a price related to its agricultural use, and to make it available to the needed ones in "sites and services" programs with technical assistance for housing construction. This might prevent the formation of illegal colonies or invasions, at least in the outskirts of the cities.
- service provision policy, especially water and sanitation. On one side, the provision of permanent services (pipelines) constitute an official tolerance signal for a settlement and increases the possibility of housing improvement with the consequent consolidation process of the settlement. On the other hand there is the need for political support (incl. financial) for the service entities programs in the peripheral quarters.

#### INHABITANTS OF THE MARGINAL URBAN AREAS

Marginal urban areas are not inhabited by a special kind of people. Population in this area does not have social desintegration, or higher crime and alcoholism rates, they are neither crowded as it generally happens in the popular classes and there is no illiteracy or instability of the family group. There is only a slight tendency to be of provincial or rural origin, easily explainable because a higher number of those city-born already have their housing problem solved and do not have to search for a new solution.

Who, then, amongst popular classes, are the ones who search marginal areas as a housing problem solution?

They are not people of a definite income level: includes very poor ones and those with relatively higher resources in the popular levels. But marginal areas are of different types: in the central slums, a significative proportion of the population is people who has appealed to this solution because they were unable to pay even the "vicinities" sector's lower rents, but maybe for a certain period afterwards. Therefore the medium income level in these slums usually is lower than the "vicinities" medium level, but both

housing types receive families of somewhat the same income range. "Vicini- ties" also differ one from the other and from one city side to the other. The ones who look for housing are not really choosing between "vicinity" or "slum" but they are comparing the advantages of a certain room level in the neighbor- hood, that the rent is feasible, with a certain kind of slum dwelling that they may buy or build.

For example, the comparison between family incomes in a slum (very poor marginal area) and a "mesones" (vicinities) central area that is also poor in San Salvador in 1967 was as follows:

Monthly family income	Col. Quifonez (slum)	Concepción Street (only "mesones")
Up to C 67 (US\$26.80)	19	12
C68 - C101 (\$40.40)	17	13
C102 - C151 (\$60.40)	24	22
C152 - C227(\$90.80)	20	17
C228 - C341 (\$136.40)	13	18
C342 - C512 (\$204.80)	3	8
C513 or more (204.80+)	2	3
Without data	2	2
Total (N)	100	100

Sample of 100 families in each area. Study made by the author.<sup>7</sup>

In the marginal quarters of the city outskirts, where there is more possibility of a permanent consolidation, settlers include medium resources people, and the internal difference is great. There may be a tendency to ex- clude poor people, due in part to transportation costs towards the city where there is more employment possibility; but it is also possible that the same needs of the area under construction creates working opportunities and also attract very poor people.

Which are the other factors that differ population of the marginal areas or that influence certain families to settle there?

The main one seems to be the group size: the number of children, and the desire to live together with other members of the family origin, maybe in the same house or in adjoining houses or in the vicinity.

In El Salvador (study of five cities including the capital),<sup>8</sup> the average size of the family group in three housing types is as follows:

Mesones (vicinities)	3.8
Slums	4.7
Illegal lots	5.8

My own study has a result of 5.8 for the Quifonez "slum", and 3.9 for Calle Concepción "mesones" (San Salvador). The city general average is 5.4. The facts are very easy to understand: the "meson owner" has a control over the tenant's admission, preferring small families, not accepting many times

families with more than one or two children. The "meson" room is generally small and there is no possibility to enlarge it. Instead, the marginal quarters and even frequently the central ones (especially on ravines like Col. Quiñonez, or on hills) allow the house enlargement; any family crowding in rooms or adjoining houses; a generally less controlled life which gives more opportunity to live with relatives if desired. This also allows the greater use of the family "exchange network" to help each other in daily duties, which has important economical advantages for working women.

It is interesting to compare the type of family groups that result in different housing types (Table 1 refers to San Salvador). We also include a housing provision area of the Urban Housing Institute: a multifamily area with a relatively low rent. The effect in selecting "normal" nuclear families by this institutions is noticed.

TABLE 1

FAMILY COMPOSITION IN DIFFERENT HOUSING AREAS IN SAN SALVADOR, 1967

	<u>Col. Quiñonez</u> Marginal quarter ("slum")	<u>Concepción St.</u> central "mesones" ("vicinities")	<u>Urban</u> <u>Center</u> Lourdes multifam.
Single person or two friends	3	18	0
Couple without children	4	5	1
Mother alone with child(ren)	16	18	3
Father alone with child(ren)	<u>1</u>	<u>1</u>	<u>2</u>
Total "deficient" families:	<u>24</u>	<u>42</u>	<u>6</u>
Father, mother and child(ren) ("Nuclear" family)	<u>34</u>	<u>37</u>	<u>64</u>
Nuclear family and grandfather/mother	8	3	12
Nuclear family and other relatives	17	5	13
Others (i.e. 2 sisters with children)	<u>17</u>	<u>13</u>	<u>3</u>
Total big or irregular families	<u>42</u>	<u>21</u>	<u>28</u>
N	100	100	100

Sample of 100 families in each area. Author's study.

In some cities a process has also been found in which a migrant family of certain rural locality establishes in a marginal area of the city, and afterwards other families of the same place settle around them, although they are not relatives. The fact is the same as for related families that settle in the same vicinity: assistance exchange facility, that also helps to find a

job: sometimes the first ones to arrive establish themselves in an occupation and afterwards help new ones to enter the same occupation. It seems that this process mainly happens when the migration is from a remote rural place to a great metropolis, and/or when migrants are from a group who feel different (Indian) than the predominant in the city.<sup>10</sup>

We can presume that the only other characteristic which distinguishes the inhabitants of marginal quarters is that they are pushful people. They are mainly people who have preferred to build their own house or buy a house, or hut, generally expecting to improve it, instead of paying rent.<sup>11</sup>

#### THE ECONOMIC AND SOCIAL ORGANIZATION IN MARGINAL AREAS

As marginal quarters represent a housing alternative, for families of the popular classes (the only way that a certain proportion of this population solves its dwelling problem, in view that the other housing solutions are not enough), the represented occupations are in general all manual activities. In the quarters under a consolidation process, like somewhat urbanized colonies, "medium class" people of non-manual occupation is also found; and generally the average level (prestige, qualification, etc.) of the represented activities will depend on the level (desirability, huts or houses' value) of the marginal area.

But there is a tendency that workers with qualifications in machinery operation, or others who find a definite job in factories, etc., resolve their housing problem in the official sector. They are the ones who comply the best with the requisites. Thus, certain over-representation is left for the marginal area from other popular sectors: workers with qualifications on building or on conventional jobs, including jobs that have lost market with the appearance of new industrial processes and others that are still standing, as well as unqualified workers.

Women's economical role is important. Because of the space, lack of control on the owners' side,<sup>12</sup> and the exchange network facility and mutual help, women may better develop their own economical activities in the small market, preparation of food to sell, and services like laundry.

In the comparison made in 1967 in San Salvador between the marginal poor quarter (slum) of Quifonez, and the "mesones" area (vicinities) of Concepción Street, also poor, there was no significant difference among men's occupations, but in Col. Quifonez there was a much higher percentage of women working in small commerce and services:

	<u>Col. Quiñonez</u> (poor squatter)	<u>C. Concepción</u> (mesones)	<u>C.U. Lourdes</u> (multifamily)
Employees	2	1	4
Main commerce. (incl. "mesones" owners)	2	4	2
Factory work or with machinery*	1	5	4
Jobs or qualifications without machinery* (i.e. sewing)	8	11	18
Small commerce, food preparation, services and unqualified work	<u>47</u>	<u>21</u>	<u>10</u>
Total:	60	42	38

100 families' sample in each area: mother's occupation. Author's study.

(\*) It is referred to electrical or mechanical machinery

The important women's job is usually underestimated in many investigations, especially those based in census methods. Both pollsters and polls take for granted that the man works, and no matter what kind of work the man does that it is registered as his occupation. But for women the situation is the reverse: frequently work is taken into account when it is a permanent job (maid, factory worker, etc.). The same women who prepare food to sell, or laundresses, although they do that every day and earn a regular salary, reply to the pollster that their occupation is "domestic job" and they are registered as outside-active-economical population.

In San Salvador working women's income is about half a man's salary (many women do not work to earn money during the same hours of the man, because of their responsibilities at home, and the jobs are usually less remunerative per hour). But her work is important to supplement the husband's scarce resources in the economy's absorbent manpower sector. Woman's income, although smaller, is usually more regular: she can always earn while he has to look after a job (as laborer, for example) that he may find for one day and not for the other. Moreover, there is something else important: it allows a much more independent woman from the man. It is frequently thought about the "instability of the family group" among the poor sectors as a misfortune or an irresponsible expression. The truth is that there are not many material considerations to oblige or induce both parts to stay together, and especially to oblige the woman: it is positive. The possibility of earning an independent life raises the relative position of the woman in the home life. (It is also doubtful to suppose that the husband is necessarily the "head" of the family. During my study, in San Salvador, many accompanied women assured nevertheless that they were the "heads" of the family, citing for example that the house was hers. The idea of a family head, that is always the husband, if there is a husband, answers to a hierarchic idea of the family and to the reality of all the families).

A marginal area of any size will surely have its internal economy: inhabitants have their needs, purchase things and look for services, and it is normal that a part of this demand results in working opportunities for those who live there. A bigger area and further away from other parts of the city will have a more developed internal economy. In most of them this means greater difference: there is enough demand to open bank and lawyer offices, while building workers and food makers are also needed.

But these building and services activities depend on how much inhabitants spend, and on the income they earn on other parts of the city. There can also be a manufacture production in the marginal area, mainly in small workshops, but a greater proportion of the quarter's population will always work outside it. Thus, the "parallel systems' economy" concept is not applicable to the marginal quarter economy. It may be a way of referring to all the absorbent manpower sector of the city or country economy.

Nevertheless, building represents an important field for intensive manpower work opportunities. We may include both remunerated work and direct self-construction by the residents: these are also opportunities to assert their own manpower. If replacing the marginal quarter with another type of more "formal" housing is decided, it is important that the change does not imply the use of intensive capital building methods, as it frequently happens in multifamily or family housing projects.

Such projects are built without participation of future dwellers (in planning and design: they incorporate sometimes to work in a "mutual help way"), providing them a finished house. It could be possible to preserve the advantages of the marginal quarter, by using the abundant manpower and allowing residents to participate in the decision processes, but within a legal frame, offering lots and services and collaborating with organized groups of future dwellers.<sup>13</sup> At present, these organized groups are the ones which operate in case of invasions.

Nevertheless, not all marginal quarters are formed by invasions, and not all quarters have a representative internal organization. In this sense, as in many others, there are enormous differences from city to city and from marginal quarter to marginal quarter. In others, there are boards or committees recognized by all the inhabitants but with no official role. But in many quarters existing committees do not count with everybody's support. In 1967, in San Salvador there were even big "slums" without any type of committee, although this must not be usual now. Any representative organization has naturally its implications in the political parties even if it is not motivated by them. There is frequently political influence in matters of helping marginal quarters, including provision of services.

## WATER SUPPLY AND SANITATION IMPLICATIONS

The first necessity is to recognize that all marginal quarters' inhabitants have the right to obtain adequate water services and excreta disposal. They are families affected by economical forces and policies, who are obliged to look after their survival or try to improve their situation, by migrating to the big city - if they are migrants - and settle in the marginal quarter. If they are denied better opportunities to earn their living, they should not be also denied the essential element for health.

The second necessity is to recognize the great economical differences from one marginal quarter to another, and plan a proper service for each one. This may need different plans, adjusted to the circumstances of the specific quarter and to its inhabitants' purchasing power. Not only one service standard should be established and look afterwards for the quarters where its residents may be able to pay the dues implied by this standard. In some illegal or marginal quarters it will be possible to use the same methods and physical solutions as in other legal colonies. In other quarters certain changes may be introduced to reduce cost. But for a third group - the so-called "slum", especially the central and crowded one besides being poor, other solutions should be brought up. It is important to approach separately these more needed marginal quarters' group; action for "marginal quarters" category should not be converted only on behalf of the easier ones, the most orderly and less poor. In some quarters, it will be necessary to think on solutions like public fountains or fountains for groups, washing places, and communal sanitary services. Here we fully go into the matter of maintenance and repair of communal facilities, and the indispensable need for the organized community's cooperation to look after such facilities. Facilities with this communal organization should be planned and designed, to make sure and assure the community that those facilities represent the best solution, and that there must be joint responsibility between them and the entity concerned. Sometimes, it may be necessary to form a local committee when there is no longer a representative organization.

The benefits of a community participation also extend to marginal quarters where it is expected to install individual connections: there are always problems that are better solved together with the community representatives. For example, the way of adopting a solution or solutions for excreta disposal must be chosen with the community. But in this consultation process it is also necessary to take into account that in a same quarter there may be differences of opinion (and partisan or factional application, that may obstruct the process mainly if the entity is considered as a political representative of the national or municipal government). There may also be differences in the families' income, enough to affect the interest in one solution or another.

These differences will be frequently observed in the solutions already independently adopted for excreta disposal. Some families have a septic tank, others a dry latrine, others have nothing. There is sometimes a shared use of a latrine between two or three families, an expression of the mentioned exchange network.

The groups with greater incomes inside the quarter will generally favor a higher standard solution although they will have to pay higher fees, in comparison with lower income groups. Or, when only one solution is proposed, it may be that only one part of the community is interested: an "apathy" is noticed among the others. It is important to indicate that this apathy should not be attributed to a lack of progress or education. It may represent a well-based mistrust that their interest will not be better served with a project that obliges the family to pay such a high proportion of their scarce resources. It can easily occur that a representative committee speaks only for the desire and points of view of part of the community that is in better economical situation. It may be necessary to seek alternative solutions so that families of different income levels may choose the most convenient solution, according to the cost (i.e., part of the cost that the family will have to pay). It is necessary to inquire about the opinion of the poor members of the community, inquiring for example with women heads of family.

Thus, in the services' provision field as in the housing field in general, objectives cannot be defined in concept terms of the abstract need of a definite standard or quality, as long as they have the necessary resources for a total subsidy to the whole needed population. Objectives must be defined in terms of rights of the whole population for a service, but also in terms of an effective demand: how much each family is able to pay. The matter will have to be inquired with each group to find a better specific solution for its case.

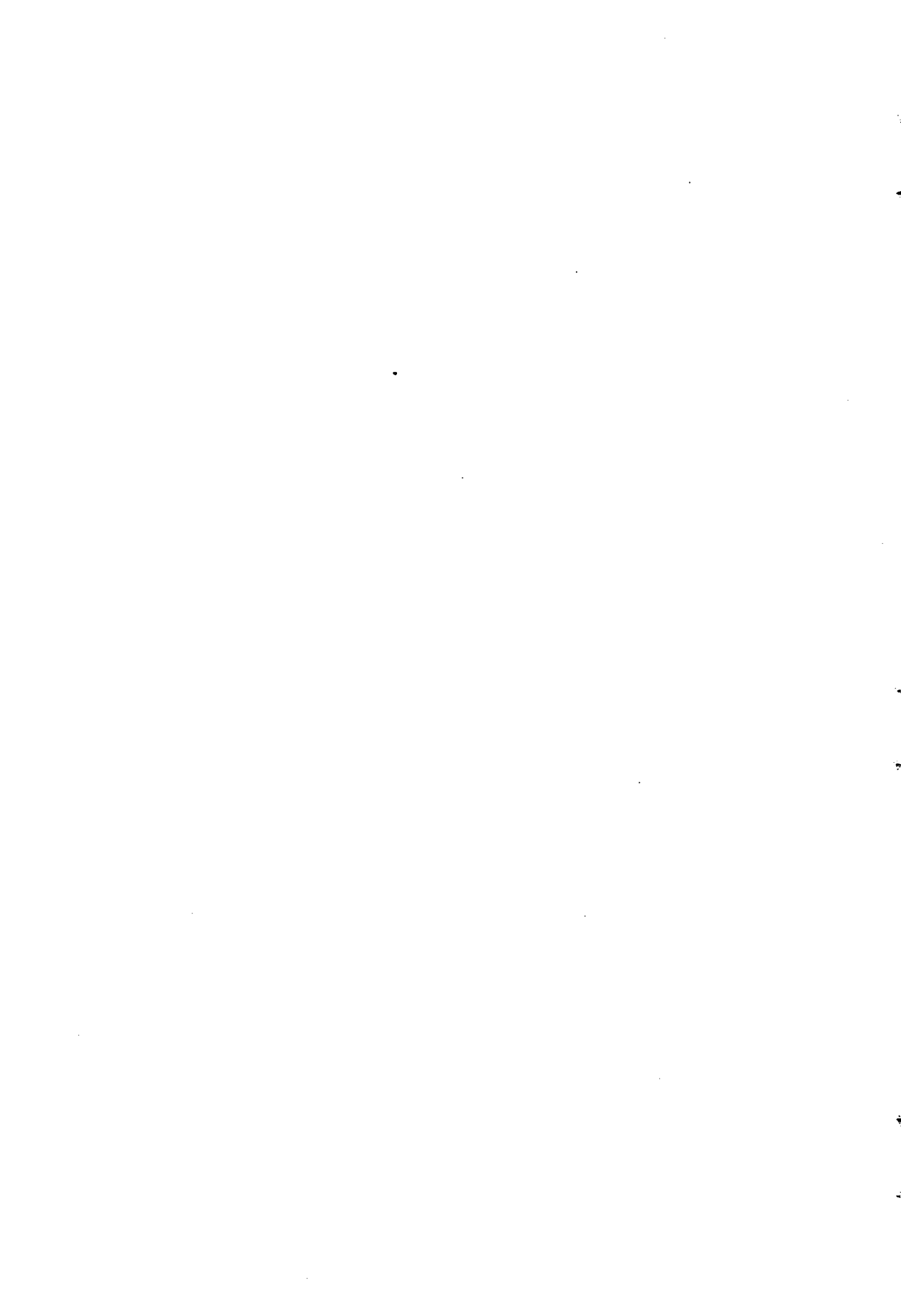


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12. In this statement the marginal quarter has a great advantage over rented housing, either private or institutional sector, where it is frequently forbidden the small commerce, etc.
13. Solution proposed by Alberto Harth Deneke: see Ref. 3 and "Quasi-legal urban land subdivisions in Latin America: a solution or a problem for low-income families?" in UN Habitat: The Residential Circumstances of the Urban Poor in Developing Countries, New York, Praeger, 1981.

9. DOCUMENTS ON INSTITUTIONAL ASPECTS



9.1 INSTITUTIONAL AND FINANCIAL ASPECTS OF DRINKING WATER SUPPLY AND  
SANITARY DISPOSAL OF EXCRETAS IN URBAN SLUM AREAS

DOCUMENT 1

Eng. Abrahao Fainzilber

The author is the only responsible for the opinions expressed in this paper, and its publication does not necessarily reflect PAHO/WHO viewpoints.

### 9.1.1 INTRODUCTION

This document refers to areas next to large urban centers, inhabited by low-income population. Physically, these areas are almost integrated to urban areas due to the expansion of the cities and peripheral nucleus, and that unoccupied lands situated in the urban areas, were occupied by low-income inhabitants, from densely populated nucleus, named "favelas" or other synonyms, as illustrated in Figure 9.1.

The area marked A in Figure 9.1 represents the urban part, areas B represent diverse situations relative to the population groups being dealt with.

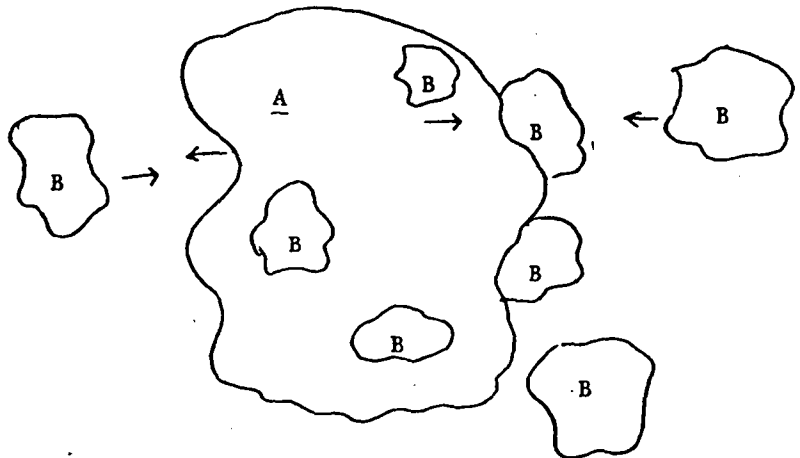


Figure 9.1 Relation between the urban area and the situations relative to marginal urban areas population groups

This is the view in the great Brazilian metropolis and in the different Latin American countries. Economically, the great human group living in these places, constitute an average fraction of the labor force of the great cities. Socially, those inhabitants, of different culture,

living with the urban inhabitants in a daily, intimate and interdependent coexistence, which could be when they go to common places, or in different ways like domestic services provided by those nucleus (B) to the residences of the urban areas (A).

The analysis of these aspects justify our concern to analyze the problem physically:

In the future, these areas will be connected to the water supply and garbage collection and wastewater disposal systems; therefore, it is necessary to work right now.

From a social economical-cultural point of view, we have a great responsibility, because it is necessary to reduce welfare differences between them and the urban populations.

This responsibility cannot be postponed any more and urgent actions should be taken.

The problem has many aspects, such as: social, cultural, political, which are all interconnected around low-income populations and in "marginal populations" as the topic of this symposium mentions.

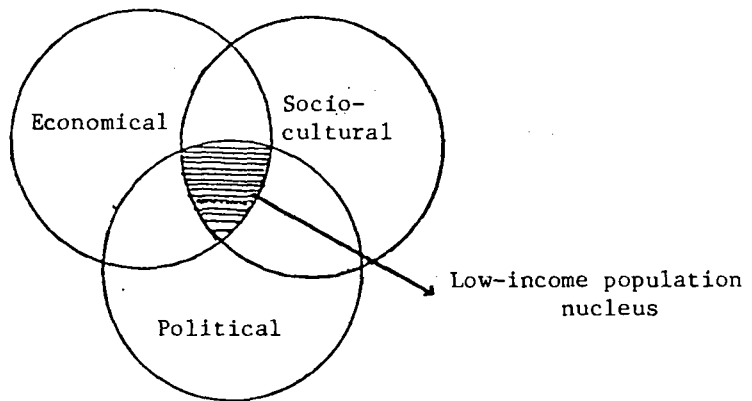


Figure 9.2 Low-income population nucleus



Today, to improve life conditions of this population is more our problem than theirs.

#### 9.1.2 DRINKING WATER AND SEWERAGE DEVELOPMENT IN BRAZIL

The purpose and professional responsibility that was tried to be accomplished was to achieve that urban populations obtain a total basic sanitation service.

We confronted many obstacles in our struggle to achieve these objectives. Among them:

- Obsolete institutions;
- Inadequate tariffs;
- Financial resources shortage.

We evolved from organizations, which were slow and had difficulties in generating their own resources (materials, human and financial), to efficient enterprises, thanks to our leader's efforts.

Through courses, seminars, consultation, specific literature dissemination - and we have to point out the important role carried-out by the Pan American Health Organization in this aspect, which has been undoubtedly the main catalyst of this changing process - we were updated and evolved towards more versatile structures, capable of achieving the expected goals.

In this process of institutional changes, the Sanitary Engineering and Environmental Brazilian Association, deserves to be mentioned. This Association supported the Sanitation National Plan, produced by the BNH - Housing National Bank, facilitating the executing organisms to make efficient negotiations through the technical assistance provided.

We developed for the creation of autonomous organizations such as public Departments or Utilities, Mixed Economy Societies or Anonimous Societies or other ones more efficient.

Now, that we have overcome the mentioned barriers, we have a great number of specialized engineers, modern and advanced technologies, with better administratively prepared institutions, better formulated, and of a high technical, administrative and financial aptitude grade.

Nevertheless, in spite of all the progress achieved in the administration field and in the technical field, those organizations would not attain their total independence. This applies either to a public utility, or to a private enterprise, because, as can be noticed in Figure 9.3, the institution depends too much from political power, which is competent, today, in defining the program's priorities. Any government, both central or local, defines its governmental priorities and defines a

real orientation so that the institutions which execute their governmental policies, may develop any sector with a greater or smaller intensity.

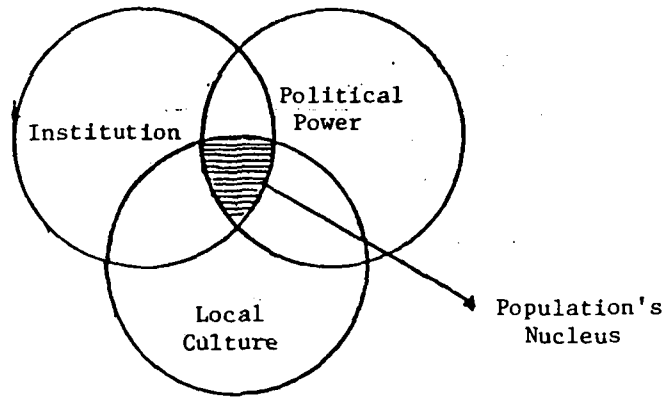


Figure 9.3 Populations' nucleus

In the case of Brazil, these programs had a considerable progress because they obtained complete support of the governments (central, regional and local).

#### 9.1.3 ASPECTS TO BE CONSIDERED TO DEFINE THE TYPE OF APPROPRIATE INSTITUTION

It is required that the intimate connection that exists between the institution and the political be respected, as it is the one which defines the priorities and strengthens the institution so that creative, managerial and technical capacities be used to take care of the most serious problems of the community.

This institution also depends directly or indirectly of the community, of the society's culture, which is more conscious and capable of knowing which are their demands to the institutions and to the political power. What was called in Figure 9.3, local culture, is really the greatest progress of those populations, which are now more educated, better prepared, more conscious of their needs and more conscious of the State's obligations and duties and those of the public institutions towards their nucleus, and towards the people who live there.

Consequently, the responsible institution for drinking water and sewerage services is not an isolated institution, it must really be an

institution conscious of its responsibilities to service the governmental priorities and the needs claimed by the people.

The latent question in this Symposium is: which is the type of institution we must adopt to solve the problems of those populations?

On this respect, it is known that during many years diverse institutions were created to attend specific problems, both of rural population and marginal population, that is of populations in areas of specific shortages. Which was the result? - the proliferation of a great number of institutions with scattered technical resources, final resources and institutional resources, and it was noticed through the years that in view of the multiplication of efforts, none of them totally achieved the expected results.

From the moment that governments and institutions decided to concentrate efforts and resources in organizations efficiently structured, the results obtained reached higher indexes.

And, what kind of options could be imagined for a type of institution that might assume responsibility for the services in those nucleus of low income populations?

- (a) A cooperative created by the inhabitants themselves?
- (b) A governmental enterprise especially designed with this purpose?
- (c) The same organization that already exists?

According to the arguments expressed and the result of the previous experiences, it is easy to conclude that options (a) and (b) would not be the most recommendable, because:

- In the case of "cooperatives" they lack of technical and administrative support, which would result in the near future that their projects would not be feasible. Some experiences already gone through have demonstrated that this is not a long lasting solution.
- In option (b), there would be an institutional proliferation, which according to late experience, it created more loss than contribution.
- Alternative (c) is left as an option, that is: to use the existent institution, because of its technical, economical, administrative capacity.

If we recall what has been said at the beginning in connection with the geography of the nucleus, which are now located in the urban area, adjacent or very near, one can surely conclude that the basic services will soon be integrated with the existing public systems. This makes us deduce that it is recommended that the existing institution initiates immediately the treatment of those systems or will have future conflicts.

In Brazil, especially in Rio de Janeiro and in Sao Paulo (the biggest Brazilian cities), the supply to those areas of poorer population, is being taken care of with success by the existing enterprises: CEDAE and SABESP, with respect to sanitation.

#### 9.1.4 MAIN TYPES OF EXISTING INSTITUTIONS:

##### 9.1.4.1 PRIVATE INTERPRISES

Set up with private investments, without Government participation. Normally they work through "concession" contracts with the Government. This type of organization does not almost exist now, especially in Latin America.

##### 9.1.4.2 PUBLIC UTILITIES

Set up and administered, directly or indirectly, by the Government (Public Power). There are two types of public utilities:

###### (a) Direct Administration

These enterprises have demonstrated, through the years, their inefficiency, due to their institutional characteristics.

They have no power to produce their own resources: hereditary, human, materials, financial and others; decision is far from their reach, and generally, it is under people who are not specifically competent.

Moreover, their income is processed through financial organisms of the general administration, which decide on the application of such resources. This process has avoided the growth of such sanitation institutions as well as to achieve their objectives.

Fortunately for basic sanitation, institutions of this type are now being transformed into more efficient ones.

###### (b) Autonomous administration

When sanitary engineering and the management methods developed, some institutions evolved, and became autonomous organizations capable of generating their technical, material, human, financial and other resources, turning to be efficient and obtaining the results expected by the governments and the society.

These institutions are the ones which allowed to increase the percentage of urban population with water supply and sewerage services, surpassing in some cases, Punta del Este's goals.

These institutions are legally formed as:

- . Departments
- . Autonomous services
- . Public enterprises
- . Private enterprises - with majority investment by the Government
- . Foundations
- . Others

Apart from its official constitution, which is constant in any of its forms, is the search for efficiency and independence to provide a high level service to the population, that is:

- . water for all the population
- . in "per capita" quantity, compatible with human needs
- . of good quality, according to sanitary standards
- . at satisfactory costs, with rates compatible with the population capacity
- . at integral time.

To achieve this, institutions must have: technical, economical, political and administrative aptitudes to have a good performance of their basic duties; plan, project, construct, operate and maintain the commercialization and administration of their services.

#### 9.1.5 ATTENTION TO MARGINAL AREAS POPULATIONS

If the existing institutions, decide to assume the social and technical responsibility to assist those populations, they must arrange the organization to adapt it to such objectives.

For this specific program, there must be two basic functions:

- The technical function - with authority for planning, design, construction, operation and maintenance of those systems. The technical projects demand special technologies and the technical function must be qualified for its development.
- The social function - as important as the previous one, must be in charge of contacting the respective population nucleus, speaking to their inhabitants, analyzing the local conditions, negotiating their participation in the different projects, evaluating not only the most urgent needs and the inhabitants' attitude to collaborate, in order to define priorities, but also planning attention and advising institutions in their duties.

A program of this magnitude is not exclusively the responsibility of the water and sewerage enterprises; its success, as can be noticed

in Figure 9.3, is intimately linked to other areas, such as, the same communities to be served, the different government areas and the local prefectures.

These activities, together with those of the public utilities, water, sewerage and electrical energy, are the ones related to health, education, public roads, housing improvement, communitary action, urbanization, etc., which are developed by other official areas and by the inhabitants of such nucleus.

The sanitation entities' social sector must be concerned about the interaction with those organisms and their respective responsibilities to obtain the programs' success.

The question that emerges now is: which is the structure that these two sectors must have in a sanitation institution?

In Rio de Janeiro, CEDAE structured a department, with engineering services and social services, with a hierarchical level equivalent to the other departments; that is, a power position, in a Technical Office.

Such Department, plans, interacts with other external organisms, projects, executes and follows-up the diverse undertakings of the government.

SABESP, in Sao Paulo, created in the Operations Office, a coordination unit to manage the program. This Office is in permanent contact with the other external institutions involved in the project, advises the enterprise in the program development, being the different enterprise's areas responsible for the execution of the physical, administrative and financial parts.

In the electrical energy sector, especially in Sao Paulo, the responsible enterprises for the sector (Electropaulo, Cesp, CPFL), begin their works in relation with electrical energy supply to low-income populations, through the operational "structure" of the institution (engineering, operation, administration, commercial, etc.) as a routine activity, as if those nucleus were normal clients.

The specific projects have special denominations, such as: "pro-light", "light for the surroundings", "attention to 'favelas'", "slums" and others. Nevertheless, any inherent area has the responsibility of its execution. The technical area develops appropriate technologies, executes works and installation; the operation area, operates and maintains; the commercial area applies its procedures; and the financial, bills and collects; in short, the whole enterprise is involved in the problem.

These enterprises work in the most diverse nucleus, in close agreement with other areas of the Government and with the Municipalities, in a joint work to improve life level of these populations.

It is important to point out the global consciousness that these organizations have - both the top direction, and staff - of the social role that they perform, with a concentration of efforts tending to obtain the projects' efficiency.

The culture of the organization absorbs these programs as a public and social responsibility.

According to experiences of these institutions and thinking over the achieved results, we may conclude, and even state, that the structure to be organized does not matter - be it sector, division, department, coordination, etc. What is indispensable is that:

- Involved persons in these programs and projects be motivated for the execution of their duty;
- Have power for their execution;
- Participate in the conduct process of the enterprise in the different phases: planning, execution and control, etc.
- The "culture" of the institutions considers these "projects" as part of their public responsibilities and integrates them into all their priority objectives.

#### 9.1.6 FINANCIAL ASPECTS OF THESE PROGRAMS

So far, we are aware that the programs which serve low-income sectors may be feasible from a technical, social and administrative point of view, having to analyze the financial aspect.

In Latin America, the implementation of the basic sanitation systems (water and sewerage), went through considerable delays resulting from two basic factors: administrative structures and financial resources not compatible with the demand.

In the case of Brazil, these two obstacles were mostly overcome. The administration strengthened its institutional structures and financial resources were obtained, in considerable amounts, according as national and international social credit organisms (IADB, IBRD-Brazil BNH), aware of the importance of such works for socio-economical development, allocated part of their financial resources, to contribute with the local governments' efforts.

During many years the difficulty in obtaining financial resources for these programs has been noticed. The formulas tried varied from official endowments at "lost funds", up to specific funds (local and international) with same effect. Rate studies must be mentioned, which were not real before, to obtain systems capable of providing incomes so that enterprises would achieve the objectives of assisting urban populations.

Resources availability, under the form of loans, besides offering adequate conditions for the execution of works and services, were a catalyst source for the establishment of fair tariff systems and the administrative development of the organizations.

How must financing must be faced to assist low-income populations?

Before analyzing different aspects that this problem involved, it is convenient to consider:

- Who must assume cost responsibility of these programs?

To define this the following aspects must be analyzed:

#### 9.1.6.1 INICIAL INVESTMENT COSTS

##### (a) Financing

This is not too feasible, because of repayment normally expected by the credit financing institutions.

- Financing by the same enterprises.

Normally the social results are more notorious than the financial results.

In most of the cases mentioned, in Brazil and in other countries, in this type of programs, populations of those nucleus participate of investments through manpower in the execution of the services, especially in placing pipelines, which represents a considerable part of the investment. In these cases, sanitation enterprises, besides projects and supervision, are responsible for the costs of materials and equipment.

##### (b) Resources Allocation

When the works are directly executed, without financing, that is without financial return, those resources come from:

- Governmental allotments; when the governments assign resources from their budget to implement the projects. Many of them have already been officially executed, denominated as "lost funds".
- Allotments from the Development Funds, of national or international origin, as the "Alliance for Progress", or others.



- Investments from the enterprise. In this case, the systems administrative institution invests its resources, as it occurs in the enlargement programs caused by the normal growth of the cities. Thus, enterprises are investing in their future clients.

Investment costs are covered by tariffs. Consequently, those costs are paid by all the community. This is a way in which the society contributes to improve their living levels.

In Brazil, most of this type of projects are implemented with financial resources of the same enterprise.

- Paid by the same inhabitants of the nucleus. These communities seldom finance all the projects; nevertheless, in most of the cases, they pay manpower costs, that is, they make the works themselves, in a collective way, thus reducing construction costs.

#### 9.1.6.2 OPERATIONAL COSTS

Administrative, operational, maintenance, commercial, and other costs, are accounted in these nucleus, together with general costs of the responsible enterprise, and form part of the general tariffs applied to all consumers and users.

Payment for the services received is made through: Rates and/or tariffs.

Rates (or taxes), applied during many years, due to its inefficiency, were somehow the responsible ones for the deterioration of the systems and contributed to the economical-financial disequilibrium of the sanitation organizations.

Now, rate collections are no longer carried-out.

Collection systems must be based on real tariffs, justified and adequate, through calculated tariff structures taking into account technical, economical and socio-economical factors of the served communities.

Tariffs may be: uniform and differential.

The uniform ones are applied when water availability is higher than demand - strange thing, at present.

The differential ones, which may be: decreasing or increasing.

The decreasing differential systems are applied in identical situations as for the uniform ones, that is, that there is a higher offer than demand. It is seldom applied also.

The tariff systems of a more frequent use are the growing differentials, which their main characteristic is the principle that: higher purchasing power consumers pay more than the others.

In these systems the basis of the tariff structure are the lower purchasing power consumers, getting gradually higher from these ones up to those of higher purchasing power, in the residential category.

The residential category, also, is a basis for growing tariffs in relation to commercial and industrial consumers.

The categories' differential tariffs may be established from the physical and economical values, but the most fair criteria is the real consumption of the users.

In this case, it is important to fix a minimum quota for less purchasing power consumers, which would be equivalent to the less value tariff, which is coherent with the payment capacity of the consumers included in this rank.

In the Sao Paulo State, these quotas correspond to: 50 KWh. for electrical energy consumption, and 10<sup>3</sup>/month for water consumption.

In this way consumers living in marginal areas, pay less in comparison with other levels.

In the case of water, these values reach 10% in relation to immediate higher category. In the case of electrical energy, the difference to the lower one is 60%.

These differences make the society participate of the projects absorbing costs and contributing to raise the welfare of lower income populations, as well as to improve their health. The economical results are obtained as a reduction of manpower absenteeism and productivity increase.

### 9.1.6.3 BILLING

Invoicing of water and sewerage bills in the nucleus under consideration may be as follows:

- Indirect. Through intermediaries or collecting accounts. This method was tried initially, in Brazilian experiences, without satisfactory result. Frictions with negative effects for the enterprise and users were generated.
- Direct. Invoicing that was more efficient was the individual account, that is, each house receives its personal account with the use of individual or collective meters.

#### 9.1.6.4 COLLECTION

Collection of the services rendered, in Brazil, was initiated as the invoicing: indirect, through a delegate, who collected and reported the accounts to the enterprise. This method was negative as it happened with invoicing.

Direct collection, presented surprising results. Individualized invoicing and each one making payment personally, in the enterprise's offices or in the banking network, presented better effective indexes than the traditional areas of the cities.

The individual respect generated greater responsibility as well as the consciousness that "a more expensive water is the one that one does not have".

#### 9.1.7 RESPONSIBILITIES INTERACTION

The sanitation enterprise interacts, necessarily, with other areas of the Government and other urban equipment, and with the respective communities in the introduction of projects of water supply and sewerage services, as has been mentioned before (see Figure 9.3).

Table 9.1 identifies responsibility levels from each part that intervenes in this process.

TABLE 9.1  
RESPONSIBILITY LEVELS OF THE PARTS WHICH INTERVENE IN THE PROCESS

RESPONSIBILITY ACTIVITIES	SANITATION ENTERPRISE	Political Power	
		Government-Other political areas	COMMUNITY
I. POLITICAL DECISION	2	1	3
II. PLANNING	1	2	3
III. AREAS LEGALIZATION	3	1	3
IV. URBANIZATION	3	1	2
V. COMMUNITY PREPARATION	2	1	1
VI. COMMUNITY TRAINING	1	-	2
VII. SPECIFIC PROJECTS	1	-	2
VIII. CONSTRUCTION	1	-	2
IX. OPERATION AND MAINTENANCE	1	-	2
X. COMMERCIALIZATION			
(a) registration	1	2	2
(b) tariffs	2	1	3
(c) invoicing	1	-	-
(d) collection	1	-	2
XI. ADMINISTRATION	1	-	2
XII. EVALUATION	2	1	2

Code: (1) Main responsibility - Action/Decision  
 (2) Secondary responsibility - Advice/Participation/Action  
 (3) Complementary responsibility - Advice/Collaboration

## I. POLITICAL DECISION

- (1) The political decision - main action that corresponds to the Political Power: establishes priorities; deliberates about resources and tariff policy.
- (2) Enterprise - technically advises in the decision and in the establishment of priorities; incorporates decisions in its working plan; decides on the completion of resources.
- (3) Community - requests; accepts the decisions; decides the collaboration.

## II. PLANNING

- (1) The main action corresponds to the water utility - which establishes the program of assistance according to the physical conditions in each nucleus and according to the availability of existing installations, and other conditions.
- (2) Other organisms of the Government, especially the social area, with information on the communities, its shortages and availabilities. Prefecture's organisms on road and other public equipment problems.
- (3) The community participates subsidizing according to their needs and collaboration engagements in the execution of the works.

## III. AREAS LEGALIZATION

- (1) The areas' legalization is a competence of the authorities - Government and Municipality. As most of the areas were occupied by invasions, it is totally convenient that the property be legalized:
  - If the occupied lands are public, the government must give the property to the dwellers;
  - If they were private ones, the Government should acquire and transfer the property.

This is important so that the population is not removed and the public facilities are not lost. Furthermore, the property stimulates its owners to invest in improvements, so that the level of the urbanization is improved in the future.

- (2) The community - is the most interested in the process, actively collaborates.
- (3) The enterprise - is informed and may act with more security.

#### IV. URBANIZATION

- (1) Urbanization is a mission of the Municipal Governments (Prefectures). In general, the occupation of those areas do not follow any outline nor alignment, the width of the roads is uneven and are narrow, dwellings are irregular. It is important that the Municipality, with short expenses and works, reduces a little these disparities in order to allow that the sanitation works be executed without great technical problems.
- (2) The community collaborates in the housing reformation with the purpose of contributing to improve the urbanization.
- (3) The enterprise - technically advises in order to obtain the conditions to set up their networks (water and sewerage).

#### V. COMMUNITY PREPARATION

- (1) Both the social and educational areas of the Government and the communities participate in this phase of the process. The communities are educated and motivated to receive the benefits, to take care of the integrity of the systems installed, and to fulfill their obligations with the enterprises, especially payment of the accounts and improvement of its rooms to make possible the installation of sanitary equipment.

In many cases the population participates with its own manpower to reduce costs.

- (2) The enterprise technically advises and follows up the education process.

#### VI. COMMUNITY TRAINING

- (1) The enterprise is responsible for training the community in lining the tubes and the proper use of the inside sanitary equipment of the dwellings.
- (2) The community learns.

#### VII. SPECIFIC PROJECTS

- (1) The enterprise is responsible for elaborating the technical projects to set up the systems.
- (2) The community provides information on the local physical conditions to select the best alternatives.

VIII. CONSTRUCTION

- (1) The enterprises are responsible for the execution of the works.
- (2) The community collaborates with different types of assistance or with their own manpower.

IX. OPERATION AND MAINTENANCE

- (1) Exclusive responsibility of the enterprise.
- (2) The community collaborates.

X. COMMERCIALIZATION

Xa. Registration

- (1) The elaboration of the registers to guarantee an efficient commercialization, must be made by the enterprise.
- (2) Notwithstanding, the other official organisms and the community must participate providing information for a reliable register in these areas.

Xb. Tariffs

- (1) The Government defines the tariff policy.
- (2) The enterprise imputes.
- (3) The community accepts.

Xc. Invoicing

- (1) Corresponds exclusively to the enterprise.

Xd. Collection

- (1) The enterprise collects.
- (2) The community pays.

XI. ADMINISTRATION

- (1) Corresponds to the enterprise.
- (2) The community collaborates - permanent dialogue.

## XII. EVALUATION

- (1) The Political Power evaluates the technical and socio-economical results.

As it has been summarized, it is possible to solve water supply and sewerage problems in low-income populations with an integration of actions and collaborations.

### 9.1.8 CONCLUSIONS AND RECOMMENDATIONS

- . To offer public services to low income populations, is not only a State obligation but also of all the society.
- . It is a right of those populations.
- . It is necessary to reduce the difference between welfare levels among them and the other economical levels.
- . The sanitation institutions, therefore, must always include those areas in the general planning of their activities.
- . A permanent dialogue is important between the sewerage utilities and those communities.
- . The participation of those inhabitants is indispensable in all the stages of those projects.
- . Collection of tariffs for services is indispensable; they feel appraised paying directly their water and sewerage bills.
- . The projects must follow technical criteria - it is neither a matter of improvisation nor enthusiasm;
- . The society participates indirectly, through the differential tariff system.
- . For the sanitation enterprises - it is important to create and develop the future client.





9.2 INSTITUTIONAL AND FINANCIAL ASPECTS OF DRINKING WATER SUPPLY  
AND SANITARY DISPOSAL OF EXCRETA IN URBAN SLUM AREAS

DOCUMENT 2

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The author is the only responsible for the opinions expressed in this paper, and its publication does not necessarily reflect PAHO/WHO viewpoints.

### 9.2.1 INTRODUCTION

The purpose of this document is to contribute to visualize, somehow, proposals related to the solution of problems faced by population living in marginal urban areas. Therefore, I have considered convenient to describe some of my experiences during more than 20 years, related to the permanent treatment provided to the population who is anxious to obtain drinking water services and sanitary disposal of excreta.

In this paper I describe at first the urban marginal areas, which I will call them "low-income neighborhoods" as they are human settlements, in order to avoid terminology which could denote discrimination; describing their organization and the work carried-out by the population aiming at solving their problems.

Next, the institutional aspects are approached emphasizing on public utilities, their organization and work they perform. Then, some financial aspects which necessarily ought to be considered are analyzed.

Finally, I am formulating some statements, as a corollary of all what I have expressed, with the intention, as I said at the beginning, to help solving the problems faced by poor people.

### 9.2.2 URBAN SLUM AREAS - NEIGHBORHOODS FOR LOW-INCOME FAMILIES

It is important that neighborhoods for low-income families of a city be identified together with all the problems, each of them imply; it is necessary to know the origin of these neighborhoods, the treatment provided to them, their development throughout time, until they consolidate and integrate with the city, from an urban, social, economical and political point of view.

In this part we will offer a very wide description of low-income neighborhoods specifically related to urban and development aspects of the city, because we consider them of close relation to drinking water and excreta disposal services.

The urban development of a city in Latin America is a well-known fact, with regard to the emergence of human settlements in the outskirts of the city or to the existence of inhabited blocks in the city. These settlements are usually formed by a population coming from rural areas, thus, clearly tipifying the field to city migration phenomenon. The afore-mentioned migration is generally due to the fact that the land does not offer survival conditions according to what population expects. Such phenomena as droughts, or abundance of rains, or lack of technical and economical aid, do not allow peasants to remain in the land with hope towards a better future, knowing that the city offers them more opportunities and expectations for a job, education, etc. Once the migration of a human group takes place, this attracts others and we face then a continuous flow of settlers from the land towards the city.

Human settlements are generally located on free areas or lands but which do not necessarily offer good conditions or characteristics for their urbanization, because the topography might not facilitate an economically functional urban design and may present serious difficulties for the installation of important services, such as transport, drinking water, excreta disposal, electricity, etc.

A neighborhood with these characteristics offers, in the course of time, serious problems in the design and construction of roads capable of rendering a rational transport; the leveling of lands to make them compatible with the level of transport required, often becomes extremely exaggerated and consequently far from economical. It may be concluded, therefore, that there are also plenty of difficulties for the installation of drinking water pipes and, mainly for those of sewage collection, having to adopt in many cases totally non economical forced solutions.

To sum up, low-income neighborhoods appearing in "difficult areas" bring about forced designs and projects and, consequently, the execution of the works imply investment highly above the normal and demand considerable time and effort.

To channel and orientate the appearance of neighborhoods, the intervention of certain organisms and institutions is required. These must be capable of advising, guiding, supervising and controlling urban development aspects. Very positive experiences have been attained concerning these matters when institutions like the following have taken part:

- . An urban planning and development organism
  - . Local governments and municipalities
  - . Public services institutions
  - . An organized population.
- The urban planning and development organisms are responsible for the technical planning of the city's growth; these are also in charge of permanently maintaining in force the rules for the zonification and definition of use for present and future urban areas. Since a director plan considers the areas of future expansion, also future areas for the settlement of low-income populations must be necessarily identified, in order to prevent new clandestine and inorganic settlements.

On the other hand, this organization must be the one that technically guides and advises the new settlements when these appear or are beginning to settle down; while in the case of existing neighborhoods qualified as irregular, studies and projects must be provided to them for urban remodelling and improvement. In some extreme cases it is even more convenient to decide transferring the settlement to a more convenient or appropriate area.

- Local governments or municipalities will be in charge of permanently controlling the execution of the works with regards to their quality and coincidence with the designs, and will be obliged to provide them technical advice and assistance. The execution of the design of roads, location of recreational areas, and green belts as well as the execution of pavement works, sidewalks, lighting, and so on, are to be controlled by these organisms.
- Public service institutions are responsible for satisfying the demand of the population concerning services such as electrical energy, telephones, drinking water, excreta disposal, cleaning, etc. Therefore, they must maintain in force their plans and programs in accordance with the urban development of the city; thus, the master plans of the services that each organism provides must be in line with the director plans of the cities. At the same time, the administration of services must consider the growth of the demand.
- The organized population of low-income neighborhoods plays a very important role in the planning and execution of every work implying the urban development of the areas where these neighborhoods settle down. This is why I present it separately, considering this a special experience.

### 9.2.3 ORGANIZED POPULATION

After having previously dealt with the emergence of low-income neighborhoods, we must consider in this chapter the role that the settled population plays, together with its organization. The best way to achieve this, I think, is to describe an interesting experience about the topic, and then state some concepts that might be taken into account.

The analysis of the population already settled in a popular urbanization shows a very complex situation, since the social, cultural, economical, political, etc., aspects make more difficult to achieve an homogeneous action. It is therefore necessary a very patient and intensive education, with the purpose of grouping the population according to very clear and definite objectives and, for certain common interest. The work of educators and/or social promoters is required at this stage to awake the interest and encourage the population on the attainment of drinking water and excreta disposal services.

I have had the opportunity to notice that when dealing with this topic, the entire population has grouped with a view to obtain health and life for each one of its members, setting aside any difference between them. I specially consider that there is no better motivation than the just mentioned services.

After providing them the necessary support and advice when evening meetings took place, or on Sundays or holidays, a central board, formed by eight to ten members under the authority of a Secretary-General was appointed through voting. This organization was adopted by all low-income neighborhoods. After approximately two or three years, a great association of low-income neighborhoods was formed because of the existence of a considerable number of central boards. This was an important organization officially recognized. Such organization, grouped a population representing 40.7% of the overall population of the city, and was under the leadership of a Secretary-General and ten members elected by all the central boards.

Over the years, the "association of low-income neighborhoods" was able to build its own premises, with facilities that made possible dissertations on various projects of interest to all or some of the neighborhoods.

In this way, since 1965 it was possible to maintain a permanent contact and dialogue both, with the boards and with the population of each neighborhood. We could notice that when they were kept informed about drinking water supply and excreta disposal, designs, surveys, budgets, financing options, and so on, we could find in them an excellent and positive attitude, a desire for help and a total participation in each and every phase of the projects.

The high degree of consciousness and identification with the solution of the problems achieved, resulted in the establishment of standards for the direct participation of the population, both in the financing and in the execution of the works. The social sense of the population was developed to such an extent that they created a special fund to look after the economical obligations of the widows and the invalids.

Each group or neighborhood programmed and executed various social activities aiming at collecting resources to attend the economical obligations of each project. These funds were deposited in savings accounts. In this way, besides participating in social activities, each family had to deposit every month a fixed amount in the savings account, to increase the economical participation of the population so that the demand for financial resources be smaller and consequently reduce interests for the benefit of the work.

Another very important aspect of the group is the voluntary determination coordinated with public services' organizations, to supply 100% of common manpower. In the particular case of drinking water and sewerage works, the population undertook the tasks of digging trenches to install drinking water and sewage pipelines. They were also in charge of filling the trenches once the lines were installed and revised. A similar task of digging and filling trenches was performed for the installation of domiciliary connections.

Now, let us see how all this work was organized. First, the enterprise that provides these services coordinated with the central board the execution of the works, then planned its initiation, as well as the stages the work would comprise, the roads or arteries in which the works were to begin, etc. The professionals and team of technicians that would be in charge of the technical aspects, design of trenches, control and inspection of the works, installation of materials, control of the filling of trenches and tests were appointed. On the other hand, the central committee, together with the technical management of the work and the population of the urbanization, appointed the committees and subcommittees for the control of the communal work. The same procedure was followed for each road or artery, so that every neighbor was responsible for the manpower works along the façade of his property, collaborating and coordinating with the neighbor located in front of his house or lot.

The success of the planning and execution of the works has been due to mutual confidence, credibility and comradeship of the population and the advisers, technicians and specialized personnel, because all of them needed to be identified with the objectives to be attained.

The participation in the works of an organized population in the opening and filling of trenches, both for water distribution and sewage collection pipelines, as well as for the domiciliary connections, has meant a 30% to 35% saving in the total budget of the work, in the cases of normal land conditions and characteristics.

Furthermore, the creation of a common fund (saved economical resources) has made possible the contribution of a down payment at the beginning of the works to finance the acquisition of materials and the work of specialized manpower. The acquisition of materials was made directly from the factories, thus obtaining important discounts which permanently safeguarded the neighbor's economy.

So far, I have wished to show the important participation of the population when it is guided with faith, good will, truth and, above all, confidence on the part of those who, like us, are committed in one way or other to obtain health and life for those whom our organizations serve.

This singular experience in obtaining drinking water and waste disposal services, in the afore-mentioned case, served as an example for other projects to receive the same treatment, such as electrification, asphalt pavement, sidewalks, etc. Then the neighborhood was no longer considered as such because of its urban and functional integration to the city.

I would not like to finish with this topic, knowing that many people would think that what I have explained is an ideal case where people have shown a special disposition for the achievement of their objectives and, that they had no problems. I must point out that this has not been the case. In this type of task, we shall always face problems: very poor and unemployed people, without resources or a job,

very difficult, incredulous, people who behave reluctantly and are negative toward the objectives we seek. However, all obstacles are overcome when we demonstrate everyone the convenience and feasibility of the projects, when we involve their participation and share with them the success of a mission. I think that because of this, the success so far achieved is the award to those who worked with faith and total devotion.

#### 9.2.4 INSTITUTIONS FOR DRINKING WATER AND EXCRETA DISPOSAL SERVICES

In this chapter we shall refer in general terms to the permanent objective the organizations and institutions for drinking water and excreta disposal services have under their responsibility.

First of all, we must differ two types of users, the one who lives in the country side and the one who lives in the city. According to this fact, the institutional organization adopts certain special characteristics.

For the provision and administration of services in rural areas, organisms adopt certain forms as follows:

(a) Local boards

These are communal or neighboring organizations in charge of the provision of services to very small populations, particularly rural ones. Experience shows that these organizations lack of a proper technical qualification to adequately perform their mission. They do not receive opportune advice, and the administration of the services faces numerous problems. Thus, in the course of time, the deterioration of the sanitary infrastructure and the lack of a technical operation, maintenance, repairing or renewal of the equipment are noticed, resulting in a problem for the government.

(b) Private enterprises

This type of organization of private ownership, is generally present where drinking water and excreta disposal services are provided, in industrial, oil or mining areas, where either the same industrial enterprise or a dealer, takes care of the operation, maintenance and administration of the services, which are entirely financed by the industrial firm.

In these cases, it has been observed that the quality of the services is relatively good and that, mainly, there are no significant difficulties.

In urban areas different problems of varying magnitude are faced, depending on the size of the city, total population, unserved population, type of water and excreta disposal technical systems, age of



the sanitary infrastructure, etc. In many cases the appearance or seriousness of the problems faced by some cities concerning these services, has motivated the organization in charge of them to undergo changes, modifications, or even to transform itself into another type of organization, so as to give a more successful attention.

Among some forms of organizations or institutions in charge of drinking water and excreta disposal services we can mention the following:

(a) State-run organisms

Defined as state-run entities (central government). All their activities related to the provision of services to the community follow rules and procedures established under a completely bureaucratic system, which permanently controls their actions. Usually, these organizations were established in the capitals of the countries, with regional, state or municipal branch offices.

(b) Municipal organizations

Entities directly depending on local governments. Their organization and fulfillment of responsibilities are framed into the organizational scheme of the local or municipal government and do not have independence nor administrative or economical autonomy from the rest of the municipal organization. Like the state-run organizations, their activities correspond to the bureaucratic system, and consequently numerous difficulties are faced in providing the services up to the expected levels.

(c) Public utilities

For some years, some Latin American countries have succeeded in clearly defining the inclusion of drinking water and excreta disposal services in the government's activity. These organisms, however, due to various considerations, may juridically adopt a certain type of nature: private or public organisms, joint ventures, or others. Regardless the form they adopt, it can be observed that in Latin America, there are organisms which have attained very positive and successful goals, as the cases of Brazil, Colombia, Chile, etc. Nevertheless, we must be sincere in pointing out the various problems these public utilities confront related to their organization and operation, as well as to their efficiency. I consider that in some countries these public utilities are not properly identified and maintained, as both their formal organization and their operational and hierarchic organization do not reach the stability levels to ensure a necessary continuity, which is an important aspect for the attainment of public interest goals.

#### 9.2.5 PUBLIC UTILITY ORGANIZATION

I consider important to refer in this part to some important concepts which identify a public organism providing drinking water and

excreta disposal services; with a view of explaining its characteristics and organization and then analyze its actions directed toward the neighborhoods.

A public utility is created with the basic objective of providing drinking water and excreta disposal services to a population which is generally insufficiently served or that the quality of the service is not the desired. Therefore, the organism is given the task of developing, controlling, operating and maintaining such services. Specific duties are assigned for this purpose in the planning, programming, financing, ruling and formulation of projects, execution of works, advisory and technical assistance aspects.

In order that the public utility carries out all these duties, they have the faculty of establishing and enforcing up-to-date rules and rates for the services it provides. Finally, to ensure the success of its actions, technical, administrative, economical and financial autonomy is given.

In short, all the faculties for an efficient accomplishment of their duties are granted to the utility organization, having to emphasize the autonomy it has to precisely differentiate this entity from the classic bureaucratic state administration.

This type of organisms normally present the following areas in their structural organization:

(a) Planning

The studies and projects that make possible the production of short, medium and long term plans are formulated in this area. Because of the information it has, it supplies all the documentary basis for the preparation of master plans. Its participation is also important in the institutional development plans.

(b) Operations

This area is in charge of carrying out all the works related to the production and drinking water treatment, its distribution and sewage collection and, finally, the execution and maintenance of domiciliary connections, including the consumption gauge. This area is also in charge of the wastewater disposal and treatment.

(c) Technical

It is the area in which engineering projects and designs are elaborated, the works are supervised and executed; it is also in charge of the reception of works executed by private individuals.

This area has a direct relation with the solution of the problems faced by neighborhoods because of the nature of its duties.

There must be a special organization in this area that only dedicates to this type of organizations.

(d) Commercial

Is the area through which the public utility gets in touch with the users, the services the organization provides are appointed, a register of all the services is maintained, the billing for the services are issued, all the collections are controlled, and a permanent coordination and information concerning metering and registration updating is maintained with the computer center or the information area.

(e) General administration

All actions related to materials and human resources administration are developed through this area. It also maintains under operation all the services required by the different areas of the organism. This area is very important because the supply of the requisitions must be made in due time and must provide quality and economical products. Therefore, its management requires all the necessary techniques, as well as the observance of clear regulation and control standards.

(f) Financial

All the administrative work concerning economical resources is carried out in this area: accounts of the operations are kept and financial studies are formulated to ensure not only the administrative operation of the organization, but also the execution of the various investment projects, even including the administration of resources derived from the internal and external debts the organism might have incurred.

In many cases, like in investment projects of singular importance, the creation and organization of a special area is determined to be integrally in charge of this type of projects, which generally maintain a special financial status in line with the contractual commitments agreed with financial entities.

Another particular important aspect in the operation of this area refers to the studies and analysis of rate structures, for the services provided by the organization, so that it can be possible to maintain updated the production costs of the services and consequently the rate structures.

To this point we have referred in general terms to the structural organization of the public utility, describing its functional areas; however, we must mention the head of the organization, the general management, and while doing so, we must conclude that it depends on the identification and planning the governmental sectors or the government consider or determine. In Latin America there are numerous

and different cases of completely autonomous enterprises which belong or are the state property, and maintain a functional relation with a determined government sector or power; there are still other enterprises which are autonomous but they are constituent parts of a "holding" of a parent enterprise; no matter how much other enterprises may provide different types of services, they are related to and are centralized in a governmental entity; in short, we can find a series of types, in which enterprises have been organized with a specific purpose, according to the reality and special characteristics of each country.

The general management is defined in many cases as a stock-holders' board, like a commercial society. Next, at another level, a board of directors and a managerial body are defined. Normally, designations have political connotation and represent different government sectors; it can be observed that these members are frequently replaced in many countries interfering with the continuity of the enterprise, not only in its actions but also in its planning. This aspect is very important because it basically means the policy with which every government plans to solve the problems of the services provided to the population.

As a reference, I can say with honor and pleasure that I was present during the institutional life of a public utility which since its creation in 1961, has had only six boards of directors and five managers, and that in all its existence it became a self-managed and self-financed enterprise, which attained year by year a bigger coverage of its services and succeeded likewise in providing services not only to the city where it was located, but also to all the provinces under its jurisdiction.

The fundamental factors which explain these successes are: mystic, disinterested and sound devotion from its directors to its workers; appropriate administrative management, without any type of foreign influences; a high degree of morality, honesty and service; a properly studied, rational and technical organization, with all the elements for evaluation and control. Special mention must be made of the great stability reached by its staff, thus making possible training to acquire the necessary specialization degree; permanent improvement and training programs, including special programs for staff and management levels.

All these factors have enabled this enterprise to have a new drinking water and excreta disposal master plan since 1983; to obtain since 1967 a metering of 97% in the capital of the country and of 90% in other provinces; to apply differential rates with a sound social sense and justice which enables it to generate economical resources to support the cost of expansion and master plan works. All these activities will result, in the near future, in the provision of services to a bigger population, which needs more and is the one that has lesser economical resources.

## 9.2.6 RELATIONS BETWEEN THE PUBLIC UTILITY AND THE NEIGHBORHOOD

In order to develop this topic, it is convenient to know about the problems the neighborhoods confront towards the enterprises or entities in charge of drinking water and excreta disposal services.

Neighborhoods present the following situation:

- They may either have or not have topographical maps of the land they occupy.
- They may either have or not have urban projects, along with sanitary and electrical facilities' projects.
- Once they have the sanitary facilities' projects, they need to have them budgeted and analyzed with priorities concerning the execution of works or the phases that might be considered in the construction.
- The participation of the population is studied, given advice and organized.
- The economical and financial aspects are analyzed and evaluated to obtain the most adequate and advantageous financial resources.
- They have to make all types of actions to obtain the revision, study and approval of all their dossiers by different entities and institutions.
- They require assistance to hire services, to obtain easy terms of payment compatible with the economical reality, as well as to apply rates that are in line with their facilities' levels.

From this general report it can be observed that the population living in neighborhoods need a permanent assistance, from the moment they begin to physically settle until the moment they reach normal urban levels. In the first place, they need help to organize themselves and to find the solution to their problems, undertaking the necessary actions with effort and realism and, above all, with their total participation.

Let us see what public utilities offer to attend the requests concerning drinking water and excreta disposal services:

The attention these urbanization might receive depends on the organization the enterprise has for this purpose; therefore, they can receive orientation or help to direct people in their efforts or, otherwise, they can be subject to a very specialized treatment.

- (a) There are enterprises which have an office in the place for the attention of these cases, which know the problem the

urbanization confronts, orient their leaders towards the attainment of drinking water and excreta disposal designs or projects. In case these are prepared by private individuals, they must be revised and approved by the enterprise.

Cost is an important factor for the execution of the works, so it depends on the efforts their leaders make towards obtaining funds from any financial entity, and if these efforts are successful, the enterprise only provides inspection and control, at a certain cost. After the execution of works the provision of services is limited only to those who can subscribe their respective service contracts, with a series of limitations.

As can be understood, this is a distressing, expensive and prolonged treatment, and frequently lasts many years. This causes exasperation and deception of the settlers which, far from collaborating, react in a negative way to leaders, officials and government in general.

- (b) But many enterprises have within their organization special areas to assist in the problems that neighborhoods confront; these areas are properly provided with multidisciplinary technical and professional personnel, not only capable of meeting the challenge that the execution of these actions imply, but also to obtaining the provision of these services.

Leaders receive assistance in the enterprises to obtain legal technical documents of the areas where they are settled, all along until the inauguration of their services, passing through processes such as:

- . Formulation of studies, designs and projects, using a technology according to the economy.
- . Feasibility study on the provision of services which analyzes the works of existing macrosystems or of those that should be implemented, defines which systems must be executed by the enterprise, without cost for those concerned, and which systems must be executed with financial participation of the settlers.
- . Formulation of budgets that allow the works' execution, supervising the system that is to be appropriately chosen for that effect, and taking into account the active participation of the population.
- . Direct actions to obtain the works' financing by formulating the feasibility studies required and by trying all the time to get the best conditions for the benefited population.

- . Detailed organization of the population to involve their participation, both in the works' execution, and in the approval of the various steps it may comprise, by formulating the necessary socio-economical studies that will ensure the success of the economical and financial operations.
- . Analysis of the different factors which finally determine the application of a new rate structure, evaluating the existing one and defining the one which has to be implemented.

The description given in general terms shows the kind of treatment the population of neighborhoods might receive in their permanent peregrination to obtain from a lot in which to build their house up to the moment they obtain all the necessary services to ensure their survival within certain parameters of safety and dignity.

#### 9.2.7 FINANCIAL ASPECTS

Every task that is to be carried out in the field of drinking water and excreta disposal services has a cost, but unfortunately all the efforts of the ones who work in the enterprises are not enough and prove useless to obtain the studies, projects and works that are needed to attend a population lacking these services.

Moreover, the entities in charge of these services cannot generate their own resources, or maybe these can be very short, difficulting or making impossible the adoption of accelerated measure to enable the implementation of the necessary infrastructure in order to meet the neighborhoods' demands. Likewise, population growth as well as the environmental pollution, require solutions in the short term.

Nowadays that Latin America confronts a real economical crisis, it is not easy for the governments of the different countries to obtain the necessary resources to pay not only the obligations, but also to afford health and life to a population that urgently requires the most basic needs to survive.

It is for this reason that we require more than ever the participation of the financial entities. A differentiation and priority of the project's nature should be made in order that these entities accept the various enterprises, entities, organisms and governments' request for funding, to make possible the provision of the vital services afore-mentioned. A favorable assistance must not only be implemented, but the interest rates which should define this type of projects must be given special consideration, trying to establish a differential rate to burden these projects the least possible, as well as to extend the longest terms possible.

It should also be considered that financial institutions strengthen their attention towards needed populations, in order that they may be benefited with non reimbursable technical assistance programs. This will alleviate the heavy economical burden the installation of these services represent.

As for these financial aspects, each country must obtain internally an organization of their economical systems to facilitate the optimal use of foreign resources, in order not to over-rate such a resource with the circulation of credit actions and decisions that is being given through different state institutions.

#### 9.2.8 FINAL CONSIDERATIONS

From what has been mentioned all along this paper concerning the provision of drinking water and excreta disposal services to neighborhoods, it can be concluded without fear of mistake that this is a complex, difficult and urgent problem, and that governments, as well as international, financial and national organisms are all engaged in this challenge together with every human being who understands and appraises human needs.

In view of the magnitude of this problem, I consider that all entities whose mission is to provide these services must very carefully revise their organization and try their best to establish a multi-disciplinary "special area" to provide the proper and opportune assistance for the solution of the problems neighborhoods confront. The authorities of these organisms must put special emphasis on the "institutional development" enabling the organization to face all the tasks which today's world demands.

Finally, I consider that the problems confronted by the neighborhoods' population are so complex and diverse, that the attention and solution of each of them require a special channeling which must be treated in different sectors of the governmental organization. Therefore, in order to avoid duplicity of efforts and that bureaucracy is minimized, the creation of a "national entity" could be considered with the exclusive task of attending to the neighborhood's different problems from the moment they appear until they consolidate and integrate with the city.

The organization this organism can be given depends on its multisectorial nature and on its national, regional, departmental or state jurisdiction.

Lastly, I wish to express my sincere gratitude to the Pan American Health Organization for having given me the honor and the opportunity to express in this paper some experiences and to state some personal opinions.



10. CASE: WATER FOR PERIPHERAL URBAN  
DISTRICTS IN GRANADA



I. PROFILE OF THE CITY

Granada now has a population of about five million inhabitants, which is expected to grow to 10 million by the year 2000. The room for urban growth to house this additional population is restricted by the steep mountains of the region and its narrow valleys, creeks and adjacent desert plains.

The city is spread out over the valleys of three rivers, covering all of the lowland in the valley of the principal watercourse, the El Taro river, where the city was founded, and part of the valleys of the other two rivers to the north and south. During the three months of the year when these rivers become torrential, they give passage to an abundance of water, but during the rest of the year their discharge is considerably lower. The combined discharge of the three rivers is as low as 20 m<sup>3</sup>/sec and as high as 200 m<sup>3</sup>/sec.

Temperatures range between 14°C in winter and 27°C in summer. There is practically no rainfall in the region. Sixty percent of the population may be rated as "low-income". Part of this population sector lives in relatively densely inhabited "barrios" on the periphery of the central urban area, and officially known as "barriadas". In addition, an estimated 13% of the population lives in overcrowded "tugurios" or slums - ruinous structures in the downtown quarter of the city with substandard sanitation.

The urban population totals 4,900,000 inhabitants, of which 1,543,500 (31.5%) live in peripheral "barrios" and 637,000 in downtown slums.

The population of the peripheral "barrios" has grown as follows since 1956:

<u>Year</u>	<u>Population</u>	<u>% of Total Population</u>
1956	119,836	9%
1959	236,716	14%
1961	316,829	17%
1970	761,755	26%
1973	1'255,000	35%
1979	1'468,657	32%
1981	1'524,838	32%
1982	1'543,500	31.5%

It may be said that 40% of the population in these "barrios" is under 14 years of age, the median age being 18.6 years compared with 20.19 years in the central urban area.

According to census data, the family averages 6.19 persons and the number of homes per housing unit is 1.046. Only 30% of the families have come from towns.

The age of the head of the family averages 43.8 years in the peripheral "barrios" against 40.19 in the central urban area, and the average age of the other family members in the barrios is 13.16 years.

The occupations of family units and family heads in this population are as follows:

	<u>Family Unit</u>	<u>Family Head</u>
Employed	24.9%	87.5%
Retired	0.9	4.8
Neither studying nor employed	36.0	2.7
Studying and employed	1.8	2.1
Looking for employment	1.3	1.8
Studying	34.6	0.3
Studying and looking for employment	0.5	0.3

The principal occupations of this population are, in percentages, as follows:

	<u>Family Unit</u>	<u>Family Head</u>
Members of technical professions	8.1	8.7
Managers and administrators	0.4	0.7
Office employees	10.9	10.0
Salesmen	19.9	18.8
Crops and animal production	2.7	2.6
Miners	0.8	1.1
Manual crafts and machine operators	37.5	38.4
Workers and day laborers	3.3	2.2
Drivers	6.6	9.1
In public services	5.1	5.6
In domestic service	2.8	1.4
Undetermined	1.9	1.9

In the order of preferences for facilities to be provided in the home, an installation for drinking water ranks second, as can be seen:

Fencing off the plot	78.2%	need of private property
Water	76.1	subsistence
Drainage	67.5	sanitation
Kitchen	50.2	"
Toilet	50.1	"
Shower	48.6	"

The population in the year 2000 was estimated by ranking the different parts of the city in three classes as of slow growth (1-2% a year) in areas already developed, and rapid growth (3-4% a year) in areas partially developed, and rapid growth (5-7% a year) in the new development areas in the peripheral barrios.

The drinking water supply and sewerage services in the city of Granada are run by the Empresa Administradora de Agua y Alcantarillado (EAA), which draws drinking water from aquifers through 250 pumping stations and from the surface waters of the Taro river, which are first treated in the EAA's facilities. This supply is provided at the rate of about 7 m<sup>3</sup>/sec from the aquifers and 15 m<sup>3</sup>/sec from the surface sources.

The water mains run from the treatment plant to the central urban area, which cover 25,000 hectares. Much of the urban population lies without the area served by that distribution system, and is provided with water from aquifers, which may hence be regarded as the principal source for the development of future water supply services.

Water losses from the distribution system are estimated at 20% of the total supply.

There are altogether 500,000 house connections, 120,000 of them metered. Billing is based on meter readings or on minimum consumption in a sector based on its income level, the lowest rate being applied in the peripheral barrios, where it is subsidized.

It is known that many connections, serving about 10% of the population, are unreported.

The sewerage system operates by gravity almost throughout, and some lines are overloaded, while most are underused. On the average, the sewer mains are operating at only 35% of their rated capacity. Many of the barrios have no main collector sewers.

Sewage is discharged into the sea untreated, and the construction of underwater emitters is envisaged in the near future. Part of the sewage is treated for use in irrigation.

The piped drinking water supply does not extend to the peripheral barrios, which are provided with water by means of tank trucks that are filled from EAA hydrants. This service is inadequate for the following reasons:

1. The tanks on the trucks are not disinfected and no public health regulation is enforced in regard to the quality of the water.
2. The users of this water pay almost ten times the EAA's minimum rate.
3. The water is stored in households in unsanitary containers.

There are at present 229 tank trucks supplying 15% of the population of Granada.

The principal sources of income for the population of the peripheral barrios are estimated as follows:

Wage of salary	70%	Help from one's family	0.4%
Sales	17%	Help from others	0.7%
Services	8.1%	Lodgers	0.2%
Pensions	3.2%	Interests/Dividends	0.4%

The income distribution pattern, in terms of aggregate monthly family income, is as follows:

Up to	US\$ 75	8.8%
From 76 to	" 100	12.9%
From 101 to	" 125	16.1%
From 126 to	" 150	16.6%
From 151 to	" 179	10.1%
From 180 to	" 200	10.6%
From 201 to	" 225	7.3%
From 226 to	" 250	6.4%
From 251 to	" 300	5.7%
From 301 to	" 350	2.0%
From 351 to	" 400	1.4%
From 401 to	" 450	0.8%
From 451 to	" 500	0.7%
From 501 to	" 625	0.4%
Over 625		0.2%

The average income is estimated at US\$165 in the barrios and at US\$213 in the central area of Granada; that is, the average income in the barrios is 77% of the income in the central area.

The disposition of the family income is estimated to be as follows:

Food	58%
Transportation	7%
Lighting	1.3%
Water consumption	2.2%
Debt amortization	22.3%
Others	9.2%

Fifty-two percent of the families do not save, and 48% of them do so in the following institutions:

Cooperatives	15.9%
Banks	14.3%
At home	12.5%
In mutual aid societies	4.2%
In materials	0.7%
In savings banks	0.4%

The family savings average about US\$16 a month.

## II. THE FUNCTION OF THE PUBLIC SECTOR

The Ministries of Health and Public Works and the Agency for the Promotion of and Support to community efforts are the central government authorities that chart the policies on sanitation, which are as follows:

- (a) To advance environmental sanitation (water supply and sewerage) programs chiefly in the countryside.
- (b) To provide water supply and sewerage services for as much as possible of the country's urban population in the present decade (a coverage of 85% of the population is hoped for).
- (c) The improvement of living conditions in the peripheral communities by installing drinking water supply and sewerage networks and connections, for which the Banca Nacional, a government agency provides financing on soft terms, and the provision of technical guidance to the population with the participation of the community support agency and the authority administering the services.
- (d) Encouragement to communities to design works for themselves and to provide labor and other resources for their execution.
- (e) The promotion and intensification of participation by towns, communities and similar population groups in the execution of development projects.
- (f) Encouragement to and coordination and analysis of the contribution of the domestic and international private sector to the agency for the support of community efforts.

## III. NEW APPROACHES

With a view to extending the coverage of services to the peripheral barrios as quickly as possible, in 1980 the EAA designed a program of works to serve 350,000 people, for which an international bank was to finance 35% of the total cost. Unfortunately, that financing program took a relatively long time (18 months) to materialize, in addition to which the counterpart contribution for 65% of that cost had to be generated by the EAA out of internal resources. However, owing to the dilatory approval of smaller rate increases than were needed, the Banca Nacional was turned to for additional financing for 35% of the

total cost with the prospective beneficiaries of the works as the borrowers; this was accomplished.

Armed with this funding, the works were put up for international competitive bidding, so required by the international banks, in a process that took an average of six months, and this time was protracted further when claims were filed by bidders.

At the same time, while the international financing was being arranged for, the population waited impatiently for the works to be executed and complained frequently to the public agencies and the Central Government. As a result, different institutions drew up programs for execution of the works with EAA support, and up to five working arrangements were presented; these were put into practice on the basic condition that the community was to take an active hand in the execution of the works (see Table 1).

The table on the following page illustrates the success of the community orientation programs in encouraging communities to acquire drinking water supply and sewerage installations by their own efforts.

#### IV. DESCRIPTION OF THE PERIPHERAL BARRIO "LAS TOTORITAS"

- (a) The "Las Totoritas" quarter covers part of the western slope in the upper reach of the Bonao creek east of the city of Granada. This tract has an area of 2,500 hectares, is 12 Km long, and is widest - 3 Km wide - where the creek empties into the El Taro river. The population of this tract is expected to reach 500,000 inhabitants when the saturation point is reached.

The part of the Bonao tract that is suitable for urban development lies between the elevations of 190 and 400 meters above sea level; the soil is alluvial, with interspersed clay beds. Up to 30 years ago this tract was farmed, and almost 60% of the total area was cultivated up to the level of 225 m.a.s.l., which allowed a gravity canal to be run out from the Taro river. With the advance of urbanization the use of the land changed, and all cultivation came to an end.

The plan for the supply of drinking water to the new makeshift housing structures in the Bonao tract called for the use of groundwater. The rapid growth of the urbanized area and the consequent loss of recharge to the aquifer as irrigation declined has substantially lowered the water table, and the further sinking of wells has been prohibited in the area.

There are at present more than 25 wells with an average discharge of 1 m<sup>3</sup>/sec, enough to supply 250,000 people with 250 liters per person/day. These wells are in the lower and



TABLE 1

Arrangement Source of financing	Contribution	Total Program	Completed or in execution	Cost per family	Works executed by
<u>Institutional Program</u> International banks Banco Nacional EEA Internal funds		350,000 Inh.	70,000 Inh.		Contracting firm
<u>WUSC Program</u> Grant from foreign institution Savings of local inhabitants EAA Internal funds		20,000 Inh.	20,000 Inh.		EAA technical supervision and Comunal Labor
<u>Community Aid Program</u> Banca Nacional Communal Aid Agency		50,000 Inh. (1 year)	50,000 Inh. 95% advanced)		EAA technical supervision and Communal Labor
<u>Technical Assistance Program</u> Savings of beneficiaries EAA Internal Funds		5,000 Inh. (1 year)	5,000 Inh. (60% advanced)		
<u>Program of Local Banks</u> Banco Nacional		15,000 Inh. (1 year)	15,000 Inh. (60% advanced)		Contracting Firm

- (1) Includes 6.5% charged by EAA for Technical Supervision.  
(2) Loans to local beneficiaries.  
(3) Loan to EAA - (4) (not recovered from local beneficiaries).  
(\*) Refers to average physical advancement of all works under the program.

middle reaches of the Bonao tract, precisely in the area that had been farmed and is today urban.

To supply water to the upper end of the tract, the EAA, following the guidelines of the master plan, planned, designed and built an offtake for surface water treated at the purification plant; the location of this plant at the 240-meter elevation necessitated the design of pumping stations in series to lift water, in the first stage, at a rate of 200 l/sec in order to provide a supply of 150 l/sec to 88,000 inhabitants of peripheral barrios. At present this system feeds hydrants in the same barrio, from which tank trucks are filled.

The canyon's sewer system functions entirely by gravity, and its discharge capacity is limited to 940 l/sec. At the lower end of the canyon a 1.60-meter diameter collector sewer runs parallel to the river; it was built to handle all the drainage descending from the tract when the population reaches the saturation point. It now receives the discharge from four provisional collectors which were installed without any regard for the overall plan when the settlement was growing. These collectors receive the drainage from the low and middle reaches of the tract.

For the years 1985 and 1986 the EAA proposes to install a main collector for the entire tract to intercept the provisional collectors and receive the discharge from the upper area. This main would have diameters ranging between 0.60 and 1.60 m, and be 10 Km long.

Although the drainage capacity of the present sewer system is 940 l/sec, it has been determined on the ground that an additional 36 l/sec (the equivalent of a population of 9,100 inhabitants of peripheral barrios) could be discharged from the upper area.

The refuse collection service is run by the District Municipality, and garbage trucks are sent out twice a week. The refuse is dumped in sanitary landfills under the administration of the Metropolitan Municipality, 20 Km away. There are few private and large numbers of public telephones. Most of the public transportation in the tract moves over a paved thoroughfare recently laid down throughout its length.

The electric power service is efficient, and an estimated 95% of the population enjoys this service in their homes.

There are several health centers and policlinics, but no hospitals.

(b) The "Las Totoritas" quarter has 42,000 inhabitants living in six sectors, each of about 7,000 inhabitants, and designated A,

B, C, D, E and F. Ten years ago the present inhabitants of the barrio invaded and occupied a tract of land near the El Taro river that had been set aside as a park, and the government compelled them to move to idle government lands in the upper reaches of the Ronao creek. For purposes of this relocation, the land was divided into lots by the competent authorities. This was how the park area called for in the Granada master plan was kept intact. The invasion had followed in the wake of an earthquake that had destroyed the settlers' homes in a blighted downtown area.

The age of the settlers does not differ substantially from the average age found in the peripheral barrios of Granada. The growth rate of the population is estimated at about 5% a year. There are 10,000 lots with shelters of any kind built on them, and the population is expected to reach 70,000 inhabitants in 10 years, 87,000 by 1999, and 111,000 by the year 2004 at that growth rate. It is assumed that part of the population would move out and settle on the high ground surrounding the barrio, as usually happens in settlements of this kind.

(c) Socio-cultural and economic conditions

- The homes have been constructed of conventional materials, predominantly brick, and most (60%) of them are half built. There are four to eight persons per home.
- The living standard of a minority of the inhabitants is relatively modest, and the majority lead a hand-to-mouth existence.
- The levels of education, occupations, employment, underemployment and unemployment are the same as those indicated for the general run of peripheral settlements in the area.
- There are no reliable data on the health situation in this particular case. However, fragmentary information indicates that the sanitary conditions leave much to be desired, and the result is large numbers of cases of water-borne diseases.
- The community is organized on the basis of directives dating back to 1971 and issued by the central government of the time through neighborhood committees and governing boards. These committees and boards have to meet certain requirements for official recognition by the competent communal authority as qualified to act on behalf of the settlers. They are organized on the following basis:
  - (1) The neighborhood committee is usually made up of the inhabitants of a block (manzana); and

(2) A number (10 to 15) of blocks constitute a group. Finally, from a meeting of the leaders of the group there emerges the central governing board, which represents the community as a whole. In some cases the groups cooperate with one another, but there are those who, with some frequency, opposed the taking of decisions, though they do not represent the majority view.

- The economic (commercial and industrial) activities pursued in the settlement are similar to those described in the previous chapter.

(d) Institutions in the sector:

- The EAA, or Empresa Administradora de Agua Potable y Alcantarillado of Granada, is responsible for the present and future infrastructure of the drinking water supply and sewerage service. It is a national public enterprise attached to the Ministry of Housing. It receives no money from the public treasury, and its sole source of funds is its rate schedule, which is approved by the central government. The purpose of the EAA is to design, build, enlarge and operate the drinking water supply and sewerage services of the city of Granada; it is technically, administratively, economically and financially autonomous.
- The Granada Municipal Government administers the hydrants installed by the EAA for filling the tank trucks, and also organizes the peripheral settlements, whose urban status it regulates by declaring them renewed, renewable or subject to demolition.
- The Ministry of Public Works administers the drinking water supply and drainage systems throughout the country, and determines the general policy for the development of urban services.
- The WUSC is a foreign agency that does social welfare work, provides technical and economic cooperation in the sanitation field, and engages in related activities.
- The Banca Nacional, a government agency for promotion of the housing sector, makes preferential loans for the execution of sanitation works.
- The EAA serves as coordinator with the aforementioned agencies. Cooperation is close and its results encouraging.
- The Servicio de Electricidad is an agency of the public energy sector with some private stockholders. At the present time, about 95% of the inhabitants of the peripheral "barrios" enjoy electric power in their homes.

- The electric power rate is about five times higher than the rates for drinking water and sewer service.
- The cost of the distribution networks in the peripheral barrios is estimated at 30% of the total cost of the drinking water supply and sewerage systems.
- For the execution of its infrastructure works the Servicio Eléctrico resorts to the Banca Nacional so that, once the indebtedness of the beneficiaries in the "barrios" has been arranged, the works can be executed by contractors without any public bidding being done.

(e) The present drinking water supply and sewage disposal situation:

The community receives its water in tank trucks filled at the hydrants. The water is stored in 50-gallon cylinders, and usually lasts for two days. Per capita consumption is estimated at 20 l/day.

The hydrants are located very close to the "barrio" - about 2 Km from the southern area. A truck can carry 6 m<sup>3</sup> of water, and makes six trips a day.

Water is also stored in 1-m<sup>3</sup> masonry tanks built at the entrances to homes.

The stored water does not meet the minimum standards of potability; it is potable as it comes out of the EAA's hydrant, but is contaminated in transit and handling.

- Sewage is removed through open ditches and cesspools; this works well because the soils in the area easily absorb the fluids.
- Garbage is collected twice a week and dumped in sanitary landfills by trucks of the Municipal Government.
- Drinking water supply and sewerage services are regarded as a felt need by the community, which is pressing its leaders to have the communal authorities and the EAA include them in sanitary works programs.

(f) General mortality

In the twelve years from 1970 to 1981 general mortality in the peripheral settlements has remained essentially unchanged at between 8 and 10 deaths per 1,000 inhabitants.

(g) Infant mortality

Infant mortality in the peripheral settlements is 92 per 1,000 live births. Deaths of children under one year usually account for more than one-third of all deaths. The largest number of deaths among children under one year of age in the aforementioned period was caused by the group of diseases comprising gastritis, duodenitis, enteritis and colitis.

(h) Statistical data on health conditions

The statistics that follow describe the health situation in the "barriadas" of the city of Granada. It is not regarded as representing the true health situation in the peripheral settlements. Although the statistical data are insufficient, the importance of the health problems of the population leaps to the eye, and it is assumed that better information would be bound to reveal that the problems are even greater.

The public health statistics produced at present are not up to standard: They are neither reliable, complete nor timely. Hence, they are insufficient to determine the magnitude of the health problems and of no use in fairly evaluating the resources available for the preparation of programs and evaluating the results of programs in progress.

The sources are not reliable because most of the staff that request the data lack technical training.

The data are incomplete because physicians do not report all cases of communicable diseases as they are required to do; parents and guardians are late in reporting births and some children die without ever being reported; not all deaths are recorded because death certificates usually go astray in the protracted registration procedure.

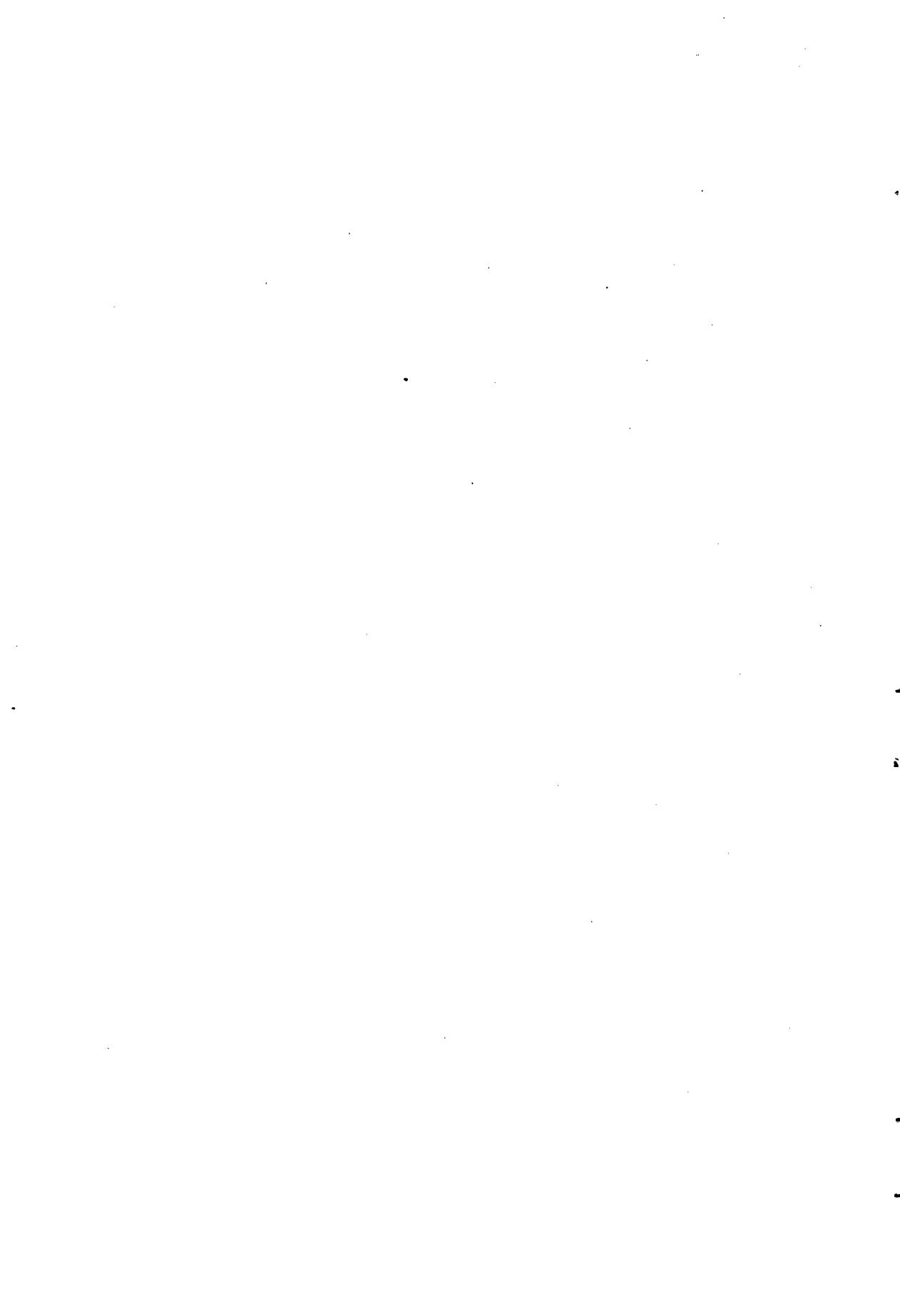
Statistics are not produced on time because reports to departments are not sent regularly or punctually.

The source of mortality statistics is the death certificate. The form used is the one recommended by WHO. The certificate is issued by a physician, who may or may not have seen the deceased.

The information on the legality of the death and the age, sex and residence of the deceased is reliable, but the same cannot be said for the information on the cause of death.

Despite these facts, the ten leading causes of death in the peripheral settlements of the city of Granada in 1981 were, in order of frequency:

Gastritis, duodenitis and colitis	26.0%
Senility and ill-defined causes	25.8%
Early childhood diseases	13.7%
Infectious and parasitic diseases	3.4%
Pneumonia	3.1%
Bronchitis	2.5%
Malign tumors	2.1%
Infections of the newborn	1.9%
Others	15.0%





**10.1 PROPOSALS FROM THE WORKING GROUPS THAT STUDIED  
THE HYPOTHETICAL CASE: WATER FOR PERIPHERAL  
URBAN DISTRICTS IN GRANADA**

This hypothetical case was analyzed by the Working Groups 1, 4 & 6 with the purpose of recommending outlines for the preparation of an eventual project that would make feasible the solution of the problem.



10.1.1. GROUP 1 PROPOSAL (MARGINAL QUARTER "LAS TOTORITAS")

10.1.1.1 OBJECTIVES

- General objectives

Improvement of health, life quality and environmental conditions for "Las Totoritas" population in Granada city.

- Specific objectives

Provide drinking water services with domiciliary connections to the whole population.

Provide sanitary sewerage services for the installation of low-cost lavatories to the whole population.

Develop a permanent sanitary education program.

Obtain organized and active participation of the population at all steps of the project.

- Strategy

Optimize the participation of interested governmental institutions, community participation and that of EAA for a better use of resources to meet the proposed objectives.

10.1.1.2 DRINKING WATER SUPPLY AND DISPOSAL OF EXCRETA AND WASTEWATER

(a) Drinking water supply project

(a.1) Introduction

"Las Totoritas" Human Settlement is situated towards the East of Granada City, occupying part of the Western slope in the upper reach of the Bónao creek.

The area that may be urbanized is 2,500 ha, with unevenness of 200 m and it is estimated it has a dwelling capacity of 500,000 inhabitants.

The settlement's present water supply is provided through tank trucks, which distribute water among the population. This system has great failures related to disinfection of water received by users.

(a.2) Design criteria

(a.2.1) Population

According to their background, present and future population is as follows:

P<sub>1984</sub> = 42,000 inhabitants  
P<sub>1994</sub> = 70,000 inhabitants  
P<sub>2004</sub> = 111,000 inhabitants

(a.2.2) Supply

According to the sector's socio-economic characteristics under study and the implementation of a low-cost sanitary system for excreta evacuation, a supply of 150 l/h/d has been estimated.

(a.2.3) Forecast period and consumption coefficient

For all the works involved in the service installation of drinking water it has been considered a 20-year forecast period, with the exception of the electro mechanical equipment for the elevation.

The consumption coefficients that affect both the daily Q<sub>max</sub> and timetable, are estimated under 1.5.

(a.2.4) Regulation volume

The necessary water volume for the supply system regulation has been considered between 15 and 20% of the daily maximum volume required. To this respect, the project considers that the storage building works could be made in stages, so that the project investment may be optimized.

(a.2.5) Resource quality

It is supposed that physical-chemical quality of the water resource from wells is good for human consumption, requiring only a previous disinfection.

(a.3) Alternative solutions for water supply

As for the information on hand, it is possible to generate only two solution alternatives for the sector's supply.

These alternatives, that are described below, are only distinguished by the supply source definition.

(a.3.1) Connection to existent Granada's network

This solution consists of enlarging the network up to the study sector in Granada City, previous an integral study of the same.

Although this solution seems economically attractive it is not so from a technical point of view, as the city will duplicate its urban population in the next 10 years and evidently will demand more hydraulic resources, that according to the text, will only be provided through its superficial source, the Taro river.

(a.3.2) Habilitation of existing wells

According to the background provided in the basic document, it can be noticed that the underground source capacity (25 wells) is enough to cover the required demand of the project's population.

This supply solution is estimated as more convenient from a technical point of view, as it does not interfere with the expected growth of the main city and at the same time it allows that "Las Totoritas" sector's growth be absorbed independently.

(a.4) Short description of the proposed solution

Drinking water supply system is defined according to the following basic features:

- Existent wells that are located in the medium and low creek area constitute the source. The total number of built wells is 25 with an average flow of 1 m<sup>3</sup>/s.
- Water intake by tubes is carried to the regulating tank, partially buried, which will be located in the upper part of the sector.
- From this place the resource is distributed, through a distribution network, that is shaped according to the pertinent master plan.

(a.5) Complexity of the adopted solution

- Land topography

The sector to be urbanized has an unevenness of approximately 200 meters and is developed on a 2,500 ha creek. Therefore, building contemplated in the project is more difficult and expensive.

- The fact that there are 25 wells makes possible to set up each one of them by stages. Moreover, building of independent distribution networks optimize in this way the pumping conditions, according to the relative location of each well.
- The orographic conditions of the sector unmistakably define the employment of short pressure cameras, guaranteeing a better service for the population. Besides, it allows the use of pipes and accessories that accept a lesser workload, reducing evidently in a minimization of investment costs.

(a.6) Technical specifications

In the equipment and materials' selection included in the project, design basic requirements that are used in the pertinent regional area subsector should be taken into account.

Quality and use of materials and equipment must be also considered and they will be in direct relation with the users' socio-economic condition.

(a.7) Project stages

	Estimated time (days)
- Background summary, both office and on site	60
- Processing of basic information and economical evaluation	30
- Selective alternative design at detail level	60

(a.8) Relation with other projects

The drinking water supply project, although it has independent characteristics, it is intimately binded to the implementation of the sanitary evacuation of excreta project of the sector under study.

The possible interference that exists with the urbanization works of the lots that comprise the sector may be cited in indirect form.

(b) Excreta and sewage disposal

Because of the small size of the lots and the quantity of water to be evacuated (125 l/inhab/day), building of a sanitary sewerage system is estimated convenient to be designed according to criteria indicated further on. The employment of sanitary appliances that use scanty water for its operation is also recommended. The effluent's discharge will be made to the main collector of the city already projected.

(b.1) Design criteria

- Supply:  $\frac{125 \text{ lpd}}{(150 \times 0.7 + \dots = 125)}$   
(Drinking water supply x coef. use + infiltration and rainwater)

- Design population:  
(Main collectors: 111,000 (year 2004)  
1st stage collectors (network)]: 70,000 (year 1994)
- Diameters:  
4" connections  
6" main network
- Trench depth:  
Pedestrian precincts: 0.50 m over crown  
Vehicle ways: 1.20 m over crown
- Revision wells:  
ea./100 m  
change of slope and direction  
intersections
- Final disposal: city collector (projected for 1986)

(b.2) Equipment and material specifications

- Appliances
  - . Bowl with water seal
- Pipes
  - . Concrete pipe
  - . PVC pipe

(b.3) Constituent parts of the project

- Interior installation: sanitary bowl
- Domiciliary connection
- Collectors and inspection wells
- Main collector
- Connection to the city collector (projected)

(b.4) Project stages

	Time/days
- Feasibility study	60
- Designs, specifications and budget	180
- Organization for building	30
- Building	720
- Organization for operation and maintenance	30

(b.5) Integration with other projects

- With drinking water supply to the settlement

### 10.1.1.3 SOCIO-CULTURAL ASPECTS

#### (a) Promotion and organization for community participation. Legal aspects of land ownership

In order that the project is a success either before, during or after its execution, it is essential to involve the community's participation. This objective can be easily met, in view that in "Totoritas" already exists an organized community structure through the "Vicinity Committees". Moreover, the fact that inhabitants have demonstrated interest that the project be developed, for which reason they are pressing their leaders so that they do the same with the authorities, is an indicator that they will put no obstacles to actively participate in the project's development.

Communal participation, during the execution of the project, will be proposed to be of monetary type, as 94.4% of the population works or has income from other sources, and the average of monthly incomes is US\$165.00. Taking the above into account, it is not expected to count with manpower contribution because of the very low unemployment rate.

Communal participation will be requested to supervise, measure and control during the system operation stage. To develop this objective conscientousness campaigns must of course be prepared about the rational use of the systems.

An important aspect, which permits to be certain that the community will participate, is that the development of water and sewage projects will give more value to the land. This is another incentive for the owner, who are the ones who dwell in the houses.

#### (b) Education and Training

- Sanitary education: First of all education must be made through audiovisual systems to incentivate and interest more the community. This decision is taken according to the estimated scholastic or educational level related to the average educational type.
- The sanitary education process must be oriented to the family groups altogether, but with emphasis on the housewife participation considering her influence in the rest of the family.
- Education must be previous to the execution of the works, with the purpose of interesting the families on sanitation.



- Contents:

- . What are communicable diseases?
  - . Does the lack of drinking water and excreta disposal influence in the origin of these diseases?
  - . How are communicable diseases transmitted?
  - . Which hygienic habits are necessary to avoid these diseases?
  - . Adequate use of services
  - . Explain the concept of relative shortage of drinking water. Importance of health care and its preservation.
- Methodology: Information programs must be carried out during the week for housewives and children (who must receive training at school) and during week-ends for the heads of the family.
- . The maximum duration of each lecture should not exceed one hour.
  - . The education process must provide fundamental importance to explain beneficiaries of the economical and financial effort that the work implies.
  - . During the sanitation execution and afterwards there must be follow-ups during a considerable time, in order to train on the use of community services.
- Self-help programs: Self-help programs must be designed for those families who are unable to cover expenses.
- . Socio-cultural, economical and health impact of the sanitation work.

10.1.1.4 INSTITUTIONAL, ECONOMICAL AND FINANCIAL ASPECTS

(a) Institutional aspects

(a.1) Introduction

To develop and carry out the project there must be participation of the central government, the administration office for drinking water and sewerage and the community. A description is made about the participation of each one of them and the duties of the water office in "Las Totoritas" community project.

(a.2) Government participation

Will participate on the following:

- Establish the policy to develop "Las Totoritas" project, which consists in providing drinking water and sanitation services to all "Las Totoritas" inhabitants.
- Coordinate and promote the drinking water supply and sanitation project in "Las Totoritas", according to the following activities:
  - . Coordinate the work between the company and supporting state organizations and the community.
  - . Promote securing necessary resources for the project in such a way that a return is obtained of the proportional investment according to the users' payment capacity.
  - . Apply and establish pertinent legislation that facilitates development, execution and operation of works.
- Community participation

The Community, through the existing local organization, will participate on:

- . Negotiation of more adequate alternatives for the solution of water supply and sanitation.
- . Project financing.
- . Care of materials assigned to the work.
- . Follow-up the execution of the work to be carried out according to its programming.
- . Facilitate the building under construction in relation to physical obstacles, of constitutions, rights of way, etc.
- . Surveillance and information to the company of the anomalies when executing the construction.
- . Control and information about deficiencies in the operation of drinking water and sanitation systems.

- EAA's duties in the project

EAA is an autonomous company from a technical-administrative, economical and financial point of view, that depends of the Housing Ministry.

The following are among its duties:

- . Planning
- . Study and design
- . Building
- . Operate and maintain water and sanitation services

- Interinstitutional relationships

They will be carried out according to the following table of responsibilities:

DUTY	ENTERPRISE	COMMUNITY	STATE OR OTHER ORGANIZATIONS
Political decision			1
Community organization	3	1	2
Planning	1	2	3
Studies and designs	1		
Financing	1	3	2
Training and sanitary education	2	3	1
Execution and supervision	1	2	
Operation and maintenance	1	2	
Evaluation	2		1

- 1 = Maximum responsibility
- 2 = Major responsibility
- 3 = Minor responsibility

(b) Economical aspects

(b.1) Background:

<u>Year</u>	<u>Population</u>	<u>No. of houses</u>
1984	42,000 inhab.	10,000
1994	70,000 inhab.	11,500
2004	111,000 inhab.	18,500

(b.2) Costs

- First stage: 100% of "Las Totoritas" population will be covered by year 1994.

Systems' building cost	US\$ 400.00/house
Domiciliary installations' cost	US\$ 50.00/house
Total:	US\$ 450.00/house

First stage total cost: US\$ 5,175,000.00

This stage may be subdivided when implementing the development of the work depending on the population demand.

- Second stage: This stage contemplates a 100% coverage of houses that will settle from 1994 through 2004.

Total cost: US\$ 3,150,000 calculated to date.

(b.3) Project benefits

Present payment for water services = US\$ 3.63 per month for a 15 m<sup>3</sup> consumption  
Cistern consumption/month = 3.6 m<sup>3</sup>  
Present cost/m<sup>3</sup> by cistern = US\$ 4.82  
Saving: US\$ 1.19

There will be a saving of US\$1.19 although there will be a 23.4 m<sup>3</sup> of additional consumption and that furthermore there will be a sanitary sewerage service.

(b.4) Operation and maintenance expenses

A 50% of the tariff is estimated to cover operation and maintenance expenses that will represent an amount of US\$20,872/month.

(c) Financial aspects

(c.1) Financial sources

- Community 20%
- National banking 50%
- EAA's resources (studies) 10%
- Government 20%

(c.2) Payment capacity and capability

- Monthly saving: EUA\$ 16.00/family
- The present water payment is 10 times the minimum normal tariff, therefore even if the provision is increased 7.5 times, they would pay less than what they pay now. The community then will be able to pay tariffs and repay loans (payment to the National Banking).

(c.3) Tariffs

- The same tariffs would continue as indicated in the previous paragraph, only the minimum monthly consumption value would be verified and a growing charge will be applied for excesses.

(c.4) Commercialization

- Use of domiciliary meters because supply is made by pumping.
- Community participation in the meters' monthly readout and distribution of "receipts".
- EAA will process readouts, issue the "receipts" and will collect them.

Readout made by the community will be verified quarterly and in a random way.

10.1.1.5 PROBLEMS AND HAZARDS

(a) Socio-cultural hazard

- After executing the works a considerable part of the population is reluctant to obtain the services.
- A population discouragement and desintegration of its communal organization is produced due to non-fulfillment or delay of the works' execution.

(b) Technical hazard

- To decrease the useful life of the works by using low-cost designs and technology.

(c) Financial hazard

- Because of the lack of saving habits and a low percentage of this in the family income, a delay is produced in the financial contribution of the Community.
- Because the central government does not assign the project's financial support.

10.1.1.6 CONCLUSIONS AND RECOMMENDATIONS

(a) Technical aspects

From a design point of view of the water and sewerage works, it is very important the use of adequate low-cost technology, optimizing in this way the economical-financial resources of the engaged sectors and at the same time satisfy the basic requirement that the provision of services originates.

An adequate programming must also be considered in the building construction. Thus, a temporary paralyzation of the works and the consequent non-fulfillment of the stipulated terms is tried to be avoided.

(b) Socio-cultural aspects

It is basically essential to meet an integral engagement of the community, through an adequate organization, with the purpose of obtaining an active participation in all the stages involving water and sewerage services implementation.

It is also important to emphasize the education aspects of the benefited community for the rational use of the services to be built.

(c) Institutional, economic and financial aspects

To obtain successful results of the project, an evident requirement is that all the organizations related to the study, should carry out combined actions. In this way, each institution and organism must assume the corresponding legal, economic and financial role.

## 10.1.2 GROUP 4 PROPOSAL

### 10.1.2.1 WORKSHOP 1 - ANALYSIS OF THE PROBLEM

#### (a) Objectives

Improvement of sanitary conditions and life quality of the inhabitants of "Las Totoritas" quarter, located in Granada City, in accordance with the socio-economic development achieved, through:

- Enlargement and improvement of the drinking water supply system in Granada, to serve the whole "Las Totoritas" quarter.
- Services' provision for sanitary disposal of excreta and wastewater to all the population.
- The provision of other complementary sanitation services.
- Organized and active participation of the community in all the project stages.
- Development of a permanent program of sanitary education, to obtain a good use and the preservation of the works executed through the projects.

#### (b) The project

##### - Description

Water supply and excreta disposal of "Las Totoritas" community, marginal sector of Granada City.

##### - Background

"Las Totoritas" community with a present population of 42,000 inhabitants, has the conditions that indicate an explosive growth (year 2004: 111,000 inhabitants) - (2.6% increase).

The national government intends and is obliged to solve the water and excreta problem of 31.5% of the population who lives in the marginal area. But this will be affected by the lack of economical resources, among other things.

##### - Design criteria

- . Revision of design standards and policies and maintenance of the system
- . Maximum per capita supply (domestic use) 70-100 l/p/d
- . Minimum diameter compatible with minimum expenses

- . Type and quality of materials
  - . Use of existent works
  - . Source selection of the water resources
  - . Analysis of altitude conditions
  - . Domiciliary installations
  - . Attention to the explosive population increase
- Equipment and material specification
    - . Meters' installation
    - . Domiciliary connections
    - . Flow limits
    - . Use of low-consumption appliances
    - . Use of low-cost accesories of national production
- Complexity grades
    - . Establishment of differential rates
    - . Optimization of the Granada City service in order to have available flows for "Las Totoritas"
    - . Meters' massive installation plan in Granada
- Constituent parts of the project and its locations
    - . Main network in Granada
    - . Set of wells
    - . Central collectors of excreta
    - . Defined urban order of properties
    - . Existence of family tanks in each lot
- Project stages
    - . Project design
    - . Consciousness campaign (communitary aid)
    - . Financing attention
    - . Present problem solution and future demand foresight
- Introduction and integration chronogram with other improvement projects
    - . It was not undertaken due to lack of time but we do consider of vital importance:

Problems and hazards

- P - Financing
- P - Communals
- P - Political decision



## Hazards

- Communal refuse  
(lack of response to their expectations)
- Insufficient water resource
- Population increase stimulus

### 10.1.2.2 WORKSHOP N° 3 - SOCIO-CULTURAL ASPECTS

#### (a) General conclusions of Plenary Session 3

The approach that must be given to the solution of the water and sanitation problems for marginal urban areas must be multisectorial, including all social and cultural situation aspects of the population to be benefited. The project must form part of the necessary activities' group for the improvement of life quality and should be assigned the corresponding priority.

In addition, every project must have an education permanent program to sensitize the population on the benefits obtained and to secure the installations' good use.

The community's active participation is necessary in the project's management process, in its construction and in the installations' operation and maintenance.

The investment capacity of the benefited population must be analyzed to estimate possibilities and to find economical cooperation ways for the project's solution.

The economy's global development must be observed, especially the employment offer, so that the infrastructure projects accompany the socio-economical and demographic evolution of the area to be benefited.

#### (b) Applications to "Las Totoritas" Hypothetic Case

The analysis of the project's socio-economic impact is a result of the works' technical characteristics. It comprises the extension of the principal Granada's networks to satisfy "Las Totoritas" needs and the works for the connection in each house. It must be taken into account that most of the shelters do not have the minimum necessary installation to use the service.

Granada's population will have restricted its consumption through measurement and rate increase for excessive consumptions. In order that this situation is accepted an information and education campaign must be carried out to reflect the hazards to which water fountains are subject to and the hazards that the lack of supply to the marginal quarters means. It must be emphasized that superflous consumption is restricted, maintaining an abundant provision for sanitary and cultural needs.

"Las Totoritas" sector will have an immediate benefit with life quality improvement, guaranteeing the settlement's urban stability and its integration to the city, quintuplying its water consumption possibilities with less effort than presently carried out to obtain it and will have a guarantee of the product quality. In order that such benefit may be used and maintained the community must be integrated to the project in all its stages.

The population must finish their shelters' construction to use the services. This requires an economical effort and due to the social characteristics, it demands self-construction and mutual help.

The project requires a complete knowledge of the community. Although there is data, it is convenient the fulfillment of a new survey where the individual and collective capacity of the population is identified, as well as the position of their leaders, their needs, their worries and political action possibilities.

The previous data indicate that water and sewerage works are priority, but in order that the project is feasible it is necessary to count with the participation of other sectors linked to same. In this case, they are mainly health, public works and services, housing, urban development and education.

To obtain the community's participation a permanent training, educational and information program must be implemented considering the following aspects:

- Training of leaders and vicinity's organizations about the interpretation of the project, its benefits and technological limitations and on the necessary community development needed for its execution and operation.
- Community training in building techniques for cooperation and the execution of the works at a domiciliary level.
- Education at a family level about the social and economical benefits that they will obtain with the works and their good use; the need for spreading into intervals that might emerge for technical, economical or cultural reasons; the limitations of the project and the need to control the population expansion of the area.

- Education of the family head about the elimination of health hazards that affect incomes.
- Education of the woman about the benefits of personal hygiene, both of the family and home.
- Sanitary education at school level
- Information about political interest, financing, accomplished goals. Implementation of an information system that allows the community to know the state of the services operation and the valued benefits. This system must be available to all Granada's population.

(c) Problems and hazards

- Refuse by the population already supplied because of the limitations they are imposed, rate increases and measurement.
- Refuse by "Las Totoritas" community because of the project's quality. They feel diminished towards the rest of Granada's population.
- Because of promotion failures population consciousness is not obtained together with favorable decision of the political levels.
- That a multi-sectorial integration is not obtained either on the operative or financial aspects.
- That because of economical instability, unemployment and under-employment increase.
- That the costs increase according to population income, losing purchasing power and savings and investment capacity.
- That the communitary educational and organization programs lose continuity during the services' operation.

10.1.2.3 INSTITUTIONAL, ECONOMIC AND FINANCIAL ASPECTS

(a) Institutional aspects

- A diagnosis must be carried out of EAA's situation to elaborate a development program and integral strengthening of the institution, establishing coordination mechanisms with other institutions and/or services which intervene in securing marginal areas.

- Revision of EAA's policies, strategies and objectives must conclude in the establishment of a care program of the marginal areas, creating a unit in charge of making the execution plan be observed, and to relate all aspects deriving from the water supply and excreta disposal problem that are our concern.

(b) Economic aspects

- The technical project must be studied having in mind cost reduction through a revision of the technical standards guided towards a diminution of diameters and of the complementary installations; using low-cost material and that are of easy installation; reducing deepness of pipelines installation, and others.
- Building must be addressed and supervised by EAA, with the provision of manpower of the organized community.
- Community cooperation must be obtained for the correct use and installation maintenance of the quarter's service.
- It must be tended towards the study of water reuse that comes from sewerage, which would become a potential source of employment creation if it is thought on irrigation, forests and pisciculture.
- The project cost must cover:
  - Water network
  - Sewerage network
  - Internal domiciliary installations

Investment stages will be:

- Water network
- Internal installations
- Sewerage network

(c) Financial aspects

- Manpower contribution by the community which becomes a 20% support of the project cost.
- EAA's direct contribution, including technical direction and others, that becomes another 20% of the project cost.
- Financing of the remaining 60% through national and/or international bank loans that users must cancel, with EAA as mediator and administrator.

- Securing non-reimbursable technical cooperation for institutional and human resources development.
- According to the provided background, the cost per family that the project will represent, including water and sewerage, would reach US\$350.00.
- With a 15-year financing, at 8% annual interest, the total value to repay 60% of the cost amounts US\$665, which becomes a monthly cost per family of US\$3.70, representing 2.2% of the average monthly rent. This amount, which coincides with the monthly expenses in water at present, would result in the need that the family groups pay additionally a maximum of 2% for service.

(d) Comments

The above hazard aspects may be summarized as follows:

- Difficulty in obtaining the necessary financing.
- Difficulties in obtaining EAA's development or in the political-institutional support to create the executing unit.
- Do not obtain the appropriate community's support.
- Involve the technical solution by the economies introduced to the project.

#### 10.1.2.4 CONCLUSIONS

(a) Feasibility of the Project

After analyzing the technical, socio-cultural, institutional, economical and financial aspects of the assigned "Las Totoritas" case, the group has concluded that the following secures its feasibility:

- Technical aspects

The following criteria must be taken into account:

- . The need for revising design standards and policies of the systems, especially in the provision, diameters, materials and regulating installations' aspects.
- . Consider Granada's situation with respect to meters installation, service optimization and use of existent collectors.
- . Urban regulation - community consciousness - installations, maintenance and possible water reuse.

- In the socio-cultural aspects, the groups find that the community has established its preference for water and sewerage services.

As it is organized in vicinity committees, it may actively participate in the project development. Considering the building conditions in which dwellings are at present, it is supposed that there will be the necessary facilities to install domiciliary services.

It is estimated that Granada's population will react favorably towards the project, as the introduction of the water and sewerage services in the marginal quarters contributes to improve all community's health.

In the institutional aspects the following must be pointed out:

- . That in view of the project's importance, political decision must secure the execution of a development program and an institutional strengthening.
- . That the institutional strengthening not only benefits "Las Totoritas" project system, but all Granada's system.
- . That the human resources training program will increase the institutional feasibility when the institutional development program is made more efficient.

The economical feasibility turns out as a result of revising the technical standards which without decreasing quality allow the use of low-cost materials and easy installation, introduction of construction solutions and alternatives that do not compromise the project's efficiency.

The population's economical capacity facilitates absorbing the cost that the work demands.

(b) Financing feasibility

The financing set up considers three sources: 20% from community's support, 20% from company's contribution; and 60% from national or international banking loans.

1. According to other similar programs the community's support has been quantified in approximately that percentage; moreover, the community's organization level will guarantee participation.

2. The company will undertake a plan for tariff reordering that would leave enough surplus to pay the works, and its support would mainly be its contribution in the technical direction.
3. To obtain the loan there is the possibility to request to the national banking which grants concessionary loans. Furthermore, due to the characteristics of the marginal groups' impact it will be an attractive program for the international development banking, which additionally might contribute with technical cooperation of a non-reimbursable character.

10.1.3 GROUP 6 PROPOSAL

10.1.3.1 GENERAL OBJECTIVES

(a) Improvement in health

- Reduce mortality which is related to deficient water supply and sanitation.
- Reduce morbidity which is related to deficient water supply and sanitation.
- Enable a cleaner hygienic household.

(b) Improvement in well-being and standard of living

- Reduce time and effort spent in obtaining water for household needs.
- Enable a cleaner, more pleasant daily life.
- Increase accessibility and availability as well as quantity of water.
- Reduce cost of obtaining water.

(c) Help make increased productivity more feasible

- Less time spent ill - reduce loss of work time.
- Less time spent hauling water allows more productive use of time raising family, learning, taking care of children and household.
- Allows more time to improve marketable skills.

(d) Foster and increase community participation and action for self-help.

(e) Achieve a higher level of understanding of the relationship between disease and water supply, sanitation, and personal and household hygiene.

(f) Achieve an increased desire to make and support necessary water supply and sanitation improvements.

(g) Achieve organized coherent community growth and proper siting which lends itself to phased positive community improvement on a short, medium and long-term basis and utilizes an intra - as well as intersectoral approach.



- (h) Incorporate existing socio-cultural values of the community into improvement projects for water supply and sanitation.
- (i) Minimize the waste and inefficiency in existing facilities (community and household) and re-invest the savings in facility improvement and extension.
- (j) Explore and expand financing mechanisms and improve their availability.

10.1.3.2 BASIC CONSIDERATION FOR THE SELECTION OF TECHNOLOGIES SYSTEM PLANNING AND DESIGN

- (a) Determine what the people who are to be served:
  - . Want (perceived needs, level of service, etc.)
  - . Are willing to pay
  - . Can afford to pay
  - . Presently pay
  - . Have for customs, habits, etc.
- (b) What are they capable of handling from organization, technical, and educational standpoint:
  - . Immediately
  - . In the future with preparation
- (c) Determine quantity of water required for the project taking into consideration:
  - . % house connections
  - . % stand posts
  - . Areas to be serviced
  - . Growth rate and location of growth - how much?
  - . Characteristics of homes and households and customs - where?
- (d) Determine whether intermittent or continuous service will be provided.
 

\*Continuous service selected for health reasons.
- (e) Determine storage requirements
- (f) Determine treatment requirements of available sources
- (g) Determination of source
  - . Utilize existing system capacity, or
  - . Utilize existing wells
  - . Do not use surface water because of cost, difficulty of treatment, etc. Must consider dependability of sources, quality of sources, and quantity of sources.

- (h) Assure compatibility with
  - . Urban planning
  - . Water agency planning
  - . Site conditions - natural and man made
  
- (i) Design life of project - compatibility of materials and equipment used.
  - Decide (10 years)
  - (20 years) based on projections of changing needs
  - (50 years)
  
- (j) Phase the implementation of projects  
Develop schedules - overall components
  
- (k) Consider land ownership, rights of way, other utilities, streets
  
- (l) Consider risks from natural hazards:
  - . Floods
  - . Earthquakes
  - . Others and man made
  
- (m) Determine feasibility of community participation:
  - . Community facilities
  - . Household facilities
  - . Previous history
  - . Social analysis, planning, design, etc.
  
- (n) Determine restriction of physical conditions:  
Soil, topography, natural drainage
  
- (o) Excreta disposal and sewage determination. Some considerations as above including projected water use, type of use consider:
  - . Sewers
  - . On-site disposal, letrines
  - . Contamination
  
- (p) Disposal alternative sewages
  - . Connect to existing facilities
  - . Project site treatment facilities (N° )
  - . Ground water contamination, stream contamination
  
- (q) Check feasibility of zoning and land use restriction
  - . Well field protection
  - . Areas subject to flooding
  - . Use for parks, recreation and sports

- (r) Consider future expansion and increased use
- (s) Consider operation and maintenance repair of equipment, equipment selection, availability of spare parts
- (t) Maximize use of existing facilities
  - . Optimize use of water
  - . Reduce unaccounted for water
  - . Control use through rate structure
  - . Consider water reuse schemes
  - . Rehabilitate existing facilities
- (u) Combine improvements to maximize health benefits. Hand washing in conjunction with excreta disposal and food preparation.
- (v) Appropriate technology should be considered and pilot projects strategically utilized.

#### 10.1.3.3 APPROPRIATE TECHNOLOGIES

- (a) Water
  - Small diameter, low pressure water systems
  - Standposts for areas which can't afford cost of household services, but incorporate future connection capability
  - Utilize sloping land and multiple storage tanks for off system and for pressure reduction
  - Small diameter service liners will flow controllers instead of water meters
  - Utilize plastic pipe for system
  - Maximize use of local materials (if possible for storage tanks and other maintenances)
  - Use branched instead of looped system
  - Minimize number of system valves. No fire hydrants
  - Utilize existing capacity and rehabilitate where necessary and possible
  - Sources combination of connection to WTP and utilization of existing wells if possible. (Need more information)

- Design - 200 l/cap.day
- Combination of house connections and communal standposts.

(b) Sewerage and sanitation

- Utilize small diameter sewer with steep slopes, and dosing siphons. Utilize 4" and 6" sewer mains in upper branches
- Minimize use of manholes, maximize use of cleanouts
- Utilize VIP latrines where sewers are not appropriate
- Utilize low water use fixtures
- Consider waste water reuse
- Consider use of community septic tanks for household clusters not presently feasible to connect to existing trunk lines.

(c) General

- Use back lot lines for Rights of Way
- Do not use areas subject to flooding or other hazards. Instead use for parks
- Twenty-five (25) year design population.

PROBLEMS AND RISKS AFTER COMPLETION OF WATER PROJECT

- Increase in population density (persons per square kilometer)
- Increase in probability of epidemics
- Increase in the demand for primary health care services
- Increase in use of public service (garbage collection, etc.)
- Decrease or reduction in agricultural production
- Unauthorized use of water for various purposes

10.1.3.4 SOCIO-CULTURAL ASPECTS

(a) General aspects

- The socio-cultural aspects will be dynamic and the total project should be designed to assure changes in a positive direction.
- Need to select indicators to measure and evaluate changes and assure early detection of negative trends and provide guidance for their amelioration.

- Conduct socio-cultural survey to determine expectations and desires of the people, their willingness to participate in the various project components, in terms of time, effort, and money, and evaluate their capacity and capability to participate in the project.

This should include family composition, habits, education levels and skills, origins, needs, priorities, etc.

- Incorporate community in self-evaluation as well as conducting evaluation by external experts.
- Expand and strengthen the woman's role in making positive socio-cultural changes through existing organizations and formation of special groups such as mothers' organizations and committees, which are involved in education and development of skills particularly those related to health, family unity, values, responsibility, sense of community, belonging and togetherness, security, etc.
- Incorporate a sufficient number of recreational areas in conjunction with schools, and areas not fit for habitation and which require environmental protection. Where necessary set aside lots for this purpose.
- Incorporation of health education and individual health responsibility in school programs.

(b) Problems and risks

- Aggravating community factors
- Acceptance of the project and the new task of the Organization
- Problems in obtaining ownership of property
- Misuse of facilities and vandalism
- Payment of water rates
- Phasing out existing supply practice
- Enforcement rate collection.

10.1.3.5 INSTITUTIONAL, ECONOMIC, FINANCIAL ASPECTS

(a) Institutional aspects

- Convene an inter-sectorial planning meeting coordinated by the Empresa Administradora de Agua y Alcantarillado (EAA) involving: Ministry of Health, Public Works, and the National Planning Institution, Housing, Banco Nacional, Municipality of Granada, The Electric Power Agency and the Comités Vecinales.

- EAA is to design, build, enlarge, operate and maintain the system in Granada. Also EAA will be responsible for the implementation of the project.
- Encourage EAA to review its procedures and methodology for obtaining loans and grants and explore alternate sources of funding for this type of project. Investigation with present agencies which are now providing loans and grants to Granada.
- Define level of service, norms and procedures, and quality of materials as well as to review any possible amendments of regulations if applicable.
- Clear the deviations from the lending agency's technical norms.
- EAA will explain the project alternatives and its ramifications.
- Define the responsibilities of all of the project participants.
- Strengthen the operating capacity of the existing institutions (institutional development).
- Review existing rate structure in light of the project according to the level of services.
- EAA will continue to operate the billing and collection under the expanded system in "Las Totoritas".

#### PROBLEMS

- Excessive lagtime of project pay interest for money not used to international banks; therefore, is necessary to complete project on schedule on all phases.
- Lack of coordination among institutions once the project has started.
- Counterpart funds not readily available.
- Rates have to be increased.
- Availability of foreign currency.
- Problem with un-used capacity of the system for a long period of time.

#### (b) Economic - financial aspects

- The cost estimates and financing will be based on 25 year life (25 populates 173,000).

- Will utilize flat rate structure based on level of service:
  - . House connection to water and sewer
  - . House connection to water only with latrines
  - . Water obtained from standposts with latrines
  
- Project will be financed and constructed in three stages with initial stage to commence in the two most densely populated sectors.
  
- Estimate percentage to receive each level of service mentioned in the second part of this item. Initial estimates based on limited information in the case study such as income, expenditures, present cost of water are:
  - 54% provided with latrines
  - 46% provided with sewer service
  - 70% provided with water service connectors
  - 30% provided with public standposts
  
- Because of employment status and age grouping it was felt that labor contributions were generally not feasible.
 

Thus, the entire project would have to be funded by loans and grants.
  
- Rough estimate of total project cost is 10 million dollars US.
  
- Estimate that a 2 million dollar grant is feasible for latrines and on-site facilities.
  
- Based on 11% interest rates for long-term loans, the following rate schedule were roughly estimated:
 

Water and sewer connection per household	\$ 9.00
Water sewer connection only	\$ 6.00
Standpost service	\$ 2.50
  
- Estimated cost per person \$70.00
  
- Cost of operation and maintenance and repair based on experience of participant as portion of total cost is 3.80.

HOUSEHOLD VS INSTITUTIONAL PRIORITIES

Indicators of success	Priority	
	Sponsor/ Institution	Self-help Household
Value created by self-help	high	high
Cost recovery	high	low
Construction speed	high	low
Physical appearance (in early stages)	high	low
Adherence to building codes and standards	high	low
Adequate shelter and safety	high	high
Security of tenure	low	high
Proximity of central city	low	high
Proximity of friends and family, and so on	low	high

Source: Compiled by the author.



### 10.1.3.6 HOUSEHOLD TECHNOLOGY

(a) Household

- . Collection of individuals who eat and sleep in the same place.

(b) Household instruments

- . Composition
- . age, sex
- . nuclear, extended
- . working, nonworking, dependent

(c) Income

- . money, wages, tips
- . gifts, lottery, inheritance
- . swaps, in-kind contributions

(d) Pattern of expenditures

- . basic needs
- . housing and infrastructure
- . investments

(e) Networks of exchange

- . types (kin, friends, workmates)
- . use (density, frequency)

Dimensions of challenge

Socio-technical solution

Definition of low-income

Household systems

Elements of solution

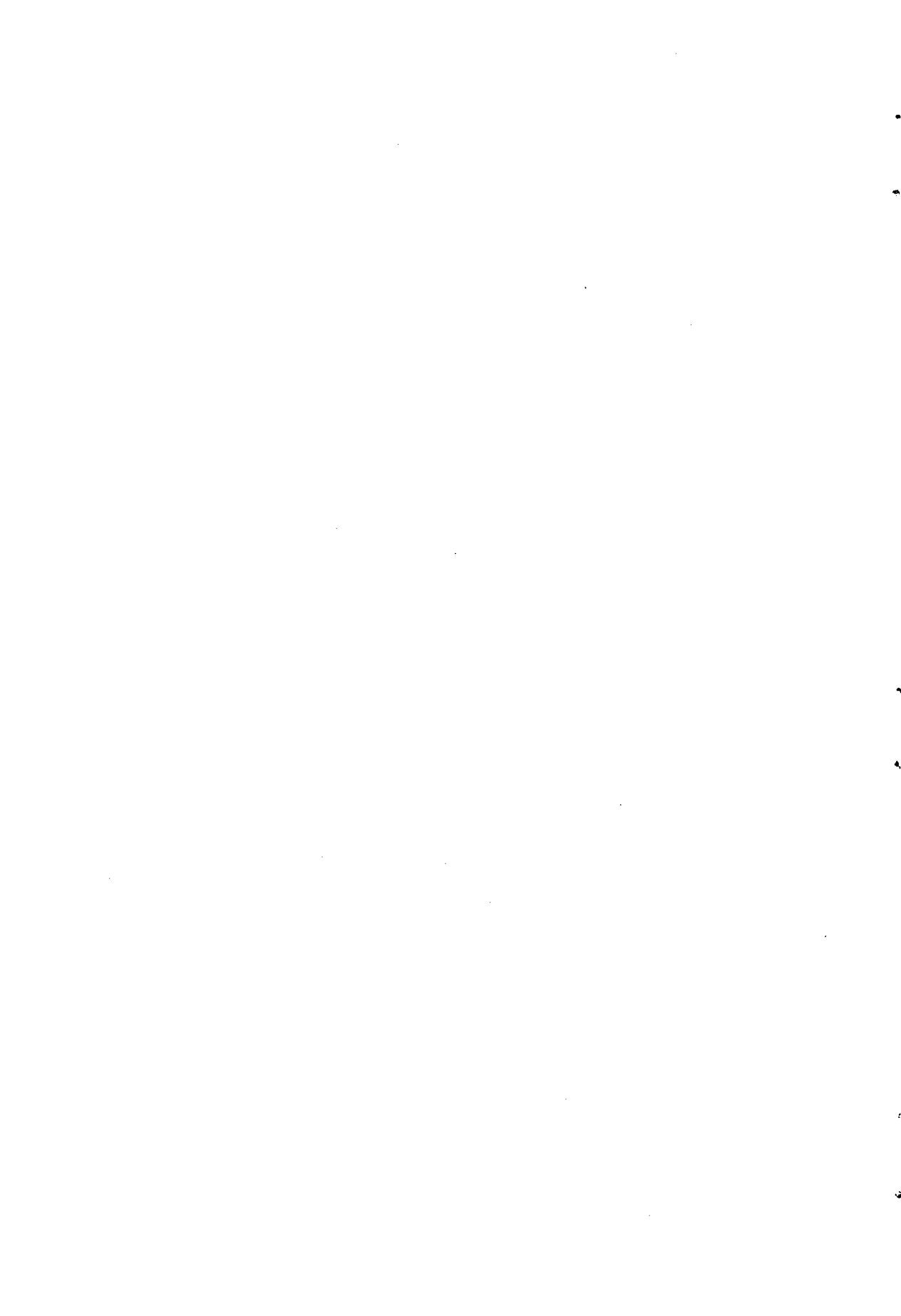
- participation
- standards
- approach

### 10.1.3.7 CONCLUSIONS

- (a) These fundamental principles were incorporated in all aspects of the project development:

- Maximize community participation and acceptance
  - Utilize appropriate technology
  - Increased and strengthened role of the woman
  - Human resources development
  - Health education
  - Institutional development.
- (b) To increase the capacity and ability of EAA to manage with the planning and implementation for this project.
- Intersectoral cooperation and coordination and integration of efforts
  - Utilize incremental staged improvements each laying a foundation for future improvements
  - Scope of project must be compatible with users ability to pay recurring costs
  - Incorporation of principle of belonging and property ownership
  - Maximum utilization of existing institution, organization and facilities, inclusive of financing.

11. HYPOTHETICAL CASE: DEVELOPMENT OF MARINA CITY'S MARGINAL  
AREAS



## DEVELOPMENT CASE OF A MARGINAL AREA IN A LATIN AMERICAN CITY

This case is a description on the emergence and development of a marginal community situated in a modern city of our continent. Taking zero (0) as a starting point for health and basic services (electricity, water, housing, transportation, etc.) optimum levels in health and basic public services were achieved in almost three decades as a result of the steady effort of its inhabitants, of local authorities and the central government.

### 11.1 CITY OUTLINE

#### 11.1.1 CITY DESCRIPTION

Our city, Marina City, like most other cities in Latin America, is a contrast city with residential, commercial and industrial sectors, which announce us the proximity of the 21st century; and with communities known as "casas brujas", "villas miserias" or "favelas", which still seem to belong to the 18th century because of their unhealthy conditions.

Marina City is located in the coast of our country; the land comprises mainly low areas near the sea; topography elevates when going inland and there are a series of hills, 100 to 200 m high, with several scattered valleys.

Marina City, at the west, is adjacent to a natural barrier which has hindered its expansion; the same happens at the south, where it is adjacent to the ocean. In view of this, the city, unlike others, has developed in a conical shape rather than a concentric one. At the north, an axis is formed by the road conveying to the second most important city in the country, and another axis displays towards the southeast, formed by the road which is the way to the airport. At the vertex of the cone formed by such axes, towards the southwestern part, lies the "center" - the downtown area - with its historical, commercial and governmental places; towards the suburbs one finds a series of residential areas, middle and middle-upper class; in the axial ends there are low-class slums, and, in recent years, middle-low class quarters have been built in both directions. In 1975, 35 communities were identified with marginal characteristics inside and outside Marina City (see Figure 11.1).

Environmental quality in Marina City varies as much as housing types; upper, middle, and low-class population have acceptable conditions, even though it is still a public nuisance to notice wastewater in creeks, solid wastes in streets and noise.

In marginal areas and low-class sectors, unchanneled wastewaters, lack of continuous services for garbage collection, overcrowding and absence of city planning, contribute to degrade the environment (see Annex 1).

### 11.1.2 POPULATION CHARACTERISTICS

Population in Marina City is divided into various administrative sectors and the special sector under study, which we will call Satellite City (see Chart 2). After analyzing the tendency in population growth of different Marina City sectors, one concludes that growth is greater among sectors developing in the outskirts, where new shanty towns or densely populated spontaneous settlements have turned up, and in old or existing marginal sectors.

When in 1965, the Institute of City Planning carried out a socio-economic survey in 19 shanty towns identified then, the number of inhabitants was found to be 34,716. At that time, Marina City had a population of 350,000 inhabitants, which meant that one of every 10 people lived in "marginal towns".

In 1968, the Office for Communal Urban Development (OCUD) made a survey which determined the existence of 63,000 inhabitants in "marginal towns", that is, a 17% of total population in Marina City, which was estimated in 373,000 people by then.

In 1973, Marina City had approximately 480,000 inhabitants, and population in "marginal quarters" was estimated in 100,000 people, or representing a 20% of the total population.

Apparently, this tendency in population growth has persisted through the years; in recent times, private plots have been invaded for the establishment of new "spontaneous settlements" or "marginal towns"; it is estimated that, in 1984, the number of inhabitants in shanty towns was about 25% - that is, 185,000 - of a total estimate of 740,000 inhabitants in Marina City (see Annexes 2 and 3).

Population in Marina City is relatively young, the biggest groups are formed by 0 - 30 year-old persons. However, family groups differ according to economical status, upper-class and middle-class families are rather small, with 3 or 4 children. On the contrary, low-income and marginal families are numerous, with 4 to 6 children, and there are frequent cases of unmarried young mothers and men with several wives, all of which contribute to the existence of a numerous young population (see Annexes 4, 5, 6 and 7).

#### Most important socio-economic characteristics

Human groups settled in shanty towns have very homogeneous demographic and anthropological characteristics. Population growth has been a long process, with two different types of human displacement:

migration of peasant families and an excess of poor and unemployed families, both as result of the overpopulation in towns where rented lodgings predominate.

The need for mutual support in order to solve their problems as well as their sound provincial behavior keep alive a high grade of communal sense. This positive attitude indicates the possibility to use their own resources in their own benefit. The fact that they were able to build their houses by their own shows how valuable their contribution was in order to solve that problem.

In Satellite City, four artesian wells, two schools, roads, and streets were built by the people's joint efforts during the 50's. The civic society of Satellite City administrated the electrical energy service at that time.

Struggle for possession of a piece of land rather than for a sanitary dwelling has led these people to group themselves in associations and confederations so as to defend what they consider to be their rights. Obviously, this love and passion for the land is greatly influenced by the high percentage of peasants living in these shanty towns, and who came to the capital city attracted by the sociological phenomenon caused by the city's economical prosperity.

#### 11.1.3 WATER AND SANITATION SERVICES IN THE CITY

According to statistics from the Water Institute, 96% of urban population has drinking water service within their property or in an accessible way, 73.5% have sewerage connections, 6.5% have septic tanks and 17.7% use sanitary privies. Garbage collection is regularly available in all urban areas including marginal sectors. Marginal communities in the outskirts have good access roads, which are sporadically covered by "cleansing campaigns", promoted by benefited populations and supported by different institutions (see Annex 1).

During the period 1985-90, the Water Institute will implement a series of programs financially supported by international agencies (IADB, IBRD, etc.), aimed at improving production, distribution and accessibility to Marina City's aqueduct, which will definitively supply already existing marginal towns. Nevertheless, new marginal settlements that may appear during the same period (1985-90) have not been considered.

Sewerage systems will also be constructed with international loans, with networks covering several sectors in the city (Puente del Rey, San Sebastian, San Cristobal, etc.). Furthermore, connection to dwellings accessible to the San Isidro sewerage system will also be promoted. This system was built more than five years ago and only 25% of beneficiary households have been connected.

For the 1985-90 quinquennial, some big collectors will be built (Río Palomo, Río Cholo, Curundu, etc.), which will allow elimination of

several septic and Imhoff tanks, thus improving sanitation in various gorges and rivers crossing the city (see Annex 8).

The economic situation affecting the people of Marina City is critical. Living cost has increased steadily in the last 10 years, recession and inflationary processes throughout the world have affected the national economy; development of private activities has not been sufficient to enable employment of a growing available manpower and the State which was the main generator of working posts during the last 15 years, has had to decrease such an activity, even suppressing or diminishing operations in several state-owned enterprises (water, aviation, cement, agriculture), thus reducing personnel.

According to the 1980 census, economically active population was 227,310 people, 23,485 of which (10.3%) were jobless.

Family groups with monthly incomes of US\$ 400 and more constitute over 53%; nevertheless, unemployment levels are greater among lower-income groups and dependant population, that is, people with lower incomes have more dependants (1 person employed each 4 dependants), within groups with higher income, the relationship is lower (1 person employed each 2.5 dependants). This means that people with lower income needs to assign higher percentages of its earnings to support its living (food, water, electricity). Therefore, its availability to invest in housing and infrastructure improvements is limited (see Annex 9).

Basic population activities belong to the service sector: 18.5% of active population works in retail and wholesale commerce, restaurants and hotels; 35% in public, communal and personal services; 12% in the incipient manufacturing industry (see Annex 10).

(a) Basic expenses of each family in food, services, housing, and the like affect in a greater percentage family budgets of groups with lower income, as can be noticed in the following comparative table.

#### FAMILY GROUP

Basic expenses	75 B./month-399 B./month		400 B./month-1,000 B./month	
	Average:	237 B./month	Av.:	700 B./month
Water	4.20	\$/month - 1.7 %	15.00	\$/month - 2.1 %
Electricity	15.00	" 6.3 %	45.00	" 6.43%
Cooking gas	6.00	" 2.53%	12.00	" 1.71%
Cleanliness	2.00	" 0.84%	4.40	" 0.63%
Telephone	-	-	10.00	" 1.43%
Food	120.00	" 50.63%	240.00	" 34.3 %
Transportation	45.00	" 19 %	100.00	" 14.3 %
Housing	35.00	" 14.77%	175.00	" 25 %
Total	227.20	- 95.86%	601.4	- 85.91%



From the above table, it is possible to deduce that "low-income" families (in marginal areas) hardly satisfy their basic needs, with almost no money left for investment in infrastructure and housing improvements. On the other hand, "high-income" families, though they also devote their family earnings to basic expenses (food, entertainment, clothing), they contribute as well to infrastructure financing (streets, electricity, water, telephone, sewerage system, etc.) (see Annexes 1 and 11).

## 11.2 DUTIES OF THE PUBLIC SECTOR

Even though constitutions in our countries safeguard respect for private prosperity, in the last three decades and especially in the last 15 years, under the concept of "land belongs to the one who works it", a great number of lands located near the city and parallel to its two expansion axes were invaded by precarious dwellers. National and local institutions were unable to stop such a phenomenon, and it actually happens that when a plot is invaded, the Ministry of Housing negotiates with the owners to buy their lands, to sell them at low prices and at long-term to these "invaders or precarious dwellers". Once this first stage is over, the "settlement" or new "marginal quarter" is consolidated, and national institutions (in charge of water, electricity, street, etc.) have to "come in" and construct their respective service infrastructure as an immediate response, which is due more to communal pressure than to a planned policy. Such is the case of drinking water: water distribution is generally started by "lining" PVC pipeline branches of small diameter, with public fountains, strategically located. This procedure, far from solving the problem, makes it worse and affects other sectors because of the following reasons:

1. While providing a solution to first invaders, it encourages the arrival of new groups (friends, relatives), who are often more demanding.
2. Families, on their own, install water inside their lots or dwellings, thus increasing demand for drinking water.
3. Institutions are then pressed for improvement of services. This is done with detriment to other sectors.

When an spontaneous settlement appears within a region with no adequate infrastructures, social, political, educational, and institutional problems and conflicts arise: new dwellers struggle against old residents for the very few public and private services in the area.

It is evident that this growing tendency of marginal population will go on, with the aggravating fact that, after two decades of receiving government support in aqueducts, sewerage systems, privies and other services in exchange for political concessions, dwellers of these shanty towns consider it to be their "right" - once new plots have been invaded

and houses built therein - to have a minimum water and sanitation service and that it is the State's "obligation" to provide it. During the months of August and September, new plots have been invaded: around 2,000 families (10,000 people) have settled down in approximately 40 hectares near the airport.

### 11.3 NEW APPROACHES AND OPPORTUNITIES TO IMPROVE WATER SUPPLY AND WASTEWATER AND EXCRETA DISPOSAL

The institution responsible for water supply has had to adopt a new approach for water supply and wastewater disposal. Although there is a total production of 104 million water gallons, for a served population of 730,000 people according to 1984 estimates, there are problems as to quantity in water supply and as to the optimum pressure in high places or distant from treatment plants (see Figure 11.4). This is due to the high water consumption among users. It is estimated that, for this year, the "per capita" consumption will be 169 gallons/day, but if we consider that many people do not receive water during most of the day, then this "per capita" consumption is even higher.

The Water Institute has understood that the solution is not only to increase water production, but rather its rationalization and better distribution.

The Water Institute aims to satisfy such a growing demand by implementing in the long range, the following programs:

- Educational campaign in order to promote a rational use of available water.
- Increase number of household connections with meters.
- Installation of control and pressure-regulating valves, in order to achieve pressure balance and flow regulation.
- Strengthen resources for the Network's maintenance and operation.
- New legal dispositions to enable a denial of service for those who misuse water, even though they pay for it.

These and other measures will allow saving a considerable water volume, which could be used to supply unsatisfied demands, thus increasing required investments for enlargements and improvements.

As funds for enlarging and extending the sewerage system will be each time harder to obtain, because of the difficulty and delay in recovering investments, the Water Institute is studying the increase of some measures or the application of new works, like the following:

- Increase application of valorization rates among served sectors.

- Financing of household connections in places with infrastructure so that investments can be recovered by valorization processes.
- In new projects for low-income areas, the possibility to include material and labor for intra-domiciliary installations will be studied, with the purpose of obtaining a greater percentage of users who will pay by valorization processes.
- Tariff establishment for sewerage use.
- In new settlements, the assignment of big plots (300-500 m<sup>2</sup>) will be promoted, so as to avoid an increased sewerage demand.

#### 11.4 MOST OUTSTANDING CHARACTERISTICS IN SATELITE CITY

##### 11.4.1 LOCATION OF SETTLEMENT AND PHYSICAL CHARACTERISTICS

Satelite City is situated within the metropolitan area of Marina City; at the south, it is adjacent to its urbanized quarters, toward the north and west, to its rural areas, toward the west, one finds rural areas and some urbanized sectors of Marina City (see Figure 11.2).

Lands toward the south show a topography where hills over 100 m high predominate with valleys in between; and toward the north and east, lands are low.

Climate is mostly of warm temperature, with great humidity and frequent electrical storms; the annual average temperature is 80°F.

The rainy season lasts approximately eight months, beginning in May and ending in December. During this period rainwaters are 90-95% of the average annual rainfall of about 90 inches; the dry season lasts from January through April.

Soil is formed by a variety of rocks, with predominance of the following:

- Marine sediments composed by sand particles, slime stone and limestone.
- Andesite and basalt flows.
- Igneous rocks.

The hydrographical network is formed by Lajas River at the north, and Juan Diaz River at the east; both serve as limits to Marina City, there are numerous gorges, creeks and pluvial ditches.

Its location within Marina City has allowed Satelite City to obtain certain services otherwise difficult to acquire (see Figure 11.2); these are:

### Drinking water

Marina City's main aqueduct line runs across Satellite City and the main storage tank (10,000,000 gallons) is located in Satellite City (see Figure 11.4).

### Sewerage system

Satellite City's dominant topography with respect to Marina City has allowed to incorporate some sewerage lines from the first network to the second one.

### Solid wastes collection

As Satellite City is nearer the final disposal location than downtown Marina City, it has been possible to provide a rather satisfactory service to urbanized areas.

### Various systems

Two of the main Marina City roads run across Satellite City: the road connecting to the country's second most important city and the road leading to the airport. Some streets inter-connecting both arteries, or streets connecting populated places to one of these roads complement this network. There are also many pathways both within urbanized areas and in "spontaneous settlements" (see Figure 11.3).

### Electrical and telephone systems

Nearness to great consumption centers and energy distributing stations has allowed extension of services to Satellite City; the same happens with the telephone service.

### Health services

Distance between Satellite City and public and private hospital centers has compelled the Ministry of Health and Social Security to establish certain facilities (hospitals and health centers) to assist a numerous population.

## 11.4.2 DEMOGRAPHIC CHARACTERISTICS

Satellite City's population, approximately 30 years after the arrival of its first dwellers, is a little over 182,800 people (1982), with predominance of those under 20 years old, who amount to 102,000

people (55%); in Marina City, population under 20 or less is 46% of the total. Families have an average of 5.2 persons; while on Marina city it is 4.2 persons per family (see Annexes 4 to 7).

Population growth in Satellite City has been one of the fastest in Latin America; an aerial photograph taken in 1953 shows the existence of 20 houses. In 1955, the number of families had increased to 200, with an approximate population of 1,000 inhabitants. In 1956, according to a survey carried out by the Institute for Economical Development, there were 315 households and 1,554 inhabitants. In 1957, the general control office performed a population survey which showed a total of 3,095 people, it had doubled in a year. In 1958, the Institute for City Planning carried out a new survey which revealed the existence of 1,355 households and 7,000 inhabitants, resulting in another duplication in one year.

In 1960, population amounted to 12,975 inhabitants; in 1970, the number increased to 70,140. From 1960 to 1970, population growth was 440%.

The last National Census showed that Satellite City had 169,870 inhabitants, this time, the growth rate with respect to 1970 was 142%; projections for the years to come are:

Year 1990 - 237,663 people  
Year 1995 - 280,088 people  
Year 2000 - 322,514 people  
Year 2005 - 380,036 people

In population surveys carried out, female population has been slightly greater (51-52%) than that of males; population of both sexes under 20 years old represent 55.8% (see Annexes 4 and 7).

With decrease in growth rates of future population and the improvement of health conditions, it is expected that the number of inhabitants under 20 years old, for both sexes, will also decrease, thus increasing the percentage and number of adult people (second and third ages).

#### 11.4.3 SOCIO-CULTURAL AND ECONOMICAL CHARACTERISTICS

Houses with walls made up of cardboard, zinc or old woods, which belonged to the first dwellers, have been replaced thanks to aggressive programs carried out by the Institute for City Planning and by the dwellers' own effort. We can distinguish now a housing typology which includes from one-family houses to multi-family buildings going through different solutions, as sale of plots with minimum urbanization services, mutual-help and self-effort systems, basic housing nucleus (floor and roof), houses in line, etc.

Government action was as follows:

- During 1960-1968, the Institute of Housing built 4,057 dwellings.
- During 1970-1976, the Institute of Housing built another 7,000 dwellings.
- During 1976-1978, special government' projects constructed additional 1,467 dwellings.
- During 1978-1981, the Institute of Housing built 1,333 housing facilities.
- From 1981 to 1983, the social security has financed the construction of hundreds of housing units. In new settlements there are at present, two different kinds of dwellings. In some new nucleus within areas still not urbanized, houses have walls made up of blocks, coated concrete floors, windows, ceiling and gratings and plated-zinc roof. In other places, residents use any material they are able to purchase, such as: woods, cardboard, tin plate, zinc, etc.

A 30% from total dwellings has two bedrooms, kitchen, living room and bathroom. Secondly, with a 27%, there are houses with only one bedroom, and finally with a 23%, there are houses with three bedrooms (see Annex 13).

When trying to describe living conditions among Satellite City's inhabitants, one finds three different groups, each having its own characteristics. There is the one formed by those living in the first urbanized areas, who have been able to overcome initial difficulties. Moreover, many of these families have higher average incomes than those families for whom housing programs were originally directed.

A second group is formed by families who could hardly be classified as "marginal"; they are professionals, merchants, public and private employees, and artisans who buy their plots in areas still not urbanized. They build their houses with more investment than those houses built by the Institute for City Planning (ICP); then, through mutual assistance, political attainments and pressures against pertaining institutions they construct (by urbanizing) infrastructures (water, electricity, streets, sewerage system, etc.) of their sector.

The third group is formed by invaders of private plots, who create "marginal settlements"; these new dwellers have similar characteristics, like: low educational level, unemployment, young and numerous families, low family incomes, unmarried mothers, mothers who also represent the father.

School registration in Satellite City is high, nevertheless, primary and secondary desertions are frequent. The ones who finish the

second level represent a third part of those who finish primary school, and also the ones who enter universities represent a third part of those who finish secondary school.

Groups with higher educational level show lower unemployment percentages but the less-educated ones have a higher unemployment percentage (see Annex 14).

Working population consists of 44,545 people, 30,255 (68%) of which are permanent employees and 8,565 (19.2%) are occasionally employed or jobless. Males, with 29,405 working posts (66%), represent most of the working population; private enterprises, with their miscellaneous activities, absorb most personnel: 17,185 (38.6%) of the total working population; the government is the second great employer with 11,735 workers (26.3%); a third group is formed by those working on their own: 4,500 people (10.1%); 36,430 people (81.7%) from the total working population earn less than 400 dollars a month (see Annexes 15 and 16).

#### Inhabitants' characteristics, formal and informal organization levels for collective decision-making

Besides the two characteristic groups traditionally forming spontaneous settlements, there is still another one. In Satellite City, one clearly distinguishes the following groups, with rather homogeneous features:

1. Peasant families, who come to the city looking for work and educational opportunities.
2. Poor families, with no resources, as a result of over-populated quarters in the cities.
3. Families with middle resources, unable to acquire houses offered by the private market in urbanized sectors.

Nevertheless, from a historical point of view, methodology employed to solve their common problems has been of a similar nature. Once the "settlement" has been formed and consolidated, associations are spontaneously created "for something", to secure land tenure and promote attainment and construction of basic services (water, electricity, streets, school, etc.).

During the 50's, Satellite City's first dwellers created societies and organizations like the "Satellite City's Civic Society". Members elected a governing board, who was in charge of representing them before the authorities; decisions were taken in periodic assemblies or meetings, where all members participated.

As the settlement process evolved, new civic associations appeared always aiming at communal improvement. In 1969, the "Satellite

City Plan" was created with the purpose of encouraging communal participation in decision-making on matters affecting the community. The clear understanding of the problem through this plan and its defined objectives, moved the Central Government to think that Satellite City deserved also political and administrative mechanisms in order to achieve its goals.

On July 30, 1970, the Special District of Satellite City was created; that same year, the first communal assembly was established, which served as pattern for the present "National Assembly of Sub-District Representatives".

The Special District of Satellite City is politically divided into five sub-districts: Amelia Denis de Icaza, Belisario Porras, José Domingo Espinar, Mateo Iturralde, and Victoriano Lorenzo. The Belisario Porras sub-district is the most populated one within the country.

In each sub-district, there exists a "communal board" with the purpose of promoting its development and keeping watch over the community's problems and needs so that they are solved and satisfied. Members of these communal boards are: a sub-district representative, elected by popular voting, who presides it, a chief magistrate and three (3) sub-district citizens. These communal boards learn about the population's problems, needs and aspirations through the "local boards", whose representatives are elected by the quarter's or locality's citizens.

These "local boards" are formed by a board of management with five members (president, vice-president, secretary, treasurer, and prosecutor), their substitutes and two plain members. At present, there are 101 local boards in the special district of Satellite City.

Representatives form a municipal council, in the capacity of alderman, and nominate a mayor who is responsible for the municipal administrative management.

#### Satellite City's economical activities

Satellite City's economical activity is very limited, as it only comprises:

- (a) Services. Sale of first-need foodstuffs, restaurants, building material stores, etc.
- (b) Industry. There are approximately 12 industries, such as factories for soap, furniture, blocks, steel elements, concrete elements, alcoholic drinks, etc.

The economical activity is not considered as a "great generator" of working posts for Satellite City's people, because:



- Small businesses are owned by family groups (Asiatic or from inner lands).
- Industries do not discriminate when selecting their personnel, that is why there is a high percentage of foreign people.
- Commercial and industrial enterprises have limited influence on the labor market required by Satellite City, a fact which gave origin to the phrase "Satelite City is Marina City's great dormitory".

The government has adopted certain measures in order to generate working posts to primarily benefit Satellite City's dwellers, such as:

- Projects carried out under contract by private enterprises for construction services (water, housing, electricity, etc.) are demanded to hire personnel from Satellite City.
- A program is being carried out for poor population groups, aimed at encouraging small entrepreneurs and workers on their own, offering them credit facilities and technical assistance; until June 1983, 41 loans were granted for a total of 383,413 dollars.
- Creation of Satellite City's Mini Industrial Park. The project contemplates the provision of services and facilities in order to reduce investment costs for small entrepreneurs, with an available area of 1.25 hectares. Estimated investment cost is 707,000 dollars, which is expected to generate 400 permanent posts.

Future land uses: Satelite City covers an area of 5,130.5 hectares; according to surveys carried out by a consultant enterprise in 1976, the program was as follows:

#### LAND USES IN SATELITE CITY

USES	Ha.	%
Totals	5,130.50	100.00
Developed	1,024.6	19.97
Under construction	113.3	2.21
Vacant	3,992.1	77.82

From the total of 1,024.6 developed hectares, 627.5 Ha (61.25%) were assigned for residential use; the remaining were used in other activities (see Annex 3).

During the last eight years, land occupation and development has been mostly for housing, with the exception of some private initiatives; apparently, vacant plots - both state-owned and private - will be mostly used for housing. Municipal authorities have requested areas for development of projects, such as:

- A peripheral market
- Sports and recreation fields
- A cemetery
- Other services for public use

#### Information related to the health sector

The Ministry of Health has five health centers and a pediatrician consulting room within the area; on the other hand, the Social Security has established polyclinics (see Annex 17).

These five health centers carry out all programs for primary health care, as follows:

1. Patient attention
  - a. Growth and development
  - b. Morbidity
2. Community's health education through primary or secondary schools or by means of organized groups.
3. Maternal attention
4. Adults' attention
5. Campaigns against hypertension, diabetes, etc.
6. Environmental sanitation.

Besides this primary health care activities, there are some other specialities within these health centers, such as: gynecology, dermatology, etc.

The two Social Security polyclinics comprise all these specialities plus hospitalization services.

It should be noted that, according to a survey carried out by the Ministry of Health's Department of Epidemiology, in a place called Monte Sinai, seven out of every ten surveyed people had Social Security coverage, therefore health services were available to them.

Table 1 shows data on water-borne diseases and environmental sanitation conditions (1982); Table 2 shows most prevailing diseases in the area.

TABLE 1  
 WATER-BORNE DISEASES AND ENVIRONMENTAL SANITATION  
 CONDITIONS, 1982

Code	Causes	No.
006	Anoebiasis	2
007	Other intestinal diseases produced by protozoa	23
008	Intestinal infections produced by other organisms	1
009	Intestinal infection wrongly defined	518

TABLE 2

Code	Causes	No.
060	Yellow fevers	1
072	Urlian fever	18
070	Viral hepatitis	12
077	Other conjunctiva diseases caused by viruses and clamidiae	9
078	Other diseases caused by viruses and clamidiae	76
091	Symptomatic precocious syphilis	63
097	Other syphilis and unspecified ones	44
098	Gonococcic infection	206
099	Other venereal diseases	14
132	Pediculosis and infection caused by Phthirus	23
131	Trichomoniasis	334
133	Acariasis	627
136	Other infectious and parasitical diseases and unspecified ones	6
062	Mosquito-borne viral encephalitis	3
096	Late latent syphilis	6

## MOST PREVAILING DISEASES IN SATELITE CITY

1982

1. Acute rhinopharyngitis (ordinary cold)
2. Acute pharyngitis
3. Intestinal parasitosis, with no other specification
4. Bronchitis, unspecified either as acute or chronic
5. Intestinal infection wrongly defined
6. Acute infection of upper respiratory tract, with multiple localization or unspecified
7. Inflammatory diseases affecting the uterine neck, vagina, and vulva
8. Other disorders of the urethra and urinary apparatus
9. Menstrual disorders and other abnormal hemorrhages affecting female genital organs
10. Other forms of protein-caloric malnutrition and unspecified ones.

### 11.4.4 SECTOR INSTITUTIONS

Even though different governments have done their best in order to satisfy service demands, generated by SateLite City's explosive growth, "supply" was usually less than "demand"; problems subsisted and increased, especially among sectors occupied by new invaders. It was evident a lack of enough and adequate services for drinking water supply, wastewater and solid wastes disposal, electrical lighting for streets and pathways, rainwater drainage, lots assignment and dwellings, new relocations, school equipment, health centers, sports facilities, etc.

A general State council was held in December 1975, in the special district of SateLite City. It was presided by the Chief of State. Community multitudinously participated, through its mayor and sub-district representatives, to formally request assistance. The Chief of State promised to urgently start SateLite City's integral urban development. The Ministry of Planning was appointed to elaborate the program. In January 1978, financial support was obtained to carry out such program through "AID Project No. 525-H.1.6-009".

The program was called "Integral Urban Development in the Special District of Satellite City" (IUDSC) and was aimed at strengthening institutional coordination and cooperation, at supplying some sectors with aqueducts, sewerage systems, electrification and public lighting, street and pathway pavement, and around 2,000 housing solutions. In an indirect way, these works would provide approximately 1,500 temporary working posts.

The program, without resources and components, was as follows:

IUDSC PROGRAM (Phase 1)

Sub-program	AID grant	GON grant	Total
Water	8,373,000	932,000	9,305,000
Electricity	1,070,000	230,000	1,300,000
Streets	2,057,000	400,000	2,457,000
Dwellings	3,500,000	2,334,800	5,834,000
<b>Total</b>	<b>15,000,000</b>	<b>3,896,800</b>	<b>18,896,800</b>

In 1982, under coordination of the highest-rank military officer in Satellite City, its technical board was created, formed by representatives from all national institutions, the community's political representatives, and some entrepreneurs or investors. The purpose was to evaluate the district's needs, to identify investment projects programed by state institutions, to improve interinstitutional coordination, to make rational use of state resources and to promote good use among the community of constructed facilities; for example: sewerage system, water.

The technical board presented the "Investment Program for the District of Satellite City, to be carried out during 1983-1984.

The program components were grouped according to the following sub-programs:

- Sub-program I: Installation of basic infrastructure
- Sub-program II: Provision of urban equipment
- Sub-program III: Construction of new dwellings
- Sub-program IV: Utilization of installed infrastructure
- Sub-program V: Generation of employment.

Projects' financing will be obtained through contribution from each State agency, according to its working programs which correspond to the Nation's general budget.

The new program has been estimated in US\$ 19.4 millions, divided into two periods: for 1983, a total of US\$ 6.1 millions (see following Table):

INVESTMENT PROGRAM FOR SATELITE CITY  
(in thousands)

Sub-program	1983	1984	Total
<b>I. INFRASTRUCTURE</b>			
Basic:	<u>2,157.5</u>	<u>3,410.4</u>	<u>5,567.9</u>
1. Aqueduct and sewerage	90.0	1,814.4	1,904.4
2. Electrification	514.5	350.0	1,164.0
3. Telecommunication	718.0	446.0	1,164.0
4. Public road	785.0	800.0	1,585.0
5. Rainwater drainage	50.0		50.0
<b>II. EQUIPMENT SUPPLY</b>	<u>1,214.3</u>	<u>2,350.0</u>	<u>3,564.3</u>
1. Education	684.3	1,100.0	1,784.3
2. Trade (market)	450.0	1,250.0	1,700.0
3. Health	80.0		80.0
<b>III. HOUSING</b>	<u>9,600.0</u>		<u>9,600.0</u>
1. Dwelling construction	9,600.0		9,600.0
<b>IV. UTILIZATION OF INFRASTRUCTURE:</b>	_____	_____	_____
1. Housing improvement	*		
<b>V. GENERATION OF EMPLOYMENT</b>	*		
1. Small enterprises	<u>322.7</u>		<u>668.9</u>
2. Orchards	272.7	346.2	618.9
	50.0		50.0
<b>Total</b>	<b>13,294.5</b>	<b>6,106.6</b>	<b>19,401.0</b>

(\*) National Program. The Institute for City Planning has been allotted US\$504,000 for Marina province.

Inasmuch as institutions supplying water, sewerage and electricity, sell such services, and funds invested in enlargement of services have to be recovered through valorization rates and application of services tariffs, these services have been under-used.

The IUDSC Program was aimed at improving living conditions among marginal sectors, where families had cheaper collective services for water and electricity.

Water was paid at two dollars per family; light was paid by declared appliance (TV set, refrigerator, electrical bulbs, etc.), which approximately amount to five dollars; excreta disposal was carried out in privies.

To acquire electricity, sewerage and water services as a whole, meant:

(a) Cost for installations per family

Aqueduct	=	30.00
Sewerage system	=	270.00
Electricity	=	<u>80.00</u>
<b>Total</b>		<b>380.00 dollars</b>

(b) Monthly payments

Water consumption	=	4.24
Aerial	=	2.00
Aqueduct valuation	=	4.42
Sewerage valuation	=	19.89
Electricity	=	<u>11.33</u>
<b>Total</b>		<b>32.88 dollars</b>

- Undoubtedly, poor families were not thus encouraged to increase their monthly incomes. The sewerage system, after five years, was only connected in a 25% from a total of approximately 6,000 possible sanitary connections.

- Something similar happened with respect to housing solutions:

Housing Solution	Projected Units	Assigned Units	Family Income US\$	Monthly Payment, US\$ (25 years)
Urbanized plot	791	2	100-159	20
Floor and roof	422	422	160-199	35
Basic unit	120	120	200-300	49

- The "urbanized plot" solution was not accepted as it had been expected because, besides troublesome actions each applicant had to undertake, monthly payments of US\$ 20 to the Institute of City Planning had to be done during 25 years; he also needed to have resources of his own in order to build his house; and if he fulfilled all these requirements, then he should be responsible for payment of water, sewerage and electricity services.
- Groups who chose the "floor and roof" and "basic unity" solutions were frequently unable to pay for water and valuation services, thus depriving the Water Institute of collecting funds for loans, improvements and enlargement of services.
- Even though the IUDCS Program did not obtain the expected success, it undoubtedly contributed to reduce deficit in service infrastructures, and permitted an improvement in life and environment quality.

(c) Available water resources

- Inventory of water resources is poor, surface waters are scarce and the scanty rivers and gorges are highly contaminated due to irresponsible usage to discharge liquid and solid wastes. Several years ago, drilling of deep wells (80-150 feet) was put aside due to pollution risks and low performance.

On the other hand, as it was previously noted, Marina City's main aqueduct line runs across Satellite City; therefore, it is cheaper and safer to obtain flows from such line.

(d) Current water supply and excreta disposal

- Almost all drinking water consumed in Satellite City is supplied by Marina City's aqueduct system; for the above-mentioned reasons, people use water from intra-domiciliary or collective installations (see Annex 13).
- Water quality is considered to be excellent, it satisfies national and international drinking water standards; "per capita" consumption is 113 gallons/person/day; distribution is through distributing lines, by gravity or by pumping, and it is stored in tanks located in different hills; people have built their houses at a higher altitude above sea level than that of the 10,000,000 gallon tank (around 100 meters).
- Excreta disposal is carried out through a sewerage network interconnected to Marina City's network; 33.2% of houses use this system.



- A 10.5% (3,190 dwellings) use networks flowing into collective septic tanks, where wastes are given an incomplete treatment.

Some 16,345 (54%) dwellings still utilize privies, either because they lack infrastructure or for economic impediments.

Urbanized and accessible locations are rather regularly served by the cleanliness service; nevertheless, the great number of existing pathways prevent big trucks from serving many sectors, thus, dwellers finally throw their wastes into cliffs and gorges. Absence of streets in the places described invariably prevents cleanliness actions.

#### Satelite City's perspectives and expectations

Experience learned through Satelite City's population growth and its consequent demand for services, as well as the highly responsible way our country replied to such demands in spite of its limited resources, encourage us to believe that both current and future needs will receive adequate answers from the people-government binomial.

Map 1

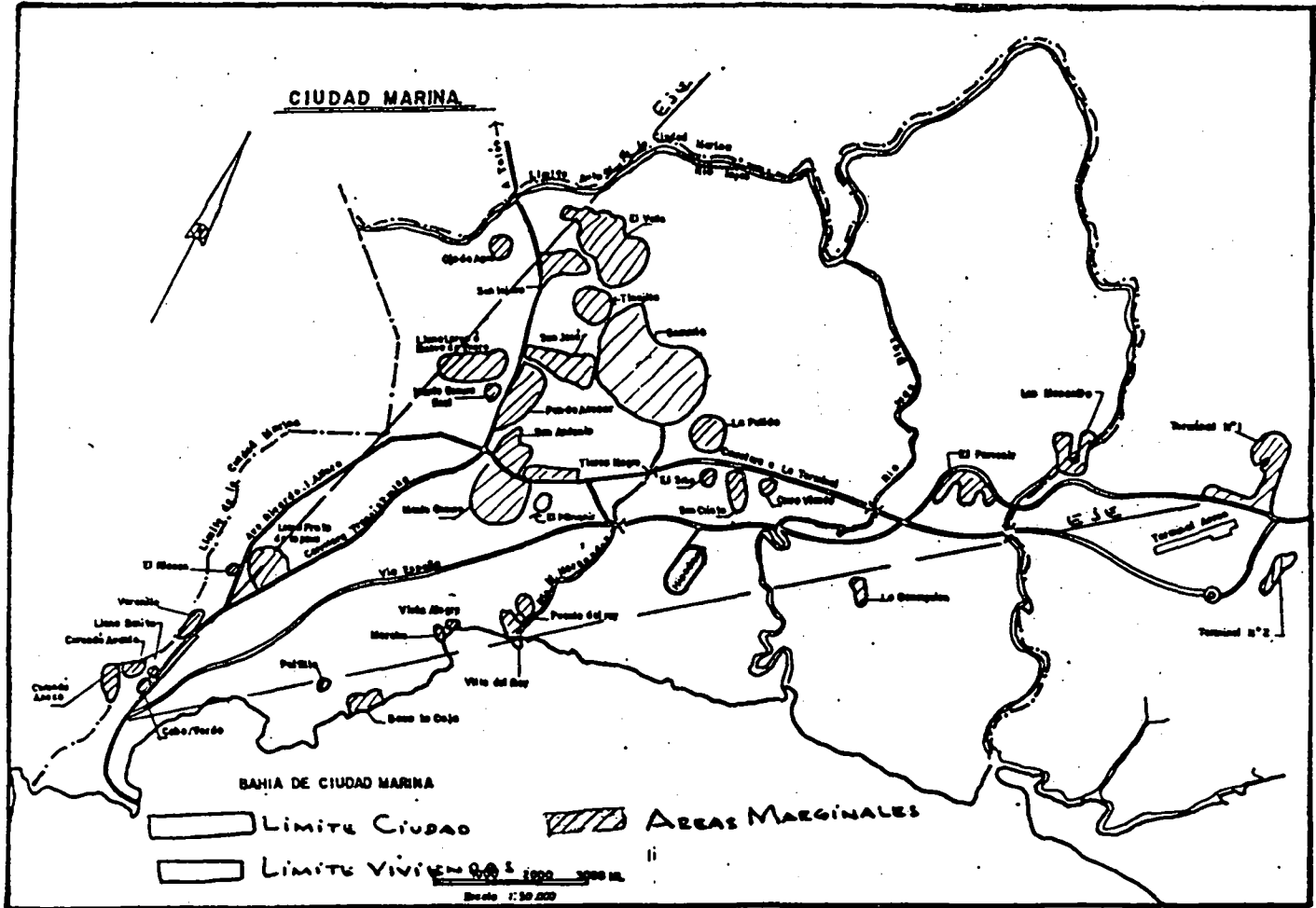


Figure 11.1

Map 2

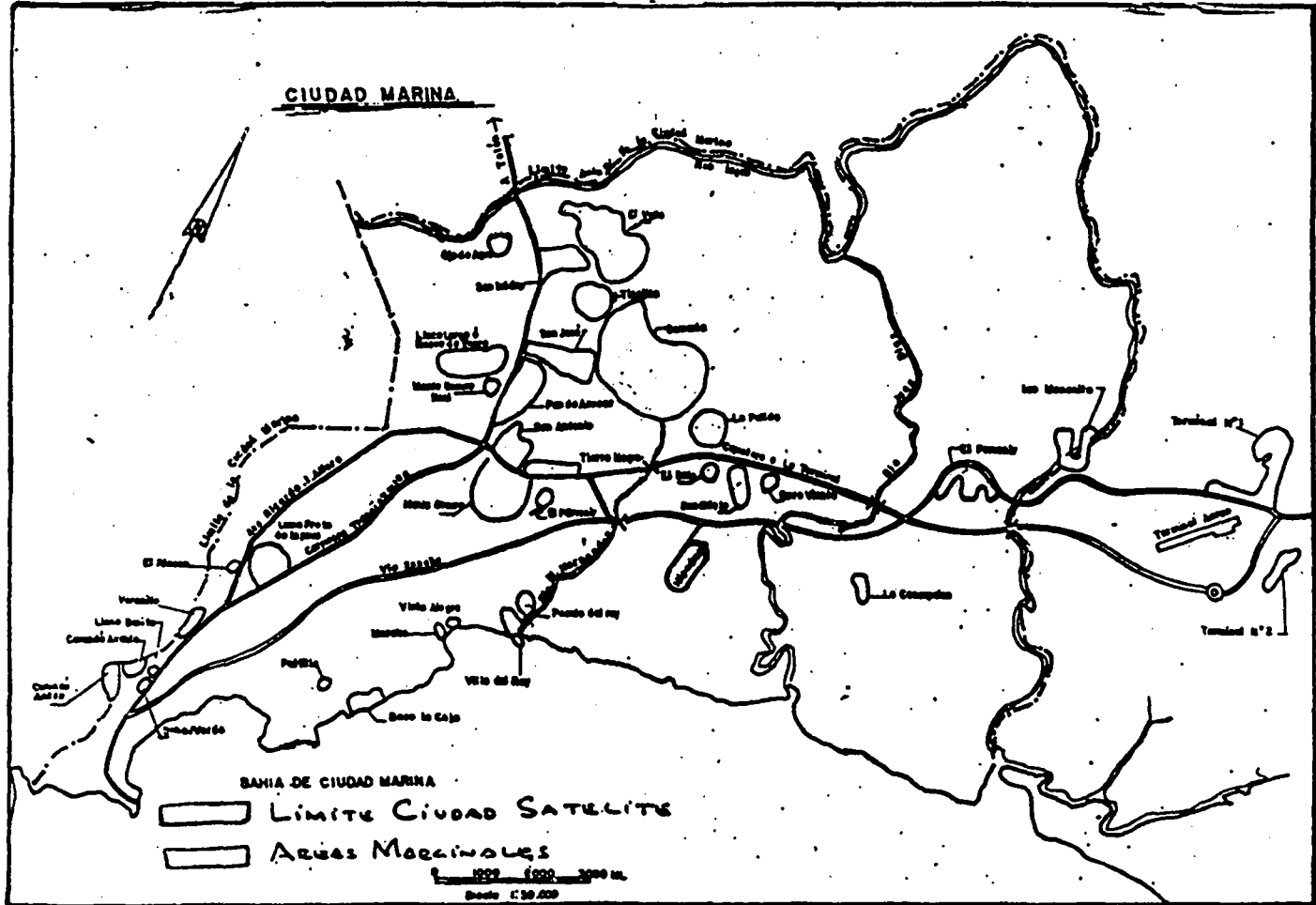


Figure 11.2

Map 3

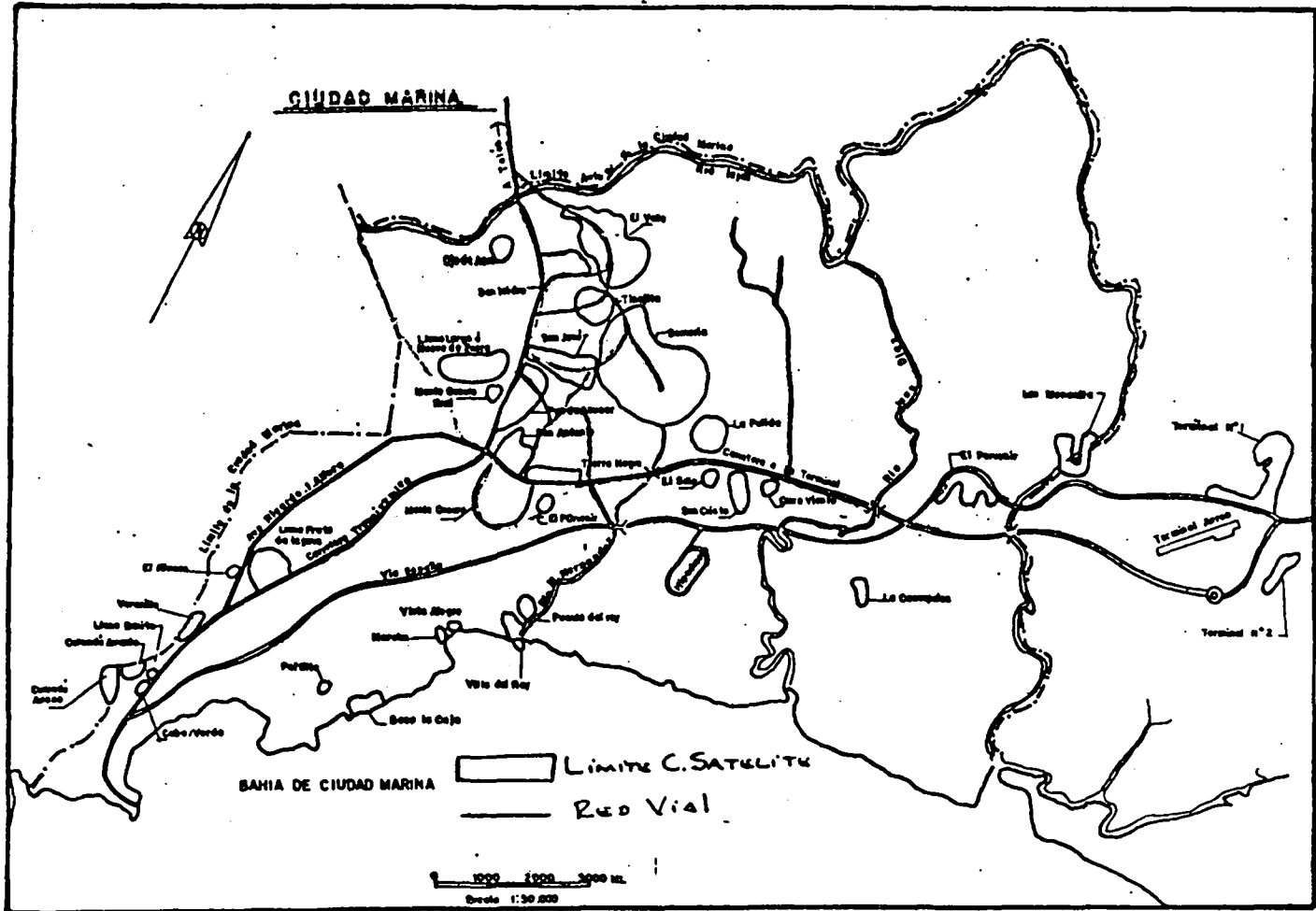


Figure 11.3



## ANNEX 1

PRIVATE OCCUPIED HOUSING, BY TYPE AND YEAR OF CONSTRUCTION  
SOME HOUSING CHARACTERISTICS: 1960 CENSUS

Housing characteristics	Dual 1/	Total		Type of housing and year of construction						Vicinity house			Year of construction unknown	
		From 1970-80	Before 1970	Individual house		Apartment		Total	From 1970-80	Before 1970	Total	From 1970-80		Before 1970
				Total	From 1970-80	Before 1970	Total							
MARINA CITY	104,300	35,940	33,643	46,995	23,470	23,175	27,765	11,780	16,005	15,210	745	14,469	19,710	
Walls:														
Blocks, bricks, stone, concrete	73,075	27,285	33,365	32,440	16,085	16,355	24,065	10,920	13,145	4,145	280	3,065	12,425	
Cement, wood (boards, logs, etc.)	34,345	7,690	19,340	12,790	6,370	6,420	3,720	840	2,840	11,820	440	10,540	7,015	
Clay and canes, adobe, straw, reed, etc.	180	95	65	155	95	60	-	-	-	5	-	-	60	
Other stuff or unvalled	955	570	270	835	370	200	-	-	-	5	-	5	115	
Unknown	105	30	-	30	30	-	-	-	-	-	-	-	75	
Roofing:														
Concrete	30,960	11,715	11,960	5,015	2,775	2,240	18,995	9,285	9,090	665	35	630	6,285	
Tile	3,055	330	2,280	1,920	270	1,650	540	50	310	130	10	120	445	
Cement fiber	2,185	720	1,025	900	480	420	565	230	335	280	10	270	440	
Metal (zinc, aluminum, etc.)	65,015	21,145	33,375	36,055	19,030	17,025	6,815	1,550	5,265	11,650	565	11,085	10,495	
Protected wood	7,100	570	4,695	1,965	400	1,565	850	45	805	2,450	125	2,525	1,835	
Straw or pulpy leaves	655	415	180	595	415	160	-	-	-	-	-	-	60	
Other	235	30	130	125	30	95	-	-	-	35	-	35	75	
Unknown	95	20	-	20	20	-	-	-	-	-	-	-	75	
Flooring:														
Paved (concrete, concrete tile, brick, etc.)	89,210	31,300	42,130	38,345	19,040	19,285	26,440	11,735	14,705	8,829	485	8,140	15,700	
Wooden	15,970	2,025	10,440	4,625	1,750	2,875	1,325	85	1,300	6,335	250	6,285	3,483	
Earthy	3,840	2,505	995	3,465	2,500	965	-	-	-	35	5	30	340	
Other	170	80	60	125	75	50	-	-	-	15	5	10	30	
Unknown	110	35	-	35	35	-	-	-	-	-	-	-	75	
Drinking water supply:														
Aqueduct inside house	78,105	27,603	37,180	33,815	15,600	18,215	27,785	11,780	16,005	3,100	320	2,940	13,425	
Public, IDAAN	74,835	26,280	35,680	31,625	14,390	17,235	27,525	11,700	15,825	2,810	190	2,620	12,875	
Public, community	2,175	835	935	1,325	800	525	115	20	95	330	15	315	359	
Private	1,245	485	565	845	410	455	145	60	85	40	15	25	195	
Aqueduct outside house	14,500	5,800	14,990	8,850	9,300	3,550	-	-	-	11,940	500	11,440	5,410	

## ANNEX 1

ANNEX 1 (page 2)

PRIVATE OCCUPIED HOUSING, BY TYPE AND YEAR OF CONSTRUCTION  
SOME HOUSING CHARACTERISTICS: 1960 CENSUS

Housing characteristics	Dual 1/	Total			Type of housing and year of construction						Year of construction unknown		
		From 1970-80	Before 1970	Total	Individual house		Apartment		Vicinity house				
					From 1970-80	Before 1970	Total	From 1970-80	Before 1970	Total		From 1970-80	Before 1970
Public, IDAAN	10,675	6,505	13,920	6,895	4,015	2,810	-	-	-	11,530	420	11,110	5,250
Public, community	1,410	1,160	885	1,690	1,105	585	-	-	-	375	75	300	385
Private	375	115	140	265	110	155	-	-	-	35	5	30	75
Sanitary well	1,850	1,035	615	1,605	1,050	175	-	-	-	40	9	40	200
Public	1,310	770	390	1,130	770	360	-	-	-	30	-	30	150
Private	540	265	225	475	240	215	-	-	-	15	5	10	50
Unprotected curbstone	515	160	195	450	270	180	-	-	-	25	10	15	40
Rainwater	110	25	50	65	20	45	-	-	-	10	5	5	35
Surface well	1,240	690	405	1,090	685	405	-	-	-	5	5	-	145
Deep well	765	475	210	630	475	205	-	-	-	5	-	5	80
Unknown	115	40	-	40	40	-	-	-	-	-	-	-	75
Sanitary service:													
Private	83,890	33,485	27,780	42,400	31,400	29,975	27,785	11,760	16,005	-	-	-	13,145
Connected to sewerage	60,395	20,490	29,410	23,405	9,705	13,700	26,495	10,765	15,710	-	-	-	10,495
Connected to septic tank	6,275	3,445	2,215	4,370	2,450	1,920	1,290	995	295	-	-	-	615
Hollow or privy	17,220	9,550	5,655	15,185	9,338	3,655	-	-	-	-	-	-	2,035
Communal	22,890	1,185	15,625	1,775	550	1,225	-	-	-	11,035	676	75,070	6,740
Connected to sewerage	19,930	475	14,250	835	145	690	-	-	-	13,090	330	23,360	3,205
Connected to septic tank	785	70	440	100	35	65	-	-	-	410	35	375	275
Hollow or privy	2,175	640	935	840	370	470	-	-	-	735	270	465	622
No sanitary service	7,415	1,215	760	1,830	1,155	673	-	-	-	175	110	65	413
Unknown	105	30	-	30	-	-	-	-	-	-	-	-	75
Bathroom:													
Private	76,935	29,315	35,220	34,750	17,535	19,215	47,785	11,780	16,865	-	-	-	12,203
Main-supplied water	71,400	26,350	33,325	31,975	14,590	17,305	47,700	11,760	15,940	-	-	-	11,725
Water supplied by other means	5,355	2,965	1,895	4,775	2,945	1,830	85	20	65	-	-	-	675
Communal													
Main-supplied water	21,655	945	15,075	1,370	370	1,900	-	-	-	14,550	475	14,075	5,735
Water supplied by other means	1,270	475	525	650	365	285	-	-	-	350	110	240	273
No bathroom	9,325	5,275	2,825	7,790	5,115	2,675	-	-	-	310	160	150	1,225
Unknown	115	35	-	35	35	-	-	-	-	-	-	-	63

## ANNEX 1

ANNEX 1 (page 3)

PRIVATE OCCUPIED HOUSING, BY TYPE AND YEAR OF CONSTRUCTION  
SOME HOUSING CHARACTERISTICS: 1960 CENSUS

Housing characteristics	Dual 1/	Total		Type of housing, and year of construction									Year of construction unknown	
		From 1970-80	Before 1970	Individual house			Apartment			Vicinity house				
				Total	From 1970-80	Before 1970	Total	From 1970-80	Before 1970	Total	From 1970-80	Before 1970		
Electrical lighting:														
With electrical lighting	100,930	31,040	91,010	30,700	10,615	27,085	27,716	11,760	13,950	14,660	645	13,975	18,483	
IRME	99,395	30,640	50,500	39,065	16,240	20,825	27,555	11,740	15,815	14,500	640	23,440	18,235	
Private	1,135	400	510	615	355	240	155	20	135	140	25	115	225	
Other kind of lighting	8,655	4,965	2,635	6,855	4,765	2,000	75	20	55	570	40	495	1,199	
Gas	305	70	140	120	55	65	15	-	15	95	15	80	75	
Kerosene	7,530	4,560	2,045	6,365	4,495	1,870	30	10	20	230	50	175	905	
Other	820	235	410	370	215	155	30	10	20	245	11	235	175	
Unknown	115	40	-	40	40	-	-	-	-	-	-	-	75	
Fuel for cooking:														
Electricity	2,335	715	1,105	810	380	430	755	304	455	255	25	220	515	
Gas	98,130	32,280	48,410	41,310	20,300	21,810	16,990	11,945	15,145	12,890	475	12,255	17,443	
Kerosene	990	345	495	500	305	175	65	15	70	255	15	230	153	
Coal	450	105	265	205	100	105	-	-	-	145	3	140	83	
Firewood	3,370	1,900	1,550	1,995	1,465	1,830	-	-	-	165	-	20	355	
No cooker	5,900	495	2,310	735	330	485	450	120	330	1,620	45	1,575	1,095	
Unknown	125	40	10	40	40	-	5	-	5	5	-	5	71	
	26,425	7,090	10,675	9,260	5,550	3,710	4,495	1,320	3,175	4,010	216	3,740	18,007	
Walls:														
Blocks, bricks, stone, concrete	12,280	4,060	5,550	4,770	2,955	1,815	2,985	1,035	1,950	1,015	70	1,785	2,673	
Cement fiber, wood (boards, logs, etc.)	9,610	2,275	4,795	3,410	1,845	1,565	1,510	165	1,442	2,156	145	2,005	2,502	
Clay and canes, adobe	225	120	65	185	170	65	-	-	-	-	-	-	48	
Straw, pulpy leaves, reed, wood sticks	145	140	215	755	540	215	-	-	-	-	-	-	90	
Other stuff or unwallied	150	85	50	135	85	50	-	-	-	-	-	-	15	
Unknown	3,315	10	-	5	5	-	-	-	-	-	-	-	3,125	
Roofing:														
Cement	3,290	1,675	1,450	495	300	195	1,475	765	840	185	10	375	705	



## ANNEX 2

POPULATION PROJECTIONS FOR MARINA CITY BY SUB-DISTRICTS, AND FOR THE  
SPECIAL DISTRICT OF SATELITE CITY FOR THE YEARS  
1970, 1976, 1980, 1990, 2000, 2010 AND 2020

Place	Y E A R S						
	1970	1976	1980	1990	2000	2010	2020
Totals	418,844	544,372	645,369	879,804	1,206,680	1,620,164	2,237,975
MARINA CITY	<u>348,704</u>	<u>420,022</u>	<u>475,499</u>	<u>642,141</u>	<u>884,166</u>	<u>1,182,506</u>	<u>1,644,063</u>
San Felipe	14,145	14,732	13,058	13,187	12,733	12,294	11,870
Chorrillo	27,834	32,869	36,722	48,449	63,920	84,332	111,261
Santa Ana	32,023	38,460	43,456	58,970	80,024	108,595	147,365
Calidonia	57,628	60,199	61,976	66,652	71,680	77,088	82,904
Betania	37,271	44,763	50,578	68,635	93,139	126,391	171,516
Bella Vista	26,659	32,018	36,177	49,093	66,620	90,404	122,618
Pueblo Nuevo	19,376	21,012	22,178	25,386	29,058	33,260	38,071
San Francisco	35,995	44,685	52,467	76,478	111,476	162,491	236,852
Parque Lefevre	31,165	38,689	44,689	64,081	91,888	131,762	188,939
Rio Abajo	27,353	32,395	36,264	48,077	63,738	84,502	112,079
Juan Diaz	26,719	34,910	43,170	65,858	102,489	133,133	209,750
Pedregal	16,356	25,290	34,164	57,275	97,401	132,254	2,668
SATELITE CITY	7,140	124,350	169,870	237,663	322,514	437,658	593,912

## ANNEX 3

PARTICULAR USES OF SOIL IN DEVELOPED AREAS OF  
MARINA CITY AND THE SPECIAL DISTRICT OF SATELITE CITY

USES	HAS.	%
Totals	5,622.50	100.00
MARINA CITY	<u>4,597.90</u>	<u>100.00</u>
Residential	1,478.00	32.14
Mixed residential	81.60	1.77
Commercial	206.80	4.50
Industrial	335.50	7.30
Transportation	4.90	0.11
Institutional	387.50	8.43
Public use	106.50	2.31
Emergency urban settlements	119.00	2.59
Public lands	984.80	21.42
Circulation	893.30	19.43
SATELITE CITY	<u>1,024.60</u>	<u>100.00</u>
Residential	626.90	61.19
Mixed residential	0.60	0.06
Commercial	28.20	2.75
Industrial	81.40	7.95
Institutional	42.20	4.12
Public use	10.70	1.04
Public lands	132.10	12.89
Circulation	102.50	10.00

Source: Research work carried out by DEMETSA for TECNIPAN - HAZANSAW.

SUMMARY OF DEVELOPED, UNDER CONSTRUCTION AND VACANT  
AREAS IN MARINA CITY AND THE SPECIAL DISTRICT OF  
SATELITE CITY, FOR JANUARY-JUNE 1976

USES	HAS.	%
Totals	15,789.30	100.00
<b>MARINA CITY</b>	<u>10,659.30</u>	<u>100.00</u>
Developed	4,597.90	43.13
In Marañon (Renovacion)	10.70	0.10
Under construction	71.20	0.67
Vacant	5,979.50	56.10
<b>SATELITE CITY</b>	<u>5,130.50</u>	<u>100.00</u>
Developed	1,024.60	19.97
Under construction	113.30	2.21
Vacant	3,992.10	77.82

Source: Research work carried out by DEMETSA for Tecnipan-Hazansaw.

## ANNEX 4

ESTIMATED POPULATION FOR MARINA CITY, ACCORDING  
TO SEX AND AGE, BY SUB-DISTRICT: YEAR 1982

Sex and age	Total	San Felipe	Cho- rrillo	Santa Ana	Cali- donia	Curundu	Betania
TOTAL	<u>398,090</u>	<u>10,994</u>	<u>24,401</u>	<u>26,549</u>	<u>23,663</u>	<u>17,929</u>	<u>45,626</u>
(Under 1 year)	(8,759)	(215)	(582)	(522)	(458)	(513)	(827)
0-4	45,444	1,118	3,019	2,708	2,376	2,661	4,291
5-9	42,114	960	2,740	2,430	2,191	2,586	4,502
10-14	41,168	1,053	2,578	2,190	2,110	2,170	4,590
15-19	45,520	1,331	2,889	2,951	2,464	2,193	5,515
20-24	40,701	1,325	2,593	3,209	2,388	1,706	4,394
25-29	34,805	1,024	2,158	2,746	2,197	1,374	3,706
30-34	30,064	731	1,779	1,952	1,699	1,171	3,449
35-39	23,552	577	1,343	1,412	1,428	903	2,712
40-44	18,926	519	1,005	1,292	1,017	760	2,498
45-49	15,774	482	858	1,112	1,006	545	2,209
50-54	14,228	458	757	1,070	989	482	1,836
55-59	12,457	360	721	906	958	431	1,659
60-64	11,479	338	715	806	951	416	1,501
65-69	8,871	282	515	662	854	221	1,110
70-74	5,554	171	355	502	407	126	666
75-79	3,485	129	166	305	345	94	448
80-84	2,155	104	117	167	151	53	280
85 & over	1,793	32	93	129	132	37	260
MALES	<u>187,045</u>	<u>5,192</u>	<u>12,241</u>	<u>12,674</u>	<u>10,986</u>	<u>9,032</u>	<u>19,825</u>
(Under 1 year)	(4,477)	(111)	(298)	(269)	(232)	(261)	(417)
0-4	22,838	566	1,522	1,372	1,181	1,333	2,127
5-9	20,321	439	1,231	1,068	1,109	1,267	2,107
10-14	21,439	516	1,357	1,176	1,028	1,194	2,314
15-19	20,157	606	1,398	1,384	1,039	1,072	2,324
20-24	17,480	582	1,331	1,412	1,051	827	1,615
25-29	16,019	528	1,123	1,367	983	621	1,567
30-34	14,020	370	868	950	778	616	1,449
35-39	11,002	299	648	741	674	438	1,185
40-44	9,010	233	512	610	500	430	1,040
45-49	7,209	225	426	503	483	259	862

ESTIMATED POPULATION FOR MARINA CITY ACCORDING  
TO SEX AND AGE, BY SUB-DISTRICT: AÑO 1982

Sex and age	Total	San Felipe	Chorrillo	Santa Ana	Calidonia	Curundu	Betania
50-54	6,658	179	422	485	471	248	780
55-59	5,797	172	386	468	466	239	630
60-64	5,644	154	400	328	438	233	796
65-69	4,153	150	287	293	360	133	460
70-74	2,431	70	192	259	176	47	268
75-79	1,450	53	48	155	145	30	149
80-84	824	26	43	66	62	31	108
85 & over	593	24	47	37	42	14	44
<b>FEMALES</b>	<u>211,045</u>	<u>5,802</u>	<u>12,160</u>	<u>13,875</u>	<u>12,677</u>	<u>8,897</u>	<u>25,801</u>
(Under 1 year)	(4,282)	(104)	(284)	(253)	(226)	(252)	(410)
0-4	22,606	552	1,497	1,336	1,195	1,328	2,164
5-9	21,793	521	1,509	1,362	1,082	1,319	2,395
10-14	19,729	537	1,221	1,014	1,082	976	2,276
15-19	25,363	725	1,491	1,567	1,425	1,121	3,191
20-24	23,221	743	1,262	1,797	1,337	879	2,779
25-29	18,786	496	1,035	1,379	1,214	753	2,139
30-34	16,044	361	911	1,002	921	555	2,000
35-39	12,550	278	695	671	754	465	1,527
40-44	9,916	286	493	682	517	330	1,458
45-49	8,565	257	432	609	523	286	1,347
50-54	7,570	279	335	585	518	234	1,056
55-59	6,660	188	335	438	492	192	1,029
60-64	5,835	184	315	478	513	183	705
65-69	4,718	132	228	369	494	88	650
70-74	3,123	101	163	243	231	79	398
75-79	2,035	76	118	150	200	64	299
80-84	1,331	78	74	101	89	22	172
85 & over	1,200	8	46	92	90	23	210

## ANNEX 5

ESTIMATED POPULATION FOR MARINA CITY ACCORDING TO SEX AND AGE,  
BY SUB-DISTRICT: YEAR 1982 (CONCLUSION)

Sex and age	Bella Vista	Pueblo Nuevo	San Fran- cisco	Parque Lefevre	Rio Abajo	Juan Díaz	Pedregal
TOTAL	<u>28,380</u>	<u>21,462</u>	<u>34,654</u>	<u>34,800</u>	<u>33,094</u>	<u>58,948</u>	<u>37,590</u>
(Under 1 year)	(470)	(529)	(622)	(762)	(771)	(1,381)	(1,107)
0-4	2,439	2,744	3,227	3,955	3,999	7,165	5,742
5-9	2,111	2,119	3,180	3,521	3,460	6,965	5,349
10-14	1,939	2,158	3,281	3,611	3,248	7,346	4,894
15-19	2,817	2,281	4,387	4,220	3,356	7,027	4,089
20-24	2,902	2,266	3,590	3,589	3,457	5,415	3,867
25-29	2,757	1,994	2,992	3,098	2,933	4,592	3,234
30-34	2,610	1,908	2,610	2,391	2,545	4,560	2,659
35-39	2,019	1,390	2,134	1,929	1,907	3,812	1,986
40-44	1,580	1,035	1,826	1,686	1,526	2,780	1,402
45-49	1,445	734	1,575	1,388	1,193	2,237	990
50-54	1,299	706	1,301	1,265	1,119	1,995	951
55-59	1,176	547	1,186	1,143	1,086	1,612	672
60-64	993	527	1,154	1,098	1,058	1,268	654
65-69	803	454	919	778	869	995	409
70-74	619	259	542	509	461	584	353
75-79	413	132	341	281	397	276	158
80-84	256	116	234	180	205	205	87
85 & over	202	92	175	158	275	114	94
MALES	<u>12,532</u>	<u>10,157</u>	<u>15,824</u>	<u>16,150</u>	<u>15,589</u>	<u>28,409</u>	<u>18,434</u>
(Under 1 year)	(242)	(268)	(324)	(389)	(386)	(716)	(564)
0-4	1,232	1,369	1,655	1,984	1,967	3,655	2,875
5-9	1,044	1,090	1,528	1,639	1,666	3,539	2,594
10-14	984	1,225	1,751	1,773	1,671	3,867	2,583
15-19	1,072	1,002	1,871	1,851	1,551	3,087	1,900
20-24	1,032	899	1,492	1,596	1,403	2,470	1,770
25-29	1,162	905	1,299	1,412	1,397	2,070	1,585
30-34	1,243	890	1,266	1,113	1,089	2,085	1,303
35-39	927	669	923	889	898	1,748	963
40-44	757	500	847	779	714	1,397	691
45-49	715	342	652	645	570	1,014	513

ESTIMATED POPULATION FOR MARINA CITY ACCORDING TO SEX AND AGE,  
BY SUB-DISTRICT: YEAR 1982 (CONCLUSION)

Sex and age	Bella Vista	Pueblo Nuevo	San Francisco	Parque Lefevre	Rio Abajo	Juan Diaz	Pedregal
50-54	592	332	600	608	531	940	470
55-59	442	246	530	528	524	834	332
60-64	420	239	492	505	517	792	330
65-69	308	228	450	355	436	493	200
70-74	305	87	207	234	233	216	137
75-79	184	46	147	107	190	89	107
80-84	79	36	78	63	94	92	46
85 & over	34	52	36	69	138	21	35
<b>FEMALES</b>	<b>15,848</b>	<b>11,305</b>	<b>18,830</b>	<b>18,650</b>	<b>17,505</b>	<b>30,539</b>	<b>19,156</b>
(Under 1 year)	(228)	(261)	(298)	(373)	(385)	(665)	(543)
0-4	1,207	1,375	1,572	1,971	2,032	3,510	2,867
5-9	1,067	1,029	1,652	1,882	1,794	3,426	2,755
10-14	955	933	1,530	1,838	1,577	3,479	2,311
15-19	1,745	1,279	2,516	2,369	1,805	3,940	2,189
20-24	1,870	1,367	2,098	1,993	2,054	2,945	2,097
25-29	1,595	1,089	1,693	1,686	1,536	2,522	1,649
30-34	1,367	1,018	1,344	1,278	1,456	2,475	1,356
35-39	1,092	721	1,211	1,040	1,009	2,064	1,023
40-44	823	535	979	907	812	1,383	711
45-49	730	392	923	743	623	1,223	477
50-54	707	374	701	657	588	1,055	481
55-59	734	301	656	615	562	778	340
60-64	573	288	662	593	541	476	324
65-69	495	226	469	423	433	502	209
70-74	314	172	335	275	228	368	216
75-79	229	86	194	174	207	187	51
80-84	177	80	156	117	111	113	41
85 & over	168	40	139	89	137	93	59

## ANNEX 6

ESTIMATED POPULATION FOR THE REMAINING MARINA DISTRICT  
ACCORDING TO SEX AND AGE, BY SUB-DISTRICT: YEAR 1982<sup>1</sup>

Sex and age	Total	Ancon	Chilibre	Las	
				Cumbres	Tocumen
TOTAL	<u>117,962</u>	<u>32,704</u>	<u>19,940</u>	<u>37,918</u>	<u>27,400</u>
(Under 1 year)	(3,070)	(428)	(602)	(1,212)	(828)
0-4	15,933	2,223	3,125	6,291	4,294
5-9	15,687	2,944	2,914	5,825	4,004
10-14	13,417	2,679	2,619	4,521	3,598
15-19	13,015	4,046	2,101	3,982	2,886
20-24	13,099	5,965	1,764	2,945	2,425
25-29	9,607	3,100	1,522	2,894	2,091
30-34	8,276	2,644	1,317	2,505	1,810
35-39	6,610	2,306	1,007	1,914	1,383
40-44	4,938	1,560	790	1,502	1,086
45-49	4,322	1,513	657	1,249	903
50-54	3,757	1,491	530	1,008	728
55-59	3,120	1,060	482	916	662
60-64	2,241	413	393	895	540
65-69	1,482	255	272	581	374
70-74	957	199	177	337	244
75-79	713	148	132	251	182
80-84	474	89	81	193	111
85 & over	314	69	57	109	79
MALES	<u>63,827</u>	<u>19,664</u>	<u>10,265</u>	<u>19,753</u>	<u>14,145</u>
(Under 1 year)	(1,584)	(242)	(307)	(613)	(422)
0-4	8,079	1,233	1,566	3,127	2,153
5-9	7,732	1,542	1,448	2,753	1,989
10-14	7,266	1,218	1,414	2,690	1,944
15-19	7,126	2,583	1,063	2,020	1,460
20-24	8,172	4,602	805	1,617	1,148
25-29	5,212	2,010	749	1,423	1,030
30-34	4,561	1,643	682	1,298	938
35-39	3,647	1,359	535	1,018	735
40-44	2,691	864	427	813	587
45-49	2,255	782	345	655	473

<sup>1</sup> Pacora and San Martin Sub-Districts are excluded.



ESTIMATED POPULATION FOR THE REMAINING MARINA DISTRICT  
 ACCORDING TO SEX AND AGE, BY SUB-DISTRICT: YEAR 982<sup>1</sup>

Sex and age	Total	Ancon	Chilibre	Las Cumbres	Tocumen
50-54	1,955	736	285	542	392
55-59	1,728	598	264	502	364
60-64	1,299	243	248	469	339
65-69	811	85	170	323	233
70-74	543	75	110	208	150
75-79	375	47	77	147	104
80-84	245	28	50	97	70
85 & over	130	16	27	51	36
<b>FEMALES</b>	<b><u>54,135</u></b>	<b><u>13,040</u></b>	<b><u>9,675</u></b>	<b><u>18,165</u></b>	<b><u>13,255</u></b>
(Under 1 year)	(1,486)	(186)	(595)	(599)	(406)
0-4	7,854	990	1,559	3,164	2,141
5-9	7,955	1,402	1,466	3,072	2,015
10-14	6,151	1,461	1,205	1,831	1,654
15-19	5,889	1,463	1,038	1,962	1,426
20-24	4,927	1,363	959	1,328	1,277
25-29	4,395	1,090	773	1,471	1,061
30-34	3,715	1,001	635	1,207	872
35-39	2,963	947	472	896	648
40-44	2,247	696	363	689	499
45-49	2,067	731	312	594	430
50-54	1,802	755	245	466	336
55-59	1,392	462	218	414	298
60-64	942	170	145	426	201
65-69	671	170	102	258	141
70-74	414	124	67	129	94
75-79	338	101	55	104	78
80-84	229	61	31	96	41
85 & over	184	53	30	58	43

## ANNEX 7

ESTIMATED POPULATION FOR SATELITE CITY DISTRICT, ACCORDING  
TO SEX AND AGE, BY SUB-DISTRICT: AÑO 1982

Sex and age	Total	Amelia Denis De Icaza	Beli- sario Porras	Jose D. Espinar	Mateo Iturralde	Victo- riano Lorenzo
TOTAL	<u>182,800</u>	<u>28,042</u>	<u>93,661</u>	<u>27,233</u>	<u>14,236</u>	<u>19,628</u>
(Under 1 year)	(5,156)	(697)	(2,924)	(643)	(378)	(514)
0-4	26,761	3,617	15,171	3,338	1,965	2,670
5-9	25,544	3,683	14,786	3,332	1,410	2,333
10-14	22,864	3,884	11,303	3,221	1,824	2,632
15-19	21,703	3,624	10,481	3,221	1,852	2,525
20-24	17,708	2,761	8,743	2,485	1,448	2,271
25-29	15,108	2,217	8,224	2,085	1,100	1,482
30-34	13,219	1,867	7,250	2,340	669	1,093
35-39	9,955	1,455	5,107	1,900	597	896
40-44	7,840	1,353	3,611	1,379	691	806
45-49	6,134	980	2,750	1,048	663	693
50-54	5,264	863	2,235	904	608	654
55-59	3,504	507	1,303	712	486	496
60-64	2,859	483	1,098	429	415	434
65-69	1,945	320	780	353	199	293
70-74	1,022	163	348	220	111	180
75-79	696	151	234	127	99	85
80-84	385	66	133	75	66	45
85 & over	289	48	104	64	33	40
MALES	<u>88,844</u>	<u>14,018</u>	<u>45,543</u>	<u>12,818</u>	<u>6,725</u>	<u>9,740</u>
(Under 1 year)	(2,659)	(363)	(1,496)	(335)	(197)	(268)
0-4	13,568	1,850	7,641	1,708	1,004	1,365
5-9	12,783	1,953	7,171	1,676	712	1,271
10-14	12,210	1,954	6,547	1,538	877	1,294
15-19	9,952	1,713	4,791	1,411	822	1,215
20-24	8,141	1,357	3,766	1,075	767	1,176
25-29	7,139	1,128	3,674	1,070	513	754
30-34	6,219	929	3,516	971	331	472
35-39	4,806	669	2,562	861	298	416
40-44	3,768	645	1,749	694	281	399

ESTIMATED POPULATION FOR SATELITE CITY DISTRICT, ACCORDING  
TO SEX AND AGE, BY SUB-DISTRICT: AÑO 1982

Sex and age	Total	Amelia Denis De Icaza	Belisario Porras	Jose D. Espinar	Mateo Iturralde	Victo- riano Lorenzo
45-49	3,033	524	1,410	486	270	343
50-54	2,407	465	1,069	387	210	276
55-59	1,733	271	653	341	204	264
60-64	1,242	235	381	225	199	202
65-69	898	139	329	173	105	152
70-74	444	84	139	92	50	79
75-79	253	60	75	35	44	39
80-84	173	24	58	46	28	17
85 & over	75	18	12	29	10	6
<b>FEMALES</b>	<b>93,956</b>	<b>14,024</b>	<b>48,118</b>	<b>14,415</b>	<b>7,511</b>	<b>9,888</b>
(Under 1 year)	(2,497)	(334)	(1,428)	(308)	(181)	(246)
0-4	13,193	1,767	7,530	1,630	961	1,305
5-9	12,761	1,730	7,615	1,656	698	1,062
10-14	10,654	1,930	4,756	1,683	947	1,338
15-19	11,751	1,911	5,690	1,810	1,030	1,310
20-24	9,567	1,404	4,977	1,410	681	1,095
25-29	7,969	1,089	4,550	1,015	587	728
30-34	7,000	938	3,734	1,369	338	621
35-39	5,149	786	2,545	1,039	299	480
40-44	4,072	708	1,862	685	410	407
45-49	3,101	456	1,340	562	393	350
50-54	2,857	398	1,166	517	398	378
55-59	1,771	236	650	371	282	232
60-64	1,717	248	717	204	216	232
65-69	1,047	181	451	180	94	141
70-74	578	79	209	128	61	101
75-79	443	91	159	92	55	46
80-84	212	42	75	29	38	28
85 & over	214	30	92	35	23	34

## ANNEX 8

LIST OF PROJECTS ALREADY FINISHED, UNDER CONSTRUCTION AND  
PROGRAMMED IN MARINA CITY AND SATELITE CITY FOR YEARS 1982-1985

	Province	Sector	Benefited population	Total cost estimated in Balboas
<b>C. INSTITUTIONAL PROJECT (OWN RESOURCES)</b>				
<b>I. FINISHED PROJECTS</b>				
<u>AQUEDUCTS:</u>				
1.	Marina	Amelia de Icaza	75	3,210
2.				
a.	Marina	Chilibre	80	3,500
b.	Marina	Chilibre	120	5,400
c.	Marina	Chilibre	2,000	18,800
d.	Marina	Chilibre	500	24,000
8.				
a.	Marina	Tocumen	2,000	32,100
b.	Marina	Tocumen	60	5,500
c.	Marina	Pedregal	500	45,000
d.	Marina	Tocumen	100	3,000
e.	Marina	Tocumen	20,000	20,000
f.	Marina	Tocumen	20,000	10,000
10.				
11.	Marina	A. Diaz	150	15,000
12.	Marina	Pedregal	*	287,000
a.	Marina			
b.	Marina	Bethania	45,000	45,000
<b>II. PROJECT UNDER CONSTRUCTION</b>				
<u>AQUEDUCTS:</u>				
8.				
<b>EAST MARINA SUB-URBAN AREA</b>				
<b>*Benefits Marina C. and Satelite Districts</b>				
a.	Marina	Pedregal	750	60,000

## ANNEX 8 (page 2)

## LIST OF PROJECTS ALREADY FINISHED, UNDER CONSTRUCTION AND PROGRAMMED IN MARINA CITY AND SATELITE CITY FOR YEARS 1982-1985

	Province	Sector	Benefited population	Total cost estimated in Balboas
c. Altos del Golf-Pumping Station	Marina	Pedregal	500	8,600
d. Bda. Ruben D. Paredes	Marina	Tocumen	300	68,600
9. SAMARIA SEVERAL SECTORS				
a. Samaria Sector 5	Marina	Belisario Porras	1,450	86,800
b. Santa Marta	Marina	Belisario Porras	250	10,150
<u>SEWERAGE SYSTEMS:</u>				
3. Altos del Crisol (El Bosque)	Marina	José D. Espinar	300	110,000
4. Rio Abajo Ext. Water Conduit	Marina	Amelia de Icaza	1,000	40,150
III. PROJECT IN INITIAL PHASE				
<u>AQUEDUCT:</u>				
4. San Cristobal	Marina	Juan Diaz	2,000	50,000
5. Seis de Abril		Belisario Porras	1,500	35,000
6. Enlargement of treatment plant	Marina	Chilibre	600,000	1,434,000
D. COMMUNITY INVESTMENT PROGRAM				
II. PROJECTS UNDER CONSTRUCTION				
<u>AQUEDUCTS:</u>				
4. Cerro Viento Rural	Marina	Jose D. Espinar	200	60,000
E. HYGIENE INSTITUTE PROGRAM				
TOURISM INSTITUTE				
1. Pitometric study Piping Institute in Marina C.	Marina			550,000
F. PROJECTS IN INITIAL PHASE				
<u>AQUEDUCTS:</u>				
29. Las Mañanitas	Marina	Tocumen	1,850	251,100
33. Pascualillo-Gonzalillo	Marina	Las Cumbres	790	80,500
34. Quebrada Ancha	Marina	Las Cumbres	1,880	142,500
37. Alcalde Diaz La Cabima	Marina	Las Cumbres	11,350	1,375,800
38. San Isidro-Villa Zaita	Marina	Belisario Porras	13,950	1,048,400

LIST OF PROJECTS ALREADY FINISHED, UNDER CONSTRUCTION AND  
PROGRAMMED IN MARINA CITY AND SATELITE CITY FOR YEARS 1982-1985

	Province	Sector	Benefited estimated population in Balboas	Total cost
<b>AT THE NATIONAL LEVEL:</b>				
3. Purchase & installation of meters		**	**	2,429,000
<b>G. I.A.-BIRF PROGRAM N°2</b>				
<b>I. FINISHED PROJECTS</b>				
<b>AQUEDUCTS:</b>				
<b>I. Rehabilitation of</b>				
<b>Aqueduct C.M.</b>				
a. Pumping station automation	Marina	**	**	80,000
b. Tank at Marina C.	Marina	Amelia de Icaza	24,500	15,000
<b>II. PROJECT IN INITIAL PHASE</b>				
<b>AQUEDUCTS:</b>				
4. Los Andes N°2-La Pulida line	Marina	J.D. Espinar- Tocumen	200,000	2,885,000
5. Rehabilitation of aqueduct Marina C.	Marina	C. Marina		1,840,000
<b>SEWERAGE SYSTEMS:</b>				
3. Curundu Stage II	Marina	Bethania	43,000	2,290,000
4. Curundu Stage III	Marina	Bethania	30,000	530,000
5. Río Abajo	Marina	Río Abajo	20,600	940,000
6. Río Cholo	Marina	Río Abajo	15,100	370,000
7. Cerro Viento	Marina	J.D.Espinar- J. Diaz	9,000	660,000
8. Río Palomo	Marina	Juan Diaz	10,000	500,000
9. Coco del Mar	Marina	San Francisco	1,600	360,000
10. El Porvenir Río Abajo	Marina	Río Abajo	800	180,000
11. El Crisol	Marina	José D.Espinar	1,400	410,000
12. San Cristobal	Marina	Juan Diaz	2,200	450,000
13. El Porvenir-Juan Diaz	Marina	Juan Diaz	850	200,000
14. Puente del Rey	Marina	Parque Lefevre	1,500	350,000
15. ANASA-Ciudad Radial	Marina	Juan Diaz	7,600	1,670,000
17. Via Brazil	Marina	Bella Vista	85,000	450,000

\*\* Benefits Marina C. and Satellite C. Districts.

## ANNEX 9

POPULATION LIVING IN INDIVIDUAL HOUSEHOLDS, BY ACTIVITY  
 ACCORDING TO MONTHLY FAMILY INCOME: 1980 CENSUS  
 (Collective households not included)

Monthly family income in US\$	Number of households	People living in households					Under 10 years old	Average number of persons per household
		10 years old and over						
		Total	Condition of activity			Unstated		
Employed	Unemployed		Economically Inactive					
MARINA CITY	<u>110,035</u>	<u>357,645</u>	<u>153,920</u>	<u>16,910</u>	<u>182,850</u>	<u>3,655</u>	<u>102,740</u>	<u>4.2</u>
Under 75	5,785	13,270	3,775	1,360	8,070	125	5,130	3.2
75 to 99	1,960	4,915	1,515	355	2,980	65	1,800	3.4
100 to 124	4,040	10,230	3,210	765	6,085	170	3,380	3.4
125 to 174	7,880	21,640	7,585	1,335	12,465	255	8,125	3.8
175 to 249	12,840	36,970	13,580	1,935	21,020	435	13,255	3.9
250 to 399	18,600	59,195	23,910	3,080	31,530	675	18,445	4.2
400 to 599	16,945	60,250	27,070	2,549	30,115	520	15,685	4.5
600 to 799	10,100	37,320	18,630	1,320	17,115	285	9,260	4.6
800 to 999	6,680	25,650	13,750	790	10,865	245	5,785	4.7
1000 & over	16,720	68,110	38,195	1,135	28,305	475	14,150	4.9
Unknown	8,485	20,095	2,700	2,360	14,300	735	7,725	3.3
SATELITE CITY	<u>30,340</u>	<u>114,030</u>	<u>44,525</u>	<u>6,565</u>	<u>61,515</u>	<u>1,425</u>	<u>42,250</u>	<u>5.2</u>
Under 75	1,330	4,045	910	465	2,585	85	1,795	4.4
75 to 99	385	1,160	290	90	755	25	580	4.5
100 to 124	1,170	3,360	1,020	245	2,045	50	1,475	4.1
125 to 174	2,690	8,070	2,750	465	4,760	95	3,760	4.4
175 to 249	4,955	16,445	5,575	995	9,645	200	7,225	4.8
250 to 399	6,645	25,030	9,880	1,255	13,540	355	10,035	5.3
400 to 599	5,265	22,690	9,935	960	11,560	235	7,505	5.7
600 to 799	2,335	11,290	5,190	430	5,600	70	3,250	6.2
800 to 999	1,445	6,905	3,565	301	2,975	860	1,880	6.1
1000 & over	1,795	8,690	4,835	300	3,500	55	2,140	6.0
Unknown	2,325	6,345	575	1,055	4,550	165	2,605	3.8

WORKING POPULATION AGED 10 AND OVER, BY OCCUPATION,  
ACCORDING TO SEX AND AGE: 1980 CENSUS

Sex and age groups (years)	Working population 10 years old and over											
	Total	Professionals, technicians & related occupations	Managers, administrators and leading category officers	Office employees and related occupations	Salesmen and related occupations	Land farmers, stock farmers, fishermen, lumbermen, and related occupations	Transportation unit, drivers and related occupations	Artisans and workers in occupations related to spinning mills, dress and footwear manufacture, carpentry, building and mechanic industry	Other artisans and workers	NEOC laborers	Personal service workers and related occupations	Workers in unidentified or unstated occupations and other NEOC workers
<b>MARINA CITY</b>	<b>156,435</b>	<b>26,520</b>	<b>13,170</b>	<b>26,855</b>	<b>13,145</b>	<b>3,720</b>	<b>8,385</b>	<b>21,630</b>	<b>4,260</b>	<b>4,365</b>	<b>30,810</b>	<b>3,455</b>
10 - 14	1,015	—	—	105	85	60	20	55	—	45	625	70
15 - 19	9,935	215	100	1,170	800	425	175	1,080	195	425	5,110	240
20 - 24	25,430	2,715	985	6,680	2,180	570	900	3,570	800	885	5,490	655
25 - 29	27,705	5,750	1,645	6,105	2,220	480	1,350	3,835	810	700	4,220	590
30 - 34	24,470	5,100	2,320	4,190	2,000	370	1,525	3,485	645	680	3,690	465
35 - 39	18,980	4,070	2,175	2,795	1,555	335	1,150	2,465	490	500	3,020	425
40 - 44	14,900	3,120	1,705	2,000	1,205	320	1,035	2,150	415	315	2,290	345
45 - 49	11,700	2,380	1,605	1,565	945	315	630	1,420	325	280	2,005	230
50 - 54	9,045	1,500	1,320	1,135	815	240	610	1,240	280	185	1,530	90
55 - 59	6,075	785	725	590	525	200	560	1,060	130	150	1,210	140
60 & over	6,645	855	575	425	780	380	420	1,195	140	190	1,535	150
Unknown	535	80	15	95	55	25	10	75	30	10	155	5
<b>Males</b>	<b>95,790</b>	<b>14,150</b>	<b>10,070</b>	<b>7,820</b>	<b>8,775</b>	<b>3,635</b>	<b>8,245</b>	<b>18,970</b>	<b>3,630</b>	<b>3,915</b>	<b>13,795</b>	<b>2,785</b>
10 - 14	385	—	—	55	50	55	15	55	—	45	100	10
15 - 19	4,495	100	75	370	570	410	175	1,005	155	405	1,050	180
20 - 24	14,460	1,275	750	1,995	1,345	545	875	3,130	690	825	2,480	550
25 - 29	16,725	3,095	1,195	1,690	1,525	475	1,335	3,290	725	620	2,280	495
30 - 34	15,050	2,665	1,485	1,125	1,320	260	1,485	2,980	575	585	1,930	360
35 - 39	11,825	2,200	1,680	770	1,035	320	1,140	2,105	385	425	1,445	320
40 - 44	9,410	1,475	1,305	600	815	320	1,015	1,865	360	260	1,150	245
45 - 49	7,465	1,340	1,175	380	630	315	625	1,285	245	240	1,030	200
50 - 54	6,265	915	1,090	360	575	240	605	1,135	220	170	785	170
55 - 59	4,555	490	625	270	345	200	555	960	125	150	715	120
60 & over	4,875	580	480	185	550	370	410	1,105	120	180	765	130
Unknown	280	35	10	20	15	25	10	55	30	10	65	5
<b>Females</b>	<b>60,645</b>	<b>12,420</b>	<b>3,100</b>	<b>19,035</b>	<b>4,370</b>	<b>85</b>	<b>140</b>	<b>2,660</b>	<b>630</b>	<b>450</b>	<b>17,185</b>	<b>670</b>
10 - 14	630	—	—	50	35	5	5	—	—	—	525	10
15 - 19	5,440	115	25	800	230	15	—	75	40	20	4,060	60
20 - 24	10,970	1,440	235	4,685	835	25	25	640	110	60	3,010	105
25 - 29	10,980	2,655	450	4,415	695	5	15	545	85	80	1,940	95
30 - 34	9,420	2,455	635	3,065	680	10	40	505	70	95	1,760	105
35 - 39	7,155	1,870	495	2,025	520	13	10	360	105	75	1,575	105
40 - 44	5,490	1,645	400	1,400	390	—	20	285	55	55	1,140	100
45 - 49	4,235	1,040	430	1,185	315	—	5	135	80	40	975	30
50 - 54	2,780	585	230	775	240	—	5	105	60	15	745	20
55 - 59	1,520	295	100	320	180	—	5	100	5	—	495	20
60 & over	1,770	275	95	240	230	10	10	20	10	10	770	—
Unknown	255	45	5	75	20	—	—	20	—	—	90	—
<b>2nd City</b>	<b>28,965</b>	<b>2,885</b>	<b>1,740</b>	<b>4,515</b>	<b>2,085</b>	<b>2,000</b>	<b>2,230</b>	<b>3,985</b>	<b>495</b>	<b>2,750</b>	<b>1,385</b>	<b>895</b>
10 - 14	155	—	—	5	15	60	5	5	—	20	40	5
15 - 19	1,770	20	10	290	70	285	45	225	35	240	465	85
20 - 24	4,735	410	85	1,215	260	190	85	565	75	620	860	170
25 - 29	4,795	640	240	930	270	215	380	690	95	451	675	205



ANNEX 11

PRIVATE INHABITED HOUSEHOLDS AND PERSONS LIVING THERE, BY DOMESTIC DOMESTIC APPLIANCES THEY OWN, ACCORDING TO MONTHLY FAMILY INCOME: 1980 CENSUS

Monthly family income (in Bal-boas)	Total		Domestic appliances in household										Washing machine		Sewing machine		No domestic supplies		Line No.
			TV set		Radio		Telephone		Refrigerator										
	House-holds	Inhabi-tants	House-holds	Inhabi-tants	House-holds	Inhabi-tants	House-holds	Inhabi-tants	House-holds	Inhabi-tants	House-holds	Inhabi-tants	House-holds	Inhabi-tants	House-holds	Inhabi-tants			
MARINA CITY	109,300	459,295	78,965	343,980	78,775	337,300	52,810	224,525	75,780	325,235	31,650	143,150	25,875	119,420	10,810	37,790	1		
Under 75	5,700	18,315	2,400	8,140	2,935	9,790	915	2,730	2,025	6,440	315	850	690	2,420	1,535	4,595	2		
75 - 99	1,945	6,700	950	3,355	1,125	3,925	475	1,495	890	3,100	175	605	275	985	425	1,350	3		
100 - 124	3,975	13,515	1,920	6,540	2,215	7,455	915	2,615	1,630	5,500	335	1,135	578	1,920	850	2,870	4		
125 - 174	7,735	29,580	3,960	15,855	4,400	17,035	1,590	5,675	3,535	13,775	445	1,815	1,050	4,505	1,495	5,045	5		
175 - 249	12,660	49,970	7,505	30,160	7,980	31,515	3,225	11,700	6,555	25,415	1,250	4,700	1,970	8,280	1,925	6,885	6		
250 - 399	18,490	77,480	13,320	55,925	13,040	53,875	7,030	26,460	12,400	51,040	3,095	12,565	3,740	16,455	1,480	3,140	7		
400 - 599	16,900	75,755	13,695	61,030	12,785	57,300	8,870	36,360	13,395	58,365	4,580	19,775	3,870	17,940	815	3,340	8		
600 - 799	10,090	46,570	8,825	40,770	8,235	37,625	6,730	29,885	8,890	40,390	4,175	18,825	2,965	14,475	245	955	9		
800 - 999	6,675	31,420	6,130	28,835	5,750	26,730	5,325	24,110	6,205	28,720	3,480	15,915	2,090	10,000	70	490	10		
1,000 & over	16,700	82,235	15,925	78,530	15,535	76,090	15,245	74,585	16,210	79,405	12,530	62,525	7,300	38,050	85	450	11		
Unknown	8,430	27,755	4,335	14,840	4,775	15,960	2,490	7,790	4,045	13,085	1,270	4,340	1,355	4,490	1,885	5,670	12		
2nd City	26,425	106,930	15,370	66,260	16,275	69,790	7,740	31,410	14,905	62,725	3,795	16,700	5,065	23,640	2,645	8,645	13		
Under 75	2,815	9,180	850	2,770	1,290	4,450	310	920	910	2,795	70	200	320	1,310	595	1,925	14		
75 - 99	905	3,205	315	1,010	415	1,565	85	280	335	1,070	40	195	145	495	160	540	15		
100 - 124	1,190	4,275	490	1,940	620	2,460	145	570	465	1,695	55	245	185	695	175	525	16		
125 - 174	2,255	9,295	1,000	4,310	1,205	5,440	355	1,320	930	3,745	110	490	255	1,290	340	1,160	17		
175 - 249	3,525	14,295	1,800	7,480	1,995	8,475	710	2,495	1,660	6,265	190	650	525	2,255	380	1,495	18		
250 - 399	4,010	16,680	2,705	11,550	2,620	11,080	1,190	4,495	2,585	10,705	375	1,620	770	3,550	235	855	19		
400 - 599	3,970	17,840	3,045	13,670	2,910	13,420	1,600	6,545	2,955	13,160	800	3,420	925	4,440	105	425	20		
600 - 799	1,750	8,290	1,450	6,820	1,400	6,485	945	4,140	1,460	6,715	515	2,415	505	2,635	25	100	21		
800 - 999	940	4,725	810	4,175	790	3,900	595	2,860	805	4,150	410	1,995	320	1,730	15	40	22		
1,000 & over	1,685	8,365	1,595	7,850	1,540	7,630	1,275	6,010	1,955	7,840	990	4,600	685	3,585	5	5	23		
Unknown	3,380	10,780	1,310	4,685	1,490	4,885	530	1,775	1,205	4,075	240	870	430	1,655	610	1,565	24		
SATELLITE CITY	30,315	156,235	19,490	105,360	19,810	103,555	8,305	43,180	17,870	93,870	5,385	28,795	5,955	33,910	4,320	19,295	25		
Under 75	1,330	5,840	485	2,300	675	3,160	130	675	425	1,940	80	475	185	929	415	1,660	26		
75 - 99	380	1,725	190	870	210	945	35	145	150	585	35	130	30	260	70	350	27		
100 - 124	1,165	4,825	490	2,275	585	2,415	130	425	410	1,695	48	185	185	690	310	1,245	28		
125 - 174	2,670	11,830	1,245	5,980	1,405	6,250	345	1,545	1,022	5,030	90	385	400	1,940	635	2,505	29		
175 - 249	4,945	23,655	2,615	12,970	2,860	13,640	640	2,990	2,125	10,360	235	1,120	675	3,735	1,020	4,275	3,043		
250 - 399	6,640	35,060	4,380	23,510	4,205	22,160	1,340	6,705	3,940	20,095	785	4,150	1,230	6,990	800	4,320	31		
400 - 599	5,265	30,195	4,095	23,315	3,925	21,865	1,775	9,500	3,850	21,415	1,165	6,025	1,235	7,395	295	1,770	32		
600 - 799	2,335	14,540	1,995	12,315	1,820	11,105	1,210	7,020	1,950	11,605	860	4,880	600	3,895	75	455	33		
800 - 999	1,445	8,785	1,325	8,000	1,285	7,565	950	5,480	1,290	7,650	735	4,035	4,090	3,155	15	80	34		
1,000 & over	1,795	10,830	1,650	9,685	1,605	9,495	1,355	7,906	1,685	9,780	1,220	6,800	630	3,755	30	190	35		
Unknown	2,325	8,950	1,020	4,140	1,235	4,955	395	1,563	950	3,715	140	610	275	1,775	665	2,435	36		

## ANNEX 12

## HOUSING CHARACTERISTICS: 1960 CENSUS

Housing Characteristics	Type of housing and year of construction											Year of construction	
	Total 1/	Total		Individual house			Apartment			Vicinity house			
		From 1970-80	Before 1970	Total	From 1970-80	Before 1970	Total	From 1970-80	Before 1970	Total	From 1970-80		Before 1970
SATELITE CITY	30,315	19,340	8,460	26,455	10,625	7,830	1,290	595	655	135	140	175	2,295
Walls:													
Blocks, bricks, stone, concrete	16,250	10,965	5,950	16,245	11,030	5,215	1,205	570	635	165	65	100	990
Cement fiber, wood (boards, logs etc.)	11,202	7,540	2,675	10,020	7,440	2,580	45	23	20	150	75	75	990
Clay and canes, adobe	20	30	15	45	30	15	-	-	-	-	-	-	5
Straw, pulpy leaves, reed	160	30	10	60	50	10	-	-	-	-	-	-	-
Other stuff or unvalled	94	75	10	85	75	10	-	-	-	-	-	-	10
Unknown	19	-	-	-	-	-	-	-	-	-	-	-	19
Roofing:													
Cement	1,920	910	955	1,220	750	470	610	140	470	35	20	15	115
Tile	53	35	10	50	35	15	-	-	-	5	-	5	-
Cement fiber	415	260	175	395	248	155	40	20	20	-	-	-	40
Metals (zinc, aluminum, etc.)	7,300	17,925	7,290	24,370	17,380	6,990	595	430	165	250	115	135	2,085
Protected wood	440	205	195	370	195	175	5	5	-	25	5	20	49
Straw or pulpy leaves	20	10	10	20	10	10	-	-	-	-	-	-	-
Other	30	15	15	30	15	15	-	-	-	-	-	-	-
Unknown	15	-	-	-	-	-	-	-	-	-	-	-	15
Flooring:													
Paved (concrete, concrete tile, brick etc.)	24,260	15,355	7,220	21,090	18,655	6,425	1,250	595	655	235	29	140	1,650
Wooden	4,070	2,450	1,195	3,585	2,415	1,170	-	-	-	60	60	25	42
Earthy	1,910	1,515	235	1,732	1,389	123	-	-	-	15	5	10	100
Other	55	35	10	40	30	10	-	-	-	5	5	-	10
Unknown	20	5	-	5	5	-	-	-	-	-	-	-	15
Drinking water supply:													
Aqueduct inside house	19,780	12,280	6,115	17,040	12,650	5,390	1,250	595	655	105	35	70	1,345
Public, IDAAN	17,680	10,895	5,605	15,185	19,295	4,890	1,220	570	650	95	30	65	1,180
Public, community	1,605	1,145	320	1,630	1,115	315	5	5	-	10	5	5	140
Private	495	240	190	485	230	185	25	20	5	-	-	-	65
Aqueduct outside house	10,360	7,010	2,475	9,200	6,905	2,375	-	-	-	205	145	100	175
Public, IDAAN	8,065	2,255	2,150	7,215	5,240	2,055	-	-	-	190	95	95	680
Public, community	2,060	1,630	265	1,150	1,630	260	-	-	-	15	10	5	185
Private	195	125	60	265	425	60	-	-	-	-	-	-	10
Sanitary well	75	20	50	63	18	45	-	-	-	5	-	5	5
Public	35	10	20	36	10	20	-	-	-	-	-	-	5
Private	40	10	30	25	10	25	-	-	-	5	-	5	-
Unprotected curbstone	25	15	20	25	25	10	-	-	-	-	-	-	-
Rainwater	35	35	-	25	25	-	-	-	-	-	-	-	20
Surface well	25	10	10	20	10	10	-	-	-	-	-	-	5
Unknown	15	-	-	-	-	-	-	-	-	-	-	-	15



## ANNEX 13

INHABITED PRIVATE DWELLINGS, BY NUMBER OF UNITS, ACCORDING TO  
TYPE AND PERSONS LIVING THEREIN: 1980 CENSUS (Conclusion)

(Buildings not used for living purposes have been excluded)

Type and persons in dwelling	Number of bedrooms in dwelling						Average number of bedrooms per dwelling
	Total	0	1	2	3 & over	Unstated	
SATELITE CITY	<u>30,315</u>	<u>8,210</u>	<u>5,800</u>	<u>9,070</u>	<u>6,965</u>	<u>270</u>	<u>1.5</u>
1	1,815	1,005	365	295	130	20	0.7
2	2,790	1,110	540	725	380	35	1.1
3	3,660	1,075	845	1,165	655	20	1.4
4	5,060	1,405	965	1,180	1,065	45	1.5
5	5,080	1,225	940	1,640	1,240	35	1.6
6	4,075	825	720	1,295	1,205	30	1.7
7	3,180	705	585	990	870	30	1.7
8	1,695	290	325	600	465	15	1.8
9	1,090	235	205	320	315	15	1.7
10 & over	1,870	335	310	540	660	25	1.9
Individual house	<u>28,490</u>	<u>7,740</u>	<u>5,415</u>	<u>8,250</u>	<u>6,815</u>	<u>270</u>	<u>1.5</u>
1	1,630	895	330	255	130	20	0.8
2	2,575	1,025	505	670	340	35	1.1
3	3,320	975	740	945	640	20	1.4
4	4,750	1,335	905	1,420	1,045	45	1.5
5	4,800	1,180	875	1,505	1,205	35	1.6
6	3,865	805	685	1,165	1,180	30	1.7
7	3,055	685	555	920	865	30	1.7
8	1,635	290	320	555	455	15	1.8
9	1,035	220	200	300	300	15	1.7
10 & over	1,825	330	300	515	655	25	1.9
Apartment	<u>1,340</u>	<u>110</u>	<u>300</u>	<u>781</u>	<u>145</u>	<u>--</u>	<u>1.7</u>
1	95	20	35	40	--	--	1.2
2	125	20	20	65	20	--	1.7
3	230	20	80	115	15	--	1.5
4	230	20	40	155	15	--	1.8
5	225	5	50	135	35	--	1.9
6	195	15	30	125	25	--	1.8
7	105	5	30	65	5	--	1.7
8	60	--	5	65	10	--	2.1
9	35	--	--	10	15	--	2.7
10 & over	40	5	10	20	5	--	1.6
Vicinity house	<u>485</u>	<u>360</u>	<u>85</u>	<u>35</u>	<u>5</u>	<u>--</u>	<u>0.4</u>
1	90	90	--	--	--	--	--
2	90	65	15	10	--	--	0.4
3	110	80	25	5	--	--	0.3
4	80	50	20	5	5	--	0.6
5	55	40	15	--	--	--	0.5
6	15	5	5	5	--	--	1.6
7	20	15	--	5	--	--	0.5
8	--	--	--	--	--	--	--
9	20	15	5	--	--	--	0.5
10 & over	5	--	--	5	--	--	2.0

## ANNEX 14

CONDITION OF POPULATION ACTIVITY AGED 10 AND OVER, ACCORDING TO  
SEX AND EDUCATIONAL LEVEL: 1980 CENSUS (Conclusion)

Sex and education level	Population aged 10 and older										Activity rate (for every 100 people)
	Economically active										
	Total	Total	Total	Employed during last week	Occasional worker	Total	Worker (re-tired)	New worker	Economically inactive	Unstated	
SATELITE CITY	114,106	51,110	44,545	43,770	775	6,565	3,815	1,750	61,571	1,425	45.4
Uneducated	4,000	935	800	785	15	135	120	15	2,930	135	24.2
Prim.schl.unfinished <sup>1</sup>	24,901	7,405	6,560	6,400	160	845	625	220	17,161	335	30.1
Primary schl.finished	28,679	14,215	12,475	12,210	265	1,740	1,140	600	14,354	110	49.8
Second.schl.unfinished <sup>1</sup>	37,451	15,135	12,890	12,635	255	2,245	1,235	1,010	22,096	220	40.6
Secondary schl.finished	10,085	7,150	6,025	5,970	55	1,125	455	670	2,890	45	71.2
University, 1-3 yrs	4,650	3,210	2,935	2,910	25	275	125	150	1,440	-	69.0
University, 4 & over	2,945	2,615	2,465	2,465	-	150	75	75	325	5	89.0
Unknown	1,395	445	395	395	-	50	40	10	375	575	54.3
Males	55,271	33,135	29,405	28,770	635	3,730	2,305	1,425	21,416	720	60.7
Without education	1,555	670	595	585	10	75	70	5	790	95	45.9
Prim.schl.unfinished <sup>1</sup>	12,001	5,305	4,750	4,605	145	555	440	115	6,521	175	44.8
Primary schl.finished	14,034	9,905	8,810	8,590	220	1,095	745	350	4,074	55	70.8
Second.schl.unfinished <sup>1</sup>	18,526	10,065	8,795	8,585	210	1,270	725	545	8,331	130	54.7
Secondary schl.finished	4,730	3,830	3,305	3,270	35	525	220	305	885	15	81.2
University, 1-3 yrs	2,230	1,655	1,530	1,515	15	125	55	70	575	-	74.2
University, 4 & over	1,525	1,410	1,355	1,355	-	55	25	30	115	-	92.4
Unknown	670	295	265	265	-	30	25	5	125	250	70.2
Females	58,835	17,975	15,140	15,000	140	2,835	1,510	1,325	40,155	705	30.9
Without education	2,445	265	205	200	5	60	50	10	2,140	40	11.0
Prim.schl.unfinished <sup>1</sup>	12,900	2,100	1,810	1,795	15	290	185	105	10,640	160	16.5
Primary schl.finished	14,645	4,310	3,665	3,620	45	645	395	250	10,280	55	29.5
Second.schl.unfinished <sup>1</sup>	18,925	5,070	4,095	4,050	45	975	510	465	13,765	90	26.9
Secondary schl.finished	5,355	3,320	2,720	2,700	20	600	235	365	2,005	30	62.3
University, 1-3 yrs	2,420	1,555	1,405	1,395	10	150	70	10	865	-	64.2
University, 4 & over	1,420	1,205	1,110	1,110	-	95	50	45	210	5	85.2
Unknown	725	150	130	130	-	20	25	5	250	325	37.5

<sup>1</sup> From 1st grade through 5th grade.

## ANNEX 15

EMPLOYED POPULATION, AGED 10 AND OVER; BY OCCUPATIONAL CATEGORY, ACCORDING  
TO SEX AND ACTIVITY BRANCH: 1980 CENSUS (Continued)

Sex and branch of economical activity.	Employed population, aged 10 and over																
	Occupational category																
	Total	Total	Government	Private Enter- prise	Coop- erative or com- munal organi- zation	Agency	Total	Government	Private Enter- prise	Coop- erative or com- munal organi- zation	Agency	Indepen- dent worker	Emplo- yer (owner)	Member of production cooperative or communal organiza- tion	Family worker	Un- stated	Line N°
SATELITE CITY	44,545	8,565	8,565	6,375	35	340	30,255	11,735	17,185	115	1,220	4,500	325	85	95	720	73
Agriculture, hunting, forestry and fishery	870	145	30	115	-	-	500	180	310	5	5	185	30	-	5	5	74
Mine and quarry exploitation	45	-	-	-	-	-	45	15	30	-	-	-	-	-	-	-	75
Manufacture industry	7,255	1,060	105	955	-	-	5,740	315	5,420	-	5	330	10	5	-	110	76
Electricity, gas & water	1,025	80	80	-	-	-	940	895	45	-	-	-	-	-	-	5	77
Construction	4,490	2,120	240	1,865	5	10	1,490	530	955	5	-	795	20	5	-	60	78
Wholesale & retail trade, restaurants and hotels	8,570	1,315	60	1,235	10	10	5,750	220	5,480	30	20	1,155	155	30	75	90	79
Transportation, storage and communications	2,990	270	80	175	10	5	1,305	760	700	30	15	1,080	50	35	-	50	80
Finance, insurance, real estate companies and services rendered to enterprises	2,350	550	355	195	-	-	1,715	585	1,120	5	5	50	-	-	-	35	81
Communal, social, & personal services	14,550	2,565	840	1,710	10	5	11,025	8,080	2,760	40	25	725	50	10	15	160	82
Zone area	1,645	335	10	35	-	310	1,215	70	50	-	1,135	20	-	-	-	15	83
Unprecisely stated activities	755	105	15	90	-	-	290	85	195	-	10	160	10	-	-	190	84
Males	29,405	5,695	1,085	6,310	25	275	19,040	6,670	11,245	80	1,045	3,830	235	75	50	480	85
Agriculture, hunting, forestry & fishery	775	130	25	105	-	-	430	130	290	5	5	185	72	-	5	-	86
Mine and quarry exploitation	30	5	-	-	-	-	30	-	30	-	-	-	-	-	-	-	87

EMPLOYED POPULATION AGED 10 AND OVER, PER MONTH INCOME RECEIVED, ACCORDING TO SEX AND BRANCH OF ACTIVITY: 1980 CENSUS (Conclusion)

Sex and branch of economical activity	Employed population aged 10 and over												Average monthly income (in Balboas)
	Total	Monthly income received (in Balboas)											
		Under 75	75 to 99	100 to 124	125 to 174	175 to 249	250 to 399	400 to 599	600 to 799	800 and 999	1,000 and over	Uncat-egated	
<b>SATELITE CITY</b>	<b>44,145</b>	<b>3,375</b>	<b>1,090</b>	<b>1,130</b>	<b>7,550</b>	<b>11,275</b>	<b>10,010</b>	<b>3,840</b>	<b>1,165</b>	<b>520</b>	<b>535</b>	<b>2,055</b>	<b>215.6</b>
Agriculture, hunting, forestry & fishery	870	35	20	105	140	110	180	110	25	30	10	105	231.3
Mines and quarry exploitation	45	-	-	-	-	5	25	-	-	-	10	-	355.0
Manufacture industries	7,255	210	125	560	1,865	2,065	1,540	475	95	40	25	255	201.9
Electricity, gas and water	1,025	5	5	15	70	300	345	110	60	35	30	10	298.9
Construction	4,490	270	65	230	900	1,505	915	535	45	-	41	285	206.8
Wholesale and retail trade, restaurants and hotels	8,570	435	300	730	2,265	2,205	1,450	455	190	85	65	390	187.2
Transportation, storage and communications	2,990	130	20	160	340	735	920	360	105	45	25	150	255.7
Finance, insurance, real state companies and services rendered to enterprises	2,350	35	10	75	350	615	590	575	80	65	85	70	264.0
Communal, social and personal services	14,550	2,160	500	1,160	1,410	3,420	3,615	1,150	345	105	125	560	213.7
Zone area	1,645	25	30	30	75	180	340	495	215	95	120	40	449.5
Unprecisely specified activities	755	70	15	65	135	135	90	30	5	20	-	190	174.1
<b>Males</b>	<b>29,405</b>	<b>1,125</b>	<b>455</b>	<b>1,710</b>	<b>4,885</b>	<b>8,145</b>	<b>7,020</b>	<b>2,870</b>	<b>960</b>	<b>405</b>	<b>455</b>	<b>1,375</b>	<b>228.8</b>
Agriculture, hunting, forestry & fishery	775	35	20	95	115	105	150	100	20	25	10	100	226.8
Mines and quarry exploitation	30	-	-	-	-	-	15	5	-	-	10	-	400.0
Manufacture industries	5,340	130	95	330	1,105	1,630	1,350	395	80	35	20	170	217.6
Electricity, gas and water	800	5	-	10	45	260	260	105	60	20	25	10	293.3
Construction	4,335	270	55	220	895	1,445	845	230	45	-	40	280	205.0
Wholesale & retail trade, rest. & hotels	5,675	250	175	420	1,415	1,460	1,000	355	160	70	50	270	196.4
Transportation, storage, communications	2,490	125	15	145	285	565	760	295	90	45	20	145	257.4
Finance, insurance, real state companies & services rendered to enterprises	1,660	20	10	55	290	420	400	250	65	45	75	30	257.5
Communal, social & personal services	6,375	220	60	355	620	1,995	1,860	680	225	70	95	195	244.0
Zone area	1,405	10	5	20	30	155	325	440	210	80	110	20	467.0
Unprecisely specified activities	570	60	10	60	85	110	55	15	5	15	-	155	170.6
<b>Females</b>	<b>15,140</b>	<b>2,250</b>	<b>635</b>	<b>1,420</b>	<b>2,665</b>	<b>3,130</b>	<b>2,990</b>	<b>970</b>	<b>205</b>	<b>115</b>	<b>80</b>	<b>680</b>	<b>181.2</b>
Agriculture, hunting, forestry & fishery	95	-	-	10	25	5	30	10	5	5	-	5	275.0
Mines and quarry exploitation	15	-	-	-	-	5	10	-	-	-	-	-	287.5
Manufacture industries	1,915	60	30	230	760	435	190	80	15	5	5	85	162.8
Electricity, gas and water	225	-	5	5	25	40	85	45	-	15	5	-	316.2
Construction	155	-	-	10	5	60	70	5	-	-	-	5	250.0
Wholesale and retail trade, restaurants & hotels	2,945	185	125	310	850	745	450	100	30	15	15	120	171.6
Transportation, storage and communications	500	5	5	15	55	170	160	65	15	-	5	5	248.9
Finance, insurance, real state companies and services rendered to enterprises	690	15	-	20	60	195	190	125	15	20	10	40	277.6
Communal, social and personal services	8,175	1,940	440	805	790	1,425	1,755	470	120	35	30	365	170.6
Zone area	240	15	25	10	45	25	15	55	5	15	10	20	220.0
Unprecisely specified activities	185	10	5	5	50	25	35	15	-	5	-	35	190.0

ANNEX 17

VITAL HEALTH STATISTICS

District	* Area Km <sup>2</sup>	* Popu- lation	* Housing units	Inhab. per housing unit	Inhab. per Km <sup>2</sup>	*Births			Mortality rate				Institutions			
						No. (P)	Rate (1)	Profes- care %	General		In- fants rate (2)	Mo- thers rate (2)	Hospi- tals	Health centers	Health S. C.	Health P.T.O.
									NTE. CER. %	Rate (1)						
TOTAL	2.152	706.434	140.441	5.0	328.3	17.961	25.4	99.7	99.9	4.0	17.5	0.2	11	35	-	2
Marina City	2.086	522.232	109.381	4.8	250.3	12.452	23.9	99.6	100.0	4.4	18.6	8.3	11	27	-	2
Satelite City	51	182.000	30.696	5.9	1584.3	5.276	28.9	99.9	100.0	2.9	15.0	-	-	6	-	-
Taboga	15	1.402	344	1.8	93.5	33	23.5	87.9	60.0	3.6	-	-	-	2	-	-

(P) Preliminary figures (1) Rate 1,000 inhabitants. (2) Rate per every 1,000 new borns alive

(3) Expenses per every 100 inhabitants (4) Beds per every 1,000 inhabitants

\* Figures expressed in thousands



## ANNEX 17 (Cont/.2)

	Health personnel										
	Physicians		Dentists		Nurses		Assist.nurses		Health assist.		Total Cons.
	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	
Total	1.228	17.4	181	2.6	1.335	18.9	1.659	23.5	2	0.0	2968.138
Marina City	1.146	21.9	162	3.1	1.309	25.1	1.607	30.8	2	0.0	2514.975
Satelite City	82	4.5	19	1.0	26	1.4	51	2.8	-	-	451.776
Taboga	-	-	-	-	-	-	1	7.1	-	-	1.387

	*Medical consultations				*Egr. Hos.	Egr. Per hab. (3)	Beds Per room (4)	Total vaccine dosages	Aque ducts	Drink. water benef.	Sanit. serv. benef.
	General medicine	Odont.	Nurse	Con. Hab.							
Total	2532.986	350.150	85.002	4.2	44.932	6.4	4.9	278.993	8	99.1	98.2
Marina City	2159.555	283.332	72.088	4.8	44.932	8.6	6.7	215.912	5	100.0	99.3
Satelite City	172.541	66.575	12.660	2.5	-	-	-	61.304	1	95.0	95.9
Taboga	890	243	254	1.0	-	-	-	1.777	2	-	-

\* Figures expressed in thousands



11.1 PROPOSALS FROM THE WORKING GROUPS THAT STUDIED THE  
HYPOTHETICAL CASE: "DEVELOPMENT OF MARINA MARGINAL  
AREAS"

This hypothetical case was analyzed by the Working Groups 2, 3 & 5 with the purpose of recommending outlines for the preparation of an eventual project that would make feasible the solution of the problem.



11.1.1 GROUP 2 PROPOSAL (PROJECT FOR THE DEVELOPMENT OF DRINKING WATER SUPPLY AND SANITARY DISPOSAL OF EXCRETA IN SATELITE CITY (MARINA))

11.1.1.1 BACKGROUND

The observed situation of scarcity for service is damaging health. According to the government policies inspired in the International Water Decade (IWD) it is considered a priority to solve these deficiencies in the shortest time.

The present status of service support is as follows:

Total population:	169,870 inhab.
Population with domiciliary water service:	53,872 inhab.
Media provision:	435 l/inhab./day
Quality of support:	deficient
Population with connection network to sewerage:	52,000 inhab.
latrine:	80,080 inhab.
Population with on site disposal - septic tank:	16,120 inhab.

11.1.1.2 PROJECT OBJECTIVES AND GOALS

(a) General objectives

- Increase health conditions and life quality of the Satellite City population without damaging Marina's environmental conditions.
- Improve Satellite City urban infrastructure incorporating it to the existent one in Marina.
- Encourage community's participation and mobilization to obtain better drinking water supply and sanitary disposal of excreta.
- Increase the population's productive capacity of Satellite City.
- Minimize hazards of real estate possession in Satellite City.
- Facilitate housewives and children work in Satellite City.

b) Specific objectives:

- Provide an adequate drinking water supply and sanitary disposal of excreta system to Satellite City.
- Provide domiciliary connections, by year 1995, to all inhabitants in Satellite city.

- Provide sewerage connection, by year 1995, to 50% of the population in Satalite City.
- For the other 50% with on site final disposal.

### 11.1.1.3 TECHNICAL DESCRIPTION OF THE PROJECT

#### (a) Design criteria

As service provision is not homogeneous the following quality levels are suggested for the slow implementation of the service:

LEVEL	TYPE	PROVISION	ACCESS	EXCRETAS
0	Truck or tank	15-20	Communitary Tanks' cleansing Water disinfection Community education	Latrine
1	Public fountain	25 l.p.d.	1 fountain ea/50 famil. org. charges p/commun.	Latrine
2	1 service spout	35 l.p.d.	House	Latrine with hydraulic seal
3	Complete service	120-180	Domiciliary	Complete bath w/low consumption lavatory a) Tank with infiltration b) Common tank with latrine c) Collection network
4	Complete service	150-250	Domiciliary	"

- Minimum diameters' definition for each drinking water supply level
  - . for 1 and 2  $\emptyset$  2"
  - . for 3 and 4  $\emptyset$  operation estimate without considering fire but pipe cleansing

b) Equipment and material specifications

- General:

- . Intensive manpower use
- . Low-cost equipment and simple technology use
- . Mechanical equipment minimization
- . Use of equipment easily available in the area
- . Project's development according to the community's idiosyncrasy.

- Drinking water

The main pipelines materials will be compatible with existent network.

For distributing pipelines and accessories, the main ones and domiciliary connections will use synthetic and low-cost materials that guarantee a good service provision.

Pipelines' materials will be of PVC up to 300 mm, and the ones of greater diameter will be of flexible iron with elastic joints.

Special parts will be of melted iron as well as accessories. Accessories in domiciliary connections referred to boxes will be of simple concrete.

It must be tried to minimize construction costs adopting a minimum of covers that guarantee the system preservation and maintenance.

The proof pressure of the pipeline must be 1.5 times the nominal pressure.

Flow meters will be installed to water consumers of level 3 leaving for the remainder of the population the provision of installations with restricted consumption in the connection.

- Sewerage

Pipeline materials should have a high absorption capacity of seismic movements. Double connections will be accepted to reduce costs, in housing units exclusively. Necessary cautions will be taken to avoid installations of washing chambers.

The collection pipelines' materials will be of PVC for diameters smaller than 300 mm and of reinforced concrete for greater diameters.

The minimum diameter to adopt will be 100 mm.

Manholes will be of masonry and reinforced concrete with inside waterproof plaster exclusively, according to presently-established standards.

Register entrances will use frame and top of reinforced concrete both in roads as in sidewalks.

The network should be measured taking into account that the use of low-consuming lavatories (5 l/max. per discharge) and the use of domestic septic tanks for solids elimination (when economical studies do recommend so). The slope will be the minimum compatible with design conditions.

c) Constituent parts of the project

Four programs are considered.

- Communal program

Activity: Provide services to all the population at levels 0, 1 and 2 in at least 3 years, benefiting in:

Water - 10,500 existent houses that do not have domiciliary connection

Excreta disposal: 18,500 houses that do not have or are short of sanitary disposal of excreta.

- Program: Optimization-utilization of existent sewerage network

Activity: (in a 3-year period) connect a total of 4,500 houses to the existent sewer network.

- Program: Drinking water at Levels 3 and 4

Activity: Provide 25,500 dwellings at Level 3 and to 8,500 ones at level 4 in a period of 9 years from 1986-1995.

- Program: sanitary disposal of excreta at Levels 3 and 4

Activity: Provide 12,400 dwellings with discharge to collection network and to 8,500, at Levels 3 and/or 4 with on-site disposal, in a nine-year period, from 1986-1995.

(d) Project program

The present proposal will be subject to:



- Analysis by the Directory of the Enterprise and other authorities: decisions and assignment of resources.
- Consultation with the community (planning phase)
- Final decision about the project execution.

Once such a proposal is approved it will be necessary to make the following tasks:

- . Prepare feasibility and design studies.
- . Bidding process of certain works and decision for executing others by the enterprise (administration) and with community groups.
- . Execution of building by stages. Supervision of works.
- . Improvement of the system, for control and other functional and structural aspects.
- . Prepare a project for institutional strengthening and development of human resources (including the preparation of promoters and procedures of community work).

In connection with the elaborated programs the attached chronogram is proposed:

#### 11.1.1.4 SOCIO-CULTURAL ASPECTS

##### (a) Community organization

To incorporate the community in all the project phases from planning to operation and maintenance, the following is necessary to be taken into account:

- Investigate the community's interest through domiciliary visits and that of the sanitary engineer to diagnose the current conditions of each house (demand, service level, etc.)
- Design

All the proposed stages for the final design will be discussed through meetings with the communal boards

- Construction

Through the use of contracted manpower by the awarded enterprise in the bidding, using personnel of Satellite City and construction materials and techniques known and accepted by them.

ANNEX

PROGRAMMING		CHRONOGRAM		YEARS OF EXECUTION									
PROGRAMS	PREPARATION ACTIVITIES	EXECUTION ACTIVITIES	1	2	3	4	5	6	7	8	9	10	
COMMUNITY PROGRAM	a. Diagnosis	a. Works' execution											
	b. Project document	b. Sanitary education to the Community											
	c. Methodology of communal work	c. Investment recovery											
	d. Promotional and educational material	d. Operation and maintenance of works											
	e. Assignment of resources												
PROGRAM - SEWERAGE OPTIMIZATION OF EXISTING NETWORK	a. Preparation of the project document	a. Project promotion											
	b. Design of a credit mechanism to future users.	b. Technical advisory											
PROGRAM - WATER LEVELS 3 AND 4	a. Project document preparation	a. Work execution											
	b. Promotional material	b. Sanitary education to the Community											
		c. Investments recovery											
		d. Operation and maintenance											
PROGRAM - SANITARY DISPOSAL OF EXCRETA LEVELS 3 AND 4	a. Preparation of the project document	a. Execution of the work											
	b. Promotional material	b. Sanitary education to the Community											
		c. Investments' recovery											
		d. Operation and maintenance											

- Operation and maintenance

The existent institution as the responsible organization of the project administration will use personnel from the community for services such as cleansing of the systems for liquid wastes disposal, meters reading, detection and repair of leakages, etc.

- Sanitary education

From the research project it must be contemplated the fulfillment of activities that allow:

- . Evaluation of social acceptance
- . Technical feasibility evaluation
- . Cost and financing evaluation
- . Establish the educational needs of the low-cost alternative methods
- . Adequate water use
- . General improvement of hygienic habits

It is important that in the community's participation, the woman's sanitary training must be considered as a necessary step for the following reasons:

- . in planning as an acceptant,
- . for the design as a user,
- . for community training as an administrator, and
- . for the evaluation of the results as exchange agent.

(b) Land possession aspects and service levels

- General view

Land possession constitutes a legal technical process that will permit the title and delivery of deeds to all owners of the properties that will be benefited with the sanitary works. This activity constitutes the only way to recover investment by the issue of credit titles through registration with an annual tax payment or rates that cover the loan for a period in years, similar to the loan with the same interest rate and with the next grace period for the initiation of the payment.

- Service levels relation

- . Precarious occupants, with no legalization of their rights to the occupied lot, will be only offered service levels 0 and 1.
- . Lot owners, who do not have service, can opt for levels 2, 3 and 4 according to the possibilities of extending networks, absorption rates of the ground and payment capacity.

- . In special cases of inadequate location of the settlements: hills, high slopes, rocky ground, exaggerated distance from the systems, etc., its transfer will be tried. Certainly, with the proper consultation and argumentation with the community.
- . All services will be paid, except in special cases.

(c) Social and economic impacts of the project

- Social impact

The communals' boards intervention in the organization responsible for the project will allow that the sources set up for an implicit acceptance on the community's side, will unquestionably result in a positive social impact.

- Economic impact

In previous chapters we have mentioned the need that the cost of the works to execute in the project, be recovered through payment by the community in the same conditions of period, interest and grace period that the loan contract indicates, that will permit the execution of the reference works. With this circumstance it is expected to receive the acceptance and cooperation of the community, that allows defining this economical formula, as a positive impact.

(d) Institutional, economic and financial aspects

- Organization description

The organization responsible for the proposed project development will be the institution that presently provides the service, which counts with governmental support. The action policy will consider the goals imposed taking advantage of the installed capacity.

- Estimated costs

The projected works for drinking water up to year 1995 include 25,500 connections of level 3 and 8,500 connections of level 4, new ones to be built, plus the services of levels 0, 1 and 2. Level 4 connection has been estimated in US\$624 and in US\$500 that of Level 3, thus obtaining a total investment of 17,950 dollars for Level 3 (25,500 connections x 500) and (8,500 x 624); for Levels 0, 1 and 2 an investment of US\$2,400,000. The estimated cost per inhabitant for sewerage service is 250 dollars, with a population density of 5.2 inhabitants per dwelling. Investment for networks is 16,150,000 dollars per 12,400 connections to be finished; besides, the construction for on-site disposal for 44,000 inhabitants at a cost of 4,300,000 has been considered, totalling 20,150,000 dollars. A total of the water and drainage project is 40,500,000 (forty million five hundred thousand dollars).

Investments will be carried out to the following annual amounts:

1st. year	400,000.00
2nd. year	2,150,000.00
3rd. year	3,300,000.00
4th. year	4,950,000.00
5th. year	4,950,000.00

and in the same amount of the 6th and 10th year.

Due to the inhabitants' negative to make use of the services and their scarce economic capacity it is suggested that the government covers 50% of the cost as an investment with fiscal funds, the institution covers 30% to be paid with the proposed increase of 25% on water payments for drainage and the 20% to be charged to users as payments for the incorporation to water and drainage systems.

- Operation and maintenance costs

Supposing that the rate covers operation and maintenance costs of the service, the annual value of same would be:  $12 \times 4.24 \times 30,135 = \$1,533,269$ .

To project these costs a 10% inflation is assumed. The major costs for new users will be equilibrated with the diminution of the losses calculated in a 50% to 25% (improvement of the system efficiency).

The previous hypothesis excludes the possibility of generating funds for reinvestment, that is also consistent with the investments' finance.

The specification of the services: registration, measurement, billing, collection and promotion of new users, will be analyzed by IDAAN's commercial unit, which administrates Marina City's system.

- Services marketing

Due to the economical capacity of the population investment costs will be covered mostly by the state as tariffs have the purpose of covering operation and maintenance costs. The water consumption value will be increased in a 25% to cover sewerage, the differential rate will be introduced and a consumption basis of  $15 \text{ m}^3$  monthly per service will be taken into account with what we will increase the system coverage. Marketing will be reorganized through a register that allows an increase in the billing. Thus, the consequent charge and control of the clandestine outlets will cover 100% of the system.

Supposing that a well-administrated system is the one in which the rate of connections/employee is between 150-250 and assuming an intermediate value of 200 connections/employee, to adequately serve

this project it will be necessary:  $30,135/200 = 116$  employees, including professionals, qualified technicians and operators, distributed as follows:

Professionals:	2
Technicians:	10
Operators:	104

- Enterprise/user's relations

Enterprise/user's relations will be completely carried out through the Institute's marketing unit which may have an office in Satellite City and can also be supported by the existent community organization to facilitate such a relation.

- As indicators of the project's success, it is proposed:

- . Number of new aqueduct connections
- . Number of new sewerage connections
- . Number of built up septic tanks
- . Number of installed latrines
- . % of reduction of water losses
- . Billing rates
- . Increase in the collection rates
- . Decrease of morbidity and mortality rates due to diarrhoeal diseases.

The Institute's planning unit is responsible for carrying out the project's evaluation and monitoring through the results obtained versus the proposed objectives. This activity will be carried out with the periodicity that circumstances recommend.

- Evaluation

(e) Problems and hazards

- Lack of political support
- Organization and procedure failures by the coordinating institute, mainly because of insufficiency of trained personnel
- Lack of acceptable financing sources
- Lack of communal support to the proposed project as non acceptance of the new rates or of the adopted technology

11.1.1.5 FUNDAMENTAL PRINCIPLES THAT HAVE TO BE APPLIED FOR THE PROJECT'S SUCCESS

(a) Technical

- Knowledge of existent systems
- Flexibility of design standards
- Adoption of appropriate technologies

(b) Socio-cultural

- Community participation at all stages
- Community's change of attitude

(c) Institutional

- Strengthening and/or reorganization of existent entity
- Securing political support
- Change of institutional attitude towards the community
- Definition and application of good personnel policies

(d) Economic and financial

- State, communal and soft credit financing
- Differential rates to cover operation and maintenance
- All services will be charged

11.1.2 GROUP 3 PROPOSAL

11.2.1.1 GROUP 3 REPORT ON FIRST WORKING MEETING OF THE REGIONAL SYMPOSIUM ON DRINKING WATER SUPPLY AND SANITARY DISPOSAL OF EXCRETA IN URBAN SLUM AREAS

The Working Group meets integrated by the following participants:

Juan Gerardo Forcada	- Argentina
Humberto Sánchez	- Brazil
Eduardo Gómez	- Brazil
Jesús Armando Leal Muñoz	- Colombia
Patricio Garrido García	- Chile
Lucía Vásquez Rotger	- Chile
Daniel Juricic	- Chile
América Huezco González	- El Salvador
Enrique Dau Flores	- Mexico
Eduardo A. Monteverde	- Uruguay
Jacobo Finkelman	- Mexico

and under the coordination of Eng. Luis Torres.

The basic document prepared by Dr. Tim Campbell is analyzed. First of all, various participants indicate that in their opinion, Dr. Campbell's presentation basically centered in developing conditions guided by housing types in the peripheral areas, its inhabitants' motivations and the way in which they can be persuaded to make effort and money investments to improve the environment.

Nevertheless, various participants indicated their concern towards items related to environmental improvement in marginal areas, and that up to a point they depend on the decisions that inhabitants may adopt of the same.

The following aspects were indicated:

- (a) Technological aspects, in the sense that a drinking water supply system is made up of distribution networks, a drinking water supply system, and existence in the place of natural water liable to be drinkable. Marginal areas' inhabitants might eventually collaborate in lying down the distribution networks, but not in the other phases of the problem.
- (b) The importance of preventing from wasting water was also indicated, by avoiding leakage and excessive uncontrolled consumption. Colombia's example was given, where average reduction of wasted water left available a water flow that may be assigned for marginal areas consumption.



- (c) Argentina's representative, cited examples of governmental plans to eradicate marginal areas in metropolis of second order, through the creation of new quarters with sanitary basic infrastructure. He made reference to successful experiences in the rural environment and indicated that as far as possible the solution for marginal areas consists in eradicating them, re-settling its dwellers.

In view of this statement, various participants indicated that although such a solution is desirable, it is not possible in most countries, due to the great amount of investments that it would require. Experiences in rural areas do not result applicable to marginal urban areas on the other side, because those areas generally have no growth or a negative one, while marginal urban areas register a very fast growth in most of the cases. It must also be taken into account proximity to their places of work.

- (d) Various participants made emphasis to the education factor, as to teach population both of marginal areas and city central areas to avoid wasting water, in order to take advantage of existent resources to serve both populations.

Afterwards, the coordinator presented to the participants the specific case that will be the Working Group study motive henceforth.

It is about Marina City, where there is a central area and a satellite town that comprises most of the marginal areas.

After a short discussion about the need to precisely define the marginal area concept, the participants made a personal study of the topic, and continued defining the general and specific objectives of the study.

General objectives are indicated as:

- . Environmental conditions improvement
- . Health improvement
- . To improve and promote communal organization.

Specific objectives are indicated as:

- Drinking water supply and excreta disposal for a proportion of the population that must be determined when it is studied in depth.
- Housing improvement.
- Per capita reduction of drinking water provision, in Marina City, that is excessive due basically to the lack of a micro-measurement and other factors to be determined.

- Establishment of an investment recovery policy.
- The representative of Uruguay indicated that one of the specific objectives should be to adequate costs of installation services to the users' economical possibilities for their absorption of tariffs and amortizations.
- This subject was discussed by the participants, in view that many of them indicated that marginal areas' inhabitants have no possibility of repaying the investments and could hardly pay operation costs of the services.

Nevertheless, it was finally agreed that the following aspects had to be studied:

- . How and in what percentage marginal areas' inhabitants could absorb recuperation costs of the investments, and how such costs should be absorbed by the central government.
- . In what proportion the international credit could be referred to face these investments, and in what conditions the loans could be negotiated.
- . In what proportion the investment fund could be created and be financed through tariff structures with a social sense, in order that the ones who consume more will pay more per cubic meter, and that users with higher economical resources who live in the central areas of the cities pay more.

At this stage the rapporteur and the revision committee of the report were designated and the session was adjourned.

#### 11.1.2.2 SECOND SESSION: TECHNICAL ASPECTS

Working Subgroup "A" results

(a) Diagnosis

- Design period

It was considered adequate up to year 2000 because 15 years is generally a useful life period for a drinking water project. Statistics also indicate a continuous growth and the causes that stimulate it have not disappeared, on the contrary the economical situation seems to be more serious. Moreover the estimated population for year 2000 (assuming that at present nobody in Satellite City has water services), is considered by anticipation that it may be supplied from the same source and sewerage used for Marina City.

- Population

<u>Year</u>	<u>Total</u>	<u>Marina City</u>	<u>Satelite City</u>
1980	645,369	476,499	169,870
1984	730,000	535,000	195,000
2000	1,206,680	884,166	322,514

- Supply

The "per capita" media consumption registered in the document are mentioned as a reference:

For Marina City - 169 gal/day = 642 l/day  
 For Satelite City - 113 gal/day = 429 l/day

Taking into consideration the experiences of other cities related to supply and losses, the socio-economic level of the population, and the fact that there are practically no industrial, commercial and institutional consumptions, the following supplies are determined:

For Marina City - 380 l/day  
 For Satelite City - 200 l/day

- Loss decrease

Starting from effective experiences and taking into account that there is no micro-mediation it is established as a goal to recuperate a 40% of the present per capita media consumption of 642 liters per day, which would reduce to 385 liters per day, approximately coinciding with the design supply for Marina City.

Having at present a flow of 104,000,000 gal/day = 395,000 m<sup>3</sup>/day, and calculating the design theories of total consumption the results for 1984 are:

Consumption in Marina City	384 x 535,000 =	195,000 m <sup>3</sup> /day
Consumption in Satelite City	200 x 195,000 =	39,000 m <sup>3</sup> /day
Addition		234,000 m <sup>3</sup> /day
Availability		395,000 m <sup>3</sup> /day
Release flow		161,000 m <sup>3</sup> /day

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(\* ) For the purpose of this case it is considered that Marina City's population does not have as yet water and sewerage services.

- Supply source evaluation

This allows to conclude that the present supply source, as well as the sewer have enough capacity to service the population growth.

Considering that the real effective consumption may be reduced to the capability of the project, the media consumption for both populations would be:

$$234,000 - 730,000 = 320 \text{ l/inhab/day}$$

therefore the supply source should theoretically be enough to supply approximately:

$$161,000 - 320 = 500,000 \text{ inhabitants}$$

which added up to the present 730,000 we would get a population feasible to be served of 1,230,000 inhabitants, that is somewhat more than what is expected for year 2000 (1,206,680). This confirms the initial indication to consider a design period up to year 2000, a first stage program that does not require to increase the source capacity nor the sewerage built at present.

- Steps to obtain loss reduction

- . Improve the administrative capacity of the Water Institute.  
Establish a permanent program for losses detection and control, to diminish the unaccountable water volume.
- . Carry-out a macro and micromasurement.
- . Formulate and apply a tariff policy that discourages excessive water consumption and that has a social sense for low-income consumers, which represent the majority of Satellite City's inhabitants.
- . Carry-out a campaign for the education and consciousness of the population to reduce the present high consumption.
- . Take necessary steps to rationalize the system operation, through the installation of complementary pipelines and valves.

Working Sub-Group "B" results

(b) Technological strategy

- Definite project elaboration

Taking into account the diagnosis elements and previous evaluation of the present system, a definite project must be outlined, to confirm its capacity to serve Marina and Satellite Cities' growth foreseen for year 2000. It should not only be referred to Satellite City's distribution network but also to the program that will allow to reduce present losses and thus utilize the surplus to serve the new population of the the two cities.

- Execution stages in accordance to resources and work chronogram for Satellite City

. A minimum program for main lines with Central Government resources at the pace that the contributions may permit. (Users' payment capacity will not allow to apply to them these works' cost).

. A minimum program of domiciliary installations in adjoining areas to the main lines and to public faucets in areas near such main lines. (This allows to take advantage in some way to the installed capacity, while resources are available for the construction of the networks).

- Program for the enlargement of distribution networks with new users' contributions. (This will be done when credits are available, that may be repaid with the users' contributions and/or with their service fees).

It will be initiated in the areas where higher economical capacity people live to be sure of a better use of the service.

- Temporary solutions

Once the minimum main lines program is built, users may be temporarily served through the following actions:

. Definite service with domiciliary connections to houses located in front of the main lines.

. Service through public faucets for houses that are not in front of the main lines.

It must be complemented through domestic filters to ascertain water potabilization, which can be contaminated between the moment it is taken out from the faucet and its consumption.

- . Service through a tank truck and complemented by a domestic filter.

Due to high rainfall (+ 90" = 2.28 m) and to long rain period (8 months, from May to December, in which it reaches a 90% or 95% rainfall) it is possible to design domestic installations to allow collection and additionally use part of this rain water.

With a 60 m<sup>2</sup> collection surface, that could be a housing area and an adequate storage the potential volume is 137 m<sup>3</sup>/year/house, equivalent to 72 l/inhab/day, that is to say 35% of the established provision of 200 l/inhab/day (including losses).

- Excreta disposal

- . Extension of the sewerage service. Due to its high cost, this will be done after the installation of the water service, when the user may have increased its payment capacity and may not be paying the lot, infrastructure and other services. Meanwhile the problem must be solved with temporary measures, such as:
  - . Septic tanks and absorption tanks installation, both individual or collective.
  - . Latrine installation.

### 11.1.2.3 SOCIO-ECONOMIC ASPECTS

After analyzing the provided information the following is deduced:

- Two population groups are presented; Marina City and Satellite City; the first one is the main and oldest settlement and the second one has more the characteristic of a sleeping room city. In both cases problems are presented because of the existence of squatters and slums.
- Employment indicators, housing incomes, service and health coverage, demonstrate to us that both groups are similar and that a considerable percentage of the population have medium and superior life levels; although, in both areas there are cases of extreme poverty being more accentuated in Marina City.
- From the existent situation it must be said that the problem we are confronting is: need to improve service levels and coverage enlargement.

- (a) Proposal for the development of the communal promotion program
- (a.1) Policies
- The program will cover all inhabitants to Marina City, including Satellite City.
  - It will be sought that the population to be benefitted participates in the problem solution, as well as in the construction, and the good use of the service.
  - Create a solidarity climate that allows the use of the same mechanism for the solution of other problems.
- (a.2) Process
- Constitute a working group with the water Company, Government and community (future users and present ones) to coordinate the campaign.
  - Verify if the technical solutions set out are socially possible.
  - Improve the objective.
  - Identify which are the desired community's behavior so that the technical solution be possible.
  - Formulation of the educational campaign:
    - . At a global level (publicity)
    - . At a specified level (communal promotion).
  - Campaign execution.
  - Introduce the evaluation system.
- (a.3) The campaign should achieve:
- Addressed to new users:
    - . That the population participate in the solution debates.
    - . That the population participate in the construction, and project's good use and conservation.
    - . That they understand that it is a problem of costly solution.
    - . That they understand that the project will be carried out by stages.
    - . That they understand that they have to pay for the service.
    - . That they understand that it is a project on the benefit of health.
    - . That this is a means to solve community problems.

- Addressed to present users.

That include:

- . That there is a serious problem in the community and that its solution demands all the community's participation.
- . That the cost they pay for the service is insignificant compared to other properties and services that are not indispensable.
- . That solidarity with dwellers of the marginal area is necessary.
- . That they should make good use of the services and avoid wastes because others are in need of them.

(a.4) Hazards

- Lack of coordination between the technical and promotional program.
- Inadequate promotional approach due to lack of a greater depth in the community study.
- Political interference in the planning campaign.

11.1.2.4 INSTITUTIONAL ASPECTS

(a) Speakers election

The representations of greater importance, of the sectors, are the following:

- Company: Staff of the Water Institute, that is the organization in charge of the operation of the sub-sector in the country.
- Community: Communal Boards, through directing boards.
- Government: Mayor.

These representations are justified because of the need of coordinating actions of existent institutions.

(b) Administration centralism

Water and sewerage service administration must be centralized according to the existent institution, the National Water Institute, with the exception of the transitory solutions, which may count with the community participation.



(c) Interrelation with other collateral aspects

Elaboration of a global policy in the developing program of the treated settlements, that would be the coordination of the sectors of public roads, rain drainage, aqueducts, sewerage and housing.

(d) Mission of the institutional projection and definition of the entity in charge of the service

Adaptation of the existent institution through the creation of a special department assigned to give a social solution to the marginal settlements, trying to establish connection with the social development programs set up by the government, in order to obtain service finance and promotion.

(e) Definition of its characteristics

The company must try to obtain a financial, technical and administrative autonomy, without losing sight of the social people that must be accomplished for the benefit of populations with problems.

The above can be obtained through the establishment of an adequate constitutional document and projecting the fulfillment of the set up objectives.

(f) Implementation of an adequate collection and measurement policy

(g) Institutional development of human resources

They may be:

- . Training
- . Selection
- . Optimum number of persons
- . Remunerations
- . Adequate policy for personnel administration
- . Potential human resources for company's development.

#### 11.1.2.5 ECONOMIC AND FINANCIAL ASPECTS

(a) The following economic and financial general policies are established:

- Self-financing of the company.
- Technical, administrative, economic and financial autonomy within the country limitations.

- Surplus that will allow making investments.
- Tariff differentiations and their periodic revision.
- Revision of technical and legal standards for their optimization.

(b) For the specific case of Satellite City it is proposed:

- Create an overtax that allows forming a rotating fund to finance the improvement of the service and extension of the networks.
- Service optimization to obtain the least possible cost.
  - . Find the minor diameters for a domiciliary acceptable system: 200 l/day/inhabitant.
  - . Meters' installation.
  - . Improve the collection system.
  - . Eliminate the losses and increase the invoiced percentage.
  - . General revision of the design criteria.

- Revision and updating the tariff system.

Leave the single tariff per cubic meter, to search for a differential system.

- Turn to loans with concessional rates to carry on this development.
- Establish the contribution mechanisms of the community to be benefited.
  - . Manpower contribution.
  - . Contribution with material of the locality.
  - . Contribution in cash.

- Establish an evaluation and monitoring system of the proposed measures.

(c) Problems and hazards

- Risk of increasing lateness due to tariff overtax.
- Adverse reaction of the community.
- Weakness of the social responsibility on behalf of the enterprise.

## 11.1.2.6 SUMMARY OF THE PROPOSED PROJECT

### (a) Objectives

- General:
  - . Health improvement.
  - . Environmental conditions improvement.
  - . Promote the population development.
- Specifics:
  - . Drinking water supply and excreta disposal for low-income population.
  - . Definition of design criteria to obtain economies in the work.
  - . Establishment of a policy for the finance of investments.
  - . Perfectionate and promote the organization and communal participation.

### (b) Technological aspects

- Consumption reduction, with the introduction of macromasurement, micromasurement, loss control, etc.
- Equilibrate water supply service through the installation of regulation systems.
- Formulate drinking water and sewerage master plans.
- Adequate standards and design criteria to obtain and economize in the investments.
- Preserve the existent water quality.
- Introduce progressive stages for service provision in the low-income areas.

### (c) Socio-cultural aspects

- Integral communal promotion (present and future users).
- Obtain the community's organized participation.
- Maintain permanent coordination between responsible organizations and the community.

### (d) Institutional aspects

The Government must assume the responsibility of providing the demanded services.

- The existent company must solve the "study" case.
- The company, securing its social purpose, must have technical, economical, financial and administrative autonomy.
- Coordinated action with other organizations involved in the community development.

(e) Economical-financial aspects

- Define a differential tariff structure and secure its evolution.
- Limit the user's resources obligations, to its economical capacity.
- Define the financial program of the investments, considering:
  - . Company's own resources
  - . Indebtness
  - . Government's contributions.

(f) Problems and hazards

- Political decisions that affect the sector's plans and programs.
- Interferences of groups with individual interests.
- Disequilibrium between self-financing of the Company and the fulfillment of its social purpose.
- Generate expectations in the community and impossibility to fulfill them.

11.1.3 GROUP 5 PROPOSAL

11.1.3.1 OBJECTIVES

(a) General (Intesectorials)

- Improve life quality
  - . Improve economical conditions.
  - . Stimulate employment.
  - . Raise education levels.
  - . Diminish infant morbi-mortality.
- Solve land ownership problem.

(b) Specifics (from S.B. entity)

- Extend coverage to marginal population.
- Increase the enterprise's efficiency.
- Promote and obtain active participation of the community.
- Strengthen sanitary education.
- Create community's training and employment opportunities related to the project.
- Create financial mechanisms to facilitate users' incorporation.

11.1.3.2 TECHNOLOGICAL ASPECTS

After revising the technical session document related to technological aspects, Group 5, constituted in a workshop.

From the exchange of ideas among the Group members there was a consensus on the identification of the most relevant aspects in the subject.

These aspects were the following:

- Revision and adaptation of design criteria and standards to local characteristics, with special reference to:
  - . Quality standards
  - . Design provisions
  - . Domiciliary connections and other systems
  - . Macro and micro measurement
  - . Operation and maintenance feasibility.
- Integration with other engineering or development projects.
- Pilot and research projects.
- Sanitary and rainfall networks, including satisfactory individual disposal.
- Appropriate technologies for treatment and final disposal.

After this relevant aspects' identification, Group 5 was subdivided in three sub-groups, denominated "A", "B" and "C", which had the task to make a more detailed analysis of items 1, 2, 3, 4 and 5 respectively.

When this analysis was finished the sub-groups integrated themselves again in one Group to make a joint revision.

Final conclusions are detailed below:

(a) Revision and adaptation of design criteria and standards to local characteristics

- Water quality standards

Considering that the water quality provided to the population is excellent, the idea would be to maintain this quality and make controls and samples according to the established guidelines on the subject. Notwithstanding the above and taking into account morbidity rates of Marina City, the following preventive and corrective actions are suggested:

- . Investigate possible causes and contamination grades within the dwelling.
- . Investigate water handling from public fountain until its consumption.

The latter actions justify an educational program to maintain good water quality up to its final consumption stage by the user.

- Provisions of design, domiciliary connections and measurement

According to the diagnosis, per capita consumption is 113 gal/h/day (approx. 430 l/h/day), with the additional burden that 72% of the population is supplied by domiciliary connections and the other 28% by public fountains. The following actions are suggested:

- . Permanent campaign for rational water use
- . Macromasurement and selective installation of domiciliary meters' program
- . Differential rate study according to the consumption level
- . Increase domiciliary connections to reach a 100% objective.

It is estimated that with these actions the consumption will decrease in a 50%, with the consequent energetic saving, increase of the coverage and satisfaction of the future demand with the same available water volume.

- Materials and equipment specifications and operation and maintenance feasibility

- . Standardize types of materials, giving preference to the national production and to the corresponding quality control, adjusting it to the enterprise's requirements.
- . Elaborate specifications for the acquisition of machinery, materials and equipment not produced in the country, and that are indispensable for the good operation of the drinking water system, according to the technical, economic and

human levels of Marina City's community, avoiding their sophistication.

(b) Integration with other developing projects

Reformulation of the integration plan with other projects and with the community is recommended, mainly in the sectors:

- . Housing
- . Health
- . Labor
- . Education.

It is expected to achieve working sources with this through training for housing self-construction as well as other duties, among others.

Normalization of land ownership and the application of adequate technologies would also be obtained to satisfy the community's requirements and expectations, taking into account their payment capacity.

(c) Pilot projects and research

Recommend to the technical board of the community the adoption of a strategy for the search of appropriate technology, applicable to all sectors, through the development of pilot projects with community participation.

- Search for additional resources for investigation activities.
- Long-term objective would be to create a research capacity of the water and sanitation enterprise.

(d) Sanitary and rainfall networks including satisfactory individual disposal

(e) Appropriate technologies for excreta treatment and final disposal

As items 4 and 5 are intimately related subjects, the Group discussed them together.

- The little advantage that users take of the existent sewerage system, reaching 25% of the connections in some sectors, called strong the attention.

A soft credit policy is recommended, at the water enterprise, local or national political level responsibility, to facilitate its connection to the existent sewerage network.

Research is also recommended for more economical solutions for population not served by the existent network.

- It is considered that if the drinking water consumption is lowered, sewerage projects would result in a lower cost.
- Due to the topographic conformation of Marina and Satellite Cities and the hydrographic networks that go across, it is considered that rainfall evacuation will almost be a normal process, not resulting in a problem. Anyhow rainfall drainage systems that are designed will be of the separate type.
- A study must be made of wastewater disposal coming by the sewerage networks of Satellite City and connecting them to those of Marina City.

Due to Marina City's topography it is considered that the solution for the final disposal of these waters will be the sea through ocean outfalls, with a possible pre-treatment to eliminate gross and floating material.

An adequate design study of the sewer outfall is recommended to avoid contamination of the beaches.

- A study must be made of the final disposal of residues coming from latrines, septic tanks or other systems that are promoted as more economical solutions than sewerage networks.

In the case of using treatment plants or stabilization ponds appropriate lands for their location must be considered.

- Take advantage of the good participation attitude of the community to enlarge sewerage networks by the self-construction system or for the construction of more economical excreta disposal systems.

(f) Problems and hazards

The group visualized the following problems and hazards that can result in the achievement and operation of the aforementioned proposed solutions:

- Insufficient institutional development of the responsible entity.
- Lack of financing.
- Difficulties to establish the interinstitutional coordination.
- Risk to increase costs because a decision was not taken on time.
- Increase the attraction for new settlements.



### 11.1.3.3 SOCIO-CULTURAL ASPECTS

Human groups located in the urban area, that have been classified as marginal, have generally developed in a period of various years and because of their origin and other common characteristics may also be classified in three groups:

- Peasant families who go to the city looking for a job and welfare.
- Poor families, without resources, as a result of over-population of the same city or others.

Medium-resources families that cannot locate themselves or acquire dwellings in urban areas and that have integrated marginal groups.

After analyzing the characteristics of the above-mentioned groups with their integral problem, proposals that could set up a solution to their situation have been defined as follows:

- (a) Make use of the existent communal organization considering its three groups

Classification of the three groups is mainly based on their income level.

- The group with higher income has possibly solved its needs, and may be considered to participate in the creation of jobs, small industries, education, direction and coordination of actions for the acquisition and/or mobilization of external resources to finance works and projects that the population requires and especially, people who lacks of drinking water and excreta disposal.
- The medium income group whose majority probably has its basic sanitation problems solved, could participate through its professional resources, service clubs, and promoting existent organizations in order to help solving the problematic situation of group 3.
- The low-income group is formed by persons with low academical and/or technical level and it is where other characteristics inherent to the really marginal population nucleus turn up. Its participation would consist in organizing itself to receive capacitation and training (small industries, craft, qualified manpower, etc.) that allow a higher income, to possess basic services through acceptance of advice in the solution of problems, resulting in an active highly motivated participation by furnishing manpower, materials, services, etc. All that in an integral development process with the other groups and with the Public and Private sectors.

(b) Incentivate the community participation taking advantage of the Food World Program (FWP) resources

Although FWP may distort the productive force in the peasants' rural areas, in the marginal urban communities and specifically in low income group 3, it may stimulate communal work to obtain a basic sanitary infrastructure, and at the same time to solve two problems, (a) its food deficit and (b) its scarce active participation. The FWP would be executed while the provision of the infrastructure program lasts.

(c) Take advantage of existent "Human Resources" in Satellite City and others from external origin

The participation of senior and university students in the development of an infrastructure for the promotion, sanitary education and community training, will facilitate obtaining a better use of technology, adequating it to the existent reality.

Stimulate nearby universities to participate in solving Satellite City problems mainly using resident students in their social work with the community (design, construction, operation and maintenance, sanitary education, etc.).

(d) Simplify and speed-up bureaucratic transactions

Revise "urban administration" standards that hinder transactions and procedures, in order to allow an efficient and quick solution of requests for services and other responsible institutional actions and of the marginal population group.

(e) Foster and develop working sources

Identify the communal manpower training level in basic sanitation in order to use it for construction, as well as technical training level. This allows using qualified manpower in the different working areas (carpenters, masons, constructors, radio-technicians, plumbers, etc.) in order to assure a monthly income increase and be able to support drinking water services and adequate disposal of excreta among other needs.

Advantage could be taken of the economical activity of Satellite City with respect to trade of construction materials (concrete blocks, bricks, gravel, sand, etc.) for the development of infrastructure works in the marginal populated areas.

The water enterprise may propitiate the formation of small contractors in the community to work where their direct participation is needed (installation, repairing and meter readout, construction and cleansing of septic tanks, latrines, etc.). The aforementioned would produce through time an integral improvement in the marginal community.

(f) Accept non-monetary contributions (materials and services supply), as payment of the basic sanitation services

With the enterprise's acceptance for promoting in the community a participation of non-qualified manpower (opening of ditches, transport, materials transportation, etc.), the contribution of local origin supplies to be used in basic sanitation works (bricks, stone, sand, gravel, wood, etc.), will generally constitute the counterpart of the community support. The organized community may promote and carry out cultural activities, sports and others in order to obtain funds for the acquisition of non-existent materials in the community.

(g) Hazards and problems

- That the groups with high incomes, abstain themselves from collaborating with other groups (low-income ones) maybe due to lack of interest, time and motivation.
- The little experience that there is in the promotion and motivation of the communities with high heterogeneous characteristics, may cause a participation failure if a non-adequate methodology is applied to the community.
- Community's opposition to actively participate in the development of the drinking water and adequate disposal of excreta programs.
- That the institutional administration that services the urban area is not sensible to the changing needs for speeding up administrative transactions, but creates dispositions that instead of solving the situation it gets worse.
- Financing to execute works is not approved by the institution or that the community suspends its contribution making the work stay unfinished, and provoking deceit in both parts.
- Participation of higher income groups that have already satisfied their basic sanitation needs, may not be obtained if there is no effective incentive.
- The lower income groups may be frustrated when they are pressed by the institution to solve a problem that they do not feel as prioritary.
- Non-acceptance of low-cost technology due to the influence of high economical level groups.
- Inadequately select the leaders who will guide or orient the community.
- Do not obtain interinstitutional coordination to develop an integrated project.

- That the provision of food (WFP) creates expectations in other communities that are developing communal infrastructural works without this incentive.
- That once the basic sanitation works are finished participation and conformation of organized groups be lost.
- Unawareness of the community values and of its idiosyncrasy to propose adequate solutions, provoking repulse and financing loss.

#### 11.1.3.4 INSTITUTIONAL, ECONOMIC AND FINANCIAL ASPECTS

Group 5, after attending the conference on institutional, economic and financial aspects, formed the Working Group, identifying the following duties:

- (a) Definition of the responsible entity for drinking water and excreta disposal services, and initiation of institutional development program tending towards improving technical, administrative, political and financial capacity

We assume, from the available information that the responsible institution of the water and sewerage service is of national character. Satellite City's problem is confronted since 1975 through a general government board headed by the chief of State, who undertook the enormous task of the integral urban development of that city. This implies for the Water and Sewerage Institute to provide a total water coverage to the population and an adequate excreta disposal.

The non-fulfillment of the fixed goals, aggravated by the critical economical situation that the country goes by, claims a reopening of the institution and the introduction of a development program that contemplates the following aspects:

- Political capacity that gives institutions and its directors enough power to set up problems and solutions at the highest decision level of the country.
- Technical capacity: it is suggested the revision of parameters and criteria for the design, construction, operation and maintenance of such services that look after the application of adequate and simplified technology getting the maximum benefit of the national industry, and the exchange of goods and services with the Latin American and Caribbean Region.
- Financial capacity: revision of the traditional financing systems (IADB, BIRF, AID) searching for new sources in the other countries of the Region.

As for the use of internal savings, obtain from the construction industry the total financing of the water and excreta disposal infrastructure, both in networks as in production units. A similar treatment is suggested to be applied when establishing new industries.

- Administrative capacity: general operation and maintenance costs reduction through a permanent policy of personnel training and a revision of the bureaucratic processes.

(b) Mechanism for the interinstitutional coordination and formal sector participation

Although the expectations pointed out in the project allow to think that an answer is being given to the sanitation needs in Satellite City, we consider that an interinstitutional coordination must be dynamic, by revising work mechanisms, and establishing a program by objectives that must be evaluated and updated by the same Coordinating Committee.

A program addressed to all community levels must be implemented, in order that people participates in its political, industrial or simple user role, in an adequate financing system and in the rational water use that allows low-income population access to these services.

(c) Organize a multidisciplinary unit designed to look after the problems of the marginal settlements and the development of human and technological resources

With the purpose of obtaining an effective community participation in the marginal areas' projects as well as technical solutions according to the expectations and possibilities of their beneficiaries, it is recommended the creation of a multidisciplinary unit responsible for:

- . speaking with the community
- . promoting projects
- . working as liaison between the community and the technical and administrative units of the enterprise

With the purpose of obtaining an efficient performance of the enterprise, in its relation with marginal area problems, it is necessary to adequately train the personnel that will be in charge of its solution, emphasizing on methods and techniques related to:

- . communal development
- . sanitary education, and
- . low-cost technology

Such a training must form an integral part of a permanent capacitation and human resources development system of the enterprise.

It is recognized of special importance the institutionalization of research and the technological development with the purpose of introducing new operative procedures to lower services costs, especially for the marginal area users.

(d) Financial and tariff system mechanisms

With the purpose of obtaining the proposed objectives, the following recommendations are formulated:

- Users' increase through a promotion based in the payment of the domiciliary connection in a split-up way.
- Strengthening of the enterprise's economy through the operation and maintenance optimization of the system (pumping, treatment, piping, distribution system, etc.).
- Possibility that the enterprise participates in the national banking market.
- Obtain soft international loans and design adequate policies to renegotiate their present indebtedness.
- Advise the community technically and economically to obtain promotional financing in national banks.
- Improve the commercialization policy (meter reatout, preparation and distribution of invoices, collection system).
- Campaign to recuperate slow payers through condonation laws, payment facilities, etc.
- Promote the creation of taxes or obligations to sumptuary articles to finance basic sanitation and marginal areas works.
- Propitiate the acquisition of imported equipment and materials through exchange of national products.
- Introduction of a tariff system that helps the scarce economical resources sectors and discourages waste.
- Application of a special tariff system that stimulates the installation of new industries.

(e) Problems and hazards

- Economical recession of the Latin American and Caribbean countries, lack of liquidity, the burden of the external debt and the demands of the international organizations, may force governments to delay these kind of projects because they do not consider them prioritary.

- The use of a special tariff to attract new industries would imply the risk that domestic users might subsidize them, as long as an idle capacity is obtained in the system.
- Accept international loans that oblige the institution to buy equipment and materials of very high patterns or bad quality for the type of work foreseen.
- Find the adequate mechanism in order to compatibilize the institutions' interests involved in solving the problems of Marina City.
- That the enterprise does not have an administrative, technical, economical or political capacity to respond to the challenge being created or even having the capacity it does not have the necessary will to solve problems.
- In the introduction of the tariff system the formulated recommendations may be contradictory.
- That the proposals imply important administrative changes, provoking opposition and holding up the desired development.
- That there is no possibility of finishing with the bureaucratic procedures, stopping the achievement of the proposed goals.
- That an adequate financing is not achieved.
- That when not obtaining approval of the tariff levels the creation of the enterprise might be impeded.

#### 11.1.3.5 CONCLUSIONS

##### (a) Technological aspects

- In all supporting processes to marginal areas it is essential to always have a pragmatic approach, that really responds to their necessities, in the appropriate level, and to their socio-economical conditions, without losing sight of the final objectives that are pursued.
- Applied research has to be institutionalized within the responsible basic sanitation entities to obtain the necessary experience to modify conventional technology, including design standards and criteria, thus making technical solutions and costs cheaper but always guaranteeing an adequate quality.
- It is necessary that water and sewerage institutions carry on an effective macro and micromasurement and use other technologies so that they may apply an unaccountable water control policy.

(b) Socio-cultural aspects

- It is recognized that the socio-cultural aspects of communities located in the marginal areas constitute one of the most important factors of the problem for the development of such areas. Therefore, help to the community must contemplate in a first place the educational aspects tending to the consciousness of the problem and training for development.
- To approach the problem of providing service to the marginal urban areas it is necessary to create efficient mechanisms to contact and dialogue with the affected communities and to participate with them in the solution of their problems. This requires to count with a multidisciplinary institutional capacity that may facilitate communication, negotiation and liaison between the community and the traditional technical and administrative levels of the enterprise.

(c) Economic, financial and institutional aspects

- The economic, financial and institutional aspects also constitute the basic elements for the necessary equilibrium most immediate problems solution of the marginal population.
- Need to count with the political decision to solve the life condition problem in the marginal urban areas, defining if inhabitants will be incorporated to the facilities and obligations of the urban population or incentivate their return to the rural or intermediate areas by means of the economical development of the same.
- Revision of the traditional financing systems (IADB, BIRF, etc.) so that loans may be in accordance with the economical viability of our countries.

11.1.3.6 PROPOSED PROJECT SUMMARY

(a) Objetives

- General (intersectorials)
  - . Improve life quality:
    - . Improve economical conditions
    - . Stimulate employment
    - . Increase educational levels
    - . Decrease infants' morbi-mortality
  - . Solve land ownership problem.



- Specifics (S.B. entity)

- . Increase coverage to marginal population
- . Increase enterprise's efficiency
- . Promote and obtain active participation of the community
- . Strengthen sanitary education
- . Create training and employment opportunities for the community related to the project
- . Create financing mechanisms to facilitate users' incorporation.

(b) Technological aspects

Analyzing technological aspects used in Marina City in water and excreta disposal, the following relevant aspect is pointed out:

- Revision and adequacy of criteria and design standards related to the socio-economical and cultural characteristics of the three identified population groups, with special attention to:

- . Domiciliary connections and other alternatives
- . Macro and micromasurement
- . Materials and equipment specifications
- . Individual systems' operation and maintenance viability of excreta disposal
- . Water quality.

(c) Socio-cultural aspects

The human groups located in the urban area, that have been classified as marginal, have generally been developed in a period of various years and because of their origin and other common characteristics they may be classified in three groups.

- . Peasant families who go to the city searching for a job and welfare.
- . Poor families, without resources, as a result of over-population of the quarters of the same city or other ones.
- . Medium-resources families that cannot locate themselves or acquire houses in the urban area and that have integrated to the marginal groups.

After analyzing the characteristics of the groups with their integral problem the following proposals that could approach the solution have been defined:

- Take advantage of the existent communal organization considering:

- . Higher-income groups
- . Medium-income groups, and
- . Lower-income groups

To promote and obtain their motivation towards active participation in the solution of their problems.

- Incentivate communal participation taking advantage of the WFP resources.
- Take advantage of the existent "human resources" (internal and external).
- Encourage and develop working sources.
- Speed-up and simplify bureaucratic transactions.
- Accept non-monetary contributions as payment for the basic sanitation service.
- Encourage and develop working sources

The following aspects have been identified:

- . Basic sanitary training of community manpower
- . Technical training that allows using qualified manpower in the different working areas
- . Propitiate the formation of small contractors within the community directed towards operation and maintenance of the system.

(d) Institutional, economic and financial aspects

- The problem. We assume that the responsible institution for water and sewerage service is of national nature. The Satellite City case was confronted since 1975 through a general council headed by the Chief of State, who compromised to the enormous task of the city's integral urban development. This means that the Water and Sewerage Institute provides total water coverage to the population and an adequate excreta disposal.

The non-fulfillment of the settled goals, due to the critical economic situation that our countries are going through, claims a reopening of the institution and the introduction of a development program considering the following aspects:

- . Political capacity to give the institution and its directors enough power to pose problems and solutions at the highest decisions' level of the country.

- . Technical capacity: the construction, operation and maintenance of such services is suggested looking after the application of adequate and simplified technology and taking the maximum advantage of the national industry, in addition to goods and services exchange with Latin American and Caribbean Region.
  - . Financial capacity: search for self-financing through use of internal sources and from Latin American and Caribbean countries. In the use of internal savings, the construction industry must be demanded for financing of water and excreta disposal infrastructure, both in networks as in production units, and apply a similar behaviour in the establishment of new industries which demand great water volumes in their processes.
  - . Administrative capacity: reduction of general operation and maintenance costs through a permanent personnel training policy and a revision of the bureaucratic processes.
- Organize a multidisciplinary emergency unit directed to attend the problems of marginal settlements and development of human and technological resources

In order to obtain an effective communal participation in providing services for low-income areas according to the expectations and possibilities of the users, their basic duties will be:

- . Dialogue with the community
  - . Promote projects
  - . Act as liaison between the community and the technical and administrative units of the enterprise. While coverage is being enlarged and it reaches an institutional development, this entity will disappear.
- A program directed to all community strata must be implemented, so that they participate in their political, industrial or single user role, for an adequate financing system and a rational water use that allows low-income population to have access to these services.

(e) General conclusions

From the available information it is noticed that present consumption of the Marina City population is 630 l/h/day. If a water consumption rationalization program is introduced trying to reach 300 l/h/day, the following will be obtained:

- Economize the design and construction of new outlet and treatment works, i.e., water production.

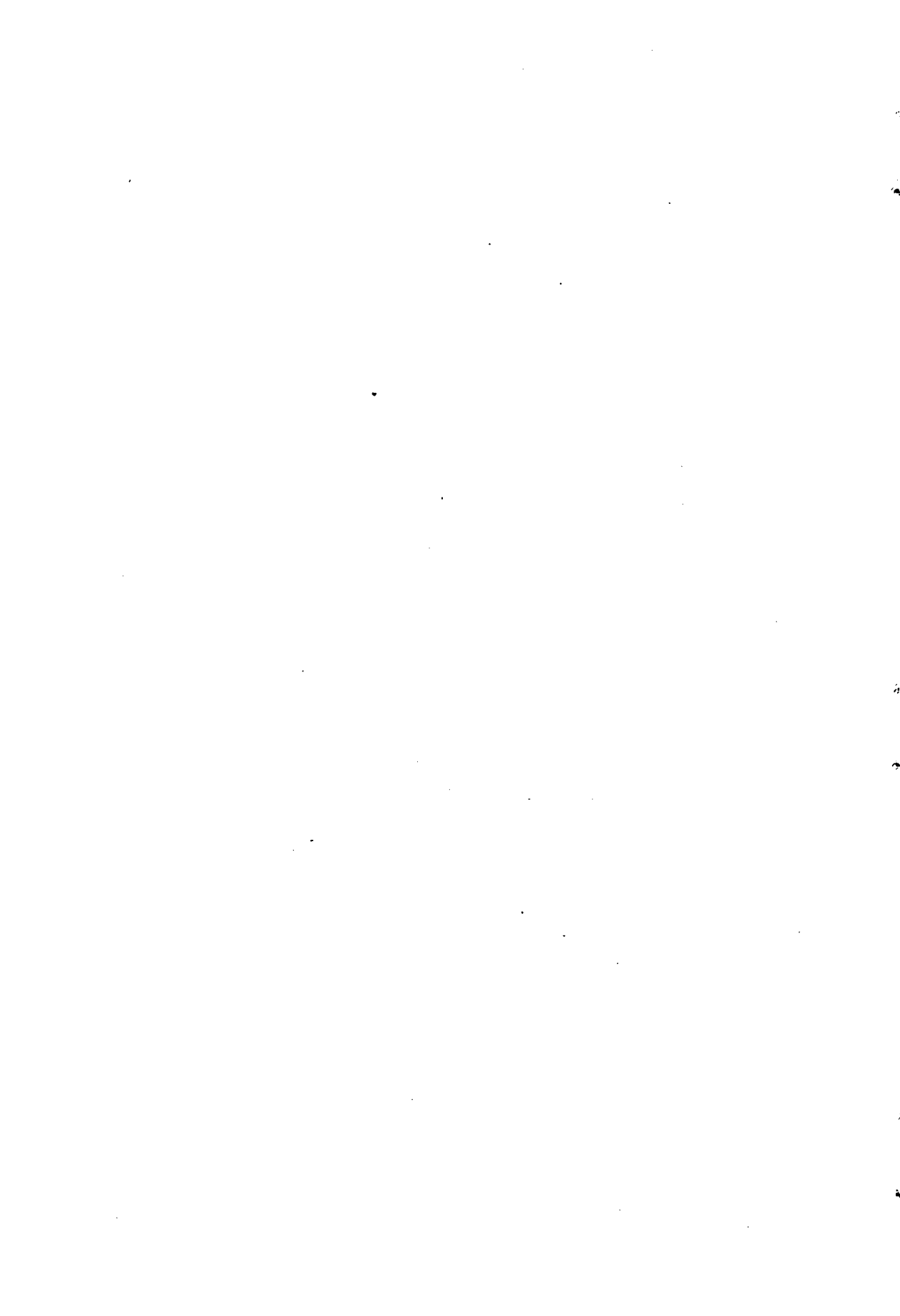
- Reduce operation and maintenance costs either in chemical products, in electrical energy, pumping equipment or personnel.

If this strategy is accepted with the economies obtained, the total extension of water coverage of Satellite City could be totally financed until year 2000 and potentially facilitate the credit for wastewater disposal through individual solutions.

Implantation of this strategy will be noticed in significant changes in the technical, institutional and community participation aspects.

III PART

DOCUMENTS RELATED TO DRINKING WATER SUPPLY  
AND SANITARY DISPOSAL OF EXCRETA IN URBAN  
SLUM AREAS, AVAILABLE THROUGH REPIDISCA



12. DESCRIPTION OF FORMAT USED

The present bibliography is made up by documents entered to REPIDISCA's bibliographic data base until 28 February 1986. Therefore, it represents a list elaborated with CEPIS contribution and that of the Cooperating Centers which form part of the REPIDISCA.

Each bibliographic reference include a first descriptive part of the document: author, city of the publicatin, editorial, year, number of pages, source where information was obtained, series data, etc. The document summary is presented afterwards with the purpose of explaining the contents of same and facilitating the decision to obtain the document. Immediately after, descriptors which identify the matters dealt with in the document, and the acronym of the Cooperating Center which has the information are indicated.

For further clarification, an example of the format used is indicated below, identifying each one of its parts:

INPUT EXAMPLE

1	2122	Escobar Cifuentes, E., Sandoval Lozano, R.	2
		Colombia. Ministerio de Salud (Bogotá, CO).	3
		Dirección de Saneamiento Ambiental.	
4		Diagnóstico, objetivos y políticas. Bogotá,	5
		Ministerio de Salud, 1982. 182 p. maps, tables,	6
		charts. 5 refs. (Serie Salud Colombiana, 6). Spanish.	9
7			8

10 Summarizes the existing situation in the country in the main environmental sanitation areas, taking as a basis the studies presented by the Health and National Planning Ministry in agreement with the environmental sanitation direction. Describes guidelines for the actions' development to provide adequate attention to the environment, it may be in basic sanitation, environmental conservation, food and zoonoses and special areas of environmental sanitation. Considers objectives both of the Environmental Sanitation Direction and the aqueducts and sewerage subsector. Includes general political guidelines with criteria on water supply, wastes disposal, environmental pollution and food production, among others.

11 Environmental sanitation / Sanitation / Colombia CEPIS \_\_\_\_ 12

- 1. Input correlative number
- 2. Personal author
- 3. Institutional author
- 4. Title
- 5. Footnote: place of edition, publishing house, publication year
- 6. Number of pages and general notes
- 7. Bibliographic references
- 8. Series
- 9. Language of text
- 10. Summary
- 11. Geographic descriptors and identifiers
- 12. Centre which prepared the input



13. DOCUMENTS REQUEST

If a copy is required of any of the documents included in item 14, it must be requested to the institution which provided the information (the acronym is in the lower right side of the quotation), indicating the identification number and document title. The average price is equivalent to US\$0.10 per page for foreign countries, and for Peru the price reduces considerably.

If the document is in CEPIS library, the "Microfiche document delivery service" may be requested at a cost of US\$1.00 per document up to 96 pages; US\$2.00 up to 192, and so on.

Institutions' acronyms which are at the end of each reference are indicated below in detail.

CARIS                      Centro Argentino de Referencia en Ingenieria Sanitaria y Ciencias del Ambiente - Instituto Nacional de Ciencia y Tecnicas Hidricas

Viamonte 542 - 1053, Capital Federal  
1802 Casilla de Correo 7, Aeropuerto Ezeiza  
Buenos Aires, Argentina

CIIMS                      Centro de Documentação, Secretaria Geral, Ministério da Saude

Esplanada dos Ministerios - B.G. terreo  
70.058 Brasilia, D.F.  
Brasilia, D.F., Brazil

CETESB                      Companhia de Tecnologia de Saneamento Ambiental, Diretoria Administrativa, Assessoria de Informatica

Rua Frederico Hermann, Jr., 345  
Sao Paulo, SP, Brazil

CIRISCA                      Centro de Informacion y Referencia en Ingenieria Sanitaria y Ciencias del Ambiente, Universidad de Chile

Blanco Encalada 2120, Piso 4  
Santiago, Chile

FEEMA                      Fundação Estadual de Engenharia do Meio Ambiente, Departamento de Apoio Técnico e Científico, Divisao de Planejamento

Rua Fonseca Telles 121, 16 andar, Sala 1501  
Rio de Janeiro, Brazil

ITCR Instituto Tecnológico de Costa Rica, Centro de Informa-  
cion Tecnologica

Apartado 159 - 7050  
Cartago, Costa Rica

ISAM Instituto de Saneamento Ambiental, Universidade Catolica  
do Parana

Rua Imaculada Conceição, 1155  
Prado Velho, Curitiba, PR, Brazil

SABESP Companhia de Saneamento Básico do Estado de Sao Paulo,  
Diretoria de Planejamento

Rua Padre Joao Manoel, 755 8° andar  
01.411 Sao Paulo, Brazil

SARH-DGUAPAC Secretaria de Agricultura y Recursos Humanos, Direccion  
General de Usos del Agua y Prevencion de la Contamina-  
cion, Subdireccion de Investigacion y Entrenamiento

Av. San Bernabe 549 - Col. San Jeronimo Lidice  
Mexico, D.F., Mexico

SEDAPAR Servicio de Abastecimiento de Agua Potable y Alcantari-  
llado de Arequipa

San Jeronimo 515-A, Umacollo  
Arequipa, Peru

USACH Universidad de Santiago de Chile

Av. Ecuador 3469  
Santiago de Chile

14. REFERENCES AND SUMMARY OF 119 DOCUMENTS

- 14.1 00048 FUNDAÇÃO ESTADUAL DE ENGENHARIA DO MEIO AMBIENTE (RIO DE  
JANEIRO, BR). FINANCIADORA DE ESTUDOS E PROJETOS (RIO  
DE JANEIRO, BR).

RELATORIO DE ACTIVIDADES DO PROJETO DE ECODESENVOLVIMENTO. RIO DE JANEIRO (BR), DICOMI, 1980. V. REFS. (FEEMA CADERNOS, SERIE RELATORIOS TECNICOS, 3, PORTUGUESE.

This work is part of the general report of the ecodevelopment project which is being carried-out at present by FEEMA, with the financial support of FINEP (Studies and Projects Financier). One of its objectives is to develop appropriate technologies for the environmental improvement in marginal and peripheral quarters, considering the participation of these areas' population.

/ URBAN SANITATION / SPONTANEOUS SETTLEMENTS / ECODEVELOPMENT / APPROPRIATE TECHNOLOGY / BRAZIL (RIO DE JANEIRO) /

FEEMA

14.2 00010 WIJK-SIJBESMA, C. VAN. INTERNATIONAL REFERENCE CENTRE FOR COMMUNITY WATER SUPPLY (THE HAGUE, NL).

PARTICIPATION AND EDUCATION IN COMMUNITY WATER SUPPLY AND SANITATION PROGRAMMES A SELECTED AND ANNOTATED BIBLIOGRAPHY. THE HAGUE (NL), IRC, 1979. 238 P. REFS. (BULLETIN SERIES, 13). ENGLISH.

Bibliography containing 145 references on education and community participation on sanitation and water supply programs. Resumés are in alphabetical order, according to the author's name. Three indexes are provided, one with the authors' name, another according to distributors, and the last one according to countries.

/ BIBLIOGRAPHY / RURAL WATER SUPPLY / SANITARY EDUCATION / COMMUNAL PARTICIPATION / RURAL HEALTH /

CEPIS

14.3 00049 GACHUBIA, E.

WOMEN'S SELF-HELP EFFORTS FOR WATER SUPPLY IN KENYA THE IMPORTANT ROLE OF NGO SUPPORT. IN ASSIGNMENT CHILDREN. GENEVA (ZH), 45/46, 1979. 167-174. ISSN 0004-5128. ENGLISH.

Kenya is one of the few countries in the world where women have so intensively worked to improve their life conditions. Traditional mutual help has conducted there to the creation of 5,000 women's associations. One of the initial objectives of these associations was the distribution of resources to purchase corrugated aluminum for each members' roof, eliminating the burden of repeatedly roofing with straw. It is now being projected the purchase of tanks for the collection of rainwater and for other activities related with health, nutrition, income, etc. These self-help efforts were brought up during the Woman's International Year. At the same time it was revealed through surveys and regional seminars that water was a priority concern for women. An NGO decision and UNICEF created the water program for health, in view of the initiatives taken by the women of the locality to face this need.

/ RURAL WATER SUPPLY / KENYA /

CEPIS

14.4 00054 JACKSON, T.  
RURAL SANITATION TECHNOLOGY LESSON FROM PARTICIPATORY  
RESEARCH. IN ASSIGNMENT CHILDREN. GENEVA (ZH), 45/46, 1979. 51-74.  
ISSN 0004-5128. ENGLISH.

The participating research is a social research method, an education process, and a way of taking actions that involve all the community, including those with less power and the poor ones. Water supply and sanitation technology has been controlled for a long time essentially by engineers and, as in other development sectors, imported models have prevailed. People involved has had very little to say where technical decisions have been considered beyond their understanding. This document discusses the participating research and the implications of the community participation in the development. On the basis of surveys of present experiences, the possible consequences of this approach to water and sanitation programs are analyzed. They could be justified in a new distribution of the knowledge and local production of appropriate technology through communal dialogue.

/ RURAL SANITATION / COMMUNAL PARTICIPATION / TECHNOLOGICAL ALTERNATIVES /  
CEPIS

14.5 00055 MEXICO. SECRETARIA DE SALUBRIDAD Y ASISTENCIA (MEXICO,  
MX) DIRECCION DE INGENIERIA SANITARIA Y SANEAMIENTO DEL  
SUELO.  
MANUAL DE SANEAMIENTO, VIVIENDA, AGUA Y DESECHOS. MEXI-  
CO (MX), LIMUSA, 1980. S.P. ILLUS. ISBN 9-6818-0020-6. SPANISH.

This publication is guided towards interested technicians and institutions in the execution or dissemination of works tending to improve life conditions of the rural environment. The purpose of the three chapters included in this book relate to water, housing and wastes, is to provide in a simple way the necessary knowledge for construction and installation to modify the environment hostile to sanitary purposes.

/ HOUSING SANITATION / RURAL SANITATION / BASIC SANITATION /

SEDAPAR

14.6 00080 ALVARADO ACEVEDO, A.  
TECNOLOGIA APROPIADA Y DESARROLLO. IN QUIRAMA. MEDELLIN  
(CO), 5(1), 1980. 45-61. ISSN 0120-2588. SPANISH.

It is referred to appropriate technology and intermediate technology concepts, examining them from a more ample context of ecodevelopment and differs them from soft technology.

/ APPROPRIATE TECHNOLOGY / ECONOMICAL DEVELOPMENT /

CEPIS

14.7 00090 HERRERA, H.O.  
DESARROLLO, MEDIO AMBIENTE Y GENERACION DE TECNOLOGIAS  
APROPIADAS. IN SUNKEL, O. / GLIGO, N. ESTILOS DE DESARROLLO Y MEDIO  
AMBIENTE EN LA AMERICA LATINA. MEXICO (MX), FONDO DE CULTURA ECONOMICA,  
1981. 558-589. ILLUS. (LECTURES, 36). SPANISH.

It refers to the determinant role of technology and its transference, and to generation of appropriate technologies, according to the type of society in which they are inserted. A methodology with its diverse stages and strategies is proposed, with the purpose of generating technologies harmonizing with the environment and for its development. The technological effects are studied on the environment, at a long-term regional level and at a short-term local level.

/ APPROPRIATE TECHNOLOGY / DEVELOPING COUNTRY / LATIN AMERICA /

SEDAPAR

14.8 0098 VOLUNTEERS IN TECHNICAL ASSISTANCE (MOUNT RAINIER, US).  
MANUAL DE TECNOLOGIA PARA LA COMUNIDAD. MEXICO (MX),  
VITA, 1972. ILLUS. SPANISH.

The manual describes techniques and layouts that can be made and used in the villages. New knowledges that have already been treated are transmitted and new ideas are encouraged. It is about hydraulic resources, health and sanitation, agriculture, food preparation and conservation, construction, home improvement, handicraft, rural industry, and communications.

/ APPROPRIATE TECHNOLOGY / BASIC SANITATION / DEVELOPING COUNTRY /

CEPIS

14.9 00416 KARLBERMATTEN, J.M., JULIUS, D.S., GUNNERSON, C.G. IBRD  
(WASHINGTON, D.C., US).  
SUMMARY OF TECHNICAL AND ECONOMIC OPTIONS. WASHINGTON,  
D.C. (US), THE WORLD BANK, 1980. 36 P. (APPROPRIATE TECHNOLOGY FOR WATER  
SUPPLY AND SANITATION, IA). ENGLISH.

The document is a summary of the final document on appropriate technology for water supply and excreta disposal in developing countries. It informs about the results of the research referred to the programs' planning, in order to implement these results. One of the most important technical contributions of this research is the design of sanitary sequences, gradual improvements that conduct from one option to the other, and are designed from its initiation to minimize long-term costs.

/ RURAL WATER SUPPLY / BASIC SANITATION / APPROPRIATE TECHNOLOGY / RURAL  
SANITATION / TECHNOLOGICAL ALTERNATIVES /

CEPIS

14.10 00417 KUHLTAN, R.H. IBRD (WASHINGTON, D.C., US).  
COUNTRY STUDIES IN APPROPRIATE SANITATION ALTERNATIVES.  
IN IBRD WASHINGTON, D.C., US). APPROPRIATE TECHNOLOGIES FOR WATER SUPPLY  
AND SANITATION IN DEVELOPING COUNTRIES V.6. WASHINGTON, D.C. (US), THE  
WORLD BANK, 1980. 176 P. (P.U. REPORT, RES 2). ENGLISH.

Study of 34 cases carried-out in 11 countries during 1977 and 1978.  
Countries and communities were selected in order to obtain a diverse sam-  
ple of existent technologies that operate under a variety of physical and  
economical conditions. The report collects many data at a micro level on  
field experiences, using low-cost technologies.

/ APPROPRIATE TECHNOLOGY / BASIC SANITATION / DEVELOPING COUNTRIES /  
CEPIS

14.11 00425 SERVICIO NACIONAL DE AGUA POTABLE (BUENOS AIRES, AR).  
CONTENIDOS EDUCATIVO-SANITARIOS APLICABLES EN LA ETAPA  
DE FUNCIONAMIENTO DEL SISTEMA DE ABASTECIMIENTO DE AGUA POTABLE RURAL.  
BUENOS AIRES (AR), SERVICIO NACIONAL DE AGUA POTABLE, 1971. 67 P.  
ILLUS. SPANISH. WORK INCLUDED IN THE DRINKING WATER NATIONAL PLAN.

It gathers basic concepts that the promoter must handle to face sanitary  
education in the second stage of the promotion process, when the communi-  
ty already has drinking water at home, and after the system is under op-  
eration. These concepts are referred to the optimum drinking water use,  
personal and domestic hygienic habits, sanitary installations for waste-  
water and excreta. It includes fluoride and the prevention of dental  
caries as an annex.

/ SANITARY EDUCATION / RURAL SANITATION / RURAL WATER SUPPLY / ARGENTINA/  
CARIS

14.12 00427 SERVICIO NACIONAL DE AGUA POTABLE (BUENOS AIRES, AR).  
MANUAL DEL PROMOTOR. BUENOS AIRES (AR), SERVICIO NACIO-  
NAL DE AGUA POTABLE, 1973. 495 P. 38 GRAPHS. SPANISH.

Publication designed to promoters of the Drinking Water National Plan in  
Argentina, professional or not, with the purpose of making available the  
indispensable concepts of the social techniques. It comprises the study,  
motivation, and organization of the community for such plan. Further-  
more, and because of the nature of the task, general considerations are  
given on the national plan, sanitary engineering motions, sanitary medi-  
cine, administration and accounting. All this information has a pedagog-  
ic criteria and is understood at any level, with abundant practical exam-  
ples.

/ RURAL WATER SUPPLY / COMMUNAL PROMOTION / ARGENTINA /

CARIS

14.13 00598 KALBERMATEN, J.M., JULIUS, D.S.  
INTERMEDIATE SERVICE LEVELS IN SANITATION SYSTEMS.  
SPRINGFIELD (US), NTIS, 1978., P. 110-133. 3 REFS. ENGLISH. WORKSHOP  
ON APPROPRIATE TECHNOLOGY IN WATER SUPPLY AND WASTE DISPOSAL. CHICAGO  
(US) 16-20 OCT. 1978.

The main alternatives on excreta disposal are described and its potential applications are explored in developing countries. Conventional engineering practices have conducted to the selection of inappropriate technologies. A comparison of costs is made of the alternatives presented and recommendations are given to improve the sanitary plan.

/ EXCRETA DISPOSAL / DEVELOPING COUNTRY / RURAL ZONE /

CEPIS

14.14 00601 WINBLAD, U., KILAMA, K.L.  
LETRINA DE VIETNAM. IN WINBLAD, U. SANITATION WITHOUT  
WATER. S.L. S.N. S.D. ILLUS. SPANISH.

It is referred to double valve latrine. Its operation, its advantages, the anaerobic process of the excretas, the design and construction, maintenance, operation and appropriate disposal of the contents, are explained

/ LATRINES / RURAL ZONE / VIETNAM, REPUBLIC OF /

CEPIS

14.15 00723 ETHERTON, D. UNICEF (NEW YORK, US).  
WATER AND SANITATION IN SLUMS AND SHANTY TOWNS. A RE-  
VIEW OF CONDITIONS AND OPTIONS FOR IMPROVEMENTS. NEW YORK (US), UNICEF,  
1980. 122. P. ILLUS., TABLES, CHARTS. ENGLISH.

Overall view of the sanitation problem in developing countries' marginal areas. A brief introduction is made to the urbanization phenomenon, critical areas growth, and conditions and hazards to which they are exposed due to lack of water supply and basic sanitation. It is referred to programs of water planning and to the Water and Sanitation International Decade. It describes the role that sanitary education has in the community, due to the resistance that certain social groups offer to the change in conduct. Technical options are presented for water supply and distribution, as well as for collection, storage and treatment. It also refers to the diverse ways that are used for excreta and solid wastes disposal.

/ RURAL SANITATION / RURAL WATER SUPPLY / SLUMS / DEVELOPING COUNTRY /

CEPIS

14.16 00773 WHITE, G.F., WHITE, A.U.  
BEHAVIORAL FACTORS IN SELECTION OF TECHNOLOGIES.  
SPRINGFIELD (US), NTIS, 1978. P. 26-46. 10 REFS. ENGLISH. WORKSHOP ON

APPROPRIATE TECHNOLOGY IN WATER SUPPLY AND WASTE DISPOSAL. CHICAGO (US)  
16-20 OCT. 1978.

Behavioral factors, such as modification and preference, may be critical in the success of drinking water and sanitation projects and in its effects on public health. Once the services have been installed, users have the option of adopting the new service without significantly changing their conduct standards, change their habits towards the services, do not use adequately the installation, or refuse completely its use. If it is assumed that the behavioral factor should be taken into consideration from the initiation of the project, the community participation is indispensable. Local people may have a significative role in decision making, especially in the decision of requesting help according to priorities, in technologies' selection within money and manpower limits, in the selection of price policies adapted to its necessities, in the incorporation of local action modalities in the administration and information transfer policy, and in the monitoring methods.

/ APPROPRIATE TECHNOLOGY / COMMUNAL PARTICIPATION / TECHNOLOGY IMPORT /  
CEPIS

14.17 01087 KANDAWIRE, J.A.K.  
SOCIOLOGICAL APPROACH TO WATER DEVELOPMENT. OTTAWA  
(CA), IDRC, 1980. P. 69-74. 9 REFS. (IDRC, 1978). ENGLISH. WORKSHOP  
ON TRAINING IN RURAL WATER SUPPLY IN DEVELOPING COUNTRIES. ZOMBA (MW)  
5-12 AUG. 1980.

The purpose of the document is to explain the relation that there must be between the social worker who trains people on communal development and the methods that must be used to obtain the maximum cooperation by the community. It is suggested that, besides comprising cultural aspects as conservative conducts, it must be tried to understand the group divisions in the community because the communal organization problems frequently derive from these divisions before cultural differences. The social structures must also be tried to be defined because leaders are identified through them.

/ RURAL WATER SUPPLY / SOCIAL ASPECTS /

CEPIS

14.18 01283 OXFAM (OXFORD, GB).  
UNIDAD DE SERVICIOS SANITARIOS OXFAM. OXFORD (GB), OX-  
FAM, S.D. 10 P. ILLUS. SPANISH.

OXFAM's sanitary services unit has been developed to provide a totally autonomous system combined with sanitary services and wastewaters, formed by four sections: latrine zone, wastewater treatment tanks, percolation filters and packing and division box. In emergency situations, the unit must be installed in one day by four semi-specialized persons; it is installed on the floor in a reasonably leveled floor, it operates by gravity circulation and therefore it does not need an energy source to pump



wastewaters nor employ any treatment or chemical spraying method and it is possible to empty out, dismantle and move the unit without difficulty to store it again for its future use. The booklet presents a description of the unit, land preparation, description of assembling phases and import installation details.

/ EXCRETA DISPOSAL / LATRINES / DISASTERS SANITATION / RURAL ZONE /

CEPIS

14.19 01285 SIMBEYE, E.K.

ON-SITE EXCRETA DISPOSAL TECHNOLOGIES. OTTAWA (CA), IDRC, 1981. P. 27-33. (IDRC, 168E). ENGLISH. WORKSHOP ON TRAINING IN SANITATION IN DEVELOPING COUNTRIES. LABATSE (BW) 14-20 AUG. 1980.

Describes different types of latrines, emphasizing its design and operation characteristics. It refers to compost latrines introduction in Tanzania.

/ EXCRETA DISPOSAL / LATRINES / TANZANIA /

CEPIS

14.20 01772 VIVAS, G.

PARTICIPACION DE LAS COMUNIDADES EN LA OBTENCION DE LOS SERVICIOS DE AGUA Y DESAGUE. IN ACODAL. BOGOTA (CO), 23(92), FEB. 1980. 29-39. ISSN 0120-0798. SPANISH.

It analyzes the experiences obtained in the metropolitan area where the Acqueduct and Sewerage Co. of Bogota operates, in relation with the communities' participation to obtain them. It mentions the urbanization phenomenon, considering the factors that cause it, the demographic explosion and the urban-rural migration, the process of obtaining water and sewerage services in the spontaneous settlements, and community organization and participation in obtaining the services.

/ COMMUNAL PARTICIPATION / RURAL WATER SUPPLY / SPONTANEOUS SETTLEMENTS / METROPOLITAN ZONES / COLOMBIA (BOGOTA) /

CEPIS

14.21 01819 FLORES SILVA, S. UNIVERSIDAD TECNICA DEL ESTADO (SANTIAGO, CL). FACULTAD DE INGENIERIA.

ESTUDIO ECONOMICO DE INSTALACIONES DE ALCANTARILLADO DOMICILIARIO A FOZA Y POZO. SANTIAGO (CL), UNIVERSIDAD TECNICA DEL ESTADO, 1978. S.P. PLANS, DRAWING, ILLUS., TABLES. SPANISH. THESIS (SANITARY INSTALLATIONS TECHNICIAN).

One of the problems that the sanitary technician must confront, is the development of a project and at the same time an installation where the public sewerage network does not exist. This work refers to the private sewerage system, specifically septic tank and absorbing well and, when

it is required, ditch and drainage system. An analysis is made of the different systems, to fix a viewpoint to select one of them, in the case it has to be applied to a sector where there is no public collector.

/ SEWERAGE / DOMICILIARY INSTALLATIONS / SEPTIC TANKS / DRAINAGES / RURAL ZONE /

USACH

14.22 02204 ALVAREZ VIGIL, J.

PRINCIPALES PROBLEMAS QUE LIMITAN LA PARTICIPACION COMUNITARIA EN LOS PROYECTOS DE ABASTECIMIENTO DE AGUA Y SANEAMIENTO. WASHINGTON, D.C. (US), PAHO, 1982. P. 1-21. 5 REFS. SPANISH. SIMPOSIO REGIONAL SOBRE RECURSOS HUMANOS PARA EL DECENIO INTERNACIONAL DEL ABASTECIMIENTO DE AGUA POTABLE Y DEL SANEAMIENTO. PANAMA (PA) 26-30 JULY 1982.

Deals with obstacles which impede obtaining active communitary participation in the water supply and sanitation projects. It mainly refers to fundamental factors or others such as users' separation from the programming, insufficient socio-cultural information, in coordination between services, agents training and others. Among extra institutional limits, population dispersion is considered, illiteracy and language barriers. It shows action strategies to solve such problems.

/ COMMUNAL PARTICIPATION / RURAL WATER SUPPLY / RURAL SANITATION / INTERNATIONAL WATER AND SANITATION DECADE

CEPIS

14.23 02232 MCGARRY, M.G.

APPROPRIATE TECHNOLOGY IN CIVIL ENGINEERING. IN GUNNERSON, C.G. ENVIRONMENTAL IMPACTS OF INTERNACIONAL CIVIL ENGINEERING PROJECT AND PRACTICES. P. 202-231. 13 REFS. ENGLISH.

Describes which are the real concepts and objectives of the appropriate technology term, indicating the relation between developing countries and industrialized countries. Appropriate technology is considered not only as a system in which the physical technical aspects are included, but a process in which cultural, social and economical factors intervene. One of the main objectives is the more equitable distribution of wealth. Three items are described: biogas plant, hydraulic water supply and urban sewerage.

/ APPROPRIATE TECHNOLOGY / CIVIL ENGINEERING /

CEPIS

14.24 02902 MITCHELL, R.J. CANADIAN HUNGER FOUNDATION (OTTAWA, CA).

EXPERIENCES IN APPROPRIATE TECHNOLOGY. OTTAWA (CA), THE CANADIAN HUNGER FOUNDATION, 1980. 149 P. ILLUS. ENGLISH.

Case studies on appropriate technology which include not only technique, products and tools, but also knowledge, handling and work organization in

a more appropriate way. It also refers to industrialization methods, the required balance between production at a clear and small range and its introduction in a determinant social context, technological alternatives are set up which will stimulate the development in the countries and indicates who will be the ones who select options.

/ APPROPRIATE TECHNOLOGY /

CEPIS

14.25 02907 SHAHALAM, A.B.M. BOGAZICI UNIVERSITY (ISTANBUL, TR).  
INSTITUTE OF ENVIRONMENTAL SCIENCES.

OPTIMAL APPROACH FOR THE SELECTION OF APPROPRIATE SANITATION TECHNOLOGY FOR DEVELOPING COUNTRIES. IN CURI, K., KOCASOY, G., SEBUKTEKIN, U., TEKELI, S. ENVIRONMENTAL TECHNOLOGY FOR DEVELOPING COUNTRIES PREPRINTS V. 4. ISTANBUL (TR), BOGAZICI UNIVERSITY, 1982. P. 1-12. 8 REFS. ENGLISH.

Describes an environmental sanitation model assigned to achieve modern sanitation services which are less expensive, more hygienic, structurally permanent and aesthetically acceptable, which moreover have the maximum comfort in its employment, with a lesser negative effect on the environment. It presents methodology, its use advantages, feasible alternative technologies, search of an optimum technology and discussion.

/ ENVIRONMENTAL QUALITY / APPROPRIATE TECHNOLOGY / DEVELOPING COUNTRY /

CEPIS

14.26 03196 PRIETO, J. EMPRESA DE SANEAMIENTO DE LIMA (LIMA, PE).  
ETAPA DE TRANSICION EN ABASTECIMIENTO DE AGUA A AREAS URBANAS MARGINADAS. LIMA (PE), CEPIS, 1981. P. 1-4. SPANISH. TALLER REGIONAL SOBRE ABASTECIMIENTO DE AGUA A LAS AREAS URBANAS MARGINADAS. LIMA (PE) 19-23 OCT. 1981.

Demonstrates his experience in the sanitation utility of Lima, contemplating the execution program of works for a whole water and sewerage supply in precarious settlements. It mentions the emergency plan carried-out by the company and it refers to the manner in which water is carried to such settlements, as well as fountain system and spouts for water trucks. Other intermediate alternatives are proposed.

/ RURAL WATER SUPPLY / PRECARIOUS SETTLEMENTS / PERU (LIMA) /

CEPIS

14.27 03197 SAENZ FORERO, R. CEPIS (LIMA, PE). PROYECTO DE DESARROLLO TECNOLÓGICO DE LAS INSTITUCIONES DE ABASTECIMIENTO DE AGUA POTABLE Y ALCANTARILLADO.

ABASTECIMIENTO DE AGUA A LAS AREAS URBANAS MARGINADAS. LIMA (PE), CEPIS, 1981. P. 1-8. SPANISH. TALLER REGIONAL SOBRE ABASTECIMIENTO DE AGUA A LAS AREAS URBANAS MARGINADAS. LIMA (PE) 19-23 NOV. 1981.

It is about precarious settlements, and considers transition stages by which they go through during their existence. It revises the organization systems of a drinking water supply utility. Comments the marginal phenomenon. It includes a table which indicates the Latin American and Caribbean populations with and without piped water. Engineering aspects are emphasized suggesting technical solutions applicable in the transition stage.

/ RURAL WATER SUPPLY / PRECARIOUS SETTLEMENTS /

CEPIS

14.28 03198 SHLUGER, E. CEPIS (LIMA, PE). PROYECTO DE DESARROLLO TECNOLÓGICO DE LAS INSTITUCIONES DE ABASTECIMIENTO DE AGUA POTABLE Y ALCANTARILLADO.

SANEAMIENTO BÁSICO PARA AS FAVELAS PROJETO DA RUA 3 - ROCINHA. LIMA(PE), CEPIS, 1981. P. 1-23. PORTUGUESE. TALLER REGIONAL SOBRE ABASTECIMIENTO DE AGUA A LAS ÁREAS URBANAS MARGINADAS. LIMA (PE) 19-23 OCT. 1981.

Informs about the basic sanitation project in the sector called Street 3 of Rocinha-carried out by the Social Development Municipal Bureau with the United Nations Infants Fund support. It elaborates a diagnosis of the physical-environmental conditions of Rocinha's precarious settlement. It mentioned the benefits derived from project Street 3. The basic sanitation principle is evaluated from a sanitary point of view and its consequent action on public health. It analyzes the method and the project, including organization, implementation, social benefits and cost. Maps of Street 3 are included.

/ RURAL WATER SUPPLY / PRECARIOUS SETTLEMENTS / BRAZIL /

CEPIS

14.29 03352 FEACHEM, R.G., CAIRNCROSS, S. LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE (LONDON, GB). ROSS INSTITUTE OF TROPICAL HYGIENE.

SMALL EXCRETA DISPOSAL SYSTEMS. LONDON (GB), THE ROSS INSTITUTE, 1978. 53 P. ILLUS. (ROSS BULLETIN, 8). ENGLISH.

Available diverse technologies are explained for excreta disposal in small communities, describing each system in simple terms, indicating their medical and social perspectives referring to excreta collection, transport, treatment, disposal and reuse, latrine design and construction and factors such as location and superstructure, insect, odor, and maintenance control.

/ EXCRETA DISPOSAL /

CEPIS

14.30 03355 SAUBOLLE, B.R.  
WOMEN'S TOILET, NEPAL. IN CANADIAN HUNGER FOUNDATION  
(OTTAWA, CA). EXPERIENCES IN APPROPRIATE TECHNOLOGY. OTTAWA (CA), CA-  
NADIAN HUNGER FOUNDATION, 1980. P. 9-10. 4 REFS. ENGLISH.

Description of a project for the construction of a woman bathroom in Ne-  
pal. It refers to removal and cleansing of the place, installation of  
latrines and bathrooms, considering the local reality. Human wastes use,  
biogas production and domestic stove's fuel are mentioned.

/ EXCRETA DISPOSAL / APPROPRIATE TECHNOLOGY / NEPAL /

CEPIS

14.31 03356 TONWLEY, G.  
COST-EFFECTIVENESS OF THE SOCIO-CULTURAL AND HEALTH BEN-  
EFITS OF SEWERLESS ALTERNATIVES FOR DOMESTIC WASTE DISPOSAL IN DEVELOPING  
COUNTRIES. IN APPROPRIATE METHODS OF TREATING WATER AND WASTEWATER IN  
DEVELOPING COUNTRIES. OKLAHOMA (US), UNIVERSITY OF OKLAHOMA, S.D. CAP.  
9, P. 521-619. ILLUS., TABLES. ENGLISH.

About treatment systems and wastewater disposal without sewerage and the  
determinant role that the economical factor has in its use, availability  
and development. It exposes the historical development of wastewater and  
its treatment, treatment of conventional systems, treatment systems of  
present sewerage, comparisons, costs, analysis and alternatives such as  
septic tanks, compost latrines, biological latrines, vacuum and aerobic  
tanks.

/ EXCRETA DISPOSAL / WASTEWATER DISPOSAL / SOCIAL ASPECTS / SOCIO-ECO-  
NOMICAL ASPECTS / DEVELOPING COUNTRY / COST-BENEFIT ANALYSIS /

CEPIS

14.32 04090 MORGAN, P.R., MARA, D.D. IBRD (WASHINGTON, D.C., US).  
VENTILATED IMPROVED PIT-LATRINES RECENT DEVELOPMENT IN  
ZIMBABWE. WASHINGTON, D.C. (US), WORLD BANK, 1982. 48 P. ILLUS., TA-  
BLES, 15 REFS. (WORLD BANK TECHNICAL PAPER, 3). ISBN 0-8213-0078-4.  
ENGLISH.

Describes pit privies, advantages and disadvantages of its employment,  
achievements and improvements obtained in Zimbabwe (Africa). Two basic  
designs are presented, one adaptable to peripheral areas and the other  
one an economical version of the first one for rural areas. It indicates  
the total cost including manpower and materials and design for commercial  
use, social acceptability in Zimbabwe. Effectiveness to eliminate odors  
and insects' control.

/ LATRINES / ZIMBABWE /

CEPIS

14.33 04099 STONER, C.H.  
GOODBYE TO THE FLUSH TOILET WATER SAVING ALTERNATIVES TO  
CESSPOOLS, SEPTIC TANKS, AND SEWERS. EMMAUS (US), RODALE PRESS, 1977.  
285 P. 7 REFS. ISBN 0-8785-7192-2. ENGLISH.

About new alternatives to save water, employing cesspools, toilets that do not use water and septic tanks. Offers compost principles, compost latrines, commercial and self-built baths, possibilities to solve pollution problems caused by these systems.

/ EXCRETA DISPOSAL / COMPOST / LATRINES / TOILETS / TECHNOLOGICAL ALTERNATIVES /

CEPIS

14.34 04670 AGENCY FOR INTERNATIONAL DEVELOPMENT (WASHINGTON, D.C., US).

COMMUNITY PARTICIPATION IN PLANNING WATER SUPPLY AND SANITATION PROGRAMS. WASHINGTON, D.C. (US), AID, 1982. 6 P. (WATER FOR THE WORLD TECHNICAL NOTE, HR.2.P). ENGLISH.

Indicates the importance and the necessary guidelines to obtain community participation in a water supply and sewerage system. Joint actions of the active agency in charge and of the community, educational campaigns, systems' development using existent resources in the location and possibility of rural operation and maintenance without foreign intervention, financial arrangements, work programs, legal explanations and appropriate technology selection.

/ COMMUNAL PARTICIPATION / RURAL WATER SUPPLY / PLANNING /

CEPIS

14.35 04678 INTERNATIONAL REFERENCE CENTRE FOR COMMUNITY WATER SUPPLY AND SANITATION (THE HAGUE, NL).

PRACTICAL SOLUTIONS IN DRINKING WATER SUPPLY AND WASTES DISPOSAL FOR DEVELOPING COUNTRIES. 2. ED. THE HAGUE (NL), IRCWSS, 1982. 119 P. ILLUS., 126 REFS. (IRC TECHNICAL PAPER SERIES, 20). ENGLISH.

Offers simple techniques and alternatives that demand little maintenance and may be administered at community level. These techniques are referred to location of water sources and their recovery, water treatment, transport and water distribution and wastes disposal and were developed on a socio-economical-cultural basis of the environment to facilitate solutions and methods adaptation.

/ WATER SUPPLY / WASTEWATER DISPOSAL / TECHNOLOGICAL ALTERNATIVES / APPROPRIATE TECHNOLOGY / DEVELOPING COUNTRY /

CEPIS

14.36 04814 BURBANO M., F.A. CONVENIO COLOMBO-HOLANDES DE SALUD (BOGOTA, CO).  
PROGRAMA DE DISPOSICION DE EXCRETAS. BOGOTA (CO), CONVENIO COLOMBO-HOLANDES DE SALUD, 1982. 29 P. ILLUS., TABLES. SPANISH.

Distinguishes objectives and methodology to be developed in the wastes disposal program. It comments aspects referred to communal participation, resources, costs and educational material. Considers technical criteria in the sanitation area, analyzing proposed alternatives of different excreta disposal systems. Includes illustrations.

/ EXCRETA DISPOSAL / COMMUNAL PARTICIPATION / PROGRAMS / RURAL ZONE /

CEPIS

14.37 04996 HATCH, J.W. WATER AND SANITATION FOR HEALTH PROJECT (ARLINGTON, US).  
PUBLIC HEALTH EDUCATION FOR LOW-COST SANITATION IN TANZANIA. ARLINGTON (US), WASH PROJECT, 1983. 38 P. MAPS, 16 REFS. (WASH FIELD REPORT, 92). ENGLISH.

Report on acceptability and feasibility studies of improved ventilated latrines, in populous urban communities, multi-ethnics of low-incomes, in Tanzania, applicable to other communities. Includes communal education to obtain a general acceptance, appropriate maintenance and use of this kind of latrine, satisfactory payment of construction costs, joint campaigns with the government.

/ SANITARY EDUCATION / LATRINES / TANZANIA /

CEPIS

14.38 05105 TUDELA, F. CEPAL (MEXICO, MX).  
ECODISEÑO DE ASENTAMIENTOS HUMANOS EN ZONAS CALIDAS. MEXICO (MX), CEPAL, 28 JAN. 1982. 1982. 104 P. ILLUS., TABLES, 78 REFS. SPANISH.

Appropriate technologies' study for precarious and rural settlements. Approaches in a global manner the design of settlements according to bi-climatic determinations. Analyses thermic processes that are developed as a result of the interaction between the environmental and constructed surroundings. Exposes technical considerations relative to the thermic radiation control. Finally, it contemplates aspects of the aeration and ventilation processes.

/ PHYSICAL PLANNING / HUMAN SETTLEMENTS / TROPICAL ECOSYSTEM / URBANISM / ARCHITECTURE / DESIGN / APPROPRIATE TECHNOLOGY /

CEPIS

14.39 05468 AGENCY FOR INTERNATIONAL DEVELOPMENT (WASHINGTON, D.C., US).

CONSTRUCTING PITS FOR PRIVIES. WASHINGTON, D.C. (US),  
AID, 1982. 10 P. PLANS, ILLUS., TABLES. (WATER FOR THE WORLD TECHNICAL  
NOTE, SAN.1.C.2). ENGLISH.

Describes basic steps in the pit privies construction. Includes number  
of workers, required materials, location map, technical plan, general  
configuration sketches, construction of a wood base, concrete base, bases'  
impermeability.

/ LATRINES / CONSTRUCTION /

CEPIS

14.40 05470 AGENCY FOR INTERNATIONAL DEVELOPMENT (WASHINGTON, D.C.,  
US).

CONSTRUCTING AQUA FOR PRIVIES. WASHINGTON, D.C. (US),  
AID, 1982. 8 P. PLANS, ILLUS., TABLES. (WATER FOR THE WORLD TECHNICAL  
NOTE, SAN.1.C.4). ENGLISH.

Describes steps to follow in aqua privies' construction. Includes re-  
quired materials, construction process for concrete privies, of wood,  
digging pits according to type, dimensions and diameters.

/ LATRINES / CONSTRUCTION /

CEPIS

14.41 05472 AGENCY FOR INTERNATIONAL DEVELOPMENT (WASHINGTON, D.C.,  
US).

CONSTRUCTING SLABS FOR PRIVIES. WASHINGTON, D.C. (US),  
AID, 1982. 13 P. PLANS, ILLUS., TABLES. (WATER FOR THE WORLD TECHNICAL  
NOTE, SAN.1.C.1). ENGLISH.

Describes steps to follow in the construction of the slab of a privy.  
Includes materials, tools and work, type of slab to be built, simple pit  
or with seat and base.

/ LATRINES / CONSTRUCTION /

CEPIS

14.42 05465. AGENCY FOR INTERNATIONAL DEVELOPMENT (WASHINGTON, D.C.  
US).

CONSTRUCTING BUCKET LATRINES. WASHINGTON, D.C. (US),  
AID, 1982. 6 P. ILLUS., TABLES. (WATER FOR THE WORLD TECHNICAL NOTE,  
SAN.1.C.5). ENGLISH.

Describes construction of tub latrines. Includes required work, neces-  
sary materials, map of the place, design plans, construction materials  
list. Indicates steps to follow in the construction and a working plan.

/ LATRINES / CONSTRUCTION /

CEPIS



14.43 05466 AGENCY FOR INTERNATIONAL DEVELOPMENT (WASHINGTON, D.C., US).  
CONSTRUCTING COMPOST TOILETS. WASHINGTON, D.C. (US),  
AID, 1982. 7 P. PLANS, TABLES. (WATER FOR THE WORLD TECHNICAL NOTE,  
SAN.1.C.6). ENGLISH.

Describes steps for a compost latrine construction. Indicates the work required, materials and tools, construction of bases and concrete or wood rooms, installation of vent pipes in the structure.  
/ LATRINES / COMPOST / CONSTRUCTION /

CEPIS

14.44 05467 AGENCY FOR INTERNATIONAL DEVELOPMENT (WASHINGTON, D.C., US).  
CONSTRUCTING PRIVY SHELTERS. WASHINGTON, D.C. (US),  
AID, 1982. 15 P. PLANS, ILLUS. (WATER FOR THE WORLD TECHNICAL NOTE,  
SAN.1.C.3). ENGLISH.

Indicates steps to follow in the construction of latrines' cabins. Indicates the required work, necessary materials, work plan, special characteristics, tools, construction process of a simple bamboo cabin with wooden roof and wooden door.  
/ LATRINES / CONSTRUCTION /

CEPIS

14.45 05473 AGENCY FOR INTERNATIONAL DEVELOPMENT (WASHINGTON, D.C., US).  
DESIGNING PITS FOR PRIVIES. WASHINGTON, D.C. (US), AID,  
1982. 8 P. ILLUS., TABLES. (WATER FOR WORLD TECHNICAL NOTE,  
SAN.1.D.2). ENGLISH.

Describes how to design a pit for latrines. Includes selection of its location, dimensions calculation, work determination, required materials, work plan, consideration of certain factors as type of land and soil layers.

/ LATRINES / DESIGN /

CEPIS

14.46 05474 AGENCY FOR INTERNATIONAL DEVELOPMENT (WASHINGTON, D.C., US).  
DESIGNING SLABS FOR PRIVIES. WASHINGTON, D.C. (US),  
AID, 1982. 9 P. PLANS. (WATER FOR THE WORLD TECHNICAL NOTE,  
SAN.1.D.1). ENGLISH.

Describes the design of a privy base or floor. Includes the type of floor to construct a simple pit or with seat and base, materials selection, possible improvements, vent pipes, and automatic washing siphons.  
/ LATRINES / DESIGN /

CEPIS

14.47 05476 AGENCY FOR INTERNATIONAL DEVELOPMENT (WASHINGTON, D.C., US).  
DESIGNING AQUA PRIVIES. WASHINGTON, D.C. (US), AID, 1982. 5 P. ILLUS., TABLES. (WATER FOR THE WORLD TECHNICAL NOTE, SAN.1.D.4). ENGLISH.

Describes the way to design an aqua privy that implies selection of the location, calculation of the storage size and of the reheating pit and work determination, necessary materials and tools for its construction.  
/ PRIVIES / DESIGN /

CEPIS

14.48 05477 AGENCY FOR INTERNATIONAL DEVELOPMENT (WASHINGTON, D.C., US).  
DESIGNING BUCKET LATRINES. WASHINGTON, D.C. (US), AID; 1982. 6 P. ILLUS., TABLES. (WATER FOR THE WORLD TECHNICAL NOTE, SAN.1.D.5). ENGLISH.

Describes the way of designing a bucket latrine which implies the selection of its location, determination of its dimensions, materials' selection, tools and work required for its design.  
/ LATRINES / DESIGN /

CEPIS

14.49 05479 AGENCY FOR INTERNATIONAL DEVELOPMENT (WASHINGTON, D.C., US).  
DESIGNING COMPOST TOILETS. WASHINGTON, D.C. (US), AID, 1982. 6 P. ILLUS., TABLES. (WATER FOR THE WORLD TECHNICAL NOTE, SAN.1.D.6). ENGLISH.

Describes the way of designing a compost toilet which implies selection of the location, calculation of the storage dimensions, and work determination, required materials and tools for its construction.  
/ COMPOST / TOILET / DESIGN /

CEPIS

14.50 05480 AGENCY FOR INTERNATIONAL DEVELOPMENT (WASHINGTON, D.C., US).

DESIGNING PRIVY SHELTERS. WASHINGTON, D.C. (US), AID, 1982. 11 P. PLANS, ILLUS., TABLES. (WATER FOR THE WORLD TECHNICAL NOTE, SAN.1.D.3). ENGLISH.

Describes the design of privy shelters. Includes the selection of the type of shelter, determination of the shape, size and special characteristics, roof, door, vent opening and calculation of required material.

/ PRIVIES / DESIGN /

CEPIS

14.51 05483 AGENCY FOR INTERNATIONAL DEVELOPMENT (WASHINGTON, D.C., US).

OPERATING AND MAINTAINING BUCKET LATRINES. WASHINGTON, D.C. (US), AID, 1982. 3 P. ILLUS., TABLES. (WATER FOR THE WORLD TECHNICAL NOTE, SAN.1.D.5). ENGLISH.

Describes the way to operate and maintain a bucket latrine, emptying it every day or every three days, removing excretas to a disposal place and its burial, routine cleansing of the latrine, including containers and periodic inspection.

/ LATRINES / OPERATION AND MAINTENANCE /

CEPIS

14.52 05484 AGENCY FOR INTERNATIONAL DEVELOPMENT (WASHINGTON, D.C., US).

OPERATING AND MAINTAINING COMPOST TOILETS. WASHINGTON, D.C. (US), AID, 1982. 3 P. ILLUS. (WATER FOR THE WORLD TECHNICAL NOTE, SAN.1.0.6). ENGLISH.

Describes the steps to operate and maintain compost toilets, latrines' composition and elements, cleansing and periodical change of parts and compost removal, monthly inspection and repair of any damage.

/ LATRINES / COMPOST / OPERATION AND MAINTENANCE /

CEPIS

14.53 05485 AGENCY FOR INTERNATIONAL DEVELOPMENT (WASHINGTON, D.C., US).

OPERATING AND MAINTAINING AQUA PRIVIES. WASHINGTON, D.C. (US), AID, 1982. 5 P. ILLUS., TABLES. (WATER FOR THE WORLD TECHNICAL NOTE, SAN.1.0.4). ENGLISH.

Describes the adequate way to operate and maintain an aqua privy, maintenance of the liquid level at flow line, each week cleansing, revision of the mud depth and valve emptiness and domestic wastewaters disposal.

/ LATRINES / OPERATION AND MAINTENANCE /

CEPIS

14.54 05487 AGENCY FOR INTERNATIONAL DEVELOPMENT (WASHINGTON, D.C., US).  
OPERATING AND MAINTAINING PRIVIES. WASHINGTON, D.C., (US), AID, 1982. 5 P. ILLUS., TABLES. (WATER FOR THE WORLD TECHNICAL NOTE, SAN.1.0.1). ENGLISH.

Describes the steps to operate and maintain privies which imply a weekly cleansing of the toilet, damages repair and filling of the pit with soil and complete removal to a new pit.

/ LATRINES / OPERATION AND MAINTENANCE /

CEPIS

14.55 05488 AGENCY FOR INTERNATIONAL DEVELOPMENT (WASHINGTON, D.C., US).  
PLANNING COMBINED WASHWATER AND EXCRETA DISPOSAL SYSTEM. WASHINGTON, D.C. (US), AID, 1982. 8 P. TABLES. (WATER FOR THE WORLD TECHNICAL NOTE, SAN.2.P.1). ENGLISH.

Discusses planning and implementation of eight steps that are following in the development of the combined excreta disposal and washwater systems' project, problem identification, communal help organization, data collection, formulation, alternatives, selection of the most adequate method, system establishment, operation, maintenance and system evaluation.

/ EXCRETA DISPOSAL / WASTEWATER DISPOSAL / PLANNING /

CEPIS

14.56 05490 AGENCY FOR INTERNATIONAL DEVELOPMENT (WASHINGTON, D.C., US).  
SIMPLE METHODS OF EXCRETA DISPOSAL. WASHINGTON, D.C. (US), AID, 1982. 5 P. PLANS, ILLUS., TABLES. (WATER FOR THE WORLD TECHNICAL NOTE, SAN.1.M.1). ENGLISH

Describes five simple methods for excreta disposal, pit privies, modern pit privies, water toilets, compost privies and bucket privies which reduce the possibility of contaminating water supply and the presence of diseases, also help to control animals' excreta and the presence of insects.

/ EXCRETA DISPOSAL /

CEPIS

14.57 05623 PERRETT, H.E. IBRD (WASHINGTON, D.C., US).  
SOCIAL FEASIBILITY ANALYSIS IN LOW-COST SANITATION PROJECTS. WASHINGTON, D.C. (US), WORLD BANK, 1983. 24 P. TABLES. (TAG TECHNICAL NOTE, 5). INTERREGIONAL PROJECT. INT/81/047. ENGLISH.

Describes the social feasibility analysis in the low-cost sanitation projects, the nature and analysis process, key questions to be considered in these programs, interest in the sanitary conditions improvement, payment capacity and availability and contribution through work and materials, technology acceptance, sanitary practices and habits, acceptance degrees.  
/ RURAL SANITATION / FEASIBILITY STUDIES / PROJECT ANALYSIS /

CEPIS

14.58 05493 NOSTRAND, J. VAN, WILSON, J.G. IBRD (WASHINGTON, D.C., US). UNEP (NAIROBI, KE).  
VENTILATED IMPROVED DOUBLE-PIT LATRINE. A CONSTRUCTION MANUAL FOR BOTSWANA. WASHINGTON, D.C. (US), IBRD, 1983. 47 P. PLANS, ILLUS. (TAG TECHNICAL NOTE, 3). ENGLISH.

Appropriate technology manual on ventilated improved double-pit latrines, mainly good to provide adequate local sanitation in urban areas. Establishes construction procedures and supervision guidelines, including diagrams, construction details and list of required materials.  
/ LATRINES / CONSTRUCTION / BOTSWANA /

CEPIS

14.59 06196 PICKFORD, J.  
APPROPRIATE SANITATION FOR URBAN AREAS AND VILLAGES IN DEVELOPING COUNTRIES. IN UNIVERSIDAD CENTROAMERICANA JOSE SIMEON CANAS (SAN SALVADOR, SV), UCA EDS., 1979. P 593-608. ILLUS., 9 REFS. ENGLISH. SIMPOSIO INTERNACIONAL DE INGENIERIA, 2. SAN SALVADOR (SV) 19-23 FEB. 1979.

Describes appropriate sanitary requirements according to the area characteristics where the sewerage services are implemented. Deals with different excreta disposal systems in rural and marginal urban environments in developing countries.  
/ EXCRETA DISPOSAL / DEVELOPING COUNTRY / RURAL ZONES /

CEPIS

14.60 06197 RYAN, B.A., MARA, D.D. IBRD (WASHINGTON, D.C., US).  
VENTILATED IMPROVED PIT LATRINES VENT PIPE DESIGN GUIDELINES. WASHINGTON, D.C. (US), WORLD BANK, 1983. 21 P. PLANS, ILLUS., TABLES, 8 REFS. (TAG TECHNICAL NOTE, 6). UNDP INTERREGIONAL PROJECT. INT/81/047. ENGLISH.

Offers vent-pipe-design guidelines, based in a study carried-out in Botswana and Zimbabwe in 1981/82. Degree, ventilation, pipes' materials, preparation of external surface, length, superstructure design, double and multiple pit latrines, other data of experiences, rural vent pipes

manufacturing and construction details, are also shown.  
/ LATRINES / BOTSWANA / ZIMBABWE /

CEPIS

14.61 06397 INSTITUTO TECNOLOGICO DE COSTA RICA (CARTAGO, CR).  
MUJER TECNOLOGIAS CASERAS. IN BOLETIN DE TECNOLOGIA  
APROPIADA. CARTAGO (CR), 3, 1981. P 1-27. ILLUS. SPANISH.

Approach to communal development programs where women work. Technology is defined as a vital factor in the women peasant development and its two phases are mentioned. The idea, which is to become aware of the needs, and the action which is the device or machinery manufacture that resulted from the ideas. Technology types and characteristics are described. Furthermore the design of a clay stove.  
/ APPROPRIATE TECHNOLOGY / WOMEN /

IICR

14.62 06341 BID (WASHINGTON, D.C., US)  
LOW-COST SANITATION INSTRUCTOR'S GUIDE. WASHINGTON,  
D.C. (US), WORLD BANK, 1983, 79 P. ILLUS., TABLES. ENGLISH.

Designed for people who perform a role in the selection, planning and implementation of the communal sanitation projects. Provides a general orientation about these matters. It is divided into four parts and each one includes a section of the slides program, discussions to reinforce important concepts and activities to help participants in the application of these concepts in their own communities. It may be used as an independent unit or as a whole with other subject materials of the seminar.  
/ RURAL SANITATION / COSTS / SOCIO-ECONOMICAL ASPECTS /

CEPIS

14.63 06886 MORGAN, P.R.  
NEW SELF-FLUSHING TOILET FOR USE IN RURAL LATRINES.  
SALSBURY (RH), BLAIR RESEARCH LABORATORY, S.D. 12 P. ILLUS. ENGLISH.

Describes the design of a latrine recently invented for the rural area. The latrine does not require an operational manual and with a limited water quantity it is able to eliminate the residues without blocking. Conditions under which these latrines must be built are included.  
/ LATRINES /

CEPIS

14.64 07029 MARA, D.D., GUMARAES, A.S.P. IADB (WASHINGTON, D.C.,  
US). TECHNOLOGY ADVISORY GROUP.

SANEAMENTO BASICO PARA COMUNIDADES CARENTES E FAVELAS. TECNOLOGIAS ALTERNATIVAS DE BAIXO CUSTO. WASHINGTON, D.C. (US), WORLD BANK, 1983. 11 P. TAG/BRA/18. UNDP INTERREGIONAL PROJECT. INT/81/047. PORTUGUESE. CONGRESSO BRASILEIRO DE ENGENHARIA SANITARIA E AMBIENTAL, 12. CAMBORIU (BR) 20-25 NOV. 1983.

Discusses some aspects referring to the development of low-cost sanitation activities in Brazil (excreta disposal in rural and urban areas). It provides some data that have meant the programs' development in this field. It examines some important questions for the development of these programs in urban areas and mentions economical and technical criteria for appropriate technology use in these local disposal systems. It deals with the use of dry and wet pits. It indicates national perspectives for this type of programs and the possibilities for an efficient cleansing of these pits.

/ BASIC SANITATION / APPROPRIATE TECHNOLOGY / PRECARIOUS SETTLEMENTS / BRAZIL /

CEPIS

14.65 06949 VIRARACHAVAN, I.

ON-SITE SYSTEMS FOR DEVELOPING COUNTRIES. IN BIOCYCLE. EMMAUS (USA), 24(6), NOV-DEC. 1983. P. 58. ILLUS., TABLES, 11 REFS. ISBN 0276-5055. ENGLISH.

Short revision of on-site disposal technologies and considerations for its application, dry pit privies, aqua privies, compost privies, toilets that use water and septic tanks.

/ EXCRETA DISPOSAL / PRIVIES / DEVELOPING COUNTRIES /

CEPIS

14.66 07477 FARIAS, M.G.F., MELO, J.C.R. DE, ANDRADE NETO, C.O. COMPANHIA DE AGUAS E ESGOTOS DO RIO GRANDE DO NORTE (NATAL, BR).

VILAS DE COHAB PONTA DE LANCA DE SOLUCOES RACIONAIS. NATAL (BR), CAERN, 1983. 59 P. PORTUGUESE. CONGRESSO BRASILEIRO DE ENGENHARIA SANITARIA E AMBIENTAL, 12. CAMBORIU (BR) 20-25 NOV. 1983.

It refers to the number of housing groups' growth in Rio Grande do Norte State, known as cohabitation villas, and describes the result of researches carried-out in same, for the implementation of sanitary sewerage systems. The best solution found that is not of a conventional type, is of low-cost and is characterized by condominium collection network located inside the rooms, which reduces the length of the street collectors. It points out the importance of the community participation in the planning, implementation and maintenance phases of the condominium network, for the project's success. It also refers to costs and tariffs.

/ SANITARY SEWERAGE / APPROPRIATE TECHNOLOGY / COMMUNAL PARTICIPATION / BRAZIL (RIO GRANDE DO NORTE, NATAL) /

SABESP

14.67 07478 RYAN, B.A., MARA, D.D. IBRD (WASHINGTON, D.C., US).  
PIT LATRINE VENTILATION FIELD INVESTIGATION METHODOLOGY.  
WASHINGTON, D.C. (US), WORLD BANK, 1983. 21 P. ILLUS., TABLES, 11  
REFS. (TAG TECHNICAL NOTE, 4). UNDP INTERREGIONAL PROJECT.  
INT/81/047. ENGLISH.

Describes research methodology in the vent-pipe-field, based on works carried-out in Botswana and Zimbabwe. The methodology is based on the temperature control, air-flow speed, wind swiftness within the air tube and the atmospheric pressure variation inside and outside the latrine. With this information it is possible to determine if the vent is characterized by solar energy absorption, by air tube or because of air effects on the tube.

/ LATRINES /

CEPIS

14.68 07574 ROSSIN, A.C., GERICKE, M.Y.U., MACEDO, L.A.A. COMPANHIA DE TECNOLOGIA DE SANEAMENTO AMBIENTAL (SAO PAULO, BR).  
SISTEMAS DE ESCOTO DE BAIXO CUSTO. METODOLOGIA PARA A ESCOLHA. SAO PAULO (BR), CETESB, 1983. 17 P. ILLUS., TABLES, 11 REFS. PORTUGUESE. CONGRESSO BRASILEIRO DE ENGENHARIA SANITARIA E AMBIENTAL, 12. CAMBORIU (BR) 20-25 NOV. 1983.

Has a short introduction to low-cost sanitation technology, paying attention to public health aspects. This study feasibility depends on a series of factors, among which the following may be cited: population, its characteristics, local conditions, available technologies, technical demands, etc. Thus, individual and collective solutions were tried to be adapted in the project for the implementation of basic sanitation simplified systems to be developed in small communities of Sao Luis do Maranhao.

/ EXCRETA DISPOSAL / APPROPRIATE TECHNOLOGY / DEVELOPING COUNTRIES / COSTS / BRAZIL (MARANHAO, SAO LUIS) /

CETESB

14.69 07577 SALES, L.N.O., FARIAS, M.G.F. DE, LIMA, S.F.V.S. COMPANHIA DE AGUAS E ESCOTOS DO RIO GRANDE DO NORTE (NATAL, BR).  
FELIPE CAMARAO OS MAIS BAIXOS CUSTOS NUMA SOLUCAO DEFINITIVA DO PROBLEMA DE ESCOTOS. NATAL (BR), CAERN, 1983, 59 P. MAPS, ILLUS., TABLES, 11 REFS. PORTUGUESE. CONGRESSO BRASILEIRO DE ENGENHARIA SANITARIA E AMBIENTAL, 12. CAMBORIU (BR) 20-25 NOV. 1983.

Conventional solutions are made with a critical viewpoint of the sewerage problem of the Felipe Camarao quarter in Natal, Rio Grande do Norte. The community is moved and asked to join the process. The pilot experience includes group connections, and mainly the use of a stabilization pond, built in a swampy soil, using local material and manpower. Interphases are investigated with unexplored related areas, the ecological impact,



agricultural potentiality of the estuary and treatment to improve the landscape, foreseeing the enlargement of the system to Rio Potengi.

/ SANITARY SEWERAGE / APPROPRIATE TECHNOLOGY / STABILIZATION PONDS / COMMUNAL PARTICIPATION / BRAZIL (RIO GRANDE DO NORTE, NATAL) /

SABESP

14.70 07578 TINOCO FILHO, A.F., ROCHA, V.F., MELO, J.C.R. DE. COMPANHIA DE AGUAS E ESGOTOS DO RIO GRANDE DO NORTE (NATAL, BR).

EDUARDO GOMES QUANDO AS FOSSAS SAO SOLUCOES ECONOMICAS E CONTROLAVEIS EM CIDADES DE PORTE MEDIO. NATAL (BR), CAERN, 1983, 27 P. MAPS. PORTUGUESE. CONGRESSO BRASILEIRO DE ENGENHARIA SANITARIA E AMBIENTAL, 12. CAMBORIU (BR) 20-25 NOV. 1983.

Considers the sewerage problem of Eduardo Gomes, Rio Grande do Norte, using sanitary microsystems which have three basic elements at a small sub-basin level. The joint connection, which is the users' responsibility; the joint septic pit, located in the sidewalks and in the squares, and are the Water and Sewerage Company responsibility; the surface urinals, of Municipal responsibility. The solution which is of low-cost considers interrelations among drainage, water supply and other urban subsystems.

/ SANITARY SEWERAGE / APPROPRIATE TECHNOLOGY / INFILTRATION / SEPTIC TANKS / BRAZIL (RIO GRANDE DO NORTE, NATAL) /

SABESP

14.71 08492 BARTONE, C.R.

CRITERIOS PARA LA SELECCION DE TECNOLOGIA APROPIADA. LIMA (PE), CEPIS, 1984. P. 174-289. SPANISH. SEMINARIO SOBRE EL PLAN NACIONAL DE SANEAMIENTO BASICO, 1. HUAMPANI (PE) 21-24 OCT. 1983.

General aspects are indicated about appropriate technology use for the Drinking Water and Sanitation International Decade. The concept of appropriate technology is defined and illustrates application examples such as the transistor radio, windmill, and sanitation in marginal urban areas.

/ APPROPRIATE TECHNOLOGY /

CEPIS

14.72 08301 ROY, A.K., CHATTERJEE, P.K., GUPTA, K.N. IBRD (WASHINGTON, D.C., US).

MANUAL ON THE DESIGN, CONSTRUCTION AND MAINTENANCE OF LOW-COST POUR-FLUSH WATER SEAL LATRINES IN INDIA. WASHINGTON, D.C. (US), WORLD BANK, 1984. 120 P. PLANS, TABLES. (TAG TECHNICAL NOTE NUMBER, 10). ENGLISH.

Manual directed to agencies, contractors and individuals involved in the construction and design programs of pour-flush water latrines and with

double pits in India. The inherent principles are of general application, and with minimum modifications, technical details may be adapted to needs of different areas. Provides the most outstanding characteristics in the design, construction, maintenance and administration. Includes tables of materials necessary for different designs and formats of contracts.

/ LATRINES / DESIGN / CONSTRUCTION / OPERATION AND MAINTENANCE / INDIA /  
CEPIS

14.73 08514 PESCOD, M.G.  
LOW-COST TECHNOLOGY. IN DANGERFIELD, B.J. INSTITUTION OF WATER ENGINEERS AND SCIENTISTS (LONDON, GB). WATER SUPPLY AND SANITATION IN DEVELOPING COUNTRIES. LONDON (GB), IWES, 1983. P. 263-295. ISBN 0-9014-2712-8. ENGLISH.

Establishes the existent differences between the terms of applied technology and low-cost technology, in the water supply and sanitation field in developing countries. Indicates that low-cost technology is not always the appropriate one. Enumerates technolocal qualities. Emphasizes small scale systems. Explains that governments of developing countries were opposed in previous years to accept water supply and sanitation programs that included basic systems; instead they preferred more expensive conventional designs originated in developed countries.

/ APPROPRIATE TECHNOLOGY / COSTS /  
CEPIS

14.74 08999 CLERE, M. LE, SHERER, K. WATER AND SANITATION FOR HEALTH PROJECT (ARLINGTON, US).  
WORKSHOP DESIGN FOR LATRINES CONSTRUCTION - A TRAINING GUIDE. ARLINGTON (US), WASH PROJECT, 1984. 405 P. PLANS, ILLUS., TABLES. (WASH TECHNICAL REPORT, 25). ENGLISH.

Guideline for a training workshop on planning, construction, and appropriate maintenance of low-cost latrines built with community participation. It is designed for participants without technical knowledge and is addressed to development promoters, field workers and specialists in rural sanitation.

/ LATRINES / CONSTRUCTION /  
CEPIS

14.75 09003 WINBLAD, U.  
COMPOST LATRINES. IN IRCWD NEWS. DUEBENDORF (ZH), 12 JUNE 1977. 9 P. ILLUS., 27 REFS. ENGLISH.

Revises 25 different systems of domestic latrines in various parts of the world, the same which are classified into four groups: discontinuous, alternated, continuous and compact with heating. Describes and illustrates each one of them.

/ LATRINES /

CEPIS

- 14.76 09171 OBLADEN, L.N. UNIVERSIDADE CATOLICA DO PARANA (CURITIBA, BR). INSTITUTO DE SANEAMENTO AMBIENTAL. CIENCIA E TECNOLOGIA NA RACIONALIZACAO DO TRABALHO E MELHORIA DAS CONDICoes SOCIAIS DO HOMEM. CURITIBA (BR), ISAM, 1985. 35 P. 12 REFS. PORTUGUESE. PROGRAMA NACIONAL DE ESTUDOS SOBRE CIENCIA E TECNOLOGIA. VITORIA (BR) 19 APR. 1985.

Approaches problems relative to science and technology in the work rationalization and improvement of the human being social conditions. Deals with two examples: VDRs (sanitary bowls of reduced discharge), and the pilot plant for Curitiba's waste recycling and compost, operated by dwellers of the marginal quarters.

/ APPROPRIATE TECHNOLOGY / WASTEWATER USE / COMPOST /

ISAM

- 14.77 09405 MAZARIEGOS, F. PEQUEÑOS FILTROS ARTESANALES PARA POTABILIZAR AGUA. IN REVISTA ICAITI. GUATEMALA (GT), 1(1), ENE. 1985. P. 12-15. PLANS, ILLUS. SPANISH.

Describes the results of the research carried-out by the Central American Institute for Industrial Research and Technology, on the design filter made almost entirely in clay, which is able to produce daily from 3 to 4 liters of drinking water, which initial cost does not exceed 10 dollars.

/ FILTERS / APPROPRIATE TECHNOLOGY /

CEPIS

- 14.78 09463 LARREA, O. WATER AND SANITATION FOR HEALTH PROJECT (ARLINGTON, US). MEDIDAS ALTERNATIVAS PROPUESTAS PARA SOLUCIONAR LOS PROBLEMAS DE SUMINISTRO DE AGUA A LOS NUCLEOS DE LA COLONIZACION SAN JULIAN EN BOLIVIA. ARLINGTON (US), WASH PROJECT, 1985. 137 P. MAPS, ILLUS., TABLES, 13 REFS. (WASH FIELD REPORT, 140). SPANISH.

Describes the background and the way in which pertinent information was collected and studied to evaluate the present situation of water supply in San Julian colonization situated in Santa Cruz department. Mentions the alternatives to solve or alleviate differences in water supply, combined use of digged pits or hand perforated, rainwater collection, among

others. Analyzes the basic requirements for the implementation of a water supply rehabilitation program in this area, observing an estimate of the foreseen costs. Formulates conclusions of the case. Encloses annexes containing details of the study development.

/ RURAL WATER SUPPLY / COMMUNAL PARTICIPATION / SITUATION DIAGNOSIS / BOLIVIA /

CEPIS

14.79 09473 ZAROFF, B., OKUN, D.A.  
WATER VENDING IN DEVELOPING COUNTRIES. IN AQUA. LONDON (GB), 5, 1984. P. 289-295. ILLUS., TABLES, 12 REFS. ISSN 0003-7214. ENGLISH.

Investigates, describes and proposes an improved system for water vending in urban and rural communities, in developing countries, where water supply is provided by tank trucks or by water vendors. Studies and compares costs between this system and pipes.

/ APPROPRIATE TECHNOLOGY / RURAL WATER SUPPLY / WATER DISTRIBUTION / TANK TRUCKS / ECONOMICAL ASPECTS / DEVELOPING COUNTRIES / LATIN AMERICA / ASIA / AFRICA /

CEPIS

14.80 09476 AMORIM, V.P. DE. PAHO (SAN SALVADOR, SV), COMITE NACIONAL DE INSTITUCIONES DE AGUA POTABLE Y SANEAMIENTO (SAN SALVADOR, SV).

SITUACION Y PROYECCIONES DEL ABASTECIMIENTO DE AGUA POTABLE Y DISPOSICION DE EXCRETAS EN AREAS PERIURBANAS Y RURALES DE EL SALVADOR. SAN SALVADOR (SV), CONIAPOS, 1985. 45 P. MAPS, TABLES. SPANISH. SEMINARIO-TALLER DE LA DIAAPS, 2. SAN SALVADOR (SV) 6-8 MAR. 1985.

Summarizes the present state of drinking water distribution and latrine program of the urban peripheral and rural areas in El Salvador, indicating their needs according to demographic studies. It also revises the institutional structure of the responsible sector, enumerating existing projects like the water supply program for the rural area and the rural sanitation program, both in charge of PLANSABAR. Ends by emphasizing the need that greater attention must be given by responsible entities to this sector of the population.

/ WATER SUPPLY / LATRINES / RURAL WATER SUPPLY / EL SALVADOR /

CEPIS

14.81 09681 ACEVES H., F.J. INSTITUTO POLITECNICO NACIONAL (MEXICO, D.F., MX). DIRECCION DE GRADUADOS E INVESTIGACION.  
AHORRO DE AGUA Y ENERGIA EN EL FUTURO DE MEXICO, USANDO ATONIZADORES Y LETRINAS. MORELIA (MX), SOCIEDAD MEXICANA DE INGENIERIA SANITARIA Y AMBIENTAL, A.C., 1984. V. 2, P. 460-466. ILLUS., TABLES, 2

REFS. SPANISH. CONGRESO NACIONAL DE INGENIERIA SANITARIA Y AMBIENTAL, 4. MORELIA (MX) 18-20 OCT. 1984.

Proposes a solution to the problem of drinking water shortage in metropolitan areas, arid and semi-arid zones of the country through the use of latrines. It indicates the advantages and disadvantages, as well as the use of spray nozzles in domestic services. For water consumption savings both systems have analyzed, constructed and evaluated by the author since 1981 to date.

/ WATER CONSUMPTION / WATER CONSERVATION / LATRINES / MEXICO /  
SARH-DGUAPAC

14.82 09682 MARA, D.D. IBRD (WASHINGTON, D.C., US).  
DESIGN OF VENTILATED IMPROVED PIT LATRINES. WASHINGTON, D.C. (US), WORLD BANK, 1984. 70 P. TABLES, ILLUS. UNDP INTER-REGIONAL PROJECT. INT/81/047. ENGLISH.

Proposes the use of ventilated improved pit latrines (VIP), as a possible technological alternative of low-cost sanitation, in rural and marginal urban zones, where population density is around 300 people per ha. Discusses general criteria and emphasizes recent VIP latrine designs.

/ LATRINES / DESIGN / BOTSWANA / ZIMBABWE / TANZANIA / GHANA / BRAZIL /  
CEPIS

14.83 09823 ROARK, P.D.  
WOMEN AND WATER. IN BOURNE, P.G. WATER AND SANITATION ECONOMIC AND SOCIOLOGICAL PERSPECTIVES. ORLANDO (US), ACADEMIC PRESS, 1984. P. 49-68. 12 REFS. ISBN 0-1211-9580-5. ENGLISH.

Discusses various descriptions of women role during the past 30 years in the rural sanitation sector and its subsequent change. Emphasizes woman participation as mediator of the social change and the need to reformulate the existent knowledge and of acquiring new approaches for an efficient water management and communal health.

/ WOMEN / WATER AND SANITATION INTERNATIONAL DECADE / RURAL WATER SUPPLY /  
CEPIS

14.84 09858 SOARES, P.A. RIO GRANDE DO SUL. SECRETARIA DO DESENVOLVIMENTO REGIONAL E OBRAS PUBLICAS (PORTO ALEGRE, BR). PROGRAMA DE SANEAMENTO ALTERNATIVO PARA A REGIAO METROPOLITANA DE PORTO ALEGRE. LIMA (PE), CEPIS, 1985. 40 P. PORTUGUESE. SEMINARIO REGIONAL DE INVESTIGACION SOBRE ALTERNATIVAS DE TECNOLOGIA DE SANEAMIENTO DE BAJO COSTO PARA ZONAS URBANAS MARGINADAS. LIMA (PE) 15-19 JULY 1985.

As from 1978 it presents planning actions of the sanitation sectors for Porto Alegre metropolitan area. Develops the proposed pilot alternative program which refers to septic tanks installation, the wastes and sewerage problems, the pilot program of the municipalities in relation to sanitary sewerage, local aspects to be considered in the introduction of a sanitary energetical refill, the use of recycled residues. Includes information on costs.

/ URBAN SANITATION / APPROPRIATE TECHNOLOGY / BRAZIL (RIO GRANDE DO SUL, PORTO ALEGRE) /

CEPIS

14.85 09859 MOITTA, F.

QUARENTA ANOS DE SANEAMENTO. A EXPERIENCIA DA FUNDACAO SESP. IN REVISTA DA FUNDACAO SESP. RIO DE JANEIRO (BR), 29(2), 1984. P. 183-198. ILLUS. PORTUGUESE.

Analyses the work and experience of SESP Foundation in the last 40 years, to provide drinking water supply and wastes' sanitary disposal to a part of the Brazilian population, especially the ones living in small communities and rural peripheral urban areas.

/ BASIC SANITATION / RURAL SANITATION / BRAZIL (SAO PAULO) /

CIMS

14.86 09894 WHYTE, A.V.

COMMUNITY PARTICIPATION NEITHER PANACEA NOR MYTH. IN BOURNE, P.C. WATER AND SANITATION ECONOMIC AND SOCIOLOGICAL PERSPECTIVES. ORLANDO (US), ACADEMIC PRESS, 1984. P. 221-241. 36 REFS. ISBN 0-1211-9580-5. ENGLISH.

Defines the communal participation concepts, its objectives and its role in the development of the Water and Sanitation International Decade. It refers to the regional activity of communal participation in the water-sanitation-education triangle, the role of those who know how to read within an alphabetical group and image of the communal worker trained in public health, education and communal organization. Points out the activities which are expected of the communal participation in the water and sanitation projects, evaluates the potential participation of the community, the need for support and governmental planning, and communal participation costs and benefits.

/ COMMUNAL PARTICIPATION / WATER AND SANITATION INTERNATIONAL DECADE / RURAL SANITATION /

CEPIS

14.87 10075 DURAN, J.C.

AGUA POTABLE PARA CADA FAMILIA - ATENCION PRIMARIA DE

SALUD. IN SALUD MUNDIAL. GENEVA (ZH), NOV. 1984. P. 8-9. ILLUS.  
ISSN 0043-8502. SPANISH.

Briefly describes the problem and current situation of drinking water supply in Latin America and the Caribbean countries. Indicates the objectives, goals and some political and financial aspects of the International Drinking Water and Environmental Sanitation Decade (1981-1990). Points out the case of Caacupe-Mi, situated at 22 km from Asuncion, capital of Paraguay, when referring to the population and place most important characteristics, as well as experiences obtained in the water supply project in that place.

/ RURAL WATER SUPPLY / PRIMARY HEALTH ATTENTION / PARAGUAY (ASUNCION, CAACUPE-MI) /

CEPIS

14.88 10177 JAHN, S.A.A., OMAR, A.H.  
IMPROVED TRADITIONAL CLAY WATER JARS. IN WATERLINES.  
LONDON (GB), 4(1), JULY 1985. P. 15-27. ILLUS., 4 REFS. ISSN 0262-8104. ENGLISH.

Emphasizes the importance of improving traditional clay jars or deposits for domestic water storage. It refers to its construction, provided by a pipe or faucet that facilitates the water outlet, and to its position and installation. Refers to the Sudan case.

/ WATER STORAGE / APPROPRIATE TECHNOLOGY / RESERVOIRS /

CEPIS

14.89 10187 CEPIS (LIMA, PE).  
TRABAJOS PRESENTADOS AL SEMINARIO REGIONAL DE INVESTIGACION SOBRE ALTERNATIVAS DE TECNOLOGIA DE SANEAMIENTO DE BAJO COSTO PARA ZONAS URBANAS MARGINADAS. LIMA (PE), CEPIS, 1985. 522 P. MAPS, PLANS, ILLUS., TABLES. SPANISH. SEMINARIO REGIONAL DE INVESTIGACION SOBRE ALTERNATIVAS DE TECNOLOGIA DE SANEAMIENTO DE BAJO COSTO PARA ZONAS URBANAS MARGINADAS. LIMA (PE) 15-19 JULY 1985.

Compilation of works exposed in the Seminar. Different appropriate technological options to the Latin American environment, such as on-site excreta disposal, adoption of sanitary bowls which use reduced water discharge, infiltration pit latrines, ventilated improved dry pit latrines (VIP), sewerage with little diameter and small depth, stabilization ponds, were discussed. The documents presented reflect the Seminar objectives, which were to evaluate the results of the present activities of research, development and demonstration (ID and D) on low-cost sanitation for marginal urban zones of the Region, advise promising technologies, analyze problems to adequate the technology for its most extensive application and the preparation and management of the projects, examine communal participation in such projects, stimulate ID and D complementary

projects in other Member Countries, adapting and apply the obtained results of the present research.

/ URBAN SANITATION / PRECARIOUS SETTLEMENTS / EXCRETA DISPOSAL / APPROPRIATE TECHNOLOGY / CONGRESSES /

CEPIS

14.90 10194 HANNAN-ANDERSON, C.  
WAYS OF INVOLVING WOMEN IN WATER PROJECTS. IN WATER-  
LINES. LONDON (GB), 4(1), JUL. 1985. P. 28-31. MAPS, ILLUS. ISSN  
0262-8104. ENGLISH.

Offers a series of practices to involve women in sanitation programs. Recommendations were elaborated after the study in three communities in Tanzania where water and sanitation programs would not contribute to improve health conditions. Considers psychosocial factors, both behavioral and religious.

/ WOMEN / RURAL WATER SUPPLY / TANZANIA /

CEPIS

14.91 10204 WATT, J., LAING, R.C.  
TEACHING AIDS FOR WATER AND SANITATION. IN WATERLINES.  
LONDON (GB), 3(4), APR. 1985. P. 25-28. ILLUS., 4 REFS. ISSN 0262-  
8104. ENGLISH.

Emphasizes the importance of audiovisual aids in sanitary education in communities and schools. Presents an example that uses illustrated plates to which figures are added or taken away while the lecture is explained. The case refers to the use of latrines.

/ SANITARY EDUCATION / LATRINES / AUDIOVISUAL AIDS /

CEPIS

14.92 10260 GUMARAES, A.S.P.  
ALTERNATIVAS TECNOLOGICAS DE BAIXO CUSTO. LIMA (PE)  
CEPIS, 1985. 66 P. 10 REFS. PORTUGUESE. SEMINARIO REGIONAL DE INVE-  
STIGACION SOBRE ALTERNATIVAS DE TECNOLOGIA DE SANEAMIENTO DE BAJO COSTO  
PARA ZONAS URBANAS MARGINADAS. LIMA (PE) 15-19 JULY 1985.

Presents a revision of the different technological options of sanitary sewerage developed by the technical advisory group of the World Bank and that are being implemented in Brazil. Describes the technical characteristics and the advantages of the absorbent pits, septic pits, dry pits, non-conventional sewerage networks, simple sewerage networks, sewage treatment biological systems, with emphasis in stabilization ponds. Includes the following annexes: characteristics related to the operation of the reduced discharge sanitary bowls, sanitary bowl and discharge box,



clay sanitary bowl, measurement example of a septic pit and a dry pit, and decanted sewerage networks.

/ SEWERAGE / APPROPRIATE TECHNOLOGY / SEPTIC PITS /

CEPIS

14.93 10262 OTIS, R.J., MARA, D.D. IBRD (WASHINGTON, D.C., US).  
DISEÑO DE ALCANTARILLADO DE PEQUEÑO DIAMETRO. LIMA (PE), CEPIS, 1985. 52 P. ILLUS. SPANISH. SEMINARIO DE SANEAMIENTO DE BAJO COSTO PARA ZONAS URBANAS MARGINADAS. LIMA (PE) 15-19 JULY 1985. ALSO AVAILABLE IN ENGLISH.

Establishes preliminary guidelines for the design of small diameter collectors which receive domestic wastewater previously sedimented. Guidelines have been prepared specially for developing countries, emphasizing the simplicity of the design and confidence in its operation. Describes the system, its parts, design criteria application for the interceptor tank, construction and maintenance.

/ SEWERAGE / DEVELOPING COUNTRIES / DESIGN / APPROPRIATE TECHNOLOGY /

CEPIS

14.94 10394 CENTRO DE ESTUDIOS EN TECNOLOGIAS APROPIADAS PARA AMERICA LATINA (VALPARAISO, CL).  
LETRINA ABONERA A BASE DE TAMBOR. VALPARAISO (CL), CENTAL, S.D., 6 P. ILLUS. SPANISH.

Describes the latrine fertilizer made up of a drum which uses a 2000 l cylinder. It is adapted with certain elements which allows excreta storage and later decomposition. Indicates the materials, tools and complementary elements, and operation recommendations.

/ LATRINES / CONSTRUCTION /

CEPIS

14.95 10395 GONTIJO, J.M., ATAIDE, C.A., SARMIENTO, S.M.G., SOUZA, J.M. DE.  
PRIVADA HIGIENICA EM MINAS GERAIS DE 1943 AOS NOSSOS DIAS. IN REVISTA DA FUNDACAO SESP. RIO DE JANEIRO (BR), 29(2), 1984. P. 193-198. ILLUS. ISSN 0304-2138. PORTUGUESE.

Describes a new type of cabin for hygienic toilets, made up of simple fiber cement plates; showing its advantages and disadvantages with relation to other construction types.

/ LATRINES / RURAL ZONES / BRAZIL (MINAS GERAIS) /

CMS

14.96 10396 MARA, D.D. IBRD (WASHINGTON, D.C., US).  
TECNOLOGIAS DE SANEAMIENTO DE BAIXO CUSTO. LIMA (PE),  
CEPIS, 1985. 13 P. 19 REFS. PORTUGUESE. SEMINARIO REGIONAL DE INVE-  
STIGACION SOBRE ALTERNATIVAS DE TECNOLOGIA DE SANEAMIENTO DE BAJO COSTO  
PARA ZONAS URBANAS MARGINADAS. LIMA (PE) 15-19 JULY 1985.

Presents a brief description of the low-cost technology projects that the  
World Bank is developing for marginal urban areas in Brazil. It refers  
to ventilated septic pits, cesspools with reduced discharge sanitary  
bowl, septic pits, non-conventional networks.

/ APPROPRIATE TECHNOLOGY / LATRINES / SEPTIC TANKS / EXCRETA DISPOSAL /  
PRECARIOUS SETTLEMENTS / URBAN ZONES / BRAZIL /

CEPIS

14.97 10398 ROURA GAME, V. EMPRESA MUNICIPAL DE ALCANTARILLADO DE  
GUAYAQUIL (GUAYAQUIL, EC).  
INFORME FINAL. METODOS ALTERNOS DE DISPOSICION DE EX-  
CRETAS PARA LAS AREAS URBANAS MARGINALES DE GUAYAQUIL. LIMA (PE), CEPIS,  
1985. 35 P. SPANISH. SEMINARIO REGIONAL DE INVESTIGACION SOBRE ALTER-  
NATIVAS DE TECNOLOGIA DE SANEAMIENTO DE BAJO COSTO PARA ZONAS URBANAS  
MARGINADAS. LIMA (PE) 15-19 JULY 1985.

Describes the project which has the purpose of designing technically re-  
commendable sanitary units, socially acceptable and economical, ventil-  
ated pit latrine (VIP) low consumption bowl and cesspool, semi-conven-  
tional bowl with septic tank of two stages connected to small diameter  
sewerage and pending pit. Includes graphs and costs.

/ EXCRETA DISPOSAL / LATRINES / SEPTIC PITS / PRECARIOUS SETTLEMENTS /  
URBAN ZONES / ECUADOR (GUAYAQUIL) /

CEPIS

14.98 10399 SOARES, P.A. RIO GRANDE DO SUL. SECRETARIA DO DESEN-  
VOLVIMENTO REGIONAL E OBRAS PUBLICAS (PORTO ALEGRE, BR).  
PROGRAMA PILOTO DE SANEAMENTO DE BAIXO CUSTO, CAMPO BOM,  
RIO GRANDE DO SUL - BRAZIL. LIMA (PE), CEPIS, 1985. 35 P. PORTUGUESE.  
SEMINARIO REGIONAL DE INVESTIGACION SOBRE ALTERNATIVAS DE TECNOLOGIA DE  
SANEAMIENTO DE BAJO COSTO PARA ZONAS URBANAS MARGINADAS. LIMA (PE) 15-19  
JULY 1985.

Describes the low-cost sanitation pilot project of Campo Bom Municipali-  
ty: its initial considerations, characterization of selected nucleus,  
and solution proposals for the nucleus Esperanza and Aurora in relation  
to excreta disposal. The introduction of inlet pits was made in some  
lots of Esperanza nucleus, and, in others, biological filters were adopt-  
ed and infiltration ditches. For the Aurora nucleus a simplified network  
was implemented which collected effluents from septic pits and carry them

to the stabilization pond. Summarizes pits maintenance program and indicates future action of the program for Porto Alegre Metropolitan Region.  
/ SEPTIC PITS / EXCRETA DISPOSAL / OPERATION AND MAINTENANCE / BRAZIL  
(RIO GRANDE DO SUL, CAMPO BOM) /

CEPIS

14.99 10402 TEKA, G.E. ETHIOPIA. MINISTRY OF HEALTH (ADDIS ABABA, ET). PLANNING AND PROGRAMMING BUREAU.  
INDIVIDUAL SEWAGE DISPOSAL SYSTEMS. IN HUMAN WASTES DISPOSAL - ETHIOPIA. A PRACTICAL APPROACH TO ENVIRONMENTAL HEALTH. ADDIS ABABA (ET), MINISTRY OF HEALTH, 1984. P. 73-88. ENGLISH.

Briefly details treatment of individual sewerage and disposal systems. Indicates the factors that must be taken into account in the selection of a particular method for wastewater disposal. Develops the septic tanks system.

/ WASTEWATER DISPOSAL / EXCRETA DISPOSAL / SEPTIC TANKS / ETHIOPIA /

CEPIS

14.100 10403 TEKA, G.E. ETHIOPIA. MINISTRY OF HEALTH (ADDIS ABABA, ET). PLANNING AND PROGRAMMING BUREAU.  
SOME NON-WATER CARRIAGE METHODS OF HUMAN WASTES DISPOSAL. IN HUMAN WASTES DISPOSAL - ETHIOPIA. A PRACTICAL APPROACH TO ENVIRONMENTAL HEALTH. ADDIS ABABA (ET), MINISTRY OF HEALTH, 1984. P. 37-61. ENGLISH.

Describes the objectives of human wastes disposal and the different methods that may be used in excreta disposal systems that do not need water.

/ LATRINES / DEVELOPING COUNTRIES / ETHIOPIA /

CEPIS

14.101 10579 BREDARIOL, C.S. FUNDACAO ESTADUAL DE ENGENHARIA DO MEIO AMBIENTE (RIO DE JANEIRO, BR).  
ECODESENVOLVIMENTO E PARTICIPACAO. RIO DE JANEIRO (BR), FEEMA, 1985. 1 V. PORTUGUESE. CONGRESSO BRASILEIRO DE ENGENHARIA SANITARIA E AMBIENTAL, 13. MACEIO (BR) 1985.

Describes the project in three stages: technical assistance to the communities, appropriate technology development and support to implementation programs for sanitation services provision in marginal quarters. Later relations between the ecodevelopment project and the different priorities established by the Rio de Janeiro policy were analyzed.

/ ECOSYSTEMS / COMMUNAL PARTICIPATION / APPROPRIATE TECHNOLOGY / PRECARIOUS SETTLEMENTS / BRAZIL (RIO DE JANEIRO) /

FEEMA

14.102 10887 JOSE HENRIQUE RIZO POMBO & CIA. LTDA. INGENIERIA CIVIL  
Y SANITARIA (CARTAGENA, CO).  
ASAS - UNA NUEVA SOLUCION DE SANEAMIENTO. CARTAGENA  
(CO), J.H. RIZO POMPO & CIA. LTDA., 1984. 29 P. PLANS. SPANISH.

Consists of a special system of small diameter of little depth and very low slopes located very near the lots' limits. Small septic pits situated in each house discharge to these networks. Because of its shape and proportions, and although its size, pits hold a high percentage of sedimental solids, contaminant charges of organic matters reduce to almost half, and it has a great accumulation capacity of mud and skimming, which allows that cleansing be made every six years for a family of seven people.

/ SEWERAGE / SEPTIC PITS / APPROPRIATE TECHNOLOGY / COLOMBIA (BOLIVAR, CARTAGENA) /

CEPIS

14.103 10960 GUIMARAES, A.S.P., ARAUJO, M.M. DE.  
ASPECTOS GERAIS DE SANEAMENTO DE BAIXO CUSTO. RIO DE  
JANEIRO (BR), PNUD, 1984. 41 P. ILLUS. PORTUGUESE. SIMPOSIO REGIONAL  
SOBRE ABASTECIMIENTO DE AGUA POTABLE Y DISPOSICION SANITARIA DE EXCRETAS  
EN AREAS URBANAS MARGINADAS. SANTIAGO (CL) 5-9 NOV. 1984.

Examines important aspects in this field, referred to the sectors' policy, experiences of low-cost technology use and future actions, programs in Brazil, and the World Bank technical advisory group role. Details technological options, such as absorbent pit, septic pit, dry pit. Deals with stabilization ponds simplified network, sanitary pit, and about low-cost sanitation systems. Presents conclusions and characteristics related to the use of reduced discharge hygienic bowls and calculation examples of the indicated pits types.

/ SANITARY SEWERAGE / LATRINES / EXCRETA DISPOSAL / COSTS / BRAZIL /

CEPIS

14.104 20949 MUÑOZ VARGAS, H.I. UNIVERSIDAD DE SAN CARLOS DE GUATE-  
MALA (GUATEMALA, GT). FACULTAD DE INGENIERIA.  
DISPOSICION DE BASURAS EN LOCALIDADES DE ESCASOS RECUR-  
SOS ECONOMICOS. GUATEMALA (GT), S.N., 1973. 83 P. PLANS, REFS.  
SPANISH. CIVIL ENGINEERING.

/ SOLID WASTES DISPOSAL / RURAL AREA / RURAL SANITATION / GUATEMALA /

CEPIS

14.105 21779 FEACHEM, R.G., MARA, D.D., IWUGO, K.O. IBRD (WASHING-  
TON, D.C., US).  
ALTERNATIVE SANITATION TECHNOLOGIES FOR URBAN AREAS IN

AFRICA. WASHINGTON, D.C. (US), IBRD, 1979. 186 P. REFS. (IBRD. P.U. REPORT, RES-22). ENGLISH.

/ EXCRETA DISPOSAL / COSTS / URBAN AREA / URBAN SANITATION / DEVELOPING COUNTRY / AFRICA /

CEPIS

14.106 22551 NIMMIGHT, G.P. UNIVERSITY OF THE PHILIPPINES (MANILA, PH). SCIENCE EDUCATION CENTER, CENTRO INTERNACIONAL DE EDUCACION Y DESARROLLO HUMANO (MEDELLIN, CO).  
COMO Y PORQUE HACER UNA LETRINA. MDELLIN (CO). CINDE, S.D. S.P. SPANISH.

/ LATRINES /

CEPIS

14.107 23267 CENTRO REGIONAL DE AYUDA TECNICA (MEXICO, MX).  
MANUAL PARA EL DISEÑO, OPERACION Y MANTENIMIENTO DE TANQUES SEPTICOS. MEXICO (MX), CENTRO REGIONAL DE AYUDA TECNICA, 1960. 107 P. (PUBLIC HEALTH SERVICE PUBLICATION, 526). SPANISH.

/ SEPTIC TANKS / EXCRETAS /

CEPIS

14.108 25265 MATEO, M., VERASTEGUI LAZO, J., ASCUE CONTRERAS, J., CASTILLO, M. INSTITUTO DE INVESTIGACION TECNOLOGICA INDUSTRIAL Y DE NORMAS TECNICAS (LIMA, PE). DIVISION DE INDUSTRIAS DE PRODUCCION DE ALIMENTOS Y AFINES.  
SITUACION ACTUAL Y PERSPECTIVAS DE LA APLICACION DE LA TECNOLOGIA DE BIOGAS EN EL PERU. LIMA (PE), ITINTEC, 1984. 50 P. MAPS, ILLUS., TABLES. DT/DIPA-001. SPANISH.

/ BIOGAS / APPROPRIATE TECHNOLOGY / BIOGAS DIGESTORS / RURAL AREAS / PERU /

CEPIS14.109 25635  
OPS (SAN SALVADOR, SV).

SITUACION Y PROYECCIONES DEL ABASTECIMIENTO DE AGUA POTABLE Y DISPOSICION DE EXCRETAS EN AREAS PERIURBANAS Y RURALES DE EL SALVADOR. SAN SALVADOR (SV), OPS, 1984. 44 P. MAPS, TABLES. SPANISH. SIMPOSIO REGIONAL SOBRE ABASTECIMIENTO DE AGUA POTABLE Y DISPOSICION SANITARIA DE EXCRETAS EN AREAS URBANAS MARGINALES. SANTIAGO (CL) 5-9 NOV. 1984.

/ RURAL WATER SUPPLY / EXCRETA DISPOSAL / PRECARIOUS SETTLEMENTS / EL SALVADOR /

CEPIS

14.110 05351 SERVICIO DE AGUA POTABLE Y ALCANTARILLADO DE AREQUIPA (AREQUIPA, PE), GITEC CONSULT, QMBH (AREQUIPA, PE). EFECTOS MACRO Y SOCIOECONOMICOS DE LA REALIZACION DE LOS SISTEMAS DE ABASTECIMIENTO DE AGUA A PUEBLOS JOVENES. AREQUIPA (PE), GITEC CONSULT, QMBH, 1983. 14 P. TABLES. SPANISH.

This study presents the macro and socio-economical effects in relation to drinking water supply to squatters and mainly emphasizing on saving water, an affordable water tariff in relation to low-income population, rotating fund to finance domiciliary connections and minimum facilities to low-income populations.

/ WATER SUPPLY / PRECARIOUS SETTLEMENTS / SOCIO-ECONOMICAL ASPECTS / FEASIBILITY STUDY / PERU (AREQUIPA) /

SEDAPAR

14.111 06357 URBINA GONZALEZ, L., CASSANOVA ZUÑIGA, D. UNIVERSIDAD DE VALPARAISO (VALPARAISO, CL). FACULTAD DE MEDICINA. COSTUMBRES SOBRE SANEAMIENTO BASICO EN POBLACION SUBURBANA. ESTUDIO DE VIÑA DEL MAR, CHILE. IN: BOLETIN DE LA OFICINA SANITARIA PANAMERICANA. WASHINGTON, D.C. (US), 94(5), MAYO 1983. P. 482-494. ILLUS., TABLES, 17 REFS. ISSN 0030-0632. SPANISH.

Describes the main basic sanitation habits of people of a marginal suburban population of Viña del Mar, Unidad Vecina Chile Sur, which may be the basis to elaborate education programs. A survey was carried-out in 242 dwellings finding that 87% of dwellings were connected to the drinking water network, 84.9% had their own connections to public sewerage and 82% had municipal garbage collection periodically. In dwellings where drinking water was carried from outside, 58% did not use clean containers and protected against vectors, and only 27.8 boiled water before consumption. A 47% of the families threw garbage into inadequate containers exposed to flies and 4.9% poured the garbage in an open field. Vector control was made by spraying insecticides in 93.8% of the dwellings, but only 2.9% protected doors and windows with wire netting. The questionnaire used is enclosed.

/ BASIC SANITATION / PRECARIOUS SETTLEMENT / CHILE (QUINTA REGION, VIÑA DEL MAR) /

CIRISCA

14.112 06809 ANJOS, G.R.F. FUNDACAO ESTADUAL DE ENGENHARIA DO MEIO AMBIENTE (RIO DE JANEIRO, BR). FAVELA DE ACARI - PERIODO NOVEMBER DE 1980 A DEZEMBRO DE 1982. RIO DE JANEIRO (BR), FEFMA/FINEP, 1983. 1 V. ILLUS. PORTUGUESE.

The report describes the sanitary sewerage systems and rain water drainage carried-out in the Acari squatter, where technical assistance was requested to the ecodevelopment project for the development of community works, projects' elaboration and follow-up of the works carried-out

under Cruzada Sao Sebastiao coordination, with resources donated by the Child International Year Campaign, promoted by the Globo Network television.

/ SEWERAGE / PRECARIOUS SETTLEMENTS / BRAZIL (RIO DE JANEIRO, RJ) /

FEEMA

14.113 06816 SOUZA, A.P., ANJOS, G.R.F. FUNDACAO ESTADUAL DE ENGENHARIA DO MEIO AMBIENTE (RIO DE JANEIRO, BR).  
DIMENSIONAMENTO DE COLETORES TRONCO EM FAVELAS DE ENCOSTA. RIO DE JANEIRO (BR), FEEMA, 1983. 14 P. ILLUS. PORTUGUESE.

The main line collectors to collect and transport sanitary sewage from hillside squatters must be qualified through an special process, that takes into account the flow in big slopes and the economical aspects to make feasible its use in vast areas. Authors propose a hydraulic design system, with a basis on this type of project studies for the Salgueiro squatter in Rio de Janeiro, and in experimental and technical studies available in the technical literature for lines and channels in great slopes.

/ SEWERAGE / PRECARIOUS SETTLEMENTS / COLLECTOR CHANNEL / BRAZIL (RIO DE JANEIRO, RJ) /

FEEMA

14.114 06817 SOUZA, A.P., ANJOS, G.R.F. FUNDACAO ESTADUAL DE ENGENHARIA DO MEIO AMBIENTE (RIO DE JANEIRO, BR).  
PROJETO DE ESGOTAMENTO SANITARIO DA FAVELA DO SALGUEIRO. RIO DE JANEIRO (BR), FEEMA, 1983. 1 V. ILLUS. PORTUGUESE

A simple way to study, determine volumes, represent and budget sewage networks for hillside squatters, using as study case, the Salgueiro marginal quarter. Innovations were proposed for the design and for the building method. Two types of budgets are elaborated, to construct through contractors or, as in this case, with the help of all the community.

/ SEWERAGE / SEWERAGE NETWORKS DIMENSION / PRECARIOUS SETTLEMENTS / BRAZIL (RIO DE JANEIRO, RJ) /

FEEMA

14.115 08434 BRASILEIRO, M.F., GRIFFIN, K.  
MUTUAL HELP AND THE MUNICIPALITY IN ROCINHA. EARTHSCAN (LONDON, GB). WHO PUTS THE WATER IN THE TAPS COMMUNITY PARTICIPATION IN THIRD WORLD DRINKING WATER SANITATION AND HEALTH. LONDON (GB), EARTHSCAN, 1983. P. 71-77. ENGLISH.

Explains joint activities developed by municipal authorities and the Rocinha squatter, Rio de Janeiro, Brazil, stimulated by a UNICEF program to

improve welfare in this marginal quarter. It gives attention to the sanitary aspect, as well as education, both children and adults. Provides recommendations on the basis of results obtained in this experience.  
/ COMMUNAL PARTICIPATION / PRECARIOUS SETTLEMENTS / SANITATION / BRAZIL  
(RIO DE JANEIRO, ROCINHA) /

CEPIS

14.116 09855 REGO, R.G. DO. PREFEITURA DE OLINDA (OLINDA, BR).  
EXPERIENCIA DE SANEAMENTO DE BAIXO CUSTO EM OLINDA (PROJETO PILOTO TRIANGULO DE PEIXINHOS). LIMA (PE), CEPIS, 1985. 21 P. PORTUGUESE. SEMINARIO REGIONAL DE INVESTIGACION SOBRE ALTERNATIVAS DE TECNOLOGIA DE SANEAMIENTO DE BAJO COSTO PARA ZONAS URBANAS MARGINADAS. LIMA (PE) 15-19 JULY 1985.

Presents the urban sanitation project of the Peixinhos Triangle prefecture which has a high population density of 384.3 inhabitants per acre. Exposes a general explanation of the problem, the municipal action proposal, project justification, area description and execution methodology. Describes the sequence of interventions and the alternatives adopted, daily garbage collection, sanitary landfills, micro-drainage, pavement, basic sanitation, wastes compost, introduction of a community center, sanitary education, housing improvement, project evaluation and monitoring.

/ BASIC SANITATION / URBAN SANITATION / PRECARIOUS SETTLEMENTS / BRAZIL  
(RECIFE, OLINDA) /

CEPIS

14.117 09925 FIGARI GOLD, E. CONCEJO PROVINCIAL DE LIMA (LIMA, PE).  
PROGRAMA ESPECIAL DE HABILITACION URBANA DEL AREA DE HUAYCAN. LIMA (PE), CEPIS, 1985. 25 P. SPANISH. SEMINARIO REGIONAL DE INVESTIGACION SOBRE ALTERNATIVAS DE TECNOLOGIA DE SANEAMIENTO DE BAJO COSTO PARA ZONAS URBANAS MARGINADAS. LIMA (PE) 15-19 JULY 1985.

Describes the special set up of the Huaycan area, as a non-concentrated organism of the Lima Municipality, in charge of planning, projecting, promoting, coordinating, negotiating resources and executing the occupation and development of Huaycan. Presents Huaycan situation as an invaded settlement which has six thousand families incorporated to the urban habilitation process. It indicates its organization, communal development, sanitation aspects and the cooperation actions that CEPIS provides in this area. Explains the lineaments of the Huacan program, which if after developing a satisfactory human settlement and a new ecological equilibrium. It refers to vicinity organizations denominated housing community units (HCU), indicating their advantages and the development possibilities of appropriate technology in the local transportation, energy use, self-built blocks, use of water, use of wastes and self-made furniture. Attaches a descriptive memoire of the program.

/ PRECARIOUS SETTLEMENTS / SANITATION / PERU (LIMA, HUAYCAN) /

CEPIS



14.118 25606 GAVIDIA, J. HABITAT (NAIROBI, KE).  
SERVICIOS DE INFRAESTRUCTURA BASICA EN LOS ASENTAMIENTOS  
HUMANOS PRECARIOS. NAIROBI (KE), HABITAT, 1984. 21 P. SPANISH. CON-  
GRESO INTERAMERICANO DE INGENIERIA SANITARIA Y AMBIENTAL, 19. SANTIAGO  
(CL) 11-16 NOV. 1984.

/ RURAL SETTLEMENTS / PRECARIOUS SETTLEMENTS / WATER SUPPLY / RURAL  
AREAS / URBAN AREAS /

CEPIS

14.119 25607 MARTINEZ GARCIA, J.M.  
SERVICIOS DE AGUA POTABLE Y DRENAJE EN ZONAS MARGINADAS  
DE LA CIUDAD DE MEXICO. MEXICO (MX), S.N., 1984. 6 P. SPANISH. SIMPO-  
SIO SOBRE AGUA POTABLE Y ALCANTARILLADO EN ZONAS URBANAS MARGINADAS.  
S.L. NOV. 1984.

/ PRECARIOUS SETTLEMENTS / WATER SUPPLY / URBAN AREAS / MEXICO /

CEPIS