UPGRADING OF SUBSTANDARD HOUSING IN PORTUGAL

Planning Strategies for the Technical Improvement of Marginal Settlements (Case Study: The Casal Ventoso)

by

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Submitted to the Department of Architecture,
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ABSTRACT

The primary scope of this thesis is to deal, from a technical standpoint, with the implementation of the upgrading concept in marginal sttlements in Portugal.

It consists mainly of two parts: The rationale of the concept, and technical strategies applied to a chosen prototypical case study area in Lisbon. A thorough explanation of the upgrading policy is given in Chapter 2.0, where social, political and economical issues are dealt with.

The core of the thesis is found in Chapter 4.0, where intermediate technologies for sanitation are exposed and compared, after which a number of options are chosen as suitable for the case study. Included also is an economic comparison of technologies based on investment and recurrent costs.

This work aknowledges the policy factors associated with the concept, yet, does not focus deeply on these, but rather on technical approaches to housing improvement.

Thesis Supervisor: Dr. Eric Dluhosch
Title: Associate Professor of Building Technology

To my late grandfather José Gago de Medeiros, without whom my will to study abroad would not have come to reality.

To the Municipality of Lisbon, a token of my love for that city, and to its honorable president, Engº Nuno Abecassis, who expressed his utmost interest for works of this nature, and opened all doors to the gathering of literature and maps for the accomplishment of this thesis.

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INTRODUCTION

The urban growth in the aftermath of the Second World War, along with national and/or local governmental policy - or the lack of it - in developing areas, led to an exacerbation of substandard housing in and around most cities of the Third World. The informal sector began, hence, to take shape on both physical and economical grounds inasmuch as a great deal of income generating businesses such as petty trade shops, "doorstep" groceries and the like, began to play a major role in these people's revenues, and remain often unaccounted for in economic studies.

The study of the uncontrolled takeover of public lands and illegal construction, began in the late 1950's, when city planners and representatives realixed that matters were getting out of hand. The first approach was to tear down every illegal unit using force as a policy tool. Bulldozing was a common procedure in those days, and, curiously enough, it is still considered, in some areas, to be the best remedy to remove such settlements. People were moved from their communities into public housing often farther away from their place of work and former dwelling location. Sometimes, action would take place shortly after they had moved in, yet, at some other times, only after a considerable period which could be as much as thirty years of continous occupancy of their "illegal" project.

If the former (immediate action) can be called removal or relocation, the latter has much more of an uprooting character, e.g., the deprivation of community traditions and kinship ties that had been established over the years. Moreover, and in the mean time, governments began to witness the increasing failure of public housing projects which, in most cases, tend to isolate people instead of regrouping them. The horizontal stratification of single family houses in marginal areas was suddenly changed into a vertical isolation of apartment walkups, where people simply did not bother to know who lived next door. Public multi-storey buildings - and I have seen quite a few in Brazil - look completely deteriorated after only a few years, as if they had been standing there for a good many decades unattended. Open spaces are totally neglected, as are common circulation areas such as stairways, pathways, corridors, etc. Facades are bare reminders of the inauguration date, with improvised extensions throughout illegally made by dwellers, and cracks, peelings, discoloration, graphiti, etc. on the walls.

"We are now in a second generation of discussion" says Janice E. Pearlman (Bibliography No. 19) referring to the shift in urban policy in the past twenty years. By the end of the 1960's and after the failure of postwar projects, planners had reached the following conclusions :

1) Marginal Settlements were not a problem to be solved but,

from a resident's standpoint, a rational approach to the need for inexpensive and well located housing.

2) They were not marginal to urban society but a part of it, insofar as physical, social and economical aspects were concerned.

3) Relocation to medium-rise buildings was but a palliative to the exponential problem of housing demand. That is to say, that the housing deficit has actually grown at a much higher rate than population. Hence, we are witnessing an evergrowing demand for housing, and the erradication of marginal settlements is not the way to go about it, regardless of what kind of housing will be provided to resettle the people, not to mention the cost of the latter.

4) Legalization and on-site upgrading were recommended as the most appropriate, immediate strategy to relieve the aforementioned deficit, as we will se in Chapter 2.0.

This thesis deals with the technical aspects of the upgrading concept. In saying this, we are not neglecting the other social and political issues, and, in fact, these have to be outlined and accounted for, as I will "set the scene" for the implementation of any chosen strategy. The methodology, in our case, was to choose a typical marginal settlement in Lisbon, characterized by a good number of substandard housing,

heavily overbuilt and overcrowded. It will be used as a prototypical example to identify the major problems affecting such settlements, and search, from a technical standpoint, for alternative approaches.

Chapter 1.0 elucidates the broad scope of the geographical, social and political characteristics of Portugal. Economic and industrial trends are also discussed prior to, and after the 1974 coup d'état. The second part of that chapter deals with the urban context of Lisbon and the different housing types encountered, among which the thesis case study is included.

Chapter 2.0 focuses on the rationale of upgrading, i.e., the social and economical background for the development of the thesis. An attempt has been made to thoroughly explain the concept and to confront it with other strategies taken in the past. In other words, it attempts to prove, on a comparative basis, that alternative policy decisions are feasible, given the means for intermediate technologies in housing and service improvements available today.

Chapter 3.0 describes the site, its parameters and constraints. The outcome of this chapter is the identification of the major problems facing the community, as well as a ranking of priorities to be tackled in the forthcoming section.

Finally, Chapter 4.0 provides technical alternatives for the problem encountered. Sanitation options are described and compared on technical and economical grounds. The social acceptability of some designs is also dealt with, after which a number of technologies are recommended to meet the site's specific requirements. At the end, a set of conclusions are drawn.

CHAPTER 1.0 THE COUNTRY

Fig. 1.1 Portugal and Europe

1.1. THE NATIONAL CONTEXT

Continental Portugal, located on the Soutwest of Europe, is bathed on the West and South by the Atlantic Ocean, and shares the Iberian Peninsula with the neighbouring Spain, on the East and North (fig. 1.1).

The country bears a rectangular-like shape of approximately 90.000 square kilometers, spanning from $42^{o}9'$ North to $36^{o}57'$ South. Lisbon, located on the mid-western section at the mouth of the river Tagus (Tejo), is the capital and major trade center, bordering the country's largest water source. This river is, as such, the natural boundary between the contrasting Northern and Southern regions of Portugal, with regard to climate, landscape, culture and types of urban and rural settlements.

The sea has always played an important role in the country's history and economic development. Medieval Portugal was essentially agrarian, yet, the people along the shoreline were also devoted to fishing and coastal navigation. This acquaintance with the sea allowed for the country to develop sea-borne trade and become, in the 15th Century, a pioneer of the great marotime discoveries which lasted for about a century.

Insofar as climate is concerned, let it be said that Portugal is mediterranean by nature, and Atlantic by geographical si-

tuation. Here again, we see a clear distinction between the North and South, where the former is, in general, more humid and cooler than the latter. Lisbon, however, has a fairly mild and pleasant climate, ranging from 10^{o} C to 32^{0} C, with an average annual temperature of 17^{o} C.

1.1.1. Population

In the 1970 census Portugal had a total of 8.123.310 inhabitants, the density being 90.6 inhabitants/km^2. As of 1977, however, these figures have increased to some 9.245.800, due in part, to the influx of returnees from the former African colonies. This issue will be briefly touched upon later in this chapter.

The populations is distributed in quite an irregular fashion, for the northern region bears a much higher density than the southern, the same condition being found along the seashore, if compared to the countryside (fig. 1.3). The overcrowding of the seashore areas is aggravated even more if one analyzes separately the districts of Lisbon and Oporto, which represent 6 percent of the continental area , and account for one third of the country's population. They are also responsible for three-quarters of the active population in the secondary and tertiary sectors.

The idea of emigrating has always been a Portuguese trait.

During the 15th Century, and as a result of the will to discover new continents, and the desire to find potential outlets for sea-borne trade, the Portuguese had reached almost every continent in the world, and many settled on a permanent basis whenever they reached land. From the 16th Century onwards, the reason for migration became a purely economical one: Job opportunities, cheap land in undeveloped areas, etc. By the 19th Century the number of migrants to Brazil, North America and Venezuela was extensive. After 1955 we encounter a flow of migration to Western Europe, namely France and West Germany, where wages were considerably higher than in the motherland (fig. 1.2)

Fig. 1.2 Legal Emigration

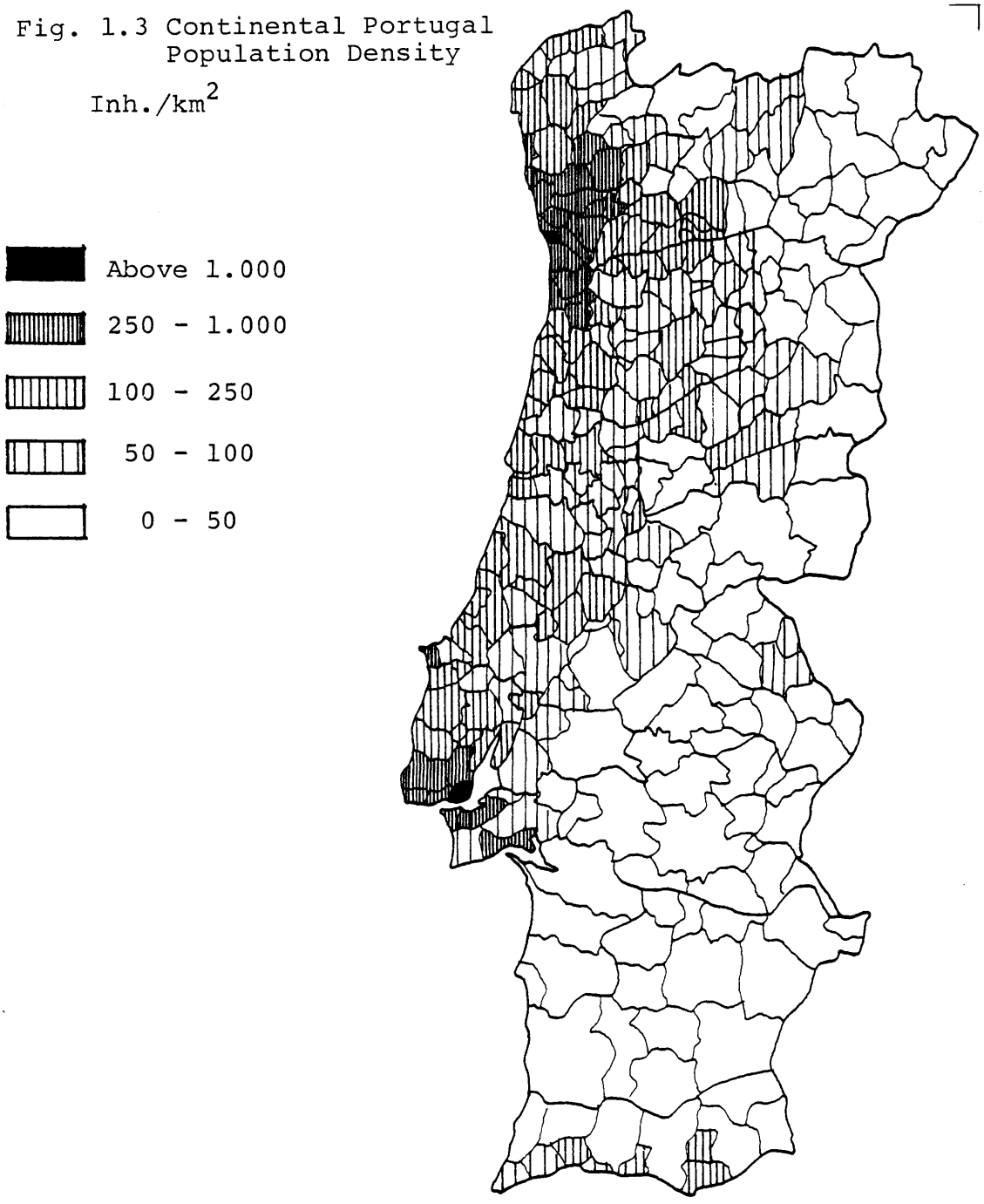
Years	Total	France	W.Germany	Canada	U.S.A.	Venez.	Brazil
1966	105.880	73.414	9.685	3.041	6.580	1.702	2.398
1970	54.099	21.959	19.755	2.252	4.377	938	1.557
1973	66.636	20.329	31.437	3.044	4.440	1.231	771
1974	26.631	11.096	3.039	3.563	4.864	589	535
1975	14.106	2.767	1.071	2.479	4.197	407	1.526

Source: Condensed from Anuário Estatístico 1980 (Bibl. No. 7)

Today, for example, we encounter more people from the Azores living in New England and Canada (appr. 500.000) than in their native islands (180.000).

Fig. 1.3 Continental Portugal
Population Density

Inh./km^2



Source: Ministério da Habitaçao
e Obras Públicas (Bibliography No. 16)

If, however, the situation prior to the revolution of 1974 was characterized by an outflow of people, after that period the trend has radically changed, with the arrival of nationals from the ex-colonies, who, during the first postrevolutionary years increased the continental population by over a million. Although we admit that a great percentage of the aforementioned figure has been absorbed by the several programs undertaken by the authorities (shelter, welfare, housing credit, etc.) they are, on the other, partially responsible for the aggravation of the housing deficit, and the growth of uncontrolled , or illegal settlements around the urban centers.

1.1.2. Economy and the Portuguese Industry

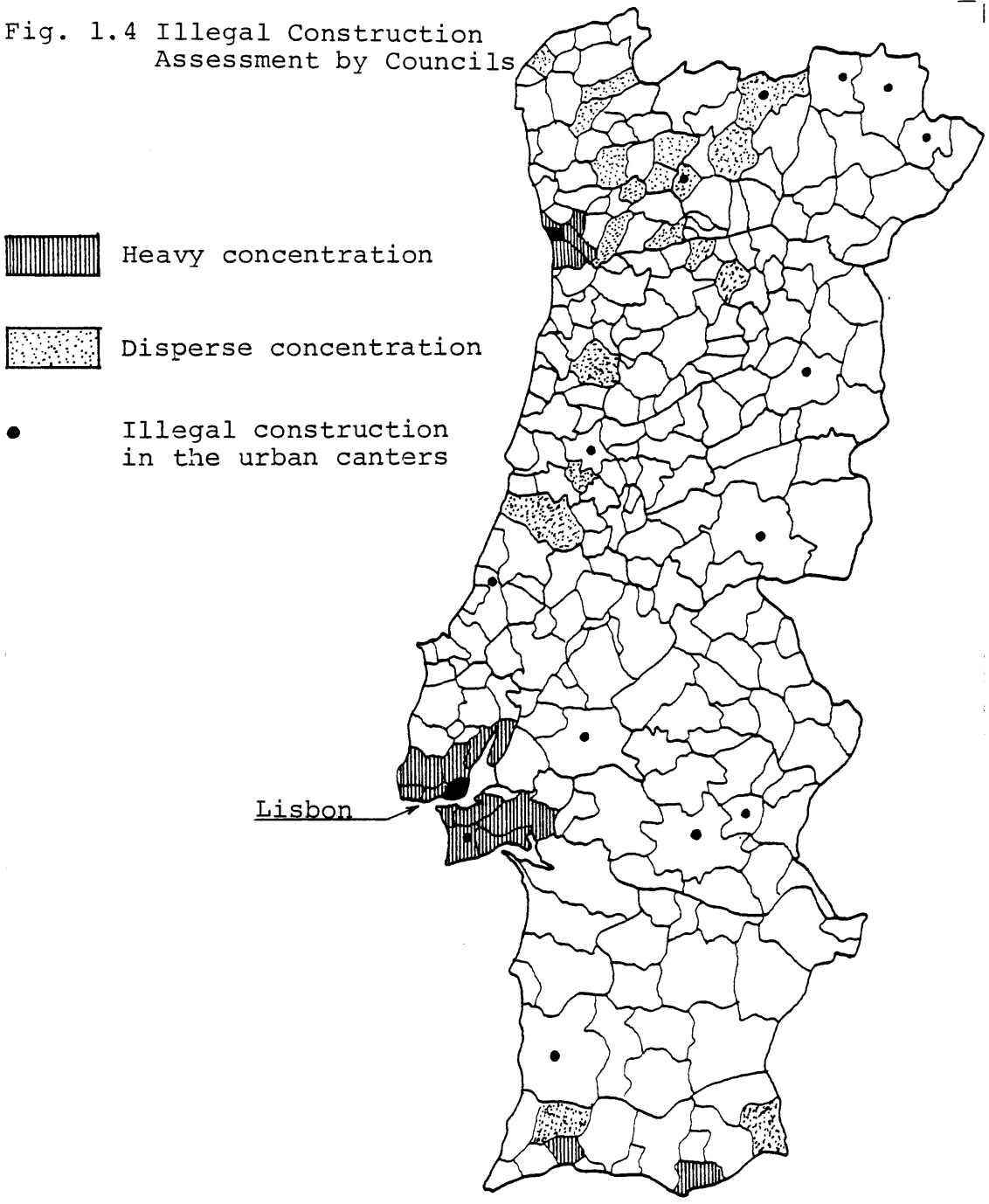
The Portuguese economy was already showing signs of desiquilibrium prior to the revolution of 1974 as a result of the increasing rate of both the inflation and the deficit in the balance of trade. In spite of the relatively high rate of annual growth (7 percent during the 1968/73 period) the country displayed a socially peaceful "facade" which was not quite what it appeared to be. There were, in fact, serious problems among all sectors of the economy, worsened by strict governmental control over the unions. The situation in the industry was somehow stable before the coup d'état, inasmuch as the average annual growth of industrial products had been of 10 percent during the 1968/73 years. This sector accounted

for 35 percent of the active labour force and was predominantly composed of small entrepreneurs who had neither the economic backing nor the technical know-how to cope with the larger West European companies. Fifty percent of the industries which too part in the Portuguese industrial world had but a few employees, never more than ten. only a small portion had the technological and financial means of international status, usually in the hands of powerful groups of investors who also controlled other sectors of the economy through channels such as tourism, insurances, newspapers, etc. By 1973, the average income per capita was estimated to be U.S. 1.300 dollars.

After the 1974 coup, the industry, which was, for the most part, in private hands, suffered radical changes, for many companies were nationalized, and others collapsed when the government imposed a national minimum salary which part of them would not sustain.

The political instability felt during the aftermath of the revolution also frightened the private investors, resulting in a 38.6 percent decrease in gross fixed capital formation in 1976. By the end of 1978, however, the wheels of the industrial sector began to gradually move again, and efforts were made to accelerate the delivery of basics such as chemical and metallurgical materials. Today, after almost a decade, Portugal is striving to catch up with the pre-revolu-

Fig. 1.4 Illegal Construction Assessment by Councils



Source: Ministério da Habitaçao e Obras Públicas (Bibliography No. 16)

tionary production figures in all sectors, especially the construction field, which had been, by and large, affected most seriously.

1.1.3. Substandard Housing vs. Governmental Action

There is a general tendency to assume substandard housing as illegal, and vice-versa. Although the link can be made in most cases, there is a difference in meaning which sould be clarified. As Prof. Lisa R. Peattie says, illegal, or irregular is

> "...a question of land sales and subdivision which was neither regulated by the municipality planning authorities, nor in accordance with official subdivision standards."
> (Peattie, L.R. Bibliography No. 22)

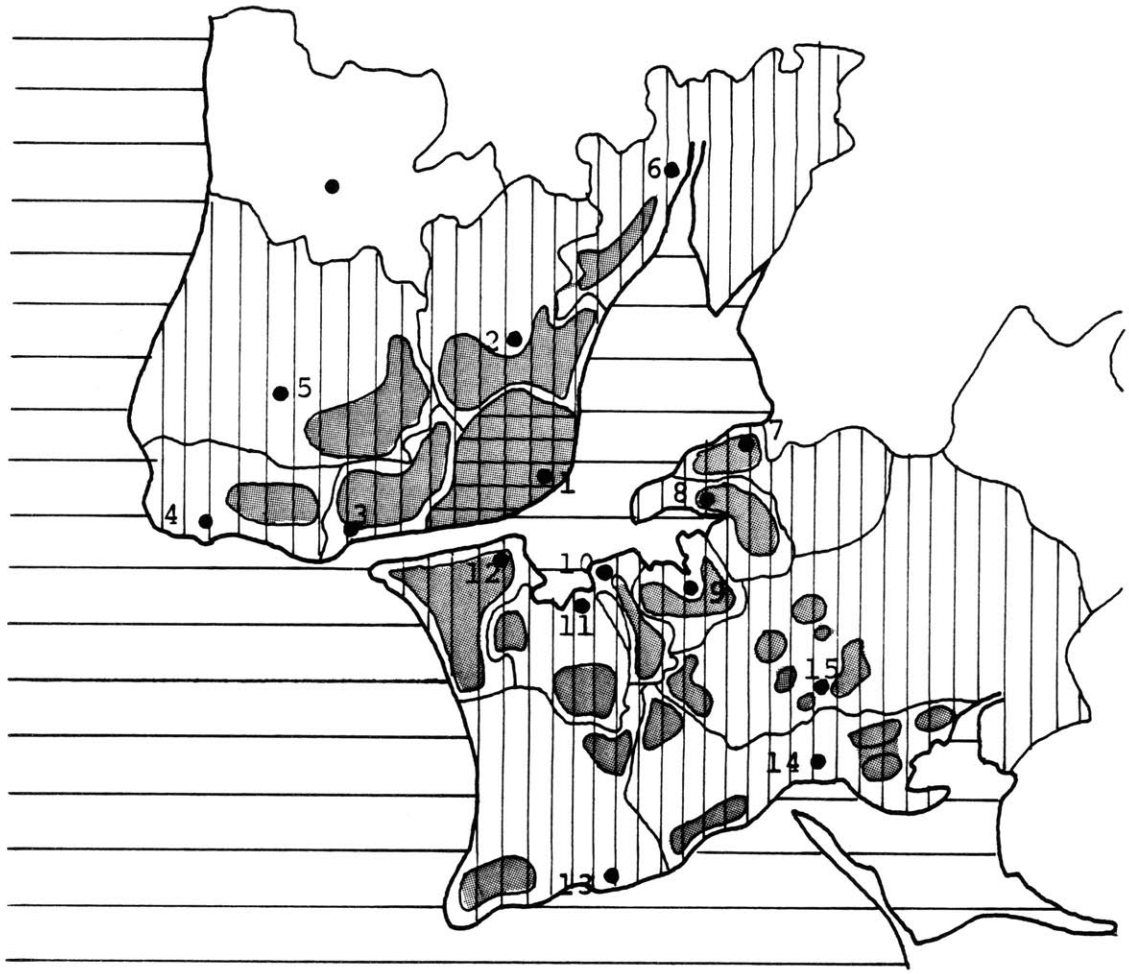
Lisbon and Oporto, the major Portuguese urban centers, are full of examples of irregular housing, such as the so-called "satellite" settlements on tne outskirts, where land is affordable and available to speculators who often put up entire neighborhoods without official consent of the municipality. Some, however, cannot be labelled as substandard insofar as they offer many utilities and minimal licing accommodations which are similar in character to standard, or livable units. On the other hand, it is true that the great majority of clandestine construction in and around Lisbon lack part of basic services, if they possess any at all. Whether on public or private land, hillside or flat sites,

inner or outer areas, the fact is that in Lisbon, according to the 1970 census, only 52 percent of the city's overall dwellings had , at the same time, water, electricity and hygienic facilties (fig. 1.7). The reasons for such a high percentage of substandard and illegal housing are no different from any other countries in the Third World. Portugal, in facts, though geographically, considered as part of Europe, may be regarded as a Third World country, considering her economic and social status.

During the early 1950's the country experienced a major increment of industrial activities along the coast where people from the countryside were moved in search for a better living and employment opportunities. Industries were heavily concentrated around Lisbon and Oporto (with few exceptions along the atlantic coast), thus, generating an unexpected overcrowding of the urban surroundings. This one-way migratory process is commonly accepted as a major factor for the inadequate planning exerted by municipal authorities, and Lisbon is, de facto, part of this universe.

The case study used in this thesis as a proptotypical example of substandard housing, the Casal Ventoso, is a much older settlement than those generated by the industrial growth and cannot, therefore, be included as such. Its particular history will be decribed later in Chapter 3.0 when I will deal specifically with this area.

Fig. 1.5 Illegal Construction - Lisbon's Surroundings



Disperse construction

Heavily concentrated construction

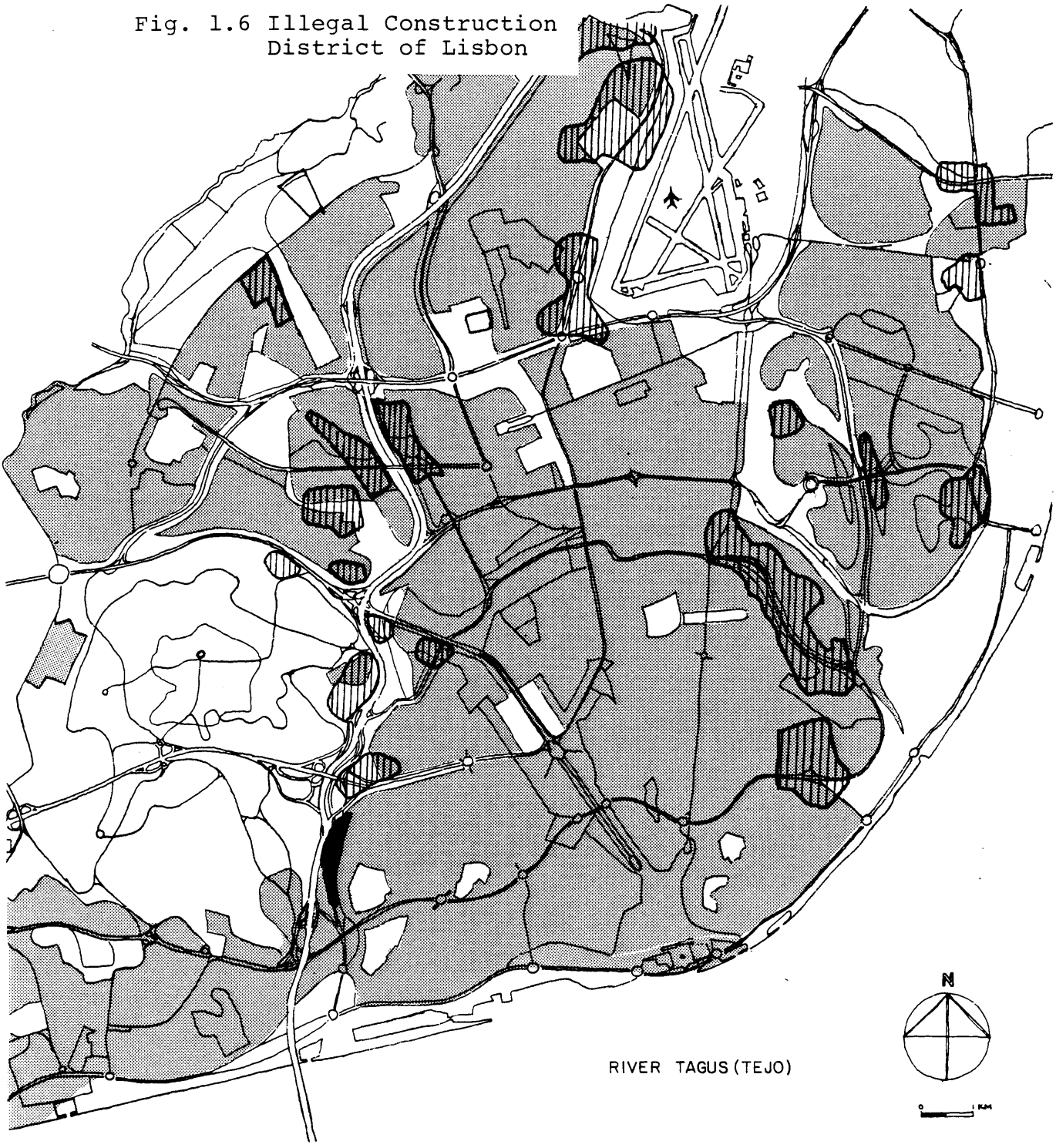
Number of units

1 - 10.000	8 - 920
2 - 11.126	9 - 1.237
3 - 11.758	10 - 1.113
4 - 3.446	11 - 1.404
5 - 3.867	12 - 6.217
6 - 4.000	13 - 2.336
7 - 108	14 - 1.779
	15 - 1.181

TOTAL : 60.492 units

Source: Ministério da Habitaçao
e Obras Públicas (Bibliography No. 16)

Fig. 1.6 Illegal Construction
District of Lisbon



In 1977, the Portuguese Ministry of Housing had detected some 64.000 clandestine dwellings in Lisbon and the metropolitan area, and these figures are expected to be even higher in the following surveys.

Thirty years ago, these settlements would appear in a radial fashion, i.e., every new development would be farther away from the downtown area than the preceding one. After 1974, and partially due to the return of nationals from Africa, a new phase began, characterized mainly by the filling in of open spaces within the city.

The informal sector had reached, by then, such a degree of expansion that the government was forced to intervene. Attempting to improve, or renovate the Areas Degradadas (degraded areas) the State created the S.A.A.L. organism - Local Service for Ambulatory Aid - who, through the municipal councils, was supposed to encourage private initiatives, so that the urban poor could transform and improve their living status. Each settlement designated as "degraded" was assigned a specific Brigada (brigade) of architects and urban planners who were to evaluate each case separately, and finally suggest economic, social and technical means by which the authorities could take action. Surveys were carried out in different communities but, truth is, they did not go much beyond much that stage. Concrete proposals appeared in some cases, yet, most of them suggested the partial or total removal of the popula-

tion into peripheral walkup apartment buildings. The fact is, that, in general, very little consideration was given to the people regarding their economical and social interests. These factors in a neighborhood community will be discussed more deeply in the forthcoming chapter when we take a look at the rationale of the upgrading concept.

The aforementioned proposals were severely criticized even before being subject to a superior evaluation. Whether because of the lack of basic data in the initial steps, or the naiveté of some of the physical proposals, the projects encountered such a strong opposition from the municipal architects in charge of analyzing them, that most were abandoned or had to be carefully revised. The hillside area used as a case study has a particularly intersting story concerning proposal vs. approval which I will describe in Chapter 3.0.

Nevertheless, a special remark has to be made with repect to the large urbanization project being carried out next to Lisbon's airport, the Alto do Lumiar. This is one of the proposals which survived the early stages of survey and appraisal, and is now being implemented, involving the renovation of a large parcel of land (300 Ha) adjacent to the airport grounds in which some 15.000 people were living in a mix of shacks and masonry dwellings. The project is probably the largest of its kind and, not surprisingly, one of the few. Its critique in depth is, however, beyond the scope of this thesis.

Fig. 1.7 Housing in Lisbon
Level of Utilities

Source: Adapted from Anuário Estatistico 1980 (Bibl.No.8)

LEVEL OF UTILITIES		NUMBER OF UNITS	%
Units in Buildings		476.725	95.36
Other Types of Units		20.125	4.03
Hotels and Similar		1.180	0.24
Mal-Defined Units		1.185	0.38
Units in Buildings	With Water	340.720	68.16
	With Private Latr.	356.250	71.26
	With fixed installation of bathroom and/or shower	286.190	57.25
	With Electricity	370.135	74.04
	With Kitchen	369.650	79.34
	All in one : Water, Bathroom, Electricity, kitchen	261.565	51.32
T O T A L		499.915	100.00

1.2 THE URBAN CONTEXT

Before we enter more deeply into a careful study of the case study area, let us have a general view of the difference among substandard housing types in Lisbon. This characterization, based on land tenure, construction quality, governmental policies and proximity to employment, will enable the reader to, later on, identify the case study in one of the categories. The classification was done, to a great extent, with the aid of Professor Anthony Leeds, an Anthropologist at Boston University who has carried extensive research in this field, and particularly, in Portugal (see Bibliography).

Excluded from this analysis, however, are the traditional centennial settlements in the very core of Lisbon, such as the Bairro Alto and Alfama. Inasmuch as these are part of the city's social and historical development - many bearing a mix of high and low-income residents, from luxurious hotels and restaurants to four-storey cortiços (dense-packed tenement buildings) - very little can be suggested aside from the physical and social upgrading of some units within these communitites. Bairro Alto, for instance, is probably the most "typical" area of Lisbon, with an imense variety of restaurants and picturesque inns. At night, prostitutes abund along the narrow streets, a business which certainly accounts for a large percentage of the neighborhood's income.

1.2.1. The Squatter Settlement

The first group comprises the conventional squatter settlement, as universally understood. A group of housebuilders, or squatters, invades a piece of land, whether public or private, and erect a number of shacks in a short period of time, so as to show his/her intention to settle on a permanent basis, as well as to make governmental or private action physically, juridically and even phsychologically more difficult [1]. Squatters are probably the most common type of irregular, or substandard housing throughout the Third World. Oddly enough, they also appear in Europe among the industrializing nations like Portugal, Spain, Greece, Turkey and, surprisingly, France (in the form of bidonvilles).

They are, of course, under permanent threat of removal, usually by the landowner's bulldozing actions. This often represents the loss of the squatter's investments in the dwelling and utilities. Although this kind of urban development is widely associated with poverty, Prof. Leeds contests that this is not always the case, as he explains:

> "...Government surpression, varied priorities of residents, removal experience, all play a role in chosing not to invest in the house, rather than, say, in land, insurance, education, stocks and inventories and so on." (Leeds, A. Bibliography No.12)

1.2.2. Government-Created Shack Towns

The Government-Created Shack Towns is very much in contrast with the first group, in the sense that it is not an universal type. In fact, we find it neither in Latin America, nor in Africa or Asia, which makes us believe that Portugal is, probably, one of the few examples having such a type, due perhaps to her social policy decribed hereafter.

In this case, the land is divided in a similar manner as a sites-and-services project, with some utilities. People erect their shacks under the surveillance of the municipal fiscais (inspectors), who prevent them from using permanent material such as brick, or concrete. Furthermore, these inspectors prohibit any sale, transfer, annexation with existing dwellings, subdivision, etc. Any disregarding of these "rules" will incur a fine, which varies accordingly to the degree of violation. In other words, any attempt to improve one's dwelling is declined by the authorities under the pretext that municipal housing (Casas Camarárias) will be provided in a near future. Eventually this "promise" will not be respected, for one can find in Lisbon a good number of tin-can neighborhoods in deplorable conditions, even worse than most favelas that I have known in Rio de Janeiro. They have existed for a long time now, and still "wait" for proper municipal housing to be provided.

Together with the chaotic condition of the residents, a monthly rent is charged upon the lots, thus, dragging any little money which might have been saved for improvement of living standards. One tends to believe that there is a policy to prevent these people from upgrading their social and physical status and, hence, perpetuate their impoverishment.

This inequitably oriented policy is even more aggravated if we take into account that there is an underlying support by the government to the private construction industries. After 1974, many industries, as well as other sectors, were nationalized. Banks, insurances, steel companies, transportation, all shifted from private to public hands. The civil construction sector, however, was one of the very few which remained in the private domain. Equally questionable was the government's failure concerning credit policy towards the socialist building cooperatives. Either by failing to extend credit, or by delaying it, the state caused a high level of bankrupcy, with a subsequent considerable benefit of the private construction firms.

1.2.3. Titled Plots Without Services

The Titled Plots Without Services, or Casas Clandestinas, are much similar to the suburbios of Rio de Janeiro, and throughout Latin America. Here, the housebuilder owns the plot, but builds without the approval of the local municipality. Usu-

ally, such settlements display a great variety in construction quality than the preceding cases, ranging from tin-can units, to masonry and concrete dwellings. The improvement of which will come gradually as the residents' financial capacity allow. This is a typical case where the housebuilder owns both the dwelling and the land, regardless of whether he rents the finished unit, or not. This is, nonetheless, a situation far from secure inasmuch as the houses are subject to fines as soon as they are erected. Yet, the residents take the risks, and often manage to "work things out" with local inspectors by means of what our biased, downward-looking eyes see as a bribe.

Although many settlement in Latin America under this category are alid out according to a pre-defined grid of streets and plots, in Portugal, this development assumes a somewhat different facade. Streets usually follow an "ad hoc" pattern and plots are sold, with no utilities, to private developers or large construction firms who, sometimes, put up an entire illegal neighborhood of 10-15 storey buildings (Case of the Brandoa development on Lisbon's outskirts, where a total of 20.000 people are housed in such conditions).

1.2.4. Pre-Fab Housing (Emergency Shelter)

Fourthly, we have the Pre-Fab low-income housing group, with the counterpart in Latin America under different names, like

Albergues and Parques proletários in Rio. In Lisbon, these are usually found around green areas, and as a result of flooding in lower areas in past years, or due to the return of nationals from Africa. They are always government controlled settlements and, therefore, little more can be said for the purpose of this work. One story, however, is worthy of note, and relates to the Casal Ventoso case study :

As we will confirm later in Chapter 3.0, the site is located next to a major thruway which connects the Southern parts of Lisbon (and the areas across the river) to the North. A visitor who enters the city from a Northern point and tries to reach the bridge (fig. 1.6, Chapter 1.0) has invariably to pass by the settlement of the case study. In early years, there was an enormous accummulation of shacks on the open space between the settlement and the highway (Ch. 3.0 fig. 3.4). By the mid 1960's the bridge over the river Tagus had reached completion, and a huge inauguration ceremony was to take place, with several foreign dignitaries invited. Thus, for prestige reasons, the government decided to remove the "unpleasant" settlement, and relocate the resident population into pre-fab emergency units on the East side of the airport. Visitors and foreign representatives would, hence, have a "clean" trip from the airport to the inauguration stand. The "temporary" neighborhood adjacent to the airport (the Bairro do Relógio) still exists after almost 20 years.

Similar cases occur in Latin American countries, where sometimes entire settlements are fenced off along a road for political reasons. When I was in Rio de Janeiro, two years ago, Pope John Paul II paid a three day visit to the city. The official program handed out by the government, stated that the Pope was to be carried by helicopter from the Galeão airport to his residence and, thus, "avoid" passing through Avenida Brazil , adjacen to the Favela da Maré. John Paul II, however, disregarded the program, and asked to be transported in an open car along the suburbios of Rio.

1.2.5. Municipal Housing

Finally, municipal housing can also be included as substandard, for most of the examples that I know of, are in a state of decay and poor maintenance. Residents in this category are not allowed to change their dwelling environment without the city's consent. What is more striking in these projects is the use and maintenance of open spaces which are osten neglected and devoid of proper care. It is a general rule in low-income public housing developments, that common spaces are "nobody" spaces and, hence, should be kept to a minimum when planned, or given very specific functions.

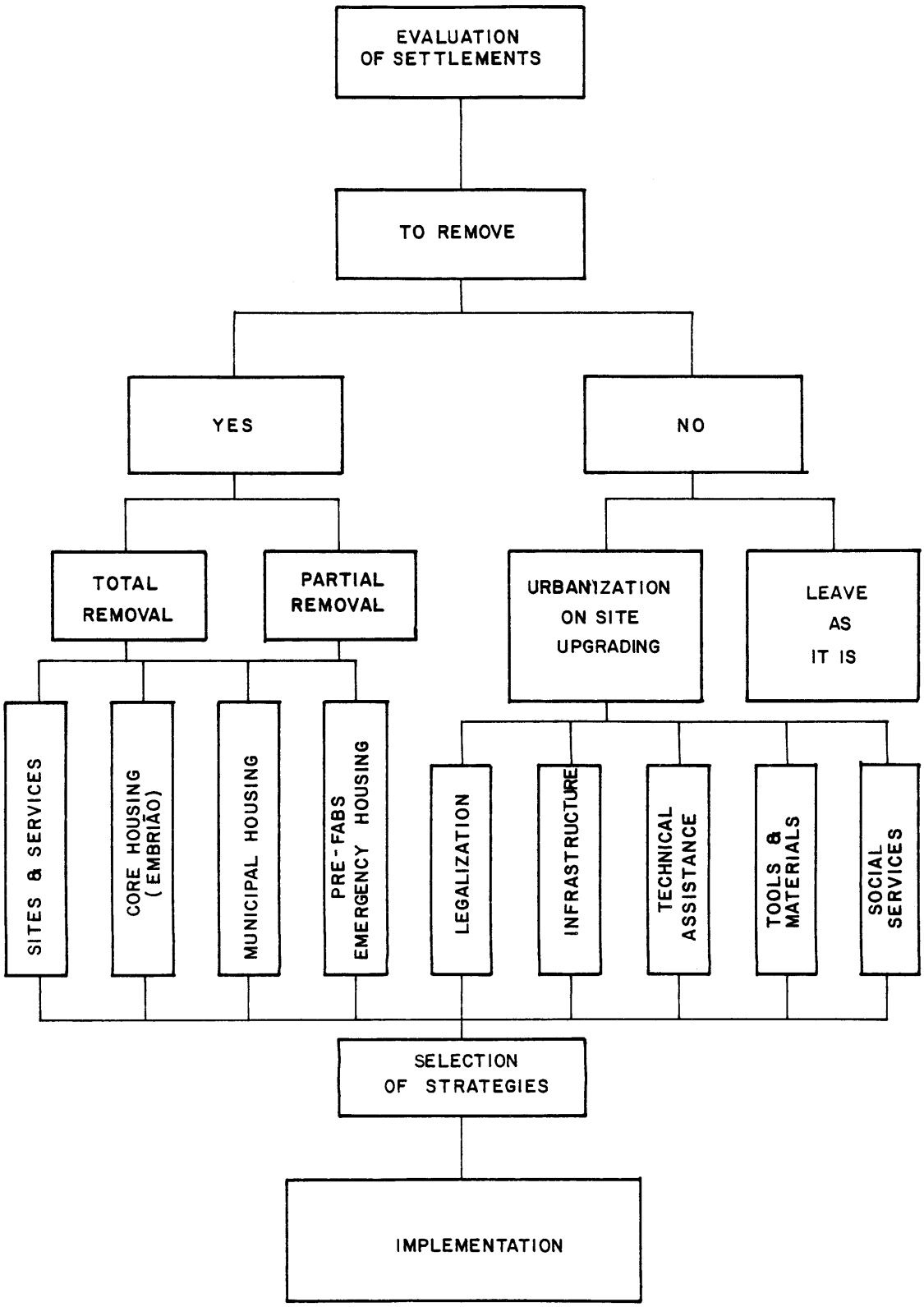
Since rents in Portugal are strictly controlled under governmental auspice which prevents raises, most of the units in the inner city areas (in private hands) are completely dete-

riorated. In the case of the private sector, landlords will not carry out any improvement, painting, or plastering whatsoever. Most of the buildings in the city are, therefore, in a state of decay with unpainted facades, cracked walls and broken window sills. Moreover, it is very common to find families paying insignificant rents such as U.S. $ 50-70 for large, conveniently located 5-6 bedroom houses or apartment buildings. When the head of the household dies, his son will "inherit" the rent - provided that he was living in the dwelling at least one year prior to the parent's death - with very little increases. A "modern" rent, or a newly signed rental agreement, on the other hand, is priced much beyond what the great number of middle-class people can afford, often taking as much as 50 percent of one's monthly income. The moment it is settled, however, it will remain constant for a long time (with small adjustments), and the percentual rate of one's wages allocated for house rent will tend to decrease over the years.

CHAPTER 2.0 UPGRADING RATIONALE

Fig. 2.1 Settlement Policy Diagram

Source: Janice E. Pearlman (Bibliography No.19)



As we saw in the Introduction, the upgrading of a community, and its social and physical implications has much to do with the development of a new thinking from the early 1960's housing debates. Rapid industrialization of the country in a comparatively short period of time, and the resulting overcrowding of cities surroundings, forced planners to look for new approaches other than the conventional bulldozing and relocation of illegal urban settlements. For the past twenty years, local governments, with the aid of international agencies such as the World Bank, USAID and the United Nations, have been carrying out tentative projects on settlement improvement through self-help, with a tremendous variety in final results, from absolute failure to total success. Third World countries, particularly the most needy for consistent short-term housing approaches, are often used by such agencies as "Guinea pigs" for trial experiences on new materials, sanotation techniques, and levels of housing provision. This should not be regarded as a prejudice, inasmuch as, to my knowledge, it is the only practical means to experiment new approaches and refine old ones.

It is clear, though, that such a policy may be the most appropriate in some cases, but less favorable in others. The degree of appropriateness which will dictate the successful outcome of such a development, will ultimately depend on the economical, social and political aspects of the country under study. Although the primary scope of this thesis is to focus

on the technical aspects of upgrading, all the others have to be considered for an overall understanding of the concept.

As political factors affecting the improvement of marginal settlement, we can estimate the following as key variables of a specific context :

1. Level of centralization of administrative organisms, and their success in enforcing laws, policies and programs. The less centralized the governmental body, the more effective will the implementation of such a policy be, at a local level.

2. Mutual aid and cooperation between settlement associations and agencies.

3. Agreement among all diferent "actors" of the housing scenario, namely houseowners, landowners, rentpayers, governmental authorities and the construction industry.

Economic factors will consist of :

1. Degree of indigenous and urban development. Countries exibit a great variety in housing characteristics, and each strategy is "limited" to a specific context to the extent that it depends on the combination of the aforementioned factors. Two African nations may not experience the same level of urban intervention, yet, on the other hand, the approach used for one of them may be also appropriate for an European nation such as Portugal.

2.Income distribution. Equalty vs. Inequalty.

3.Credit Policies and nature of financial organizations.

4.Levels of unemployment / underemployment.

5.Mortgage system, subsidies, etc.

Finally, social factors include :

1.Cooperative behaviour of the settlement.

2.Land tenure.

3.Nature and structure of residents.

4.Associations and informal communal networks.

5.Kinship and household composition. Family cohesion.

6.Demographic profile, life style, social security, etc.

When one is confronted with a substandard settlement, and tries to understand the underlying mechanism behind the asbestos roofs and wire fences, one starts thinking of all possible strategies to improve its physical and social condition. A simple ordering of alternatives could look very much like fig. 2.1, starting from the evaluation of the existing context to the ultimate stage of intervention.

Interestingly enough, the two diametrically opposed solutions, to my belief, are not Yes or No regarding removal of the

settlement, but rather the No itself, which can represent either the mere neglecting of the situation - Leave as it is - or, what seems to be the most humanitarian way, i.e., to try to upgrade it with the least possible relocation of residents. Very often, a solution is not as "neat" as it may seem in the diagram, and represents a mix of procedures leading to the same final goal. In other words, the upgrading of a community, for example, shown as a non-removal option, may involve a partial relocation of the population, although on a small scale. Sites and services projects, included in the Yes group can be part of the upgrading implementation for, what planners call, the overspill of people from the old settlement into newly developed areas. This overspill can be accomplished in two ways :

1. A governmental body provides the land plots with utilities and housing at a minimum level (Core housing, support frames, unfinished slab + wall structures, etc.).
2. The task is shared by both the agency and the user, the former usually providing the site and basic network connection, and the latter putting up the units through some kins of mutual aid, or self-help. A good example of a mutual aid development can be found in El Salvador's communal projects carried out by the local Foundation for Low-Cost Housing. Future residents of the area to be developed are encouraged to work together in groups between 20 t0 25 families every weekend, for a period of 3 to 6 months. While these groups know they will live in the area, they are not told which plot

(with an unfinished unit) belongs to whom, until the self--help process has ended. Afterwards, each family finishes its own house according to personal needs and priorities.

Although this approach might look good for El Salvador, the social/political structure of the country play a role in its success. Other administrations may impede such programs from thriving, as Janice E. Pearlman tells us why :

> "... Policy makers have often voiced objections to self-help on the basis of the apparently untidy and uncontrolled appearance of self-built houses and community environments. The ambiguity of doing nothing has often been preferred by such policy makers to decision to make public investments in what might become ugly and blighted slums. Indeed, visual appearances are not irrelevant, and may provide instant and important clues to levels of health, safety, and resident satisfaction."(Pearlman,J. Bibl.No.19)

Still on this partial removal issue of settlement upgrading, one has to bear in mind some important factors. The idealistic approach, as I said, would be the total on-site normalization of land, building standards and density. However, there are cases where, due to the need for public space, (schools, playgrounds, police, etc,), or to physical hazards (steep slope construction, precarious foundations, etc.), a certain number of shacks has to be removed, and its residents relocated. When this happens, efforts should be made in regard to the following :

1. The population moved should be granted a land title on the new site, or given proportional indemnification. Moreover, the agency in charge of the removal process, should provide the movers with free transportation of their materials and personal goods, or compensate for the value of the dwelling, if the latter will eventually be levelled.

2. A number of housing alternatives, such as urbanized lots, core units, sites and services, should allow the movers a fair choice according to individual financial capabilities.

3. Proximity, whenever possible, to former settlement, is ideal, for most of the residents are assumed to have their jobs nearby, when not in the settlement itself.

The upgrading concept has, hence, strong arguments to be among the most widely adopted strategies for industrializing nations, after the failure of public housing projects. Rather than saying that it is good for a number of reasons, and bad for others, the issue lies on a much more contextual level ; the primary question should be "How well will it perform, given a certain neighborhood structure, and given the economical and political parameters of a certain country ?" Together with this, other questions arise, involving several aspects of the concept, such as :

1. Are strategies applying self-help techniques economically better than those that do not ?

2. At what level do we intervene in the upgrading of utilities (water, sewerage, electricity, waste, storm drainage) ? Do we consider the already existent precarious network - as in the case study - or simply neglect it and start over again ?

3. How do we upgrade an existing sewerage network which has been underdimensioned and is, hence, inefficient for today's overcrowded population ?

4. How to run service connections in a settlement displaying such an ad hoc pattern of street layout ?

5. How to improve garbage collection and disposal, so we can avoid the well known "garbage dumps" on every empty plot available ?

Most of these issues are purely technical ones, and it is here where I will focus this thesis which follows, above all, a technical path. On Chapter 4.0 special attention will be paid to the questions raised hitherto, as well as others, concerning levels of service proposed (minimum, standard), and design approaches to water supply and sanitation.

Given the economical, social and political factors that must be accounted for in any implementation project, let us now use the same criteria to stress, on a schematic form, the main arguments of an upgrading policy, chosen for the development of this work :

Economic Arguments

1. Upgrading preserves, to a great extent, the housing stock which, in my case, has considerable value.

2. Upgrading is comparatively cheaper per dwelling unit than rremoval by bulldozing and/or the provision of new public housing.

3. Upgrading may utilize local labour, and preserve the vast network of secondary jobs.

4. Upgrading avoids the percentile loss of jobs associated with relocation.

Political Arguments

1. Upgrading avoids social instability with relocation.

2. People tend to become suspicious towards the authorities when forcibly removed from their homes, their community and their jobs.

3. Given the scale of substandard settlements in the urban centers, it is not politically feasible to remove them.

Social Arguments

1. Upgrading preserves the extensive friendship ties among

residents and local associations (clubs, church, etc.)

2. Upgrading helps improve the communities economical and physical appearance and, thus, narrow the gap between the latter and the more standard, "respectable" urban settlements nearby.

There is also an evergrowing consciousness that the problem of substandard housing is not the quality of the units per se, but rather the undesirable physical and social environment. That is to say, that instead of concentrating efforts to improve the individual units' physical appearance, governments should first act at an infrastructure level, and "clean" the settlement from unsanitary waste garbage, open drains, inadequate polluted water supply, litter and other filth. If this is accomplished, one may dare say that there is less need to worry about the "shack-like" appearance of the housing stock. People I had the opportunity to speak with, have always told me that they can bear the shortage of space, the lack of rigidity of their dwellings, and even the overcrowding of their bedrooms. What they cannot tolerate is the accumulated garbage on empty plots and alleys, their children running along open sewers, subject to all kinds of diseases, etc.

2.1. COST RECOVERY

The provision of basic services, whether at a minimum or standard level, has to take into account the issue of cost recovery insofar as economy is the bottom line for any successful development. It is not wise - although it happens - to start a project without studies on the recurrent costs os service provision. Moreover, it often occurs that cost recovery policies are developed when the project is under way, or after completion.

The World Bank, along with other international agencies for urban renewal, have carried out studies on this issue, and applied some of them in many Third World countries. While Portugal has had little assistance from the Bank - except for agricultural development - we can, nevertheless, point out some useful lessons from ongoing projects in other developing nations, and understand why this particular section of settlement planning is so relevant.

Three key factors are considered of primary importance for a better cost recovery assessment :

1. Development of a "good" tax policy. This means that the following criteria must be met :

    1.1. Tax should be <u>acceptable</u> and seen by the local population as fair in principle.

1.2. Tax should be equitable, i.e., should clearly reflect the variety in benefits enjoyed by different persons, and their capacity to pay.

1.3. Tax should be understandable to the population being charged. People should understand why they are paying, how, where and when they should do it.

1.4. Tax should be convenient to allow for payment to be made as easily as possible. In other words, residents should be able to pay their taxes locally to a visiting official, who would also provide technical advice when asked for.

2. A monetary system of assessment can be used to evaluate the amount each household is to pay. I consider this point of particular importance, and see no reason why it should not apply to the Portuguese context : Every piece of property is assigned a number of tax units depending on a) Its area. b) Its use, and c) Its need for urban services. While the tax units for each lot would be fixed for a long period, the corresponding rate applied would vary periodically to meet revenue needs.

3. Charging for services. The following should be included in the tax units assessment, and payment for these would vary according to the level of provision : a) Public security. b) Public health and environmental services. c) Amenities. d) Sewerage. e) Drainage. f) Water supply and g) Sanitation.

The bottom line of economic studies, insofar as the urban poor are concerned, is affordability. Generally speaking, governments stipulate housing standards which meet only a small parcel of the intended target population. In other words, the approach to design of shelter for the poor is done backwards by planners. First, they establish a set of technical and sanitary standards considered as minimal , after which the "package" is offered to whomever is capable to afford it. In Africa, for example, a health inspector in charge of sites and services projects, proposed that all plots should have indoor waterborne toilets. If carried out, the plan would leave out most of the population, unable to meet such standard. A low cost, intermediate sanitation unit, serving various families, on the other hand, would cover much large a percentage of people than the former "idealistic" approach.

Hence, planners and government representatives should first determine how much the target population can afford, how much they consider the service fee to be reasonable, and only then, design a housing unit or a site network suitable to their income. Standards, as we see them should come last.

CHAPTER 3.0

CASE STUDY : BACKGROUND

Figure 3.0 A two-storey old house uphill

Fig. 3.2 Aerial view of the Casal Ventoso (from the South)

Fig. 3.3 Aerial view of the Casal Ventoso (from the East)

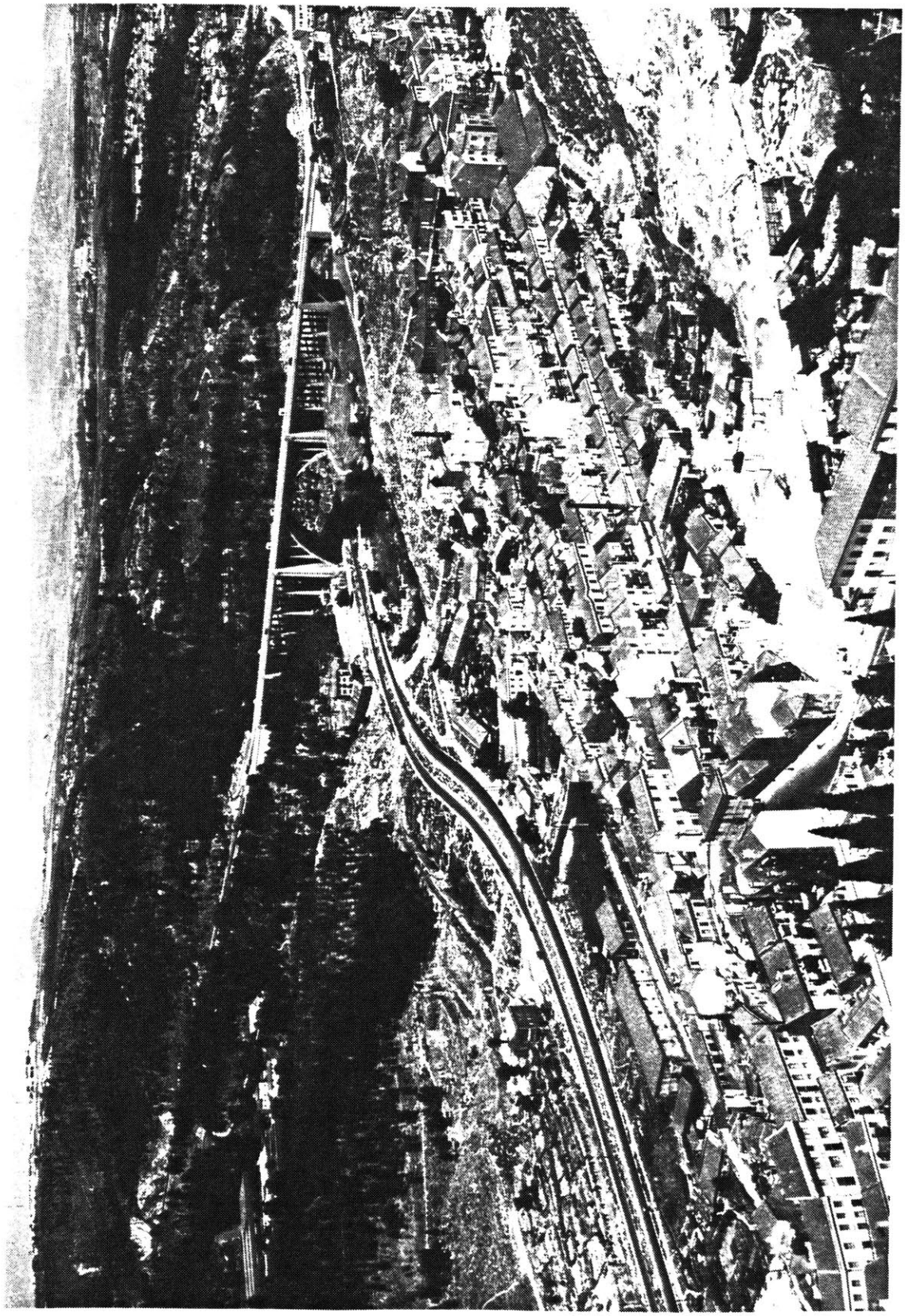


Figure 3.1 Site plan

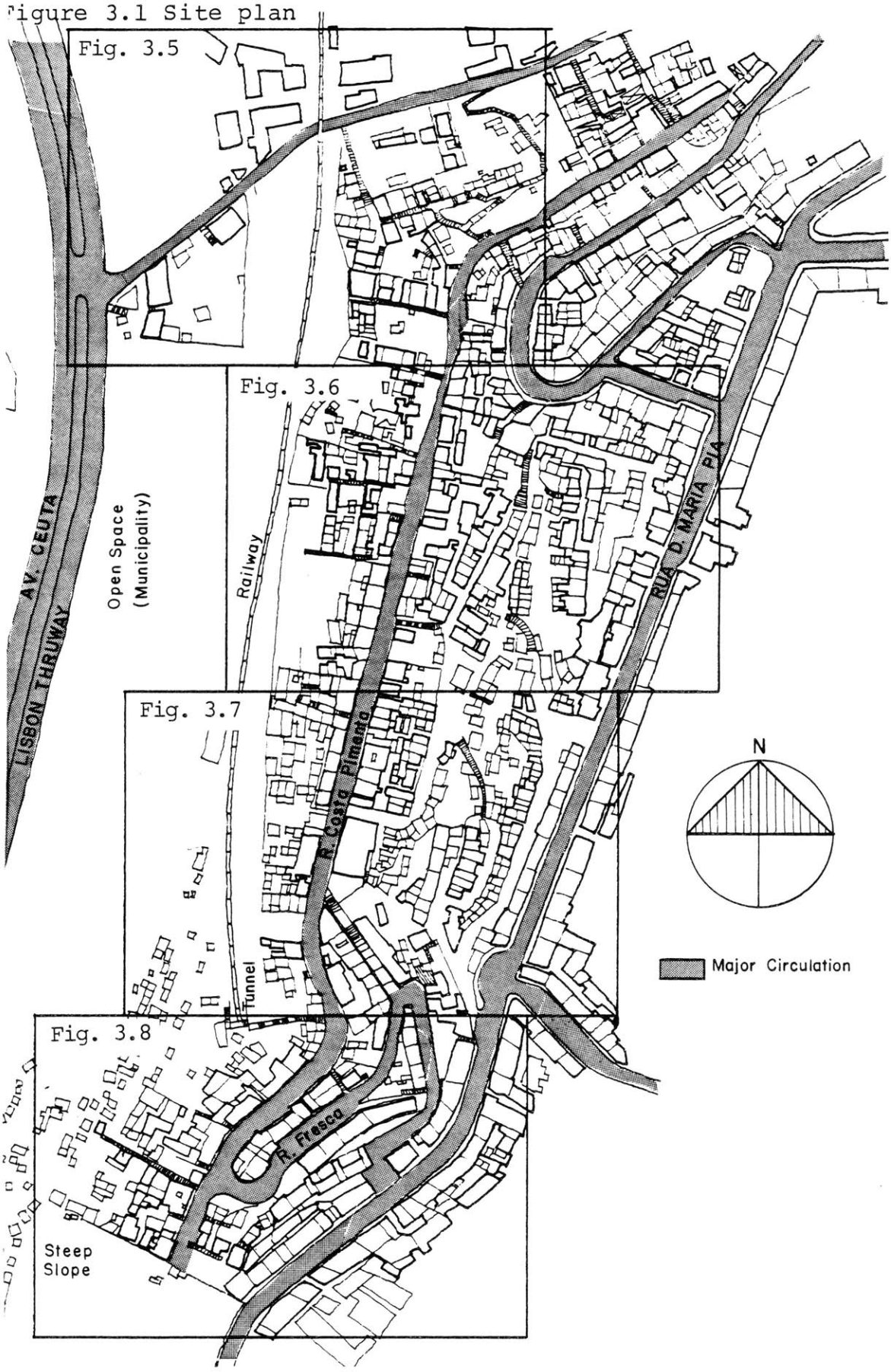


Fig. 3.5 Casal Ventoso de Cima (Upper Casal Ventoso)
Scale (in meters): 1:1000

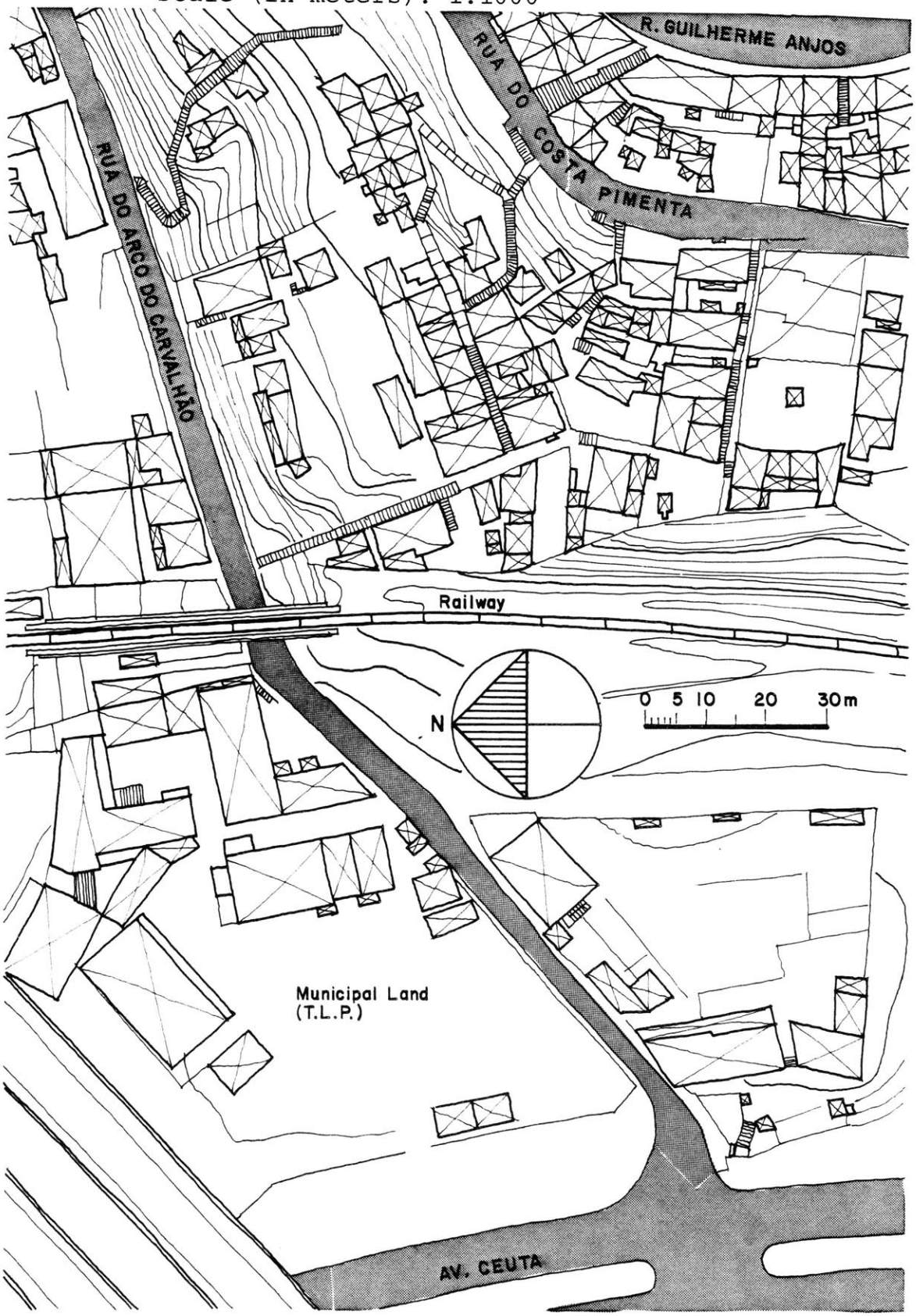


Fig. 3.6 Casal Ventoso de Cima (Upper Casal Ventoso)

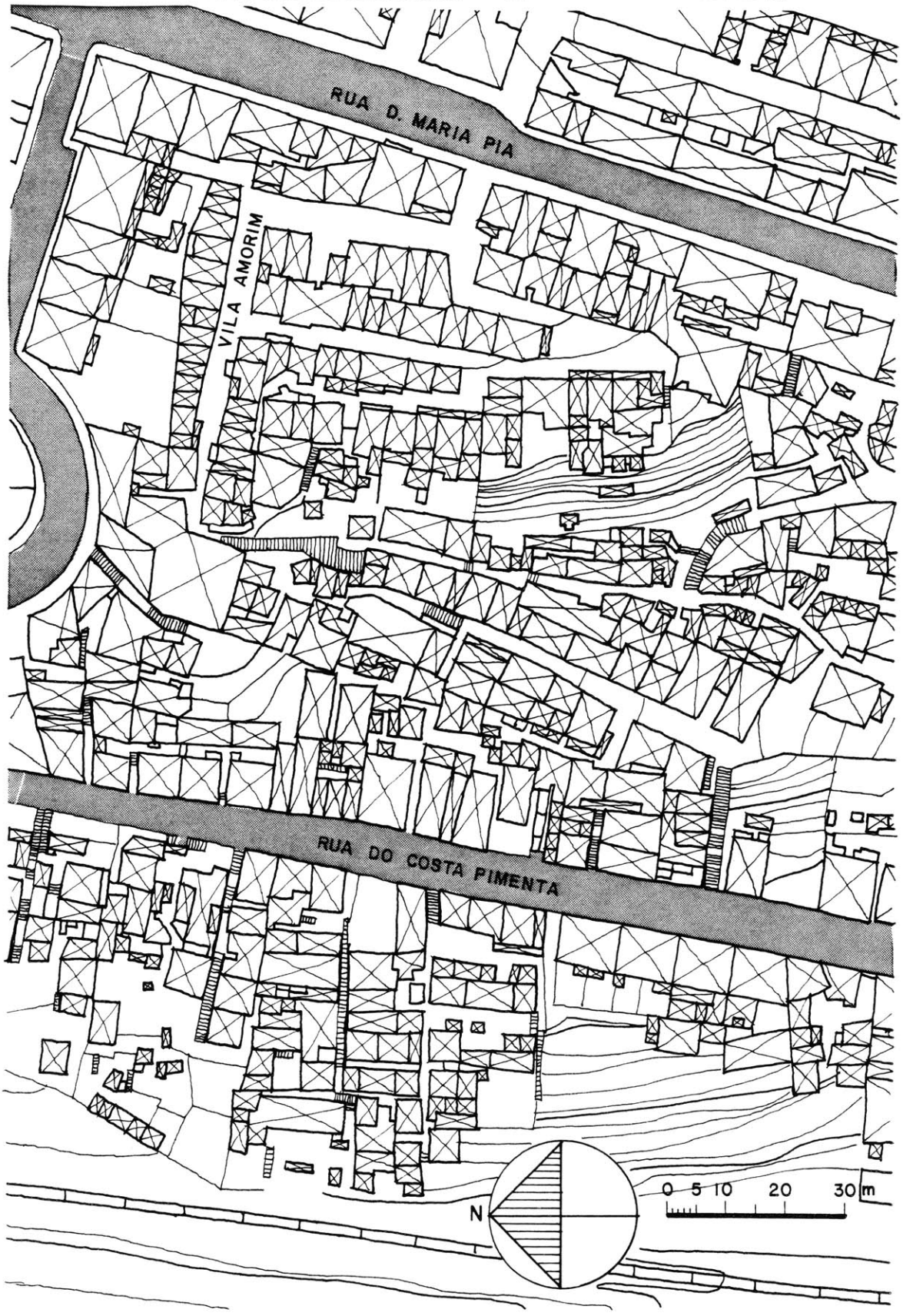


Fig. 3.7 Casal Ventoso de Baixo (Lower Casal Ventoso)

Fig. 3.8 Casal Ventoso de Baixo (Lower Casal Ventoso)

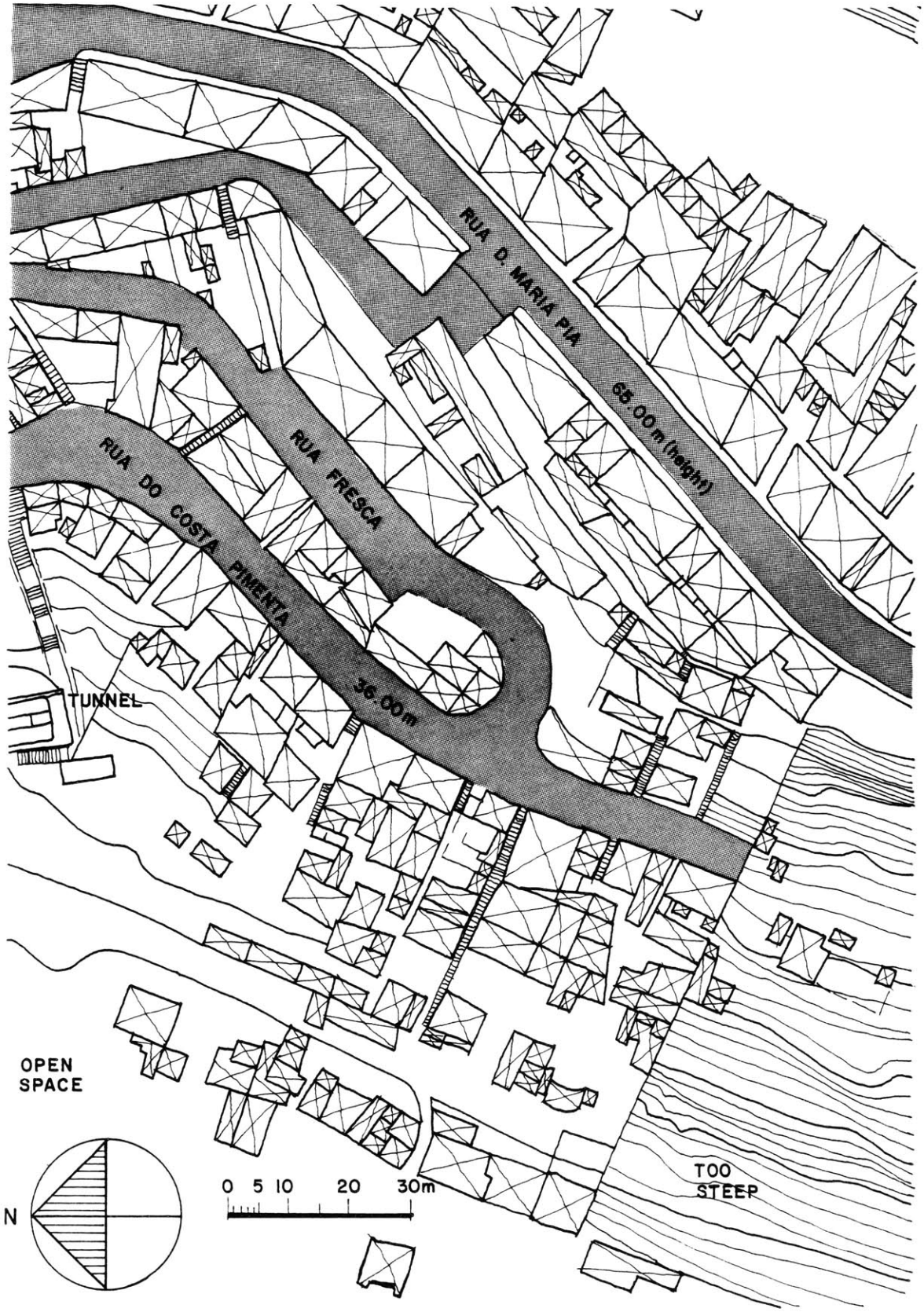
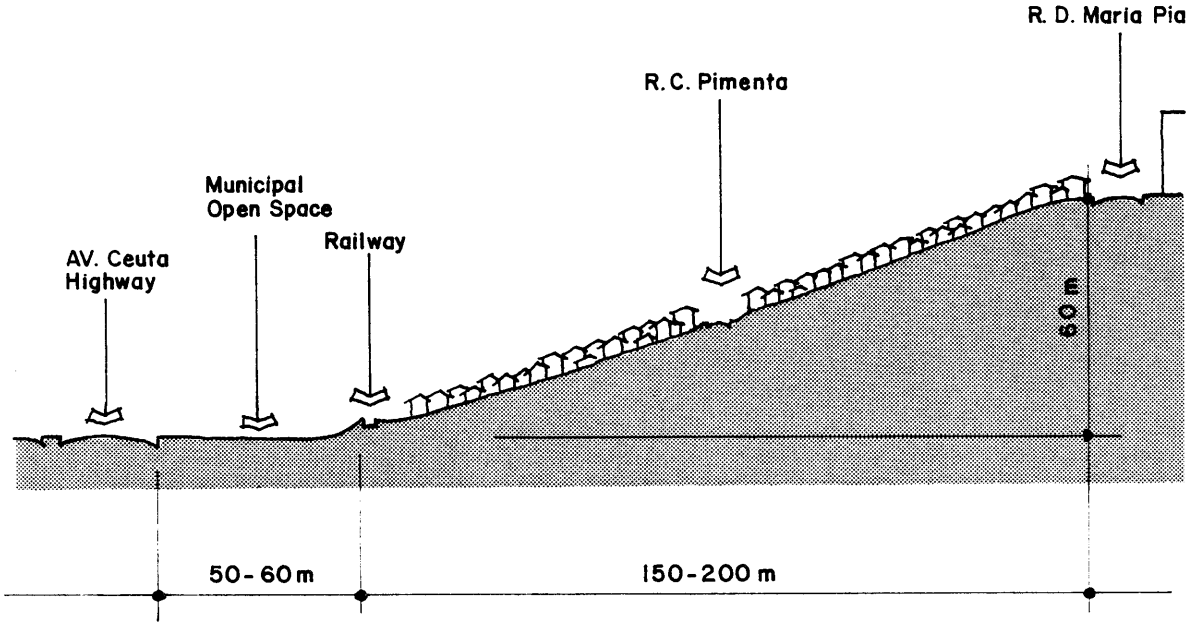


Fig. 3.9 Schematic Section



3.1 PHYSICAL CHARACTERISTICS

The case study settlement chosen as a typical marginal settlement in Lisbon, covers an area of about 15 hectares of land, stretched on the east side of a major thruway (see figs. 3.4 and 3.5/3.8). The site is entirely located on a hillside, bounded on the East by R. Dona Maria Pia - the crest of the hill -, on the West by Av. de Ceuta (Lisbon's thruway), on the North by R. Arco do Carvalhão, and on the South by a natural slope of more than 50 percent inclination, which makes construction prohibitive. In fact, all the settlement is extremely pitched, with slopes ranging from 10 to over 50 percent in some areas.

The Casal Ventoso bears a roughly rectangular-like shape of 800 x 200 meters. A typical section would look very much like fig. 3.9 : Next to the highway, and along the whole site, there is an open space 50-60 meters wide belonging to the Municipality. A railway separates the former from the houses, and runs North-South on a level slightly higher than the open space. Coming from the North, the railway passes on a bridge over R. Arco do Carvalhão (fig. 3.5), runs alongside with the settlement and enters a tunnel next to the Southern end where the hill becomes steeper (fig. 3.8). Houses abut next to it,and spread uphill to the main circulation street at the crest (R.D.Maria Pia). Difference in height between the open space and the top of the hill is average 60 meters. This figure, if seen as the shortest side of an irregular triangle, together with a 200-meter average width, represents a geometrical section with a 30 percent slope.

The surroundings of this community comprise an open forestry area to the West of the highway, a settlement with similar housing characteristics to the North, a cemitery to the Southeast and a "traditional", middle class, cluster-like neighborhood to the East.

The railway is not fenced off, therefore, pedestrian crossing often occurs by residents who utilize the public transportation means running on the nearby highway. Fortunately, traffic on this railway is very limited, averaging some two

or three trains per day.

3.2 POPULATION

According to the last census, the official resident population was about 15.000 people, accounting for a gross density of 880 people per hectare. The real figure, however, is likely to be even higher inasmuch as the construction of shacks has developed since the census, especially on the lower part of the settlement bordering the railway. Another factor which might be responsible for higher indexes in the future has to do with governmental policy and is often found in developing nations : As soon as the word is spread out that a community will be upgraded - assuming that this strategy is considered - the density rapidly increases, with many newcomers also wanting "a share of the benefits". Therefore, as a complementary suggestion to the strategies brought forward in the previous chapter, one could say that a fair assessment of the resident population has to be done prior to any implementation program.

People in the area are predominantly middle to old-aged, the greater percentage lying between 50 and 60 years. The second largest group is in the 18-30 year range, most of whom do not have a permanent employment, and spend their time on occasional jobs. Most of the women do not work, and those who do, are mainly housemaids or nurses. The male population

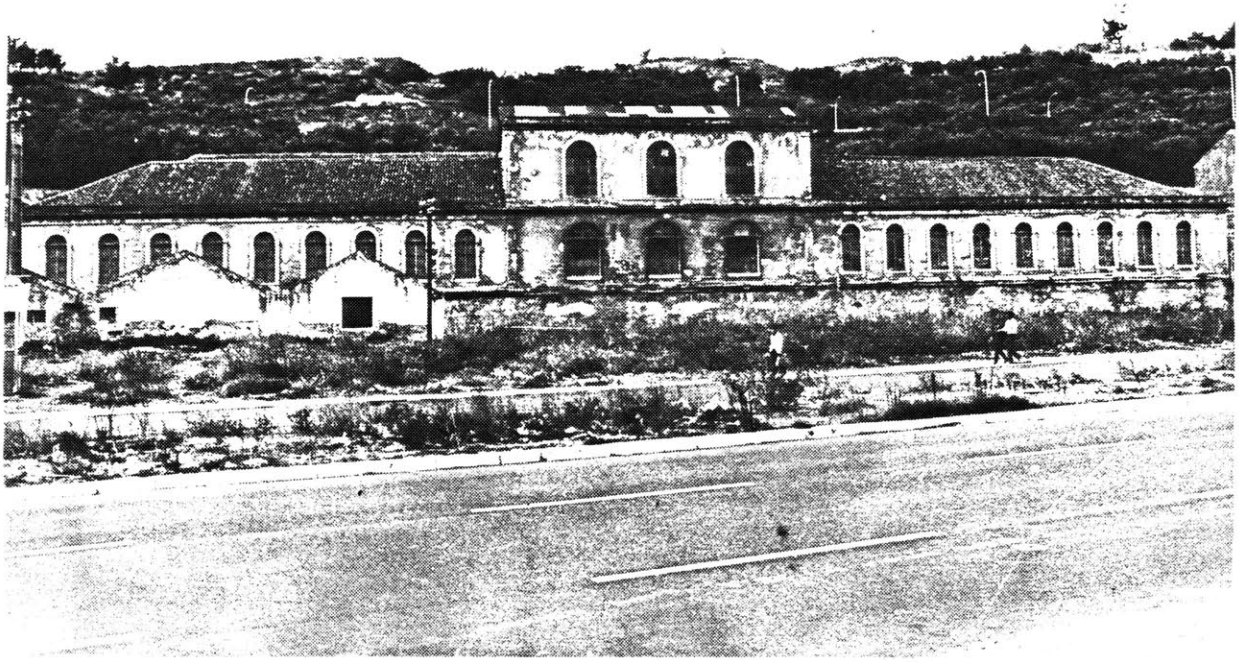
fortunate enough to have a fixed job, work usually in the nearby docks or have their own small businesses in the neighborhood such as markets, repair shops and bakeries.

During daytime, women sit on the numerous stairways with the children, and seem to chat endlessly while their husbands gather in the local recreation club, or in the closest bar. Another place for meeting and gossiping is around any of the few common washing places (fig. 3.19). At night, the settlement exhibits a somewhat different facade, when prostitutes wander about, along with young groups of so-called "street kids". The place is literally turned into a no-man's land, those residing in the premises soon return to their homes and do not come out until daybreak.

3.3 HISTORY

Inasmuch as this settlement is very old, its origins are no less "yellowed" by the years. There seem to be two different versions as to how it all started, none of which, in my opinion, is absolute per se, but both have their logic and are likely to have happened simultaneously, like different streams of water running to the same river. Whichever is historically true, the fact is that the settlement exists for as much as 160 years. An ancient map of Lisbon dated from 1837 names the area Castelo Ventoso, posteriously changed to Casal Ventoso, the word Casal standing for a conglomeration of single family houses.

Fig. 3.10 A factory in ruins
(next to the highway)



family houses.

The first version is widely accepted by historians who devote their research to this particularly interesting neighborhood : In the beginning of the 19th Century there were a number of factories located at the bottom of the hill and in the nearby surroundings. Few of them still survive, although in ruins, as the one shown in fig. 3.10. The proprietors used to live in large mansions adjacent to the factories and owned most of the land which represents, nowadays, the case study area. One of the large centennial houses can still be

seen in fig. 3.11 facing the highway (corner of R.Arco do Carvalhão). In order to facilitate employees transportation - thus, allowing for time and money savings - workers were given small plots of land next to the factories, and encouraged to build and remain in the area. The prosperous industries attracted more and more people and soon the adjacent land was gradually taken over by single family dwellings.

The old master houses are now but vague reminders of those days, overcrowded by several families who share the same centennial walls, the same rotten floors and roof leaks.

The second version is given to us by one of the oldest living residents who claims to know every square meter in the site, and has witnessed much of its growth. During the early years of the past century - he says, - there was a wine merchant who, once a year, would come from out of town and put up an ambulatory store to sell his annual harvest. The sale normally took place on R. D. Maria Pia at the crest of the hill, and people would gather from different areas to buy his notorious wine. Some of them remained after the merchant had left, and built their houses on the hillside, closer to the few water sources.

Gradually, the settlement began to take shape, and was named "Lower Casal Ventoso". an area comprising the Southern part of the existing site (Figs. 3.7 and 3.8) still bearing the

Fig. 3.11 A two-storey old mansion bordering the highway

Fig. 3.12 Apartment walk-up

Figs. 3.11 and 3.12

The mix of housing patterns and construction quality is striking. From centennial houses (above) to four-storey walk-ups (below) the settlement shows the reminescences of a prosperous past, together with a somewhat neglected present.

original name. Ventoso, or windy, was given because the dwellings, built on the steep slope, would encounter strong winds blowing from the mouth of the river Tagus.

As time went by, the more prosperous people would move to the upper part of the hill (figs. 3.5 and 3.6) known as the "Upper Casal Ventoso", and would, in turn, rent their former homes to rural migrants, factory employees or people whose work was somehow related to the harbour. The poorest who were unable to pay the required monthly fees - yet wanted to remain close to employment - would live in caves which existed in a nearby stone quarry. Sometimes, a whole family lived in such conditions and many were subject to all sorts of illnesses e.g., bronquite and pneumonia. The quarry is still a landmark in the area, yet, the caves no longer exist.

3.4 CIRCULATION SYSTEM

Insofar as public transportation means are concerned, the site is well serviced with buses running on both the highway at the bottom level and the upper street (R.D.Maria Pia). Residents can easily reach any point in the metropolitan area as well as many outskirt neighborhoods. Insufficient public transportation has never been a complaint in the words of the residents. The problem regarding this issue seems to be the fare charged for a ride rather than the frequency of the network.

Within the settlement there is only one street for automobile traffic (fig. 3.4) which begins at a southern point of R. D. Maria Pia and runs Northward through the entire neighborhood. Aside from this, all the circulation is done on foot through the dozens of pedestrian passages and stairways squeezed between dwellings. Very few residents have cars, a luxury restricted to small merchants who have established their businesses next to the access street (fig. 3.13).

The railway, although physically important to the study of pedestrian circulation, has no interconnection whatsoever with the site. Only cargo trains serving the harbour run on this track, and do not stop at any point along the hill. The frequency, as mentioned hitherto, is very low, therefore, there is no major hazard for free crossing by those who use the public transportation on the highway.

Another type of pedestrian walkway can be found in a cluster-like arrangement (fig. 3.14). The Vilas, as we know them, are but a group of row houses opening to a dead end street, 3-4 meters wide. A typical element of these - also found in major access routes and walkways - is the infinite number of washing troughs (tanques de roupa) standing in front of each home, the reason for it being discussed later on.

Fig. 3.13 Rua do Costa Pimenta

Fig. 3.14 A typical "Vila"

Figs. 3.13 and 3.14

Two types of circulation, vehicular and pedestrian. Above is a view of the middle crossing street running on the North-South axis. Below is a typical Vila with the everpresent tanques (washing troughs) aligned in front of each dwelling. The best housing quality can be found here.

3.5 LAND TENURE

Reviewing the classification of housing types in Chpater 1.0 we may now include the Casal Ventoso in the "Titled plots without services" category. Most of the land is privately owned by descendants of the first settlers. Some landowners possess a number of abutting plots and ususlly live in one of them while making their income out of the remaining rentals. The neighborhood has, hence, a mix of resident owners and rentpayers living in illegally built dwellings. Interestingly enough, the entire housing stock has been put up without the official consent, yet, all bear a number on the door, which means that the Municipality "accepts" the settlemant as such and, thus, provides mail service to most households. It is not clear to me how the mail is distributed. The assumption is that the whole "package" is delivered to the local association whereupon a group of selected residents is responsible for the scrutiny and distribution of letters.

3.6 HOUSING STOCK

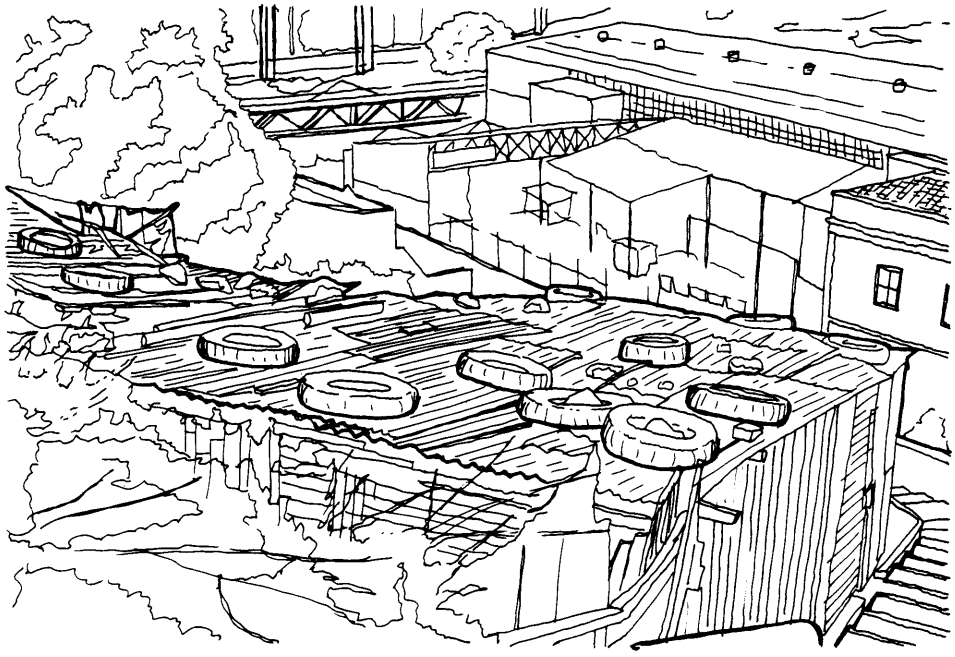
Houses in the settlement are mostly single storey, with few exceptions appearing on the North end and up the hill, where two to four-storey concrete/masonry units can be found. The construction quality is quite diverse, and so is the use of materials. An aerial view of the area will clearly show the different patterns encountered, which follow a general rule:

Fig. 3.15 Substandard housing

Figs. 3.15 and 3.16

The lower section of the settlement exhibits a higher degree of substandard housing. Asbestos sheets and wattle - to mention a few - are used for shelter. Tires hold the roof against the winds and are widely found in the area. Note the railway bridge in the background (below) crossing over the Northern boundary, R. Arco do Carvalhão (refer to site plan, fig. 3.5).

Fig. 3.16 Substandard housing



The farther downhill we go, the more deteriorated housing stock we will find. On the upper sections, houses are soundly built, well painted and properly maintained (fig. 3.17). Small Vilas are probably the best examples of well kept dwellings and walkways, with flower pots on the water troughs and window sills. A common pattern found almost everywhere are the hanging clothing from ropes attached to steel or wooden arms improvised on the walls. With very little space indoors - sometimes a family of 8 shares a 20 m^2 house - most of their life is turned towards the street. All the cleansing, washing, work and gathering, happens at the doorstep rather than inside. Uphill houses are usually brick made, with a wooden roof frame and typical clay tiles.

In the area between the middle crossing street and the railway, - the lowest strip of land in the site - the change in construction quality is dramatic. If in the former case we identified maybe half a dozen materials, here, the shacks are put up with almost every conceivable means, from wattle to asbestos sheets (figs. 3.15 and 3.16). Some units are among the most degraded I have seen, even worse than any favela shack of Rio de Janeiro. To make a long list of materials short, the most popular include wooden boards or sticks, corrugated zinc and asbestos sheets, oil barrels and food cans, rusted chicken wire, canvas, rocks, cardboard, scrap iron, used pieces of thread, as well as automobile parts and tires. The latter are used on the zinc roofs (fig. 3.16) to hold the

Fig. 3.17 A dwelling unit uphill

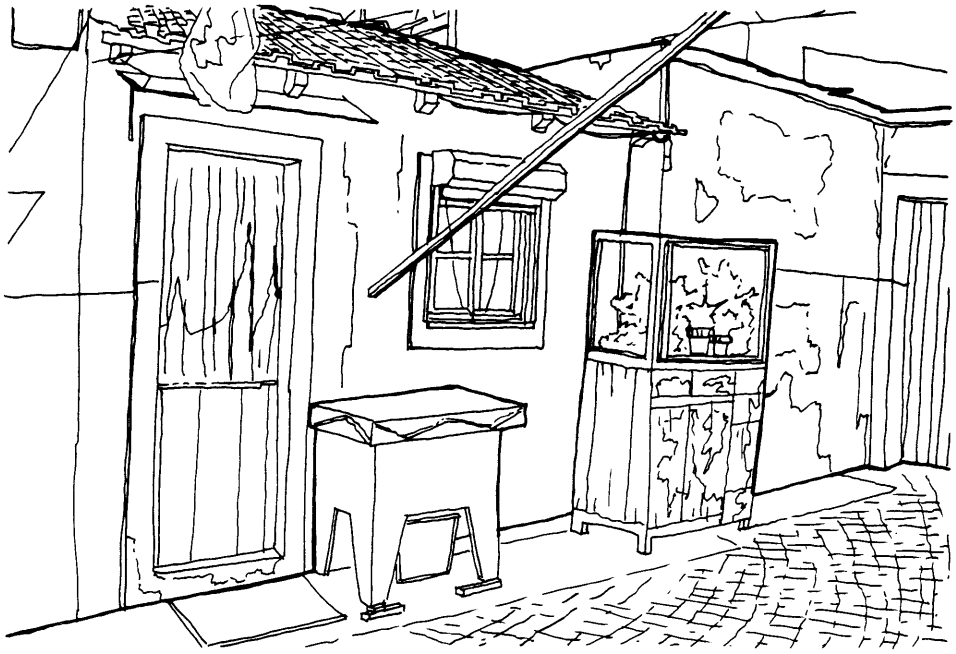


Fig. 3.18 Improvised housing

Figs. 3.17 and 3.18

A "neat" dwelling uphill (above), where a family of six is squeezed into an 18 m^2 area. All houses open directly to the street.
A not-so-"neat" view of improvised extensions (below) on the back of a building. On the foreground, an entirely suspended shack and, on the background, a bathroom extension.(note the sewer pipe running underneath)

structure against the gusty winds that often blow in the area. Contrary to what one might suspect when looking at roof tires, these do not mean that the dwelling has a temporary covering, waiting for an extra income to grow vertically. The reason is purely the one explained above, for the residents have no intention to build an extra storey inasmuch as the dwelling is rented from somebody living up the hill. In fact, this settlement does not exhibit the progressive characteristics of a developing community. Construction does not go on, as in other marginal areas in Latin America, and the housing stock is quite permanent as such.

The assessment of the housing stock described in this section is useful for the scope of this work insofar as the reader will have a better and realistic understanding of the site. It is not, however, a starting point for the development of low cost technological alternatives for housing construction. As mentioned before (Chapter 2.0), authorities should first concentrate their efforts on the improvement of basic infrastructure, i.e., sewers, storm drainage, water supply, electricity and garbage collection ; and, only after, tackle the housing quality issue. The following chapter will focus on design strategies for low cost infrastructure regarded, to me, as more important than the soundness of some dwellings. The percentage of substandard units, compared to the total stock of 3.000, is no more than 7 percent, and confined to the area bordering the railway. Any implementation project

to upgrade the neighborhood will ultimately have to deal with these units, yet, the priorities have to do with thousands of people rather than a few hundred.

There are no open spaces within the settlement, apart from atreets and walkways. Empty plots do exist, numbering between 20 and 30, despite the excessively high population density. Usually these are fenced off, and serve as "natural" garbage deposits where, in some cases, an entire plot is filled with 1 to 3 meters of waste materials from nearby constructions.

3.7 THE PROBLEM SETTING

Generally speaking, the major problem facing the Casal Ventoso is one of infrastructure and hygiene. Residents whom I talked with agree with my standpoint which claims that upgrading of utilities and improvement in garbage collection comes first, the housing quality second. In this section I will bring forward the areas in which authorities should concentrate efforts, and explain, one by one, the present condition of utilities and garbage collection, and the need for immediate action.

3.7.1. Sewers

From the total stock of 3.000 dwellings only 4 percent (100) have indoor toilets with waterborne sewerage. Within this

Fig. 3.19 Common Water Taps

Fig. 3.20 Improvised sewerage

Figs. 3.19 and 3.20

Public water taps are scarce yet do exist. The abutting residents place their troughs next to it. Those residing farther away will use buckets to bring water to their homes.
Improvised sewers are typical throughout. From a total stock of 3.000 dwelling units, only a few hundred have some sort of sewerage system.

meager percentage, the great majority of units located on the upper areas of the hill and in few multi-storey walk-ups (figs. 3.12 and 3.20). Moreover, most of them were done after the building was completed, calling for the re-opening of walls and floors. Almost every varanda (cantilevered balcony) standing on slim iron bars (fig. 3.18) are nothing other than bathroom additions with sewer pipes running down on the facade into a septic tank or, in case of the most fortunate into the almost inexistent sewerage network.

Residents, however, have found ways to get rid of human waste. There are on the site a few sewerage pipes running downhill to a connecting main along the highway. At some points where these are exposed, people have opened a number of holes where all the feces are hand poured after being carried in a bucket from each private dwelling. The hygienic problem is quite obvious, together with environmental hazards such as flies and mosquitoes which gather next to the open holes.

In the forthcoming chapter we will look at low cost sanitation alternatives and identify one or more suitable for this specific context. The question, once again, seems inevitable and must be asked throughout this paper as a result of any taxonomy : Given the number of strategies, which one is more applicable to the social,economical and technical level of the target population ?

3.7.2 Electricity

A few number of electric poles run on the middle crossing street and in some walkways. Generally, the majority of the households has electric power, whether oficially or "improvised". Improvisation is done, as in other countries, by running an illegal extension connected to the main lines. the outcome of this is that these "pirate" dwellings a sublit and prevent the officially connected to get the necessary power. Furthermore. the population seems to hinder any attempt to improve their status quo by frequently stealing light bulbs from public posts (especially in walkways). With few lights after dark, people remain in their homes and leave the streets in the hands of a different strata - burglers and prostitutes - certainly not desirable.

3.7.3. Garbage Collection and Disposal

The disposal of garbage is among the major problems affecting the settlement. Every empty plot or open space which does not have a clear function is filled with garbage waste and construction leftovers such as old timber, broken bricks and the like. Collection takes place only along the access route (R.C. Pimenta) which serves less than 20 percent of the housing stock. The remaining residents use either the natural dumps of neighboring empty plots or, what commonly happens, simply throw it downhill on a steeper slope.

The infinity of ziguezaguing stairways interconnecting the shacks on the lower sections makes it difficult for any successful collection. The issue has much to do with social education, yet, in Chapter 4.0 we will look at some atrategies from a technical standpoint.

3.8 GOVERNMENTAL ACTION

The settlement has been declared Área degradada (degraded area) by the Municipality of Lisbon. It has also been object of several studies and discussions in local universities. The general public is constantly speaking about the issue, and almost every literate person in Lisbon has heard or read about the Casal Ventoso, for it has been widely exposed in newspapers, radio and television. Moreover, it is hard to ignore it inasmuch as its aspect, as seen from the highway, is physically striking.

While I will not go over its social repercussion, I will briefly explain the governmental approach which took place in 1975. By then, an organism in charge of the assessment of substandard and illegal housing (the S.A.A.L.) had been created. Sma-l groups of architects and planners were assigned specific settlement in order to evaluate both their present condition and the potential for future action. The group responsible for the case study, after several months of research and gathering of statistical data, came up with a proposal

for partial removal of people which literally remained as such : a proposal.

Basically, the plan was to relocate part of the population in three stages, with the traditional bulldozing used as a policy instrument. The first parcel of people would be removed to the nearby hill on the North of the site (approximately 7.000 people). The second group would be relocated to a distant site (Quinta das Fonsecas) or "eventually to other areas where land would be available" (from Architect Santa Rita in charge of the proposal for the area). The third group was intented to move downhill into 10 to 12-storey apartment buildings to be erected on municipal grounds adjacent to the highway. After all the expropriation had taken place, the empty dwelling would be levelled to give place to primary schools, playgrounds, and other amenities lacking in the area. The final re-development of the site would house 5.000 people or 34 percent of its present population.

The project encountered severe critique from the municipal architects in charge of its approval. The reasons for such are quite understandible, for, in my opinion, it failed in two prime areas : The economic and, above all, the social. Economic feasibility studies were not carried out with the necessary depth the project required, and many question still remain unanswered. An example, for instance, brought forward by one of the municipal Architects, Mr. A. Carrilho, is the

lack of economic data concerning the buildings proposed for the open space. The soil is of alluvial nature and the cost of the foundations would be certainly high. Water and sewerage mains also run underneath the area and the effects of the pile work on the latter have not been foreseen.

It also failed on the social ground insofar as there was little consideration given to the resident people who have their living roots established for decades and cannot be seen as numbers amidst a typewritten paper of statistical data. People expect the city to take action, yet, such a radical approach will only increase the population's suspicion towards future governmental projects (see social arguments Chapter 2.0). "To tear apart the Casal Ventoso is to erase part of Lisbon's history", say the resident people.

CHAPTER 4.0 CASE STUDY : STRATEGIES

In this Chapter we will deal with the issues which directly affect the chosen site, namely sanitation and garbage collection. These were identified in the previous section as the main priorities fór improvement in the settlement. High density and some level of degraded housing - around 10 percent - are also problems to be faced in an upgrading implementation, yet, are of a lesser degree of priority as compared to infrastructure and the problem of accumulated garbage. Special attention will be paid to sanitation alternatives, their technical, economical and social parameters.

4.1 SANITATION OPTIONS

In a world where 70 percent of the human race does not have access to piped water, there is more between the indigenous "hole in the ground" and a conventional sewerage than one might suspect. During the past fifty years a number of sanitation options have been developed in this country and in Europe, which deserve our attention and that of government authorities in industrializing nations like Portugal. Some, are easier to build and maintain, others, are socially more acceptible, along with a number of factors which include cost, level of municipal input, levels of water supply, social preference to human waste reuse, availability of open spaces, to mention but a few.

While this thesis deals with the technical aspects of upgra-

ding,, nevertheless, the overlapping of this issue over others is unavoidable, for I am aware that any implementation has a good deal of policy involved, not to mention politics. In other words, an attemptive policy decision for one user group may have detrimental effects on another. Therefore, to limit the scope of this work to its major concern - technical strategies - some assumptions have to be made before we proceed any further. The most important - and ostensibly most reasonable - is that the Municipality of Lisbon, although willing, cannot afford the provision of conventional sewerage to this community and, hence, may be susceptible or even obliged to accept alternative strategies which are simpler technically, and less costly. As of now, waterborne sewers are beyond what authorities and the resident population can pay for. Furthermore, and especially in this particular area, full sewerage would prove to be inadequate for two physical reasons.

The first is the entirely irregular layout pattern of streets and dwellings. Some sections of the Casal Ventoso display such a complexity of house arrangement and differences in levels, that a regular and simple laying of pipes would be near impossible and increase the overall cost beyond affordability. Secondly, the whole site has an average slope of 25-30 percent. In a recent conversation with Prof. Rybczynski at McGill University, Montreal (April 14, 1983) I learned that conventional sewerage is not practicable for steep sites due to the

excessive speed of water in the pipes. The principle is that in a conventional system the liquids should slowly carry down all solids at a rate of approximately one meter per second. In a steet site, the water in the inclined pipes would flow too rapidly and, thus, sometimes, leave behind solids, which could clog the system at certain points.

A recent World Bank publication on sanitation options (Bibliography No. 10) classifies as "critical" information the following items for a proper selection and design of such options:

Fig. 4.1 Critical Information For Implementation of Intermediate Technologies in Sanitation

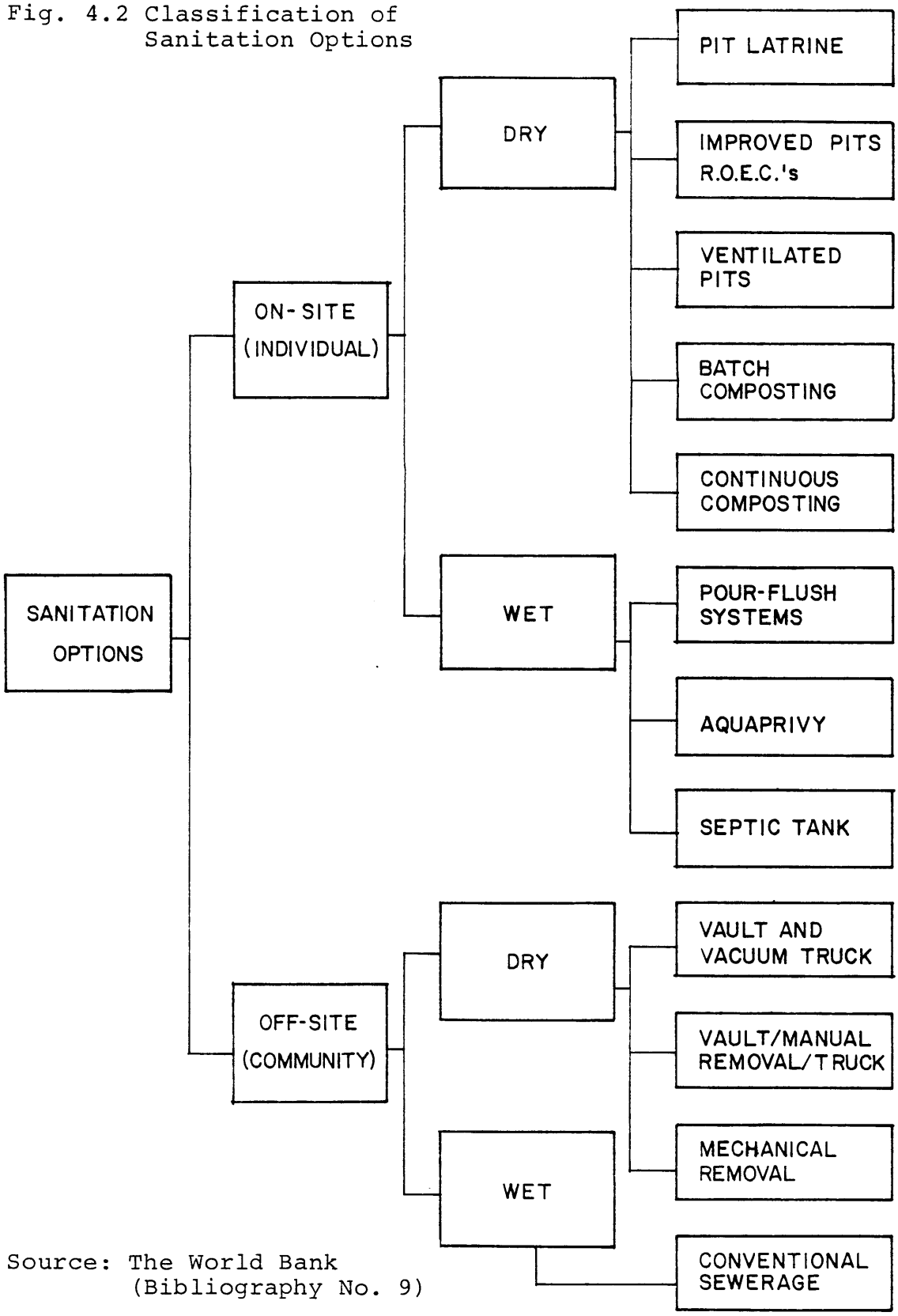
Climatic Conditions	Temperature ranges. Precipitation (including drough or flood periods).
Site Conditions	Topography. Geology (including soil stability). Hydrogeology (including seasonal water table fluctuations). Vulnerability to Flooding.
Population	Number (present and projected). Density (including growth patterns). Housing types (including occupancy rates and tenure patterns). Health status (of all age groups). Income levels. Locally available skills (managerial and technical). Locally available materials and components. Municipal services available (including roads, power).
Environmental Sanitation	Existing water supply service levels (including accessibility, reliability, and costs). Marginal costs of water supply improvements.

	Existing facilities for excreta disposal, sullage removal and storm drainage. Other environmental problems (such as garbage or animal wastes).
Sociocultural Factors	People's perception of present situation, interest in, or suceptibility to change. Reasons for acceptance or rejection of any previous upgrading attempts. Level of hygiene education. Religious or cultural factors affecting hygiene practices and technology choice. Location or use of facilities by both sexes and all age groups. Attitudes toward resource reclamation. Attitudes toward communal or shared facilities.
Intitutional Framework	Allocation of responsibility ; Effectiveness of state, local or municipal institutions in providing water, sewerage, sanitation, street cleaning, drainage, health and education services, housing and urban upgrading.

Source: The World Bank (Bibliography No. 10)

The classification of such systems differs according to a particular author's nomenclature, yet, the design and functions encountered throughout the literature turn out to be much the same. Essentially, all the classifications were done based either on the level of water required in the system - or the absence of it - or the way in which human waste is handled. World Bank experts divide the alternative sanitation options into two major groups, ON-SITE and OFF-SITE (fig. 4.2). On-Site systems are those done on an individual or limited basis, with little institutional requirements, whereas the Off-site cover a much broader spectrum of communal options

Fig. 4.2 Classification of Sanitation Options



Source: The World Bank (Bibliography No. 9)

requiring higher municipal involvement.

Within these two groups, systems are subdivided, according to water needs, into Dry and Wet. Basically, there are five types of On-site sanitation options, and three Off-site:

ON SITE	1. Pit Latrines
	2. Pour-Flush Toilets
	3. Composting Toilets
	4. Aquaprivy
	5. Septic Tank
OFF SITE	1. Bucket latrines
	2. Vault and Vacuum Trucks
	3. Waterborne, conventional sewerage

Of all the above, only the bucket latrine systems will not be included in our description and later selection inasmuch as they are far less hygienic than the others. This option consists of defecating into a bucket - which, in fact, is being done presently in the case study settlement - and having the feces emptied overnight. Usually this option is used in poor areas where resources are extremely scarce, and people are absolutely unable to afford any of the remaining. For Portugal, however, this situation is not as critical as that, and, thus, I see a great potential for the implementation of some other systems to such an extent that the latter need not be considered.

The following section contains a technical description of

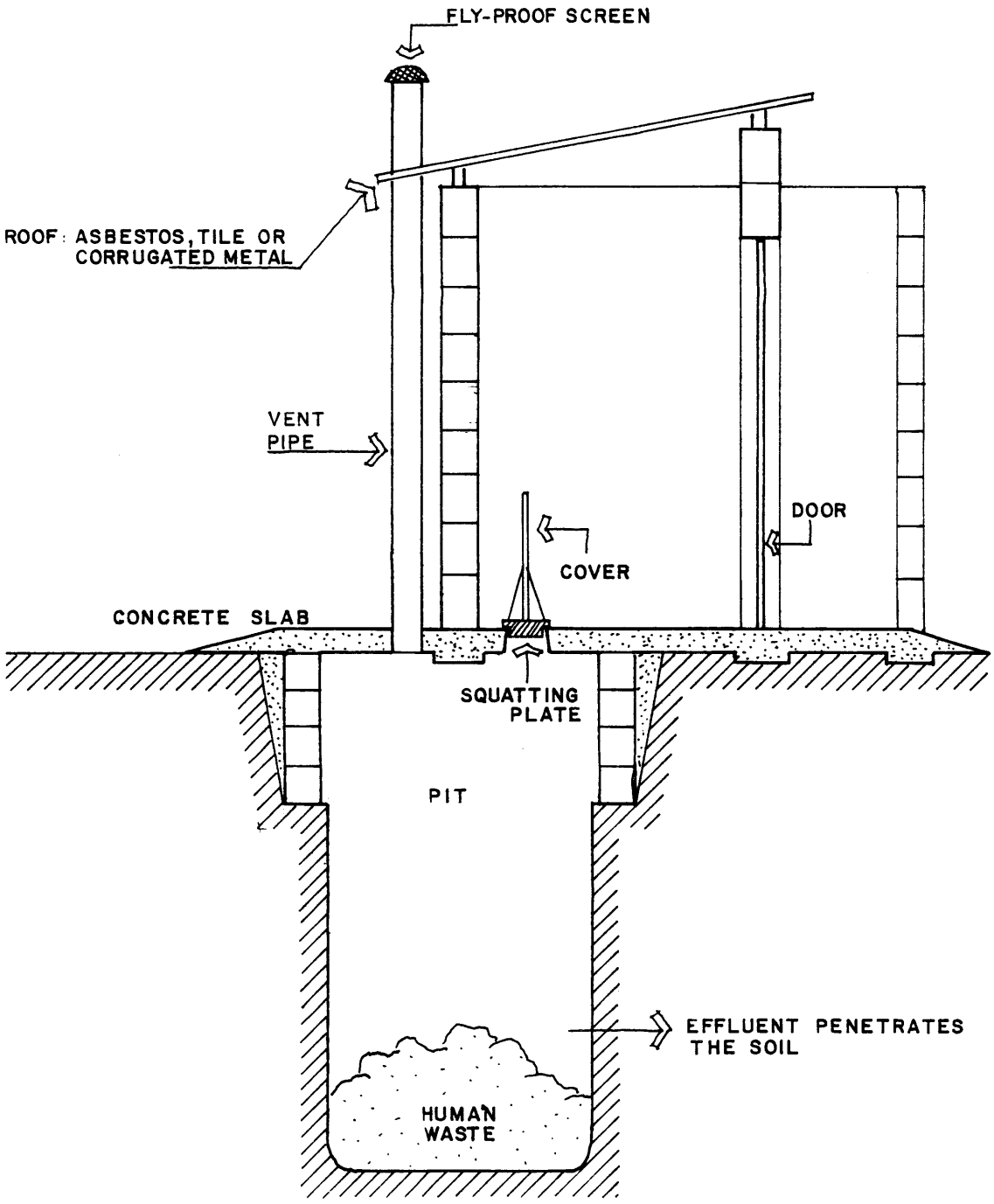
each option, and their suitability. Costs are dealt with later on, prior to the selection of one or more technologies for the case study area.

4.1.1. Pit Latrines

Pit Latrines are, by and large, the most simple design for human waste disposal and, hence, the least costly. An improvement over the simple "hole in the ground" , these facilities are composed essentially of three parts : A superstructure, a squatting plate, and a pit (fig. 4.3). The superstructure can be of different materials dictated by local availability. The pit has a variable height, and the liquids infiltrate in the permeable soil while the solids remain in the bottom. When the vault is almost full, it is covered, and a second pit is dug nearby. The system requires no water at all.

The literature is extensive in this field, and many designs can be found with variations in size, shape, and number of vaults. Where there is a lack of open spaces, a double pit latrine can be used alternatively (fig. 4.4) i.e., one squatting seat is permanently closed while the other is being used. Once a vault is full - usually after two to three years - it is sealed and the second one put to use. The system can, therefore, operate indefinitely, and the accumulated humus be used, after a decomposting period, as a soil conditioner.

Fig. 4.3 Pit Latrine
Unimproved Version



Source: The World Bank
(Bibliography No.10)

Fig. 4.4 Double-Pit Latrine

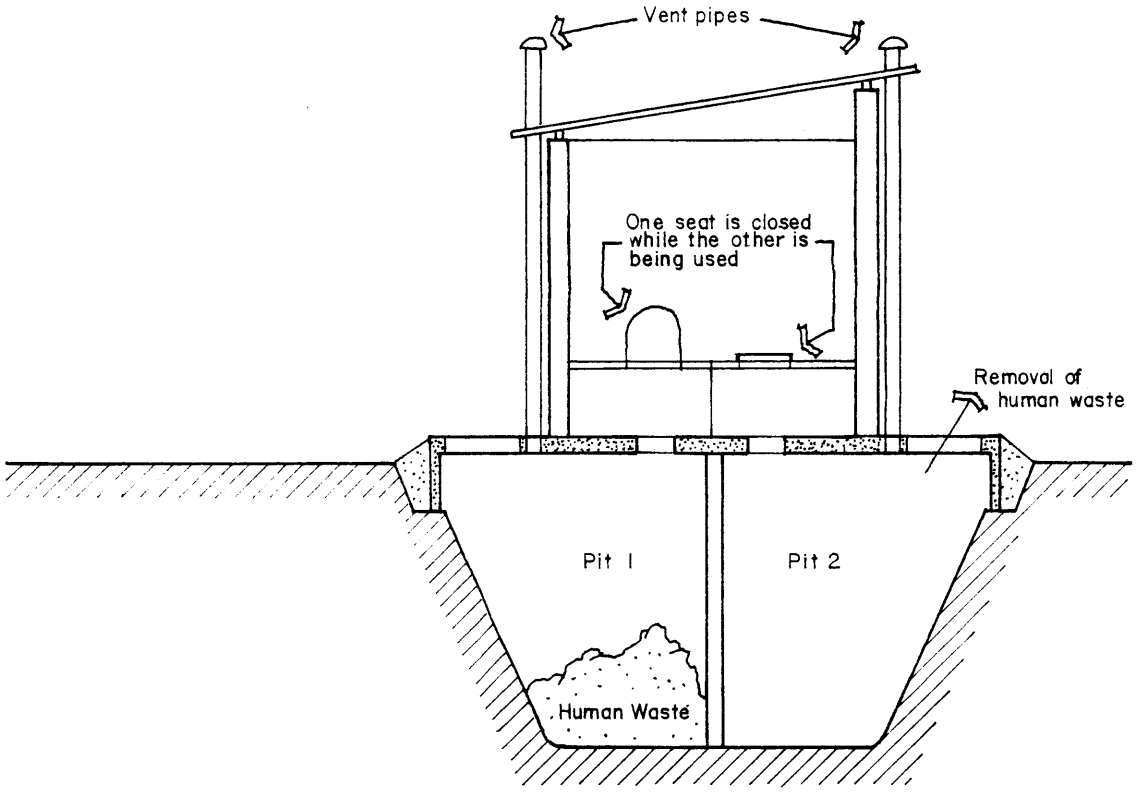
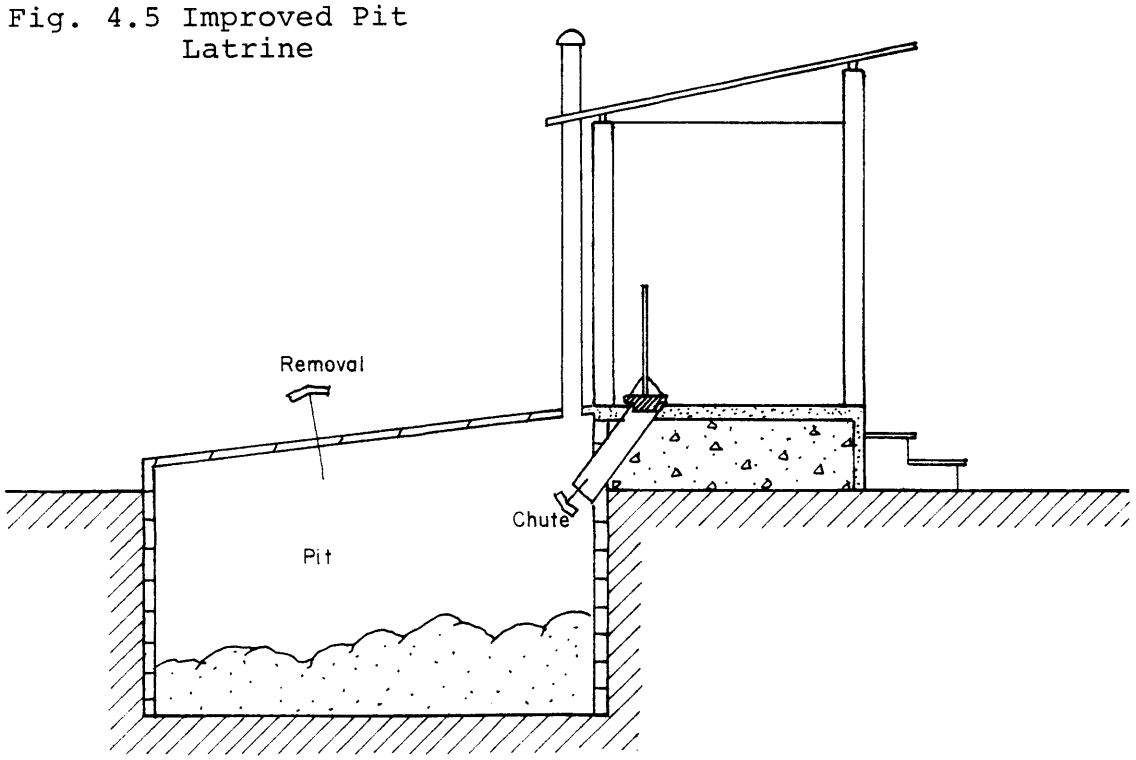


Fig. 4.5 Improved Pit Latrine



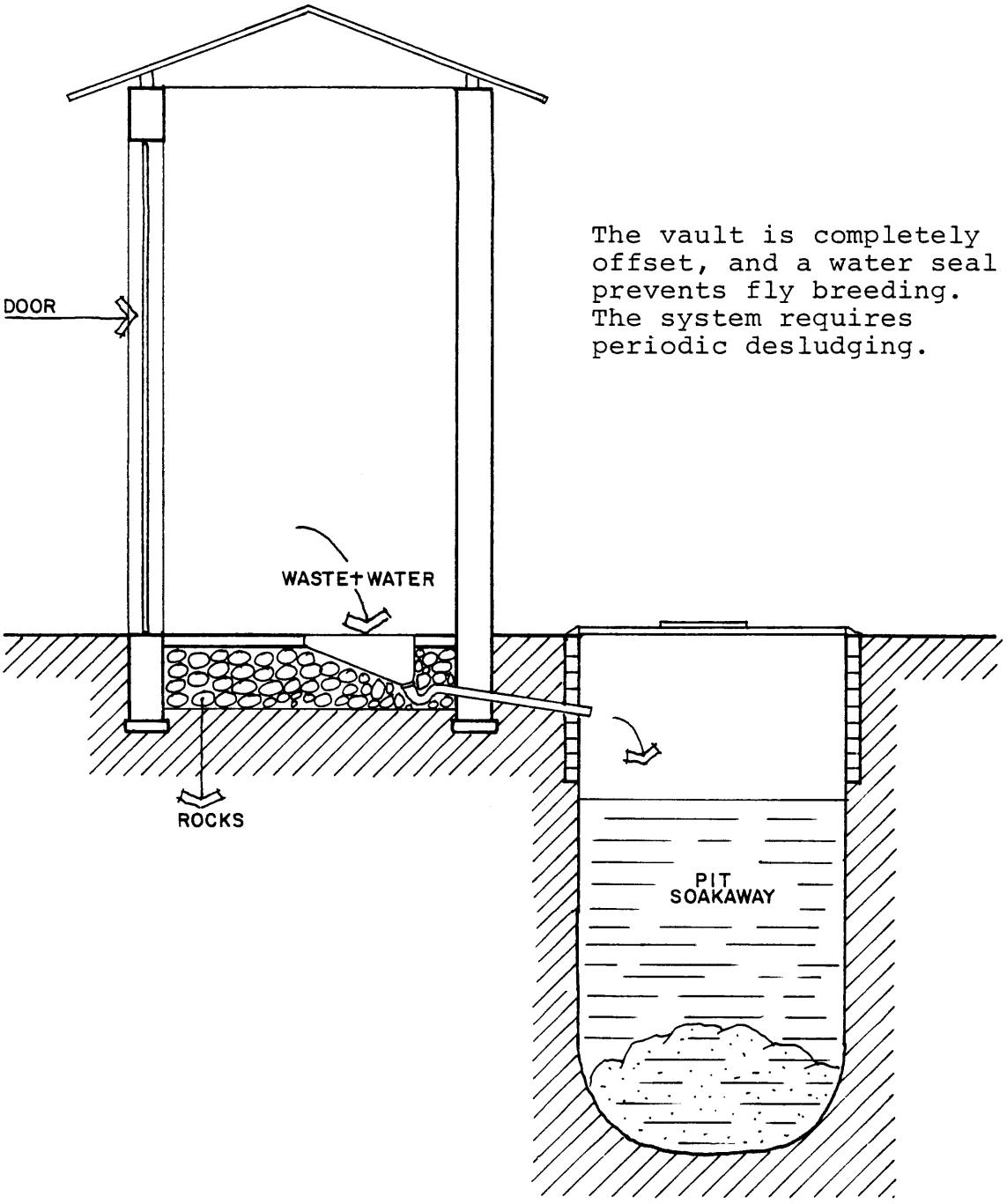
Source: The World Bank (Bibliography No. 10)

Another improvement over the simple pit is shown in fig. 4.5 where the vault is entirely offset from the superstructure. Fly and insect nuisances are less likely to occur, and emptying of the pit becomes easier, although special attention must be paid to the inclined squatting chute which must be thoroughly cleaned to avoid clogging. The primary condition for their use is a good degree of soil porosity to allow for easy liquid infiltration. Main advantages include the high potential for upgrading (to a pour-flush toilet), very low cost, minimal water requirements and little municipal involvment.

4.1.2. Pour-Flush Toilets

The striking difference over the former system is characterized by a completely offset pit and a water seal which covers the feces and prevents fly breeding and odors to enter the squatting area (fig. 4.6). A small amount of hand-poured water - one to two liters - is needed to flush down the waste. The squatting fixture has a number of designs and materials, from ceramic to plastic and concrete. Given the proper inclination of the connecting pipe, distance from the squatting place to the soakaway pit can be as much as 6-8 meters (prof. Rybczynski, personal communication). This feature represents one of the main assets of this option, which allows for an indoor bathroom with all the conveniences of a conventional system, and an outdoor pit nearby.

Fig. 4.6 Pour-Flush Toilet



The vault is completely offset, and a water seal prevents fly breeding. The system requires periodic desludging.

Source: The World Bank
(Bibliography No. 10)

The cost and labour requirements are similar to the pit latrines and will be discussed later on when we look at the selection process. The water seal vault is probably more complicated to build by individuals on a self-help basis, requiring some technical assistance, yet, minimal skills. Periodic desludging of the latter is necessary. The advantages are much the same as the pit latrines with the additional indoor potential.

4.1.3. Composting Toilets

Where waste reuse is desired and socially accepted, this system has proved to be very successful and relatively simple to operate. Basically, composting toilets are containers where excreta is decomposed along with organic refuse. The process can take place aerobically, anaerobically, or, in some cases, both.

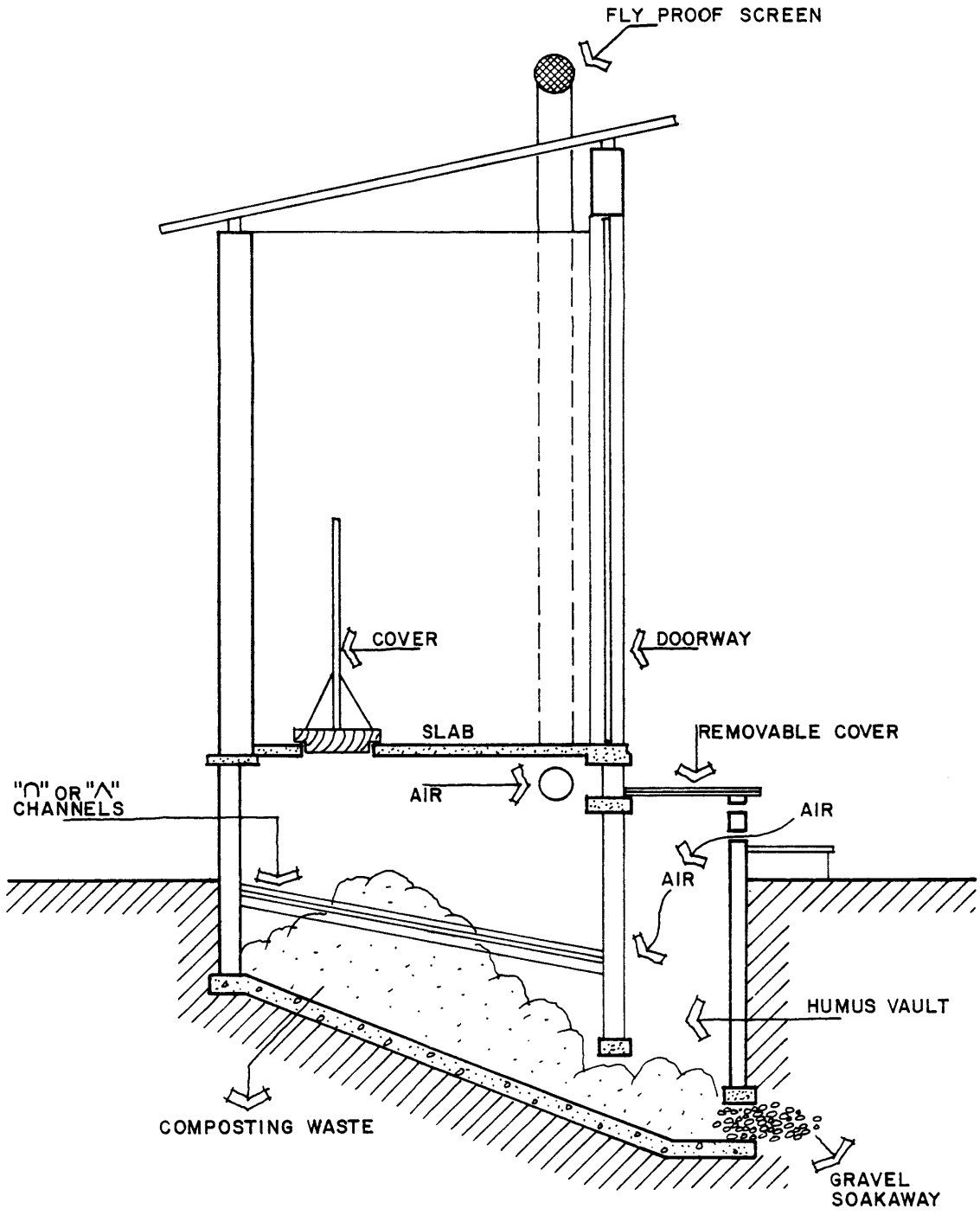
There are two types of composting toilets, Batch (or alternate) and Continuous. Within each category, a number of variations occur, some of which we will have the opportunity to look at closely when selecting a proper sanitation alternative for the case study.

Batch composting toilets use two alternating pits. When one is nearly full, it is sealed, and composting takes place while the other vault is put to use. Carbon bearing materials

are added to the feces, to help the process which takes usually one year until the humus can be used as a fertilizer. If organic refuse is not added, the system works very much like a pit latrine. Some designs allow for urine separation, yet, the most common design has permeable walls where liquids penetrate into a gravel soakaway. The humus-like material found after a year of vault-sealed composting is fairly dry, and low in volume. In fact, the solid portion of human waste is only 10 percent of the liquid, for an average person produces an yearly amount of excreta of 43 kg as compared to approximately 430 kg of urine.

Continuous composting toilets, developed from a Swedish design, have only one chamber located below the squatting plate (fig. 4.7). The chamber has a sloping bottom where human waste undergoes decomposition, along with organic refuse. The composting system shown in this section, known as MULTRUM, has two adjacent and connecting compartments : The first, underneath the squatting plate, bears a series of inverted channels for better air distribution, and is ventilated through a fly-proof duct. The second compartment, or humus vault, receives the organic refuse added to the feces. A MULTRUM-like system can be entirely prefabricated or built on site. A recent development of the Swedish design by the Low Cost Housing Group at McGill University in Montreal, called MINIMUS is described in depth in section 4.2.3. (Appropriate Technology vs. Case Study), and uses the widely known concrete block

Fig. 4.7 MULTRUM Continous
Composting Toilet



Source: Winblad,U.
(Bibliography No. 36)

as the major material.

Maintenance of both systems is more complex than the preceding cases. Organic refuse, such as sawdust, grass, etc. have to be added regularly at correct rates ; The temperature in the composting chamber has to be kept as high as possible so that most pathogens contained in the feces can be eliminated. Advantages in this category are the high agricultural quality of the humus produced and the minimal water requirements.

4.1.4. Septic Tanks

This is probably the most well known and utilized system after conventional sewerage. A typical arrangement is found in fig. 4.8 : It consists of two or three compartments (usually two) which accept both excreta and wastewater from the household. The first compartment is the settlinr tank, filled with water where solids settle to the bottom. The effluent sullage is discharged into a soakaway pit or infiltration field. Such tanks are normally connected to flush toilets and need to be periodically desludged. They can also be upgraded, especially in the sullage disposal section, replacing the soakaway pit by a small-bore sewer (fig. 4.9). The system has all the main features of an indoor toilet. Institutional, or municipal requirements are higher than PF toilets, and so is the cost, as we will see. The main constraint, aside from the economical one, is the availability of open spaces in high density

Fig. 4.8 Septic Tank
With Soakaway Pit

Source: Rybczynski, W.
(Bibliography No. 25)

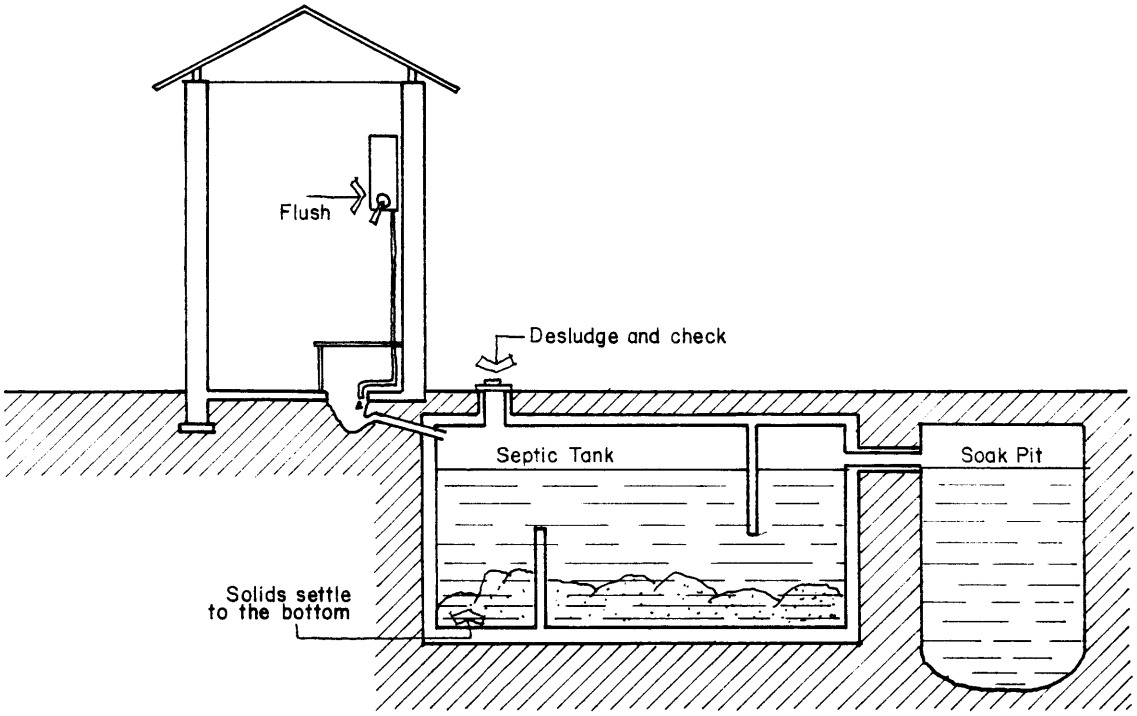
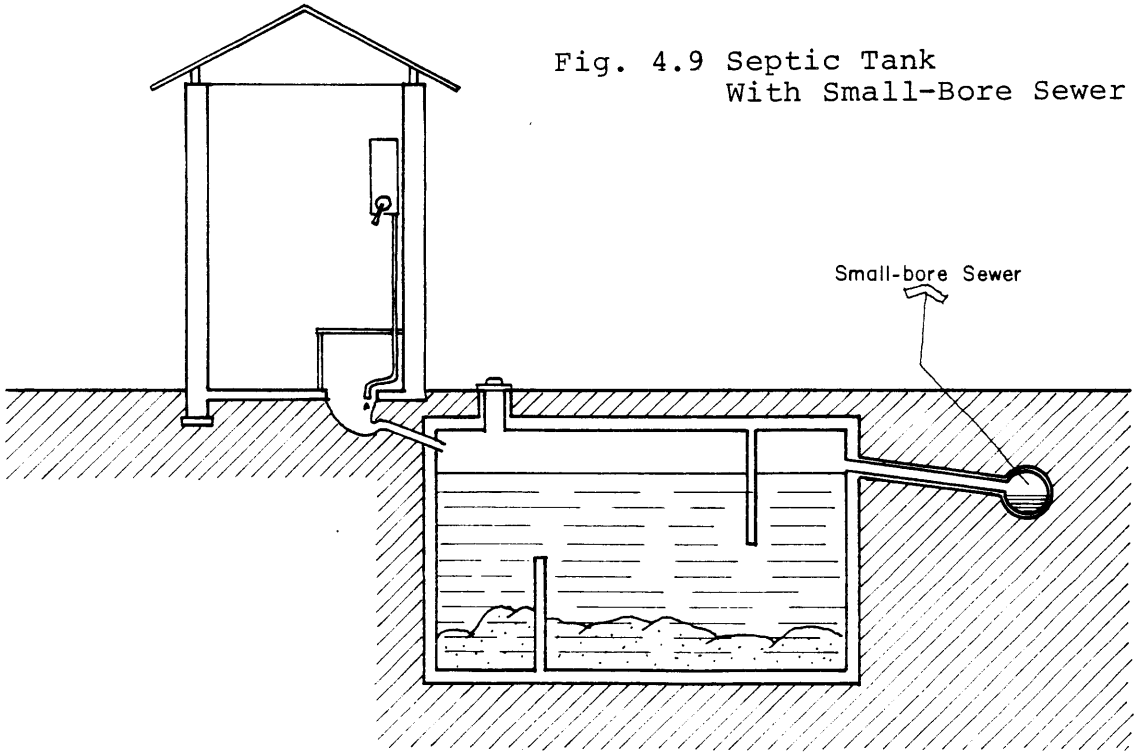


Fig. 4.9 Septic Tank
With Small-Bore Sewer



areas for infiltration fields, as well as the degree of porosity of the soil.

4.1.5. Aquaprivy

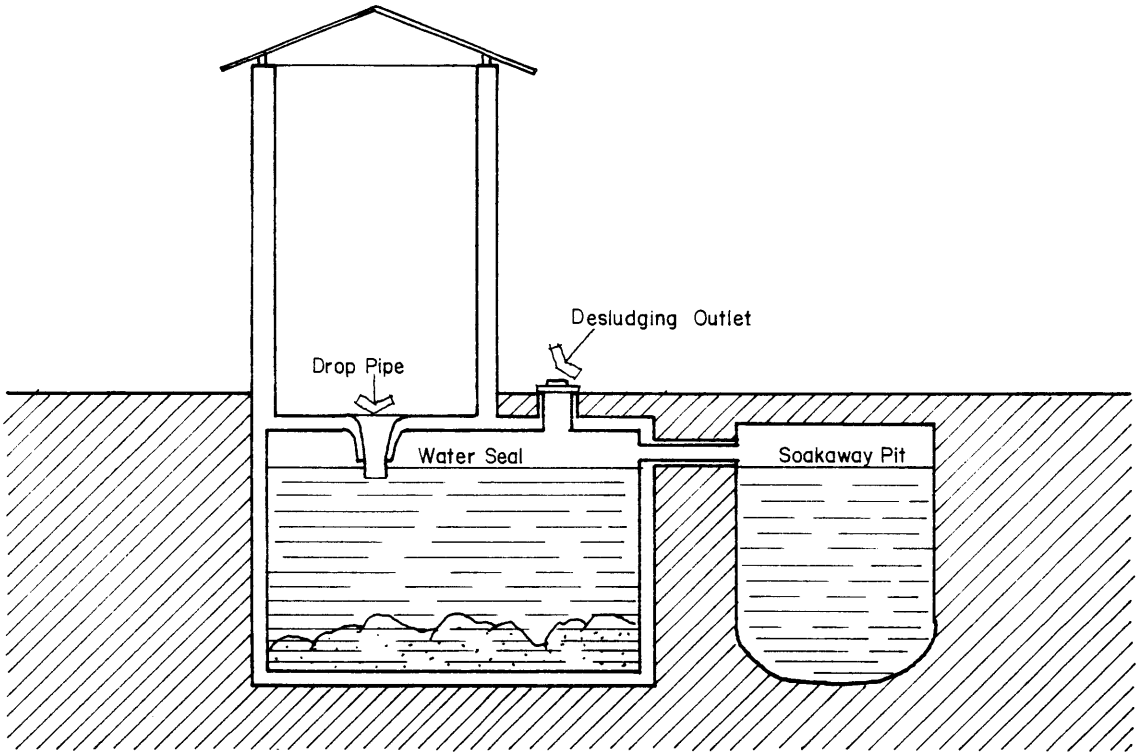
The Aquaprivy, invented in 1917 in India by Griffin and Williams, operates much like a septic tank, with the difference that the settling tank is now located immediately below the squatting place (fig. 4.10). A drop pipe is submerged below the water level and no flush toilet is needed. Waste falls by gravity with only a small amount of water necessary in the process (as in PF systems).

Alike septic tanks, it calls for periodic desludging and, hence, municipal input. The vault can be made either of concrete blocks or bricks, and must be made watertight with mortar. Prefabricated tanks do exist, yet, can cost as much as twice the price of the on-site tank. Maintenance requirements are high in the sense that careful attention has to be paid to preserve the water seal. If the level drops below the edge of the drop pipe, the odors and possible fly infestation will penetrate indoors, causing a considerable nuisance.

Upgrading of this system is similar to septic tanks, when a small diameter sewer, carrying but liquids, will substitute the soakaway pit (fig. 4.11).

Fig. 4.10 Aquaprivy
With Soakaway Pit

Source: Rybczynski, W.
(Bibliography No. 25)



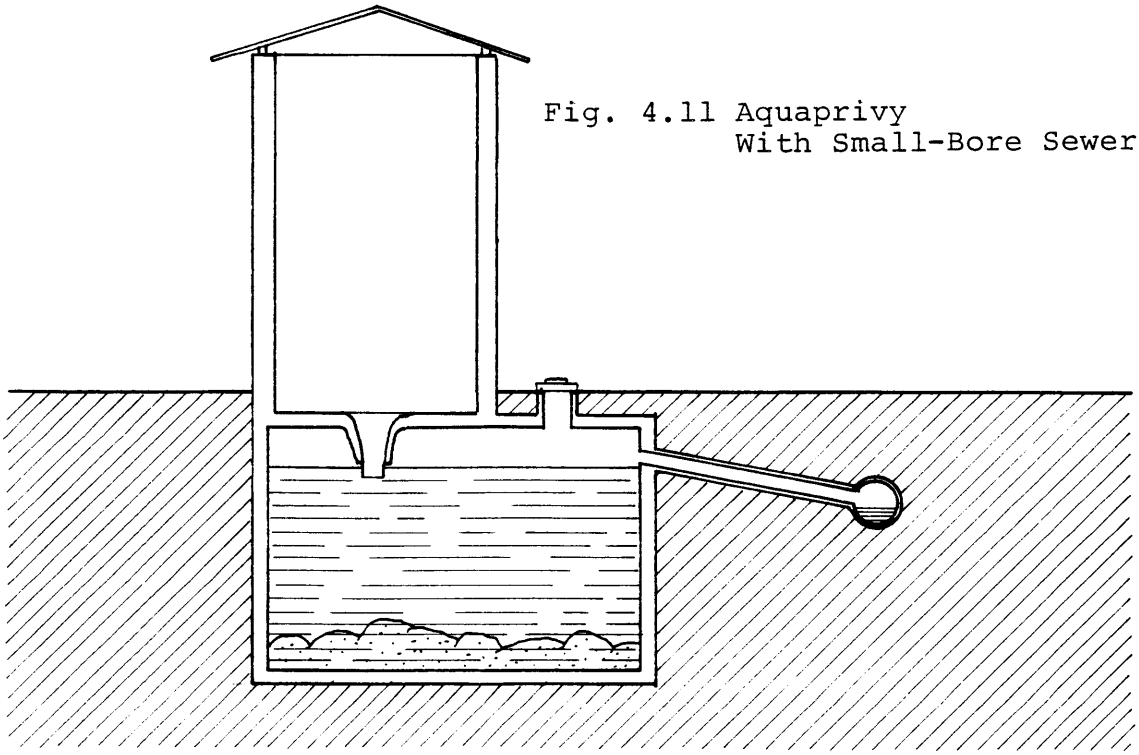
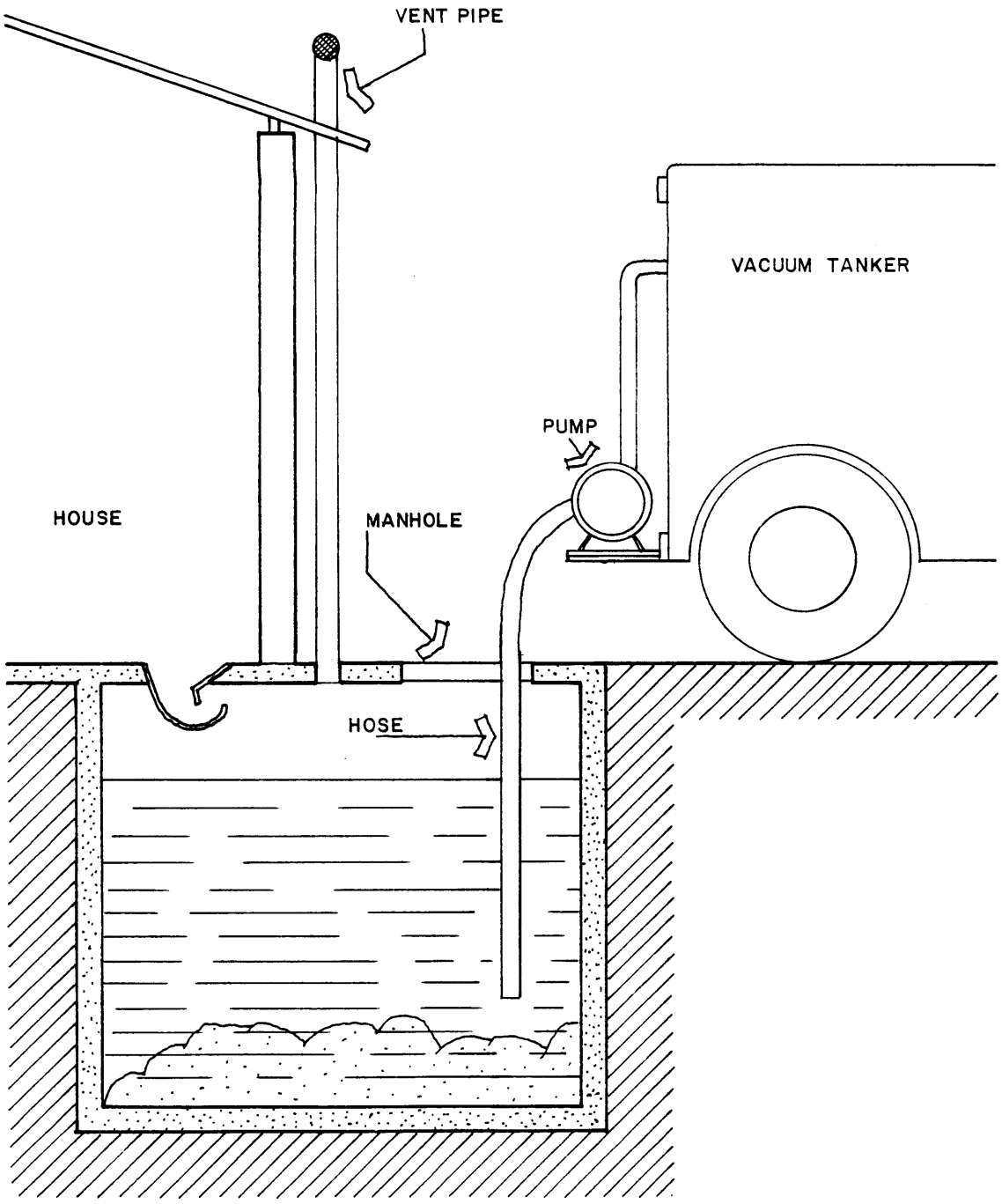


Fig. 4.11 Aquaprivy
With Small-Bore Sewer

Fig. 4.12 Vacuum Truck System



Source: The World Bank (Bibliography No. 10)

4.1.6. Vault and Vacuum Truck

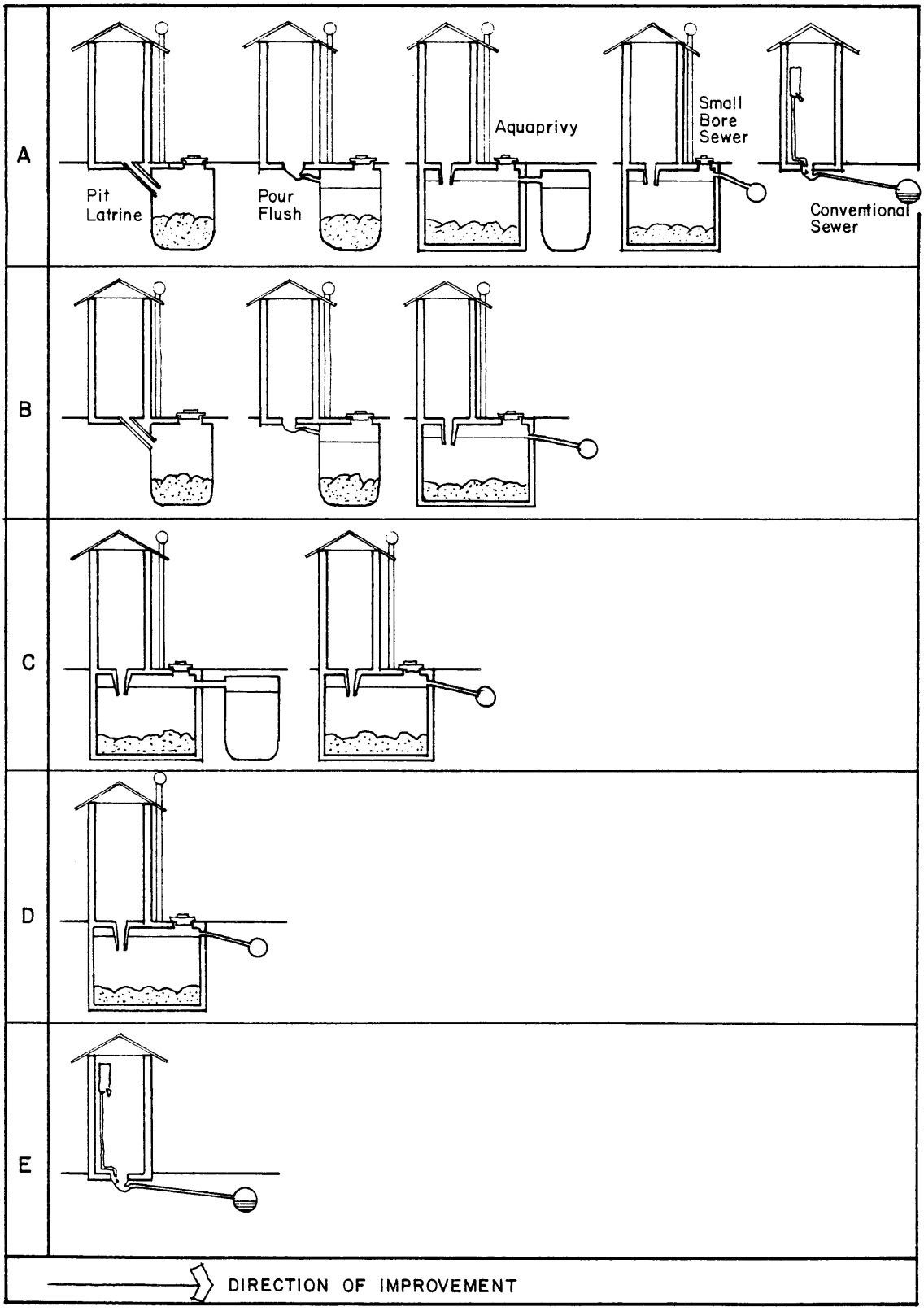
From a user's standpoint, this system is no different from any other pour-flush, or aquaprivy. The main difference is the size of the vault, and its emptying. Desludging is done by a vacuum tanker at regular intervals of two to three weeks (fig. 4.12). The tanker is equipped with a suction pump and a hose up to 100 meters long, which can, hence, reach the houses located far from the access streets. The size of the vault is smaller than other systems, if it is to be regularly emptied.

This vault can also receive waste from more than one household, so that each time the tanker operates, it serves a good number of units rather than a single family. Municipal involvment is, by and large, obvious, unless the community, through its association, is responsible for hiring a private company for vault emptying. Provisions for night-soil disposal have to be made, yet, most of these systems are part of an urban network where off-site disposal has already been thought of.

4.1.7. Upgrading of Technologies

All systems have, as we saw, a great potential for upgrading. This means that, as individual resources and needs increase, the sanitation option can be improved with little modifications. A schematic diagram is shown in fig. 4.13, represen-

Fig. 4.13 Upgrading Diagram



Source: Shah, Mahendra. (Bibliography No. 30)

ting one of the possible alternatives or directions of improvement. Septic tanks are not included, for instance, yet, they can be improved as well. In the same way, a single-vault composting toilet can be added a second vault, and so forth. The diagram is useful to show that the modifications are possible, and technically simple to perform, provided the user is taught to understand how the system operates, and informed about the range of alternatives available.

4.2. SELECTION OF APPROPRIATE TECHNOLOGIES

4.2.1. Cost Comparison

Several authors have approximative figures regarding the cost of these systems, according to personal involvment in field studies. To adopt a certain analysis from a given literature would narrow our understanding of the problem, and bias our preference for any system included in that bibliography.

The World Bank, with all its 144 countries affiliated, has accumulated considerable experience in developing areas over the past 15 years, and is, probably, the best source for a reasonable analysis.. The Bank has experimented all the aforementioned options throughout the world, with varying degrees of success, and, thus, is now in a position to rank them both

economically and technically.

Included in this section is a comparison based on investment and recurrent costs (described below), and percentages allocated for collection and treatment of each technology. Although the following charts apply to projects undertaken in Africa and Asia, we can still have a fairly good idea of the disparity among prices. The cost figures, in 1978 U.S. dollars, may not be updated, but certainly the proportional rate among them has remained much the same. The analysis can be easily "digested" by lay people in the field, and general professionals, for the complex economic calculus have already been done by economists at the Bank, and need not be duplicated here.

This comparison is not exhaustive as such, for some issues are not covered by the method used. For example, the analysis does not reflect macroeconomic goals, such as employment generation, or savings and/or fluctuating investment rates. Another point is that, since no market currently exists for such alternative technologies, it becomes difficult to quantify them, and only a qualitative analysis as to the environmental consequences of a particular system will show its long-term efficacy. Furthermore, it must be noted that the least cost option need not always be selected, especially when there are differences in the output of service. A least cost comparison can only be easily assessed when levels and quality of service are the same.

Finally, the reader should note that we are dealing only with economic costs, which can be estimated based on availability of labour, levels of water provision, etc. The final user, on the other hand, is more concerned with financial costs, or how much will he be charged for such services (in the case of communal facilities), and how that charge will be distributed over a period of time. Financial costs are difficult to estimate, and will not be dealt with in this paper, for they depend exclusively upon policy variables such as governmental subsidies, interest rates applied, continuity of level of income, and other factors.

The most important figure to bear in mind in the following cost comparison is the Total Annual Cost per Household (TACH), comprising investment and recurrent costs for a given system. The investment cost is a sort of downpayment, or the initial capital needed to implement a chosen option. Recurrent costs involve the maintenance of the system throughout its lifetime, e.g., possible damage, material added (for composting toilets), as well as municipal requirements such as trucks and pumps. The TACH, however, should not be understood as the total cost of the sanitation option, but rather an economic figure derived from a series of parameters among which the lifetime of the system and the yearly interests applied to an investment loan are the most important. It is useful for us insofar as we are able to rank the technologies, and observe the exponential rise from, for instance, a pit latrine, to an Aquaprivy, where

the former has a TACH of US $ 25, and the latter, six times more, or US $ 168.

Options with the highest TACH (fig. 4.14) - greater than $ 300 - include conventional sewerage and high-tech septic tanks used in Japan and Taiwan. In the middle cost group between $ 150 and $ 200 are aquaprivies and their variations, and vault/vacuum trucks. Low cost options under $ 100 include most of the individual systems, as well as bucket latrines.

Fig. 4.14 Cost Comparison Chart
Investment and Recurrent Costs (1978 US dollars)

TECHNOLOGY	TACH	Inv.Cost	Rec.Cost	Inv.%	Rec.
Low Cost					
PF Toilets	18.7	13.2	5.5	71	29
Pit Latrines	28.5	28.4	0.1	100	--
Communal Toilets	34.0	24.2	9.8	71	29
Vacuum Trucks	37.5	18.1	19.3	48	52
Septic Tanks	51.6	40.9	10.7	79	21
Composting Toilet	55.0	50.9	4.8	92	8
Bucket Latrine	64.9	36.9	28.0	57	43
Median Cost					
Sewered Aquaprivy	159.2	124.6	34.6	78	22
Aquaprivy	168.0	161.7	6.3	96	4
Japanese Vacuum Truck Cartage	187.7	127.7	60.0	68	32
High Cost					
Japanese Septic Tanks	369.2	227.3	141.9	62	38
Conventional Sewerage	400.2	269.9	130.4	67	33

Source: The World Bank (Bibliography No. 10)

In fig. 4.14 we find a comparative chart of all systems, regarding their TACH, and corresponding investment and recurrent costs. These are important for a municipality which has, for example, limited present resources, but a good growth potential and, hence, prefers to invest in a system with low initial cost, and higher expenditures in the long run. Vault truck systems are, by and large, those requiring the least initial percentual investment, yet, the highest operational costs. Others, like a pit latrine, do not require any maintenance at all (or at least, very little, if we consider the labour required to empty it every two to three years).

Fig. 4.15 Functional Compohents of Sanitation Options

TECHNOLOGY	TACH	ON-SITE	COLLECTION %	TREATMENT
Low Cost				
PF Toilets	18.7	100	--	--
Pit Latrines	28.5	100	--	--
Communal Toilets	34.0	100	--	--
Vacuum Trucks	37.5	45	37	8
Septic Tanks	51.6	100	--	--
Composting Toilets	55.0	85	--	15
Bucket Latrines	64.9	51	40	9
Median Cost				
Sewered Aquaprivy	159.2	56	25	19
Aquaprivy	168.0	100	--	--
Japanese Vacuum Truck Cartage	187.7	68	18	24
High Cost				
Japanese Septic Tanks	369.2	90	7	3
Conventional	400.3	50	21	29

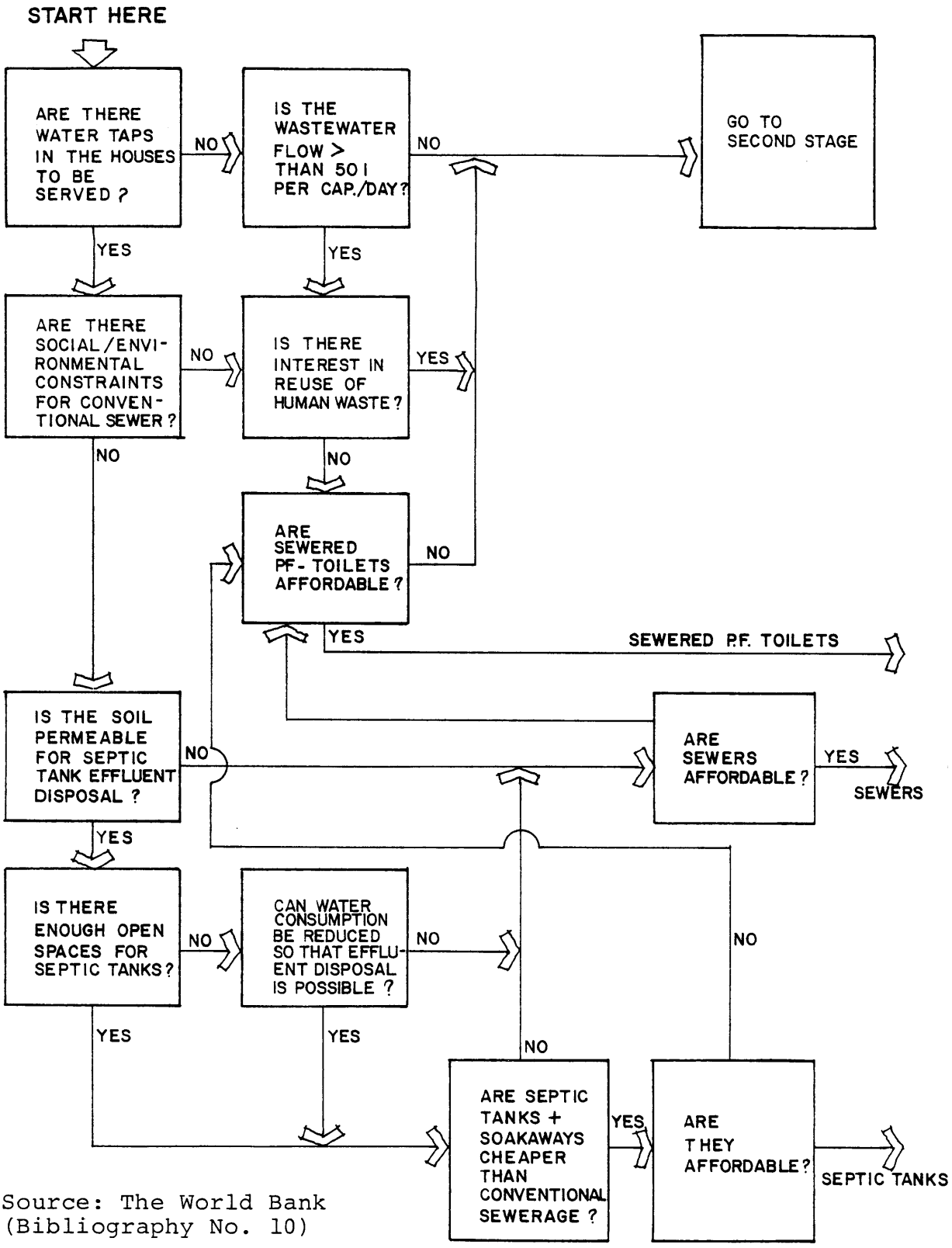
The previous chart can be made even more explicit, if we break it down into the functional components of sanitation options, e.g., differentiating costs for construction of the facility, collection of human waste, and treatment, where applicable (fig. 4.15).

Again, vacuum trucks require a higher percentual cost for collection, due to the need for a fleet of tankers, and off--site facilities for their maintenance. Some do require municipal involvement, whether at a small or larger scale, and some do not. In the selection of a specific technology, one cannot foresee, at this point, the level of input that a certain municipality is willing to provide toward a specific community, if the latter's tenure status is still to be decided upon. Although the ideal situation would be a stable partnership between government and community, this may not always happen. That is to say, that residents should not expect "things to happen", for the wait may be a long one. If outside assistance does arrive, so much the better. Hence, any option, regardless of cost, should account for the least municipal involvement, and the most communal, on-site action.

4.2.2. The Algorithm Method

Once the cost of a system has been properly assessed and ranked among others, it is now time to focus on the technical and social aspects of the selection process. Technical

Fig. 4.16 The Algorithm Method



Source: The World Bank
(Bibliography No. 10)

Fig. 4.17 The Algorithm Method
(Continued)

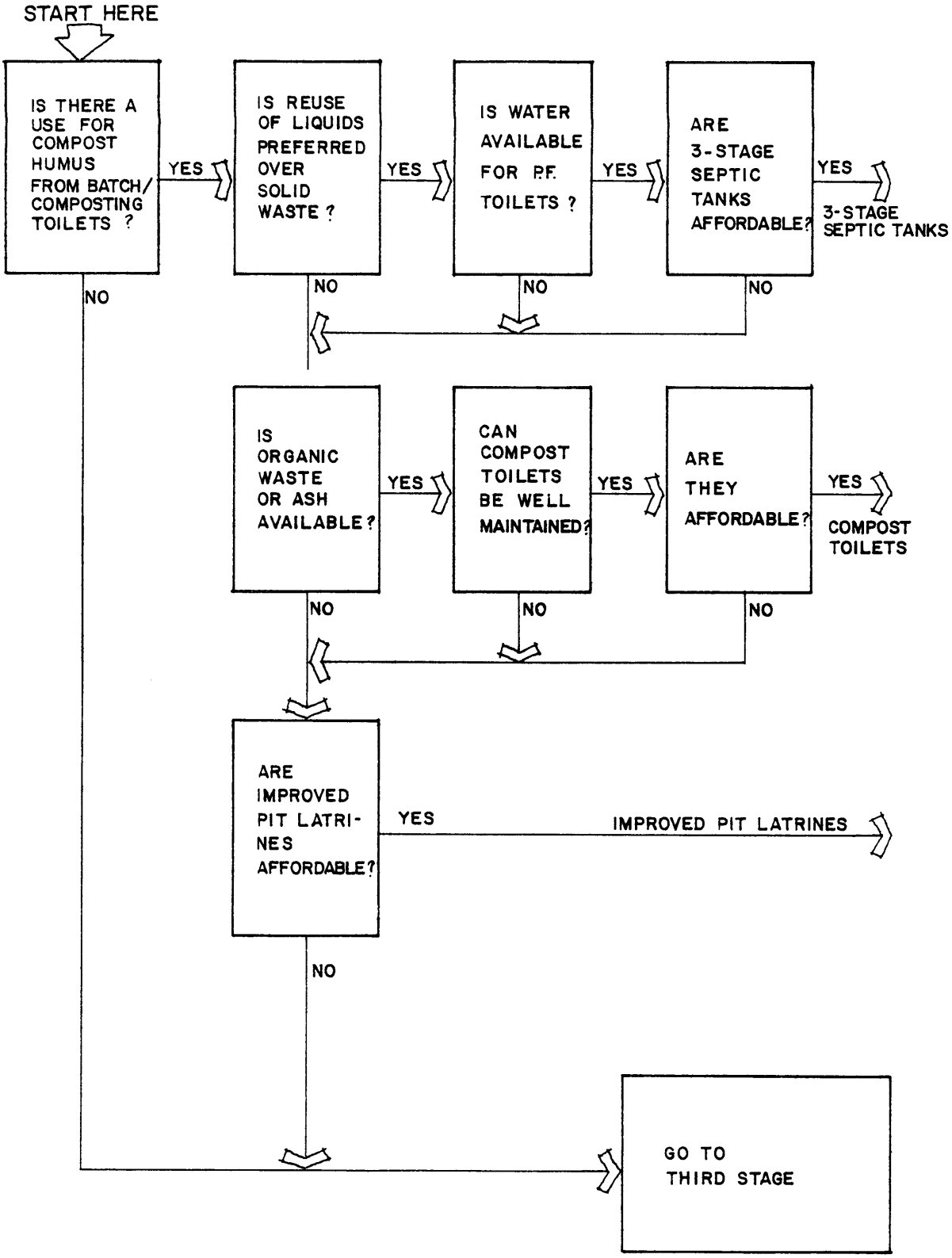
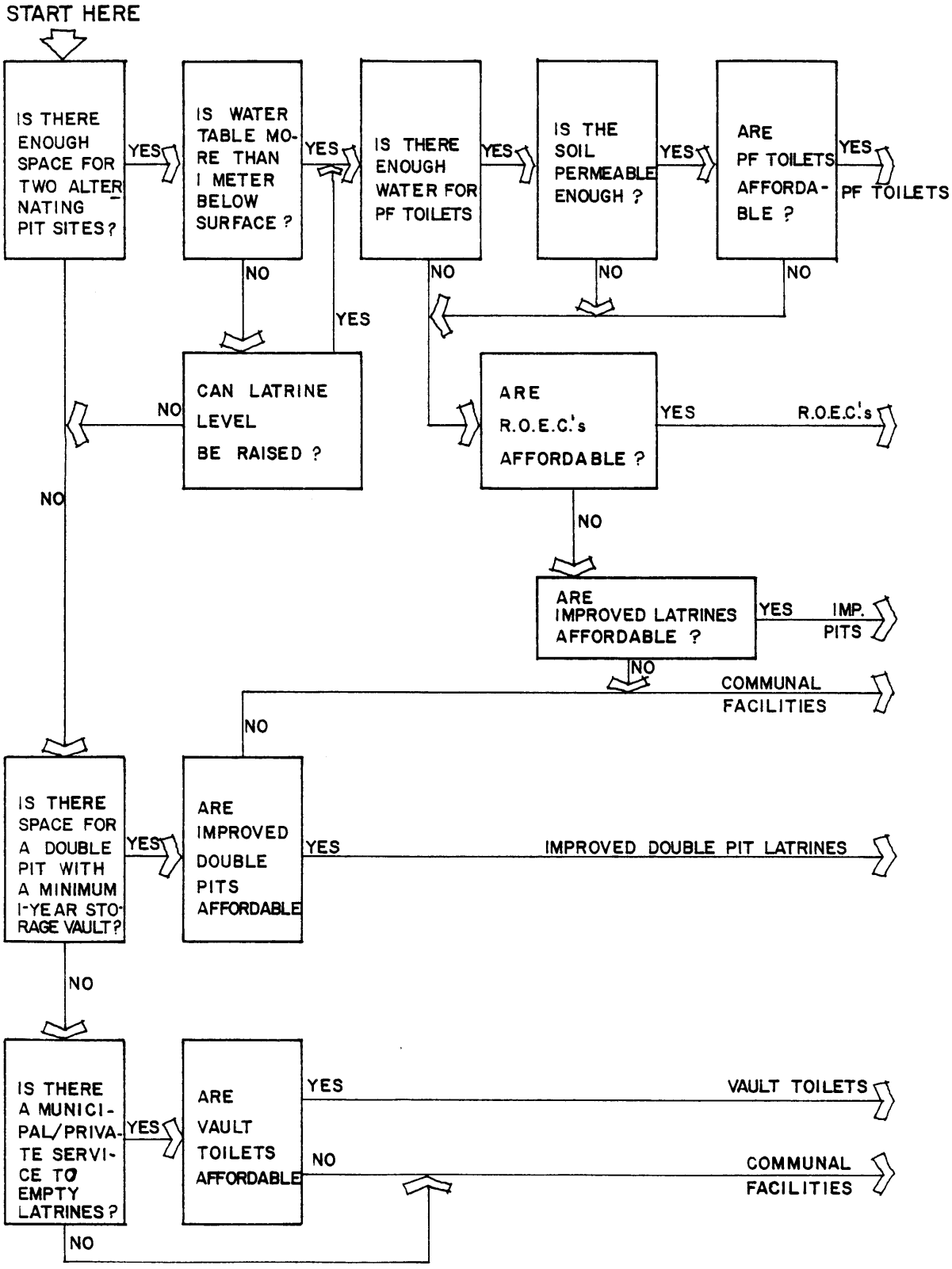


Fig. 4.18 The Algorithm Method
(Continued)



issues include soil conditions, availability of materials, skilled labour for certain technologies, etc. but most important of all - and that which will ultimately dictate our choice - is the level of water provision. Social factors are, perhaps, the least considered by engineers and planners, yet, concern directly the user who will make use of the sanitation option. The reuse of excreta as a soil conditioner is a classical example of social constraint, as many societies will not accept it. Unless there is a general understanding of the benefits of such systems, and the voluntary willingness to handle human waste, such options should not be considered, even if the technical and economical grounds are fulfilled (except if a positive and sufficiently effective educational program can be launched at the beginning). Likewise, the maintenance of a water seal in an aquaprivy has also to be thoroughly understood and maintained, for proper operation of the system. Especially in the case of individual options, the final user should be given the opportunity to "learn" how a certain system operates by means of simple sketches like those included in the chapter, along wity non-technical, or simple instructions given by the municipality through local associations.

The World Bank has developed an algorithm method (Figs. 4.16 through 4.18) to help planners choose the most suitable option for given settlements. Selection occurs after a series of key questions are asked, involving technical, social and economical aspects. For each question, there is always a "Yes"

or "No" leading to a later stage and, ultimately, to an objective system. A noteworthy point is that the method starts with the crucial question of water supply ("are there water taps in the households to be served?") from which the algorithm complex can be derived. The last box to be checked in the diagram prior to any objective technology, poses the ultimate economical question which seems the hardest to surpass: "After finding your way through the labyrinth of technical and social checkpoints, can you afford the technology that best matches your answers ?" If not, another option, less costly, is offered.

The main advantage of such a method is that it presents, in a rather simple format, a series of vital questions to be asked by planners who, would, otherwise, neglect them. Some times, more than one option can be found as most suitable, or it might happen that, due to a number of circumstances, the final technology proposed is not the most appropriate. Therefore, the algorithm diagram should not replace engineering judgement, but act as a guiding instrument inasmuch as it asks the right questions in the right sequence.

4.2.3. Appropriate Technologies vs. Case Study

As we saw in Chapter 3.0, the Casal Ventoso settlement has but a few public water taps at certain points throughout the hill. Household water is, with few exceptions, nonexistent,

a drawback which already limits our list of possible options. The havily dense housing stock and, consequently, the limited number of open spaces for individual septic tanks, pit latrines, or similar systems, is another problem to be considered. Finally, the large number of people makes it difficult for the implementation of some technologies unsuitable for high density areas.

Any proposal for the site has to bear much of a piece meal character, i.e., it has to adjust to the different conditions encounetered within a given community. In other words, the solution is a combination of sanitary options, rather than a single one set to meet all needs. The site is highly sloped at some points, less at others ; Heavily built up here, less dense there ; some houses have small backyards, some do not; and last, some people may be susceptible to waste reuse, amd sime may not. All this contributes to a multiple approach to sanitary improvement, which could be conceivably satisfied by the following proposed scenario(s) :

1) Communal Facilities

There are on the site, some vacant plots of land - between 20 and 30 - which are, at present, filled with construction left-overs and garbage waste. A number of these are next to the major access street crossing the site, and, thus, have a high potential for public use, since no other spaces exist. In two or three of these plots, and at a reasonable distance from

each other - say, 150 to 200 meters -, communal facilities could be provided at low cost by the city, with showers and latrines similar to the one belonging to the local association where all the residents presently gather to wash themselves. The sanitary system adopted in this case would be a number of septic tanks next to these facilities, connected to a small-bore sewer pipe. The city would provide the water connection to each of the facilities, the cost of such services being charged on the residents for a limited period of time, provided that the users are made aware of what service is to be provided, and explained the benefits of such an improvement.

Construction of the facilities could utilize local labour force, and should not take much time to build. The cost of a septic tank network is fairly cheap, compared to conventional sewerage, and technically simple to build, requiring little skills. The small diameter sewer connected to it would carry no solids and, hence, the slope of the site would not represent a problem but, rather, an advantage. The tanks need periodic desludging, this requiring the only municipal involvment over the lifetime of the system.

Such a strategy would, then, be halfway between what exists today (e.g., one building with communal showers serving 15.000 people), and the provision of full sewerage to every household. What we are proposing is a descentralization of the

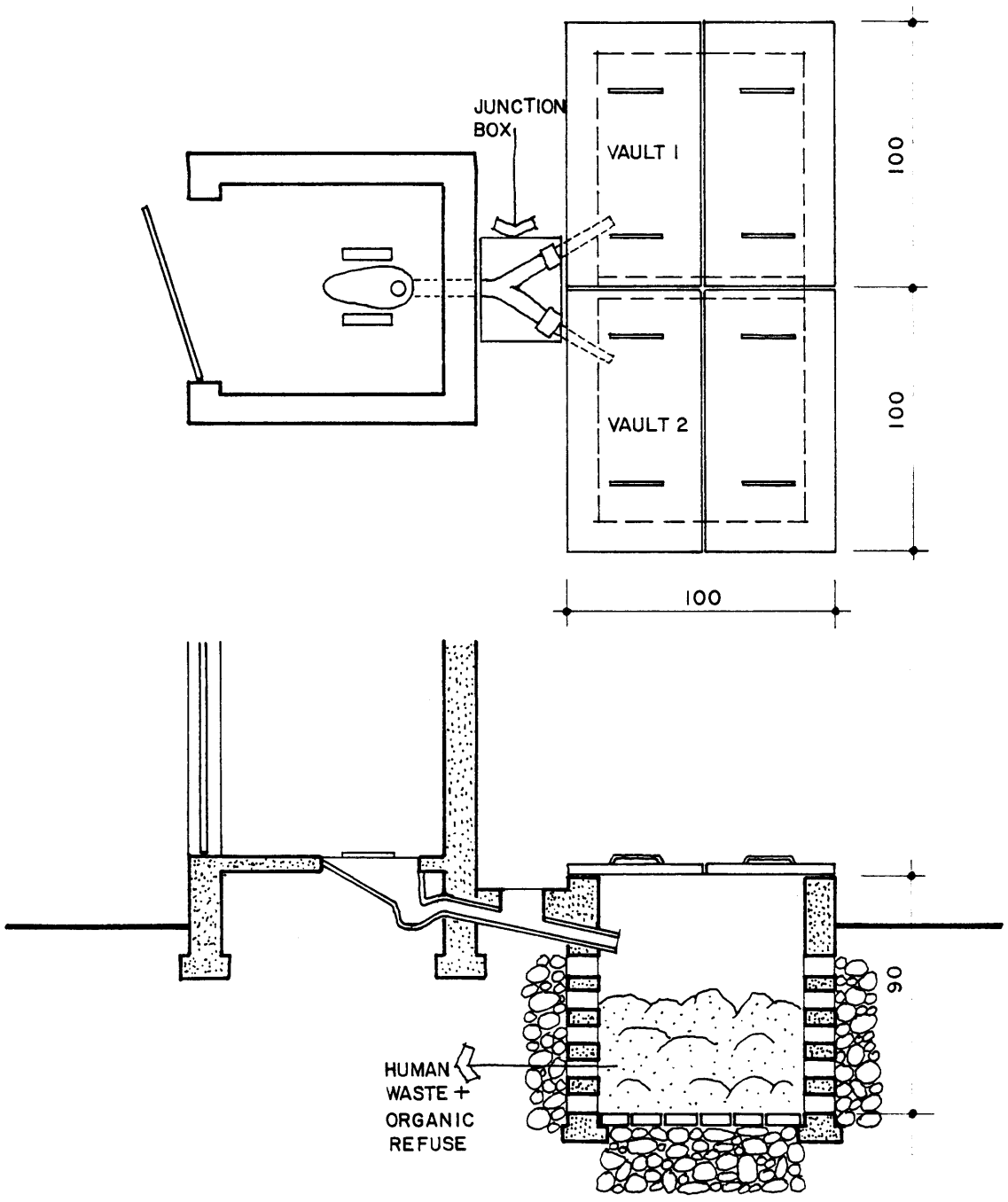
sanitation process by using the locally available plots, namely those adjacent to access routes. Each facility would serve a reasonable fraction of the resident population, and the system should operate certainly better than now, with municipal input required only at the level of water connection, and maintenance of the tanks.

2) Individual Systems

There are some people who, for several reasons - illness, old age, etc. - do not wish to use communal facilities and, thus, must be given the option of alternative, individual technologies. Some may also be willing to spend more than others in order to have an indoor bathroom, or may have the required open space in a backyard for it. In short, those who can afford a private system should be offered one or more options, and choose according to personal interests and ability to pay.

The options in this case are restricted to those requiring the least municipal action, and, among them, the composting toilet seems to be the most appropriate. First, they require little or no water for operation,and maintenance is very low (i.e., limited to adding organic refuse regularly), whereas aquaprivies, for example, require higher maintenance and regular desludging. Secondly, the use of composted humus can be seen as an asset inasmuch as people in the settlement come from rural areas where animal waste has been used for years in agriculture. I believe that the idea of reusing hu-

Fig. 4.19 Double-Vault
Composting Toilet
With Organic Refuse

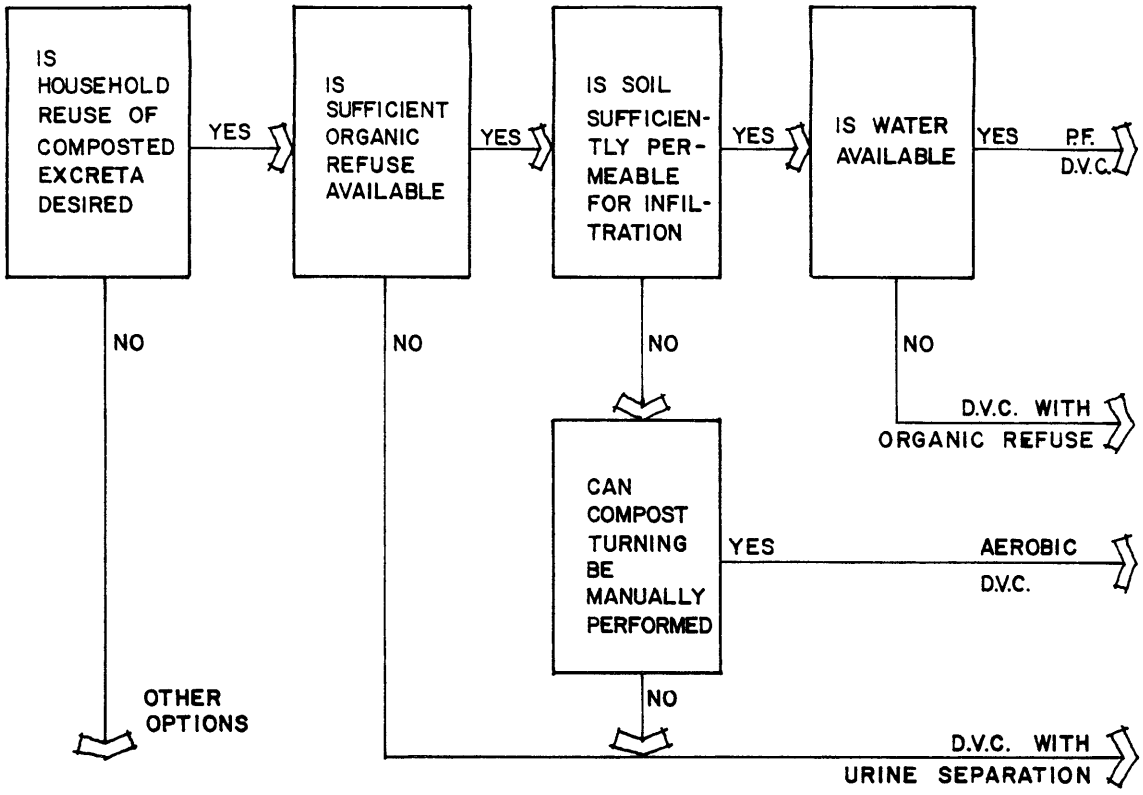


Source: Rybczynski, W.
(Bibliography No. 24)

man excreta would be well accepted (possibly if explained by simple educational leaflets or meetings), especially if we consider that only those who do not use the communal toilets will opt voluntarily for this technology. As Prof. Rybczynski says, the implementation of composting toilets in such countries represents "a modification of current practice rather than a new attitude towards reuse" (Rybczynski, W. Bibliography No. 24). The following types appear as possible candidates for such a course of action :

The first system is one of the Batch/Alternate type known as the Double-Vault Composting Toilet (DVC). Developed by I. Patel in India in the 1960's, this option combines the conveniences of an indoor, pour-flush toilet, with a composting vault (fig. 4.19). Basically, there is a squatting place and a double pit nearby. An "Y"-type pipe, in a junction box, connects the toilet to either one vault, depending on which is used. The vault is completely permeable, i.e., perforated on the sides and bottom, to allow for flushing water to infiltrate into the ground. Before it is put to use, the vault is 3/4 filled with organic refuse, after which it is ready to a-cept human waste. Once full, the vault is sealed, and composting begins anaerobically during a period between 6 to 12 months, while the diverter in the junction box is moved to the adjacent vault. From a user's standpoint, the system performs like a conventional indoor bathroom, with the exception that the water is hand-poured, whereas the waterborne

Fig. 4.20 Algorithm Method for
Double-Vault Composting Toilets



Source: Rybczynski, W. (Bibliography No. 24)

system has a mechanical flush.

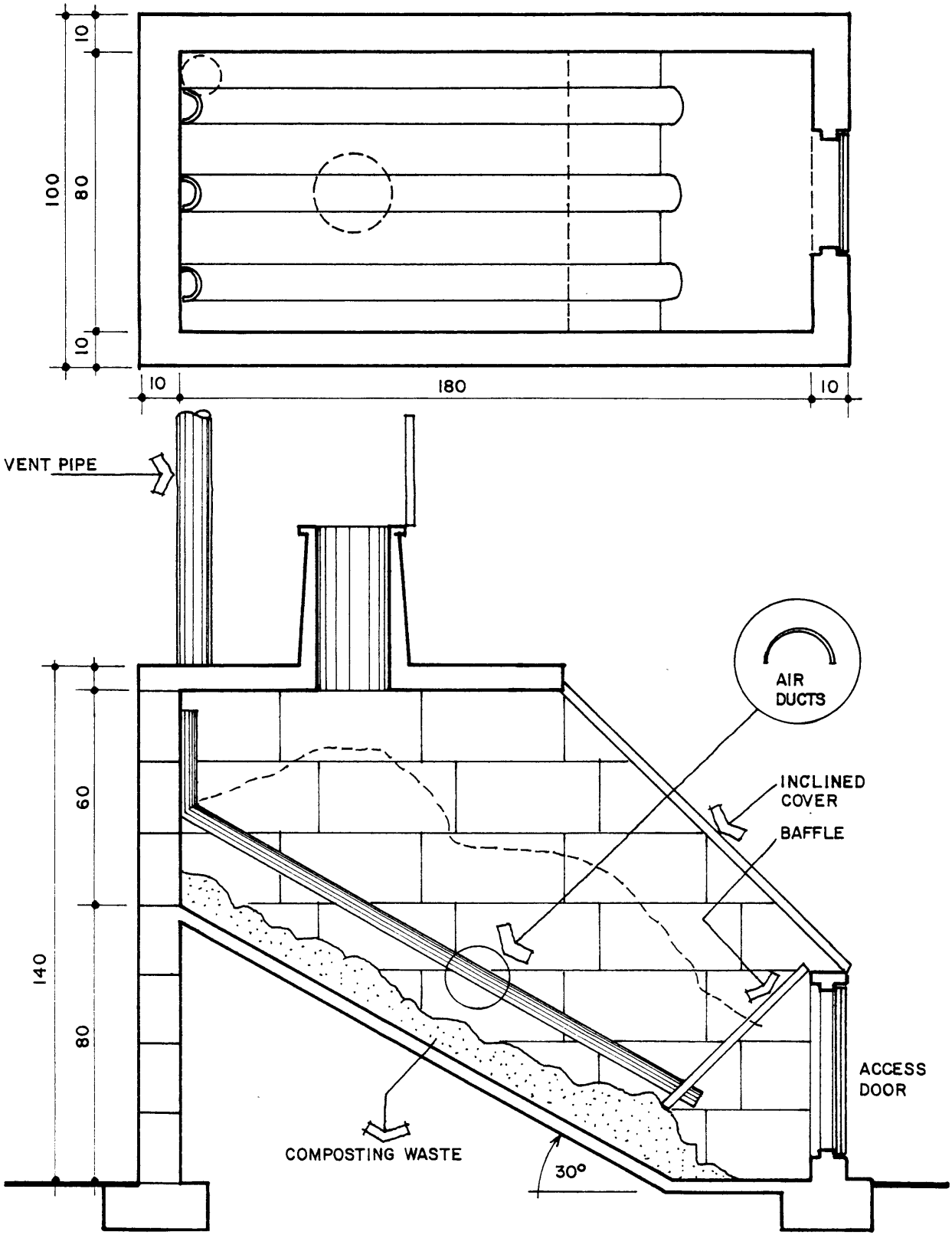
A number of variations in DVC toilets can be found, with differences in the composting process (aerobic/anaerobic), and separation of excreta from urine. Prof. Rynczynski, who has done extensive research in this field, adopted the second stage of the World Bank's algorithm method fig. 4.17) - in the section referring to DVC toilets - to accept all the variations in this particular option (fig. 4.20 above). For our purposes, however, only the first (DVC with organic refuse) need to be considered, for the key questions leading to it have positive answers for this settlement.

The cost of DVC toilets is extremely low, averaging between US $ 30 and $ 40, and limited to the necessary materials for its construction. Unlike other technologies which require quite an open area, the DVC vault takes no more than one meter in front, or in the back of the dwelling. It can, therefore, be installed on any pedestrian walkway throughout the neighborhood.

The second individual option (fig. 4.21) was developed by the Mimimum Cost Housing Group of the School of Architecture, McGill University. The MINIMUS is a single-compartment composting toilet based on the Swedish CLIVUS MULTRUM (developed by Rickard Lindstrom in the 1950's). Whereas the Swedish model is entirely prefabricated (fiberglass), the MINIMUS is adapted to concrete block construction. The principle, nonetheless, remain the same as its predecessor, in that human waste and organic refuse are mixed in a sloped chamber, producing a dry humus suitable for agricultural reuse.

The bottom of the compartment is made with sand, gravel, and a thin coating layer of concrete. The air ducts can be of PVC pipes cut in half, and the squatting slab, of concrete cast in situ (or wood). An inclined door allows for garbage disposal, and should be oriented towards the sun, in order to facilitate the heating up of the chamber, and help the composting. The dimensions shown (in cm), should be appropriate

Fig. 4.21 MINIMUS Composting Toilet



Source: Rybczynski, W. (Bibliography No. 26)

for a family of 4-6 persons when utilized regularly. Composting (or mouldering) takes as long as 3-4 years.

The system described has undoubtebly higher maintenance requirements than a DVC toilet, yet, does not use any water at all. Special attention should be given to the following points for a proper and successful operation of a MINIMUS :
1) Construction should be made airtight, and all openings - vent pipes and access door vents - be protected with fly--proof screens.

2) One of the most common problems is liquid buildup in the chamber. Before the MINIMUS is put to use, it is necessary to spread over the bottom a layer of rich top soil and absorptive material such as peat moss, sawdust or dried grass. Moreover, carbon bearing material must be added frequently to the compartment, to control the Ph balance, and avoid urine buildup. When organic waste is not available, sawdust, peat moss, wood ash, or grass clippings will do much as well.

4.3 GARBAGE COLLECTION

The issue of garbage collection is much more difficult to tackle, inasmuch as it involves a good deal of policy decision and municipal input. While we were dealing with sanitation options at the level of the individual, we had at hands

a series of alternatives which, along with other characteristics, required a certain degree of municipal involvement. This outside help could be ranked and weighed regarding costs and technical assistance, whereupon a number of technologies would be selected.

Little can be done in garbage collection improvement without a strong commitment from the city. It is useless to suggest that people should not dump their garbage in neighbouring plots and use the public containers along the access routes, for this is not likely to occur. The site is steep, and full of narrow stairways at certain points. There is only one street for automobile traffic (refer to fig. 3.4, Chapter 3.0) where garbage is collected by means of containers located along its extension. The abutting residents do make use of the latter, yet, it is understandable that people residing anywhere up or downhill refuse to cope with the difficulties associated to the physical conditions of the site. This kind of undiscipline will continue to happen in the area of garbage disposal, regardless of how many containers the city will place on the access street, or the frequency of the collection service. What the Municipality can do is to lessen the problem with two simple strategies, one of which has to do with the sanitation issue :

1) By giving a <u>specific use</u> to open spaces with, for example, sanitary facilities provided as described in the previous

section, or by forcing the owners of vacant plots to develop them (by, say, high taxation of vacant land). The city will reduce substantially the amount of plots filled with litter, and residents will have less and less places to "choose from" when disposing their garbage. A vacant plot is a natural invitation for garbage dumping and vermin breeding, which can be avoided, if given a specific and well designated function.

2) The former suggestion does not cover all the plots, for only those next to access streets are potentially usable for communal facilities, while the others are subject to appropriate bylaws and policy decisions to encourage building, a matter which is beyond the scope of this thesis. The second improvement in the system has to do with the areas of the site served by dead-end pathways such as Vilas and the like. In order to ease garbage disposal the city could use a system of hand carts, i.e., a number of small containers would sit at the end of each walkway and transported, say, bi-weekly, on hand carts to the neerest street where municipal trucks would collect them. The idea is to use people where trucks cannot enter.

Let it be said, once more, that both strategies cannot be accomplished without direct municipal input, and are, hence, harder to manage and "digest" than others.

CHAPTER 5.0 CONCLUSION

The understanding and implementation of alternative technologies for low-cost housing has its obstacles, among which the so-called "information gap" is the most striking. In the case of sanitation options, for example, architects and engineers are usually unaware of the full range of technical possibilities that exist between the cheap hole in the ground and a $ 400 per capita conventional sewerage. The lack of information begins at the school level - where the student is confronted with different configurations in sewerage layout instead of different levels in sanitation strategies - and this lack of understanding of all options is, in turn, passes on to planners and administrators. That is to say, that most municipalities in industrializing cities are usually technically prepared exclusively to deal with sewerage and waste treatment facilities at the level of the most costly system available, used in the "rich", industrialized world. This does not mean, however, that the advantages of a conventional waterborne network should be underestimated. From a user's point of view, it is still the most "convenient", hygienically safe and easy to operate system of all alternatives. But, it should be remendered that it also calls for the highest amount of flushing water (4-5 gallons). The institutional requirements are more comprehensive and technically complex than any other system, with regarding the maintenance of pipes, and off-site treatment (waste and sullage disposal); above all, it is beyond the economic reach of the majority of people in substandard settlements in, and around

the urban centers of developing countries.

The information gap is a two-way process. If, on the one hand, engineers are biased in their learning of sanitation technologies, municipal authorities, on the other, will not call for advice on an examination of different sewerage networks, partially because what professionals know best are only conventional systems, and also because the city is not offered alternatives with proper technical and economical assessment.

This thesis does not pretend to cover all aspects of settlement upgrading. In fact, it focused mainly on those issues identified in the case study as a priority over others. Many important aspects of broader nature concerning this vast subject were left out, and need to be studied and dealt with in another effort in the future by the author, or others. This is acknowledged and included here as a caveat in order that this thesis be judged on the basis of its limited aims, and to avoid it to be labelled as an oversimplification of ugrading strategies, but rather a look in depth at some issues, especially sanitation and waste disposal.

A more extensive work in this field would ultimately have to deal with housing stock quality, and other issues inherent in the problem of comprehensive marginal settlement upgrading. Although the ratio of shacks and tin-can huts is low in the

Casal Ventoso, other communities may have higher indices of substandard units and, hence, regard this issue as primordial in a list of short term strategies. The problem of construction quality within the upgrading concept deserves, per se, a whole thesis involving policy decisions and thorough research on the subject of self-help and co-operative movements. The provision of materials for dwelling improvement, the storing and distribution of the latter, as well as the form of subsidy by which the user will have access to them, all play a major role in the technical approach to housing. Policy issues regarding land tenure and landlord - tenant relations have also to be accounted for in a future research. One question, for example, that arises in the landlord - tenant interaction has been addressed to me on several occasions in conversations with local rentpayers : How can they improve their physical environment if the houses where they live are rented, and the landlords will charge them additional rent increases for any addition/expansion/improvement of the dwelling unit ? Or, put another way, is it fair to penalize a rentpayer with an extra charge when he tries to improve his living standards by his own efforts, and with his own money ?

Within the scope of the main strategies set forth in this thesis - low-cost sanitation options - there are also some technical and environmental aspects which have not been fully exposed. For example, the technical ones include those sys-

tems such as chemical toilets and bucket designs, developed mainly in Europe, and which contain, with some differences in shape and operation, liquid, mechanical or electrical devices adapted to toilet fixtures for a safe disposal of waste and reduction in water consumption. These systems, like the TE-BE, MINIHJARTAT, CIPAX, WANTO, IFO (all Swedish), DUAL FLUSH (U.K.), TURQUO (France), VACU-FLUSH, VACUUM MACERATOR, HEAD-MATE (U.S.A.) and others, are relatively high-tech and require highly qualified and expensive expert maintenance for best results. Therefore, I feel that they do not apply to this particular case problem, or that the strategies presented have considerable advantages in cost and construction over the aforementioned. Other systems for human waste disposal, like the algae digester septic tank, are still on a very experimental level, and may deserve close attention of engineers and planners in a near future. As of now, I do not consider this system as being at the level of practicability as those discussed in this thesis which concentrated mainly on ease of construction, technical simplicity and ease of maintenance.

Environmental aspects not included in this work, refer to health studies on diseases caused by human feces. The World Bank and other international agencies, as well as some universities, have carried out research on this issue prior to design proposals for any of the discussed sanitation options. The suitability of a given system has to meet, aside from

technical and economical standpoints, the particular and general health requirements of a certain nation. Some areas may be especially prone to be invaded by one or the other type of pathogen found in excreta, others may be more susceptible to fly breeding. The assumption, in this case, is that any technology presented here, which has proved itself to be successful in continents such as Africa and Asia - where health hazards are extremely high in some areas - will also be suitable for Portuguese environmental conditions, insofar as temperature, climate, labour, economy and social nature of people.

A final remark concerning the municipality of Lisbon, which has been struggling for the past thirty years with the "embarassing" issue of substandard housing. In chpater 2.0 we have seen the reasons why the institutional system should look for alternative measures in settlement rehabilitation. The bulldozing policy has now been widely condemned by social scientists, architects and anthropologists, who have witnessed its failure in the past, and look for a more humanistic, less radical approach in days to come, with a higher degree of respect for our fellowman. This commitment to a more humane tratment of marginal areas will not become reality if it is not embraced by those who hold the power and, hence, decide the future of settlement like the Casal Ventoso.

Thus, there is an alternative road for planners and city re-

presentatives. There is an alternative future for the Casal Ventoso. The upgrading of a community is, given the social, technical and environmental means available today, a better approach for helping the urban poor. Moreover, the outcome of such a policy - vis-a-vis the uprooting of dwelling environments and living traditions - will certainly be less of a stain on our memory in the future.

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