THE PRIVATISATION OF MUNICIPAL SOLID WASTE MANAGEMENT IN RECIFE, BRAZIL

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ABSTRACT

The last decade has witnessed a massive change in the balance between private and public sector participation in the economy, worldwide. The delivery of infrastructure services is one of the economic activities where these changes have been the most prevalent. This thesis aims at contributing to a clearer understanding of the effects that privatisation may have on the life of city dwellers.

It examines the privatisation of Municipal Solid Waste Management (MSWM) in Recife, northeastern Brazil. This examination is based on the results of a research carried out in 1994. It is a comparative study involving two areas of the city: the first is privately served, while in the second services are publicly provided. The comparison is based on four variables: accessibility, quality, productivity and costs of MSWM to the public sector.

This study has adopted a comprehensive approach in the comparison of the two areas, considering the point of view of the private and public service operators, users and nonusers, and the municipal administration, which is responsible for the provision of MSWM in the city.

In accordance with this approach, three surveys were carried out: an archival records survey, both in the private and public agencies involved in MSWM; a household survey in the two areas of study, which covered users and nonusers; and a set of non-scheduled interviews, which involved managers, policy-makers, politicians, experts, and community representatives in the city.

This research has found that the private provision of MSWM in Recife, as opposed to the public sector provision, is associated with higher levels of accessibility, productivity and quality of service delivery. However, the costs to the public sector of services provided by private and public operators do not show any significant difference.
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PART 1 - CONTEXT AND BACKGROUND

CHAPTER ONE - INTRODUCTION

1.1 Rationale and Significance

One of the most pressing challenges facing municipalities in developing countries at the end of this century is meeting the demands for infrastructure services. The adequate provision of infrastructure in cities of the developing world has become an issue of immense proportions. Nearly all recent demographic projections indicate that the rapid growth of urban populations in developing countries that has characterized the 1990s will continue well into the next century. Urban populations in these countries are currently growing at the rate of 6.3 percent per year and, in low income countries, as much as 8.8 percent (World Bank 1991a). By the year 2000 this population will be around 1.1 billion, reaching 40.0 percent of the total population. Around the year 2025 all developing countries will be predominantly urban (UNCHS 1987; World Bank 1991a).

The crucial problem of providing infrastructure services to this growing population is aggravated by the increasingly high concentration of the poor in cities. According to the World Bank (1994), already inadequate infrastructure is deteriorating rapidly and one billion people in the developing world still lack access to safe water and nearly two billion lack adequate sanitation services such as municipal solid waste management (MSWM) and sewerage. It has been estimated that the global burden of solid wastes amounted to 1.3 billion metric tons in 1990 and it will increase at an annual rate of 2.7 percent through the year 2010 (Beede and Bloom 1995). Developing countries account for a disproportionately high share of this total relative to their share of the world income. This situation has had a disastrous impact on the quality of life and the environment in urban areas, calling for urgent solutions.

Furthermore, coping with the urban infrastructure services challenge is crucial to developing countries because infrastructure can deliver major benefits in poverty
alleviation, environmental sustainability and economic growth. Cities have high economic and social importance due to the strong linkages that urban economies have with macroeconomic performance. Increasingly larger shares of GDP in developing and middle economies come from urban economies (Harris 1992). Good infrastructure raises productivity and lowers production costs. Cities are also social entities that provide public and private support mechanisms which are fundamental for living. Those mechanisms are related to the social and development opportunities in which infrastructure services have a crucial role (Mattingly and Meikle 1991).

However, cities in developing countries must resolve these extremely pressing problems within the severe resource constraints caused by the fiscal crisis that characterizes most of these countries, particularly those with large external debts. Evidence suggests that the municipal administrations in developing countries have neither the financial resources nor the administrative capacity to extend infrastructure services to the growing poor population. Financial statistics in Latin American countries show that infrastructure service provision outlays in these countries are equivalent to 8 percent of their GDP (Guarda 1987). Studies carried out by the World Bank (1994) estimate that demands for services will continue to outstrip public investment capacity over the next decade.

Facing the immense challenge of providing urban infrastructure services in the context of scarce resources that characterizes developing countries involves tackling inefficiency and waste - both in investments and in delivering services - and responding more efficiently to user demands. Indeed, the need for efficient infrastructure in cities is stressed in most of the development strategies presented by international development agencies and donors, as illustrated by The World Bank (1994), which proposes a policy framework and strategy that emphasize the need to broaden the concern from increasing the quantity of infrastructure to improving the quality of infrastructure services provision. This calls for re-thinking the issue of how these services should be delivered to the user and who should be responsible for their
provision. Since the public sector does not have the resources to meet the demands, the involvement of the private sector has been a major and much debated innovation in public administration throughout the developing world, proving to be a most controversial issue.

The privatisation of infrastructure services is no less controversial. Municipal administrations in developing countries have been encouraged by national governments and international development agencies to involve the private sector in service provision as a strategy to increase the efficiency of cities. However, alongside the spreading of privatisation policies in many countries there remains a limitation on the knowledge of the forms that the process can take and its implications for the different groups of the society. Privatisation policies are highly sensitive to the context where they are implemented, posing difficulties for the contribution of the experiences to the general knowledge on the subject. There seems to be a consensus in relation to the need for more empirical evidence about this policy, not only from different social and economic contexts, but also in relation to different levels of public administration and to different services.

1.2 Objectives of the Study

This research focuses on the privatisation of municipal solid waste management in Recife, Brazil. Its general objective is to address the question of the privatisation process in the context of developing countries, setting the privatisation experience in the context of urban management. It aims at adding to the understanding of how the process takes place in practice and assessing its impacts on service delivery in relation to different groups of the community and the public sector.

This research has two specific purposes:

(i) to provide a description of the current practice of MSWM in both the private and
the public sector;
(ii) to assess the implications of the privatisation of municipal solid waste management regarding improvements in quality, productivity, accessibility and costs of services to the public sector.

1.3 Theoretical Approach

The theoretical approach of this research has been developed with a view to meeting two main purposes. First to provide a rounded picture of the private and public provision of MSW M services in the city, in which the points of view of the main social actors involved in the activity are taken into consideration. Users, delivering companies, experts, decision makers, politicians, community leaders and the government all had their opinions and points of view taken into account in this research.

Secondly, to compare the performance of both the private and the public sector in very similar contexts of MSW M service delivery. This is due to the difficulty of drawing conclusions from experiences which have taken place in different cities, different services or different levels of administration. To this purpose this research has been carried out in one city, Recife, which has been divided into two areas, one served by the public sector and the other by the private sector. The analyses of the accessibility, quality, productivity and costs of services have focused on those aspects which present a high level of similarity between the public and the private provision of MSWM, allowing reliable comparisons.

This research has been carried out in five main steps:

- First, a review of the literature about privatisation has been carried out, aiming at identifying the main arguments for and against the policy which are relevant to the subject matter of this thesis, namely municipal solid waste management;
Secondly, the main economic and technical characteristics of MSWM services, which define the specificity of this privatisation experience, have been identified;

Thirdly, an analytical framework has been developed, as well as a research design appropriate to the purposes of the research;

Fourthly, the collection of data from the main actors involved in the provision and consumption of MSWM in the city has been carried out through the use of three main methods, a household survey, an archival records survey and semi-structured interviews with key-role holders;

Finally, this data has been analyzed through the use of different statistical methods, allowing the conclusions of the research to be drawn from the empirical evidence collected in the settings of the service provision.

1.4 Structure of the Thesis

This thesis is reported in ten chapters, divided into three main parts:

Part I - Context and Background;
Part II - Methodological Approach
Part III - Findings and Conclusions.

Part I encompasses five chapters, including this Introduction. Chapter Two provides a discussion of the literature on privatisation in general and in developing countries in particular, considering the economic, the fiscal and financial, and the political dimensions of the issue. Chapter Three examines the economic and technical characteristics of infrastructure services, discussing their relevance to the privatisation decision. Chapter Four focuses on municipal solid wastes management, discussing its role in urban management and defining key terms and main characteristics of these services. Chapter Five provides a discussion of the Brazilian context of privatisation policies, particularly privatisation of infrastructure services, examining the legal and historic framework of such policies.
Part II comprises Chapters Six and Seven. Chapter Six describes the analytical framework of this research. It examines the problem, research questions, hypothesis, variables and measurements of this research, searching for the most adequate and feasible way to survey the subject. It discusses the nature and the methods of research and closes with a research strategy. Chapter Seven discusses the theoretical and practical basis of the many methodological decisions that have been made throughout the work, providing a detailed report of the methodology used in this study. It examines the approach and type of design that have been used, the conditions under which the field work has been carried out and the sampling and analytical processes employed in this study.

Part III encompasses Chapters Eight, Nine and Ten. Chapter Eight provides a detailed description of the current practice of municipal solid waste management in Recife, considering both the private and the public sectors. It examines the institutional, financial and operational aspects of service provision in the City, highlighting similarities and differences, which provide the grounds for the comparison between private and public performances. Chapter Nine reports the findings of the four comparative analyses between the private and public sector which have been carried out in this research. It assesses differences in accessibility, quality, productivity and costs of MSWM services to the public sector. Finally, Chapter Ten provides a summary of these findings, discusses the conclusions of this research and comments on their significance to the general knowledge about the privatisation of infrastructure services in general and MSWM services in particular, in the context of developing countries.

1.5 Summary of this Research Contribution

There are few studies addressing the provision of municipal solid waste management in the geographic, socio-economic and cultural context of developing countries, and this research provides useful information to remedy that deficiency.
The work examines the implications of the privatisation of an infrastructure service to the different groups of the society, considering not only issues of productivity and costs but also accessibility to services and quality of provision. This broad analysis provides significant information to the process of decision-making in relation to the privatisation of urban infrastructure services in other cities of developing countries.

Finally, the findings of this research are based on data collected in the settings of MSWM provision in a developing country, considering the points of view of the main social actors involved in service provision. This provides strong and reliable empirical evidence about the subject, rather than theoretical predictions which are much more common in the literature. This evidence contributes to the general knowledge about the forms that privatisation can take in practice at the municipal level and the assessment of the most adequate and feasible way to introduce the participation of the private sector in the provision of infrastructure service in cities of the developing world.
CHAPTER TWO - PRIVATISATION: A REVIEW OF THE DEBATE

2.1. Introduction

This chapter, together with Chapters Three and Four, defines the boundaries of the field of work of this thesis: the privatisation of urban infrastructure, particularly municipal solid waste management (MSWM) in developing countries. The present chapter examines the contribution the existing literature can make to the exploration of the subject in terms of the focus of this study - the association between privatisation of infrastructure services and the effects on those involved with the provision and consumption of these services.

What becomes increasingly clear in this review is that privatisation has taken economic literature by surprise. During the seventies, standard text books did not even include the subject, as observed by Hurl (1992). In the late 1970s and early 1980s the issue was brought to attention by technical literature and political documents. In the last ten years, however, the literature on privatisation has become increasingly vast.

Nonetheless, there are shortcomings that limit its contribution to the thesis objectives. As Sanchez et al. (1993) highlight, alongside the spreading of privatisation policies in many countries there remains a limitation on the knowledge of the forms that the process of privatisation can take and the impact on society. There are many reasons for this limitation. The authors comment on the small number and abstract nature of theoretical predictions. They also claim that there are few available case study sources of information, highlighting the dissimilar and relatively recent nature of the various privatisation experiences.

This dissimilarity of experiences has proved to be a major problem in this review. It is a direct consequence of the high degree of sensitivity to the context of implementation presented by privatisation policies. Different economic, institutional,
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political and cultural backgrounds strongly affect the form the process takes in practice and pose difficulties for generalising the experiences of the knowledge on the subject (Batley 1992b).

Furthermore, other problems arise from the conceptual definitions and methodological approaches of the studies: a major problem is the failure by privatisation researchers to incorporate work on the effects on different groups of consumers. This gap has already been highlighted by Woodward (1993). Ribes et al. (1990) emphasize that there has been little systematic analysis of the impact of each adjustment measure, privatisation being one, on different poverty groups and at the household level.

Before assessing the literature in greater detail, attention turns to some initial problems so that their implications can be borne in mind throughout the discussion that follows.

First, there is the fact that privatisation was initially conceived as a mechanism for anti-statism (Manzetti 1993). By the end of the 1960s and throughout the 1970s the most important arguments in favour of a return to the ethics of the market were fully established in the literature. However, the issue was always dealt with as a macro-economic policy, with objectives and effects over national aspects, such as: foreign debt, national government expenditures, payment balance, etc. Only by the end of the 1980s have texts on the privatisation of specific local government services been produced.

Secondly, there is the well-known problem to those who research on the so called "developing countries" or "less developed countries". These concepts themselves are highly controversial, but the practical implications of analysing a literature on such countries are undoubtedly worrying. In the case of privatisation, the considerable variation of situations that characterize these countries jeopardizes the application of many findings or even data from one experience to another. If we select some figures such as the size of the public sector, for instance, we have data showing that the
average contribution of public enterprises to GDP in developing countries is 7 per cent, but a closer examination reveals that it ranges from 3 per cent in Paraguay to almost 40 per cent in Ghana (Cook and Kirkpatrick 1988). Berg and Shirley (1987) found that 445 divestitures had occurred around the world during the eighties. But, excluding Chile and Bangladesh, the number drops to approximately a hundred.

A third point to bear in mind is that most of the literature on privatisation, particularly in the early years, had highly ideological motivations. Whether from Conservative think-tanks of the UK or from Reagan's opponents in the USA, this literature provides many arguments, both in favour and against it, but very little evidence to support them (Manzetti 1993). Although there has been a trend towards a better balance between ideological and pragmatic approaches in the last four or five years, the fact remains as a main limitation to the contribution provided by the literature to research on privatisation.

The intention of highlighting these initial problems is not to imply that such work is of no value, but rather that the identification of these basic problems means caution is needed when applying any of the findings of these works to the Brazilian experience.

In the following section, 2.2, the different definitions and consequent approaches taken by previous works in examining the privatisation of infrastructure services are discussed. This involves looking at how commentators have defined privatisation, the difficulties in this process, and what has been done to overcome such difficulties. Section 2.3 examines the shifts of economic paradigm that prepared the way for privatisation policies in economics, highlighting how these shifts took place in developing countries in general and Latin America in particular. Section 2.4 presents the main arguments in the privatisation debate, organising them according to three main dimensions: the economic, the fiscal and financial, and the ideological. The chapter concludes in section 2.5, by summarizing the main findings of the literature.
review relevant to the subject matter of this thesis. This is in relation to the original questions of which are the effects of privatising infrastructure services on different groups of the population and the public sector, as highlighted in Chapter One.

2.2 The Definition of Privatisation

2.2.1 Approaches to a Definition

Privatisation, as a concept, possesses multiple meanings and ambiguous connotations. The literature presents various definitions from different commentators and a wide range of interpretations of the term, which are taken throughout the world. Ramanadham (1989), for instance, provides fifteen connotations of privatisation, while Kate Ascher (1988) identifies many different methods of privatisation, which highlight the variety of ways in which privatisation can be carried out.

Two main approaches to the definition of the term privatisation are relevant for this research. The first refers to privatisation as a transfer of assets from the public to the private sector, while the second takes it to mean a transfer of functions from the public to the private sector.

2.2.1.1 Transfer of Assets

This first approach refers to those commentators who use a narrow definition of the term, usually associating it to the sale of assets from publicly-owned enterprises to the private sector. In this case the term privatisation could be used interchangeably with the term divestiture. Some authors, such as Hurl (1992), also use the term denationalization. This is the way in which it was used by the Thatcher Government.

Among the main theorists who use this more restrict meaning of the term, there are
Hemming and Mansoor (1988) and Van de Walle (1989). To these authors the term is taken to mean (Hemming and Mansoor 1988:1):

*A class of institutional reform that transfers ownership and control of public enterprises from the public to the private sector, with particular reference to asset sales.*

Beesley and Littlechild (1988:11) claim that the term privatisation is generally used to mean: "The formation of a Companies Act company and the subsequent sale of at least 50 percent of the shares to private shareholders".

Other commentators, such as Bannock et al. (1987:37), use the same approach highlighting however that the issue of control transfer is not central to the definition of privatisation. The term, therefore, would mean

*The sale of government-owned equity in nationalized industries or other commercial enterprises to private investors, with or without the government control in these organisations.*

To authors who use this rather narrow definition of the term, institutional arrangements between private and public sector that are not associated with the transfer of assets are not considered privatisation, as illustrated by Van de Walle (1989), who refer to them as *partial privatisation.*

2.2.1.2 Transfer of Functions

The second approach to the definition of privatisation identified in this review gives a broader meaning to the term. In this case, policies associated with the transfer of functions from the public to the private sector are also considered privatisation, as illustrated by Young (1991) and Manzetti (1993), to whom the term privatisation
means the transfer of assets and service functions from the public to the private sector. The definition of privatisation provided by Bryan Hurl (1992) is another example of such an approach. Relying upon the different forms that privatisation has taken to date, he suggests that the term encompasses three types of policies: \textit{denationalization}, \textit{deregulation} and \textit{franchising}. According to the author, \textit{denationalization} refers to the sale of public assets to the private sector; \textit{deregulation} (a synonym of \textit{liberalisation}) covers the policies to remove legal barriers to entry a previously protected market, to allow private enterprises to compete; \textit{franchising} relates to the initiatives intended to allow the public sector to continue the financial provision of services and goods, while they are delivered by the private sector. Definitions of service provision, production and delivery are provided in section 2.2.3 of this chapter.

Very similarly, Cook and Kirkpatrick (1988) also distinguish three main meanings to privatisation:

(i) \textit{change in the ownership} of an enterprise (or part of an enterprise) from the public to the private sector. That meaning \textit{denationalization or divestiture}, which has different procedures in different places, such as equity sales to the public, sale of the enterprise as an entity, joint-ventures or the pure liquidation of a SEE;

(ii) \textit{liberalisation or deregulation} of entry into activities previously restricted to the public sector;

(iii) \textit{transference of the provision of goods and services} from the public to the private sector. Franchising, contracting out of public services and the leasing of public assets are examples of this form of privatisation.

Also similar is the position of Head and Steel (1984). They suggest that privatisation activities may be divided into four groups:

(i) the first refers to the sale of nationalized industries to the private sector and the gradual withdrawal from comprehensive public provision in areas like education,
health and the social services. These activities are similar to those called *denationalization* by other commentators;

(ii) the second covers activities related to the relaxation or abolition of the monopolistic powers of SEE, which is called *liberalisation* or *deregulation* by other authors;

(iii) the third group covers the activities of *contracting out* or *franchising* of public services to the private sector;

(iv) the last group of activities involves the substitution of customers' fees for tax finance.

The fourth group of activities must be highlighted, since it relates to the issue of service financing. This type of privatisation policy implies changes in relation to who pays for the services. This is an important point in the privatisation of infrastructure services and is further discussed in this thesis.

### 2.2.1.3 Re-definition of the Role of the State

Other authors use an approach that provides the fullest sense to the term. To those, the concept of privatisation encompasses all those activities related to the re-definition of the state's role in the economy.

Le Grand and Robinson (1984), for instance, say that, in this most general sense, any proposal that involves the rolling back of the activities of the state may be perceived as privatisation. Savas (1987) also defines privatisation as the reduction of the role of the state, while increasing the role of the private sector, either in ownership of assets or in activities. Cook and Kirkpatrick (1988) claim that privatisation covers a range of different policy initiatives designed to alter the balance between the public and the private sectors.

Ramanadham (1989) and Gayle and Goodrich (1990) provide two good illustrations
of this approach. They claim that privatisation encompasses a wide continuum of possibilities, between denationalization at the one end and market discipline at the other. Therefore, the term covers divestiture as well as the replacement of budgeted public activity by private market mechanisms. Examples of such mechanisms are consumer cooperatives, co-production, variously structured public/private partnerships, state management contracts for the public services, users charge, lease-purchase arrangements and even tax reductions, intended to stimulate private sector investment.

Sanchez et al. (1993), in the same direction, suggest that even the liquidation of public enterprises may be included among the policies defined by the term privatisation, when such companies interfere with the normal operation of the market under private agents.

In summary, in this approach, the term privatisation covers all the initiatives to strengthen the discipline of the market in the economy. Furthermore, one must bear in mind that, worldwide, new legal variations of hybrid forms of public/private partnership are invented every day, adding to the concept, which must be comprehensive enough to cover the new possibilities.

2.2.2 Definition Difficulties

This review has identified definition difficulties in all three approaches discussed above. Even where the term privatisation is taken in its fullest sense, there remain problems, which stem from two main points:

(i) Difficulties in talking about a public and a private sector;
(ii) Difficulties in the concept that, increases in the role of the private sector lead to reductions in the role of the state.
2.2.2.1 Private and Public Sectors

The use of the terms private and public sector introduces problems in the definition of privatisation because such concepts are not clear-cut. According to Richard Rose (1983), they are neither static, nor mutually exclusive, as demonstrated below.

Public Sector, accordingly to Bannock et al. (1987), comprises central and local authorities, together with the nationalized industries and other state owned enterprises (SOE). It usually has social and distributional roles in the economy.

Private Sector is a more complex concept. There are two main approaches to the term:

(i) The first stresses the issue of ownership. Bannock et al. (1987), for instance, suggest that the term is usually associated with the part of the economy in which the economic activities are carried out by private entities of different shapes and scales. They may be formal or informal, depending on whether they are officially registered with the government or not. Also using the same approach, Biersteker (1993) includes under the definition of private sector the private professional associations, all nonprofit making entities, and the private household economy sector.

(ii) The second approach relates private sector to the idea of profit making, rather than ownership. The term private sector, therefore, encompasses a wide range of entities that act in the economy with the objective of making profits. They may vary in scale and ownership, with a formal or informal nature.

Besides the problems in the definition of the terms, it is argued by many commentators, such as Gayle and Goodrich (1990), that the main difficulty with the use of such concepts is that, in practice, the public and private sectors take multiple hybrid forms. Within most countries, hybrid institutions have emerged, exemplified by 'public television' (supported by private contributions), 'private day care centres' (dependent on public grants), and so forth. This is why, it is argued, those concepts
should be represented by a continuum with a private sector and a public sector end, comprising the hybrid forms in between.

2.2.2.2 Reducing the Role of the State

The second problem found in this review in defining privatisation is that in many cases the definition embodies the belief that privatisation policies reduce the role of the public sector while increasing the role of the private sector. However, the evidence suggests that some aspects of government may grow with the greater involvement of the private sector in the economy, while others remain static or even decline (Rose 1983).

Many commentators argue that even if ownership is shifted from the public to private sector, the government is not free from shouldering the responsibility. Letwin (1988), for example, stresses that with the introduction of privatisation policies new regulatory mechanisms may be established to maintain a proper balance between the interests of the customers and the private producers. Therefore, the privatisation of many roles of the government, in several cases, increases the need for government intervention and adds more roles to the public sector. Roth (1987), in the same direction, claims that the government plays a crucial role in privatising infrastructure services, since it must set a regulatory framework to ensure that the private sector operates effectively and is responsive to social needs.

2.2.3 Definition Models

The previous section examined the main problems posed by the definition of privatisation. This section aims at presenting the way in which some commentators attempt to overcome these definition difficulties, in order to understand properly the various meanings the term privatisation can take on.
Because privatisation is a composite concept some commentators choose to approach the issue using models, rather than looking for a single definition. This section focuses on the contributions of Le Grand and Robinson (1984), Klein (1988), and Kolderie (1990), according to whom a comprehensive definition of privatisation should rely on the analysis of the different activities or functions that the public sector usually takes in the economy.

To Le Grand and Robinson (1984), the state intervention usually takes these forms:

(i) **Provision** - the state provides a particular commodity itself through owning and operating the relevant institutions and the relevant personnel;

(ii) **Subsidy/funding** - the state uses public funds to lower the commodity price below the one that would otherwise obtain. This price may be zero;

(iii) **Regulation** - the state issues rules about the commodity, regulating the quality, quantity or its price.

They claim that the different forms that privatisation takes in practice depend on which of the roles are taken by the government: reduction in **provision**, reduction in **funding** or reduction of state **regulation**. Moreover, they argue, privatisation forms may differ not only in the type of state intervention whose reduction or elimination they require, but also in what is proposed in its stead. Figure 2.1 below presents all the possibilities of private and public sector combination in relation to service delivery activities, considering the profit-making and the non-profit-making parts of the private sector that are proposed by Le Grand and Robinson (1984):
Figure 2.1 Model based on Le Grand and Robinson

<table>
<thead>
<tr>
<th>Function</th>
<th>Public Sector</th>
<th>Non-profit-making Private Sector</th>
<th>Profit-making Private Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provision</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Funding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regulating</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Adapted from Le Grand and Robinson (1984)

According to the figure above there are several possible combinations of actors and functions in service provision; however, according to the authors, there are three main proposals regarding this issue:

(i) the pure replacement of the state by the profit-making private sector;
(ii) the replacement of one form of state activity by another: reduction of state provision, for example, coupled with an increase in regulation of private provision;
(iii) the replacement of state intervention by the non-profit-making private sector, such as workers' cooperatives, consumers' cooperatives, community associations and so on.

Ted Kolderie (1990) presents another useful model. He combines providing and producing, government and non-government concepts to show all the possible combinations between these concepts. The distinction between production and provision of a service, according to the literature, is:

*Provision* of a service means deciding on the quantity and quality, ensuring that it is financed and executed (Davey 1993). It includes activities such as policy making, deciding, buying, requiring, regulating, franchising, financing and subsidizing.

*Production* of a service covers the deployment and management of staff and other resources to deliver it (Ibid). It includes activities such as operating, delivering, running, doing, selling, administering. Each of these activities may be broken into
several parts, which can be privatised separately.

Figure 2.2 shows the four cases of private and public arrangements in service delivery.

**Figure 2.2 Model based on Kolderie**

<table>
<thead>
<tr>
<th>Production</th>
<th>Provision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government</td>
<td>Government</td>
</tr>
<tr>
<td>Government</td>
<td>Cell 1</td>
</tr>
<tr>
<td>Non-government</td>
<td>Cell 2</td>
</tr>
</tbody>
</table>

Source: Adapted from Kolderie (1990)

Cell 1, where government provides and produces a service is the pure public sector case;
Cell 2, production is private and provision is public;
Cell 3, provision is private and production is public;
Cell 4, both activities are private.

The model provided by Rudolf Klein (1988) is very similar to Kolderie's model, except that he uses the concepts of *funding, production, public* and *private*. In this case providing includes all the activities that are carried out in managing services, except the task of finding the necessary financial resources. Figure 2.3 provides an illustration of the possible combination in a highly simplified way:

**Figure 2.3 - Model based on Klein**

<table>
<thead>
<tr>
<th>Production</th>
<th>Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Public</td>
</tr>
<tr>
<td>Public</td>
<td>Cell 1</td>
</tr>
<tr>
<td>Private</td>
<td>Cell 3</td>
</tr>
</tbody>
</table>

Source: Based on Klein (1988)
Cell 1 represents the pure model of comprehensive state welfare: the state provides the finance and delivers the services. The National Health Service in the United Kingdom is, or at least used to be, an example of this case. Cell 2 combines state provision and private funding. Real life examples of this combination are difficult to find. Cell 3 represents the case of the state limiting its role to making transfer payments that allow consumers to buy their own services in the private market. There are examples of private production of services in many countries throughout the world. Finally, Cell 4 shows what Klein calls the "nightwatchman model", in which the state is not involved in financing nor in producing the service, but operates through legislation, regulating service provision.

The advantage of using such models to define privatisation is that, unlike single definitions, they split the general concept of the term. This allows the visualisation of the different possibilities of privatisation and make the analysis of the cases provided by reality easier, approximating theory and practice. In some countries, particularly developing countries, the greater majority are mixed cases the trend of privatisation is to expand these possibilities to more flexible and innovative ways of partnership between private and public sector.

It is suggested in the literature that, to have a wider perspective of privatisation, one must think of the private and public sector relationship as a continuum. At the one end funding, producing and providing would be roles of the private sector, and at the other these activities would be the role of the government. Privatisation, therefore, could be defined as a move from any point in this continuum towards the "private end". The limits, speed and strategy of the process of privatisation in each case will be determined by the socio-cultural, political, institutional and natural environment in which the process must take place.
2.3 The Shift of Paradigm

2.3.1 Introduction

Section 2.2 highlighted the main issues involved in the definition of privatisation. It pointed out that this process is part of a new development strategy at the core of which is the redefinition of the role of the state in the economy. This section discusses the economic paradigm in the context of which privatisation policies were created.

2.3.2 The Economic and Political Context of Statism

During this century, there has been a steady expansion in the role of the state within national economies in the developed countries. In Britain, for example, between 1932 and 1982, public expenditure grew from 29 per cent of GNP to 54 per cent (Brown and Jackson 1986). In most developing countries the share of the public sector in the economy remains much lower, but has also been growing, at least until the mid-1980s (World Bank 1990).

This expansion is the result of the growing awareness of the failure of the market system to provide satisfactorily for all (Devas and Rakodi 1993). During the 1940s and 1950s, it became widely accepted that the state played a crucial role in economic policy. Governments were believed to be better at producing a wide range of goods and services than equivalent private firms (Brett 1988). The rationale beyond this belief was based on the concept of "market failure", and on the experience of the market crisis of the 1930s. Governments believed that the state should be in command to organize and plan the development due to its capacity to plan on a larger scale and because of its broader perspective.

The concept of market failure is central to the understanding of the economic rationale that supported state intervention in the economy. The term market failure is associated
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with the inability of the markets to provide goods and services in the quantity and quality that the society needs. It happens because the access to the goods and services produced in the private market is based on the criteria of ability to pay, therefore, those citizens with fewer resources, it is argued, do not have their demands met by the market mechanisms.

The economic literature presents three main cases where market failures tend to occur, in other words, where access to goods and services in the market by "worse-off" individuals is prevented: the case of public goods, merit goods, and natural monopolies. Where goods and services present these characteristics, the post-World War II consensus held that their provision by the government was superior. The concepts of public goods, merit goods and natural monopolies are further discussed in Chapter Three. They constitute the classic justification for state intervention and are central to the discussion of privatisation of infrastructure services.

Throughout the 1960s, market failure continued to provide a strong rationale for state interventionism in the economy. Private market imperfections were believed to prevent the economy from achieving an efficient allocation of resources. Governments responded with direct state participation in productive activities.

This approach was actively supported by the major international and bilateral aid agencies (Letwin 1988). Toye (1985) points out that these agencies were engaged in competing with each other to finance public sector steel mills, for instance. They also encouraged development planning, provided technical assistance to strengthen planning capabilities and allocated investment funds to public sector projects (Cook and Kirkpatrick 1988).

According to Brett (1988), many theorists, such as Gunnar Myrdal, Paul Singer, Raul Prebisch, Thomas Balogh, Dudley Seers and Kaldor, took up the arguments that were born in developed countries and extended them to the developing world, laying the
basis to the emerging discipline of "development economics"

2.3.3 The Creation of State Owned Enterprises -SOE

As a result of this established belief in the advantages of government intervention in the economy, during the 1960s and 1970s a great number of State Owned Enterprises (SOE) were established as instruments of economic policy, since nationalisation measures justified both the regulation and the control of certain markets. SOE were perceived as necessary to provide those services and goods that the private sector seemed unwilling or unable to offer, or that were not offered in the quantities and quality that society required, according to the theory of market failure.

A great number of SOE were also created to pursue social objectives such as: decrease regional inequities, enhance employment creation and provide social services and housing (Van de Walle 1989). This is particularly true in developing countries. As Manzetti (1993:2) suggests:

*SOE were set up as direct instruments by which investment flows could be guaranteed, regional development programs could be assured, full employment policies could be pursued, fairer income distribution across social classes could be accomplished, and sentiments towards economic nationalism could be satisfied.*

In summary, the creation of new SOE and the nationalization of private companies were at the core of state interventionism. They were widely accepted and economically sustainable in both developed and developing countries, due to the steady economic growth that characterized the world economy up to the end of the 1960s, or in some countries, until the oil shock crisis in 1973.
2.3.4 The Economic and Political Context of Privatisation

The recession that the oil crisis produced in the developed countries brought a complete reversal of this particular intellectual tide. Inflation, centralisation and rigidities in governmental firms led to a re-evaluation of the interventionist approach. According to Manzetti (1993), the state sector began to be perceived as over-extended and too costly, leading to fiscal deficits, tax increases and inflation. The burden of the state interventionism outstripped the perceived benefits involved. Many political and intellectual groups started to switch back to market-oriented policies, considering state capitalism as the root of all evil. By the end of the 1980s this approach was considered a failure and a profound shift to the right in world politics had happened. This shift occurred in developed capitalist countries, as well as in communist and developing countries (Devas 1993).

State owned enterprises, the most tangible symbol of state interventionism, became a prime target in this swing back to a more conservative vision of the economy. The two main arguments against SOE provided by their critics are: they are inefficient, and they are resource drains. Studies providing evidence that, in the majority of the countries, SOE failed to achieve their planned objectives provided the basis for the first argument (United Nations 1977; Shen 1979; Killick 1989). The second relied on studies that showed that public sector investments performed poorly (UNIDO 1979; Baun and Tolbert 1985).

In other words, critics argued that state owned enterprises did not directly benefit the consumers and that they were extremely costly to society as a whole. As a result of this perception, issues such as efficiency, productivity, and consumer power were at the core of the economic debate, and privatisation was the logical response, becoming an essential component of policy-making.

The dominant economic paradigm that characterised the 1980s and early 1990s,
therefore, has a neo-classical market-oriented view of the development process. Its central issues are the re-examination of the balance between the role of the private and the public sector in the economy based on the arguments of economic efficiency and consumers' choice. It places emphasis on private ownership and competition and considers that the key to economic progress lies within entrepreneurship and the sound business principles employed by the private sector (Marulanda 1993).

2.3.5 Privatisation Policies in Latin America

In Latin American countries the shift to market-oriented development strategies was equally strong. As suggested by Batley (1992b:5)

    Most developing countries participated during the 1980s in the sea change of opinion which challenged the assumption that the extension of the public provision and regulation was good for equity, efficiency and development.

In fact, privatisation has been a central element in the economic deregulation packages put forward by the political and economic right across the continent, although the pace and extent of change has varied from one country to another. Two crucial elements are at the base of the return to market-oriented policies in Latin America: the severity of the economic crisis and policy bandwagoning (Van de Walle 1989; Manzetti 1993). Batley (Ibid) argues that

    Even where the arguments for the greater efficiency and effectiveness of the private sector and self-help may not have been accepted, the limits of public finance or the pressures of international aid have forced a pragmatic adjustment.

The failure of previous policies, which mixed elements of monetarism and
keynesianism, and the lack of alternative solutions led to a neo-orthodox approach to stabilization. One should add to this the fact that Margaret Thatcher and Ronald Reagan based their administrations on this neo-orthodox economic recipe, eventually followed by other European countries, some of them with strong traditions of state intervention, such as France and Germany. The success experienced by many of these countries created a strong model, and neo-orthodoxism, or neo-liberalism, became the economic paradigm of the western world during the 1980s (Manzetti 1993).

The role played by the advocacy of international agencies in the adoption of this approach in developing countries is also highlighted by Letwin (1988). This pressure to privatise in many of these countries began in the early 1980s from the International Monetary Fund, the World Bank, USAID, the United Kingdom's Overseas Development Administration, and other external agencies, as part of structural reforms that aimed at reducing the fiscal demands and increasing the vitality of the private sector (Young 1991). According to Mosley (1988), between 1980 and 1986 forty Structural Adjustment Loans were introduced by the World Bank, 73 percent of them requiring improvements in public enterprises financial performance, privatisation being one of the preferred policies to achieve this goal.

In Latin America, the pressure from external financial agencies, such as the International Monetary Fund (IMF), the World Bank and the Inter-American Development Bank, induced governments to adopt stabilization strategies based on market reforms. This model was also strengthened by the success of Chile in the implementation of such policies.

Although it has been argued by most commentators that privatisation alone cannot guarantee a successful reform program, it is certainly believed to play a very important part in the new development strategy. The dominant paradigm of the 1980s was based on the perception that increased productivity and efficient management introduced by the privatisation process were the only realistic strategies for survival in the
increasingly competitive global markets (Marulanda 1993).

2.3.6 Privatisation in the 1990s

In the 1990s, we may be witnessing the emergence of a new perception of the development strategies. The failure of stabilization programs in Africa, criticisms of privatized companies in the UK and the recent crisis in Mexico and Argentina, which implemented strong privatisation programs, may be at the root of this new perception, leading to a more balanced approach to the issue of privatisation. Although such policies are still economic orthodoxy worldwide, some commentators, such as Brendan Martin (1993), point in the direction of an approach which pragmatically draws elements from both the statism and neo-conservative paradigms. An example of this is the following statement from the Inter-American Regional Organization of Workers of the International Confederation of Free Trade Unions ORIT- ICFTU, quoted by Martin (1993:27):

Market versus planning and private sector versus public sector formulas are development options that have been polarized, thus evading a penetrating discussion about which influence and form of the state is more suitable to a new stage in development

Martin (1993:28) also provides a quotation of Otton Sollis, a prominent economist in Costa Rica, which illustrates an alternative approach to state reform and privatisation:

I agree with a drastic re-structuring of our state, our public sector, which implies including some privatisation, not out of ideology, because the state is bad, but in the context of a massive reorientation of the state investment...You have two dogmas - the ones who do not want to touch the state and the ones who want to privatise because of the dogma. I want to privatize for reorientation - we need flexible minds.
Another sign of this emerging approach to the need for a better balance between private and public sector is in the World Development Report - 94 of the World Bank, one of the agents in the spreading of privatisation policies worldwide. This volume is dedicated to the issue of infrastructure and stresses the need to reform infrastructure services in developing countries, suggesting three basic principles:

(i) introduce competition - directly where feasible, indirectly where it is not;
(ii) give users and stakeholders a strong voice and real responsibility;
(iii) manage infrastructure like a business, not a bureaucracy.

By stressing the issue of competition and business-like management, the Report highlights the market-oriented approach of the World Bank; however, privatisation is not pointed out as the only or the best policy option to enhance the efficiency or the quality of infrastructure services. In fact, the term privatisation is not used, the emphasis being on the partnership between sectors. Moreover, the Report stresses that governments have a continuing, if changed, role in infrastructure management. The debate on how to enhance the provision of services has moved from the issue of forms of ownership to the issue of forms of management.

The increasing awareness of the environmental problems involved in economic development may also be another direct challenge to the current ideological orthodoxy, which favours maximum economic growth and the deregulation of the private sector (Devas 1993). The widening gap between the rich and the poor and the terrible position of the world poorest are also important points which are beginning to force a rethinking of the orthodoxies of the 1980s (Cornia et al. 1987; Onimode 1988; Killick 1989).

Those issues seem to be at the core of the change in the approach to privatisation policies in the nineties. Drawing from the experience of the many countries which have tried neo-conservative measures, a re-examination of such policies may lead to
the refinement of privatisation proposals.

2.4 The Privatisation Debate: Review of the Main Arguments

2.4.1 Introduction

The academic debate on the pros and cons of privatisation has traditionally centred around economic arguments. However, a host of other issues are involved. This section aims at providing a review of the main arguments which base the privatisation debate in different fields of study, highlighting their links to the hypothesis and methodology of this research.

It must be stressed that this review refers to the commentators regarding their position in relation to each of the arguments which are discussed, not in relation to their position for or against privatisation. In many cases, commentators who challenge some arguments for privatisation only disagree on the form that the policy must take in practice, in different contexts. While others consider that the policy, although based on theoretically sound grounds, is misused in practice. On the other hand, some authors agree with some arguments for privatisation policies, but are against their introduction for reasons related to the implementation process.

Privatisation as a policy phenomenon has been justified, designed and carried out in many different ways, worldwide. Therefore, the reasons which are presented in the literature for and against privatisation range from very pragmatic arguments, based on short-term economic rationality of allocation of resources, to greater, or even more important, long-term political aspects of the issue. For the sake of clarity, this review presents the arguments according to three dimensions, which may be predominant in each case: the economic, the fiscal and financial, and the ideological dimensions. This categorisation by no means implies a reduction of the scope of the arguments, nor an oversimplification of the issues involved in the discussion.
2.4.2 The Economic Approach

As discussed in the previous section, within the economic dimension the debate of privatisation has its origins in the debate of the role of the modern state in the economy. Both discussions draw on the theory of market failure, non-market failure and welfare economics. The following are the main economic arguments used in the privatisation debate:

2.4.2.1 Efficiency

Perhaps the strongest, and certainly the most presented, arguments for privatisation in the literature are related to the issue of efficiency. It is argued by privatisation theorists, as demonstrated below, that a greater involvement of the private sector in economic activities increases the level of efficiency and introduces greater benefits for the consumers. Empowering consumers enhances, in its turn, the performance of the economy as a whole.

To discuss this argument, the appropriate starting point is the examination of the two main concepts that are associated with the term efficiency: the concepts of Pareto-optimality and economic growth.

The concept of Pareto-optimality is often presented in the literature as the definition of efficiency. It is widely accepted among economists that (Le Grand 1991:2):

"an allocation of resources is Pareto-efficient if it is impossible to re-allocate those resources in such a way to make one person better off without making another worse off."

For this to happen two kinds of efficiency must hold: productive efficiency, which occurs when the output of an economy is being produced at the lowest cost; and
allocative efficiency, which occurs when the resources of a society are being allocated to the production of goods and services in accordance with consumer's preferences (Bannock et al. 1987; Hurl 1992; Beesley and Littlechild 1988).

The above definition implies that a potential Pareto-improvement always constitutes an increase in welfare, introducing the second concept usually identified with efficiency: economic growth. According to Le Grand (1991), this identification is widespread both in the popular and academic discourses on the economy, and is present in most arguments for privatisation. In this line of thought, increases in production lead to increases in individuals' utilities and, therefore, to increases in social welfare.

The association of efficiency with the concepts of Pareto-optimality and economic growth means that when allocative and productive efficiency occur, the consumers have the greatest benefits - they are the sovereign with the power - and society's resources are at optimal use. This proposition forms the entire basis for welfare economics, as the latter is conventionally interpreted.

2.4.2.2 Privatisation and Efficiency

Now that the association between higher levels of efficiency in the economy, consumers empowering, and optimization of the use of collective resources is clear, attention turns to the reasons why privatisation theorists argue that the private companies are more able to achieve higher levels of efficiency in the economic activities than their public counterparts.

The literature review has shown that privatisation advocates use three main approaches to the issue of the superior efficiency of the private sector: some use theoretical arguments regarding competition, others base their argumentation on the issue of property rights, and the third group choose to analyze the performance of the public
sector, basing their case upon the evidence of SOE failure. These three lines of argumentation are now discussed.

2.4.2.3 Efficiency and Competition

The process of competition is perceived by many commentators as the main mechanism for increasing the level of efficiency in the economy. Cook and Kirkpatrick (1988), for instance, claim that improvement in economic efficiency is a result of an increase in market competition. Keegan (1993) and Beesley and Littlechild (1988) also agree that competition provides pressure for efficiency and maximizes consumers' benefits. Hurl (1992:75) argues that "the argument for privatisation involves a belief in competition because it improves productive and allocative efficiency". Also according to Goodman (1985) and Butler (1985) competition provides the main reason for the belief in the superiority of the private sector in the provision of most goods and services.

The many reasons provided by the literature for the link between competition and higher efficiency can be broadly grouped into four categories:

(i) Competition causes firms to enhance productive efficiency. It forces companies to use production inputs in the most efficient way in the production process. Competing for access to capital leads companies to use it more efficiently. Moreover, companies are less willing to provide uneconomic services and goods, thus releasing resources which will be used more productively (Hurl 1992);

(ii) Competition creates a customer-oriented culture within the organisations, with two important implications. First, companies operate with clear objectives, which are oriented towards the satisfaction of the clients, leading to a greater allocative efficiency since the consumers' preferences determine the allocation of resources in the production process; secondly, consumers have more choice, more power. The
correspondence between the self-interest of consumers and providers is maximized, their pursuit tending towards their common good (Batley 1992b);

(iii) Competition leads companies to eliminate restrictive labour practices, benefiting tax payers and consumers (Hanke 1987a);

(iv) The exposure to competition in the external environment leads to the formation of better managerial skills. Management monitoring is encouraged and firms undergo a selection process in which only the more efficiently managed units succeed (Ibid). This process raises the level of management in the economy as a whole, contributing to raising the level of efficiency.

The role of competition has been re-emphasized with the development of the theory of contestability. Contestability refers to the possibility of costless entry and exit of competitors in a market. Baumol et al. (1991) argue that under contestability, the (perpetual) potential entry of new competitors can enforce the good conduct of agents already in the market. The benefits of competition do not depend only on the existence of several producers, they point out, the critical requirement being that monopoly can be contested. The theory of contestable markets, which deals with the place of market forces in situations where there are economies of scale or scope (Hurl 1992), indirectly strengthens the arguments for privatisation.

It is argued by privatisation advocates that, while being the most important mechanism to achieve higher levels of efficiency, competition is also the natural environment of the private companies. This is so, according to the commentators who follow this line of argumentation, because the process of competition is generated in the natural search for higher efficiency, which is the most important characteristic of the private sector, since this search for greater efficiency is also the search for higher profits. Indeed, producing goods at the lowest possible cost (productive efficiency) and in accordance with consumer's preferences (allocative efficiency) is the way to maximize profits.
Since private firms are profit maximizer entities, which are always seeking efficiency, they are much more able to achieve this than public companies.

The literature also provides the comments of authors who, although agreeing that competition is vital to achieve higher levels of efficiency, challenge the association of competition and private sector. As a result, they are cautious in relation to the assumption that the introduction of privatisation policies is directly related to greater competition. Ford (1990), for instance, argues that, despite a common misconception, the evidence shows that, in practice, competition may not necessarily arise from privatisation. In the Organisation for Economic Co-operation and Development Report (1991) it is stated that full privatisation or divestiture does not necessarily increase the level of competition, and other ways to promote competition in infrastructure services delivery are suggested. Those who claim that privatisation, particularly divestiture, is not directly associated with competition highlight that efficiency gains are unlikely to be achieved where privatized enterprises are protected or operate within a monopolistic or quasi-monopolistic environment, preventing competition from being assured.

2.4.2.4 Efficiency and Property Rights

A second approach to the greater efficiency introduced by the involvement of the private sector in the economy is related to the issue of property rights. The common use of the term "property", instead of "property rights", may lead to a certain confusion, as noted by Dales (1977). Therefore, it is important to highlight at this stage that the term "property" relates to rights, rather than to things. When you own something, you own a set of legally defined rights to use it. As a result, ownership is circumscribed, rather than outright, since these rights are created and limited by the society's system of law.

Property rights form interfaces between law and several social sciences, especially economics, political sciences, and sociology. The interface between economics and law
is particularly important in the privatisation debate, since the arguments of the property rights school are centred on the association between property rights and economic performance. Privatisation theorists, as illustrated by Hanke claim that the type of ownership arrangement of a company affects its economic performance. This claim is illustrated by Hanke, who argues that (1987b:51):

*alternative forms of ownership give rise to different economic incentives and, subsequently, different economic results*

In a very simplified way, the property rights theory is based on the fact that (Ibid)

*private enterprises are owned by individuals that are free, within the limits of the law, to use and exchange their private property rights in these assets. These rights give individual owners "residual claim" on the assets of private enterprise.*

When goods and services produced by these assets meet consumers' demands and present costs which are lower than market prices, there exist profits and the owner's wealth is increased. On the other hand, if the costs of production are higher than market prices, the value of a firm, and the owner's income and wealth are diminished. In short, owners of private enterprises gain from efficient management and bear the costs of inefficient management. This is the rationale that provides the basis for the property rights school, which claims that the private sector is better fitted to achieve higher levels of efficiency in economic activities, as compared to the public sector.

Private property rights, according to the above rationale, create incentives to higher efficiency and greater consumer power in the production of goods and services. Different commentators highlight different aspects of the property rights theory in their claim that ownership does matter, as illustrated below.
Beesley and Littlechild (1988) highlight the issues of consumers' choice, introduced by the fact that the natural environment of the private sector is the competitive market. They argue that privately owned companies have a greater incentive to produce goods and services in the quantity and variety which consumers prefer, because those companies which are more successful in meeting consumers' needs make profits and grow, while the others wither and die. In other words, the very nature of the private companies, profit-making entities, determines their superior economic performance and greater efficiency in the economy as a whole.

There are commentators who highlight financial reasons for the importance of ownership in the economic performance of firms. According to them the discipline of the capital market means that access by firms to additional resources for growth depends on previously demonstrated ability, therefore there is a selective process in which higher levels of efficiency in the economy are achieved. This position is illustrated by Letwin (1988:45) who claims that "privatised companies are pushed towards efficiency because of the disciplines imposed by the financial market".

Property rights theorists point out another consequence of property rights which leads to the greater efficiency in the privately owned companies: the supposed superior managerial skills presented by the private sector. According to this argument, private owners face incentives that make it desirable to monitor the behaviour of managers and employees in their firms. As a result of this kind of monitoring, private managers are encouraged to maximize the profits and the value of the firm by supplying consumers' demands in the most cost-effective way over time. Public enterprises, on the other hand, are nominally owned by the taxpayers, who cannot buy or sell these assets. Therefore, they do not have strong incentives to monitor the behaviour of public managers and employees. Even if some individual decided to do it, the costs of acquiring the necessary information, monitoring public employees and organizing an effective political force to modify their behaviour would be too high in relation to the benefits, since these would be spread over a great number of taxpayers (Hanke
The consequences of public ownership, therefore, are inefficiencies, since public managers and employees allocate resources that do not belong to them. Because they do not bear the costs of their decisions, they tend to present behaviours that increase production costs, or divert attention from consumers' demands.

Publicly and privately owned enterprises also present fundamental differences in the planning process, according to the property rights school. These differences have significant consequences in terms of economic performance of the firms. It is argued that public plans are developed by managers and employees who neither bear the costs of their mistakes nor directly benefit from correct foresight. As a result, a public plan is considered good when planning rules and procedures are followed. Private planning is entirely different. Mistakes in the anticipation of consumers' demands and production costs diminish the present value of the enterprise, and private planners have to answer to the owners of the private enterprises for the losses incurred by planning mistakes.

Furthermore, in developing countries, planning and management of publicly owned enterprises are plagued by political interference. This interference occurs not only at the level of the enterprises' definition of objectives, but also in the everyday management of resources. This fact aggravates the inefficiencies introduced in the economic performance of publicly owned enterprises.

As a result of these beliefs, the property rights school adherents argue that ownership does matter, and that therefore the transfer of functions from the public to the private sector is not sufficient to introduce higher efficiency levels in the economy. They claim that the transfer of assets is vital to guarantee greater benefits to the consumers, and to the economy as a whole. Beesley and Littlechild (1988), for instance, claim that for political reasons privatisation may be a necessary accompaniment to the
introduction of greater competition in the economy. To these authors, competition policies are more effective against a private company than against a publicly owned industry. Furthermore, alternative ways of increasing market pressure on publicly owned enterprises are politically limited. They suggest that the transfer of ownership to the private sector is vital for achieving better economic performance in nationalized companies because the intervention of the government in the management of SOE based on self-restraint is implausible.

Again, the literature presents a range of counter-arguments for the claims of the property rights school. Many commentator challenge the relevance of ownership for the economic performance of companies. Cook and Kirkpatrick (1988), for instance, claim that, if a market is competitive, the driving forces of competition ensure that higher levels of efficiency are achieved, irrespective of the type of ownership. These theorists usually view the contribution of privatisation to efficiency with much scepticism, as illustrated by Dorgan (1989), who argue that the crucial factor in determining the efficiency of enterprise is the degree of competition it faces, ownership itself per se being irrelevant.

Jonathan Aylen (1988), in regard to privatisation policies in developing countries, suggests that competition and liberalisation offer more pressure for efficiency and gains to consumers than the sale of state owned enterprises, creating private monopolies. These commentators claim that privatisation impacts on the level of economic efficiency are unclear and overestimated by their advocates. Van de Walle (1989:604), for example, argues that

*Grand claims were made on the basis of ideology and conjecture that privatisation could greatly enhance overall economic efficiency and thus have a strong impact on national output. This view has not resisted scrutiny.*

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In fact, recent works suggest, as illustrated by Hemming and Mansoor (1988) and Rees (1986), that efficiency gains from privatisation are modest, and limited to reductions in productive and regulatory inefficiencies.

There are also those who challenge the association between private sector and better management. They argue that managerial efficiency and independence from the government can hardly provide sound grounds for the introduction of privatisation policies. They are insufficient arguments, according to these authors, because efficient, flexible and independent management may well be more common in private firms, but they can be introduced in any enterprise, irrespective of property ownership.

And finally, there are those commentators who claim that the argument that links privatisation to higher levels of efficiency in the economy as a whole does not hold, irrespective of whether the assumptions about the increased competition or the better management of the private sector are true or false. They make the point that the argument does not hold simply because it relies on the assumption that privatisation policies reduce the presence of the public sector and of its inherent inefficiencies in the economy. This, as already pointed out in this review, does not necessarily happen. As stressed by many authors, such as Roth (1987), Letwin (1988) and Rose (1983), privatisation may not alter the balance between private and public sectors in the economy, or it may, in some cases, alter it in favour of the public sector, due to the need to regulate private sector activities to maintain a proper balance between the interests of the customers and the private producers. Therefore, irrespective of whether those assumptions are true or false, the argument does not hold.

2.4.2.5 The Failure of State Owned Enterprises

This literature review has found that there is a group of commentators who, although resting their cases for privatisation on efficiency grounds, base their arguments on the evidence of SOE failure, rather than on theoretical economic views. They claim that
that since public enterprises are inefficient, private companies should substitute them in most of the economic activities. Although their arguments are based on the issues of competition and property rights, they highlight the facts associated to the performance of SOE to present their case.

Four main aspects are highlighted in the discussion of SOE inefficiency:

(i) First, their inability to achieve their objectives, as illustrated by Sanchez et al. (1993:1):

*the acknowledgement that SOE have not been able to guarantee the multiple objectives for which they were created has been the common thread for the introduction of privatisation policies*

(ii) Secondly, the poor financial performance of SOE. Van de Walle (1989), for instance, claims that in Latin American countries, despite the fact that SOE have often benefited from privileged access to capital, various subsidies and protection from domestic and foreign competition, their performance is generally considered to be unsatisfactory. Either they lose money or do not make as much money as they should.

(iii) Thirdly, there is the issue of inefficiencies which SOE are believed to introduce in the economy. This aspect is highlighted by authors such as Sanchez et al. (1993) who point out that fulfilling SOE's objectives proved costly to the society because resources were allocated inefficiently. Also Hurl (1992) claims that SOE create inefficiencies. He argues that they show reduced incentive to minimize current costs, leading to a lack of technological and organisational innovation. Wortzel and Wortzel (1989) and Klein (1988) add that SOE are inefficient because they lack flexibility and are slow in adapting to changes, due to their special privileges.

(iv) Fourthly, there is the issue of regulatory failure. This concept relates to the
disadvantages that public ownership introduces in the enterprise because of its
dependence on the government and the related advantages of the private companies.
Hurl (1992), for instance, stresses the independence of the private sector from the
damaging consequences of government interference in the company management as
one of the main benefits of privatisation policies. Jonathan Aylen (1988) emphasizes
some of the benefits that privately owned enterprises have in relation to the publicly
owned ones, which lead to greater efficiency:

- private firms can diversify into new fields of activity, competing with existing
  enterprises;
- private firms can merge with another or take over a firm;
- they can evade political interference by claiming that shareholders' interests come
  first;
- they can pay higher salaries, recruiting and retaining better managers.

Rudolf Klein (1988) adds that privately owned firms are less hampered in their pursuit
of cost-cutting by organisational rigidities, professional conservativism and unionized
self-interest. They are also believed to have a greater ability to diversify and re-deploy
assets.

Van de Walle (1989) presents a list of problems that are common in public companies
in developing countries and that summarized the main problems of publicly owned
firms:

- unclear, multiple or even conflicting objectives;
- inadequate planning, leading to ill-conceived investments;
- political interference in routine operations;
- lack of trained manpower;
- overstaffing;
- external factors and patronage in the recruiting of staff;
The Privatisation of Municipal Solid Waste Management in Recife, Brazil

- lack of accountability.

Those characteristics are presented as opposed to the efficient management practised in private enterprises, summarized by (OECD 1991):

- clarity of objectives;
- management autonomy;
- continuous assessment of performance;
- managerial incentives.

In short, the argument is that the overall results of SOE creation were inefficiencies, losses and, some add, corruption. Rather than contributing to the economy, SOE became a substantial drainer of resources. Privatisation "rolls back" the role of the public sector in the economy, and is therefore the path to stop cash drain and cut government expenditures.

On the other hand, there are those commentators to whom the analysis of SOE's performance not only does not provide sound grounds for the justification of privatisation policies, but also raises important questions that the private sector's advocates choose to ignore. Drawing on the theory of government intervention in the economy, they highlight the reasons for the creation of SOE and, in the light of these reasons, challenge the evidence of their poor performance.

Hemming and Mansoor (1988), for instance, argue that the main reason for the creation of SOE was their presumed capacity to deal with the sources and consequences of market failure, which is the core concept in this line of argumentation. According to the concept of market failure, as discussed in Section 2.3, government intervention is necessary to provide those services and goods that the private sector does not provide in the quantities and at the level of quality that society requires, or does not provide at all.
Since the arguments pro privatisation do not solve the problem of market failure, it is argued that the introduction of privatisation policies tends to increase inequalities within the society, since some consumers, particularly those less well-off, would be deprived of basic commodities. This argument challenges the assumptions that the private sector introduces greater consumer benefits and a more efficient allocation of resources which are at the core of the arguments pro-privatisation. This is a very important issue in the privatisation debate, particularly in relation to the privatisation of basic social and infrastructure services, where the aspects of accessibility and equity are critical.

Those who challenge the evidence of SOE failure as a sound basis to justify privatisation policies rest their case on four main issues:

(i) First, the evidence about the poor performance of SOE is extremely contradictory and unable to support the argument of SOE failure, particularly in the case of Latin American countries (Gayle and Goodrich 1990; Cook and Kirkpatrick 1988; Bishop and Kay 1988; Finney 1989).

(ii) Secondly, the performance of SOE must not be evaluated on the basis of their contribution to the improvement of market efficiency, since this has never been their objective. It has already been highlighted that to some commentators, such as Le Grand (1991), efficiency cannot itself be one of the primary objectives of an economic and social organisation but must be perceived a measure of the extent to which the organisations succeed in attaining their primary objectives.

(iii) Thirdly, even where it applies, the evidence of SOE poor performance is not enough to dismiss the need for government intervention in the cases of market failure. Since this issue is not successfully resolved by privatisation advocates, there remains the basic justification for public sector intervention. In other words, commentators whose case relies on the grounds of market failure claim that the evidence of poor
performance of publicly owned enterprises does not justify the introduction of privatisation policies.

(iv) Fourthly, the reasons for the alleged bad performance of SOE are usually managerial, such as unclear, multiple or even conflicting objectives. If any enterprise is expected to fulfil diverse and contradictory purposes, its simple transference to the private sector will not bring gains in efficiency. On the other hand, a high level of management and incentives that will maximize efficiency can be introduced under any type of ownership.

2.4.3 The Fiscal and Financial Approach

The main fiscal and financial benefits of privatisation presented in the literature are related to its role in assisting in balancing the national budget, avoiding tax increases. Particularly in developing countries, one of the strongest drives for reform and for privatisation are unpleasant budget realities (Heald and Steel 1984; Cook and Kirkpatrick 1988; Roth 1987). Manzetti (1993) adds:

> although many governments present privatisation as a means to improve economic efficiency in the long-term, in the short-term the "impetus towards reform in LDCs is deficit reduction"

Van de Walle, in the same direction, argues (1989: 603):

> For governments in the throes of economic stabilization efforts, tangible increases in revenues or decreases in expenditure weigh much more heavily than the less tangible prospect of greater economic efficiency some time in the future.

The main arguments pro privatisation which are presented in the literature in relation
to its fiscal and financial benefits are:

(i) Privatisation raises substantial amounts of money for the government's depleted coffers from the sale of profitable SOE (Manzetti 1993). The domestic currency raised by privatisation can be used to expand nationalised industries and to finance other capital investment programs; and the foreign exchange is directed to decreasing the foreign debt (Vernon 1988; Redwood 1990). These benefits have become increasingly important to those governments whose commitments, such as social security bills, reduced tax rates and low public borrowing cannot otherwise be reconciled.

(ii) Privatisation helps to cut expenditures. By introducing privatisation policies governments cut back in areas where their presence is not necessary. By selling loss-making SOE, budgets are alleviated and no additional deficits to the state are created (Manzetti 1993).

(iii) Privatisation lowers pressures on the budget in other ways. By improving efficiency of ex-SOE it reduces government exposure to claims for subventions and capital injections (Heald and Steel 1984).

(iv) Privatisation helps the balance of payments of a country. Via debt-equity swap operations and purchases in hard currencies it can make an important contribution to a better balance of payments of the country. The balance of payments also benefits from privatisation, in the long-term, if the new private owners reorient production from domestic to export markets (Manzetti 1993).

On the other hand, there are many counter-arguments to the above assumptions. There are commentators who argue that fiscal and financial benefits from privatisation are illusory and/or reflect the substitution of present for future consumption. The main arguments presented in the literature are:
(i) In relation to the money raised from the selling off of profitable public enterprises, it is argued that privatisation is fiscally neutral where the capital market works well, the valuation of assets is correct and the proceeds from a sale are equal to the present discounted value of the future stream of profits from the company. In this case the composition of state assets changes, but not its level (Van de Walle 1989). Where domestic capital markets are weak there are uncompensated wealth transfers when public assets are sold at a value lower than the market's;

(ii) In the cases where privatisation requires large external financing the impact on the budget is likely to be negligible, as future cash flows to the budget are being converted in one lump sum now (Hemming and Mansoor 1988);

(iii) Other commentators, such as Van de Walle (1989), add that if the money raised by privatisation of profitable SOE is used for servicing the foreign debt, which is usually the case in developing countries, there is no financial or fiscal benefit to the government at all. Moreover, the country, at large, loses;

(iv) Regarding the claims upon the budget, it is claimed that they might remain unchanged or become larger, because, after privatisation of public enterprises the government will have no operational control over the ex-SOE, but could still be forced, through lobbying, to provide financial support for the industry.

(v) As for the assumed contributions to the country's balance of payments by the reorientation of newly privatised productions towards exports, it is argued that it is an argument for the reorientation of markets, rather than for the introduction of privatisation policies.

Furthermore, the critics of privatisation also claim that, although the fiscal aspects of the policy have not been adequately researched to date, it is easy to envisage dreadful problems ensuing if countries under dire fiscal stress, particularly developing countries,
use privatisation of SOE to bring down internal or external debts, to finance expenditures - such as funding welfare programs on a cash basis, for example - or to avoid tax increases. This approach could create a time bomb under the fiscal health of the country (Heald and Steel 1984; Veljanovisky 1990).

In addition, other problems could emerge, such as heavier transaction costs, large discounts (reinforcing the position of political and business elites) and even the promotion of no competition at all (Heald and Steel 1984). This approach obviously conflicts with other market-based policies, privatisation becoming, in practice, antithetical to market liberalisation (Veljanovisky 1990).

2.4.4 The Political and Ideological Approach

A great part of the literature usually regards privatisation as an economic or financial issue, highlighting therefore its financial and economic results. But many writers emphasize that privatisation policies have political and ideological motives and objectives as well. That means privatisation policies are hoped to have an impact on the politics, society and culture of the countries where they are implemented (Whitfield, 1983; Veljanovsky, 1987; Hanke 1987a; Redwood, 1990; Aharoni, 1988).

The political nature of the decision to privatise is stressed by many commentators. Letwin (1988), for one, claims that the decision to privatise is made by politicians and administrators instead of businessmen or financiers, which clarifies its political nature. Others highlight the pressure from international aid and financial agencies to promote privatisation in developing countries, as another clear sign of the political and ideological nature of both the policy and the agencies. Manzetti (1993:1) stresses the political nature of the privatisation decision, suggesting that "the decision to privatise rests ultimately upon political calculations as politicians are the ultimate arbiter of the decision-making process".
The political decision to privatise, it is argued, is made on the basis of ideological and pragmatic calculations. As previously pointed out, the pragmatic arguments for privatisation and its counter-parts are related to efficiency gains and fiscal and financial benefits. Ideological arguments, however, have proved to be instrumental in shaping the decision to privatis in many countries, such as Chile and the United Kingdom (Ibid). Many advocates of privatisation tend to present their case in ideological terms, such as Bauer (1981), Lal (1985), Friedman (1962) and Rose (1983). They like to emphasize the private initiative and private market as the most successful route to economic growth and human development.

The main elements in the ideological justification in favour of privatisation presented in the literature are:

(i) First, the assumed superiority of private sector ownership as a means to promote economic well-being. On this basis, the transfer of SOE to the hands of the private sector creates more incentives for investments and strengthens the basis of a free market-dominated economy (Manzetti 1993);

(ii) Secondly, the advantages of a smaller state in terms of individual freedom and community strength. It is argued that privatisation enhances consumer power by improving accountability and extending choices (Beesley and Littlechild, 1988; Redwood, 1990). The argument of creating a greater consumers' choice gives, as Whitfield (1983) suggests, the impression of a greater freedom. In the same way, the rolling back of the frontiers of the state is perceived as freeing the citizens from control by the state, enhancing, therefore, individual freedom and community awareness;

(iii) Thirdly, the changes that privatisation promotes at the organisational level, particularly in the negotiation of wages, imposing a market discipline through the stemming of the militancy of strong worker unions (Whitfield 1983; Klein 1988;
The Privatisation of Municipal Solid Waste Management in Recife, Brazil

Aharoni 1988);

(iv) Fourthly, and certainly the strongest and most presented ideological argument in favour of privatisation is the desire to foster a new culture of "popular capitalism". Privatisation through the selling of firms in public offerings to a broad constituency of individual shareholders is argued to be the principal means of spreading ownership. The spread of ownership, the core idea in popular capitalism, is believed to promote crucial changes in the society, the most discussed in the literature being:

(i) The spread of ownership shifts people's attitude towards the wealth-creating process (Redwood 1990). This reasoning is based on the old conservative tenet that the right to property is a fundamental pre-requisite in a democratic society. Privatisation is believed to be a form of ownership democratization, cementing the link between capitalism and democracy (Manzetti 1993).

(ii) It strengthens society's belief in capitalism. According to many privatisation advocates, selling firms in public offerings to a broad constituency of individual shareholders leads to a greater belief in the capitalist system, as one feels part of it and benefitting from it (Hanke 1987b). As its most simplistic, a wider-share holding democracy could be a pro-capitalist democracy (Hurl 1992).

(iii) The spread of share ownership is believed to shift the pattern of political allegiance. It is believed, for instance, that former detractors of privatisation, once becoming a share holder, changes into a supporter of the policy and of the parties which promoted it (Hanke, 1987b). Thus, broadening share ownership is believed to create a substantial voting bloc to prevent future moves back to a state-run economy (Saunders 1993; Aharoni 1988). There is a widespread belief in political circles that privatisation wins votes (Vickers and Yarrow 1988). The basis of these beliefs lies in the fact that, "while telling researchers they disapprove the sale of SOE, people flock in their millions to buy shares when they come to sale, attracted by the profits that are
generally made" (Saunders 1993:17).

(iv) Popular capitalism is also believed to transform work culture, promoting important shifts at the organisational level. Besides eroding the trade union powers, it encourages the vertical identification within companies as a result of the extension of worker share ownership (Ibid). It is also believed to break the sense of alienation felt by the users of services, the wider community and the producers, posing a more direct contact between them. This would bring about many benefits to the enterprise, since this increased contact with the larger range of shareholder-customers, encourages the business to greater efficiency and effectiveness in meeting customer's demands (Redwood 1990).

According to Manzetti (1993), popular capitalism played an important role in the justification of privatisation in Thatcher's government. It was expected to ignite again that spirit that had been buried by the welfare programs of the Labour and Conservative governments after World War II. It was also used in Chile during the 1980s, stressing the inviolability of the right to property, although in this case its linkage to democracy was not highlighted. Ideological arguments are decisive in politically polarized societies, such as the UK and Chile in the 1970s.

In short, the ideological underpinning of privatisation is the belief that real public ownership, understood as the ownership by the people, is the ultimate goal of popular capitalism (Whitfield 1983) and privatisation is considered to be the principal means of achieving it. By increasing the private citizens' ownership, privatisation would spread wealth and more and more people would benefit from the capitalist system.

This ideological basis for the introduction of privatisation policies, as were the more pragmatic arguments, is dismissed by their critics. The main counter-arguments in the literature are:
(i) Many commentators, as illustrated by Manzetti (1993), start by suggesting that ideological motivations, although crucial in some countries, do not constitute either sufficient nor necessary conditions to the decision to privatise in most developing countries. As a result, they underscore the power of neo-conservative ideas, highlighting more conjunctural and pragmatic political factors in the privatisation decision. In Latin America, for example, it is claimed that ideological considerations play a secondary role. They were used to give more credibility to the privatisation process. Selling some shares to company workers or the general public, characteristics of popular capitalism, were used to soften popular opposition.

(ii) The arguments pro-privatisation that are based on the advantages of the spread of share ownership are dismissed as circular arguments for wider share ownership and hardly arguments for privatisation (Hurl, 1992).

(iii) As for the changes in the work culture introduced by privatisation, commentators such as Whitfield (1983) claim that the decanted advantages of shares ownership distract the attention from the fundamental issue of control. Small shareholders have no control of companies. Therefore, the gains towards a better work culture due to a greater contact of the managers with a larger range of share holder-customers are none.

As the emerging of a new "enterprise culture" made possible by popular capitalism, even in those countries where neoconservative ideology played an important role in the decision to privatise, it is argued that its sociological effects have been overrated. Studies in the UK have shown that the claims that have been put forward about the sociological impact of privatisation are enormously exaggerated. As Saunders (1993:17) suggests, based on his study of the privatisation of water in the UK:
Britain may or may not be on the road to becoming a "nation of share owners", but even if it is, it is unlikely to make much difference to the way ordinary people live their lives. The "big idea" of the 1980s turns out, sociologically, to have been much ado about nothing.

2.5 Summary

This chapter provided a literature review which covers the main lines of argumentation in the debate of privatisation in developing countries. It has found that privatisation is not a straightforward concept, possessing multiple meanings and ambiguous connotations. Its interpretation varies greatly, particularly due to the many forms that the policy takes in practice, throughout the world.

In general terms, this review identified three main approaches to the definition of the term:

(i) the transfer of assets from the public to the private sector, mostly by sales. This is the narrowest interpretation of the term and in this sense it is used interchangeably with the term divestiture;
(ii) transfer of functions from the public to the private sector, which includes other forms of private sector involvement in the economy, besides the transfer of assets;
(iii) finally, there are those who associate the term with any changes in the economy which redefine the role of the state.

The latter, the broadest connotation of the term, provides the sense in which the term is used in this research. The review highlights that the major problems in the definition of the term privatisation are associated with difficulties in the definition of private and public sector and with the idea that privatisation implies the reduction of the role of the state in the economy.
The review describes the shifts in the economic paradigm in the last decades, discussing the changes in the economic and political context that allowed the revision of the interventionist approach in the economy and its replacement by privatist approaches, in which context privatisation policies emerged. It highlights this process in the case of developing countries, particularly in Latin America.

A review of the privatisation debate is, then, presented, discussing the main arguments for and against the introduction of such policies. It highlights the association of competition and increased efficiency to the private sector as the strongest argument for privatisation, but emphasizes that, besides the economic arguments, the debate is also based on important fiscal and financial reasons, particularly in developing countries, due to deficits and other budget difficulties faced by the majority of their governments. Finally, the review presents the political and ideological arguments found in the literature, which support or dismisses the claims of benefits introduced by privatisation policies.
CHAPTER THREE - PRIVATISATION AND INFRASTRUCTURE SERVICES

3.1 Introduction

The previous chapter has provided a review of the literature on the issue of privatisation, particularly privatisation in developing countries. The review has made it clear that privatisation is a very complex subject, involving a wide range of issues. It is necessary, therefore, at this stage, to limit the scope of this research and to define its field of work. This is the purpose of this chapter, which is the third of Part I of this thesis. It introduces the issue of infrastructure services and discusses the concept of efficiency in this context, thus defining the scope of the study.

The focus of this study is on the privatisation of municipal solid waste management (MSWM) in developing countries. The set of services referred to as MSWM is part of a much larger group of services, usually provided to the market by the public sector of the economy, generally called infrastructure services.

This chapter comprises six sections, including this introduction. In the second section it discusses the concept of economic infrastructure, defining key terms. The third section discusses some common economic and technical characteristics of infrastructure services production, while section 3.4 examines the economic characteristics of infrastructure services consumption. These characteristics are relevant to the privatisation decision and to decisions regarding the best way of doing it, particularly in developing countries. In Section 3.5, the discussion centres on the issue of efficiency in the context of infrastructure services, since increases in efficiency have provided, perhaps, the commonest argument for the introduction of private firms in the provision of infrastructure services. The chapter closes with section 3.6, which summarizes the main economic issues in the privatisation of infrastructure services.

3.2 Economic Infrastructure

The stating point in the definition of this research scope is the discussion of the term
infrastructure. The issue of infrastructure has lately received much attention in the developing world. Nearly all the international development agencies have emphasized the need to provide access to infrastructure to a greater proportion of the population in developing countries, particularly to the low income groups. The World Development Report 1994 of the World Bank, for instance, is dedicated to this issue. It highlights that the developing countries invest US$ 200 billion a year in new infrastructure - 4 percent of their national output and a fifth of their total investment - with the aim of raising productivity and improving living standards.

However, despite its huge importance, the term infrastructure has not been precisely defined. Usually, infrastructure is used as an umbrella term for a range of activities which share some economic and technical features. These activities are sometimes referred to as "basic public services" because they are generally carried out by the public sector, particularly in developing countries. Some development economists, such as Paul Rosenstein-Rodan, Ragnar Nurkse and Albert Hirschman, refer to them as "social overhead capital", yet this term also lacks a precise definition (World Bank 1994).

A distinction must be made between economic infrastructure and social infrastructure. Economic infrastructure refers to those public services which are basic to the economic production or to the activities of the households\(^1\). While social infrastructure - such as health and education services - is equally important to the social and individual development, it is sufficiently different to merit separate consideration, having specific characteristics and involving a different set of issues.

This research deals with economic infrastructure, in which two important concepts

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\(^1\)The term infrastructure most commonly refers to the physical aspect of a service network, such as roads and pipes, and is sometimes extended to the institutional structure. In this study, however, a broader meaning of the term is used, based on the definition provided in the World Development Report 1994: Infrastructure for Development of the World Bank, in which economic infrastructure includes public utilities, public works and the transport sectors.
must be discussed: public services and infrastructure services. This discussion is relevant to a better understanding of the economic characteristics of the production and consumption of these services, which ultimately have a great influence in the decision to introduce privatisation policies in their provision.

3.2.1 Public Services

As with the term privatisation, the concept of public service is difficult to define unambiguously. It comprises such a large and varied range of services that generalisations are often misleading. However, for the sake of clarity, some distinction must be made in order to define the limits of this research.

For the purposes of this research, public services are defined according to Bannock et al. (1987), as intangible and non-transferable economic goods, as distinct from physical commodities, which are available to the general public. As already pointed out in Chapter Two, public services can be privately, publicly, or privately/publicly provided.

3.2.2 Infrastructure Services

According to the World Bank (1994) infrastructure services include public utilities, such as electricity, gas, telecommunications, water supply, sanitation and sewerage, municipal solid waste management (MSWM), and piped gas; public works, such as major dams and canal works, and roads; other transport sectors, such as urban and interurban railways, urban transport, ports and water ways and airports.

Since many of these services share some economic characteristics, the following discussion may be useful to the analysis of the privatisation of all infrastructure services. However, it must be borne in mind that the focus in this research is on the privatisation of municipal solid waste management, a public utility. Therefore, other
infrastructure services - such as public works and the transport sector - which have less similarities with public utilities are not within the scope of this research.

3.3 Economic Characteristics of Infrastructure Services Production

Infrastructure services have certain technological and economic characteristics which make them subject to special policy attention. These characteristics may be related to the production or to the consumption of the service. It is important to highlight that infrastructure services differ not only from other goods, but they also differ among themselves. As a result, the set of characteristics of these services which are discussed below are with regard to the majority of the cases. The characteristics of each service must be analyzed if the effects of privatisation on service delivery are to be properly assessed.

3.3.1 High Sunk Costs

It is generally accepted that modern infrastructure services, particularly in urban areas, are supplied through a networked delivery system designed to serve a multitude of users. This delivery system is usually dedicated, that is, it carries only one good. Because the investments in the delivery system cannot be converted to other uses or moved elsewhere, it is usually said that those costs are "sunk" (World Bank 1994).

Most infrastructure services have costly delivery systems, that is to say that they have high sunk costs. High sunk costs mean that factors of production can only be duplicated with very high unit costs. As a result, it would be very costly to have several networks in the same geographical area competing for the same users.

Being irretrievable, sunk costs represent a barrier to entry in an industry because they scare potential entrants from entering (Bannock et al. 1987). This is particularly true when costs are high, as with infrastructure services. This is a very important issue to
be considered in the decision to introduce private sector participation in service provision.

### 3.3.2 Economies of Scale

The above characteristics of the networked systems may sometimes create economies of scale. This term is used where the unit cost of serving one additional user declines as the level of output rises. Or in other words, economies of scale occur where the average cost of producing a commodity falls as output of commodity rises (Ibid). Such economies may be so great that, in some cases, the industry can support only a few or even a single firm. The existence of economies of scale in most infrastructure services is used to explain the predominance of few and large companies in their production.

It is debatable whether there exist positive economies to larger scale in the provision of urban infrastructure. Small organisations enjoy advantages of flexibility and proximity for their clients, but, on the other hand, they often pay a price in terms of the need for external coordination. The most important sources of economy related to size in the provision of urban infrastructure services are probably managerial and staffing economies. Larger organisations can afford to employ managers and professional staff of a higher calibre than small authorities, however, there is always the risk of larger organisations quickly becoming "top-heavy" (OECD 1991).

Although not as important as managerial and staffing economies, there are some financial advantages related to larger scale organisations. Especially in relation to those systems where there is a degree of financial devolution, larger organisations are apparently more able to obtain better terms from the capital market. Furthermore, it seems that they tend to be better equipped to manage the cash-flow and to obtain maximum returns from such things as the investment of liquid funds on the short-to-very-short term money market (Ibid).
As for technical economies of scale, they may be present in some infrastructure services, for example in the design and operation of wastewater treatment plants. However, they must be set against the very high costs - when real interest rates are high - on the "indivisibility" of the investment, if this implies investment in surplus capacity in advance of demand (Ibid).

In sum, the differentiated nature of the possible economies and the many differences in the context of infrastructure services suggest that, although economies of scale may occur in some cases, it would be misleading to generalize the assertion to all the services. As a result, in the decision about the size of organisations, careful attention needs to be given to other aspects to avoid the pitfalls of larger sizes.

### 3.3.3 Natural Monopolies

Natural monopolies are industries "in which technical factors preclude the efficient existence of more than one producer" (Bannock et al. 1987: 291). Economic activities that present characteristics such as high sunk costs and economies of scale have usually been considered natural monopolies. This is why infrastructure services are generally considered as such. As with the case of economies of scale, this generalisation may also be very misleading. Many infrastructure services which are considered natural monopolies, are monopolies because of policy, not technology. In fact, infrastructure services differ greatly in terms of the size of sunk costs, and in terms of declining marginal costs (World Bank 1994).

Municipal solid waste management, in particular, presents several aspects that set the service apart from any other type of technological investment, therefore, a thorough examination of the specific characteristics of this service is carried out in Chapter Four.
3.4 Economic Characteristics of Infrastructure Services Consumption

As for the characteristic of infrastructure services in terms of consumption, three important concepts must be discussed: public goods, merit goods, and externalities.

3.4.1 Public Goods

Public goods, as opposed to private goods, can be defined in terms of two characteristics in their consumption:

(i) Rivalry;
(ii) Excludability.

Goods are rival when their consumption by one user diminishes the supply available to other users. Goods are excludable when users are identifiable and can be prevented from benefiting from them. Public goods present low levels of rivalry and excludability. Their consumption by one user does not reduce the possibilities of consumption available to other users. The consumption of public goods is collective, therefore their consumers are not identifiable. As a result, it is impossible to exclude them from benefiting from the good. This characteristic is also known as low divisibility or low subtractibility (Batley 1992b). Private goods, by contrast, are both rival and excludable.

Some authors add a third characteristic that public goods may present: non-rejectability, which means that individuals cannot abstain from their consumption even if they want to. National defence is one example of this type of good (Bannock et al. 1987).

According to this definition, founded in neoclassical economic theory, public goods are believed to be better provided by the government, since private firms are not
willing to provide goods and services whose consumers cannot be easily identified or excluded.

Most infrastructure services are excludable and rejectable to a certain extent, since to benefit from them users must have access to the networked system or to some sort of facility. Most infrastructure services can be metered and charged for. According to the World Bank (1994), many infrastructure services are almost (although not completely) private goods. However, the degree of rivalry can vary enormously between different services. These characteristics show that infrastructure services are not pure private goods, but it is certainly wrong to consider all infrastructure services as public goods. Again an analysis of each specific service is necessary in the process of deciding about infrastructure privatisation.

3.4.2 Merit Goods

Many infrastructure services are considered merit goods. This is to say that the consumption of these services, at least at a minimum level, is considered as essential to the society, since they confer direct benefits and have good externalities. It is generally believed that the public sector should be the provider of such services because the consumers underestimate their benefits and would not pay, or could not pay, for its real value. Therefore the private sector could not ensure their consumption in sufficient quantities. In this case society as a whole would lose (World Bank 1994).

3.4.3 Externalities

Most infrastructure services produce spillover effects from users to nonusers, which are called negative (costs) or positive (benefits) externalities. These negative or positive consequences of service delivery and consumption are not fully accounted for in the price and market system.
Infrastructure services present many external effects of this nature. They may be generated in the production or in the consumption process. Positive externalities of infrastructure services are, for instance, improvements in public health, in the housing conditions or in the environmental conditions of a population. Negative externalities may include, for example: pollution, resettlement of populations, or loss of agricultural land. Social and environmental externalities are particularly important in the analysis of the implications of the way in which infrastructure services are provided.

The above economic characteristics of infrastructure services are of paramount importance in the privatisation discussion. As already seen, to the extent that specific infrastructure activities entail natural monopolies, are considered merit goods, or have substantial externalities which are not reflected in the accounts of private suppliers, it is argued that the public sector should be the provider, or that much regulation is needed. This is the core of the market failure theory. As seen in Chapter Two, those elements have provided most of the arguments for the commentators which are against the introduction of privatisation policies in the field of infrastructure services.

However, what became increasingly clear in the last sections is that many services where production by the government was widely accepted as superior, do not present the characteristics of a pure public good nor are they cases of market failure. Furthermore, many have undergone technological changes that call for a re-examination of the belief in the superiority of the government in their provision.

Therefore, it is argued in this research that the decision to privatise infrastructure services must rely on two main analyses: the first refers to the economic, financial and sociological aspects of the environment where the privatisation is to take place. The second, and equally important, refers to the discussed technical and economic characteristics of the production and consumption of the specific infrastructure service that is under focus.
3.5 Efficiency in the Context of Infrastructure Services

The previous section presented the main technical and economic characteristics of infrastructure services, stressing the importance of taking them into consideration in the decision to privatise, and how to privatise. Attention is turned now to the discussion of efficiency in infrastructure services provision. This is particularly important, since efficiency provides the strongest and most commonly presented argument in the privatisation debate.

According to the literature review presented in Chapter Two, despite being one of the main issues in the privatisation decision, the interpretation of the term efficiency varies. This variation results in the use of different approaches in studies that evaluate efficiency of economic activities. The literature review has also shown that, traditionally, the assessment of efficiency in the provision of infrastructure services tended to focus strictly on optimum allocation of resources in the production process, or to be a simple comparison of the cost of each unit of physical quantity of service made available to the user, as noted by Tomazinis (1985) in relation to transport services.

In this research this approach is not considered satisfactory, therefore an attempt is made to establish an interpretation to efficiency in the context of infrastructure services that allows a more comprehensive assessment of service provision. It starts by arguing that such an interpretation of efficiency should take into consideration the economic characteristics of the production and consumption of the service to be evaluated.

In regards to these economic characteristics, sections 3.3 and 3.4 have shown that most infrastructure services are excludable and rejectable to a certain extent. However, the level of rivalry can vary enormously between different services. This means that infrastructure services present the characteristics of both private and public goods.
(some authors name such goods and services as *quasi-public* or *quasi-private* goods). It has also been pointed out that most infrastructure services are considered merit goods, since their consumption, at least at a minimum level, is regarded as essential to the society. They also present substantial externalities, which affect users and nonusers.

These characteristics indicate that when efficiency is used as a criterion for evaluating the performance of infrastructure services provision (which is the case in this study) it must have a wider sense, which accounts for the social significance of such services. In fact, the spillover effects of their provision affect users and nonusers, and the impacts of the lack of provision of such services on public health and environmental terms are relevant to the collectivity. As a result, an appropriate approach to efficiency of infrastructure services must be comprehensive enough to consider both productive and allocative efficiency, in such a way that the objectives and interests of all the social agents that are involved in their production and consumption are encompassed.

To achieve such a comprehensive approach to efficiency, this research relies on the views of Le Grand, who suggests an interpretation of the term according to which (1991: 27):

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\text{an allocation of resources is efficient if it is impossible to move towards the attainment of one social objective without moving away from the attainment of another objective}
\]

This interpretation suggests that efficiency (Ibid) "can be defined only in relation to the ability of social and economic organisations to attain their primary objectives". A corollary of this proposition is that, in the context of infrastructure services, *the efficiency of forms of service provision can only be assessed in relation to their ability to attain their primary objectives.*
This approach to efficiency has been considered appropriate, since it allows the inclusion of the interests and points of view of the social agents involved in service production and consumption, as long as they are embodied in the definition of the primary objectives of the service provision. This guarantees that both productive and allocative efficiency be assessed or, in other words, it allows the assessment of efficiency from the economic and from the social point of view. This constitutes the main reason for its use in this study.

In analytical terms, this interpretation implies that the first segment in the assessment of service efficiency is the identification of a set of objectives that represent the interests of the main actors involved with the service. The second segment is to measure to what extent each of these objectives is achieved.

One may be tempted to view such an efficiency analysis as more properly being an analysis of effectiveness in goals achievement. The difference between these two types of analysis may frequently be found more in semantics than in essence. This is, of course, not so when the primary objective of the analysis is simply cost recovery. In this case efficiency analysis takes its most traditional form. This research, however, deals with the efficiency of infrastructure services, therefore, it has a much broader objective. Its ultimate purpose is to assess the impacts of privatisation on the main social agents in the process of service production and consumption. These include producers, users, nonusers and the government, to name a few. This broader objective makes the relationship between the analysis of efficiency and effectiveness in goal achievement much greater and, in practical terms, implies the need for a combination of different analyses in studies on infrastructure services efficiency, defined by the definition of the specific service objectives.

The definition of the primary goals of service provision is better performed in the context of each specific service. Chapter Four carries out this task in relation to MSWM, aiming to provide the efficiency analysis in this research with a set of
objectives that takes into consideration the interest of the main social agents involved in MSWM.

3.6 Summary

This chapter has discussed the privatisation of infrastructure services in general. It starts by examining the definition of key terms such as public services and infrastructure services. Public services are defined, for the purposes of this research, as intangible, non-transferable economic goods, as distinct from physical commodities, that are available to the general public. They may be privately, publicly or privately/publicly provided. The term infrastructure services refers to those public services which are basic to the economic production or to the activities of the households. They include public utilities, public works and other transport sectors. It must be stressed however, that public works, the transport sector and social infrastructure are not within the scope of this research.

Attention then turns to the analysis of the main economic and technical characteristics which are shared by most infrastructure services, in terms of the production process, such as: sunk costs, economies of scale and natural monopolies. The economic and technical characteristics of infrastructure services consumption follows, highlighting three important concepts: public goods, merit goods and externalities.

Finally, the concept of efficiency in the context of infrastructure services is discussed, stressing the need for a comprehensive interpretation of the term, expanding the efficiency analysis beyond the traditional analysis of allocation of resources in the production process.

This research interprets efficiency in infrastructure service provision as the ability of forms of service provision to attain their primary objectives. It is emphasized that the definition of the primary objectives of service provision may vary among the different
services, but it must always include the interests of the main social actors in service production and consumption, if a meaningful assessment of efficiency is to be achieved.
CHAPTER FOUR - MUNICIPAL SOLID WASTE MANAGEMENT (MSWM)

4.1 Introduction

This chapter constitutes the fourth segment of Part I of this thesis, which aims at defining the field of work of this research and at providing contextual and background information necessary to the analysis of the subject matter of this work: the privatisation of MSWM in developing countries.

This chapter focuses on municipal solid waste management and is divided into nine sections, including this Introduction. The second section discusses the role of MSWM in urban management, stressing the lack of specific studies on the issue of MSWM in developing countries. Section 4.3 provides the definition of key terms. The fourth section examines the main technical and economic characteristics of the services involved in MSWM, according to the discussion in Chapter Three. Section 4.5 examines some of the many forms that the privatisation of MSWM has taken in practice, in different parts of the world, so as to provide a contextual background to the introduction of the case focused in this research. Section 4.6 examines the current practice in MSWM in developing countries, highlighting the main problems and discussing the context in which calls are made for the introduction of privatisation policies. Chapter 4.7 discusses these reasons that are given for the superiority of private sector provision of MSWM. Section 4.8 defines efficiency in the context of MSWM in developing countries, based on the interpretation of efficiency provided in Chapter Three. It also defines the main actors and the main objectives of MSWM provision, discussing each of them in relation to the introduction of a greater private sector participation in MSWM provision. Finally, section 4.9 summarizes the main issues discussed in this chapter.

4.2 The Role of MSWM in Urban Management

The rapid urbanisation and industrial growth in most developing countries presents a huge challenge to those responsible for the management of urban development and the
provision of services. Infrastructure services, in particular, play a crucial role in defining the future of cities. The adequacy of infrastructure helps one country's success and another's failure, since there are important links between infrastructure services and the ability of cities to increase productivity, expand trade, cope with population growth, reduce poverty and improve environmental conditions (World Bank 1994).

Municipal solid waste management is one infrastructure service that has proved to be an enormous challenge in cities of developing countries. Indeed, it has become one of the most pressing problems faced by those municipalities. Besides being a costly service, MSWM has generally failed to respond to citizens' needs. It is estimated that, on average, it consumes between 20 and 50 per cent of the available operational budgets for municipal services, yet serves only 60 to 70 per cent of the urban inhabitants (Bartone 1990).

Despite the increasing importance of MSWM in urban management, the literature review shows that solid wastes management has usually failed to draw the attention of researchers, being one of the least studied infrastructure services, particularly in developing countries (Stevens 1980; Pickford 1993; Rego 1994). The gaps in the knowledge in this field are of a varied nature. They range from the absence of a clear definition of solid waste and its associated activities, to a lack of reliable data about its operating and financial costs (Cointreau 1991; UNCHS 1990; Rego 1994). This lack of research and information on MSWM in developing countries is even more regrettable because, as noted by Rego (1994), there are a number of contextual issues that make solid waste management radically different in those countries, as compared to industrialized countries.

Municipal solid waste management, as an infrastructure service, plays a role in increasing urban productivity, contributing to environmental sustainability and helping to reduce poverty, although a safe collection and disposal of urban solid wastes provides benefits for all income groups.
Productivity is improved because MSWM is a sanitation service, with clear connections to public health. Different infrastructure services have different impacts on productivity, and there is no study directly related to MSWM, in this respect. However, the links between sanitary environments and the health of populations have long been established.

Effective MSWM protects the health of residents from exposure to contaminants in the waste. In many developing countries this constitutes an important problem because MSW commonly has excreta mixed in, due to the lack of sanitation in low-income neighbourhoods (Bartone 1990). An adequate MSWM also protects the health of population by limiting their exposure to disease-carrying insects and rodents, reducing the risk of disease transmission (Cointreau-Levine 1994). An effective MSWM also prevents solid wastes from accumulating, complicating urban street drainage, constraining traffic and deteriorating aesthetic conditions of the urban area.

MSWM is also crucial in protecting the environment. According to the World Bank (1994), one of the most positive impacts of infrastructure on the environment concerns the removal and disposal of liquid and solid wastes. However, the coverage of those services is insufficient and problems with the disposal are many. In developing countries, the resources allocated to disposal activities are usually much less than 5 per cent of the available municipal budget for MSWM, while this figure in industrialized countries varies from 25 to 30 percent. As a result, open dumping is the most common disposal arrangement for solid wastes (Bartone 1990).

The consequences to the environment of poor MSWM are varied. Leachate from dump sites are a major chemical contaminant of surface and ground water resources (Ibid). And there is also the growing problem of hazardous and toxic wastes, which poses particular concerns about safe disposal as countries industrialize. Uncontrolled dumping of toxic wastes has led to soil contamination in the Upper Silesian industrial region of Poland and to subsequent food crop contamination (World Bank 1994).
Continuous burning of open dumps contributes to air pollution problems in many cities (Bartone 1990). The dumping of solid waste on hillsides, due to poor collection services, together with poor drainage systems, are regarded as the main reasons for slope collapse in Recife, Brazil (Prefeitura Municipal do Recife - PCR 1991).

Adequate MSWM helps to alleviate poverty. In the past the majority of poor households lived in rural areas, however, the World Bank (1991a) estimates that around 57 per cent of the world's poor will be living in cities by the turn of the century. And the urban poor often benefit most directly from good MSWM because the unserved are, almost always, the growing low-income groups concentrated in the peri-urban areas, subject to unsanitary conditions. Due to the lack of access to MSWM and other services they have poor health conditions and fewer employment opportunities. Improving MSWM in cities, therefore, is a real welfare issue (World Bank 1994).

4.3 Definition of Key Terms

4.3.1 Solid Waste

According to Pfeffer (1992), solid waste is any solid material that is rejected because it holds no intrinsic value to the society. This definition shows that materials which some people consider wastes, for social, economic or cultural reasons may be of value to others (Rego 1994). For the purposes of this research, solid wastes are defined as the solid materials produced by human activities or by nature that are discarded onto the environment, becoming a source of potential biological, physical or aesthetic problem to the population.

4.3.2 Municipal Solid Waste

Municipal solid wastes in this research are the solid residues that result from the
municipal functions and services. This includes wastes such as: residential/domestic wastes; commercial and institutional wastes; non-hazardous wastes from industrial processes; construction and demolition wastes; street refuse, including dead animals; and public areas and beach refuse. Hazardous wastes from industrial processes and radioactive sources are not considered municipal solid wastes, according to this definition, and are not included in this study.

4.3.3 Municipal Solid Waste Management

Municipal solid wastes management includes all the activities necessary to the municipality to remove and adequately dispose of all the rejected solid materials discarded on to the urban environment that fall within the above definition of municipal solid waste. It involves all the administrative, financial, legal, planning and engineering activities associated with this objective.

Municipal solid waste management comprises four main groups of operations: solid waste collection, public cleansing, solid waste disposal and resource recovery. These activities are further detailed in the following sub-sections.

4.3.4 Solid Waste Collection

Solid waste collection includes all the activities associated with the collection of solid wastes generated in identified sources (or spot sources) and put together for collection by the generator. It encompasses five separate operations: the on-site storage, the collection itself, the transport of the collected waste to the transfer station, the transport to the processing site and finally the transport of the rejected material to the disposal site. In small MSWM systems, for economic reasons, the collection vehicles are used to haul the SW to the disposal site, reducing the total to three main operations. All these operations are interrelated, for instance, the method of pickup used influences on-site storage methods, which in turn affect the size and type of
collection vehicles. Therefore, in carrying out solid waste collection all the operations must be closely coordinated.

4.3.5 Solid Waste Disposal

Solid waste disposal includes operations related to the processing and final disposal of solid wastes. Perhaps it is in the operations of solid waste disposal that the main differences in MSWM in developed and developing countries are most obvious. The traditional methods of solid waste disposal in developed countries are incineration, landfill operation and material recovery systems. Although landfills have become an issue of immense proportions for economic and environmental reasons, apparently they will continue to be employed for the foreseeable future for the disposal of the majority of the urban solid wastes generated in cities. In developing countries, despite the existence of some landfills and recycling plants, open dumps are the most common form of waste disposal, although totally inadequate.

4.3.6 Public Cleansing

Public cleansing, for the purposes of this research, comprises all the activities involved in the cleaning of public areas of wastes generated in scatter sources (or unidentified sources), either by human activities or by nature. It includes activities such as street sweeping or washing, weeding, grass-cutting, general clean-ups and, in some places, drains cleaning. The transportation of such wastes to the transfer station or directly to the disposal site is also included in public cleansing operations.

4.3.7 Resources Recovery

The term resources recovery refers to a variety of processing systems used to recycle useful materials, such as aluminium, paper or plastic. This is done to recover energy, as is the case with refuse-derived fuel (RDF), or to upgrade the quality of the refuse,
as is the case of composting where compost does not hold market value. It also
involves activities related to the identification and promotion of resource recovery
opportunities. In developing countries there are programs with this objective but,
perhaps, most of the resources recovery is carried out by recycling networks in the
informal private sector, which involves a great number of people.

4.4 Characteristics of MSWM

MSWM presents technical and economic characteristics that differ greatly from other
infrastructure services. In this section, those characteristics that may affect or be
affected by the privatisation process are discussed.

There are four main activities within the overall definition of municipal solid waste
management. However, due to the great number of methods and technologies involved
in resources recovery, in this section only three operations are analyzed in terms of
the technical and economic characteristics discussed in section 3.2:

(i) solid waste collection;
(ii) solid waste disposal;
(iii) public cleansing.

4.4.1 Solid Waste Collection

In terms of service production, perhaps the main characteristic to be stressed is that
Solid Waste Collection does not present high sunk costs, as defined in sub-section
3.2.2. The size of the sunk costs is closely related to the existence of economies of
scale in the service. According to Bartone (1989), experience shows that there are
almost no economies of scale for collection districts greater than 50,000 population.
That is to say that the economies of scale in collection services are not significant
enough to constitute a barrier to competitors, as demonstrated by Savas (1982), in
relation to cities in the United States. Any of its factors of production can be duplicated without much cost increase. As a consequence, MSW collection services cannot be regarded as a natural monopoly on the basis of the technical and economic characteristics of their production.

As for service consumption, it is debatable whether Solid Waste Collection is a public good or not. Batley (1992b) argues that this service does not have clear public good characteristics, since it is possible to charge and to exclude non-payers. Cointreau-Levine (1994), on the other hand, suggests that the service is a public good therefore should be provided by the government. Bartone (1991), and Rego (1992) argue that Solid Waste Collection exhibits characteristics of both private and public goods.

MSW is a nonrivalled service, since any resident can enjoy it without diminishing the supply available to others. As for excludability, however, Cointreau-Levine (1994) suggests that, although it is possible to identify the consumers of Solid Waste Collection and to charge for the service, the exclusion of non-payers is not feasible. It is possible, argues Cointreau-Levine (Ibid), only in societies with a high degree of organisation, otherwise it may introduce negative externalities to the overall public welfare. This suggests that the service is nonexclusive and nonrivalled, the essential characteristics of a public good. The author highlights, however, that the level of excludability of the service depends on the method of storage used by the households. In low income communities, where the solid waste is collected from communal bins located in public areas, or by the use of a bell system, the service is regarded as a public good and should be treated as such. Where the service is provided on a door-to-door basis, despite still being a public good, it may be treated as a private good.

Municipal Solid Waste Collection does not have the characteristics of a merit good. Although the service presents significant externalities in relation to public health, urban productivity, and environmental sustainability, according to Schertenleib and Triche (1989), most recipients of the service are willing to bear its cost. This shows
that the populations are aware of its importance to their individual households and to the communities at large. This fact provides further justification for the treatment of solid waste collection as a private good.

In practical terms, these dual characteristics of MSW collection indicate that the involvement of the private sector in service provision could be introduced relatively simply. However, direct public sector involvement is likely to be required in regulating and ensuring the provision of the service, particularly in poor areas where the production of waste per pickup point is low (Batley 1992b).

4.4.2 Solid Waste Disposal

As for Solid Waste Disposal, the characteristics are rather different. In relation to the production of disposal services, according to Schertenleib and Triche (1989), the sunk costs can be high, and there are significant economies of scale. As a result, the duplication of disposal facilities is very costly to the society, and there are considerable barriers to the entry of competitors. Considering three different technological options of waste disposal: sanitary landfills, composting and waste-to-energy incineration systems, Cointreau-Levine (1994) argues that economies of scale are present in solid waste disposal where more than 200 tonnes are handled per day. On the grounds of those characteristics, Solid Waste Disposal services are usually regarded as natural monopolies.

As for the economic characteristics related to the consumption of the service, the disposal of SW presents low divisibility and excludability. It benefits no specific individual but the society as a whole. It needs to be done for reasons of public health and environmental protection, which also benefits the public at large. These characteristics suggest that it is a public good.

As previously highlighted, Schertenleib and Triche (1989) note that urban dwellers are
usually willing to pay for collection services, but not for disposal services. This fact can be interpreted as the service being a merit good, that is to say that it introduces significant benefits to the society, but individuals are not aware of its importance and underestimate its real value. As a result, they are not willing to pay for it.

Solid Waste Disposal has relevant externalities, which are mostly positive. However, there are also negative externalities, generally in regard to environmental sustainability. An adequate disposal of solid wastes prevents the contamination of surface and groundwater, the breeding of disease-carrying insects and rodents, the pollution of the air and the chemical contamination of the soil due to industrial wastes. Negative externalities, however, occur due to the failure of firms to choose adequate technologies of waste disposal, or failure of the government to implement and enforce regulation preventing clandestine dumping of wastes.

4.4.3 Public Cleansing

Public cleansing involves sweeping, and sometimes washing, of public streets, grass cutting, and cleaning of public lands, such as beaches, public market areas, public event venues, etc. Despite the importance of those services to the life of individual urban dwellers and to the protection of the environment, it is one of the least studied areas of solid waste management.

In terms of service production, the sunk costs are not high, and the economies of scale are also very small. It means that competitors have no or very few barriers to entry, therefore the service cannot be regarded as a natural monopoly.

As for service consumption, street cleansing services are consumed collectively and they are nonrivalled and nonexclusive. That is to say that street cleansing is a clear public good, also called collective good. Unlike solid waste collection it cannot be treated as a private good, since it benefits the public at large and not any specific
individuals. It is very difficult, if not impossible, to charge individual waste generators in relation to the costs of the service they consume, therefore it is virtually impossible to exclude those who do not pay, and public cleansing cannot be discontinued without jeopardizing the public welfare (Cointreau-Levine 1994).

Street Cleansing Services do not have the characteristics of a merit good, since the majority of the recipients of the service are willing to bear the costs of its provision. However, as already pointed out, there are difficulties in charging for the service according to individual consumption.

As with most solid waste management services, the externalities of public cleansing services are positive and related to public health, urban productivity and environmental protection. Aesthetic conditions of the city are particularly jeopardized by non-existent or inadequate public cleansing provision. This aspect is particularly important in cities where the tourism industry is economically significant, or which compete for providing locational advantages to service firms.

4.5 Forms of Privatisation of Municipal Solid Waste Management

The privatisation of municipal solid waste management may take a number of alternative forms. Short of directly delivering the services to customers, municipal administrations may choose from a range of institutional alternatives of involving the private sector in service provision. Local governments may choose to work with the profit-making private sector or with the voluntary private sector. In MSWM there has been some experimentation in working with the communities, for example Olinda and Cabo, towns in the Metropolitan Region of Recife, northeastern Brazil, where community-based solid waste collection projects have been implemented (Rego 1994), but their discussion is not within the scope of this study.

This research focuses on the methods of involving the profit-making private sector in
The Privatisation of Municipal Solid Waste Management in Recife, Brazil

MSWM provision. Where municipalities decide to work within this market approach, they must also choose from a number of contractual arrangements, according to their specific objectives and characteristics of the city. Those forms of contractual arrangements differ in relation to a range of aspects in service management, such as: capital finance, management control, strategic planning control, the need for regulation, the incentives to efficiency, and the effects on competition. This section discusses the most common forms of contractual arrangements between the private and the public sector in MSWM to date, which are:

(i) Contracting out;
(ii) Granting of Concessions;
(iii) Franchising;
(iv) Divestiture

With the exception of divestiture, sometimes called full privatisation, all the other forms of privatisation considered in this research are hybrids, involving the private sector in ways which allow the retaining of some elements of more traditional public sector responsibility.

4.5.1 Contracting Out

Contracting out specific services or elements of solid waste services provision has become by far the most frequent way in which private skills and private finance have been drawn in MSWM. This is not an innovative contractual arrangement to urban services; in fact, it is quite common for such things as construction and maintenance of highways, public transport systems, and even water supply and treatment. It is already well established in countries such as France, Canada, Germany, the United Kingdom and the United States (OECD 1991).

In the field of MSWM, many countries, including the above, have contracted out
services to the private sector. Studies carried out in developed countries, regarding costs of collection services, show that the private contractors have lower costs than public monopolies. Two studies conducted in the USA showed costs to private contractors were 10 to 30 percent lower than to public monopolies. In cities researched in England and Wales, costs to private sector were 22 percent lower than to the government. In Canada, a study showed that privately provided collection services had costs 41 percent lower than those of public monopolies (Donahue 1989; Stevens 1980).

In many developing countries, such as Korea, Brazil, Colombia, Thailand, Indonesia, and Nigeria, city administrations have experimented contracting out of MSWM, with varied degrees of success. However, there have been no comparable studies to allow the conclusion that costs of contracted private provision of MSWM are lower than those of a public monopoly (Cointreau-Levine 1994).

Nonetheless, regarding costs, contracting out is considered by many authors as the best way to involve the private sector in MSWM, in developing countries. Cointreau-Levine for example, after analysing data from several experiences with contracting out from cities of the developing world, suggests that (1994:21):

*among the various private sector participation options, contracting for solid waste service holds the greatest promise to developing countries as a way of lowering costs.*

MSWM presents some characteristics that provide the grounds for such arguments. According to Donahue (1989), the service involves simple technology, low economies of scale, and moderate investment costs, which means that there are virtually no barriers to entry. To introduce competition, therefore, is very easy. Studies show that in Latin America, most of the private firms involved in MSW services were small to medium sized (Bartone et al. 1991). Data from Seoul, Korea, and Lagos, Nigeria,
show that the contracted private firms were also relatively small, with less than ten vehicles on average (Cointreau-Levine 1994).

The firms which are contracted are usually paid by the municipal administration according to the quantity of SW collected, or the length of streets and size of public areas cleansed. The monies may come from direct users charges or revenues from taxes, which usually are billed to several services simultaneously. The costs of billing for SW services are believed to be very low in this system, circa 3 percent of the total, according to Stevens (1980).

Contracting out MSWM raises important issues related to monitoring of services, specifications of contracts and length of contracts.

In summary, contracting out MSWM appears to introduce productivity improvements, both in developed and developing countries. This may be due to the fact that it is feasible for relatively small firms to enter the business, making competition easy. And competition is a crucial element in enhancing productivity of MSWM. Furthermore, the arrangement also shows great management flexibility, since, according to Cointreau-Levine (1994), efficiencies may be achieved even where only parts of the cities have the services privatized.

4.5.2 Franchising

Some authors in the field of infrastructure services consider franchising and the granting of concessions or licences as the same type of contractual arrangement between the private and the public sector, as illustrated by the OECD (1991). To those, the granting of concession is an umbrella term covering many types of arrangements that present similar basic characteristics, including the franchising of service provision. Others, such as Cointreau-Levine (1994), in relation to MSWM, use the terms as referring to different methods of private sector involvement. To the latter,
the term granting of concession refers to those arrangements which are also known as BOO, or Build-Operate-Own; BOOT, Build-Operate-Own-Transfer; and BOT, or Build-Operate-Transfer, while franchising refers to the concession of the right to provide services in a monopoly basis, in defined areas of the city, to the private sector. This section discusses franchising of MSWM according to this understanding of the term.

Under franchising arrangements municipal administrations give the exclusive right of delivering SW services in all, or in parts, of the city to private firms. In return, those firms pay a licence fee to the government. The costs of providing the service are covered by the fees charged to the users by the private providers of the services, who bear the costs of billing and collecting the fees of each household and establishment receiving their services. Therefore, franchising differs from the simple contracting with private firms to manage services inasmuch as it also involves the transfer of a greater role in financing the services to the private organisations (OECD 1991).

Franchising is a type of private and public partnership in service delivery which is particularly appropriate to municipal solid waste or other infrastructure services which present economies of contiguity. This happens where economies are achieved when services are exclusively provided within an area or along a contiguous route (Donahue 1989). This characteristic makes franchising one of the most popular methods of involving the private sector in solid waste services provision.

The element of competition is introduced in the process by competitive tendering, generally used by municipal administrations to ensure that services are provided at the least costs and by the most efficient providers. That is to say that franchising creates competition for the market, rather than competition in the market. In the case of MSWM, private companies compete among themselves to have the right to provide the service during a period of time in certain specified areas. However, there remains some degree of monopoly within areas or routes. To protect the users and to avoid
abuses, the public sector usually applies some regulatory controls. For instance, the fees charged may be regulated by ceilings fixed by municipal ordinance (OECD 1991; APWA (American Public Works Association) 1975).

Franchising of MSW services is employed in many cities in developed countries and some experiments have also been carried out in developing countries. Apart from the economies of contiguity, MSWM presents other characteristics which makes franchising an appropriate way of privatising the service: it does not require high costs of investment, and market and technology uncertainties are not great, therefore usually various potential competitors exist with the required conditions to provide the service. However, this arrangement seems to work better in high-income areas, or when involving large generators of solid wastes. In developing countries, it should be employed only in those areas where public cleanliness awareness is already present or can be readily raised (Cointreau-Levine 1994).

4.5.3 Granting of Concessions

The granting of concessions differs from franchising because it transfers to the private sector an even greater responsibility in relation to financing services. In return, private organisations are usually granted more freedom in the management and planning of the services and of the associated facilities (OECD 1991).

The most frequent model of concession involves the granting by the municipal administration to a private firm of the right to construct, operate and manage a facility for a fixed time period. After this time the private firm can either return the assets to the public sector, the Build-Own-Operate-Transfer (BOOT) approach, or alternatively it can continue to own and operate it indefinitely, which constitutes the so-called Build-Own-Operate (BOO) type of concession (Rego 1994). In most cases the time period is specified, but in some cases it is left to be determined by the speed with which the private firm recoups the costs of its original investment, together with an
appropriate return on the capital employed (OECD 1991).

The granting of concessions, particularly the BOOT arrangement, seems to be a method of privatisation particularly beneficial to municipal administrations, since it involves the private sector in financing facilities which are eventually reverted to the public sector. However, despite the fact that the period of time agreed is usually sufficient to allow the depreciation of investments and to provide a reasonable return on the capital employed, the private sector in developing countries has found it difficult to implement BOOT arrangements (Cointreau-Levine 1994).

The BOO type of concession, on the other hand, although apparently being an arrangement more in tune with the market-oriented approach of MSWM, does not seem to have a strong appeal to municipal administrations. Perhaps this is due to the fact that the assets do not return to the public sector after some years of operation (Ibid).

In both forms of granting a concession there are aspects that must be thoroughly examined. Perhaps the most important is the specification of the construction and operational requirements, including maintenance. Also issues related to the conditions in which the assets must be transferred to the public sector, as well as other service specification must be clearly defined between the parties (Rego 1994).

4.5.4 Divestiture

Divestiture, or full privatisation, is regarded as involving the full transfer of responsibility for the provision of a service on to private organisations. There are very few experiences with this kind of privatisation regarding infrastructure services (OECD 1991).

According to the literature review presented in Chapter Two, divestiture may be
interpreted as involving the transfer of assets, functions and control over the provision of a service from the sphere of the public sector (beyond the controls that normally regulate private organisations). It may also be interpreted as the transfer of assets and functions to the private sector, while the control remains in the hands of the public sector. In practice, there are services operating in both ways: those totally free of control and those subject to public sector regulation, although the latter is much more common (Ibid).

In MSW collection, divestiture of full privatisation usually takes the form of open competition between private service providers. This is also known as private subscription (Cointreau-Levine 1994). In this form of privatisation, households and other users hire private firms to collect their solid wastes. The costs are covered by fees which are charged, billed and collected by the service providers.

Because each user has the freedom to hire any of the competing firms, the economies of contiguity disappear. The cost of travelling is spread over fewer collection points to each service provider. This fact, combined with the cost of billing and collecting fees, causes the total costs to become very high in open competition. Furthermore, unless prevented by regulation, price setting tends to occur (Ibid), hampering the benefits to the customers introduced by the freedom of choice.

In solid waste disposal, however, better conditions to open competition between private organisations seem to exist. According to Cointreau-Levine (1994), the provision of disposal services and facilities in areas where open competition exists may be beneficial to private providers, to individual users and to society at large, provided there are enforced regulations which establish clear specifications regarding environmental protection.
4.6 The Current Practice of MSWM in Developing Countries

As previously pointed out, there are many differences in the way MSWM is performed in developing countries, as compared to the industrialized world. The many contrasts in climate, natural environment, culture and wealth pose difficulties in the use of technological and institutional solutions designed to the developed world, in most cities in developing countries. Failure to acknowledge these dissimilarities usually leads to unsuccessful policies.

In most developing countries municipal governments have primary responsibility for the provision of solid waste management within their jurisdictional boundaries (Cointreau 1991). It is typically a public service, with all the activities of collection, public cleansing and waste disposal being managed and performed by a municipal agency.

Municipal solid waste management presents a number of specific problems that are typical of most cities in developing countries. Rego (1994) highlights a set of issues which are related to economic development, urban environment, technology, working conditions and unionization, institutions, citizen participation and regulatory framework. All these issues, and the interaction between them, affect the provision of municipal solid waste services. This section, rather than discussing these issues in themselves, aims at examining the present practice of MSWM in the developing world, highlighting the main problems in service provision caused by the specific conditions of MSWM faced by municipalities.

4.6.1 Low Levels of Coverage

Perhaps the main problem in MSWM faced by most cities in developing countries is the low levels of coverage achieved by their systems. It has already been stressed that in many urban areas it is estimated that only 70 to 90 percent of the population is
served. In many cases less than half of the municipal solid waste is collected (Bartone 1991).

These low levels of coverage are further heightened by the fact that, as with most infrastructure services, the urban poor are the most directly affected by the lack of access to MSWM. The unserved areas are usually the low-income peri-urban settlements and slums, which present narrow streets, usually unpaved, or are located on steep hillsides. Often these groups have no political influence in demanding services.

4.6.2 Poor Services

In most cities in developing countries the existing operations in the served areas are not satisfactory. The main operational problems relate to frequency of collection and public cleansing operations, level of reliability, level of effectiveness and the use of inadequate or inappropriate equipment.

4.6.2.1 Frequency

Frequency of services, particularly of collection operations, is of great importance in developing countries, as compared to the developed world. According to the U.S. National Commission on Productivity (1973), in the United States 90 percent of MSWM systems provide twice-a-week or once-a-week pickups. However, in most developing countries, such frequency of collection cannot be considered adequate. In fact, the frequency of pickup usually ranges from three to six times per week. This is mainly due to three factors:

(i) Biological properties of wastes. The proportion of putrescible and vegetable matter in wastes is higher in developing countries, generating vectors and offensive odours (Flintoff 1976);
(ii) Climate. The hot climates accelerate the decomposition of wastes (Cointreau 1982);

(iii) Lack of space for domestic storage. In most developing countries, poorer populations lack adequate space for domestic storage of solid wastes (Rego 1994).

4.6.2.2 Reliability

The above factors also demand a high level of operational reliability. If a failure occurs in an area with a programmed frequency of three times a week, the odours of waste decomposition would soon become a nuisance to the population, since they are usually noticeable after two days and, depending on the amount of vegetable matter, after an even smaller space of time (Flintoff 1976). Reliability is particularly important in the case of communal pickup points, since overflowing bins cannot be used by the population, moreover, in communal bins there is less control over the age of the wastes placed for collection, and flies can more easily complete their breeding cycle (Rego 1994).

A second aspect that stresses the need for reliability in MSWM operations is related to diseconomies generated by uncollected wastes. The households must feel confident in relying on services, otherwise they will tend to dump their solid wastes on to public areas, water streams and other inappropriate sites, or place refuse around collection points, causing public health and other environmental problems in the city.

Unreliable services also threaten community participation in service provision. If the service provider fails to deliver a reliable service, a complete loss of rapport can be anticipated between the public and the authorities, since citizen participation is a two-way channel (Coffey 1990).
4.6.2.3 Effectiveness

Effectiveness of collection services, for the purposes of this research, is taken to mean the rate of success of one operation in collecting all the waste placed by householders in the pickup points. It involves the willingness of operators to cover all the routes and all the pickup points avoiding or rapidly rectifying spillage. It also relates to the willingness of operators to collect spillage caused by householders or other agents around the pickup point.

In relation to public cleansing, effectiveness is related to the level of cleanliness of streets and public areas achieved by the service. In the case of street sweeping, there are cases in which the established level of cleanliness is not achieved in the first pass, therefore the effectiveness is related to the number of passes necessary to obtain that level of cleanliness.

4.6.2.4 Inadequate Disposal

As already pointed out in section 4.2, the service that presents the most contrasting differences in MSWM between developed and developing countries is wastes disposal. Open-dumping remains the most prevalent form of waste disposal throughout the developing world (Cointreau 1982, Bartone 1990). Some larger cities have "landfill" operations, however, the great majority of them do not meet the minimum requirements for controlled landfills (Bartone 1991).

A number of economic, environmental and public health concerns are raised by such lax disposal practices, since they result in resources degradation and productivity losses. Despite the negative impacts of inadequate disposal of wastes, this issue has failed to draw the attention of MSWM planners, beset by operational problems and lack of resources. They often fail to perceive the ecological and environmental health damages that result from inappropriate waste disposal (Bartone 1991).
As a result, only a small proportion of the financial resources used in MSWM refers to treatment and disposal operations, usually much less than 5 percent, as compared to industrialized countries, which allocate 25-30 percent of their municipal budgets for MSWM to disposal services.

4.6.3 High Costs

Municipal Solid Waste Management is a costly service, particularly to municipalities of developing countries (UNCHS 1989). It has been estimated that cities spend as much as 20 to 40 per cent of their annual revenues on managing MSW in the developing world (Cointreau-Levine 1994). In terms of national budgets, it has been estimated that costs with MSWM may reach 1 percent of GNP, in developing countries (Rego 1994). Moreover, many municipal administrations in those countries have undertaken a range of efforts and investments to improve their solid waste services, however, most of those investments have proved to be missed opportunities (Bartone 1990). They have not succeeded in achieving higher levels of quality in service provision and environmental protection, nor have they expanded the services to all the urban households.

4.7 The Privatisation of MSWM in Developing Countries

Section 4.2 highlighted the important role that MSWM plays in urban management in cities of developing countries, discussing the relevance of such services to public health, urban productivity and environmental sustainability. However, the last section has shown that despite the significance of the service, and despite all the efforts of municipal governments, the overall picture may be summarized by services that present low level of coverage, poor quality and high levels of costs.

Although the demand for service shows a trend of increase in its level, the resources of municipal governments to face the problem do not appear to follow the same path,
due to the fiscal crisis that characterizes most cities in developing countries. The level of expenditures already being made for municipal solid waste management indicate that the solutions to improve the response of government to the demands for services which involve the use of more financial resources are unrealistic (Cointreau 1989).

In response to the failure of the public sector to solve the problems presented by MSWM services in developing countries, many theorists and policy-makers call for a greater involvement of the private sector in service provision. Municipal governments are also under pressure from international commercial companies in the field of MSWM and the countries from which they operate, from bilateral aid agencies and from international development agencies, such as the World Bank, to undertake privatisation (Cointreau 1989). They all suggest that there is substantial scope for expanded private sector involvement in the activity.

The involvement of the private sector in MSWM is believed to improve the efficiency of MSWM, based on a number of studies which provide evidence that the private sector is a better provider of those services than the public sector (Donahue 1989; Bartone et al 1991). Four main arguments are raised to support this belief in the gains introduced by private sector participation in MSWM:

(i) In the context of financial resources scarcity, as is the case with municipal governments in developing countries, privatisation may be looked upon as a potential source of finance. The involvement of the private sector mobilizes private investment, expanding the resources to service provision (Cointreau-Levine 1994);

(ii) Private service provision can be successful in terms of enhancing the quality of services, as long as the conditions for contestable markets are met (Bartone et al 1991);

(iii) It is a means of introducing better management into service provision. Better
management leads to a number of gains in terms of equipment and labour productivity. A comparative study carried out in Latin America shows that vehicle efficiency in the private company was nearly 71 percent higher than in the public company. As for labour productivity, private company presented a 13 percent higher level of productivity, as compared to the public company (Ibid).

(iv) Privatisation offers developing countries opportunities of service delivery at lower prices, when the private sector is involved in those cases where there is adequate reason to believe that it might be able to accomplish the service objectives less expensively (Cointreau-Levine 1994; Bartone et al 1991). Donahue (1989), after summarizing evidence from more than 2000 cities in the USA, Canada and the United Kingdom, suggests that services provided by public monopolies typically cost 25 to 41 percent more than contracted services (Bartone et al 1991).

Besides the above arguments for the greater involvement of the private sector in MSWM, Cointreau-Levine (1994) provides two other reasons that are quite common in the privatisation decision in developing countries:

(i) the first refers to the introduction of private sector firms in service delivery as a means of tackling benefits to workers introduced by labour unions, such as negotiated wages, labour restrictions and job security. In other words, privatisation has been used as a means of "union busting" in many cities of the developing world, particularly in Latin America;

(ii) the second refers to the government's need to be accountable. Because MSWM is highly visible and uncollected wastes easily raises sentiments of dissatisfaction among citizens, politicians and municipal governments are sometimes anxious to turn solid waste provision over to the private sector and escape dealing with it, thus avoiding accountability.
4.8 Efficiency in MSWM in the Developing Countries

The last section has discussed the main reasons why privatisation is believed to enhance MSWM services efficiency. This section aims at discussing efficiency in the context of MSWM in developing countries.

Based on the interpretation of efficiency in infrastructure services, in Chapter Three, it is assumed in this research that a comprehensive and integrated analysis of efficiency in MSWM must consider the interests of the main social agents involved with the service. This approach implies that efficiency is strongly linked to a fundamental quality in service provision: accountability (Donahue 1989; Cointreau-Levine 1994).

According to this view, in the process of evaluating policies, particularly in relation to efficiency issues, it is necessary to consider and carefully weigh the points of view of all the main social actors involved. Donahue (Ibid) suggests that where the population is concerned with the way in which goods and services are produced and with the equity in their distribution, any legitimate analysis of efficiency must incorporate these concerns.

Based on these views, the efficiency analysis of MSWM carried out in this research comprises two main segments: the first refers to the definition of MSWM objectives, taking into consideration the interests of the main social agents involved in the process of service provision and consumption; the second segment refers to the measuring of the extent to which each of these objectives has been achieved. The next section aims at carrying out the first task.

4.8.1 The Objectives of MSWM

The definition of the objectives of MSWM provision starts with the identification of
the main actors in the process of service delivery, since it is necessary to know and
to consider their points of view in relation to service provision.

According to the experience of the developing countries, there are a large number of
actors involved in MSWM provision both in the formal and informal sectors (Alencar
1993; Rego 1994). However, due to research constraints, the definition of the
objectives relies on the points of view of four main actors involved in service
provision and consumption: the users, the operators, the non-users and the municipal
government.

The identification of the main actors in MSWM provision allows the definition of its
main objectives. Each of these actors has multiple objectives in relation to service
provision. For example, users are concerned about having access to the service at a
good level of provision and at a good price; the government is concerned with the
coverage of the service and with the costs of its provision, etc. However, to each actor
there is a primary objective, which is predominant in relation to the others. In this
research, as a form to maintain the comprehensive approach previously discussed and
to comply with time and budget limitations, the set of services objectives has been
defined to cover the main objective of the four actors considered. These objectives are
now discussed.

4.8.1.1 The Nonusers' Point of View

Considering the essentiality of MSWM and the low levels of coverage presented by
most developing countries, the point of view of the nonusers of these services is
regarded in this research as particularly important.

They may be nonusers either because the area where they live is not covered or
because they are not able to pay the price of the service. It also includes the point of
view of those citizens who are somewhat remote from any immediate or direct use of
the service, and all the future inhabitants of the city who may be new arrivals or yet unborn offspring of the present citizens. This latter consideration, which is usually one of the least weighted factors in privatisation studies, takes on an added dimension and significance due to concerns regarding resources conservation and limitation.

The main concern of nonusers of MSWM services in developing countries is obviously the level of service accessibility. Although accessibility is considered to represent the main concern of the nonusers of MSWM services, this research acknowledges that it is also relevant to many other social actors, considering the consequences of the shortage of service coverage to public health and to environmental sustainability.

4.8.1.2 The Users' Point of View

Although the users represent the raison d'etre of the service itself, their point of view has not been taken into consideration in many analyses of the impacts of privatisation on infrastructure services.

In this research it is assumed that the users of the MSWM services are most concerned with issues related to the amount of work to be done in disposing of their waste. They are also concerned with the cleanliness of the area where they live. Aspects such as the distance of the pickup point, the frequency of domestic waste collection, the effectiveness of street sweeping, etc, are of the utmost relevance for them. Therefore, from the point of view of the individual users, it has been assumed that the most important aspect to be considered in the analysis of MSWM privatisation is the quality of service provision.

4.8.1.3 The Operator's Point of View

In the case studied there are two operators of services: the private firm ENTERPA and
The privatisation of municipal solid waste management in Recife, Brazil

the public sector provider, DLU. As discussed above, the operator is interested in
many issues in relation to MSWM provision. Its objective in service delivery is to
provide the service at an acceptable level of quality, to all those who can pay for it,
and at the lowest possible cost. Therefore, quality, affordability and productivity of
service provision are, to a certain extent, all important to service providers. However,
considering the nature of this social agent - a profit-making entity - it becomes clear
that providing the service at the lowest possible cost is its main concern, since the
lowest possible cost means the highest possible level of profit. Therefore, in this
research, it is assumed that the provider is primarily concerned with achieving the
highest possible level of productivity.

The point of view of the operator has traditionally been predominant in studies on the
efficiency of infrastructure services, including MSWM. As a result, efficient service
delivery has many times been confused with productive service delivery, and studies
tended to be focused on performance criteria and on outputs measurements. Those
elements are central in efficiency analysis, but they are by no means sufficient.

4.8.1.4 The Municipal Government's Point of View

The point of view of the municipal government must also be considered in the
analysis of MSWM efficiency in Brazil because, according to the Brazilian
Constitution, the provision of SW services is a municipal government responsibility,
regardless of the involvement of the private sector.

Municipal governments have a vast set of objectives in democratic societies, since
they represent the interests of the municipal society at large. They have the
responsibility to ensure that the collective goals established by the population of the
city are achieved, since they act as the specific instruments of that society. As such,
in practice, municipal governments manage the collective financial resources of the
municipality, and in the present fiscal crisis that characterizes local administrations in
developing countries, deal with the increasingly high costs of MSWM provision. As a result, besides acting to achieve society's goals, in the provision of MSWM governments have their own explicit objective: to lighten their financial burden. Therefore, this research assumes that the primary goal of municipal governments in relation to MSWM service delivery is the lowering of the costs of service provision to the public sector.

In summary, based on the literature review about MSWM in developing countries, it is assumed for the purposes of this research that there are four main objectives in MSWM: the accessibility, the quality, the productivity and the costs of services to the public sector. These objectives comprise the points of view of the main social actors involved in service provision in those countries. The following sections discuss these objectives, highlighting the possible impacts of privatisation on each one of them.

4.8.2 Accessibility and Privatisation

Improving the accessibility to the services is a major issue in the debate on MSWM in developing countries. As previously discussed, this is due to the very low levels of coverage found in most cities throughout the developing world and to the fact that the poor are the most hit by this problem. The lack of access to MSW services only intensifies existing inequalities between different groups in the society. Given the essentiality of MSWM, addressing the issue of equal access to service by all members of the society becomes a priority in the discussion about these services in developing countries. According to Bartone (1989:9):

\[
\text{as with other basic sanitation services, extending refuse collection services into low-income peri-urban areas is a public health and environmental priority.}
\]

Due to the social, economic and environmental importance of infrastructure services,
Due to the social, economic and environmental importance of infrastructure services, the concern with maintaining a fair and equitable access to such services has become particularly great because the force of economic change has widened the gap between rich and poor and between different parts of urban areas (OECD 1991). The equity criterion is exercised, in practice, by the equal treatment of all citizens in terms of access to public services. This is sometimes called horizontal equity.

Access to at least a minimal infrastructure is one of the essential criteria for defining welfare. According to the World Bank (1994: 20):

*to a great extent, the poor can be identified as those who are unable to consume a basic quantity of clean water and who are subject to unsanitary surroundings, with extremely limited mobility or communications beyond their immediate settlement.*

The involvement of the private sector in MSWM is believed to improve the accessibility to the services. The arguments which provide the grounds for this belief are closely related to those discussed in Chapter Two, regarding privatisation policies in general. The two main ones in relation to accessibility to MSWM are:

(i) Privatisation enhances the accessibility of services because the private sector is more able to lower the costs of provision, thus saving money that can be used on the expansion of services to new areas;

(ii) Accessibility is also improved by the introduction of resources mobilized from the private sector into service expansion.

However, some commentators consider that accessibility is precisely the one aspect of service delivery that has higher risks of being jeopardized by the privatisation of MSWM. Rego (1994), for instance, suggests that it is doubtful that the private sector will be interested in serving poor communities which present a low per capita
production of solid waste, and are located in distant peri-urban areas or in slums, with narrow and unpaved streets, often on steep hillsides.

Furthermore, there is the possibility that the resources released by the lowering of costs in service provision be used in other areas of municipal administration, which all face problems with scarcity of resources, rather than in the expansion of services to poorer areas (Schertenleib and Meyer 1992). This is also true of the new resources that the private sector is believed to introduce into service provision; they also may be used in areas other than improving accessibility to groups that have a low level of political leverage. Privatisation alone, therefore, is not enough to improve the accessibility to MSWM services. Unless decision-makers in MSWM implement measures to ensure that the gains from cost reduction, and new resources brought into service provision are used to enhance accessibility to service, privatisation may have no impact on the accessibility of MSW services.

4.8.3 Quality and Privatisation

The involvement of the private sector in providing MSW services often raises difficult issues in relation to maintaining the public interest. There are three main reasons why the quality of services must be thoroughly assessed in the process of privatisation:

(i) The first relates to the strong possibility that the improvements in service productivity - which often are the main reason for the involvement of the private sector in service provision - are achieved at the expense of the service quality. This is why some commentators stress, as illustrated by Tomazinis (1975), that the quality of a service must be examined parallel to and in conjunction with any measure of productivity. Municipalities, therefore, when involving private provision of MSW services, must address the problem of improving productivity within the framework of improved or constant levels of quality of service.
(ii) The second reason relates to the fact that the quality of services is directly linked to the point of view of the individual users of MSWM services. Due to the enormous task of expanding services without spending more resources, it is usual for municipalities to concentrate their efforts in reducing operating costs, without taking into consideration that in the case of any government intervention in MSWM the point of view of the users must always complement the point of view of the operators. This is particularly true when the participation and co-operation of the users in the operation of the service is considered a relevant aspect in improving the levels of productivity, which is the case with MSWM. Aspects of productivity improvement may have a great appeal to individual users; however, their concerns exceed those of the service operator, since they involve all the aspects related to users' comfort, such as frequency of collection, distance of pickup point, quietness of equipments, etc. This means that the involvement of the private sector must address the issue of reducing costs within the context of similar or improved levels of users' satisfaction with the service.

(iii) The third reason stresses that, from the point of view of the society at large, the quality of services is directly linked to issues of environmental adequacy. It has been emphasized that the provision of MSW services has many externalities, a great number of them related to the environment. Inadequate collection causes a range of problems regarding the contamination of natural resources. The disposal of wastes may present even more significant externalities related to environmental sustainability. Therefore, any governmental intervention in the field of MSWM, such as the involvement of the private sector, must aim at enhancing, or at least maintaining, the quality of service in terms of environmental protection, since governmental actions must represent the point of view of the society at large.

4.8.4 Productivity and Privatisation

Due to the already high level of expenditure in MSWM services in developing
countries, it is unrealistic to suggest that more resources be spent. Therefore, it is necessary to expand services to more people using the same amount of resources; in other words, accessibility must be improved by improving productivity.

Productivity means the ability to produce goods and services having exchanging values. To assess the ability to produce it is necessary to rate it and then compare with the productivity found at another point of time, or at another comparable process of production. The fundamental expression of productivity is the ratio of outputs over inputs of a production process.

To increase productivity means to do more work per unit of input, such as units of labour, units of capital, unit of financial resources, or units of energy, for example. In MSWM, increases in productivity may be reflected in serving more people with the same amount of input factors or to serve the same number of people with less input.

According to Tomazinis (1975), productivity measurements can be made only of processes that produce distinguishable products, and where it is possible to specify and normalize units of inputs. The definition and measuring of outputs of the MSW services is relatively simple. Problems arise in relation to defining and satisfactorily measuring the inputs of the process of service provision.

In economic studies productivity ratios are usually based on dollar values of inputs and outputs. Engineering productivity studies, on the other hand, base productivity ratios in physical terms, expressing the physical accomplishments that labour or equipment can reach. The latter is the approach used in this research, for two main reasons: first productivity ratio based on dollar costs of inputs of service provided by municipal governments in developing countries are extremely difficult to attain. Furthermore, the comparisons of productivity between the private and public sectors would demand further efforts to homogenize costs in different contexts.
reliable data about the financial resources used in the process of service production in the public sector in general, and in MSWM in particular. Municipal administrations generally present a number of problems with measuring and keeping records in relation to capital expenditures and operating expenses in MSWM. The accounting systems are inadequate or non-existent, resulting in a widespread lack of information regarding real costs of service. Cointreau (1994:21) emphasizes this problem and adds that:

*Accounting systems in most developing countries show cash-flows rather than accruals, with no clear delineation between recurrent and capital expenditures...there is typically no attempt to keep track of depreciation, debt service, personnel benefits...within the solid waste management accounting system. The result is that most developing countries believe their costs for municipal solid waste management service to be less than 50 percent of what they really are.*

There are cases where data on total or partial cost of some factors of MSWM production exist; however, they are aggregated in such a way that it is virtually impossible to carry out adequate productivity analysis. Moreover, the means of translating the data into meaningful information which could be used to improve the productivity of services is absent. This lack of reliable data places difficulties in carrying out comparative studies of productivity. Section 8.2 discusses the ways in which such difficulties have been overcome in this research.

This paucity of reliable data about MSWM costs in developing countries, as pointed out by Cointreau (1989), has also consequences related to the mechanisms of social control of services: MSWM is not accountable to the public in general or to political leaders, in those countries. As a result of this impossibility to monitor productivity, the cleanliness of the city becomes the only measure of the performance of MSWM, irrespective of costs. This situation leads to a complete lack of motivation of
irrespective of costs. This situation leads to a complete lack of motivation of managers, within the public sector, to improve productivity of services. Is also leads to the inability of those managers to monitor the productivity of privatized services, so as to assure that gains in productivity become resources for the expansion of services.

4.8.5 Costs of Services and Privatisation

Solid waste services are not only costly to the municipalities in the developing world, but they also consume a higher share of income in those countries than they do in industrialized countries. Cointreau (1989:11), in this regard, argues:

It is startling that most developing countries are experiencing collection costs that are roughly half the costs being experienced in developed countries, when the general income of residents is only a small fraction of the income of residents in industrialized countries. This means that a much greater proportion of available local revenues would have to be spent on solid waste services in developing countries to achieve a comparable level of cleanliness, than is being spent in industrialized countries.

Privatisation is believed to lower the costs of services to the public sector because, as discussed in Chapter Two and in Section 4.7, private providers are believed to be better managers. The main reasons for this belief are:

(i) There is evidence that private provision of MSWM introduces increases in the efficiency of equipments and labour by:

- introducing new technologies;
- carrying out better maintenance operations;
introducing more appropriate operational techniques and equipments;
- dealing more freely with labour unions requirements;
- introducing more strict staffing management;

(ii) Privatisation introduces new financial resources in MSWM, releasing the investment resources of the municipal government to be allocated to other areas;

4.9 Summary

This chapter discusses the main issues in the privatisation of MSWM in developing countries. It starts by examining the role of such services in the context of the management of cities in the developing world. Definitions of the key terms in MSWM are provided so as to allow greater clarity in the discussions that follow in relation to the main characteristics of MSWM production and consumption. It has been highlighted that different operations within MSWM may present different economic characteristics.

Attention then turns to the current practice of MSWM in developing countries, examining the main problems in the provision of service, due to the financial, cultural and institutional context in which they are performed. This analysis clarifies the reasons for and the context in which the introduction of privatisation policies have been discussed, including the pressure from international economic, aid and development agencies.

Efficiency in the context of MSWM in developing countries is then addressed. According to the more comprehensive definition of efficiency discussed in Chapter Three, the main actors involved in MSWM are: the users, the operators, the nonusers and the municipal government. The definition of the objectives is based on the main interest of each of these social actors. Four main objectives have been defined: the accessibility, quality, productivity and the costs of services to the public sector.
5.1 Introduction

This is the last chapter of Part I of this thesis, which provides information on the background and context of the research. Part II, comprising Chapter Six and Seven covers the analytical framework and the methodology used in this research.

The present chapter discusses the Brazilian context of MSWM. It comprises six sections, including this Introduction. Section 5.2 examines the sanitation services in the country and the involvement of the private sector in their provision. Section 5.3 briefly discusses the Brazilian Programme of Divestiture, highlighting its aspects relevant to the purposes of this research. In section 5.4 attention turns to the City of Recife, examining physical, demographic and socio-economic aspects. Section 5.5 discusses MSWM in Recife. It provides historical aspects of service provision in the city, examines the reasons given for the introduction of the private sector in service delivery and the role of the informal private sector in MSWM in the city. Section 5.6 provides a summary of the chapter.

5.2 Sanitation Services and the Private Sector in Brazil

5.2.1 Legal Aspects

Public services in Brazil are those established and maintained by the public sector to respond to the needs of the State and to collective interests. According to the Brazilian Constitution (Art 175), public services must be provided by the public sector, either directly or through granting concessions or permissions to private or public organisations (Duarte 1989).

Law number 8987 of 13 February 1995 establishes the framework for granting of concessions and permissions. According to this piece of legislation one may conclude that the interpretation of the term "granting of concessions" in Brazil also refers to a
number of contractual arrangements including those known as franchising.

The services which are regulated by the concessions law are defined in the Provisional Measure 890, issued in conjunction with Law Number 8987. Among the many economic activities described by the Provisional Measure there are basic sanitation, water supply and treatment, urban cleansing and solid waste treatment (Art 1°, VI, VII, VIII, IX).

5.2.2 Standardization and Universality

In Brazil, the paradigm of urban service provision during the last three decades has been based on the notions of universality and standardization. These notions emphasise the redistributive aspect of government intervention in services provision. Thus, it was widely accepted that a standard level of public services was to be provided to all citizens regardless of their economic origin or, in other words, their ability to pay. In theory, the public sector should therefore provide services to citizens directly since the private sector does not operate outside the market. These principles have begun to be challenged only since the end of the eighties, when the idea of privatising public services began to be discussed.

On these grounds, sanitation policies which were implemented in Brazil since the sixties and particularly during the seventies relied upon public sector service provision including: water supply and treatment, drainage, sewage collection and treatment, urban cleansing and solid waste collection and disposal. State owned enterprises (SOE) were established at state and municipal levels to manage government concession granting services.

Alongside management models, the institutional and technological frameworks of the SOE were usually modelled on those of other countries. Many SOE are still operating on this basis at present. In the majority of Brazil's states, water and sewerage services
are operated at the state level, while drainage and solid waste management are the responsibility of municipal administration.

The model followed by the SOE responsible for water and sewage services was established by the central government in the early seventies, during the military dictatorship. The principles on which the operation was based were those of universal coverage at a standard minimal level of quality and quantity of services. This model was centred around a monopolistic service delivery and was financed by fees charged to the users according to household consumption within a full cost recovery approach. To serve poor populations the SOE relied upon cross-subsidies.

The goals established for water and sewage coverage services during the seventies and eighties were never achieved. However, water supply coverage grew from a national average of 45 percent of the population during the sixties to 80 percent by the end of the eighties. In urban areas, 88 percent of the households now have water supply. Sewage figures have not shown much improvement and the coverage is still very low at present: 44.5 percent of urban households (IBGE 1991).

SOE were also set up to provide drainage and MSWM services, usually at the municipal level. The principles and overall institutional and financial organisation were very similar to those established at the state level, at least in the state capital cities. For both drainage and MSWM the national coverage for all urban households is around 80 percent at present (Ibid). However, due to the high level of municipal autonomy, changes have occurred more often as compared to the state level, and at present there is a range of different institutional and financial arrangements throughout the country where many of them involve the private sector, particularly regarding MSWM.

The involvement of the private sector in services related to drainage raises a range of different issues as compared to MSWM, since the service has distinct production and
consumption characteristics. Drainage services may be regarded as a natural monopoly and as a good merit. Nevertheless, the private sector has been involved in drainage service provision in many cities of the country, usually by contracting construction and maintenance activities.

5.2.3 MSWM and the Private Sector

In many cities in Brazil, the management of municipal solid wastes has oscillated between the public and the private sector. The first records of this service in the country come from Rio de Janeiro dating back to the 18th Century. These records indicate that the responsibility for MSWM was held by the city administration. In turn, the city administration hired or granted a concession to a private firm to remove wastes in general from the streets of the city.

In 1864 sewage was separated from solid wastes for the first time, and two different private companies were contracted to the different services. A Brazilian firm was in charge of solid wastes collection and disposal while an English company was responsible for the sewage collection and treatment. Private contractors provided the service until 1940 when the public sector decided to establish the Public Waste Management Inspectorate. The public sector has been responsible for MSWM ever since (Leite 1989).

Records on municipal solid waste management in Sao Paulo suggest that the services were formally established in 1869, when a contract for refuse collection was signed by the public sector and a private company. This was followed by a series of agreements until the public sector started to provide the service directly in 1913. The public sector was in charge of MSWM until 1968, when the private sector was again contracted to provide the services. Increased involvement of the private sector has occurred since this time. In addition to street cleaning and the collection of solid wastes, the operation of transfer plants, landfills, composting plants, incinerators and
other disposal facilities are presently in the hands of private companies (Ibid).

The two examples discussed above illustrate the fact that the involvement of the private sector in MSWM in Brazil has changed over a period of time, from city to city. It must be emphasised that the examples discussed above refer to formal changes of responsibility for the service. In practice, even nowadays, when the public sector is unable to provide sufficient quantity or quality of services responsive to user demands, the private sector has historically delivered these services to the unserved populations in most Brazilian cities. Private sector services are generally regarded as illegal, rarely reach minimum levels of quality and, more often than not, are very costly to the user.

5.3 The Brazilian National Programme of Divestiture

Brazil's programme of privatisation, the National Programme of Divestiture (Programa Nacional de Desestatizacao), was launched in 1990 with the inauguration of the new President Fernando Collor de Mello. The programme was initiated as a result of the widespread recognition that the State was too big and poorly managed.

The fundamental objectives of this programme supported by the publication of Law number 8031 of 12/4/90 were:

(i) to re-ordinate the strategic position of the State in the economy, transferring to the private sector activities which are inappropriately undertaken by the public sector;

(ii) to contribute to a reduction of the fiscal deficit and to balance the State budget simultaneously;

(iii) to allow new investments in the SOE and in activities which are transferred to the private sector;
(iv) to contribute to the modernization of the industrial park, extending its competitiveness and enhancing its managerial ability in various sectors of the economy;

(v) to enable the State to concentrate its efforts only in the essential activities that cannot be carried out by the private sector;

(vi) to contribute to strengthening the capital market by offering real state values and democratization of access to the enterprises' assets included in the privatisation programme.

It is evident that the main purposes of the Brazilian privatisation programme are very similar to those pursued by many other countries, particularly in Latin America. It must be noted that, according to the law in Brazil, the term "privatisation" refers to the sale of the rights by the government that guarantee both the preference in social deliberation - directly or through controlled enterprises - and to the government's power to elect the majority of shareholders. In short, only the transfer of ownership and control of the SOE to the private sector is considered to be privatisation in Brazil.

This law excludes from the privatisation programme all established SOE having the specific objective of performing activities considered of particular concern to the federal government. These activities were established by the Constitution of 1988, on the basis of their strategic relevance to the development of the country, such as developments in telecommunication services, power generation and distribution, airports, rails, and petroleum and natural gas production.

The privatisation programme aimed at transferring US$ 18 billion in state assets, particularly in steel, petrochemicals and fertilizers, between 1990 and 1992. Other sectors, such as oil, telecommunications, energy, ports and rail, were to be targeted next.
Since 1980, Banco Nacional de Desenvolvimento Economico e Social (BNDES), the National Bank for Economic and Social Development, has been responsible for conducting privatisation programmes in Brazil. During the eighties, approximately US$ 1 billion of state assets were transferred to the private sector. Between 1990 and 1991, the amount was US$ 1.7 billion in privatisation sales and 18,000 jobs were transferred to the private sector. By the end of 1992 there remained 180 SOE in the country to be privatised, with assets valued at US$ 120 billion and a net value of US$ 50 billion (Guerra 1992). Between 1993 and 1994 the privatisation programme moved at a very slow pace, perhaps due to the new political conditions introduced by the impeachment of President Fernando Collor de Mello.

During the year 1995, under the new president, Fernando Henrique Cardoso, a new law and a provisional measure were introduced into the legal system with the aim of increasing the speed of the privatisation programme. Although facing immense resistance from the unions, political parties, and many other sectors of the society, this legislation allowed more economic activities to be performed by the private sector in the country, including the provision of most of the infrastructure services. Such services included sanitation services among others, which had been excluded at the outset of the privatisation programme.

5.4 Recife

5.4.1 Physical Aspects

Recife is located in the northeastern region of Brazil. Its latitude and longitude are: 8°03'14" and 34°52'52", respectively. Its altitude is 4.5m above sea level. The city is 2,124 km north of Sao Paulo, 1,868 km north of Rio de Janeiro and 1,657 km north-east of Brasilia, the capital of the country, as presented in Figure 5.1:
5.4.2 Administrative Aspects

According to Figure 5.1 there are nine Metropolitan Regions (MR) in the country: Porto Alegre, Curitiba, Sao Paulo, Rio de Janeiro, Belo Horizonte, Salvador, Recife, Fortaleza and Belem. Three of them are in the northeastern part of Brazil: Fortaleza, Recife and Salvador.
Recife is the capital of the State of Pernambuco. It is the central municipality of the Recife Metropolitan Region (RMR). Recife is divided into six Political and Administrative Regions (PAR), the basis of the entire city administration. Fig 5.2 shows a schematic map of the Recife, the six PAR and the division of the areas served by ENTERPA and DLU.

Figure 5.2 - Recife, PAR and the Two Areas of Study
This geographic division has been used in this research since most of the available data and cartographic information in the municipal administration is presented on this basis. Each PAR is divided into districts of different areas and populations. There are 94 districts in total. Figure 5.3 shows the main demographic characteristics of the six PAR in Recife.

**Figure 5.3 - Political and Administrative Regions of Recife**

**Districts, Population, Area and Density - 1993**

<table>
<thead>
<tr>
<th>PAR</th>
<th>NoDistricts</th>
<th>Pop</th>
<th>Area (ha)</th>
<th>Density (pop/ha)</th>
</tr>
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<tr>
<td></td>
<td></td>
<td>Abs</td>
<td>%</td>
<td>Abs</td>
</tr>
<tr>
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</tr>
</tbody>
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Source: Based on information from PCR 1991

### 5.4.3 Demographic Aspects

According to the 1991 National Census (IBGE 1991), the population of Pernambuco in 1990 was around 7.1 million, which is geographically concentrated along the coast. A proportion of 40.2 percent of this population lives in the Recife Metropolitan Region (RMR). Recife is the main city of its Metropolitan Region, which has a population of 2.86 million. Recife has a population of 1,296,996, which represents 45.4 percent of the population of its Metropolitan Region and 18.2 percent of the population of Pernambuco State.

In the period between 1980 and 1991 (both census years), Recife's population experienced a 0.66 percent growth rate per annum. This is the second lowest rate
among Brazil's capital cities, the lowest population growth being that of Rio de Janeiro (0.43 percent).

As Figure 5.3 indicates, the population of Recife is unevenly distributed amongst the PAR and, within each PAR, amongst the districts. There is a substantial concentration of people in the North West (19.9 percent) and South Regions (23.5 percent) of the city, which together comprise 43.4 percent of the population.

As for population density, there exist many differences between the PAR. The most dense region in the city is the North, having 133.7 pop/ha. This density is more than double the average of Recife (60.3 pop/ha) and is much higher than densities in any other region. This may be explained by the fact that 6 of the 18 districts of the North Region have densities higher than 150 pop/ha.

Nevertheless, there are few differences in household density among the regions. Figures are very homogeneous in all regions, varying from a minimum of 3.8 people per household in the Centre Region to a maximum of 4.38 people per household in the North Region. The average household density of Recife varies by approximately 10 percent (4.23 inhabitants per household). Obviously, this average does not relate to the large variation among different housing condition variables, such as the size of the house, type of sanitary facility, number of rooms, and supply of electricity (according to district and PAR). Therefore, on no account should the above figures be considered as an indicator of the level of living conditions in the city.

5.4.4 Socio-economic Aspects

Historically, the economic development of Recife always has been associated with its port. The city was consolidated as a regional trade centre for sugar and cotton, two highly seasonal and fluctuating activities very much influenced by international markets. Industrialisation took place in the late fifties, based on textiles for export and
mechanical supplies for sugar mills. During the seventies a strong process of modernisation changed the structure of the industrial sector. The majority of the units shifted from traditional industries to intermediate and capital goods. During this decade, the annual growth of the city's output was 7.2 percent, and by 1980, 54 percent of manufacturing output was non-traditional. The average growth in jobs was 25,000 per year and productivity expansion was 2.8 percent in this period (PCR 1991).

The eighties brought stagnation to national and local economy. The metropolitan economy experienced a negative growth rate in 1981 (-4.4 percent) and in 1983 (-7.3 percent). The average economic growth rate of the city's economy was 1 percent over the decade. As a result, unemployment and informal jobs increased rapidly and productivity dropped.

The Recife Metropolitan Region (RMR) commands a high proportion of economic activity from Pernambuco State. It accounts for 61 percent of the State's GDP, 68 percent of its industrial production where the City of Recife remains to be the hub of the State and of the RMR. However, the Region's relative economic importance has been declining in recent years. Indeed, the city is the only municipality of the RMR which is experiencing a net emigration, mainly to other areas of the metropolis. Its port activities have been increasingly shared by the Port of Suape, on the southern fringe of the Region (Batley 1992a). In the 1980s, job creation levels have risen more slowly than in the 1970s.

Currently, services and trade are the main economic activities in the RMR and Recife. A notable feature of the labour market in Recife is the open unemployment which reached 7.6 percent of the population of working age in December 1992. This figure is greater than those of most Metropolitan Regions in Brazil. There is also a high percentage of people working in tertiary activities compared to industrial activities in this region.
As part of recent work carried out by two bodies of the Central Government, Fundação Instituto Brasileiro de Geografia e Estatística (IBGE) and Instituto de Pesquisa Economica Aplicada (IPEA), the Metropolitan Regions of the country have been studied in relation to a poverty line that divides the population into 'poor' and 'non-poor' in each Region. This division is based on the consumption structure and prices information from the Pesquisa Nacional por Amostra de Domicílios - PNAD (IBGE 1992).

In this study, the Recife Metropolitan Region has the highest percentage of population below the poverty line among the nine Metropolitan Regions in the country (48 percent), followed by Fortaleza (41 percent) and Salvador (39 percent) both in the northeastern part of Brazil. The City of Recife has 42 percent of its population below the poverty line, a total of 542,000 people.

With regard to the variation in relative poverty of Recife, the same study demonstrates that, despite the economic and political crisis of the eighties in the country, the poverty in all nine MR has reduced over the decade. Thus Recife, which began the eighties with 55.6 percent of poor in 1981, had a slightly smaller proportion of poor in 1990, 48.5 percent.

In summary, Recife is a city where almost half of the population lives below the poverty line and whose economic activity has been declining in the past years. The administration of the city has undergone a financial and fiscal crisis, resulting in a very low capacity for investment.

5.5 MSWM and the Private Sector in Recife

5.5.1 Historical Aspects

In Recife, the public sector was traditionally responsible for municipal solid waste
management until 1985. The Municipal Health Secretariat was the public sector body in charge of solid waste collection and street cleansing until the late fifties. In the early sixties, a major re-structuring of the service took place when the city was divided into sub-areas and technologically updated vehicles and other equipment were purchased. Alongside the new structuring of service management there arose a greater concern with the disposal and treatment of solid wastes. A project of decentralized disposal units was designed, using the latest technologies (PCR 1992).

Additionally, three large composting plants were designed using the Beccari composting system. This technology uses anaerobic digestion of the organic component of solid wastes contained in closed cells. A first unit was built in 1962, aimed at serving the western and part of the southern areas of the city. The other two units designed were never built.

In 1977, a second re-structuring of the service was implemented. An urban development undertaking, Empresa de Urbanizacao da Cidade do Recife (URB), was set up to tackle the increasingly large problems including solid waste management created by the rapid urbanization that occurred during the seventies. A special department was given responsibility to provide MSWM. More and better trained staff were hired and a new management model was adopted based on more centralized decision making and operational processes.

In 1985, a third reorganisation of MSWM occurred in Recife. Responsibility for the management of solid wastes was transferred from URB to the city’s public works undertaking, Empresa de Obras Publicas Cidade do Recife, and an urban cleansing superintendency (SLU) was created to run the services.

The most significant change that occurred in 1985 was the involvement of the private sector in the provision of MSWM services in Recife. A mixed model of private and public service provision was established in the city. Approximately 40 percent of the
city's geographic area was contracted out to a private firm (with headquarters in Sao Paulo) called ENTERA Engenharia Ltda, for MSW services provision. The remaining part of the city continued to be served by the public sector. This contract lasted for five years. In 1995 important changes in the involvement of the private sector in MSWM were introduced in Recife.

5.5.2 The Reasons for Privatising

For the objectives of this research it is important to note that arguments which spurred the decision to privatise MSWM in Recife are dissimilar to the underlying arguments for the process that is currently taking place at the federal level within the Brazilian privatisation programme. Evidence suggests that the reasons for privatising MSWM in Recife were related more to financial and managerial problems than to the ideological and economic objectives discussed in Chapter Two. Apparently, the main reasons for involving the private sector in service provision in Recife are linked to:

(i) financial difficulties, particularly cash flow limitations. This is due to the falling municipal revenues and to the consequent strict control of municipal expenditures implemented by the municipal administration;

(ii) managerial difficulties of the municipal administration in responding to the demands for services, having few and ill-prepared staff and inadequate and outdated equipment;

(iii) difficulties in dealing with service stoppage. Services cease as a result of the strikes called by unions. Contracting out to a private firm, particularly if payments are by tonnage collected, allows the municipality to continue provision of services during union strikes rendering it a more powerful position in negotiation talks.

The above arguments for private sector involvement are in debate, however. In any
case, there is no evidence that achieving improved efficiency and greater consumer benefits (arguments which usually provide the grounds for privatisation processes) formed the basis of the decision to involve the private sector in MSWM service delivery in Recife.

Introducing greater competition, for instance, does not seem to have played an important role in the decision, since the contract signed in 1985 foresaw the possibility of automatic extension. Furthermore, the renewal of this contract in 1990 was not put out for public competition. On the contrary, the contract was offered to ENTERPA on the grounds that there were no conceivable local competitors and that other incoming firms were bound to have initial high start-up costs (Batley 1992a).

5.5.3 The Informal Private Sector

Although this study focuses on the formal involvement of the private sector in MSWM services provision, it is important to note that the informal private sector is an important actor in the MSW services system in Recife even today. This part of the private sector plays its role mainly in recycling the fraction of solid waste which has a commercial value. It is estimated that up to seven or eight thousand people base their living on recycling wastes in the city outside of a formal organisation (Alencar 1993).

There is an informal network for the commercialization of recycled materials in the city. It is formed by a group of approximately 1,500 scavengers who work in collaboration with 120 middlemen, who sell the collected material to 30 industries. These industries re-use or recycle some materials which are utilised in production and transformation processes. The materials in greatest demand are paper, plastics, metals, fibres, bones and glass (Ibid).

There are different activities which comprise this informal recycling network carried
out by a range of actors. At least seven types of such actors have been identified to date: the buying peddlers, the street scavengers and sweepers (who work in the streets), the dump scavengers (who work in the dump), the deposit proprietors, the trimmers, and the industries who process the materials. Amongst these actors, the street and dump scavengers face appalling work conditions, exposed to contaminated materials in an entirely unsanitary environment. Moreover, the scavengers relate with middlemen and/or deposit owners who impose prices on the materials. As a result, there is a large difference between the prices paid to the scavengers and the prices paid by the industries. It is estimated that scavengers earn circa half the minimum wage per month, although they usually work more than eight hours per day (Alencar 1993).

Even under such shocking working conditions, the scavengers are directly responsible for the removal of anything between 10 to 15 percent of the wastes generated in the city, which represents the recycling of approximately 130 tons of solid wastes every day (Ibid). Despite the large contribution made by this informal private sector in reducing the volume of wastes disposed of by the municipal administration, the public sector had not implemented any continuous work involving their participation in the system by the end of this research field work.

5.6 Summary

This chapter gives a description of the Brazilian context of solid waste management where the empirical part of this research took place, specifically in the City of Recife. It has thus led to a better understanding of findings and methodological decisions in this study

The chapter begins by discussing the provision of infrastructure services in Brazil, highlighting the issues of standardization and universality and constituting the principles of service provision in the country previous to the introduction of
privatisation policies. It then examines the Brazilian National Programme of Divestiture as it is called Brazil's privatisation programme. After providing an overview of the national context, the chapter goes on to analyze the relationship between the private and the public sectors in MSWM provision in Recife. It highlights historical and legal aspects of this relationship, including the informal private sector participation in resources recovery in the city.
PART II - METHODOLOGICAL APPROACH

CHAPTER SIX - THE ANALYTICAL FRAMEWORK

6.1 Introduction

The previous chapters have presented the theoretical aspects of privatisation, particularly of privatisation of infrastructure services with a focus on municipal solid waste management. These aspects have defined the basis of the study field work. The field work has also been complemented by contextual background information of MSWM issues in Brazil and Recife (provided in Chapter Five). Attention now turns to the discussion of the analytical framework which shifts the research from the theoretical and conceptual level to the empirical level. This is the aim of the present chapter. It examines the elements which were devised as analytical tools to guide the collection and analysis of evidence during the course of this research.

This chapter consists of nine sections including this Introduction. The second section focuses on the problem that has called for the implementation of this study. It describes the context in which the subject matter of this research has emerged, discussing its importance and relevance. Section 6.3 highlights the points of view from which this research is carried out. It defines whose interests and concerns are addressed in this analysis of the impacts of privatisation on MSWM provision. Section 6.4 defines which specific questions within the many questions raised in the debate of privatisation are to be addressed in this study. Section 6.5 discusses the variables used in this study. Research problems are conveyed with a set of concepts which are then converted into variables, the elements appropriate for empirical analysis. In section 6.5 the aspects of service provision which are relevant to the analysis of the privatisation impacts are converted into variables; it also analyzes the relationship assumed to exist between these variables. Section 6.6 presents the hypotheses that guided the research and its development into a set of derived sub-hypotheses. Section 6.7 defines which sub-systems, within the MSWM system, are examined in this research. In other words, it defines which services and operations are considered in the
comparative analysis, since not all services and operations are comparable. Section 6.8 presents and discusses the measurements that have been performed during the research; it explains which tools have been used to measure the properties of the MSWM in Recife, in order to test the hypothesis. The chapter closes with Section 6.9, a summary of all the research elements.

6.2 The Problem

6.2.1 The Social and Economic Significance of Cities

The social relevance of cities in developing countries has been noted by many authors in the literature on human settlements. Mattingly and Meikle (1991:1), for instance, argue that "cities are social entities that provide public and private support mechanisms which are fundamental for living". Those mechanisms are related to the social environment and development opportunities, in which homes, social and economic services play a crucial role. However, the authors also emphasize that urban settlements are very relevant as economic entities since they play a fundamental role in reversing economic decline and in accelerating growth while meeting the needs of their populations.

As Mattingly and Meikle (1991) remark, an increasing number of commentators have emphasized the economic significance of cities of developing countries. This economic importance relies on the strong links that urban economies hold with macroeconomic performance (World Bank 1990). Macroeconomic policies affect cities and towns because they establish the broad economic environment for urban activities. Examples are the policies related to health and education and the prices of key inputs such as water and energy, which are dealt with at the national level and have an effect on cities' activities.

Similarly, the performance of urban economies also affects macroeconomic
performance. According to Harris (1990), the allocation of labour force combined with supportive capital equipment that occurs in cities provides a number of economies of scale and agglomeration, such as the labour market economy, economies of specialisation, and economies in the provision of common services. Urban settlements have the command of transport and communication networks and access to larger markets. This concentration of facilities, according to the author, makes for greater economies and defines a decisive role for cities and towns in national growth. On the other hand, the performance of urban economies may have negative impacts at the macroeconomic level. Poor performance of local governments in managing their revenues, for instance, contributes to the consolidated budget deficit at the national level.

Empirical evidence also supports this belief in the economic significance of cities. In all countries, increasingly larger shares of GDP come from urban economies. This importance, however, appears to be greater in developing and middle income countries. Harris (1990:10-11), argues:

*Figures suggest that now nearly 60 percent of the gross national products of developing countries is generated in urban areas (by about one-third of the labour force), and 80 percent of the increment in national outputs....In Middle Income Countries, the economic role of cities and towns appears to be even greater. For example, in Turkey....the urban contribution to gross domestic product is of the order of 75%....*

6.2.2 The Main Features of Cities in Developing Countries

The increasing economic importance of cities and towns in developing countries has been acknowledged in many development strategies of national governments and international agencies. However, to build strategies that succeed in allowing the urban
activities to play their important role in the economic and social recovery of their countries, policy-makers must take into consideration four main trends presented by urban areas in developing countries:

(i) rapid pace of urbanisation;
(ii) concentration of growth in larger cities;
(iii) growing poverty;
(iv) fiscal crisis of urban governments.

(i) The trend towards high levels of urbanisation, which has been a very important phenomenon in developing countries over the past decades, appears set to continue into the next millennium. The urban population in these countries is expected to continue to grow, reaching 39.3 percent of the total in the year 2000 and reaching 4 billion people around the year 2025 (UNCHS 1987). According to the World Bank (1990), rapid demographic growth will add 600 million people to cities and towns in developing countries during the 1990s, about two thirds of the expected total population increase. In 1992, 62 percent of the population of countries with middle income economies lived in cities, 36 percent of them in cities of over one million inhabitants (World Bank 1994). By 2025, all developing countries will be predominantly urban (UNCHS 1987).

(ii) Rapid urbanisation in developing countries has generally been accompanied by the even more rapid growth of large cities. The trend towards increased concentration is evident in all developing regions, excluding China. In 1992, approximately a quarter of the population of countries of middle income economies lived in cities of one million or more people (World Bank 1994). The location of the world's largest cities is shifting from the developed to the developing countries. Mexico City and Sao Paulo will be the world's largest cities by the end of the century, with projected populations of 26 and 24 million respectively (UNCHS 1987).
(iii) The third important issue to take into account in defining urban development strategies in developing countries is the growing poverty of the population. According to the World Bank (1986), an increasingly larger share of urban dwellers in developing countries are living outside the legal framework of the cities, as squatters. They lack water, sanitation, urban transport and shelter. They are also unserved by social services, such as health and education. It is estimated that one billion people in the developing world still lack access to safe water, and nearly two billion lack adequate sanitation (World Bank 1994).

(iv) The fourth relevant feature in cities nowadays is the fiscal crisis of urban governments. This is a widespread problem, and involves enormous amounts of money. Demands for services supersede public investment and apparently will continue to do so well into the next century. Studies carried out by the World Bank (1994) estimate that in developing countries infrastructure typically represents about 20 percent of total investment and 40 to 60 percent of public investment. Public infrastructure investment ranges from two to eight percent of GDP. Finance statistics in Latin American countries show that the public urban sector do not have the resources to respond to the needs of urban dwellers. Urban services provision outlays in these countries are equivalent to eight percent of their GDP (Guarda 1987).

6.2.3 The Need for Urban Efficiency

As urban economic activities prove to be crucial to economic growth, national governments and international development agencies have become increasingly aware of the need for efficient management of the cities in developing countries. The need for efficient cities is stressed in most of the development strategies presented by international development agencies and donors, as illustrated by the World Bank, which devoted its World Development Report 1994 to the issue of infrastructure and emphasised its role in alleviating urban poverty and constraints on urban productivity.
It is argued that infrastructure can deliver great benefits in economic growth, poverty alleviation and environmental sustainability, but only when it provides services efficiently. Indeed, constraints such as infrastructure deficiencies reduce the productivity of firms and households and thereby reduce the aggregate productivity of the economy. The provision of adequate infrastructure services is an important point in improving the productivity of the urban economies. Moreover, it is equally important on equity grounds. As a strategy, it improves productivity while directly meeting the basic needs of the growing numbers living in poverty, thereby improving equity as well.

6.2.4 Privatisation as a Strategy to Increase Urban Efficiency

It has been pointed out that cities in developing countries have a central role in the economy and must be made to work efficiently. Increasing the efficiency of infrastructure services is one of the main ways to improve cities' economies. However, the fiscal crisis in local governments in most developing countries indicates that urban infrastructure must be improved within severe resource constraints, since the public sector does not have the resources to respond to the needs of cities.

This is the context in which the involvement of the private sector in the provision of urban infrastructure services emerges. Privatisation has been a major and much debated innovation in public administration throughout the world since the 1980s. It is probably the single structural reform most frequently proposed for developing countries, particularly at the urban level. Privatisation is presented as a strategy to improve the efficiency and the speed on meeting urban needs, while lightening the financial burden of public administration.

The implementation of privatisation policies in infrastructure services can be regarded as an issue as controversial as privatisation in general. However, apart from the debate on privatisation in general (discussed in Chapter Two) the involvement of the private
sector in infrastructure service provision can only be discussed in the specific context of each service, as pointed out in Chapter Three. This is to say that, although many of the questions raised in that debate also hold true in relation to the privatisation of infrastructure services, empirical studies aimed towards addressing those questions must gather evidence in the context of each service. This is particularly relevant to MSWM, a service that presents many specific characteristics that set it apart from other infrastructure services, particularly in developing countries. The analytical framework used in this research has been based on this belief and all of its elements reflect inherent aspects of MSWM provision.

6.3 The Points of View of the Research

Chapter Four has explained that an integrated and comprehensive study on the efficiency of MSWM must take into account the points of view of the main social agents involved in the process of service provision and consumption. The object of this research - MSWM privatisation in developing countries - has as its main characteristic the fact that it involves a number of actors, who may be differently affected by the process. In this study four social actors have their primary concerns taken into account in the definition of MSWM services objectives: the users, the nonusers, the operators and the municipal government.

This focus resulted in the selection of the following objectives in the provision of MSWM: the accessibility, the productivity, the quality and the costs of services to the public sector. These aspects provided the basis of the analysis of privatisation impacts on MSWM carried out in this study. This is considered appropriate since the interests of the main actors involved in the provision of there service are embodied in these aspects, ensuring the comprehensiveness and integration of the study.
6.4 Research Questions

The participation of the private sector in MSWM in developing countries has increased in the last years, due to privatisation policies implemented by local governments. A number of studies have been carried out to understand how privatisation affects service delivery. However, many questions regarding the impacts of such policies on the everyday life of the cities are yet to be addressed.

This research aims to address some of these questions which are related to the objectives of MSWM: accessibility, quality, productivity and costs of the service to the public sector. It follows that the questions that this research aims to address are:

(i) Does privatisation improve the accessibility of MSWM services?
(ii) Does privatisation improve the quality of MSWM services?
(iii) Does privatisation improve the productivity of MSWM services?
(iv) Does privatisation lower the costs of MSWM services provision to the government?

6.5 The Variables

In order to move from the conceptual to the empirical level, the questions outlined above must be converted into variables. It is as variables that these aspects appear in the sub-hypotheses and have been tested in this research. According to Nachmias and Nachmias (1992:54) "variables are empirical properties that can take two or more values. If a property can change in value or kind it can be regarded as a variable". In the case of this research, the conversion into variables of the four aspects of service delivery discussed above did not pose difficulties, since they all can have different values attached to them.
costs of services to the public sector.

There are many types of variables, according to the objectives of each research. In this particular case, two kinds are relevant: dependent variables and independent variables. Dependent variables are those the research wants to explain and independent variables are those expected to explain the changes in the dependent variables. This distinction is analytical and relates to the purposes of each research. Therefore, as with the great majority of the studies that deal with the consequences of policies, there is one single independent variable and numerous dependent variables in this research.

The independent variable is the process of privatisation of MSWM in Recife. The dependent variables are the aspects whose variations are associated with the independent variable. The first question raises the issue of the association between privatisation and improvements in terms of access to services. Therefore the first variable is the accessibility to the services. The second question is associated with the impact of the privatisation process on the quality of services; the second variable is the quality of the services. The third question embodies the primary concern of the operators of the services; the variable is the productivity in service delivery. And finally, the fourth question associates privatisation with the lowering of costs of MSWM provision to the public sector. The fourth variable is the cost of service to the public sector.

There are several types of relationships between variables. In this particular case, this relation is assumed to be asymmetrical, i.e., it is assumed that the independent variable is essentially responsible for the dependent variables (Rosenberg 1984). Furthermore, it is assumed that this relation involves an association between ends and means. This relation is purposive: it is based on the fact that the means contribute to the ends. It thus assumes that privatisation policies are a means of achieving certain goals in service delivery, which is an argument in favour of privatisation largely used in the literature.
6.6 The Hypothesis

This research focuses on the association of the introduction of the independent variable and changes in the dependent variables in a particular direction, since the independent variable is interpreted as a means of achieving these changes. Therefore, the guiding hypothesis is:

The presence of the private sector improves the efficiency in the provision of municipal solid waste management services in Recife, Brazil.

The interpretation of efficiency discussed in Chapter Three indicates that this guiding hypothesis leads to the following set of sub-hypothesis:

(i) The private sector provides a higher level of accessibility to MSWM services in Recife;
(ii) The private sector presents a higher level of quality in the provision of MSWM services in Recife;
(iii) The private sector presents a higher level of productivity in the provision of MSWM services in Recife;
(iv) The costs to the municipal administration of MSWM services provided by the private sector are lower than the costs of the public sector provision in Recife.

6.7 The Services Measured

Drawing on the discussion of Chapter Four, the analysis carried out in this research at the outset considers the total MSWM system existing in Recife as a combination of four major elements:

(i) a collection sub-system;
(ii) a public cleansing sub-system;
(iii) a processing and disposal sub-system;
(iv) a resources recovery sub-system.

After this major distinction is made, a further subdivision of the systems takes place in private and public services. In this manner the problem of analysing the impacts of privatisation in the MSWM system can be more clearly defined since, in the particular case focused on during this research, the formal private sector has not been involved in all the sub-systems but only in the SW collection and the public cleansing sub-systems. To avoid the risk of incomparability only these two subsystems have been used in the comparison between sectors. Furthermore, the variables are measured in relation to the operations which are common to the two sectors.

6.8 The Measurements

The variables which are relevant to this research have been discussed and defined in Section 6.5. The purpose of this section is to present the measurements which bridged the conceptual-theoretical level with the empirical-observational level. More specifically, in this research these measurements explain which properties of the MSWM in Recife have been measured. Chapter Seven presents the methods which have been used in carrying out these measurements.

In a very simplified way, measurements may be defined as procedures to assign numerals to properties or variables, according to rules (Berger and Patchner 1988). Those numerals which measurements produce are used in this research to assess the level of quality, productivity, accessibility and costs of MSWM to the public sector, in both the privately and publicly served areas of Recife.

Fritz (1990) identified in the existing literature a variety of guidelines and indicators related to sanitation services such as water supply and sewerage. However, no such information is available in the MSWM field. As a result of this deficiency, a set of
measurements were used in this research based on the suggestions of different commentators in the specific literature, particularly in the works of Stevens (1980), Cointreau (1989) and Fritz (1990). For the sake of clarity, the measurements are presented in relation to the variable and to the each service described in this research.

6.8.1 Accessibility

Accessibility is regarded in this research as the main concern of the nonusers of MSWM services. The links of these services with public health and environmental sustainability indicate that accessibility is also a concern of other agents in the society, particularly the government. It is important to emphasize that accessibility is directly related to issues of equity and equality. Indeed, many indicators of social development are based on the level of access of the members of society to infrastructure services.

It has been argued that the lack of access to infrastructure services may be due to insufficient coverage or lack of users' financial capability to pay for the service. In the case of MSWM the issue of affordability as an obstacle to consumption is controversial. This depends on the sub-system analyzed and the techniques and technologies used. In the particular case under focus in this research, considering solid waste collection and public cleansing as they are provided in Recife, it is argued that the lack of access to MSWM is not due to issues related to affordability.

This argument is based on the fact that MSWM in the city is a non-exclusive and non-rejectable service. As discussed in section 3.4.1, being non-exclusive means that once the service is provided one user cannot be prevented from benefiting from it. Being non-rejectable means that individuals cannot abstain from their consumption even if they want to. These characteristics render it virtually impossible for the operators or to the municipal administration to exclude users on the basis of ability to pay once the service is provided in the area. It also renders it impossible for users to reject the service, particularly in the case of public cleansing. Therefore, nonusers are usually
The Privatisation of Municipal Solid Waste Management in Recife, Brazil

the inhabitants of unserved areas. It may be argued that they are the poorer communities, on the grounds of work carried out in similar cities. At any rate, it is not the factor of individual financial capability to pay for MSWM services that determines the lack of access to services. As a result of this consideration, the assessment of accessibility in this research is made on the basis of the availability of services.

The above characteristics of MSWM services determine another aspect of this analytical framework. Since the nature of the service consumption does not exclude individual users on the basis of their socioeconomic condition (as is the case with other infrastructure services) this research has employed two further measurements beyond what is usual in other studies. This is to say that availability has been measured in absolute terms, through measuring coverage, and also in relative terms, through analysing frequency and pickup point. Coverage has been measured in two ways, in relation to the access to any regular MSWM service, and in relation to the amount of solid waste which is actually collected from each household. In summary, the measurements used in this research are:

- coverage - percentage of the population which has access to any regular MSWM service;
- coverage - in relation to the amount of solid waste which is collected from the household;
- frequency of collection - percentage of the population in relation to the number of pickups per week;
- points of pickup - percentage of the population in relation to the different types of pickup points.

6.8.2 Quality

The quality of services is regarded in this research as the main concern of the users. As already highlighted in Chapter Four, the assessment of the impact of privatisation
in MSWM must address the question of quality due to the possibility of increased productivity at the expense of the level of quality, which is not in the interest of the individual users nor of society at large.

In this research, the quality of the MSWM has been regarded as a combination of effectiveness and responsiveness in service delivery. The measurements which have been used are in relation to both solid waste collection and public cleansing, resulting in the following aspects to be measured:

- Type of equipment used in the collection - In relation to vehicles or other equipment used by the providers to collect the waste;
- Time of waste collection - The collection may be performed during the day or during the night;
- Method of domestic storage - In relation to the type of bin or other containers used by the householders to store the waste until the collection;
- Reliability of scheduled collection - In relation to failures in collecting the wastes at day and time established in the schedule of operation;
- Quietness of collection services - In relation to both equipment and associated crews;
- Cleanliness of the areas just after the services - In relation to spillage during the collection or refusal to collect spillage by users or other agents;
- Responsiveness of the service to users' complaints - In relation to the speed and ease with which inadequate aspects of collection are rectified after a complaint has been made by the user.

6.8.3 Productivity

On the grounds of the work of the US National Commission on Productivity (1973) and Cointreau (1989) nine measures to assess productivity of MSW collection services related to labour productivity have been used:
As identified by Flintoff (1984), in developing countries productivity of equipment should be given great importance in evaluation studies on MSWM due to the high costs of equipment. This point is also noted by Cointreau (1989) who suggests that the optimization of the use of capital investment items should be considered in productivity studies. To assess this aspect, this research focuses on the use of two main types of equipment: compactor trucks and open top trucks. The following measurements were taken for each type of equipment:

- Number of equipment held in operation per week / Total number of vehicles;
- Number of people served / Vehicle per month;
- Tons collected / Vehicle per month.

6.8.4 Cost of Service Provision to the Public Sector

The cost of service provision to the public sector has been identified as the government's main concern regarding assessment of the impact of MSWM privatisation. In relation to DLU this cost is the operational cost of the provision of the service itself. Regarding ENTERPA, this cost is that which has been agreed in the contract and which is passed on monthly to the firm by the municipal government. The analysis of costs carried out in this research examined the costs of MSWM in the
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period from 1990 to 1994. These costs are also analyzed in relation to the Municipal Expenditures. To assess the level of cost recovery in the city the revenues from the TLP (Taxa de Limpeza Publica), the urban cleansing tax, are examined in relation to the costs of MSWM to the municipal administration.

The comparison between the two areas of study (the basic measurement in the testing of the sub-hypothesis (iv) in section 6.6) is based on the following measurements:

- dollar cost / household;
- dollar cost / per capita;
- dollar cost / per ton.

6.9 Summary

This chapter focuses on the analytical framework devised to guide the collection and the analysis of the evidence gathered during the course of this research. It starts by discussing the problem that has called for the implementation of this study. It highlights the increasingly important social and economic role of the cities in the developing countries and their main features, which constitute the context where policies of privatisation emerged as a strategy to improve the efficiency of cities.

The chapter then goes on to present the main elements of this research's analytical framework. It defines the points of view of the research and the questions that are addressed in the study. These questions are then converted into variables, and the way in which these variables are assumed to interact with each other is examined. This results in the definition of the guiding hypothesis of this work, which leads to a set of sub-hypotheses.

The services which are analyzed in this study are discussed to clarify the comparability of the aspects examined in the comparison between sectors carried out
in Chapter Nine. The last part of this chapter discusses the measurements which have been used to assess the impacts of privatisation on the four selected aspects of MSWM provision. A set of measurements is defined in relation to each of the four variables: accessibility, quality, productivity and costs of services to the public sector.
CHAPTER SEVEN - METHODOLOGY

7.1 Introduction

This chapter is the second and last of Part II of this thesis, which describes the methodological approach used in this research. This chapter presents the way in which the research has been designed and implemented. Regarding the design, the overall strategy of the study is defined through discussion of the theoretical and practical rationale of several methodological decisions that were made throughout the work. Regarding the study implementation, this chapter describes in detail the field work and follows three main objectives, as suggested by Fowler, Jr. (1993): first, to allow the replication of the data collection effort; secondly, to allow readers to detect procedural differences between research that would affect comparability; and thirdly, to provide an overview of the possible kinds of errors that can affect the estimates of this study.

This chapter comprises eight sections, including this Introduction. The next section focuses on the approach and type of design that was employed in this study. It highlights the main ideas that are embodied in this approach and the theoretical and practical conditions that have affected the research design. The section discusses the decisions which have been taken in this study regarding its internal and external validity. Section 7.3 examines the data collection process, focusing on the methods which have been used and the choice of site. Section 7.4 discusses the survey research. Section 7.5 examines the non-scheduled interviews, while section 7.6 focuses on the archival records survey. It describes the particular combination of techniques and procedures that were employed in the secondary data analysis. Section 7.7 is a discussion of the process of data analysis, examining the statistical procedures employed in the comparative analysis which have been carried out in this study in relation to each dependent variable: the accessibility, quality, productivity and costs of services of MSWM to the public sector. The last section, 7.8, provides a summary of the chapter.
7.2 The Theoretical Conditions

In any research there are many theoretical elements which have direct implications on the approach and design that are employed in the implementation of the data collection and analysis processes. This section discusses three of them in relation to the present study: its central problem, general purpose and specific purpose. These factors, combined with the need to ensure the internal and external validity of the study findings, have determined the methodological approach which has been used.

7.2.1 Central Problem, General Purpose and Specific Purpose

As previously discussed in Chapter Six, the central problem of this research is the relationship between the introduction of privatisation policies and changes in the efficiency in the provision of MSWM services in Recife. This problem emerged from conflicts and hiatuses in the literature, as well as from the gap in empirical proof of the accepted propositions found in the debate on privatisation (Chapter Two).

The general purpose of this research, therefore, is to create new data from a particular empirical situation through which the theoretical structure that housed those propositions may be extended (if correct) or improved in terms of its actual significance (for the elimination of error is a necessary condition for the truth).

Regarding the specific purposes, this investigation aims:

(i) to provide a description of the current practice of MSWM in both the private and public sectors in Recife;
(ii) to assess the implications of the privatisation of MSWM in Recife for the efficiency in service provision, interpreted as the changes in the accessibility, quality, productivity and costs of service to the public sector.
The first implication of these conditions for this particular research was the decision to use an evaluative approach. To establish the type of relationship that exists between the independent and the dependent variables it was necessary to evaluate the practical outcome of private sector involvement related to accessibility, quality, productivity and costs of MSWM to the public sector in Recife. Indeed, as Hakim (1987) suggests, many are the cases where research dealing with policies develops into evaluative studies.

This evaluation may be designed to determine the direction and the magnitude of the relation between variables. The direction is considered positive when increases in the independent variable lead to increases in the dependent variable. Where decreases in the dependent variable occur the direction is considered negative. The magnitude of the relation refers to the extent to which these variations occur (Nachmias and Nachmias 1992). In this research the evaluation allowed the determination of the direction of the relationship between the variables; however, the evaluation of the magnitude of this relationship demands more sophisticated statistical analysis than that carried out in this study.

A second decision related to design and derived directly from theoretical conditions was the use of variant methods of data collection, usually referred to as triangulation. This issue is further discussed in section 7.3 of this chapter; however it is important to note at this stage that the decision to triangulate was greatly influenced by the fact that this investigation deals with a policy in practice i.e. it deals with the complexities of a real life situation. This characteristic implies a need to have a rounded and balanced picture of the topic. To this end data was collected at different levels, from different sources and through different methods.

The other theoretical conditions that influenced the design of this investigation refer to internal and external validity of the research findings. These are issues crucial to any scientific research. The way in which they were taken into consideration in this
particular design is discussed in the sections below.

7.2.2 Internal Validity

Campbell and Stanley (1963) defined "internal validity" as the problem of inferring causation between variables. It is considered a sine-qua-non of any scientific research. In fact, according to these authors, internal validity is the basic minimum without which research cannot be interpreted.

In this particular research, internal validity is resolved through addressing the question of whether the privatisation of MSWM in Recife caused changes in the accessibility quality, productivity and costs of these services to the public sector in Recife. To achieve this some steps were to be taken:

- First, it was necessary to demonstrate that in Recife the level of accessibility, quality, productivity and cost of services to the public sector vary with the level of private sector involvement in MSWM. This process is usually termed as establishing covariation;

- Secondly, all rivaling explanations for this correlation had to be ruled out, thus proving that the relation is not spurious;

- Thirdly, it was necessary to establish the time order, to illustrate that changes in private sector involvement in MSWM in Recife were prior to changes in accessibility, quality, productivity and costs of services to the public sector.

To infer causation, i.e. to prove that the changes in the independent variable caused the changes in the dependent variable, the literature suggests that three elements must be present in the research design (Nachmias and Nachmias, 1992):
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(i) comparison, because it allows demonstration of covariation;
(ii) control for rival explanations, since it would encourage the determination that
the covariation is not spurious;
(iii) manipulation, which helps to establish the time order of the events.

However, in this case, as with most phenomena studied by social research, only some
of these elements could be achieved. Since this investigation deals with real life
situation, the degree of manipulation and control was severely reduced for social,
political and ethical considerations. Therefore experimental designs were ruled out,
although they are the most unequivocal evaluation of causal relationship.

The alternative designs commonly used in social research are often referred to as
quasi-experiments, correlational designs, or pre-experiments (Ibid). These designs
usually have weaker internal validity since they do not allow the three basic elements
to infer causation. However, researchers seek ways to approximate the experimental
design, strengthening the validity of their findings.

In this research there are two groups of residents in Recife, which enabled a
comparison to be made, namely between those who live in the area served by the
public sector and those who live in the area served by the private company
ENTERPA. Therefore a correlational design was employed. This is a design
commonly employed in social sciences and is often referred to as cross-sectional
study. The basis of this design is a comparison and it is therefore very strong in terms
of establishing covariation.

This research consisted of a cross-sectional comparison between the private and public
provision of MSWM services in Recife, as described above. The comparison of two
or more units at one point in time is called "static group comparison" (Labobitz and
Lagerdon 1981). According to Bulmer (1984), through this method data is collected
at one point in time from two or more groups which differ in their exposure to a
particular variable. This research involved three surveys to compare the two areas of study:

(i) a survey conducted on the population of these areas, using a random sample of households;
(ii) an archival records survey within the private and public operators of MSWM;
(iii) a set of interviews with relevant key-role holders within the private and public sectors.

In this way, the users, the non-users, the operators and the public sector have provided data which have been used in the comparative study carried out in this research. The surveys above are further discussed in section 7.4, 7.5 and 7.6 of this chapter.

As with all research designs, correlational designs have advantages and disadvantages. The fact that the research takes place in natural settings is a disadvantage: it renders control over rival explanations for the relation more difficult to establish. Moreover, it is usually impossible to manipulate the independent variable, posing difficulties in determining the direction of the causation.

These are major shortcomings of correlational designs and they are the basis of controversy in the literature over demonstrating causation in these cases. Some commentators consider that causation is never demonstrated in non-experimental designs while others acknowledge that drawing causation through these designs is a very indirect process and thus strongly challenges the argument of its impossibility and considers it a puristic point of view (Marsh 1982).

The literature reaches a consensus on the view that no design can solve the problem of control and representation simultaneously. Nachmias and Nachmias (1992) stress that the basic dilemma of any research is that designs which are strong in internal validity tend to be weak in external validity. In other words, designs that produce
stronger evidence on causation usually pose difficulties in generalisation of the research findings. On the other hand, research weak in internal validity is also weak in external validity, since without strong evidence no generalisation can be made. Therefore, the design of this research aimed at strengthening these two aspects within the practical conditions of the work.

In relation to the second element of establishing causation, proving that the covariation is not spurious, the internal validity of this research findings was strengthened by the use of auxiliary information. These data were collected from different sources so as to provide grounds for logical considerations that allowed rival explanations for the correlation between the variables to be eliminated. A second method for strengthening the internal validity of the research was the use of a multivariate method of statistical analysis, which is discussed in section 7.7 and in the statistical appendix.

The third operation used to infer causation between the variables is the demonstration of time order which, for this particular research, requires demonstration that changes in the level of the private sector's involvement are prior to the focused effects on MSWM (since a posteriori facts cannot influence prior phenomena). In this research, the time order between the phenomena that occurred to the variables was established on the basis of logical and theoretical considerations and on auxiliary information, also collected for this purpose.

7.2.3 External Validity

External validity refers to the issues of drawing general conclusions from the results of a research to relate to other populations and to natural settings. The first issue is related to the representativeness of the sample and the second to reactive arrangements in the research procedures.

Any sample must be representative of the population from which it was selected so
as to allow the conclusions and finding of the research to be assumed as true for the whole group. While experimental designs have shortcomings in relation to representation (since many experiments rely on volunteers or have an incidental sample), correlational designs have advantages in this regard. They permit the use of probability samples, which allows generalisations to be made on larger populations (Nachmias and Nachmias 1992).

To strengthen the external validity, and therefore the generalizability of the findings of this research, probability methods of sampling were used. The sampling process is further discussed in Section 7.4.1 of this chapter.

Reactive arrangements relate to the settings in which the research is carried out. The implementation of research in artificial situations poses difficulties in generalising its conclusions to real life settings. Conclusions may be specific to that particular artificial situation. This obviously jeopardizes the external validity of the research. In this particular case, the research was carried out in natural settings, thereby reducing the issue of reactive arrangements and enabling greater generalizability to other real life situations.

7.3 Data Collection

7.3.1 Choice of Methods

Methods of collecting data are not as developed and systematic as other methods in the different stages of a research. There are several modes of data collection in the Social Sciences, each has certain advantages and certain limitations, and research findings are affected by the nature of the method of data collection used, to a certain extent. As Campbell and Fiske point out (1959:13):
knowledge in Social Sciences is fragmented, is composed of multiple parcels... The separateness of specificity of those bodies of knowledge is a consequence, not only of different objects of enquiry, but also of method specificity. Each method is one basis for knowing, one discriminable way of knowing.

As a result of the emphasis placed on the importance of the method of data collection in research designs there has been much discussion on the appropriateness of methods to different situations. The most widely accepted view among researchers today is that different kinds of information are best gathered in different ways.

The strategy of combining the different modes of data collection is already very common in Social Sciences, particularly in the case of research related to policies. As previously highlighted, it was first called "triangulation" by Campbell and Fiske in 1959 and has been widely emphasized ever since (Webb, 1966; Galtung 1967; Denzin 1970; Bulmer 1982, Marsh 1982).

The main feature of methodological triangulation is the use of different strategies and techniques in the study of the same object. The advantage of this strategy is that, by relying on various methods to collect information, the researcher minimizes the degree of specificity that each introduces in the final body of knowledge. Denzin (1970:35) emphasizes that methodological triangulation raises the social scientist

above the personal bias that stems from single methodologies. By combining methods...observers can partially overcome the deficiencies that flow from one investigator or one method.

Therefore the strategy strengthens the validity and reliability of the evidence, increasing the credibility of the research findings.
Furthermore, as Majchrzak (1984) notes, the complexity of the environment and the need to obtain a comprehensive picture in research which deals with policies further supports the use of multi-dimensional approaches, i.e., the use of multiple methods and work at multiple levels. According to this author, this provides more valid, reliable and robust conclusions as a basis for action.

The literature presents various methods of data collection, according to different classifications and under different names. Nachmias and Nachmias (1992), for instance, suggests a classification that distinguishes four general types of data collection: observational methods, survey research, secondary data analysis and qualitative research.

The methods chosen for data collection in this research resulted from a combination of available techniques most appropriate and fruitful for its design. In this process several factors were taken into consideration in addition to the theoretical conditions discussed in section 7.2. These factors relate to practicalities of the field work, such as the research site, the sample frame, the availability of information, and financial and human resources. As a result, the research design combined three types of data collection derived from three different sources:

- A survey was employed to collect data from the actual and potential users of the MSWM in Recife. All households in the city were considered, irrespective of whether service was available. Primary data specific to the objectives of this research was generated through surveying the population.

- A second survey was carried out among the providers of the services. This survey considered the public and the private providers, as well as the decision makers in the public sector involved with MSWM in Recife. The survey was conducted on the different levels of decision, from the Planning Secretary to members of truck crews.
An archival records survey was carried out in the public and private sectors among units which were involved in MSWM. This is one type of secondary data analysis where information has been collected previously by others to meet different objectives and is currently stored in institutional archives.

The three methods of data collection above are complementary, which serves to improve the quality of the information used to base the research findings and conclusions. They are described in detail and further discussed in Sections 7.4, 7.5 and 7.6 of this chapter.

7.3.2 Choice of Site

The research was carried out in Recife, Brazil. The decision to conduct the research in this location was determined by both methodological and practical aspects. The main considerations in choosing the survey site were:

(i) That Recife is divided into two areas: one which is privately served and one which is served by a public company. Both areas are suitable for random sampling since they include: all of the different socio-economic levels of the population, all of the different topographic conditions that exist in the city, and variant types of urban tissue. These are the three main elements that affect the delivery of MSWM. It has already been highlighted that the possibility of using a random sample is an important strength of correlational designs in terms of its generalizability of the research findings.

(ii) That the involvement of the private sector began (on a significant basis) in 1985. By the time of this research field work, both sectors had been in operation in the city for almost one decade. This fact, like the use of random sample mentioned above, has advantages in terms of the use of a correlational design. The length of time since the beginning of the privatisation process is enough to have enabled decision makers, managers and operational workers to establish opinions and personal views concerning
the subject, which were surveyed by this investigation. It also allowed a fair amount of reliable data to be collected in a systematic way, making possible an archival records survey as part of the field work. These two facts have proved very important for comparison to be made between public and private delivery of MSWM in the city. This is an important aspect of the internal validity of the research findings.

Equally important to the choice of this research site were the practical aspects associated with the field work. Recife was chosen on the strength that it is familiar to the researcher. Current employment within the administration of the city furnished the researcher with knowledge of the archives and other sources of data within the public sector. It also facilitated the approach of the private providers of MSWM in the city. A third advantage is associated with the mobilization of human and material resources within the public sector which enabled the survey to be conducted within a very short span of time. An additional advantage was the fact that the researcher was familiar with the physical and socio-economic aspects of the city. This proved very important in dealing with the difficulties which arose in field work.

7.4 The Survey Research

There are a wide variety of survey methods of data collection in the Social Sciences. The methods consist of asking questions to individuals who have presumably undergone experiences that are relevant to the testing of the research hypothesis (Fowler, Jr. 1993). The answers obtained are the data on which the research hypothesis is examined. The main objective of the survey research is to assess the opinion of the users of MSWM on the accessibility and quality of the services that were available to them, their attitude in relation to solid waste management, and to verify information on service coverage and delivery collected through other methods and from other sources simultaneously.

There are several survey research methods, such as mail, telephone, personal
interviews and group administration. Researchers may use a single mode or a combination of two or more ways to survey the population. This research is based on personal interviews whereby the interviewer asks questions to a potential respondent, face to face. The questions are designed to produce answers which are relevant to the testing of the research hypothesis.

Personal interviews are usually more costly than other alternatives. However, it was considered critical to this research to use this mode of data collection, particularly due to the specifics of the research site and the sample frame. The three main reasons were:

(i) Telephone surveys, the cheapest alternative, were ruled out because in Recife a large group of households do not have access to a telephone. The majority that would be excluded if a telephone survey were employed are the poorer groups, which are apparently those who suffer the most from the poor quality of MSWM or from the lack of service altogether. The need to include these groups in the sample frame was a major reason for choosing a personal interview method;

(ii) Mail survey methods were also ruled out due to the issue of accessibility to the respondents. Complete and reliable addresses were not available in many parts of the city, particularly the poorer ones. Mailing in this case could easily go undelivered or not reach the right units.

(iii) The third reason relates to the writing and reading skills of the population. In the Northeastern part of Brazil, 39.3 percent of the population are illiterate (IBGE 1991). A further substantial group, although literate, was likely to consider self-administered approaches more of a burden to their reading and writing skills. This might have led to an exceedingly high rate of non-response which may have jeopardised the representativeness of the sample and therefore lowered the generalizability of the research findings.
Additional methodological reasons founded the choice for interpersonal interview methods:

- First, face to face interviews are preferable when the level of motivation of potential respondents is low (Fowler, Jr. 1993). The population in Recife has been the subject of a great number of surveys in the last decade due to the redemocratisation process among other factors. Since 1981 eight general elections and one plebiscite has taken place in the country. These events alone originated dozens of opinion surveys. The addition of market, academic and other surveys led to the assumption that the population would not be motivated to co-operate, unless they had personal contact with the interviewers. A personal interview allows the interviewer to explain the objectives of the research to the respondents and emphasise the importance of their participation as a means of encouraging them to co-operate.

- Secondly, interpersonal interviews are associated with high response rates. In mail surveys that do not include follow-up procedures the rate of response is likely to be less than 50 percent (Herberlein and Baumgarter 1978). Procedures to increase these figures were likely to be lengthy and therefore not feasible in this particular survey due to time constraints. Moreover, the presence of an interviewer is more effective in encouraging the potential respondent to participate than a mailed or phoned message. These facts were further supported in light of the specific conditions described above.

- Thirdly, interpersonal interviews allows more control over the interviewing situation. This permits the interviewer to make important decisions such as who actually answers the questions or whether the questions have been completely understood. In this research, most of the questions addressed issues such as costs, availability, and quality of the services. Therefore, it was assumed that the heads of the households (both or one of them, male or female) were preferred to be interviewed. In some cases, adult sons and daughters or members of the aggregated families proved to be more able to answer the questions. The interviewer decided who should be interviewed in such cases.
Fourthly, face to face interviews make probing for further details and better descriptions of situations easier than in other methods. It is also easier to collect supplementary information that is important in establishing the time order of the events or to interpret the results during the data analysis stage.

All these advantages influenced the decision to use personal interviews in this investigation. However, this method also has weaknesses, which were taken into account in the design of this survey research. The major methodological setback of the personal interview method is its vulnerability to interviewer bias. The very flexibility introduced by the one to one situation in an interview (advantages are described above) also introduces bias that may jeopardise the validity of the data. Interviewer bias occurs when the interviewer's presence influences the answers respondents give. There are ways to minimize this problem which are usually related to the standardization of the interview and to the training of interviewers. Nonetheless, as Nachmias and Nachmias (1992) argue, even when verbal communication is avoided, non-verbal communication or factors such as the gender or the race of the interviewer may influence the respondents.

In order to avoid interviewer biases a schedule-structured interview was employed with the users survey in this research. This is the most structured form of personal interview. It has less flexibility than other types of personal interviews but it also has advantages in consistency since it minimizes differences in the way questions are asked by the interviewers. All the questions were written, their wording and sequence were fixed and identical for all respondents, which constituted a questionnaire to be administered by the interviewers.

The term "questionnaire", as Oppenheim (1992) argues, refers only to self-administered and postal questionnaire to some authors while others include interview schedules (face to face or by phone) under the same name.
Further measures to ensure that biases were not introduced in the handling of the interpersonal aspects of the interview were introduced during interviewer training. Interviewers were instructed to ask the questions as they were worded, in order to avoid conveying personal views or giving any indication that might affect responses. Nonetheless, interviewer bias remains an important disadvantage of the method and must be taken into consideration in the evaluation of the research findings.

Four main steps were taken to implement the survey research. The first relates to the sampling process, the second to the questionnaire design, the third to the selection and training of the interviewers, and the fourth refers to the field work procedures. These steps are discussed in the following sections.

7.4.1 Sampling

The sampling process involves the selection of a subset of the population (the sample) that accurately represents the relevant attributes of the set (Nachmias and Nachmias, 1992). The basic requirement of any sample, therefore, is that it be as representative as possible of the population from which it is drawn. Representativeness is necessary to allow the generalisation of the inferences based on the analysis of the sample to the whole population. In other words, the validity of any research findings is directly linked to the level of representativeness of the sample.

In this research a probability sample has been used. This is a method of sampling where it is possible to specify the probability for each unit of the population to be included in the sample. The use of this method allows the estimation of the level of representativeness of the sample. It allows one to specify to what extent the findings are relevant to the whole population, based on the analysis of the sample.

The main issues to be addressed in the sampling process are: the definition of the population, the sampling unit and the sample frame, the sampling design, and the
sample size. These definitions help to determine the extent to which results of this research may be generalised.

7.4.1.1 Population, Sample Unit and Sample Frame

The central problem of this research, the changes in MSWM provision introduced by the presence of the private sector in Recife, defines the household survey population. Four main aspects of the service are to be assessed: the quality, the accessibility, the productivity and the costs of services to the public sector. Therefore, the sampling unit is the household and the population may be defined as all households in Recife, in March 1994. The definition of the sample unit is based on the fact that MSWM services are provided to households and not to individuals, blocks nor streets. Households are charged for the service and households are the units considered in the legislation concerning MSWM.

The second definition relates to the question of which households should be analyzed to test the hypothesis. Since the issue of accessibility is fundamental to the hypothesis testing, all households should be analyzed, whether having these services available or not. Those households which are not served cannot answer the entire questionnaire. Nevertheless, it is important to note how many unserved households there are and what their main characteristics are, so as to address the question of accessibility to this public and basic sanitation service. Indeed, as has been stressed before in this study, in research which deals with policies, a degree of description is essential to mapping out how the policy is working in practice, especially in regard to the issue of accessibility. Therefore the research population should include the total number of households in the city, at the time of the survey.

The sample frame is a list of all the units of the population, from which a subset is selected. In other words, it is the set of units that have the chance to be selected. The quality of the sample frame is crucial to the representativeness of the sample and
therefore to the generalizability of the research findings.

Three aspects must be taken into consideration when defining a sample frame.

(i) First, the list of the units should be comprehensive enough to guarantee that all the units of the population are included;
(ii) Secondly, the sample frame must be efficient by eliminating excess units which are not relevant to the research. This enables selection procedures of the relevant units to be cost and time efficient;
(iii) Thirdly, it must be possible to calculate the probability of each unit to be chosen in the selection process.

Most commonly, a list of the units which incorporates all of these characteristics is not available. This was also the case in this research. Since the unit of analysis was the household, a list of the residential units in the city, including household addresses, would have been useful. Although there is a property tax which is collected by the Municipal Secretariat of Finance, their list does not include all of the units in the city, since in the poorer areas many houses do not formally exist. The informal City of Recife are squatted areas, illegally occupied, or are units which simply did not receive the licence to be built. Nevertheless, these units were included in the sample frame, since most of them have available MSWM. Those which did not have the available services were crucial to the assessment of the accessibility of the services. Additionally, a list of all the low income areas of the city was used, which provided an estimate of the population in each area. From this list, a quota of units in each of the randomly selected areas was determined and a set of procedures was given to the interviewers so as to ensure the randomness of the process of selection of the units to be interviewed.

The list and maps found in the city and state administration failed to include all units of the research population. Sampling was therefore conducted in many stages, based
on a combination of different maps. The procedures of the selection process are discussed in the following section.

7.4.1.2 Sample Size

The many measures that were taken throughout the investigation to minimize errors from different sources were presented in the various sections of this chapter. This section discusses the errors that are introduced by the sampling procedures. There are two major types of errors in this case: the standard error (or error margin, or sampling error), and the non-sampling error associated with the rate of non-response.

The standard error is related to the level of precision of the research estimates. It is crucial to the determination of the sample size. The second central element used to define the sample size is the confidence interval that is considered acceptable. Taking into consideration the constraints of material and human resources usually encountered during research field works, the acceptable standard error was defined as 5.0 percent, with an interval of confidence of 95.0 percent. A variance of 25.0 percent was found adequate since it has been used in various similar research conducted in the city, including a survey on MSWM carried out in the same period by the municipal administration. As a result, the total number of households to be surveyed, or the sample size, was approximately 385. In fact, a total of 450 households were selected to be interviewed in the field work, which has been considered adequate.

The non-sampling error which is most pervasive is the non-response error. The lower the response rate, i.e. the greater the proportion of units of the sample that do not answer the questionnaire, the greater the negative effects on the sample results. There are different types of non-response, having different effects on the sample results. The usual cases of non-response in this research were related to people who were ill, not at home or refused to answer. The procedures to overcome these difficulties are discussed in the next section. It is important to note at this stage that the non-response
rate, which is crucial to defining the biasing effects, was very low: 5.3 percent. Thus, 24 selected households refused to answer the questionnaire.

7.4.1.3 The Sampling Design

In the sampling process, alongside the definition of the size of the sample there is the important question related to the way in which the units of the sample are selected. This is usually called the sampling design. There are several strategies and techniques which may be combined into the sampling design, according to the specifics of each research.

In this research a multi-stage sampling design has been used. This sampling process is a very useful approach when no adequate list of the units of the population is available. Multi-stage sampling is based on the assumption that a population can generally be regarded as comprised of a hierarchy of sampling units of different sizes and types (Moser and Kalton 1971). It consists of linking the units in some kind of grouping that can be sampled in the first stage of the process (Fowler, Jr. 1993). A list of the units of each selected group is then made and a further sample is selected at the second stage of sampling. This process may include many stages depending on the different situations.

There are several strategies employed for multi-stage sampling. In this study, a cluster sample was used. This is also called area probability sample or simply area sample. It is a particular type of multi-stage sampling which groups the units of the population at various stages of the process, according to geographically defined areas. It is a widely used sampling design because it may be employed for any population that can be defined geographically, regardless of its size. Costs of the data collection process are simplified and minimized.

In accordance with the cluster sampling strategy, the entire geographic area of Recife
was divided into a number of smaller areas. The same divisions as those introduced by the city administration were used as it presented advantages in terms of the cartographic material available. As emphasised in section 5.4.2, the city is divided into six Political and Administrative Regions (PAR), where each one is divided into a number of districts.

As already highlighted, a list of addresses of the households in each PAR or in each district of the city was not available; therefore, the selection of the households to be interviewed was not straightforward. In fact it has been done in three stages, which are discussed below.

(i) The first stage of the sampling process consisted of drawing a random sample of districts from each PAR;
(ii) In the second stage, a sample of streets was randomly selected within each district;
(iii) In the third and final stage, a random sample of households was drawn in each street.

To define the number of units to be selected in each stage discussed above some decisions have been made:

- First, a quota of households to be interviewed in each PAR was defined, proportionate to the contribution of the PAR population to the total population in the city. Therefore, in the first stage of the sampling process (the selection of a random sample of districts in each PAR), 20 percent of districts in each PAR were selected. The quota of households to be selected in the PAR was then distributed among the selected districts, proportionate to the district population;

- Secondly, since MSWM services are delivered through routes, or sets of streets, it was decided that two households in each street should be interviewed, to ensure greater reliability of the data.
The decision to use all PAR, instead of a sample of them, was based on the fact that PAR are too big and present a positive intra-class correlation; households in a particular PAR tend to be more like each other than like households of other parts of the city. Indeed, one of the criteria of this administrative division was the degree of homogeneity within the PAR. Therefore, if a sample of PAR had been selected, whole classes of units would have been excluded from the survey, jeopardizing the representativeness of the sample. As Moser and Kalton (1971) argue, the more heterogeneous the clusters are within themselves, the less precision will be lost by clustering. By using a sample of districts drawn from all the PAR, all the strata were represented in the sample, whereas only a sample of clusters was included. Still in relation to the size of the PAR, it is argued that large clusters increase the sampling error (Ibid). Therefore in this research a decision was made to have a large number of small clusters, rather than a small number of large clusters.

A major part of the difficulties experienced in the sampling process was in drawing the sample of streets in some of the poorer areas, since they were not well represented in the official maps. This difficulty was overcome by fixing the number of households to be interviewed in each of these areas, based on the size of their population in relation to the size of the district population. Maintaining the decision to interview two households in each street or alley, the selection of which streets to choose was left to the discretion of the interviewer in that area. After selecting the streets, all households were numbered and two were randomly selected. Detailed instructions on how to ensure the representativeness of the sample during street and household selection were given and, to ensure the randomness of the process, the researcher was directly involved.

In general, some rules applied:

- Those households in which members asked to be interviewed were ruled out;
- If the selected unit was empty or the family refused to be interviewed, the next unit
to its left was interviewed. This process was repeated until the questionnaire was completed;
- In multi-familiar units, only one household was to be interviewed.

7.4.2 Questionnaire Design

Reliability and validity are important issues in research design and as such they have been discussed in section 7.2.2 and 7.2.3. However, these characteristics are also of crucial importance in many other stages throughout the investigation process. In this section they are discussed with regard to one of the measuring instruments: the questionnaire.

The function of the questionnaire is to measure; the question design is mainly determined by the variables that are to be measured. The questionnaire must translate the objectives of the investigation into questions. To a great extent the level of success of the questionnaire design in this task will determine the reliability and validity of the research findings. All aspects of the questionnaire design, such as question format, sequence and wording, respondent approach, questionnaire length and appearance and coding, must be taken into consideration with regard to reliability and validity of the information that will form the basis of the research findings and conclusions. These issues are now discussed, along with the description of the design process before and during the field work.

In designing the questionnaire the researcher must bear in mind two questions so as to avoid measurement errors:
(i) Is this measuring instrument measuring what it is supposed to? This question relates to the external validity of the data collected;
(ii) Is the design stable and consistent? This question relates to the reliability or internal validity of the research findings (Berger and Patchner 1988).
Focusing on reliability, a series of measures were taken in the questionnaire design so as to increase the consistency and stability of the instrument. In order to avoid inconsistencies across the answers it is important to ensure that the respondents understand the questions in the same way. As Fowler, Jr (1993) points out, two respondents in the same situation should answer a question in the same way. They should also have the perception of what constitutes an adequate answer for the question. Some steps were taken to accomplish this:

- To ensure that the question content was clear and identical for all respondents, questions were fully written and the interviewers were instructed to ask them exactly as they were in the questionnaire. This served as a means of minimizing random errors produced by the interviewers.

- The sequence of questions was fixed. In this way, any variation in respondents' answers may be considered a consequence of differences between respondents and not of variations in the interviewing process. This step was taken in order to avoid random error.

- The words were carefully selected to be comprehensible by all groups surveyed and those terms which were open to other interpretations were avoided. The vocabulary was thoroughly tested so as to ensure understanding by all the respondents, again avoiding systematic error.

- All the questions in the schedule were close ended, i.e., a set of acceptable answers was provided. Indeed, the type of questions used also affects the reliability of the answers. The use of a closed approach was intended to ensure that all respondents had considered the same universe of content before giving their answers (Oppenheim 1992). This improved the consistency of the answers, improving their reliability and allowing the comparison of the results of several groups. A list of answers to each question was therefore written on separate cards and read aloud to the respondents,
who were asked to choose the one that most closely represented their views.

Further advantages of using closed questions not directly related to reliability were also considered, such as: closed questions are easier to ask and to answer; they can be attitudinal as well as factual (Oppenheim 1992); they require no writing and therefore answering the questionnaire is much quicker; and their quantification and analysis is straightforward.

The disadvantages of close ended questions are related to the loss of spontaneity and expressiveness, and to the bias introduced by forcing respondents to choose from one of several alternatives. To avoid the latter, an "Other (please specify)" alternative was provided in every question. The "other" option is also useful when respondents find that the answers in the set of responses fail to express what they think. The frustration caused by this may jeopardize the rapport or even the rate of response. These factors might weaken the reliability and validity of the research findings. The "don't know" option was also provided since, although the topic is a familiar one, in some cases respondents genuinely did not know the answer.

- Some filter and contingency questions were used to elicit information relevant to the hypothesis testing, but that did not apply to all respondents. Apart from instructing the interviewers during the training process, written directions were provided next to the filter question as reminders to the interviewers in these cases. This was employed so as to reduce random error introduced by different procedures by different interviewers.

- Leading questions were avoided. "A leading question is one in which the answer is implied in the question. These questions lead the respondent on" (Berger and Patchner 1988:28). Respondents may be biased in favour of answers they believe will please the interviewer, thus introducing systematic errors.
7.4.3 Questionnaire Format

The questionnaire was comprised of twenty eight questions (see Appendix 2), divided into three sections:

Section A, with eight factual questions (1 to 8), to elicit objective information from the respondents regarding different aspects of the MSWM services they had available in their area, such as type of MSWM which was available to them, the frequency of service, the pickup point, the amount of solid waste they produced, the alternative ways of dealing with solid waste, etc. This section provided important pieces of information for the analysis of the level of accessibility and quality of MSWM provision in the area. The same information was collected by other methods and from other sources in the same research using triangulation, once more, as a means of increasing reliability of the evidence.

The design of the set of alternatives provided in each question was based on field work and on the information from other surveys on MSWM carried out in different places. A first version of the questionnaire was used in a pre-test implemented with a small group of Recife residents at the beginning of the field work. In this version most questions were open ended, unless alternative question types were the only ones possible. The process of testing these questions gradually led to a close ended format. A second version of the questionnaire was used in a second pre-test where most of the questions were close ended. This time the survey sample units were used as part of the training of interviewers. The sets of possible answers were then improved and discussed with the interviewers. A total of five versions of the questionnaire were discussed during the process of questionnaire design, the fifth being considered adequate. However, in all the cases where the "other" alternative was used the respondent was asked to specify the answer, which was fully written by the interviewer.
Section B contains fifteen questions, most of them attitudinal in nature. The content of the questions relates to the opinion of the respondents on the quality of MSWM (Questions 9 to 15), their knowledge and opinion about SW final disposal in Recife (Questions 16 to 18), the responsiveness of the delivering companies (Questions 19 to 21) and costs of the services to the users (Questions 22 and 23). To measure the opinion of the users on the quality of MSWM, the rating scale format was used. A list of common problems in MSWM was presented and the respondents were asked to point out the frequency or intensity with which these problems affected the service in their street (Questions 12 to 15). Questions 10 and 11 asked the respondents to point out which were the weakest aspects of service in their street. Questions 16 to 23 were simple close ended questions where the respondent was required to select the appropriate answer concerning their knowledge on the subject.

Section C contains six questions. They are factual questions regarding the background of the respondents. They were asked mainly to provide information through which the respondents could be classified, according to: gender, age, occupation, income and size of the household (Questions 24 to 28).

The questions were grouped in sections according to their nature. This enabled the questionnaire to be standardised more easily. More importantly, the sections facilitated interviewer training in introducing the questions. However, this grouping might introduce a type of bias known as "response set". It refers, accordingly to Bailey (1987), to the tendency to respond to all questions in a specific way regardless of their content. To avoid this error, the sets of answers were presented in different ways, varying their categories, each time sets of questions regarding the same issues were grouped together.

The order in which the sections were arranged in the questionnaire was based on the following assumptions:
The first section should be factual questions on the services available in the respondent's street, so as to avoid questions related to personal or sensitive areas during the initial part of the interview. These questions did not pose difficulties to the respondent, since they were close ended and related to straightforward issues. The interviewer had information from other sources about the same subject and was therefore sensitive to any difference from the existing pattern of the area quite rapidly and able to concentrate on establishing a rapport. Having had the first section run quickly and smoothly, the second section was introduced in an easy atmosphere.

The second section consisted of the attitudinal questions, regarding respondents' opinions and level of knowledge on issues related to the MSWM services available to them in the area. These types of questions may be considered somewhat threatening, since people may not like to admit they don't know something or that they have never thought about it. Therefore, these questions were placed after the factual ones so as to provide the respondents with some time to reflect on the MSWM service and enable them to express their feelings and opinions about the services. Respondents were also able to make a comparison among the many aspects of the service and to point out the weaknesses and strengths. On the one hand, at this stage of the interview the interviewers had the chance to establish some rapport to make the task easier for respondents. On the other hand, since these are the most crucial questions in the questionnaire, they should not be presented at the end of the instrument, where, according to Berger and Patchner (1988), sloppy or incomplete responding is most likely to happen.

The third section consisted of personal questions. Issues such as income, age and level of education were addressed. Since these questions are considered embarrassing or threatening to the respondents, they were placed at the very end of the interview. All aspects such the length of the questionnaire, the questionnaire type, the content and the sequence of questions, as well as the training of the interviewers, affect the time used to complete a questionnaire. This is important in the estimation of time and
resources to be used, as well as in the estimation of the response rate. The piloting work was also important in this aspect, since the time of completion of the questionnaires was tried out in relation to the rate of response. This information was the basis of the decision to keep a total of twenty eight questions, which involved an average completion time of 12 minutes.

Each interviewer was provided with an interview information sheet and an introductory letter, attached (see Appendix 2) to each questionnaire. The letter explained the purpose of the research and the importance of having the respondents' participation. In addition, the general nature of the questions and the required time for completion of the questionnaire was explained in the letter. It also provided the names of the interviewer, the researcher and the sponsoring institutions, as well as the means of making any complaint or further comments about the research. The interviewers were instructed to read the statement to the potential respondent or to allow them to read it and ask questions.

The importance of the introductory letter relates to the reliability and validity of the research findings. A greater reliability of the answers is achieved because the letter ensures that all the respondents are introduced to the research in the same way. The researcher can then be assured that differences in the responses are real, and not caused by inconsistencies related to the interviewer's introduction. The validity of the research findings is strengthened by using the introductory letter as it increases the potential respondent's willingness to participate and thus increases the response rate.

**7.4.4 Training and Piloting**

A total of twelve interviewers worked on the survey research. They were selected from a larger number of professionals that work in the Social Policies Secretariat and in the Department of Environmental Planning of the Secretariat of Urban and Environmental Planning in Recife. There were six male and six female interviewers aged from 20 to
45 years old. They were sociologists, biologists, public relations officers and students of Sociology and Biology.

The selection process took place during the first two days of the three day training period. On the first day a version of the questionnaire was introduced to interviewers and discussed in detail. Their opinions and suggestions were asked as a means of stimulating and involving them in the research process. The involvement of interviewers was a major objective of the training process and viewed as equally important as the instructions which were given. According to the previous experience of the researcher, poorly motivated interviewers are likely to introduce bias in the survey to the same extent as poorly instructed interviewers. By the end of the second day, the interviewers were selected on the basis of their motivation, understanding of the research objectives and willingness to follow instructions. As a result of their participation, changes in the questionnaire were made and clearer instructions were introduced.

On the third day, interviewers were taken to two of the districts in which the survey was to take place, and each one filled in five questionnaires. These 60 questionnaires were analyzed, their errors were discussed, the questions were improved and new instructions were given. The training process therefore was part of the design process of the questionnaire and the final definition of the field work procedures.

The piloting of the field work, therefore, had many objectives in relation to the three issues discussed above:

- to increase the motivation and the involvement of the interviewers;
- to test the results of the theoretical part of the training process;
- to improve the questionnaire design by testing it in the settings where it was going to be used, and by discussing the instrument with the interviewers;
- to estimate the level of non-response;
to estimate the completion time of the questionnaires;
■ to estimate the overall duration of the field work.
■ to define field procedures in relation to the part of the sampling process that was
to take place in the field work;
■ to define field work organisation and procedures.

In this pre-test, the level of non-response was slightly higher than in the research
proper, perhaps due to the fact that the interviewers' ability to encourage people to
answer the questionnaire improved during the field work. Another possible reason is
the fact that only one district was considered in the pre-test.

7.4.5 Field Work Procedures

The survey was carried out from 9 to 12 of March 1994. Each interviewer received
a map of the area, a set of questionnaires, introductory letters and cards. The average
time to fill out the questionnaires took 12 minutes. The average number of
questionnaires completed per day was 11.

Field work procedures formed an important part of the training process in this
research, as discussed in the previous section, due to the approach of training the
interviewers in the field. Moreover, since in some areas the previous selection of units
to be interviewed was not possible, interviewers had the responsibility of selecting
the two households in each street which were to be interviewed. This demanded three
important elements:

(i) An adequate knowledge on the part of the interviewers of the crucial role played
by the randomness of samples in the reliability of the data;
(ii) Very clear and well discussed field work procedures to avoid biased being
introduced in the sampling and interviewing processes;
(iii) Very close supervision by the researcher of every step taken by the interviewer
The field work procedures in relation to the sampling process have already been discussed in section 7.4.1. The definition and discussion of the overall procedures have been discussed in the previous section. As for the supervision of the fieldwork, to ensure a low level of questionnaire replacement a sample of 10 percent of the completed questionnaires was checked by the researcher on the day following completion. Although several errors in addresses were found, no interviewer needed to be replaced and only twelve questionnaires needed replacement due to errors in completion.

7.5 The Non-Scheduled Interviews

As previously pointed out in section 7.3.1, the data collection process in this research employed the triangulation approach. As a result, different sources and different methods of data collection have been used to gather information on the accessibility, quality, productivity and costs of MSWM services to the municipal government. The previous section discussed the household survey, which collected data from the users and non-users of the services, using a questionnaire as the measuring instrument. This section examines the second survey conducted in this research: the non-scheduled interviews.

In this survey data was collected from:

- The operators of the services, in both the private and public sectors. Different levels of management have been targeted, from the highest posts in both companies to truck drivers and crews in the streets;
- Decision makers within the public sector, such as urban managers and planners on various bodies in the municipal administration, including the Secretary of Finance, the Secretary of Urban and Environmental Planning and the president of EMLURB;
The Privatisation of Municipal Solid Waste Management in Recife, Brazil

- Politicians. A member of the Municipal Council and a member of the State of Pernambuco Parliament who are particularly involved with urban infrastructure;
- Experts involved with MSWM in the city.

To collect data from the above sources, non-scheduled interviews were used, since these allow a greater freedom of expression and the gathering of details which are relevant to accomplishing a rounded picture of their views in relation to MSWM service provision in the city. All the interviews were carried out by the researcher from April to May 1994. A list of issues and relevant questions to be raised during the interview was used to ensure the objectivity of the interview, while allowing a relaxed atmosphere.

A total of 46 non-scheduled interviews have been conducted. The information gathered in this survey was used to cross check the data from the household survey and the archival records survey, which is discussed in the next section. A list of the roles and functions of the interviewees is provided in Appendix 3.

7.6 Archival Records Survey

Secondary data provided the basis for the analyses of productivity of MSWM provision in the two areas of study, and costs of services to the public sector. As with interviewing, there are several methods of secondary data analysis. In this research the method of secondary data analysis employed was archival records survey.

The archival records survey was conducted in both the private and public sectors. Two main sources of evidence were employed in this survey: governmental records and quasi-governmental records.

Governmental documentation took many forms:
The Privatisation of Municipal Solid Waste Management in Recife, Brazil

- administrative papers, such as: proposals and progress reports, financial reports, annual performance reports, etc;
- legal documentation: contracts, regulations, legislation, specifications, balances, budgets, etc;
- formal studies and evaluations;
- other internal documents: plans, memos, agreements, etc.

Quasi-governmental documents were:

- personnel reports, performance reports and financial records, contracts and agreements, internal regulations, etc, from ENTERPA;
- articles, studies and evaluation reports from NGO related to sanitary/environmental issues and/or community development issues.

Data was collected from three governmental levels: state, metropolitan and municipal. Investigating at the different levels allows a more comprehensive and balanced picture of the study subject in research that deals with the results of policies implementation, as previously highlighted. A list of the bodies from which information was collected is provided in Appendix 4.

The access to the archives of the private and public operators was crucial to the evaluation of the amount of inputs used in the process of service provision in the two areas of study. Although the level of concern with the subject differs considerably between the public and private sectors, sufficient information has been gathered to allow the description of the current practice of MSWM provision in Recife in Chapter Eight and the comparison of the level of productivity between the two sectors which is carried out in Chapter Nine.

The costs of the services to the public sector have also been analyzed based on data collected through the archival records survey. In this case the archives of DLU,
EMLURB and the Secretariat of Finance were surveyed. The data collected was the basis of the analysis of the costs of services provided by both ENTERPA and DLU, allowing the comparison carried out in Chapter Nine.

As with non-scheduled interviews, secondary data analysis was used in this research also for triangulation purposes. There are many advantages of adding production of primary data to the analysis of existing information. In this particular case, the method was used in the analysis of accessibility and quality of MSWM services with the following objectives:

- to strengthen the reliability of data collected from the users by the household survey;
- to improve the reliability of the information collected through the non-scheduled interviews;
- to collect auxiliary information so as to control against rival explanations for the possible correlation between privatisation and efficiency changes in MSWM, strengthening the validity of the research findings;
- to put into context the primary data produced.

7.7 Data Analysis

This research has employed distinct methods in the analysis of the data regarding accessibility, quality, productivity and costs of MSWM provision to the public sector in Recife.

In the analysis of the accessibility of services, data was collected through the household survey, archival records survey and non-scheduled interviews. The analysis of the level of access to MSWM services was based on the coverage, the frequency and the points of pickup of the service available in each area of study, as previously discussed in 6.8.2. The data from the household survey was analyzed through SPSS - Statistical Package for Social Sciences. Statistical analysis consisted of frequencies
and cross tabulations. The resulting information was compared and consolidated with the information from the archival records survey and non-scheduled interviews.

The analysis of quality was based principally on the data collected through the household survey, since the point of view of the user was the most relevant. Additionally, the resulting information was compared with the information from the non-scheduled interviews and archival records survey, particularly data from the operators of the services and the decision-makers in the public sector. Statistical analysis consisted of frequencies and cross tabulations which provided the findings reported in Chapter Eight and Nine. Multi-variate analysis, particularly logistic regression analysis, has been used to assess the aspects of MSWM provision most relevant to the level of quality of the service from the point of view of the users. A logit model has also been used to define the differences between the performance of the private and public sectors in relation to quality of service provision. Further details of these statistical analysis are in section 9.4 of the next chapter and in Appendix 1.

The productivity analysis was based on the archival records survey and non-scheduled interviews. Approximately nine different measurements have been employed in the analysis of labour productivity, while three were used in the vehicle productivity analysis, as discussed in section 6.8.1. These measurement are based on the suggestion of various commentators in the literature and adapted to the Brazilian context by the researcher.

The data on costs of services was gathered mostly from archival records survey. Data from the private and public sectors were constantly compared and discussed with the managers in both delivering companies and with the Secretariat of Finance. Among the four dependent variable analysis, the data on costs of services was the most difficult to analyze. Difficulties were due to the lack of data and to the poor quality of the existing information. Moreover, the measures to curb inflation and stabilise the economy of the country caused many currencies to be used during the period covered.
in the analysis, 1990 to 1994. As a result, all the values were converted into US dollars to allow inferences to be made. In this process a decision was made to ignore the inflation of the American currency, due to the small impact this factor would have on the final figures. Section 9.6.1 further discusses the analysis of costs of MSWM provision to the public sector in Recife.

7.8 Summary

This chapter discusses the methodology used in the collection and analysis of data in this research. It begins by highlighting the role of theoretical conditions such as the central problem, the general and the specific purposes of this research in the definition of its design. It also discusses the ways in which the issues of internal and external validity were taken into consideration in the many methodological decisions that have been made throughout the work.

The chapter examines the data collection process. It points out the triangulation approach that has been used as the main characteristic of this process. This approach means that different sources of data and different methods of collection have been used in this research with the purpose of strengthening the validity and reliability of the study findings and conclusion. A detailed description and discussion of these sources and methods is then carried out regarding the three surveys conducted in this research: the household survey, the archival records survey and the non-scheduled interviews.

The data analysis process is also examined in this chapter. The way in which the data has been processed and interpreted with regard to each dependent variable is discussed. The chapter examines the distinct statistical techniques that were used in the process of analysis of the variables, clarifying the interrelation between the different surveys conducted in this research.
CHAPTER EIGHT - THE CURRENT PRACTICE OF MSWM IN RECIFE

8.1 Introduction

This is the first chapter of part III of this thesis, which presents the findings and conclusions of the study. This chapter presents the current practice of municipal solid waste management in Recife, covering both the private and the public provision of service. Chapter Nine presents the findings in relation to each one of the four independent variables, productivity, accessibility, quality and costs of services to the public sector in MSWM. Chapter Ten presents the conclusions and the general comments on this research, bringing the thesis to a close.

This chapter examines the institutional, financial and operational aspects of the current practice of MSWM in Recife. It provides an extensive analysis of service delivery, covering all the operations performed by both providers, ENTERPA and DLU. Its main objective, however, is to highlight the main differences and similarities in service provision, which are relevant to the comparison (carried out in Chapter Nine) between specific aspects in the performance of the private and public sectors.

The information reported in this chapter is based on data collected from the archival records and from the interviews with managers and other decision-makers in both delivering companies. The archival records analyzed in the municipal administration were mainly from the Secretariat of Finance, from EMLURB, the Public Cleansing Maintenance undertaking, and particularly from DLU, the Directorate of Urban Cleansing. In the private sector, the archival records were from the private company ENTERPA.

This chapter has five sections, including this Introduction. Section 8.2 examines the institutional organisation of the services in the context of the municipal administration. Section 8.3 discusses the financial aspects of MSWM in Recife and section 8.4 analyzes the operational procedures of the two companies. This task is carried out for each service and for each operation in the two forms of service provision. The chapter
The Privatisation of Municipal Solid Waste Management In Recife, Brazil

8.2 Institutional Organisation

As highlighted in section 5.5.2, since 1993 the municipal body responsible for MSWM in Recife is the Directorate of Urban Cleansing - DLU, which is part of the Urban Cleansing and Maintenance undertaking - EMLURB. This undertaking is attached to the Secretariat of Public Works and Infrastructure of the municipal administration.

The Urban Cleansing and Maintenance undertaking is responsible for the maintenance of roads, drainage system, including canals, parks and municipal buildings, the operation of street lighting and all the operations related to urban cleansing. As presented in Figure 8.1, it has three directorates, the largest one of these being the Directorate of Urban Cleansing - DLU.

Figure 8.1 - EMLURB Administrative Organisation - 1993

Source: Based on information from PCR (1993)

The Directorate of Urban Cleansing (DLU) is responsible for the activities of street
sweeping and weeding, cleaning public markets and other public areas, and collecting solid wastes from households and establishments in approximately 60 percent of the city area. Moreover, the directorate is also responsible for the supervision of the private organisation ENTERPA Engenharia Ltda, contracted to carry out solid wastes services in the remaining 40 percent of the city. Additionally, DLU is responsible for the weighing and disposing of the solid waste collected in all areas of the city and for the collection of solid wastes from hospitals and clinics.

Figure 8.2 - DLU Administrative Organisation - 1993

![Diagram showing DLU's administrative organisation]

DLU has 1665 employees, distributed in four departments, as shown in Figure 8.2. The Department of Planning and Operational Support is responsible for the planning, controlling and monitoring of all activities. The Department of Administrative Support constitutes the channel between the EMLURB and the DLU administration of staff and equipment. The Department of Equipment Maintenance is responsible for the maintenance of vehicles and other equipment and for the management of transport activities in general. Finally, the Department of Solid Waste Collection and Urban Cleansing is in charge of all the operations related to these issues, supported by the other departments.
ENTERPA is a private firm originally from Sao Paulo. It has worked in the field of solid wastes services in several large cities in Brazil and outside the country. The area of Recife which is served by ENTERPA has varied since 1984, when the organisation was first contracted. Initially, the firm was responsible for those areas which presented flat, wider, paved roads, in high income neighbourhoods, which roughly correspond to the central and southern areas of the city. Eventually more areas were added to those, which have a greater proportion of poor population. Figure 8.3 presents the administrative organisation of ENTERPA.

**Figure 8.3 - ENTERPA Administrative Organisation - 1993**

![Coordination General](#)
- Division of Administration
- Division of Equipment Maintenance
- Division of Solid Waste Collection
- Division of Urban Cleansing

Source: Based on information from PCR (1993)

With 1628 employees, ENTERPA is responsible for sweeping the streets, collecting solid waste from households and businesses, cleaning public markets and other public spaces, cleaning the beaches, and occasionally pruning the trees in approximately 40 percent of the municipal territory. All these operations are further discussed in section 8.4. The headquarters of the organisation are located in Sao Paulo, but a new local head office has been built in Recife.
Regarding administrative aspects, it can be said that there is an important similarity between the two providers of MSW services in Recife. Both have very centralized administrative and finance structures. ENTERPA, for instance, has the operation of services in the city regarded by its administration as a branch activity. As a result, its investment programme, expenditure and salary payments are decided and distributed by headquarters (Batley 1992a). Even more time consuming activities of maintenance and repair of equipment are carried out in Sao Paulo.

There is also a high level of administrative centralisation within the local head office of the private firm in Recife. This aspect is illustrated by the fact that all the administrative and maintenance activities in the city are performed in the head office, which covers the whole city. Although the operation of services is based on a division of the city in several areas, there are no offices with localized functions. Only in the activity of street sweeping does a small degree of decentralization occur, since the storage of equipment is made in several buildings throughout the city, where a few operational decisions take place (PCR 1993; Batley 1992a).

Despite being public, DLU presents very similar administrative and financial characteristics to those of its private counterpart, ENTERPA. DLU also presents a high degree of centralisation of its operations, with all the administrative and maintenance activities being carried out in its head office. Again, only street cleaning activities show a degree of decentralisation. However, there seems to exist a greater operational autonomy, at management level, in the relationship between DLU and EMLURB, as compared to the local office and the headquarters of ENTERPA.

This higher degree of administrative autonomy in DLU is limited by the high level of financial dependence of the Directorate on EMLURB and the central bodies of municipal administration. The degree of administrative and financial autonomy of DLU has been the subject of discussion for many years, within and outside the directorate. In 1990, aiming at providing more financial and administrative freedom,
the directorate, then a superintendency, gained its own budget and supply department, separate from EMLURB (PCR 1990). However such initiatives did not have continuity, and further changes in that direction have not occurred since then. This issue is further discussed in the next section.

8.3 Financial Aspects

In financial respects, DLU is highly dependent on decisions from the municipal government. This is apparently due to two main factors. The first is of an administrative nature and relates to the fact that, due to the uncertain financial climate in Brazil previous to the establishment of the stabilization programme and the new currency, the Real, many cities in the country, including Recife, introduced a system of a single municipal account (Conta Unica), aiming at controlling expenditures. Within this system there may be some freedom at the operational level of management, however, in financial terms, decisions are rigorously controlled throughout the municipal administration. As a result of this policy, the budget of DLU is determined by the municipality and any major expenditure has to be approved by higher levels of financial decision within the administration.

The second reason for the financial dependence of DLU on the city government is the fact that virtually all its income comes from municipal allocations. There is a charge for public cleansing and refuse collection, Taxa de Limpeza Publica (TLP). However, it is not directly paid to EMLURB, but it is billed and collected by the Property Tax department of the Secretariat of Finance, together with the property tax (IPTU) and the street lighting charge (TIP), and enters into the system of Conta Unica. Other revenues of DLU are related to fees charged to the general public for special contracts of collection, incineration, and disposal at the Muribeca Site. Another source of revenue are agreements signed with governmental institutions at other levels, for the collection of solid wastes. However, together, all these sources account for only approximately 7.4 percent of the directorate revenues, while TLP accounts for 92.6
percent of DLU revenues, according to Figure 8.4.

**Figure 8.4 - DLU Revenues - 1994**

<table>
<thead>
<tr>
<th>Source</th>
<th>$R</th>
<th>US$</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLP</td>
<td>5967072</td>
<td>6890383</td>
<td>92.6</td>
</tr>
<tr>
<td>Special Contracts</td>
<td>341482</td>
<td>394321</td>
<td>5.3</td>
</tr>
<tr>
<td>Private Disposals</td>
<td>12689</td>
<td>14653</td>
<td>0.2</td>
</tr>
<tr>
<td>Agreements</td>
<td>103780</td>
<td>119839</td>
<td>1.6</td>
</tr>
<tr>
<td>Incineration</td>
<td>15309</td>
<td>17678</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6440332</strong></td>
<td><strong>7436874</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Source: Based on information from the Secretariat of Finance - PCR 1994

As for the precise impact of DLU revenue on the general revenue of the municipality, it is estimated by the Secretariat of Finance that TLP in 1994 accounted for approximately 2.0 percent of the municipal revenue.

The dependence of DLU on municipal allocations is well illustrated by the fact that all its revenues cover on average around 13.0 percent of its expenditure. This is certainly due to the low prices charged for the services in the city, in relation to its costs. The TLP is, theoretically, calculated on the basis of the costs of the service provided by the DLU. In practice, however, there are many impediments to calculating its value on a full cost-recovery basis, amongst which two must be highlighted:

(i) First, there is the simple fact that the costs of the services in the city are only roughly estimated, since a more accurate assessment demands a set of information which is not available in DLU and EMLURB at present. This important issue of lack of costs accountability is further discussed in the next chapters;

(ii) Second, although costs are based on estimates, it has become quite clear that the value of TLP cannot be calculated on a full cost recovery basis because it would be too costly for the average household to pay at present, let alone the poorer ones. This
is due to the high operational costs of both ENTERPA and DLU. The issue of cost of services is further discussed in Chapters Nine and Ten.

Besides the above mentioned problems, further difficulties in implementing a full cost-recovery approach to MSWM exist. Some of those problems are related to the TLP billing and collecting processes. Because those activities are performed by the Property Tax department, TLP is exposed to as many exemptions as the property tax. That is to say that on average only approximately 50 percent of the households are billed every year.

Other problems relate to cultural aspects in the perception of what is fair for a public enterprise to charge for. As a result of this perception, many services are performed free by the DLU or are heavily subsidised. For instance, public hospitals in Recife, around forty in number, are not charged for the collection of their solid waste. Many activities of sweeping and weeding are also carried out in schools, creches and hospitals of the municipality without any payment whatsoever. Finally, in poorer areas, fines are not imposed, and special services are charged about one fifth of the normal price.

The price which is charged to each household for MSWM in Recife is the same in the areas served by the private and public sectors. As previously stressed, approximately 50 percent of the households in the city are billed for MSWM. Considering that, in 1994, TLP revenues were US$ 6,890,383 in the city, and that around 150,000 households were billed, the annual cost per household for MSWM in that year can be estimated as US$ 45. However, this is a rough estimate, since the exact number of billed households which have effectively paid the TLP in each year is not known by the municipality.
8.4 Operational Aspects

8.4.1 Solid Waste Collection

DLU estimates that the per capita production of solid waste in Recife is circa 1.35 kg per day. This estimate is based on research carried out by the former DLU in 1983. Although the daily per capita production of solid waste is very sensitive and changes with time and in different socio-economic contexts, more recent studies and estimates do not exist, therefore this figure is the basis of planning and decision making in MSWM in Recife, to date. Based on this information, the daily generation of solid wastes in the city, in 1993, has been estimated around 1,753 tons. Of this total, 1688 tons (96.3 percent) were collected by the municipal administration, 51.7 percent by ENTERPA and 48.3 percent by DLU (PCR 1993a). Figure 8.5 shows the total amount of waste generated in the city in 1993, presented by quarters and the monthly average for the private and public sectors.

### Figure 8.5 - Solid Waste Collected in Recife by Operator - 1993

<table>
<thead>
<tr>
<th>Quarter</th>
<th>DLU</th>
<th>ENTERPA</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>tons</td>
<td>%</td>
<td>tons</td>
</tr>
<tr>
<td>1</td>
<td>84356</td>
<td>54.2</td>
<td>71399</td>
</tr>
<tr>
<td>2</td>
<td>79827</td>
<td>51.5</td>
<td>75028</td>
</tr>
<tr>
<td>3</td>
<td>71240</td>
<td>48.6</td>
<td>78352</td>
</tr>
<tr>
<td>4</td>
<td>58168</td>
<td>38.4</td>
<td>89404</td>
</tr>
<tr>
<td>Total</td>
<td>293591</td>
<td>48.3</td>
<td>314183</td>
</tr>
<tr>
<td>Monthly Average</td>
<td>24466</td>
<td>48.3</td>
<td>26182</td>
</tr>
</tbody>
</table>

Source: Based on information from PCR (1993a)

The figures show that, although covering around 40 percent of the geographic area of the city, ENTERPA is responsible for a much higher percentage (51.7 percent) of the collected waste. These numbers are explained by the fact that the areas covered by the
private firm are either more densely occupied, such as the business centre, for instance, or have higher income. In other words, areas with more solid waste per pickup point. It must be stressed, however, that, due to the specific conditions of the urbanisation in Recife, small areas of very low income are encrusted in many high income neighbourhoods. This means that ENTERPA does serve poor areas, although in a smaller proportion as compared to the DLU. A significant difference between the two areas relates to topographic characteristics. DLU serves more hilly areas than ENTERPA, and this fact influences the type of equipment each deliverer has to use.

There are many different classifications for the types of solid waste in the literature. In Recife, four main sources are considered as far as operational procedures are concerned. According to the source of production, wastes are divided into domestic, commercial, industrial and medical. Solid wastes from households, or domestic wastes, commercial and industrial establishments with a daily production of less than 100 litres are collected together, in regular collection operations. Wastes from large generators, are collected under special contracts or directly disposed of by the generators in Muribeca Site (PCR 1993a).

Solid waste from hospitals is regarded by the municipality as an important problem. There is a free service to public hospitals, and special arrangements for some larger private hospitals; however, this corresponds to approximately 80 health service establishments, among a total of more than 400 in the city. That is to say that medical wastes from small clinics, dentists, laboratories, surgeries etc., are collected together with domestic waste. Moreover, even in those cases where the medical waste is separately collected, to date, DLU uses the same operational procedures as used for domestic wastes: the same vehicles, the safe personal safety equipment, the same storage and transfer methods. This is totally inadequate, since medical wastes require a special set of procedures in handling and disposal. Failing to apply established safety measures may lead to the exposure of workers and the general public to pathological and infectious wastes.
8.4.1.1 DLU Operational Procedures

In 1993, DLU performed five types of collection services in the city (PCR 1993a):

(i) Household Collection;
(ii) Special Contract Collection;
(iii) Special Collection;
(iv) Selective Collection;
(v) Sections Collection.

The amount of SW collected in each operation is presented in Figure 8.6.

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Household</th>
<th>Sections</th>
<th>Special Contracts</th>
<th>Selective</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12047</td>
<td>30711</td>
<td>4838</td>
<td>29</td>
<td>36731</td>
</tr>
<tr>
<td>2</td>
<td>12408</td>
<td>39769</td>
<td>4663</td>
<td>37</td>
<td>22950</td>
</tr>
<tr>
<td>3</td>
<td>12559</td>
<td>34179</td>
<td>4343</td>
<td>96</td>
<td>20063</td>
</tr>
<tr>
<td>4</td>
<td>12209</td>
<td>28517</td>
<td>4072</td>
<td>78</td>
<td>13291</td>
</tr>
<tr>
<td>Total</td>
<td>49223</td>
<td>133177</td>
<td>17916</td>
<td>240</td>
<td>93035</td>
</tr>
</tbody>
</table>

Source: Based on information from PCR (1993a)

The figures show that the Sections Collection is the operation that generates the largest amount of solid waste, approximately 133,177 tons. It is followed by the Special Collection, the Household Collection, the Special Contracts and the Selective Collection. The Sections Collection collects more than double the solid waste collected by the Household Collection. This may be due to the unsatisfactory level of coverage presented by the service, which causes a large amount of SW to be dumped on to public areas. Figure 8.7 shows the contribution of each operation to the total amount of solid waste collected in the city.
Household Collection

This refers to the collection of SW produced by the households and small businesses, which produce 100 litres or less of solid waste per day. This type of collection is also called "conventional collection", due to the type of equipment used. The use of conventional equipment, mainly compactor trucks and open top trucks, is possible because the areas served in this manner usually present paved and wide roads. Each truck has a crew of one driver and four collectors.

As for frequency, parts of the area served in this way have the solid waste collected on alternate days, and others, every day, except for Sundays. Collection occurs during the day, since DLU only operates one shift per day. Occasional night collections occur in special situations.

Although the collection of household waste on a door-to-door basis is the standard level of service to the city (PCR 1992), it is interesting to note that, in 1993, this type
of collection corresponded to only 17 percent of the total waste collected by DLU.

**Special Contract Collection**

This refers to the collection of SW produced by large generators, with a production of solid wastes over 100 litres per day. The frequency and the price of the service are specified in a special contract negotiated with DLU, but users may be served by ENTERPA, depending on their location. Approximately 300 establishments had such contracts in 1993, but this number varies greatly from year to year, and according to the MSWM approach of the administration. This type of service was responsible for 6 percent of the total solid waste collected by DLU in 1993.

**Special Collection**

This is a daily operation in which open top trucks are used. It corresponds to approximately 32 percent of SW collected by DLU in 1993. The Special Collection collects wastes from a set of special public cleansing operations such as:

- general clean-ups, events and seasonal operations such as carnival and summer clean-ups;
- cleaning and weeding of municipal buildings, such as cemeteries, schools, hospitals and creches;
- wastes illegally dumped on to public areas, particularly construction debris;
- wastes from the removal of sand and weeds from the cleaning of curbs;
- wastes from household collections which use special equipment and are stored in some predetermined places for collection from trucks.

**Selective Collection**

This refers to a recently launched project which aims at stimulating the re-use or the
The privatisation of municipal solid waste management in Recife, Brazil

recycling of materials. The project involved educational and informative visits to businesses, schools and large residential buildings aiming at sensitizing and mobilizing the users to recycle resources. It had a highly educational sense at that early stage, combined with long term commercial objectives. Some activities of actual recycling of wastes were already in practice. At the time of this research fieldwork, the project involved five types of operations:

(i) Household Selective Collection;
(ii) PEV;
(iii) Community Collection;
(iv) Governmental Institutions;
(v) Papa-vidros.

Household Selective Collection - It consisted of a pilot project with the domestic selection of solid waste. The households of a set of residential buildings in one of the densely populated areas in the high-income neighbourhood of Boa Viagem agreed to take part in the project and technical staff promoted lectures to increase the knowledge of the group on the issue of resources recovery. A number of "green bins" was distributed to the population for the selection of solid waste and a special door-to-door collection was introduced. Additionally, some collective bins were placed in strategic points of the area for the recycling of materials by the population in general. The project ended in October 1993.

PEV - Standing for Pontos de Entrega de Vidros, this operation consisted of the distribution in strategic points of the city of special containers to store paper, glass, metals and plastics for recycling purposes. This was done by a private company in partnership with the public sector and part of the revenue from the sales of the recycled materials was donated to charity.

Community Collection - This consisted of a scheme set up in a number of poor areas
of the city, in which the population could swap recyclable materials, mostly paper, plastic, metals and glass, for food. For this, the municipal governments officers took a range of basic items such as milk, rice, beans, sugar and coffee to these areas, on established days of the week, and collected the recyclable materials from the population.

**Governmental Institutions** - This operation aimed at the promotion of environmental awareness among governmental institutions personnel, focusing on the need to recycle paper. To this end, posters and special "green bins" were distributed around the buildings and lectures on the subject were promoted by technical staff from DLU, to sensitize and motivate staff.

**Papa-vidros** - This operation consisted of placing special containers at strategic points in the city for the use of the population in recycling glass. The material was then sold by the municipal government to the industries of the region and the revenue was donated to the promotion of social works in the municipality.

Around 240 tons of solid wastes were recycled in 1993, therefore its impact on the total amount of SW collected is still negligible. Figure 8.8 presents the total amount of materials recycled in Recife in 1993.

**Figure 8.8 - Types of Materials Recycled in Recife - 1993 (Kg)**

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Metals</th>
<th>Paper</th>
<th>Glass</th>
<th>Plastics</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2440</td>
<td>9235</td>
<td>13467</td>
<td>2370</td>
<td>27512</td>
</tr>
<tr>
<td>2</td>
<td>3774</td>
<td>15172</td>
<td>12936</td>
<td>4962</td>
<td>36844</td>
</tr>
<tr>
<td>3</td>
<td>16858</td>
<td>32899</td>
<td>32157</td>
<td>14098</td>
<td>96012</td>
</tr>
<tr>
<td>4</td>
<td>13060</td>
<td>19535</td>
<td>38642</td>
<td>7412</td>
<td>78649</td>
</tr>
<tr>
<td>Total</td>
<td>36132</td>
<td>76841</td>
<td>97202</td>
<td>28842</td>
<td>239017</td>
</tr>
</tbody>
</table>

Source: Based on information from PCR 1993a)
According to Figure 8.8, the main material recycled in Recife is glass, which is in demand from industries of the region. The second most recycled material is paper, followed by metals and plastics. Figure 8.9, below, shows the contribution of each of the main materials recycled in Recife to the total amount in 1993.

**8.9 - Materials Recycled in Recife - 1993 (Kg)**

<table>
<thead>
<tr>
<th>Material</th>
<th>Quantity</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>97,202</td>
<td>37.4%</td>
</tr>
<tr>
<td>Plastics</td>
<td>51,672</td>
<td>19.9%</td>
</tr>
<tr>
<td>Metals</td>
<td>36,132</td>
<td>13.9%</td>
</tr>
<tr>
<td>Paper</td>
<td>74,781</td>
<td>28.8%</td>
</tr>
</tbody>
</table>

Source: Based on information from PCR (1993a)

Among the five operations of Selective Collection the most successful in terms of quantity of materials recycled is the Community Collection, which recovered around 100,972 Kg of resources in 1993. This amount corresponds to approximately 42 percent of the total. The second and third are the PEVs (27 percent) and the door-to-door Collections (14 percent).

Figure 8.10, below, shows the contribution of each operation to the total amount of materials recycled in the city.
8.10 - Materials Recycled by Operation in Recife - 1993 (Kg)

Source: Based on information from PCR (1993a)

**Sections Collection**

This refers to the collection of the wastes from the different sections in which the city is divided for operational purposes. This operation collects wastes from general clean-ups, events and seasonal operations such as carnival and summer clean-ups, wastes from the cleaning and weeding of municipal buildings, such as cemeteries, schools, hospitals and creches and wastes illegally dumped into public areas. It corresponds to the remaining 45 percent of SW collected by DLU.

**8.4.1.2 ENTERPA Operational Procedures**

It has already been stressed that ENTERPA and DLU have similar operational procedures. As with DLU, the standard collection service in the areas served by ENTERPA is a door-to-door collection, which picks up domestic, commercial or industrial wastes from generators of less than 100 litres of SW per day. Frequency of service may be daily, except Sundays, or on alternate days. An important distinction
between the public and the private firm, regarding SW collection, is that the latter operates in two shifts, whilst the former operates a single shift per day. This means that in the privately served area, collection may occur during the night. ENTERPA carries out four different types of operation:

(i) Household Collection;
(ii) Assorted Wastes Collection;
(iii) Tree Pruning Collection;
(iv) Street Sweeping Collection.

The total amount of SW collected by ENTERPA in 1993 was 224,466 tons. This corresponds to approximately 48 percent of the solid waste collected in the city. Figure 8.11 shows the wastes collected by quarter by each of the four operations carried out by ENTERPA in the city:

Figure 8.11 - Solid Waste Collected by ENTERPA by Operation - 1993 (ton)

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Household Collection</th>
<th>Street Sweeping Collection</th>
<th>Assorted Wastes Collection</th>
<th>Tree Pruning Collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>53966</td>
<td>106</td>
<td>16045</td>
<td>1388</td>
</tr>
<tr>
<td>2</td>
<td>55959</td>
<td>109</td>
<td>17507</td>
<td>1562</td>
</tr>
<tr>
<td>3</td>
<td>56030</td>
<td>108</td>
<td>20424</td>
<td>1575</td>
</tr>
<tr>
<td>4</td>
<td>58511</td>
<td>129</td>
<td>29537</td>
<td>1227</td>
</tr>
<tr>
<td>Total</td>
<td>224466</td>
<td>452</td>
<td>83513</td>
<td>5752</td>
</tr>
</tbody>
</table>

Source: Based on information from PCR (1993a)

Figure 8.12, below, shows the percentage relative to each one of the four collection operations carried out by ENTERPA. It is clear in Figure 8.11 and 8.12 that, unlike DLU, the Household Collection is the most important operation in the structure of ENTERPA. However, the Assorted Wastes Collection is also an relevant operation which accounts for approximately 27 percent of the SW collected by the private company.
Household Collection

Despite its name this operation includes the collection of household, industrial and commercial wastes. In general terms it can be regarded as similar to the "household" or "conventional collection" of DLU. This door-to-door collection may occur during the day or during the night. In terms of frequency, there are two types: daily, except Sundays or on alternate days. The equipment used is compactor trucks, although in the poorer areas which are not accessible by conventional equipment the services are reduced to the regular collection of wastes from communal bins. This type of operation accounts for 71 percent of the waste collected in the privately served area.

Assorted Wastes Collection

This operation collects solid wastes dumped by population on to streets and other public areas and which accumulate in certain spots, usually called "critical points". The wastes may be bulky refuse, construction debris or just household or commercial
wastes. Construction debris illegally dumped on to streets is very common in cities of developing countries, since there are a large number of uncontrolled building sites (Rego 1994). As a result, the main equipment used in this type of collection is the open top truck. This operation accounts for 27 percent of the wastes collected by ENTERPA.

**Tree Pruning Collection**

ENTERPA is responsible for pruning the trees in the areas where it operates. The resulting wastes, mostly leaves and branches, are collected by special equipment. This is a small operation which accounts for only 2.0 percent of the wastes collected by the company.

Some comment must be made at this stage regarding the operational procedures of DLU and ENTERPA. The first relates to the Household Collection. This type of operation is regarded by the municipal administration as the standard collection service in the city, as is explicitly registered in its recently published Master Plan (PCR 1991). As such it guides the whole approach to MSWM in the city. However, as observed in Figure 8.7, this type of service accounts for only 17 percent of the total amount of SW collected by DLU in Recife in 1993. On the other hand, nearly one third (32 percent) of the wastes collected by DLU relates to Special Collections. This means that the special type of service collects double that is collected by the standard operation of DLU in the city. Due to the high costs of these services, such special operation must be subject of scrutiny, aiming at transferring its costs to the generators of the wastes, particularly regarding construction debris and wastes from municipal buildings and cemeteries.

The second aspect relates to the collection of SW from the sections. Since this operation relates to the picking up of wastes which have not been collected by the Household and Special operations, and have been illegally dumped onto streets and
public areas, it is expected to present figures which reflect its residual nature. However, the very opposite proved true. This is the operation which collects the most SW in the area served by DLU (45 percent). It has been argued by DLU managers that the waste collected by this operation is the result of weeding and cleaning up of large areas, and waste which has accumulated on the streets, therefore it is usually very dense, with high levels of moisture and sand. Indeed, this is usually the case, particularly in developing countries, where only a percentage of the roads are paved (Rego 1994). It is argued, therefore, that this percentage does not correspond to the population which is actually served by this operation. Nonetheless, these figures still raise important questions in relation to the planning and operational procedures of the Household Collection of DLU, particularly in terms of coverage, frequency and reliability of the Household Operation. These issues are further discussed in Chapter Nine.

As for ENTERPA, the analysis has shown that it has a smaller and less diverse range of operations, than DLU. It has no operations related to environmental education of the population, such as the selective collection performed by DLU, nor does it carry out any activity related to service reduction or resource recovery, such as those developed by DLU. As a result, the great majority of its resources are concentrated on the operation of the Household Collection, which is responsible for 71 percent of all the SW it collects. Even in relation to this operation, the private company does not make any effort to improve services to the areas with access difficulties. As previously highlighted, the poor communities within the ENTERPA area served by communal bins placed at places of easy access to the conventional equipment used by the firm. This may pose difficulties for households to dispose adequately of their SW, resulting in illegal dumping of refuse in inadequate areas.

Finally, in terms of possible comparisons between the two companies, the analysis has shown that the comparison between the household collections of the two companies is possible and reliable, since they serve similar areas and use similar equipment and
operational procedures. The comparison between the operation of *section collection* of DLU and the *collection of wastes dumped on to streets* by ENTERPA has also proved adequate, since, again, equipment, operational procedures and areas served are quite similar. This means that, regarding SW collection, there are grounds for comparing accessibility, quality, productivity and costs of services to the public sector in the two areas served either by the public or by the private sector. Services which are compared correspond to the majority of the services carried out by DLU (62 percent) and ENTERPA (98 percent). Those services which were shown to be dissimilar in terms of equipment, type of areas served and operational procedures have not been considered in the comparisons carried out in this research.

8.4.2 Public Cleansing

As stated in Chapter Four, public cleansing includes all cleaning operations in public areas. In Recife, four cleansing operations are regularly carried out:

(i) Street Sweeping;
(ii) Weeding;
(iii) Beach-cleaning;
(v) General clean-ups.

ENTERPA operates all four public cleansing services in the area it covers, while DLU performs only Weeding and General clean-ups. As with solid waste collection, in public cleansing operations in which both companies are involved, their procedures are very similar. An analytical description of all the public cleansing operations follows.

*Street Sweeping*

This service is carried out on a regular basis only by ENTERPA. It is performed
manually in the paved streets of the city, which form approximately 60 percent of the total (PCR 1993a). The sweeping may be performed by a single operator with a handcart, or, in busier areas, by a team of two operators with a handcart. Each team is responsible for a determined length of curb. ENTERPA owns mechanical sweepers, but has encountered problems in their operation due to the specific characteristics of the road system in Recife. Furthermore, such equipment usually has too high operational and maintenance costs (Rego 1994).

The total length of paved roads in the area served by ENTERPA is around 851.55 kilometres. The service covers 100 percent of the area, with varied frequencies. Many roads in the central parts of the city are cleaned as many as six times per day, while in other areas streets are cleaned daily (26 percent), or on alternate days, which is the majority of the cases (71 percent). Less populated areas have the streets cleaned weekly (3 percent). On average, 22,562 km of roads were swept every month in the area privately served in 1993. This operation may occur during the day or, in business and commercial areas, during the night. Figure 8.13 shows the length of streets swept by frequencies.

**Figure 8.13 - Length of Streets Served by Frequency - ENTERPA - 1993**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Km</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>222.8</td>
<td>26.0</td>
</tr>
<tr>
<td>Three Times per Week</td>
<td>610.5</td>
<td>71.0</td>
</tr>
<tr>
<td>Once a Week</td>
<td>18.2</td>
<td>3.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>851550</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Based on information from PCR (1993a)

**Weeding**

Weeding operations are also performed by ENTERPA. Weeding is particularly
important in Recife, due to two main factors:

(i) first, weeding increases the productivity and the effectiveness of street sweeping operations. This is particularly relevant since, as noted above, street sweeping consumes a high amount of resources. Indeed, curbs clear of weeds make sweeping much faster and easier. In some cases, weeds virtually impede the total removal of sand and other materials from the curb.

(ii) secondly, weeding also protects the drainage system of the city. Since there is a high proportion of sand in the SW generated in the city, the less effective sweeping causes a larger amount of sand to be left in the curbs, which is eventually washed off by the heavy rains common in tropical cities, and damages the drainage system.

In Recife, paved and a few unpaved streets are cleared of weeds. However, despite the importance of this operation, weeding is carried out on a periodical basis. Theoretically the frequency is once every three months; however, in practice, a programme is established every month, according to the availability of human resources. In some cases, the operation occurs as a response to demands from the population. This system does not appear to work to satisfaction, since weeding operations are the subject of a high number of complaints to both private and public deliverers. In 1993, ENTERPA weeded and cleared of sand 1904 km of curb in paved roads, while DLU weeded and cleared of sand 140 km of unpaved roads (PCR 1993a).

**Beach-cleaning**

This operation is performed by ENTERPA. Its importance is due to the relevance of the seaside and its white sand beaches to the tourism industry in the city. It consists of sweeping the coastal avenue and surrounding roads, cleaning the beach sand, weeding, and collecting the wastes from approximately 60 coconut stalls located on the beach sand. The cleaning of the sand is carried out manually and by using tractors
and special equipment to sieve the sand.

Each of those activities has a different frequency. Streets are swept twice a day, in the morning and in the evening, while the sand is cleaned weekly. Collection of solid wastes is on alternate days, and green areas and parks are weeded and have the grass cut according to the availability of workers.

**General Clean-ups**

Apart from the above activities, public cleansing includes a range of operations which are generally called multi-purpose clean-ups. They involve the washing up of streets in the business and commercial centre, public markets and street markets; grass-cutting in green areas which are not parks or gardens maintained by the public works undertaking, the cleaning of stairs in poorer hilly areas; general clean-ups of public-events areas; clean-ups of schools, creches, libraries, community association buildings, etc. They occasionally include drain-cleaning and gully emptying activities.

Such clean-up operations constitute the main public cleansing operation of DLU, while for ENTERPA it has a more peripheral role. They are periodically performed at the request of the public or the municipal administration and according to the availability of resources. They may also be undertaken to restore certain streets to an acceptable cleanliness standard, when sweeping service is not frequent enough. Those clean-ups are usually carried out by large teams of workers, vehicles and equipments (Rego 1994). In 1993, 15,124 tons of wastes were collected by clean-up operations, which constitute over 10 percent of the wastes collected by the section collection, and around 7 percent of the total waste collected by DLU (PCR 1993a).

**8.4.3 Disposal and Resource Recovery**

In Recife, as in most cities in developing countries, virtually all the collected solid
wastes are disposed of at one open site. Known as the "Aterro da Muribeca", this site opened in 1986 as the result of the efforts of the metropolitan agency to create an integrated system of solid waste disposal. It was first operated as a controlled landfill. However, by the completion of this research fieldwork, operational conditions were so poor that it was regarded by the municipal administration as an open dump. Aterro da Muribeca is operated by DLU, but it is used by the municipality of Recife, of the neighbouring Jaboatão, and by private generators who directly dispose of their wastes. Figure 8.14 shows the average amount of wastes which is disposed of at the Muribeca site per quarter.

Figure 8.14 - Solid Waste from Recife Disposed of at Muribeca Site - 1993

<table>
<thead>
<tr>
<th>Quarter</th>
<th>DLU tons</th>
<th>DLU %</th>
<th>ENTERPA tons</th>
<th>ENTERPA %</th>
<th>Total (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>84327</td>
<td>54</td>
<td>71399</td>
<td>46</td>
<td>155726</td>
</tr>
<tr>
<td>2</td>
<td>79790</td>
<td>52</td>
<td>75028</td>
<td>48</td>
<td>154818</td>
</tr>
<tr>
<td>3</td>
<td>71144</td>
<td>48</td>
<td>78352</td>
<td>52</td>
<td>149496</td>
</tr>
<tr>
<td>4</td>
<td>58089</td>
<td>39</td>
<td>89404</td>
<td>61</td>
<td>147493</td>
</tr>
<tr>
<td>Total</td>
<td>293350</td>
<td>48</td>
<td>314283</td>
<td>52</td>
<td>607533</td>
</tr>
<tr>
<td>Monthly Average</td>
<td>24446</td>
<td>48</td>
<td>26182</td>
<td>52</td>
<td>50628</td>
</tr>
</tbody>
</table>

Source: Based on information from PCR (1993a)

A negligible percentage of wastes are incinerated in Recife. The incinerator was opened more than 30 years ago, when a composting plant was built in the city, as already mentioned in Chapter Five. Since the composting plant was decommissioned the equipment operates at only 10 percent of its capacity (PCR 1991). In 1993, around 187 tons of wastes were incinerated by DLU, which corresponds to 0.03 percent of the total waste collected in the city.

As for resources recovery, in 1986 great emphasis was placed on the issue, and a plan was designed aiming at recycling the fraction of the wastes that held commercial value, and composting the remaining organic fraction. The plan also aimed at using
small recycling and composting plants, to allow the decentralization of the final
disposal of solid wastes in the city. To this end, in 1987 a second composting plant
was built, using an aerobic composting technique, and twelve more were planned.
However, due to administrative lack of continuity, this unit, the only one to be built,
operated for a few years, and was out of commission at the time of this research field
work. In 1993, the selective collection operations succeeded in recycling around 240
tons of wastes; however this corresponds to only 0.04 percent of the waste collected
in Recife.

Despite being virtually the only means of waste disposal in Recife, receiving nearly
1700 tons of waste every day, the operational conditions of the Muribeca site
presented many problems, the most relevant being the fact that after being dumped,
the solid waste was left uncovered and exposed, due to lack of equipment to cover it
adequately. This problem was aggravated by the fact that hundreds of scavengers and
solid wastes weighers and buyers worked on the site every day, in an entirely
inadequate form of contact with the wastes. Furthermore, no measures of
environmental protection were taken, and even the produced leachate was allowed to
contaminate soil, ground and surface waters. Added to all these problems, there was
the fact that this site was about to reach its exhaustion point, since it had been used
for almost ten years, which was its projected capacity. To solve this problem, in 1993
the municipal administration contracted a project of bioremediation of the site. This
technique of biological treatment was expected to allow further use of the site and to
halt environmental degradation.

8.5 Summary

This chapter provides information on the current practice of municipal solid waste
management in Recife. It examines financial, administrative and operational aspects
of the service in both the private and public sectors.
The chapter highlights the difference in size and structure between the institution organisation of the two operators. In terms of operational procedures, the similarities in their level of centralisation are emphasized.

The financial aspects discussed in this chapter indicate that DLU is highly dependent on decisions from the municipal government, due to the low level of cost recovery in the system. This fact makes the Directorate of Urban Cleansing dependent on municipal allocations for nearly all its expenditures.

In the detailed description of the services carried out by both sectors provided in section 8.4, the qualitative and quantitative aspects of each operation are discussed. This description focuses on those services which are similar in the two areas of study, since they provide the basis for the comparison carried out in Chapter Nine. It examines the final disposal of municipal solid waste in the city, discussing the poor operational conditions of the Muribeca open dump and the plans to implement a project of bioremediation of the site. Finally, the initiatives towards resource recovery in the city are examined, particularly the construction of pilot composting plants and the plans to decentralize the final disposal of waste in the city.
CHAPTER NINE - PRIVATISATION AND ACCESSIBILITY, QUALITY, PRODUCTIVITY AND COSTS OF MSWM

9.1 Introduction

The previous chapter presented the findings of this research in relation to the current practice of MSWM in Recife. It provided a description of the way in which the services are organized and delivered in the city. The purpose of the present chapter is to present the findings of this research in relation to the association of the private sector involvement in MSWM services provision and the accessibility, quality, productivity and costs of the services to the government.

This chapter has seven sections, including this Introduction. Section 9.2 provides the socio-economic and demographic data about the respondents of the household survey, discussing similarities and differences between the two areas of study. Section 9.3 presents the findings in relation to the accessibility of MSWM services. It provides a comparative analysis of the coverage and level of services in the two areas of study. Section 9.4 examines the association between privatisation and quality of MSWM services. It provides two statistical analyses. The first uses descriptive statistics to examine selected aspects of service quality in the two areas of study, based on data collected through the household survey. The second analysis uses inferential statistics to define which are the most relevant aspects of MSWM services quality from the users' point of view. It then compares the performance of the delivering companies in relation to each of the aspects selected, examining whether there are significant differences in the level of quality between the MSWM services provided by the public and private sectors. Section 9.5 presents the findings of this research in relation to the productivity of MSWM services. It compares the level of both labour and equipment productivity in the provision of services in the two areas of study using data collected through the archival records survey and semi-structured interviews. Section 9.6 analyzes the costs of MSWM services to the public sector. It presents the findings of a comparative analysis of costs of services to the municipal administration in the two areas of study. It also defines which part of these costs is recovered by the public
The privatisation of municipal solid waste management in Recife, Brazil

cleansing tax. Finally, section 9.7 summarises the findings and closes this chapter.

9.2 Data About the Household Survey Respondents

The household survey covered 450 units, 179 (39.8 percent) in the publicly served area and 271 in the privately served area (60.2 percent), in accordance with the population coverage of each operator. The distribution of these units in the geographical area of the city was defined by the sampling design, discussed in section 7.4.1.3. Figure 9.1 below shows this distribution among the PAR.

<table>
<thead>
<tr>
<th>PAR</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>47</td>
<td>10.4</td>
</tr>
<tr>
<td>2</td>
<td>63</td>
<td>14.0</td>
</tr>
<tr>
<td>3</td>
<td>90</td>
<td>20.0</td>
</tr>
<tr>
<td>4</td>
<td>74</td>
<td>16.4</td>
</tr>
<tr>
<td>5</td>
<td>82</td>
<td>18.2</td>
</tr>
<tr>
<td>6</td>
<td>94</td>
<td>20.9</td>
</tr>
<tr>
<td>Total</td>
<td>450</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Of the 450 selected households 24 refused to answer the questionnaire. This section presents the socio-economic and demographic aspects of the respondents who answered. The data covers the sex, age and occupation of the respondents, as well as the size and income level of their households (addressed in Section C of the questionnaire).

Age of Respondents

The data about the age of the respondents was grouped into 4 categories: young people, aged between 18 and 29; mature people, aged between 30 and 39; middle aged, between 40 and 59; and elderly, 60 and over. Figure 9.2 shows the distribution
of the sample according to these categories in the two areas of study.

**Figure 9.2 - Age of Respondents**

<table>
<thead>
<tr>
<th>Age</th>
<th>Private</th>
<th></th>
<th>Public</th>
<th></th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>freq</td>
<td>%</td>
<td>freq</td>
<td>%</td>
<td>freq</td>
<td>%</td>
</tr>
<tr>
<td>Young 18-29</td>
<td>30</td>
<td>12.9</td>
<td>26</td>
<td>15.6</td>
<td>56</td>
<td>14.1</td>
</tr>
<tr>
<td>Mature 30-39</td>
<td>55</td>
<td>23.7</td>
<td>36</td>
<td>21.6</td>
<td>91</td>
<td>22.8</td>
</tr>
<tr>
<td>Middle aged 40-59</td>
<td>96</td>
<td>41.4</td>
<td>65</td>
<td>38.8</td>
<td>161</td>
<td>40.3</td>
</tr>
<tr>
<td>Elderly 60+</td>
<td>51</td>
<td>22.0</td>
<td>40</td>
<td>24.0</td>
<td>91</td>
<td>22.8</td>
</tr>
<tr>
<td>Total</td>
<td>232</td>
<td>100.0</td>
<td>167</td>
<td>100.0</td>
<td>399</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Missing cases: 51

The largest group in the sample is formed by middle aged people (40-59), with 40.3 percent of the cases. The second largest groups are mature and elderly people, both with 22.8% of the cases. The smallest group is the young, aged between 18-29. The age distribution of the sample presents a concentration in older groups due to two main factors:

(i) First, the fact that the interviewers were instructed to select one of the heads of the households to answer the questionnaire. Where it was not possible, the adult member of the household with the best knowledge of MSWM was selected;

(ii) Secondly, in 87 percent of the cases the interviews were carried out during the day, on weekdays. This fact caused a great number of questionnaires to be completed by the adults more likely to be at home at this time, such as pensioners. This may have elevated the average age of the sample.

The figures indicate that differences in the distribution of the population among the age groups between the two areas of study are not significant.
Sex of Respondents

From the 426 people who answered the questionnaire 47.7 percent were males and 52.3 percent were females, as shown in Figure 9.3. This distribution is perfectly compatible with the figures for the total urban population of the State of Pernambuco: 47.4 percent of males and 52.6 percent of females (IBGE 1991). This confirms the reliability of the sampling process. The figures below indicate that regarding the sex of respondents there are not significant differences between the two areas of study.

Figure 9.3 - Sex of Respondents

<table>
<thead>
<tr>
<th>Sex</th>
<th>Private</th>
<th></th>
<th>Public</th>
<th></th>
<th>Total</th>
<th></th>
<th>Pe*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq</td>
<td>%</td>
<td>freq</td>
<td>%</td>
<td>freq</td>
<td>%</td>
<td>freq</td>
</tr>
<tr>
<td>Male</td>
<td>122</td>
<td>47.1</td>
<td>81</td>
<td>48.5</td>
<td>203</td>
<td>47.7</td>
<td>47.4</td>
</tr>
<tr>
<td>Female</td>
<td>137</td>
<td>52.9</td>
<td>86</td>
<td>51.5</td>
<td>223</td>
<td>52.3</td>
<td>52.6</td>
</tr>
<tr>
<td>Total</td>
<td>259</td>
<td>100.0</td>
<td>167</td>
<td>100.0</td>
<td>426</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Missing cases: 24

* Sex of the population of the State of Pernambuco (Fundacao Instituto Brasileiro de Geografia e Estatistica IBGE 1991)

Occupation of Respondents

The data related to the occupation of the respondents was grouped into 13 categories. As previously mentioned in relation to age, the time when the interviews were carried out may also have affected the pattern of the occupation of the respondents. Housewives formed the largest group, accounting for 28.9 percent of the respondents. This may be due to the fact that housewives tend to be the people with the most knowledge about MSWM services in the household, therefore the most likely people to be selected by the interviewer to answer the questionnaire. Small traders follow with 14.3 percent of the cases. Since many small traders sell goods in the same unit where they live, this could explain the high number in the category, added to the fact that selling goods at home is a very common alternative for supplementing income in
poorer areas. Pensioners and retired people are the third largest group (13.4 percent), followed by public servants (9.4 percent) and self-employed people (9.2 percent). These numbers are shown in Figure 9.4.

Table: Occupation of Respondents

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Private</th>
<th></th>
<th>Public</th>
<th></th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>freq</td>
<td>%</td>
<td>freq</td>
<td>%</td>
<td>freq</td>
<td>%</td>
</tr>
<tr>
<td>Trader</td>
<td>46</td>
<td>17.8</td>
<td>15</td>
<td>9.0</td>
<td>61</td>
<td>14.3</td>
</tr>
<tr>
<td>Public Servant</td>
<td>30</td>
<td>11.6</td>
<td>10</td>
<td>6.0</td>
<td>40</td>
<td>9.4</td>
</tr>
<tr>
<td>Self-employed</td>
<td>23</td>
<td>8.9</td>
<td>16</td>
<td>9.6</td>
<td>39</td>
<td>9.2</td>
</tr>
<tr>
<td>Trade Employee</td>
<td>8</td>
<td>3.1</td>
<td>1</td>
<td>0.6</td>
<td>9</td>
<td>2.1</td>
</tr>
<tr>
<td>Businessman</td>
<td>14</td>
<td>5.4</td>
<td>20</td>
<td>12.0</td>
<td>34</td>
<td>8.0</td>
</tr>
<tr>
<td>Senior Professional</td>
<td>15</td>
<td>5.8</td>
<td>3</td>
<td>1.8</td>
<td>18</td>
<td>4.2</td>
</tr>
<tr>
<td>Industry Worker</td>
<td>3</td>
<td>1.2</td>
<td>7</td>
<td>4.2</td>
<td>10</td>
<td>2.3</td>
</tr>
<tr>
<td>Odd Job Man</td>
<td>2</td>
<td>0.8</td>
<td>3</td>
<td>1.8</td>
<td>5</td>
<td>1.2</td>
</tr>
<tr>
<td>Unemployed</td>
<td>3</td>
<td>1.2</td>
<td>3</td>
<td>1.8</td>
<td>6</td>
<td>1.4</td>
</tr>
<tr>
<td>Domestic worker</td>
<td>5</td>
<td>1.9</td>
<td>3</td>
<td>1.8</td>
<td>8</td>
<td>1.9</td>
</tr>
<tr>
<td>Housewife</td>
<td>74</td>
<td>28.6</td>
<td>49</td>
<td>29.3</td>
<td>123</td>
<td>28.9</td>
</tr>
<tr>
<td>Retired/Pensioner</td>
<td>27</td>
<td>10.4</td>
<td>30</td>
<td>18.0</td>
<td>57</td>
<td>13.4</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
<td>3.5</td>
<td>7</td>
<td>4.2</td>
<td>16</td>
<td>3.8</td>
</tr>
<tr>
<td>Total</td>
<td>259</td>
<td>100.0</td>
<td>167</td>
<td>100.0</td>
<td>426</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Missing cases: 24

With regard to differences between the two areas of study, Figure 9.4 indicates that the number of pensioners and retired people in the publicly served area is higher. The same is true of businessmen and odd job men. The privately served area shows a higher number of traders, public servants, trade employees and senior professionals. The other categories do not show any important difference.

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**Household Income**

Regarding the income level of the households in the sample, the data was grouped into six categories: the first encompassed the household incomes of less than 1 Minimum Wage (MW), the second those from 1 to less than 3 MW, the third 3 to less than 5 MW, the fourth 5 to less than 7 MW, the fifth 7 to less than 10 MW and the last category included those households whose income levels were equal or superior to 10 MW.

Figure 9.5 shows the distribution of the households in the sample according to the income level. The largest group in the sample is 1-3 MW. Almost half of the households in the sample are in this group (54.2 percent). The second largest group is category three, 3-5 MW, accounting for 21.2 percent of the total. This means that over 80 percent of the households in the areas of study had an income of less than 5 MW. The Minimum Wage during the time of the household survey was approximately US $ 65.

<table>
<thead>
<tr>
<th>Level of Income</th>
<th>Private freq</th>
<th>Private %</th>
<th>Public freq</th>
<th>Public %</th>
<th>Total Freq</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1 MW</td>
<td>18</td>
<td>8.1</td>
<td>12</td>
<td>7.2</td>
<td>30</td>
<td>7.7</td>
</tr>
<tr>
<td>1-3 MW</td>
<td>102</td>
<td>45.7</td>
<td>109</td>
<td>65.7</td>
<td>211</td>
<td>54.2</td>
</tr>
<tr>
<td>3-5 MW</td>
<td>56</td>
<td>25.1</td>
<td>26</td>
<td>15.7</td>
<td>82</td>
<td>21.2</td>
</tr>
<tr>
<td>5-7 MW</td>
<td>23</td>
<td>10.3</td>
<td>12</td>
<td>7.2</td>
<td>35</td>
<td>9.0</td>
</tr>
<tr>
<td>7-10 MW</td>
<td>14</td>
<td>6.3</td>
<td>5</td>
<td>3.0</td>
<td>19</td>
<td>4.9</td>
</tr>
<tr>
<td>More than 10 MW</td>
<td>10</td>
<td>4.5</td>
<td>2</td>
<td>1.2</td>
<td>12</td>
<td>3.1</td>
</tr>
<tr>
<td>Total</td>
<td>223</td>
<td>100.0</td>
<td>160</td>
<td>100.0</td>
<td>389</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Missing Cases: 61
Note: Minimum Wage in March/1994 - US $ 65

It is worth noting that although slums and squatted areas were included in the
research, only households in permanent shelters were selected, since MSWM services cannot be adequately assessed when provided to temporary shelters. This fact may have raised the average income level of the sample.

Figure 9.5 indicates that the distribution of the population among the income groups considered in this research shows that in the publicly served area a higher percentage of households earn 1-3 MW, while in the privately served area a higher percentage of household earn 3-5 MW, as compared to the public area. The percentage of households in the privately served area that earn less than 5 MW is approximately 76 percent, while the figure in the publicly served area is higher, 88.6 percent. Moreover, considering household incomes higher than 3 MW, the privately served area presents a percentage of 46.2, while in the publicly served area the figure is 27.1 percent. All these numbers indicate that the income level in the privately served area is higher than in the publicly served area.

Size of the Household

The size of the household varied from 1 to 20 members within the 389 valid answers to this question. The means was 4.9 people and the mode was 4 people.

The average number of people per household in the City is 4.23 (IBGE 1991) which is compatible with the numbers found in this research. As for differences in the two areas of study, the figures indicate that in the privately served area the highest percentage of households has four members, while the highest percentage of household in the publicly served area has six or more people.

Figure 9.6 shows the distribution of the sample according to the number of people per household.
The Privatisation of Municipal Solid Waste Management in Recife, Brazil

9.3 Privatisation and Accessibility in MSWM

9.3.1 Methodology

Accessibility is a major issue in the privatisation debate. As pointed out in section 4.8.3, access to basic infrastructure services is one of the most commonly used measurements of poverty. There is a worldwide consensus about the need to expand infrastructure in order to extend the reach of services, allowing competitiveness, economic growth and poverty reduction in developing countries. Indeed, evidence has shown that in these countries the poor are the most hit by the lack of access to infrastructure services, particularly those who live in the peri-urban areas of cities. This research examines the differences in accessibility of MSWM services in the two areas of study in relation to four main aspects:

(a) Coverage of the population;
(b) Level of income of the households;
(c) Level of services;
(d) Geographical location of the dwellings.

Figure 9.6 - Household Size

<table>
<thead>
<tr>
<th>No of People</th>
<th>Private</th>
<th></th>
<th>Public</th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq</td>
<td>%</td>
<td>freq</td>
<td>%</td>
<td>freq</td>
</tr>
<tr>
<td>1</td>
<td>8</td>
<td>3.6</td>
<td>2</td>
<td>1.2</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>18</td>
<td>8.1</td>
<td>17</td>
<td>10.2</td>
<td>35</td>
</tr>
<tr>
<td>3</td>
<td>38</td>
<td>17.0</td>
<td>27</td>
<td>16.3</td>
<td>65</td>
</tr>
<tr>
<td>4</td>
<td>48</td>
<td>21.6</td>
<td>33</td>
<td>19.9</td>
<td>81</td>
</tr>
<tr>
<td>5</td>
<td>39</td>
<td>17.5</td>
<td>32</td>
<td>19.3</td>
<td>71</td>
</tr>
<tr>
<td>6</td>
<td>34</td>
<td>15.2</td>
<td>19</td>
<td>11.4</td>
<td>53</td>
</tr>
<tr>
<td>7+</td>
<td>38</td>
<td>17.0</td>
<td>36</td>
<td>21.7</td>
<td>74</td>
</tr>
<tr>
<td>Total</td>
<td>223</td>
<td>100.0</td>
<td>166</td>
<td>100.0</td>
<td>389</td>
</tr>
</tbody>
</table>

Missing Cases: 61
The triangulation approach adopted in this research, as stressed in section 7.3.1, involved amongst other things the use of various sources of information and different methods throughout the data collection process. In the assessment of the accessibility of MSWM in Recife two main sources were used: the service delivering companies (DLU and ENTERPA) and the users. Three methods of data collection were employed: the archival records survey, the households survey and the semi-structured interviews. As previously discussed, this increases the validity and reliability of the research findings.

9.3.2 Coverage of Solid Waste Collection

Coverage in MSWM services is usually expressed by the percentage of the population in one city that has access to a regular service, as discussed in section 6.8.2. In this research two methods have been employed in the estimation of MSWM coverage in Recife. The first method is based on the archival records survey and semi-structured interviews with managers in the two delivering companies: DLU and ENTERPA. It uses an estimated daily average per capita production of solid wastes. The results are in section 9.3.2.1. The second method is based on the data collected from the users through the household survey. The results are in section 9.3.2.2.

9.3.2.1 Archival Records Survey

According to the data of the archival records in the two delivering companies the MSWM coverage in Recife in 1993 was approximately 96.3 percent of the population. This estimate is based on the estimated daily average per capita production of 1.35 kg of solid wastes in general. This figure is the result of the last research conducted in the city by DLU in 1983. Considering that the two delivering companies combined collected approximately 1,688 tons of SW per day in 1993, it is estimated that 1,250,370 people are served per day, or 96.3 percent of the population. This figure is compatible with figures from other Latin American cities, such as those in Figure 9.7:
The Privatisation of Municipal Solid Waste Management in Recife, Brazil

Figure 9.7 - MSWM Coverage in Selected Cities in Latin America - 1991

<table>
<thead>
<tr>
<th>Cities</th>
<th>SW Collected (tons / day)</th>
<th>Coverage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rio de Janeiro</td>
<td>4925&lt;sup&gt;1&lt;/sup&gt;</td>
<td>95&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Sao Paulo</td>
<td>9592&lt;sup&gt;2&lt;/sup&gt;</td>
<td>95&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Mexico City</td>
<td>15000&lt;sup&gt;3&lt;/sup&gt;</td>
<td>80&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Caracas</td>
<td>3610&lt;sup&gt;2&lt;/sup&gt;</td>
<td>91&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Buenos Aires</td>
<td>2400&lt;sup&gt;2&lt;/sup&gt;</td>
<td>99&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Santiago</td>
<td>2600&lt;sup&gt;2&lt;/sup&gt;</td>
<td>99&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Havana</td>
<td>1400&lt;sup&gt;1&lt;/sup&gt;</td>
<td>100&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Source: 1 Alencar (1993) 2 Bartone et al. (1991)

This level of coverage means that every day around 65 tons of SW remain uncollected in the streets and public areas and that 11,355 households do not have access to MSWM services in the city.

Figure 9.8 presents the findings of the archival records survey in relation to coverage of the population in Recife. According to the data the two companies serve very similar percentages of the population of the city: 49.8 and 46.5 percent of the population to the private and public sector respectively.

Figure 9.8 - MSWM Coverage by Delivering Company - 1993

<table>
<thead>
<tr>
<th>Population</th>
<th>Delivering Company</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Private</td>
<td>%</td>
</tr>
<tr>
<td>Served</td>
<td>719044</td>
<td>49.8</td>
</tr>
<tr>
<td>Non-served</td>
<td>NE</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>NE</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Based on information from PCR (1993)
Note: NE - not estimated

The coverage of the population in each area of study could not be estimated on the
basis of the archival records because the exact number of people who live in each area is not known by the municipal administration. This means that the location of the 3.7 percent of households which are not served in the city is also unknown.

It is important to note at this stage that the per capita production of MSW is not easy to determine. Many commentators in the literature, as illustrated by Rego (1994) highlight that the production and the composition of SW are very sensitive to changes in the natural and socio-economic environment. Variables such as climate, level of income, consumption patterns and cultural traditions all influence the density and the amount of the waste one produces. This means that the estimation of SW per capita production varies in time, from city to city and even between different parts of a city. Surveys to estimate this production must be carried out regularly to allow adequate planning and operational decisions.

As previously pointed out in this section, in Recife the last survey with this purpose was carried out in 1983, when the daily average per capita production was estimated in 1.35 kg. Although conditions have greatly changed since, this figure is still the basis of all planning decisions on MSWM in Recife. Due to the possible errors introduced in the estimation of coverage based on this figure, a decision has been made in this research to carry out a second assessment of MSWM coverage that does not use the per capita production, but is based on the data from the household survey. The results are in the following section.

9.3.2.2 Household Survey

The estimated coverage based on the household survey has been found to be compatible with that based on the archival records survey. The evidence gathered in this research suggests that 94.8 percent of the households have access to a MSWM service in Recife, while the archival records survey found that the coverage in the city is 96.3 percent. Figure 9.9 shows the data collected in the household survey.
The data from the household survey allows the assessment of the coverage within each area of study. According to Figure 9.9, the private company serves 98.0 percent of the population in its area, while the public company serves 89.8 percent. Therefore, the private sector shows a superior coverage of the population.

The use of two methods in the estimation of coverage increases the reliability of the results, which have proved to be compatible and complementary. Furthermore, the consistency of the findings is also reflected by the fact that although the estimation of coverage based on the household survey does not take into account the daily per capita production of SW in the city it resulted in a figure compatible with the findings of the archival records survey.

The household survey also allows an exploratory assessment of the accessibility of services based on the amount of SW which is actually collected from the households. The decision to carry out such an assessment stemmed from the high percentage of wastes collected by operations such as the sections collection of DLU and assorted wastes collection of ENTERPA. A second reason is the fact that in developing countries, due to factors such as lack of adequate storage space and appropriate bins, climate and waste composition, it is very difficult for the population to keep the SW inside the property between collection days, particularly when services are not perceived as reliable. Therefore, it is not unusual for many households to place for
collection only the refuse produced on the day of collection, dumping the wastes produced between operations on to slopes, vacant plots, gullies, canals, rivers and public areas.

Although part of this SW is eventually collected by the urban cleansing system, it increases the costs of services and causes problems from the environmental and public health point of view. By the time it is collected this exposed SW has already damaged the environment, bred disease vectors and caused aesthetic pollution and offensive odours. Moreover, because it is often thrown into water streams and onto slopes, as has been discussed, it is one of the main problems of drainage and slope collapse in the particular case of Recife.

This alternative method of coverage estimation - by assessing the amount of SW which is actually collected by the services - is relevant because the municipality has established in the Recife Master Plan (PDCR) that the standard level of SW collection in the city is a house-to-house collection that removes 100.0 percent of the SW produced by the household. Figure 9.10 presents the findings of the household survey in relation to the estimation of coverage at this standard level in the two areas of study.

**Figure 9.10 - Amount of SW collected per Household by Delivering Company**

<table>
<thead>
<tr>
<th>Percentage of SW Collected</th>
<th>Delivering Company</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Private</td>
<td>Public</td>
</tr>
<tr>
<td></td>
<td>freq</td>
<td>%</td>
</tr>
<tr>
<td>100 %</td>
<td>217</td>
<td>83.8</td>
</tr>
<tr>
<td>50% - 100%</td>
<td>36</td>
<td>13.9</td>
</tr>
<tr>
<td>Less than 50%</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>None</td>
<td>5</td>
<td>0.9</td>
</tr>
<tr>
<td>Total</td>
<td>259</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Missing Cases: 25
According to these figures, the SW collection operations collect the total of the refuse produced in 79.5 percent of the households. A further 14.6 percent have half or more than a half of their SW collected and 0.7 percent of the households have less than half of their solid waste actually collected by the system.

Regarding the comparison between the two areas of study, evidence suggests that the private sector collects 100.0 percent of the waste produced by 83.8 percent of the population in its area. The public sector collects 100.0 percent of SW from only 72.9 percent. Therefore, the private sector shows a superior coverage at the standard level of service established for the city.

The percentage of people that have 50-100 percent of their waste collected is approximately the same in both areas of study. Less than 1.0 percent of the served population in the two areas of study have half or less of their solid waste collected.

Accepting that the daily SW production is 5.7 kg per household, this data suggests that an amount of 200 to 250 tons of SW is disposed of at inappropriate sites every day in Recife, a figure three to four times higher than the 65 tons estimated by the municipal administration. This may partly explain why such high amounts of waste are collected from public areas in the city by operations such as the Assorted Collection by ENTERPA and the Special and Section Collections by DLU, as discussed in section 8.4.1. These figures have environmental, health, social and financial implications which have already been discussed in this study.

9.3.3 Accessibility and Income Level

This research has found that there is a clear link between low levels of income and low level of access to MSWM services. Figure 9.11 presents the evidence that is the basis of this conclusion.
According to the figures above, all the non-served households earn 5 MW or less per month. This means that all the households that earn more than 7 MW are served. The group with the lower level of income presents the highest percentage of non-served people (13.3 percent). There is also evidence that the groups of lower income present higher percentages of people that do not have access to SW collection services. In other words, the lower the income, the lower the access to MSWM services.

Considering the amount of waste collected by the system it has been found that 100.0 percent of the SW is collected in 89.4 percent of the households that earn more than 10 MW. This percentage declines as the level of income of the household falls. In the group that earn less than 1 MW per month, the percentage is 70.0 percent. In the group that has 50-100 percent of the SW collected the percentages do not follow this pattern. They are quite similar to all the income groups except for the group of income level between 7-10 MW, which presents a very small percentage, 5.3. Again, in the group that has 0-50 percent of the waste collected the income level does not appear to have any influence. The figures are presented in Figure 9.12.
In summary, amongst those who have access to SW collection services there seems to exist a clear association between income level and the percentage of the population which has the total amount of SW produced collected by the system. However, the same association does not appear in the groups that have other proportions of SW collected by the system.

As for differences between the privately and publicly served areas it has been found that the private sector collects 100.0 percent of the SW from 83.3 percent of the households. The figure to the public company is 69.7 percent. Half or more than a half of SW is collected by the private company from 98.2 percent of the households and by the public company from 88.6 percent. In sum, in terms of coverage, the private sector serves more people and collects more solid wastes from the households as compared to the public sector.

### 9.3.4 Accessibility and Type of Service

Regarding the association between the type of service and the level of income of the
household, this research examined three main types of service: house-to-house, stationary bins and others, as explained in Chapter Seven. These types of service have been examined in relation to the level of income and to the amount of SW actually collected from the household.

Regarding the association between types of services and income levels this research has found that there is a clear association between low level of income and access to types of collection service perceived as inferior by the population. Indeed, according to the non-scheduled interviews with DLU managers and community leaders, stationary bins and other methods of collection are regarded by the population as non-satisfactory types of SW collection. Nonetheless, Figure 9.13 shows that approximately 5.0 percent of the population are served by these types of collection in the city.

Stationary bins serve around 1.3 percent of the population and other services, such as households taking the SW to the truck or to the tractors, are used to serve 3.6 percent. As for the income level of these households this research has found evidence that all of them earn less than 7 MW per month and in 85.0 percent of the cases they earn less than 3 MW per month. Evidence also shows that the higher the income, the higher the access to a house-to-house service. All the households with income level superior to 7 MW have access to this type of service.
### Figure 9.13 - Type of SW Collection by Level of Income of the Household

<table>
<thead>
<tr>
<th>Level of Income (MW)</th>
<th>Type of SW Collection Service</th>
<th>Total</th>
<th>freq</th>
<th>%</th>
<th>freq</th>
<th>%</th>
<th>freq</th>
<th>%</th>
<th>freq</th>
<th>%</th>
<th>freq</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>House to House</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1 MW</td>
<td>24</td>
<td>77.4</td>
<td>0</td>
<td>0.0</td>
<td>2</td>
<td>6.4</td>
<td>5</td>
<td>16.2</td>
<td>31</td>
<td>7.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-3 MW</td>
<td>185</td>
<td>87.7</td>
<td>4</td>
<td>1.9</td>
<td>10</td>
<td>4.7</td>
<td>12</td>
<td>5.7</td>
<td>211</td>
<td>54.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-5 MW</td>
<td>76</td>
<td>92.7</td>
<td>1</td>
<td>1.2</td>
<td>1</td>
<td>1.2</td>
<td>4</td>
<td>4.9</td>
<td>82</td>
<td>21.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-7 MW</td>
<td>34</td>
<td>97.1</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
<td>2.9</td>
<td>0</td>
<td>0.0</td>
<td>35</td>
<td>9.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7-10 MW</td>
<td>19</td>
<td>100.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>19</td>
<td>4.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;10 MW</td>
<td>12</td>
<td>100.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>12</td>
<td>3.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>350</td>
<td>89.9</td>
<td>5</td>
<td>1.3</td>
<td>14</td>
<td>3.6</td>
<td>21</td>
<td>5.4</td>
<td>389</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Missing Cases: 61

The analysis of the amount of SW collected from the household and the type of service which is available revealed that the coverage in the city at the standard level, combining the two companies, is only 74.6 percent, as shown in Figure 9.14. Approximately 89.0 percent of the population have a house-to-house service, while stationary bins serve 1.2 percent of the households. Other services present a higher percentage as compared to stationary bins: 3.8.

It is important to note that the percentages in Figure 9.14 are calculated in relation to the whole population of the two areas of study, including non-users of MSWM services. The figures in Figure 9.15 present the percentage of people served at the standard level calculated in relation to the population of the city that has access to services, i.e. users of the services. This explains some slightly different percentages in the two Figures.
Figure 9.14 - Amount of SW Collected by Type of Service

<table>
<thead>
<tr>
<th>Amount of SW collected</th>
<th>House to House freq</th>
<th>House to House %</th>
<th>Stationary Bin freq</th>
<th>Stationary Bin %</th>
<th>Other freq</th>
<th>Other %</th>
<th>None freq</th>
<th>None %</th>
<th>Don't know freq</th>
<th>Don't know %</th>
<th>Total freq</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>318</td>
<td>74.6</td>
<td>5</td>
<td>1.2</td>
<td>11</td>
<td>2.6</td>
<td>0</td>
<td>0.0</td>
<td>4</td>
<td>0.9</td>
<td>338</td>
<td>79.2</td>
</tr>
<tr>
<td>50-100%</td>
<td>55</td>
<td>13.0</td>
<td>0</td>
<td>0.0</td>
<td>5</td>
<td>1.2</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>60</td>
<td>14.2</td>
</tr>
<tr>
<td>50%</td>
<td>4</td>
<td>0.9</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>4</td>
<td>0.9</td>
</tr>
<tr>
<td>0-50%</td>
<td>2</td>
<td>0.5</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>2</td>
<td>0.5</td>
</tr>
<tr>
<td>0%</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>22</td>
<td>5.2</td>
<td>0</td>
<td>0.0</td>
<td>22</td>
<td>5.2</td>
</tr>
<tr>
<td>Total</td>
<td>379</td>
<td>89.0</td>
<td>5</td>
<td>1.2</td>
<td>16</td>
<td>3.8</td>
<td>22</td>
<td>5.2</td>
<td>4</td>
<td>0.9</td>
<td>426</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Missing Cases: 24

n= 426

Considering the ownership of the company, the findings are: the private company serves 80.0 percent of the households at this standard level, whereas the public company serves a slightly lower percentage: 76.7 percent. The difference between the coverage of the population at the standard level between the two areas is very small. This is also true terms of coverage with other types of services: 20.0 and 23.3 percent to the private and public sectors respectively.

Figure 9.15 - Coverage by Type of Service by Delivering Company

<table>
<thead>
<tr>
<th>Type of Service</th>
<th>Delivering Company</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>private freq</td>
<td>%</td>
</tr>
<tr>
<td>Standard</td>
<td>200</td>
<td>80.0</td>
</tr>
<tr>
<td>Other</td>
<td>50</td>
<td>20.0</td>
</tr>
<tr>
<td>Total</td>
<td>250</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Missing Cases: 50

The poor in Recife are the worst hit by the lack of access to MSWM services. They present the highest percentages of non-served households considering all the methods of coverage assessment used in this research, particularly the coverage at the standard level of service established for the city. Lower levels of income are also associated
with inferior types of service. This research has found that a typical non-served household usually has 5.3 members. In approximately 76.2 percent of the cases its income is less than 3 MW, and in 95.1 percent of the cases it is less than 5 MW.

9.3.5 Accessibility and Geographical Location

As for the association between access to MSWM services and geographical location this research found that the Political and Administrative Region 5 (PAR 5) has the highest percentage of non-served households: 14.8 percent. PAR 3 follows with 4.5 percent and PAR 6 with 3.2 percent. PAR 5 also presents the lower percentage of people served on a house-to-house basis. These figures are in Figure 9.16.

Figure 9.16 - Type of service by Political and Administrative Region (PAR)

<table>
<thead>
<tr>
<th>PAR</th>
<th>Type of Service</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>House to House</td>
<td>freq</td>
</tr>
<tr>
<td></td>
<td>Stationary Bin</td>
<td>freq</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>freq</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>freq</td>
</tr>
<tr>
<td></td>
<td>Don't Know</td>
<td>freq</td>
</tr>
<tr>
<td></td>
<td></td>
<td>%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>%</td>
</tr>
<tr>
<td>PAR 1</td>
<td>40</td>
<td>87.0</td>
</tr>
<tr>
<td>PAR 2</td>
<td>57</td>
<td>95.0</td>
</tr>
<tr>
<td>PAR 3</td>
<td>76</td>
<td>86.4</td>
</tr>
<tr>
<td>PAR 4</td>
<td>67</td>
<td>91.8</td>
</tr>
<tr>
<td>PAR 5</td>
<td>55</td>
<td>79.7</td>
</tr>
<tr>
<td>PAR 6</td>
<td>84</td>
<td>93.3</td>
</tr>
<tr>
<td>Total</td>
<td>379</td>
<td>89.0</td>
</tr>
</tbody>
</table>

These numbers show that the coverage varies between different parts of the city, apparently due to topographic conditions and the level of income of the communities. The southwestern part of the city, which corresponds to PAR 5 and 6, is the worst served area. It is also an area which presents many steep hills with unpaved roads and narrow allies. A large part of the households are only accessible through unpaved
stairs. This explains the low level of coverage in the area. PAR 3, in the far North of the city, is also an area which presents topographical problems, although conditions are slightly better as compared to PAR 5 and 6.

Since the distribution of the area of the city between the private and the public companies is not based on the PAR's boundaries, it has not been possible to assess the accessibility of MSWM in relation to geographical location within the two areas of study.

9.3.6 Accessibility and Level of Service

In residential collection the level of service is determined principally by two factors: frequency of pickup and point of pickup. These aspects are relevant because they define access in time and in space. While numerous other factors might also determine the level of service, for the purposes of this research these two categories suffice.

9.3.6.1 Frequency of Pickup

The frequency of pickup usually ranges from several times per day to once per week. It has been discussed in Section 4.6.2.1 that the frequency of pickups in developed countries is usually twice-a-week or once-a-week. However, in most developing countries pickups are more frequent, mainly due to the biological properties of their waste, hot climates and lack of space for appropriate storage of the wastes between collection operations. Figure 9.17 presents the collection frequency per week in five Latin American cities:
In this research three categories of frequency have been examined: six times per week, three times per week and other. The results are shown in Figure 9.18.

These figures show that the two companies serve very similar percentages of households with a frequency of six times per week: 39.4 percent for the private company and 39.3 percent to the public company. In relation to the frequency of three times per week the private sector presents a higher percentage, 56.3 percent, as compared to the public sector, 48.0 percent.
This research has found evidence that the private company serves 95.7 percent of the households at the frequency of three pickups per week, which is considered the appropriate frequency in developing countries, as discussed above. The public sector serves a lower percentage: 87.3 percent.

Around 8.0 percent of the respondents in the households survey declared to have other frequencies of service, however DLU reports that there is no frequency of service other than six and three times per week and that these answers may reflect failures in the system rather than other frequencies of pickup.

9.3.6.2 Point of Pickup

Points of pickup may be individual or collective with different methods of storage. In Recife, the three main types of pickup points are:

(i) Individual with the SW placed at the curbside;
(ii) Collective with the SW placed in storage facilities located inside property grounds, particularly used in multi-storey buildings;
(iii) Collective with the communal bin placed in public areas.

The type of pickup point influences the accessibility and the productivity of MSWM services. The amount of work imposed on the householders defines the difference in accessibility and the amount of work imposed on the collection crew defines the difference in terms of productivity. Figure 9.19 presents the types of pickup points used in the two areas of study. It must be stressed that the percentages are calculated on the basis of the number of households that are served in each area, as distinct from Figure 9.13, whose figures are related to all valid answers, including households which do not have access to MSWM services. This causes the percentages to be slightly different.
The difference between the two delivering companies in terms of distance of pickup point is very small. The great majority of the households in both areas have individual pickup points, 86.6 and 87.7 percent to the private and public companies respectively. The difference in relation to collective points of pickup, such as stationary bins and trucks, is also negligible. In sum, there is no important difference between sectors in terms of distance of pickup point.

9.4 Privatisation and Quality in MSWM

9.4.1 Methodology

Chapter Two has shown that the issue of service quality plays an important role in the arguments for and against privatisation. As pointed out in Chapter Seven, many authors argue that increases in quality are introduced by the involvement of the private sector in economic activities. In the same direction, commentators in the field of infrastructure services suggest that the privatisation of MSWM tends to improve the quality of service provision. Quality is also central to the main argument against the privatisation of infrastructure services, since theorists point out that there is a risk that privatisation policies introduce improvements in quality at the expense of the accessibility to these services.
This section aims at finding out what the differences in service quality are between the two areas of study and which aspects of service delivery are significant in the definition of service quality from the users' point of view. Furthermore, this section presents findings which draw further conclusions regarding the supposed trade-off between accessibility and quality in MSWM in Recife.

To increase the validity of the findings the analysis of quality in this research is based on data gathered from the users of MSWM services, collected in the settings of service provision through a household survey. However, it must be borne in mind that this section deals with the users' perception of service quality. The concept of users' satisfaction has been introduced in the analytical process, which is based on the assumption that \textit{the higher the users' level of satisfaction, the higher the level of quality of the service provided}.

Different methods have been used in this research to assess MSWM quality, aiming to improve the reliability of the findings. This analysis consisted of two main parts:

(i) In the first part different aspects of service delivery have been analyzed using descriptive statistics. The data used in this analysis was collected from the users through the household survey. The results provide a comprehensive picture of the users' views of service quality and allow a first comparison between the level of users' satisfaction in the privately and publicly served areas. These findings are discussed in section 9.4.2.

(ii) The second part of the analysis uses inferential statistics to establish which are the most significant aspects of service delivery in the level of users' satisfaction in Recife. By using logistic regression analysis the contribution of each of these aspects in the explanation of the level of satisfaction of the users has been examined. This is particularly important to future research in the field of MSWM planning. Finally, a comparison has been carried out between the performance of the delivering companies in the two areas of study in relation to the selected aspects of service delivery in order
to find out whether there are significant differences in the quality of service provision between the private and public sectors. These findings are presented in section 9.4.3.

9.4.2 Quality in MSWM: A Descriptive Statistics Analysis

As pointed out in the previous section, two analyses of MSWM services quality have been carried out in this research. This section aims to present the findings of the first analysis, which uses descriptive statistics to provide a detailed picture of the services in the city based on the household survey.

The decision to carry out this analysis is based on three reasons:

(i) First, it complements the broader description of the current practice of MSWM in Recife (discussed in Chapter Eight) with the users' point of view;
(ii) Secondly, it provides a close examination and a detailed description of those aspects of service delivery which have been selected \textit{a priori} as the most relevant in service quality;
(iii) Thirdly, this analysis allows a preliminary comparison between the performance of the two sectors, providing the grounds for the more complete comparison carried out in the second analysis of quality of MSWM discussed in section 9.4.3.

The aspects of service delivery which are examined in this analysis are those which were selected at the questionnaire design stage: type of equipment used in SW collection, time of the day in which SW is collected, method of domestic storage used by the household, responsiveness of the delivering company, reliability of services, cleanliness of services, quietness of the crew and quietness of the equipment. These aspects are also used in the presentation of the research findings.
With regard to the type of equipment used in the SW collection, this research has found that compactor trucks are by far the most commonly used equipment in both areas of study. They account for 76.7 percent of the valid cases, followed by open top trucks with 8.7 percent, handcarts with 8.4 percent, sledges with 2.0 percent and finally tractors, which account for only 1.5 percent of the cases. Figure 9.20 shows these figures and their distribution between the two delivering companies. This information is compatible with the information collected from the delivering companies.

The numbers in Figure 9.20 indicate that in the privately served area compactor trucks are the equipment used in 82.3 percent of the valid cases. In the public sector the figure is 67.3 percent. The public company uses a larger percentage of open top trucks, 13.3 percent, while the private sector uses open top trucks, according to the users, in only 5.9 percent of the cases.

This research has found that the public sector makes much more use of less traditional equipment than the private sector. Tractors are used in 3.3 percent of the cases in the publicly served area, while this figure for the private company is only 0.4 percent. Handcarts, which are used in 1.5 percent of the served households, are also more common in the publicly served area (9.3 percent) as compared to the privately served area (7.9 percent). Sledges are only used by the public sector as part of "special collection" schemes in areas of very difficult access, where other equipment cannot be used, which means 5.3 percent of the households in its area.
In summary, the private sector has a much more homogenous fleet, using very little alternative equipment. In 88.2 percent of the households compactor and open top trucks are used. Less traditional equipment accounts for only 8.3 percent of the cases in its area. The public company uses more open top trucks and alternative equipment. The managers interviewed in both companies argued that this is due to the fact that the public sector serves a higher percentage of poor people, whose dwellings are usually associated with specific urban tissues such as hilly areas and narrow streets, posing difficulties for the access of conventional equipment.

### 9.4.2.2 Time of Solid Waste Collection

As for the part of the day in which the SW is collected, this research has found that in Recife 53.7 percent of the households are served during the day and 26.0 percent are served during the night. The time seems to vary in 18.1 percent of the cases, and 2.2 percent of the households did not know the time their SW was collected, as shown in Figure 9.21.
Based on the interviews with staff in both delivering companies, it had been assumed that the users in Recife preferred their SW to be collected during the day, although other factors related to productivity such as traffic congestion and shift schedules indicated the night collection as necessary in some routes. However, in this research no evidence has been found to support this assumption. The correlation between time of collection and level of users' satisfaction did not prove to be strong, as further discussed in section 9.4.3.

The private sector operates in two shifts, therefore its household collections occur during the day or during the night, whereas the public sector operates only one shift, during the day. As a result, Figure 9.21 shows that 40.9 percent of the collections in the privately served area occur during the evenings/nights and 37.4 percent during the mornings and afternoons. In the publicly served area night operations are only 0.7 percent of the total. This is the only important difference in terms of time of collection between the two areas of study.
9.4.2.3 Method of Domestic Storage

Another aspect of MSWM services which has been examined in this quality analysis is the method of storage. In Recife, as in most developing countries, this issue is particularly important due to the hot climate, the waste composition and the poor housing conditions of a large percentage of the population. These factors all contribute to the exposure of individuals to waste decomposition and its resulting health hazards. This research has found that the different types of storage used by the households in Recife can be grouped into two main categories:

(i) Permanent Bins - There are two main types of permanent bins in the City: stationary and portable. Both may be individual or communal. Stationary bins are usually made of metal, masonry or concrete. Portable bins are generally made of rubber, plastic or metal;

(ii) Temporary Devices - They are usually individual. In poorer areas they are made of a range of materials such as cardboard, rubber, metal, plastic, wood, etc; in the better-off areas the households use plastic bags to store SW indoors and subsequently place them directly at the curb to be collected, dispensing with the use of bins.

This research has found that temporary devices are much more common than permanent bins in both areas of study, although the percentage is slightly higher in the area served by the public company, 64.0 percent. These figures strengthen the argument for frequent and reliable collections, since this method of storage does not minimize exposure of wastes. In the literature it is argued that the method of storage directly influences the levels of productivity and quality of services.

The distribution of the population in terms of the method of storage is presented in Figure 9.22.
The Privatisation of Municipal Solid Waste Management in Recife, Brazil

Figure 9.22 - Method of Domestic Storage of SW by Delivering Company

<table>
<thead>
<tr>
<th>Method of Storage</th>
<th>Delivering Company</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Private</td>
<td>Public</td>
</tr>
<tr>
<td></td>
<td>freq</td>
<td>%</td>
</tr>
<tr>
<td>Permanent Bins</td>
<td>100</td>
<td>39.4</td>
</tr>
<tr>
<td>Temporary Devices</td>
<td>154</td>
<td>60.6</td>
</tr>
<tr>
<td>Total</td>
<td>254</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Missing Cases: 46

9.4.2.4 Responsiveness of the Delivering Companies

To assess the responsiveness of the delivering companies three questions have been designed to find out: (i) whether any member of the household had ever made any complaint about the service: (ii) by which means; (iii) whether there had been a response. The findings about responsiveness in both areas of study is presented in Figure 9.23.

Figure 9.23 - Responsiveness by Delivering Companies

<table>
<thead>
<tr>
<th>Complaint</th>
<th>Delivering Company</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Private (%)</td>
<td>Public (%)</td>
</tr>
<tr>
<td></td>
<td>Total Response</td>
<td>Total Response</td>
</tr>
<tr>
<td>Had Complained</td>
<td>5.4 42.9</td>
<td>7.2 66.6</td>
</tr>
<tr>
<td>Had Never Complained</td>
<td>94.2 n/a</td>
<td>92.8 n/a</td>
</tr>
<tr>
<td>Don't Know</td>
<td>0.4 n/a</td>
<td>0.0 n/a</td>
</tr>
<tr>
<td>Total</td>
<td>100.0 n/a</td>
<td>100.0 n/a</td>
</tr>
</tbody>
</table>

Missing Cases: 24

According to these figures, there is a low level of complaints about MSWM services in Recife: 6.1 percent of the population had made a complaint to the delivering companies. Comparing the level of complaints in the two areas of study this research
has found that it is also low and very similar, the difference between them being negligible.

In relation to the responsiveness of the delivering companies, Fig 9.23 shows that of the 5.4 percent of the households in the privately served area who had made a complaint, 42.9 percent had received a satisfactory response; while in the publicly served area, of the 7.2 percent who complained, 66.6 percent received a satisfactory response. The rate of responsiveness, therefore, is higher in the public company.

Considering the means used to complain, this research has found that the majority of the complaints - 45.8 percent - were made by directly addressing the delivery crew during operations. Complaints made by phone accounted for 29.2 percent of the cases, followed by personal visits to the Urban Cleansing Department, 20.8 percent, and by complaints made by mail, 4.2 percent.

The distribution of means of communication used to make complaints between the two areas shows that in the publicly served area the percentages were equally distributed amongst three means: phone calls, personal visits to DLU and speaking directly to the delivering crew (33.3 percent). In the privately served area complaints were mostly made by directly addressing the delivering crew (58.3 percent), followed by phone calls (25.0 percent) and visiting ENTERPA and by mail, both with 8.3 percent of the cases.

The relationship between means used to make the complaints and responsiveness shows that the most effective way to complain to both companies is personally to visit the company's headquarters. Using the mail to complain is the most ineffective way in both companies. Phone calls and directly addressing the crew during operations are more effective in the case of the public company as compared to the private company.
9.4.2.5 Reliability of MSWM Services

In this research the reliability of MSWM services has been measured by the frequency of failures in scheduled operations, therefore all the services which have regular operations in both areas of study have been considered and the combined results are presented in Figure 9.24.

Figure 9.24 - Frequency of Failure in SW Collection by Delivering Company

<table>
<thead>
<tr>
<th>Frequency of Failure</th>
<th>Delivering Company</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Private</td>
<td>Public</td>
</tr>
<tr>
<td></td>
<td>freq</td>
<td>%</td>
</tr>
<tr>
<td>Very Often</td>
<td>5</td>
<td>2.0</td>
</tr>
<tr>
<td>Often</td>
<td>4</td>
<td>1.6</td>
</tr>
<tr>
<td>Occasionally</td>
<td>14</td>
<td>5.5</td>
</tr>
<tr>
<td>Seldom</td>
<td>87</td>
<td>34.3</td>
</tr>
<tr>
<td>Never</td>
<td>132</td>
<td>52.0</td>
</tr>
<tr>
<td>Don't Know</td>
<td>12</td>
<td>4.7</td>
</tr>
<tr>
<td>Total</td>
<td>254</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Missing Cases: 46

The reliability of MSWM services in the city appears to be satisfactory. A percentage of 5.9 of the households considered failures to occur often or very often; 11.6 percent considered failures to occur occasionally and 79.0 percent stated that failures seldom or never occur.

The comparison between the two areas of study has shown that the private company presents a higher level of reliability than the public company. Only 3.6 percent of the households answered that failures were very often or often, while this percentage to the public company was 10.0 percent, more than double. Those who found failures to occur occasionally are also much more frequent in the publicly served area (22.0 percent) than in the privately served area (5.5 percent). For those who find that
failures seldom or never occur, the difference is also high: to the private company the percentage is 86.3 percent and to the public company 66.6 percent.

9.4.2.6 Quietness of MSWM Services

The quietness of services has been measured in relation to quietness of equipment and quietness of delivering crew, combining all the MSWM services provided in the City.

Considering the quietness of equipment, this research has found that in Recife equipment used in MSWM services is considered noisy or very noisy by a fairly high proportion of users, approximately 18.1 percent. Around 24.5 percent of the respondents found the level of noise of equipment satisfactory, and 54.0 percent considered them quiet or very quiet.

As for the differences between the two delivering companies, the public sector seems to use quieter equipment than the private company. Figure 9.25 shows that 24.1 percent of the households served by the private company found the equipment used to be noisy or very noisy, whereas in the publicly served area this percentage is much lower: 8.0 percent.

As for those who consider the quietness of equipment to be satisfactory, the public sector and private sector present similar percentages, 25.6 and 22.7 percent respectively. In the privately served area 46.5 percent of the households consider the equipment used to be quiet or very quiet, a percentage much lower than that of the publicly served area: 68.6 percent. These figures show that in terms of equipment, the public sector has a much lower level of noise than the private sector.

Relating these findings to those about the type of equipment used by the companies there would be a case to argue that the high level of noise presented by the private company in relation to the public company may be due to the high percentage of
compactor trucks used by the former. The fact that the public company serves a higher percentage of poor areas forces the use of lighter equipment such as open top trucks, handcarts, sledges and tractors, which contribute to the lower level of noise it presents. However, one must bear in mind the level of noise a piece of equipment presents involves many other factors such as the technology used and the quality of maintenance and operation.

**Figure 9.25 - Quietness of Equipment by Delivering Company**

<table>
<thead>
<tr>
<th>Quietness of the Equipment</th>
<th>Delivering Company</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Private</td>
<td>Public</td>
</tr>
<tr>
<td>Very Noisy</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Noisy</td>
<td>54</td>
<td>11</td>
</tr>
<tr>
<td>Satisfactory</td>
<td>65</td>
<td>34</td>
</tr>
<tr>
<td>Quiet</td>
<td>117</td>
<td>101</td>
</tr>
<tr>
<td>Very Quiet</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Don't Know</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>254</td>
<td>150</td>
</tr>
</tbody>
</table>

Missing Cases: 46

Turning to the quietness of the delivering crew, this research has found evidence that the majority of the population in Recife consider the delivering crews to be quiet. Of the 404 households surveyed, 71.0 percent considered the crew quiet or very quiet. A further 21.0 percent find their level of noise satisfactory. Crews are considered noisy or very noisy by only 5.4 percent of the households. Figure 9.26 shows a similar picture.
Figure 9.26 - Quietness of the Delivering Crew by Delivering Company

<table>
<thead>
<tr>
<th>Quietness of the Delivering Crew</th>
<th>Delivering Company</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Private</td>
<td>Public</td>
</tr>
<tr>
<td>freq</td>
<td>%</td>
<td>freq</td>
</tr>
<tr>
<td>Very Noisy</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Noisy</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>Satisfactory</td>
<td>59</td>
<td>26</td>
</tr>
<tr>
<td>Quiet</td>
<td>171</td>
<td>114</td>
</tr>
<tr>
<td>Very Quiet</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Don't Know</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>254</strong></td>
<td><strong>150</strong></td>
</tr>
</tbody>
</table>

Missing Case: 46

The comparison between the two delivering companies shows that the public company crews are quieter than those of the private company. The percentages of those who find the crews noisy or very noisy are similar for the two companies (5.3 and 5.5 percent). A slightly higher proportion of households find the level of noise produced by the crews of the private company satisfactory (23.2 percent), than is the case with the public company (17.3 percent). However, when those who find crews to be quiet or very quiet are considered, the public company presents a higher percentage (76.7 percent) as compared to the private company (67.7 percent).

In summary, considering the quietness of the equipment and of the delivering crews used in the provision of MSWM services in Recife, this research has found that the public company gives a better performance than the private company. Equipment and crews are considered quieter in the publicly served area than in the privately served area.
9.4.2.7 Cleanliness of the MSWM Services

The cleanliness of MSWM services has been assessed by the frequency of spillage and the level of cleanliness of the street after the operations. Figure 9.27 shows the resulting numbers.

Figure 9.27 - Cleanliness of MSWM Services by Delivering Company

<table>
<thead>
<tr>
<th>Cleanliness of Service</th>
<th>Delivering Company</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Private</td>
<td>Public</td>
</tr>
<tr>
<td>Very Dirty</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Dirty</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>Satisfactory</td>
<td>65</td>
<td>46</td>
</tr>
<tr>
<td>Clean</td>
<td>160</td>
<td>89</td>
</tr>
<tr>
<td>Very Clean</td>
<td>16</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>254</td>
<td>150</td>
</tr>
</tbody>
</table>

Missing Cases: 46

The population in Recife, according to these figures, is satisfied with the level of cleanliness of the MSWM services. Approximately 66.8 percent of the respondents consider the service clean or very clean. A further 27.5 percent find the level of the street cleanliness after the services satisfactory and 5.7 percent of the surveyed households find the streets dirty or very dirty after the service.

The comparison between the two areas of study shows that there is not a significant difference in terms of service cleanliness between the private and the public sector. The percentages of the households who find the streets dirty or very dirty after the operations are similar in the two areas of study, 6.7 and 5.1 to the public and private sectors respectively. The figure in relation to those users who find the level of cleanliness of the streets satisfactory is slightly higher in the publicly served area,
whereas the percentage of those who find the services to be clean or very clean is slightly higher in the privately served area.

9.4.2.8 The Level of Users' Satisfaction

To assess the level of users' satisfaction in this analysis the answers to question 9 in Section B of the questionnaire have been used. The question asks the respondents how much of a problem MSWM services are to their households. Figure 9.28 presents the results.

**Figure 9.28 - Level of Users' Satisfaction by Delivering Company**

<table>
<thead>
<tr>
<th>Level of Satisfaction</th>
<th>Delivering Company</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Private</td>
<td>Public</td>
</tr>
<tr>
<td></td>
<td>freq %</td>
<td>freq %</td>
</tr>
<tr>
<td>A Big Problem</td>
<td>45 17.4</td>
<td>53 31.7</td>
</tr>
<tr>
<td>A Small Problem</td>
<td>34 13.1</td>
<td>22 13.2</td>
</tr>
<tr>
<td>It is not a Problem</td>
<td>180 69.5</td>
<td>91 54.5</td>
</tr>
<tr>
<td>Don't Know</td>
<td>0 0.0</td>
<td>1 0.6</td>
</tr>
<tr>
<td>Total</td>
<td>259 100.0</td>
<td>167 100.0</td>
</tr>
</tbody>
</table>

Missing Cases: 24

The figures above show that 63.6 percent of the population in Recife do not consider MSWM services a problem. If we interpret this as evidence of satisfaction the percentage of people who are satisfied with the level of quality provided by the company that serves the area where they live is 63.6 percent. A further 13.1 percent consider the services to be a small problem, and 23.0 percent consider the services as a big problem. Interpreting these answers as evidence of dissatisfaction means that 36.1 percent of the households in the city are dissatisfied with MSWM services.

The comparison between the two areas of study shows that the privately served area presents a higher percentage of people who are satisfied with the services: 69.5 percent
of the total, whereas the figure in the publicly served area is 54.5 percent. Those who consider the services to be a big problem are 31.7 percent in the publicly served area, whilst the figure to the private company is 17.4 percent. Dissatisfied people in the privately served area are 30.5 percent, while in the publicly served area the percentage is 44.9. In summary, the level of satisfaction is superior in the privately served area.

9.4.3 Quality in MSWM: An Inferential Statistics Analysis

The previous section has presented the findings of this research in relation to the quality of MSWM services based on data from the users - collected through the household survey - using descriptive statistics. It has provided a detailed examination of MSWM in Recife in relation to those aspects of service delivery which were assumed to be the most relevant in the level of satisfaction of the users, or in other words in the level of quality of the services. This examination provided the basis for a preliminary comparison between the two sectors.

This section aims at presenting the findings of the second analysis of service quality carried out in this research, which used inferential statistics, more specifically multivariate analysis, with three objectives:

(i) To define whether there is any difference in the level of users' satisfaction between the two areas of study;

(ii) To develop a procedure for predicting the level of satisfaction of the respondents and, in so doing, to identify which of the aspects of service provision addressed in the questionnaire are significant to the level of quality in MSWM in Recife. This means a selection of relevant aspects of service delivery carried out a posteriori i.e. based on the results of the survey;
(iii) To define how public performance compares with private performance in relation to the aspects found to be relevant in the provision of MSWM in Recife.

In this research a particular type of multivariate statistical technique has been used, logistic regression analysis. Multivariate analysis is generally used to identify the variables which are important in predicting whether an event will or will not occur, as well as identifying the variables useful in making the prediction (Norusis/SPSS 1994).

The basic assumption that has been used in the descriptive analysis has also been used in this section: the higher the level of users' satisfaction, the higher the quality of MSWM services. The statistical procedures used in this research are discussed in greater detail in the statistical appendix. The findings of this analysis are presented in the following sections.

9.4.3.1 The Level of Users' Satisfaction

To achieve the first objective - to find out whether there is any difference in the level of users' satisfaction between the two areas of study - questions 9, 10 and 11 in Section B of the questionnaire have been used:

- **Question 9** - How much of a problem is MSWM for your household?

- **Question 10** - The following is a list of the most frequent problems in solid waste collection. According to your experience in this street, what do you consider to be the main problem with this service?

- **Question 11** - Now, considering public cleansing, please indicate which of the following is the main problem with this service in this street.
The decision to use three questions - rather than just question 9 as in the descriptive analysis - was aimed at increasing the accuracy and validity of the measurement, since it combines the responses of a question related to MSWM in general and questions specific to SW collection and public cleansing.

The responses to questions 9, 10 and 11 were grouped into two categories - "satisfied" and "dissatisfied". In question 9, those who found MSWM to be a problem, either big or small, were considered dissatisfied. In question 10 and 11 only the respondents who answered that none of the listed aspects could be considered as a problem in the service they have available in their areas were regarded as satisfied in the categorisation.

This procedure has shown that most people in Recife are satisfied with the MSWM service they have available. As shown in Figure 9.29, 55.4 percent of the population of the City are satisfied, while 44.6 percent are dissatisfied.

<table>
<thead>
<tr>
<th>Level of Satisfaction</th>
<th>freq</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissatisfied</td>
<td>144</td>
<td>44.6</td>
</tr>
<tr>
<td>Satisfied</td>
<td>179</td>
<td>55.4</td>
</tr>
<tr>
<td>Total</td>
<td>323</td>
<td>100.0</td>
</tr>
</tbody>
</table>

The comparison of the two areas of study in relation to the level of users' satisfaction, has found that the privately served area presents a higher level as compared to the publicly served area. As shown in Figure 9.30, in the area served by the private sector 60.0 percent of the households are satisfied with the MSWM services they have available, while 47.5 percent of the respondents served by the public sector are satisfied with the services. Dissatisfied people in the privately served area are 40.0, while the figure to the public sector is 52.5 percent.
In short, although the difference is not dramatic, the majority of people served by the private sector are satisfied with the services, while the majority of the respondents served by the public sector are dissatisfied.

9.4.3.2 Relevant Aspects in the Quality of MSWM

As previously pointed out, in this analysis the selection of the aspects of service delivery which are significant to the level of users' satisfaction has been carried out through the use of logistic regression analysis. By constructing a logit model, the analysis aimed at finding out what it is that causes high levels of users' satisfaction with MSWM in Recife.

The construction of the logit model started out by hypothesising that the probability of satisfaction depends on a set of explanatory variables and their associated parameters. These explanatory variables were frequency, type of equipment used in SW collection, time of SW collection, method of domestic storage of SW, distance of pickup point, responsiveness of the delivering company, cleanliness of services, quietness of crew and equipment and reliability of services.

Through a process of experimentation a model that explained satisfaction with services was determined. The final model includes only the variables that proved to have
significant explanatory power, which were selected using the Likelihood-ratio (LR) test. In other words by the end of this stage the selection of aspects of service delivery which are relevant to the level of users' satisfaction - and to the level of quality in MSWM - were statistically determined.

The analysis has found that only four of the nine aspects that were assumed to explain the level of quality of MSWM provision proved to yield significant explanatory power in relation to the users' satisfaction: reliability, cleanliness, quietness and frequency of services. The type of equipment used in the service, the time of the day in which the service is provided, the method of domestic SW storage and the responsiveness of the delivering company did not present statistical significance in the level of users' satisfaction.

As with the first analysis of quality discussed in section 9.4.2, in this analysis the reliability of MSWM services is measured by the frequency of failures in the scheduled operations. Low levels of failure are interpreted as higher reliability of service. Cleanliness of services is assessed by the level of cleanliness of the street just after the operation. In the assessment of the quietness of services the level of noise of both the crew and the equipment is taken into consideration. Finally, the frequency of services is measured by the number of operations per week.

To test whether the model is biased towards the public or the private sector, a new variable was introduced - the delivering company - and its significance in the level of users' satisfaction was analyzed. The testing of this new variable aimed to find out whether there is any aspect in service delivery - other than those already taken into consideration - which presents differences between the private and the public areas and yields significant explanatory power in relation to users' satisfaction. The negative result of the test strengthened the reliability of the logit model and led to the conclusion that it can only be the performance of each sector in relation to the four
attributes - reliability, cleanliness, quietness and frequency - that accounts for the difference in the level of users' satisfaction.

9.4.3.3 The Association Between Variables

The strength of the dependence of the level of users' satisfaction on each of the four selected variables has also been examined in this research. Again, due to the triangulation approach adopted throughout the study, two methods have been used. The first uses a measure of association called Goodman and Kruskal's lambda which is a common measure in the case of nominal variables that follows the logic of proportional reduction error (PRE). Lambda always ranges between 0 and 1, making the meaning of association clearer. A value of 0 means that the independent variable does not contribute to the prediction of the dependent variable. A value of 1 means that the independent variable completely explains the dependent variable (Norusis/SPSS 1994). Figure 9.31 presents the values of lambda to the four selected variables.

Figure 9.31 - Value of Lambda by Aspect of MSWM Services Delivery

<table>
<thead>
<tr>
<th>Value of Lambda</th>
<th>Aspect of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reliability</td>
</tr>
<tr>
<td>0.30</td>
<td>0.25</td>
</tr>
</tbody>
</table>

The values of Lambda presented in the table above show that the independent variable which has the strongest contribution in the prediction of the level of users' satisfaction is the reliability of services. The second and third are the cleanliness and the quietness of services. The weakest correlation is with the variable frequency.

The second method employed in the assessment of the association between the level of users' satisfaction and each of the selected variables used logistic regression analysis. In logit models the contribution of individual variables depends on the other
variables in the model. A statistic which has been used in this research to examine the partial correlation is the R statistic. Its value varies from -1 to +1. A positive value indicates that as the variable increases in value, so does the likelihood of the event occurring. If R is negative, the opposite is true (Norusis/SPSS 1994). The values of R indicate the partial contribution of the variable to the model. Figure 9.32 presents the R statistic in the logit model.

**Figure 9.32 - Value of R by Aspect of MSWM Services Delivery**

<table>
<thead>
<tr>
<th>Aspect of Service</th>
<th>Reliability</th>
<th>Cleanliness</th>
<th>Quietness</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value of R</td>
<td>0.26</td>
<td>0.21</td>
<td>0.16</td>
<td>0.10</td>
</tr>
</tbody>
</table>

According to the logit model, the reliability of services is the variable with most explanatory power in relation to the level of users' satisfaction. The second most significant variable is the cleanliness of the service, followed by the quietness and frequency of services.

It is important to highlight the fact that the ranking of the variables in terms of their contribution to the prediction of the level of users' satisfaction in Recife is the same regardless of the method used in the assessment. In short, this research has found that reliability, cleanliness, quietness and frequency, in that order, are the aspects of service delivery which explain the differences in the level of users' satisfaction with MSWM services in Recife. According to the basic assumption, that is to say that these have proved to be the most relevant attributes in service quality from the users' point of view.

### 9.4.3.4 Quality and Ownership of the Delivering Company

Having defined which are the most significant aspects in the quality of service delivery, attention now turns to an examination of the performance of the two sectors
in relation to the four explanatory variables identified in the model: reliability, cleanliness, quietness and frequency of services.

Reliability of Services

The assessment of service reliability is based on the answers of the respondents to question 12 in Section B of the questionnaire, regarding all the MSWM services provided in the two areas of study:

- Question 12 Sometimes the crew fails to provide the service at the scheduled time. Please indicate which of the following answers best describes how often it happens in this street.

The questionnaire provided a five alternative scale to the level of services. In the analysis those responses have been grouped into four categories. Alternatives 1 and 2 were grouped in the category "low level of service", alternative 2 was considered as "satisfactory level of service" and alternatives 4 and 5 were grouped in category "high level of service". Finally, alternative 6 was considered as "missing cases".

The analysis has found that the reliability of services in Recife is perceived as high by 68.2 percent of the population. A further 27.3 percent find it satisfactory. Only 4.5 percent of the households consider the reliability of services as low, as shown in Figure 9.33.

As for differences between the privately and the publicly served areas, Figure 9.33 shows that a greater percentage of households in the area covered by the private sector perceive the level of service as high, 74.4 percent, while the figure in the publicly served area is 57.6 percent. The difference is 16.8 percent. As for those who consider the reliability of services as low, in the area served by the private company the percentage is 2.9 percent, while the number in the publicly served area is 7.2 percent.
In other words, in terms of reliability of services it appears that the private sector presents a better performance of service delivery.

**Figure 9.33 - Reliability of MSWM Services by Delivering Company**

<table>
<thead>
<tr>
<th>Level of Service</th>
<th>Delivering Company</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Private</td>
<td>Public</td>
</tr>
<tr>
<td>freq</td>
<td>%</td>
<td>freq</td>
</tr>
<tr>
<td>------</td>
<td>-------</td>
<td>------</td>
</tr>
<tr>
<td>Low</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Satisfactory</td>
<td>54</td>
<td>49</td>
</tr>
<tr>
<td>High</td>
<td>177</td>
<td>80</td>
</tr>
<tr>
<td>Total</td>
<td>238</td>
<td>139</td>
</tr>
</tbody>
</table>

Missing Cases: 57

**Cleanliness of Services**

The level of cleanliness of services has been measured by the responses to question 15 in Section B of the questionnaire.

- **Question 15** Regarding spillage, how would you rate the street after MSWM services?

In the analysis the responses were grouped into four categories. Alternatives 1 and 2 were grouped in category "low level of service". Alternative 3 was considered as "satisfactory level of service", alternatives 4 and 5 were grouped into category "high level of service" and alternative 6 was considered as "missing cases".

According to this categorisation, the analysis has shown that in Recife the level of cleanliness of services is considered high by 70.1 percent of the population. A further 26.5 percent find it satisfactory. Only 3.4 percent of the population find the level of cleanliness of services to be low.
The level of cleanliness of services presents only a marginal difference in the two areas of study. The percentage of people who perceive the cleanliness of services as high in the privately served areas is 71.7 percent and the figure to the publicly served area is 67.4 percent. The percentage of households who find the service satisfactory is higher in the areas served by the public sector, 30.5 percent while the figure is 24.3 percent in the other area. Those who consider the level of cleanliness as low are 4.0 percent in the area served by the private sector and 2.1 percent in the publicly served area. Those numbers show that in terms of cleanliness of services the differences between the two areas of study are not significant. The data is presented in Figure 9.34.

**Figure 9.34 - Cleanliness of MSWM Services by Delivering Company**

<table>
<thead>
<tr>
<th>Level of Service</th>
<th>Delivering Company</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Private</td>
<td>Public</td>
</tr>
<tr>
<td>(freq)</td>
<td>(%)</td>
<td>(%)</td>
</tr>
<tr>
<td>Low</td>
<td>10</td>
<td>4.0</td>
</tr>
<tr>
<td>Satisfactory</td>
<td>60</td>
<td>24.3</td>
</tr>
<tr>
<td>High</td>
<td>177</td>
<td>71.7</td>
</tr>
<tr>
<td>Total</td>
<td>247</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Missing Cases: 46

**Quietness of Services**

As previously pointed out, the quietness of services has been assessed considering the level of noise of both the equipment and the delivering crew, using questions 13 and 14 in Section B of the questionnaire.

- **Question 13** - In relation to quietness, how would you rate the equipment used in MSWM services in this street?
- **Question 14** - Still in relation to quietness, how would you rate the MSWM delivering crew in this street?
In both questions the answers were grouped into four categories: alternative 1 and 2 were grouped into category "low level of service", category 3 was considered "satisfactory level of service", alternatives 4 and 5 were grouped in category "high level of service" and alternative 6 was considered "missing cases".

According to this categorisation, this research has found that in Recife the percentage of households who find the level of quietness to be high is 64.5 percent, while 30.5 percent find it satisfactory. Only 5.0 percent consider the level of quietness as low. Figure 9.35 presents the data.

Examining each area of study, there is evidence that the level of quietness of services is considered high by a higher percentage of people in the publicly served area, 76.6 percent, as compared to the privately served area, 57.3 percent. On the other hand, the percentage of those who find the level of quietness of services satisfactory is higher in the privately served area, 37.2 percent, while the figure in the publicly served area is 19.1 percent. The difference between the two areas in relation to those who find the level of quietness low is not significant, 5.4 and 4.3 percent. In summary, these figures show that the level of quality in terms of quietness of services is higher in the publicly served area as compared to the privately served area.
Frequency of Services

In this analysis the frequency of services has been assessed based on question 3 in Section A of the questionnaire.

**Question 3** - How many times per week is the solid waste collected from your house?

The alternatives have been grouped into two main categories, satisfactory and non-satisfactory. Alternatives 1 and 2 were grouped in category "satisfactory level of service", alternative 3 was considered as "non-satisfactory level of service" and alternative 4 was considered as "missing cases".

Following this categorisation, this research has found that in Recife, 95.7 percent of the population find the frequency of MSWM services satisfactory, a very high percentage, which leads to the conclusion that frequency of services does not seem to be a problem in the city. Figure 9.36 presents the evidence.

**Figure 9.36 - Frequency of MSWM Services by Delivering Company**

<table>
<thead>
<tr>
<th>Level of Service</th>
<th>Delivering Company</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Private Sector</td>
<td>Public Sector</td>
</tr>
<tr>
<td>freq</td>
<td>%</td>
<td>freq</td>
</tr>
<tr>
<td>Unsatisfactory</td>
<td>5</td>
<td>2.1</td>
</tr>
<tr>
<td>Satisfactory</td>
<td>236</td>
<td>97.9</td>
</tr>
<tr>
<td>Total</td>
<td>241</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Missing Cases: 59

In the privately served area this figure is 97.9 percent, while in the publicly served area it is 91.8 percent. Those who find the frequency of MSWM services unsatisfactory in the privately served area are 2.1 percent, while the figure in the publicly served area is 8.2 percent, nearly four times as much. Therefore in terms of
frequency of services both services perform well, however the private sector has a superior performance.

9.5 Privatisation and Productivity in MSWM

9.5.1 Methodology

It has been pointed out in Chapter Four that improving productivity in the provision of infrastructure services has become the main objective in public sector reform (OECD 1991). The need to achieve a greater productivity in the provision of MSWM in developing countries is perhaps even greater and stems from three main factors: first, the high levels of expenditure with these services which already exists in most municipalities; second, the lack of money to expand the system, which presents low levels of coverage; and third, the increasing demand for such services in urban areas.

This research carried out a comparative analysis of productivity of MSWM services in the private and in the public sectors. The analysis has been carried out using the engineering approach as distinct from the econometric approach. This means that the productivity ratios which have been used are based on physical units, such as labour, equipment, tons of weight and time, rather than in terms of dollar cost of inputs, which is more usual in economic studies. This fact does not reflect a reduced concern with the dollar values of inputs, but aims at making feasible a productivity analysis of MSWM services in developing countries where the paucity of reliable data regarding costs of services in municipal administrations is widespread (Cointreau 1992). The assessment and comparison of productivity between private and public sectors based on physical terms has proved to be feasible and reliable to a satisfactory level. A separate analysis of the current MSWM costs to the government in Recife is carried out in section 9.6.
The present productivity analysis relies on data collected from archival records in both the private and public sectors. The difficulties in the process of gathering data from archival records about infrastructure services in municipal administrations in developing countries has already been discussed in Chapter Four. To increase the reliability and the validity of the collected data they have also been discussed in the semi-structured interviews carried out with a number of selected key-role holders, according to the triangulation approach used in this research (see Appendix 3).

Productivity has been measured for both labour and equipment, considering MSWM in general and using the measurements which have been discussed in Chapter Seven. Section 9.5.2 presents the findings in relation to MSWM services production in both the private and the public sector. Section 9.5.3 presents the findings of the comparative analysis of labour productivity and section 9.5.4 presents the findings related to equipment productivity.

9.5.2 Production of MSWM Services in Recife

Although some of the data presented in this section have already been presented elsewhere in this thesis, it is important to bring them together to provide the basis of the productivity analysis that has been carried out. Figure 9.37 summarizes some general information about the generation of MSW and service production in Recife. As shown in this Figure, it is estimated by the municipal administration that around 65 tons of MSW remain uncollected every day in Recife, which gives a good illustration of the need to expand services in the city. The analysis of coverage in this research suggests that this figure may be three or four times larger. This calls for the need to increase productivity, thus releasing resources to expand services without creating new burdens on the municipal budget.
Figure 9.37 - General Information about MSWM in Recife - 1993

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>1,298,229(^1)</td>
</tr>
<tr>
<td>Households</td>
<td>306,910(^1)</td>
</tr>
<tr>
<td>Average Household Size</td>
<td>4.23(^2)</td>
</tr>
<tr>
<td>MSW Generation per capita</td>
<td>1.35 Kg(^2)</td>
</tr>
<tr>
<td>MSW Generated Daily Average</td>
<td>1,753 tons</td>
</tr>
<tr>
<td></td>
<td>Monthly Average 52,578 tons</td>
</tr>
<tr>
<td></td>
<td>Annual Average 630,936 tons</td>
</tr>
<tr>
<td>MSW Collected Daily Average</td>
<td>1,688 tons</td>
</tr>
<tr>
<td></td>
<td>Monthly Average 50,648 tons</td>
</tr>
<tr>
<td></td>
<td>Annual Average 607,776 tons</td>
</tr>
<tr>
<td>Coverage</td>
<td>96.3%</td>
</tr>
<tr>
<td>Households not Covered</td>
<td>11,355</td>
</tr>
<tr>
<td>MSW not Collected per Day</td>
<td>65 tons</td>
</tr>
</tbody>
</table>

Sources: 1 IBGE (1991)  
2 PCR (1993a)

It has already been highlighted that a great difficulty in trying to raise MSWM productivity levels in developing countries is the fact that municipal administrations usually do not keep track of the level of productivity of services, either in terms of dollar costs of inputs or in relation to physical units. Therefore in this research, data from several different sources of information have been gathered and analyzed, resulting in the estimations presented in Figure 9.38. This information about service production in the two areas of study was used in the comparative productivity analysis carried out in the following sections.
According to Figure 9.38 the private sector serves a higher number of households. Despite the household size being smaller in its area as compared to the publicly served area the private sector collects a higher tonnage of MSW per day, perhaps because the level of income in its area is higher that in the public area, meaning that the amount of waste per household is larger as well. These figures show that there is an adequate basis for productivity comparisons at this level. This task is carried out in the next section, regarding labour productivity, and in section 9.5.4 in relation to equipment productivity.

9.5.3 Labour Productivity

MSWM in developing countries tend to be intensive in labour, since equipment is usually a costly input and often inadequate to operate in areas that present topographic difficulties. The total number of MSWM workers in Recife on the time of this research field work was 3,920, distributed between the private and the public sectors. The different functions in which they were allocated have been grouped into four main categories: administration, maintenance of vehicles and equipment, monitoring and support, and operational functions. In Recife around 79.9 percent of the MSWM staff worked directly in the delivery of the services, 8.8 worked with monitoring and support activities, 6.7 percent worked with maintenance of vehicles and equipment and
5.7 in administrative functions. Figure 9.39 below presents this data together with the distribution of staff per type of work in the two delivering companies.

![Figure 9.39 - Function of Staff by Delivering Company - 1993](image)

<table>
<thead>
<tr>
<th>Functions</th>
<th>Delivering Company</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Private</td>
<td>Public</td>
</tr>
<tr>
<td>Administration</td>
<td>50 3.1</td>
<td>172 7.5</td>
</tr>
<tr>
<td>Maintenance</td>
<td>58 3.5</td>
<td>206 8.9</td>
</tr>
<tr>
<td>Monitoring and Support</td>
<td>48 2.9</td>
<td>293 12.8</td>
</tr>
<tr>
<td>Operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drivers</td>
<td>135 8.3</td>
<td>197 8.6</td>
</tr>
<tr>
<td>Collectors</td>
<td>343 21.1</td>
<td>550 24.0</td>
</tr>
<tr>
<td>Sweepers</td>
<td>994 61.1</td>
<td>874 38.2</td>
</tr>
<tr>
<td>Total</td>
<td>1628 100.0</td>
<td>2292 100.0</td>
</tr>
</tbody>
</table>

Source: Based on information from PCR (1993b)

Figure 9.39 shows that in the private sector 90.5 percent of the staff have operational functions, while the figure to the public sector is 70.8 percent. The difference is significant. Administrative functions account for 3.1 percent of the staff in the private sector. In the public sector administrative functions account for 7.5 percent of the staff. A similar relation exists for maintenance functions, 3.5 percent in the private sector and 8.9 percent in the public sector. As for monitoring and support, the difference is even greater, 2.9 percent in the private sector and 12.8 percent in the public sector. To fully understand the meaning of these figures two points must be highlighted:

(i) First there is the fact that the public sector performs more activities of monitoring and support than the private sector. Activities such as planning, supervising and monitoring have increased since the privatisation process began because the public sector is accountable for all MSWM services in the city, including those provided in the private sector area. This means that the public sector must monitor and plan the
activities of the private sector. Furthermore, the public sector performs educational activities such as those highlighted in Chapter Eight regarding resources recycling. It also takes on medical and social services for the staff.

Nonetheless, compared to the private sector the public sector appears to be overstaffed in administrative and maintenance areas since according to the interviews with the managers in both sectors the differences in activities discussed above do not account for the greater percentage of workers in these two areas. As for operational functions evidence suggests that the public sector is understaffed as compared to the private sector. Within operational activities the public sector has a larger number of collectors despite the fact that it collects less solid waste and serves fewer people than the private sector.

(ii) The second aspect to be considered in this analysis of labour productivity relates to the significant differences in the public cleansing operations. It has been pointed out that the private sector carries out regular street cleaning while the public sector is more involved with seasonal, programmed and occasional operations which involve more manual activities. Due to this fact the productivity analysis whose findings are presented in the next sections are related to labour and equipment used in SW collection operations which do not include any of these differences. As a result, in all the calculations the sweepers in both sectors have been excluded.

To assess the labour productivity in the two delivering companies the measurements below have been carried out, as discussed in section 6.5. Figure 9.40 presents the findings of these measurements in the two areas of study.

- Tons collected / Worker-hour;
- Tons collected / Collector-hour;
- Tons collected / Driver-hour;
- Households served / Worker-hour;
The Privatisation of Municipal Solid Waste Management in Recife, Brazil

- Population served / Worker-hour;
- Population served / Collector-hour;
- Operational staff / Total staff;
- Total staff / Household;
- Total staff / Population served.

Figure 9.40 - Labour Productivity by Delivering Company

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Delivering Company</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Private Sector</td>
</tr>
<tr>
<td>Tons Collected/ Worker-hour (x 10)</td>
<td>2.12</td>
</tr>
<tr>
<td>Tons Collected / Collector-hour</td>
<td>0.42</td>
</tr>
<tr>
<td>Tons Collected / Driver-hour (x 10)</td>
<td>1.07</td>
</tr>
<tr>
<td>Households Served / Worker-hour</td>
<td>38.54</td>
</tr>
<tr>
<td>Population Served / Worker-hour</td>
<td>156.86</td>
</tr>
<tr>
<td>Population Served / Collector-hour</td>
<td>313.72</td>
</tr>
<tr>
<td>Operation Staff / Total Staff</td>
<td>0.75</td>
</tr>
<tr>
<td>Total Staff / 1,000 Households Served</td>
<td>4.00</td>
</tr>
<tr>
<td>Total Staff / 1,000 Population Served</td>
<td>0.98</td>
</tr>
</tbody>
</table>

Source: Based on information from PCR (1993b)

The figures show that in terms of tons collected the private sector presents a much higher productivity considering all the three measurements related to the issue, namely:

(i) productivity of the total staff of the delivering companies;
(ii) productivity of the collectors (workers involved in the collection of solid wastes in the streets);
(ii) productivity of the drivers.

The productivity of the total staff is nearly 2.6 times higher, while the drivers' productivity is 56.0 percent higher and the collectors' productivity is 55.0 percent.
superior as compared to the public sector. Considering the number of households there is evidence that 38.54 units are served per private sector worker-hour, while nearly one third of this number, 13.79, are served in the public sector. As for the population served per worker-hour, the private sector presents a number 2.5 times larger that the public sector.

The private sector involves 4.0 workers to serve 1,000 households, while the public sector involves 10.4. This means a difference in productivity of 160.0 percent. A similar difference exists in relation to the number of worker to serve 1,000 people. The figures are 0.98 for the private sector and 2.33 for the public sector. In short, considering all the measurements carried out in this research the private sector presents substantially higher labour productivity than the public sector.

9.5.4 Equipment Productivity

The productivity of equipment is an extremely important issue in the MSWM because it is a very costly input. Nonetheless, compactor trucks are a very common item in the fleet of delivering companies in developing countries, although inadequate in many cases. In Recife, 214 operational vehicles are used in the provision of MSW services, 155 by the public sector and 59 by the private sector.

According to Figure 9.41 the fleet of the private sector has less than a half of the vehicles of the fleet in the public sector. Besides being much smaller, the fleet in the private sector is much more homogeneous, which partially explains the smaller number of people working in maintenance activities. It must be pointed out, however, that the smaller and more homogeneous fleet is only possible because the area where the private sector operates presents fewer topographic problems and unpaved roads. This fact must be borne in mind when considering the figures in relation to equipment productivity in MSWM in Recife.
The comparison of the types of vehicles in the two sectors shows that in the private sector fleet compactor trucks are in the majority at 62.7 percent, while in the public sector they form only 24.5 percent of the fleet. Open top trucks, on the other hand, are in the majority in the public sector fleet at 58.0 percent, while they are only 28.8 percent in the private sector. Wooden top trucks are not important in either sector, accounting for only 8.5 percent of the vehicles in the private sector and 4.5 percent in the public sector. Tractors make up 13 percent of the vehicles in the public sector, but the private sector does not use them. Again the physical access to poorer areas may explain this difference.

A significant aspect of equipment productivity is related to the percentage of vehicles which on average are in operation. It is usual in developing countries to have a high proportion of vehicles in maintenance, since the fleet is often old and preventive maintenance is not satisfactory or completely non-existent.

Figure 9.42 presents the percentages of vehicles in operation, considering only the three types which are common to the two sectors. It shows that the private sector has a higher percentage of vehicles in operation, considering all three types of equipment. The differences are always significant. The number of vehicles in operation is usually associated with the age of the fleet, quality of preventive maintenance and quality of
roads in the collection routes. According to the interviews with the managers, all these factors play a role in the explanation of these figures. They also add the fact that in the private sector there is a reserve set of vehicles (around 15 percent) that come into operation when a problem occurs, keeping up the number of vehicles in operation.

Figure 9.42 - Vehicles in Operation by Delivering Company - 1993

<table>
<thead>
<tr>
<th>Type of Vehicle</th>
<th>Delivering Companies</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Private</td>
<td>Public</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Operation</td>
<td>Total</td>
<td>Operation</td>
</tr>
<tr>
<td></td>
<td>freq     %</td>
<td>freq      %</td>
<td>freq     %</td>
</tr>
<tr>
<td>Compactor Trucks</td>
<td>31        83.8</td>
<td>37        26</td>
<td>68.4</td>
</tr>
<tr>
<td>Open Top Trucks</td>
<td>16        94.1</td>
<td>17        80</td>
<td>88.8</td>
</tr>
<tr>
<td>Wooden Top Trucks</td>
<td>5         100.0</td>
<td>5         5</td>
<td>71.4</td>
</tr>
<tr>
<td>Total</td>
<td>52        88.1</td>
<td>59        111</td>
<td>82.2</td>
</tr>
</tbody>
</table>

Source: Based on information from PCR (1993b)

Taking these figures into consideration, this research carried out a productivity analysis in relation to open top trucks and compactor trucks, since the number of wooden top trucks is not significant. The following measurements have been taken in both sectors:

- number of equipment held in operation per week / total number of vehicles;
- number of people served / vehicle per month;
- tons collected / vehicle per month.

The comparison covers 82.5 percent of the fleet in the public sector and 91.5 percent in the private sector. Figure 9.43 below presents the findings.
The Privatisation of Municipal Solid Waste Management in Recife, Brazil

Figure 9.43 - Equipment Productivity by Delivering Company - 1993

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Delivering Company</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Private Sector</td>
<td>Public Sector</td>
</tr>
<tr>
<td>Vehicles in Operation / Total Vehicles</td>
<td>0.87</td>
<td>0.83</td>
</tr>
<tr>
<td>People Served / Vehicle per Month</td>
<td>11,956</td>
<td>4,746</td>
</tr>
<tr>
<td>Tons Collected / Vehicle per Month</td>
<td>16,157</td>
<td>6,371</td>
</tr>
</tbody>
</table>

Source: Based on information from PCR (1993b)

The figure above shows that the ratio between the number of vehicles in operation - open top and compactors - is higher in the private sector, however the difference is not dramatic. An important difference exists in the ratio of people served by truck per month. The figure for the private sector is 2.5 times bigger than that for the public sector. The same relation is true to the tonnage collected by vehicle per month.

These differences in equipment productivity are associated with two important factors. The first relates to the capacity of each type of vehicle. Figure 9.44 presents data about equipment capacity.

Figure 9.44 - Equipment Capacity by Delivering Company - 1993

<table>
<thead>
<tr>
<th>Type of Vehicle</th>
<th>Delivering Company</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Private</td>
<td>Public</td>
</tr>
<tr>
<td></td>
<td>Capacity Used</td>
<td>%</td>
</tr>
<tr>
<td>Compactor Truck</td>
<td>7.0 tons</td>
<td>6.52 tons</td>
</tr>
<tr>
<td>Open Top Truck</td>
<td>6.0 tons</td>
<td>5.54 tons</td>
</tr>
</tbody>
</table>

Source: Based on information from PCR (1993b)

These figures show that the private sector uses a higher percentage of the capacity of its equipment, over 90 percent, while the public sector uses approximately 80 percent. This partially explains the big differences in equipment productivity presented in Figure 9.44. However, the differences in the proportion of open top trucks and
compactors in the fleet of the private and public sectors must also be highlighted. In the private sector approximately 62.7 percent of the fleet consists of compactor trucks and 24.5 percent of open top trucks. In the public sector open tops are 58.0 percent and compactors are 28.9 percent. Considering that compactor trucks have higher productivity, this fact may also account for the dissimilar productivity levels.

9.6 Costs of MSWM to the Public Sector

9.6.1 Methodology

It has been previously highlighted in this thesis that MSWM provision may be a costly service to the municipal administrations in developing countries, sometimes corresponding to as much as 40.0 percent of the municipal budget. This is one of the most common reasons for the involvement of the private sector in service delivery. This section aims at comparing the costs to the government of MSWM services provided by the public and private sectors in Recife. In this analysis three questions have been addressed:

(a) How much does MSWM cost the government in Recife?
(b) What are the differences between costs of the private and public providers?
(c) Which part of these costs is paid by the users?

In the process of collecting the necessary data three sources of information were used: the delivering companies, the users and the municipal administration, particularly EMLURB and the Secretariat of Finance. As with the other assessments in this research, three methods of data collection were used, aiming at increased validity and reliability: the household survey, the archival records survey and the semi-structured interviews.
The Privatisation of Municipal Solid Waste Management in Recife, Brazil

Due to the different currencies used in Brazil during the eighties and early nineties, in this research all the values are given in US dollars in order to make comparisons feasible in an environment of high inflation and several different economic packages. As previously noted, the inflation of the US dollar in the period covered in this analysis (on average 3.8 percent per annum) has not been considered in the calculations.

9.6.2 Costs of MSWM to the Municipal Administration

To answer question (a) the costs of MSWM services to the municipal administration in Recife have been analyzed in the period from 1990 to 1994.

The evidence shown in Figure 9.45 is that over the five year period MSWM costs have increased approximately 47.06 percent, a very significant amount. The variation in each year in relation to the previous year does not show a clear pattern over the period. However absolute costs are on the increase between 1991 and 1994.

**Figure 9.45 - Costs of MSWM Services - 1990 to 1994**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total (US$)</th>
<th>Variation (%)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>22,087,709</td>
<td>n/a</td>
</tr>
<tr>
<td>1991</td>
<td>20,535,884</td>
<td>-7.1</td>
</tr>
<tr>
<td>1992</td>
<td>28,715,080</td>
<td>+39.8</td>
</tr>
<tr>
<td>1993</td>
<td>31,519,125</td>
<td>+8.9</td>
</tr>
<tr>
<td>1994</td>
<td>32,483,801</td>
<td>+3.0</td>
</tr>
</tbody>
</table>

* In relation to the previous year
Source: Based on information from PCR (1995)

Regarding the impact of MSWM costs on the municipal expenditures, this research has found evidence that it has increased over the same period, from 7.9 percent in 1990 to 12.5 percent in 1994, having reached 14.6 percent in 1993, as shown in Figure 9.46.

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The second question to be answered in this research, regarding costs of MSWM, is in relation to the differences between costs of the private and public provision. The comparative analysis of MSWM costs in the two areas of study is based on the figures for 1993 since this is the year upon which all the analyses of this research are based.

In 1993 the costs of MSWM to the government were approximately US $ 31,519,125 which corresponded to 14.6 percent of the municipal administration expenditures. Of this total, 51.0 percent corresponded to the on-payments to ENTERPA and 49.0 percent are related to DLU costs, as shown in Figure 9.47. Considering that 607,776 tons were collected in the city in 1993 from collection and public cleansing operations, the cost per ton was approximately US $ 52. The cost per household is approximately US $ 107 and the cost per capita is around US $25.
A study carried out by Yepes and Campbell (1990) in different cities of developing countries estimate notional costs for solid waste and public cleansing to range from US$ 15 to 27 per metric ton. However, the numbers from Brazil are better compared with other middle-income countries. Cointreau-Levine (1994), based on MSWM collection conditions observed in a wide range of middle-income countries in different regions of the world, has found that costs of these services range from US$ 30 to 70.

In Latin America, inter-country costs comparisons of MSWM based on a single currency (US dollar) are very difficult to make due to exchange rate distortions resulting from economic stabilisation packages and other economic specificities in different countries (Bartone et al. 1991). However, Figure 9.48 presents some costs of MSWM in Latin American cities, which are only indicative and therefore should be treated with caution.
The distribution of these costs between SW collection, public cleansing and disposal also vary in different countries. Approximately 95 percent of the MSWM costs in most developing countries are attributable to collection and public cleansing, while the approximate figure in developed countries is 70 percent (Cointreau-Levine 1994). The costs per ton of public cleansing, including general clean-ups of open areas and street sweeping, are two or three times the costs per ton of collection.

In some areas of Recife, the sweepings and general wastes from public cleansing operations are collected by the same teams and equipment that perform solid waste collection. This difference is reflected in the cost accounting system, which makes separating the costs of public cleansing from solid wastes collection and disposal virtually impossible. However, the interviews with the managers and experts carried out in this research revealed that the share of costs of disposal in the total costs of MSWM is estimated to range from 5 to 10 percent, which is compatible with the findings of Cointreau-Levine (1994).
9.6.4 Comparison of MSWM Costs in the Two Areas of Study

As discussed in section 2.4, the private provision of goods and services is considered by many commentators to be beneficial to the consumers, since the higher productivity presented by the private sector in the production process would be reflected in lower prices to the consumers.

It has also been previously discussed in section 4.5 that studies carried out in developed countries, as illustrated by Donahue (1989), found evidence that MSWM services provided by public monopolies typically cost 25 to 41 percent more than contracted services. However, differences in costs of MSWM production between the private and public sectors in developing countries have not been sufficiently assessed to allow firm conclusions.

The evidence found in this research indicates that the cost of each collected ton of solid waste in the privately served area was approximately US$ 51, while in the publicly served area the cost was US$ 53, as shown in Figure 9.47. These figures indicate that the cost per ton in the privately served area is 3.8 percent lower than the cost in the publicly served area, which is only a marginal difference. This difference is particularly small when one considers the substantial differences in productivity reported in section 9.5. The difference in the cost per capita is also marginal. As for the difference in the cost per household (12.8 percent), apparently it reflects the difference in the size of the household between the two areas of study, which can be observed in Figure 9.38. Therefore, the evidence suggests that there is no significant difference in costs to the public sector of services privately and publicly provided.

Apparently these findings substantiate the position of Bartone et al. (1991), who notes that private sector provision can be successful in terms of costs containment of services as long as the conditions for contestable markets are met. The issue of
The Privatisation of Municipal Solid Waste Management in Recife, Brazil

Contestability of markets seems to be crucial for the lowering of costs of MSWM services provided by the private sector in developing countries.

Although this research does not have a longitudinal design, Figure 9.49 provides a series of unit costs of MSWM services provided by the private sector in selected years between 1987 and 1994.

### 9.49 - Costs of MSWM Services in the Privately Served Area

**Selected Years 1987 - 1994**

<table>
<thead>
<tr>
<th>Service</th>
<th>Costs of Services to the Municipal Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1987</td>
</tr>
<tr>
<td>Street Cleaning (US $/km)</td>
<td>8.80</td>
</tr>
<tr>
<td>Beach Cleaning (US $/pm)</td>
<td>22,220</td>
</tr>
<tr>
<td>SW Collection (US $/ton)</td>
<td>15.49</td>
</tr>
<tr>
<td>Pruning of Trees (US $/ton)</td>
<td>12.67</td>
</tr>
<tr>
<td>Transport (US $/ton x km)</td>
<td>0.23</td>
</tr>
<tr>
<td>Transport of collection (US $/ton x km)</td>
<td>n/a</td>
</tr>
<tr>
<td>Transport of other Residues (US $/ton x km)</td>
<td>n/a</td>
</tr>
<tr>
<td>Weeding Paved Road (US $/km)</td>
<td>n/a</td>
</tr>
<tr>
<td>Weeding Unpaved Road (US $/km)</td>
<td>n/a</td>
</tr>
<tr>
<td>Special Wastes Collection (US $/ton)</td>
<td>n/a</td>
</tr>
<tr>
<td>Street Sweeping Collection (US $/ton)</td>
<td>n/a</td>
</tr>
</tbody>
</table>

1 Variation over the period 1987 - 1994
2 Variation over the period 1990 - 1994
Source: Based on information from PCR (1994)

These figures show that in 1990 the structure of prices underwent changes that created new services, such as the weeding of paved and unpaved roads and the Assorted Wastes Collection. The transport prices were split into transport of collection, transport...
of other residues and transport of wastes from street cleaning. The necessary information to assess the influence of this splitting of transport costs in the overall prices of the services was not available during this research field work.

These figures also indicate that the unit prices of all the services provided by the private company in the city have suffered increases over the two periods considered in the figure. Many factors may explain such increases, among which two must be highlighted:

(i) a decrease in the level of productivity in the private production of MSWM in the period;
(ii) lack of capability of the municipal administration to negotiate the terms of the contract between the private contractor and the public sector.

However, pinpointing the exact combination of factors and the extent of their contribution to the situation pictured in Figure 9.49 demands further analyses which are not within the scope of this research.

9.6.5 Cost Recovery in MSWM in Recife

In Recife all the costs with MSWM are covered by the funds allocated by the municipal administration to EMLURB, according to the Conta Unica system, as discussed in section 8.3. Cost recovery for these services is achieved through a user tax, collected with the property tax. Although DLU has four other sources of revenue, the TLP - Tax of Urban Cleansing - accounts for nearly 92.5 percent of all the revenues. Due to this fact the analysis of the rate of cost recovery in MSWM in this research is based on the costs of services and on the revenues from TLP. The contribution of TLP to the total municipal revenue in the last five years is very small, ranging from 0.96 to 1.83 percent, as shown in Figure 9.50 below.
The Privatisation of Municipal Solid Waste Management in Recife, Brazil

Figure 9.50 - TLP in Relation to the Municipal Revenue - 1990 to 1994

<table>
<thead>
<tr>
<th>Year</th>
<th>TLP (US$)</th>
<th>Total Municipal Revenue (US$)</th>
<th>TLP / Municipal Revenues (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>3,186,403</td>
<td>296,092,996</td>
<td>1.08</td>
</tr>
<tr>
<td>1991</td>
<td>3,889,745</td>
<td>254,138,334</td>
<td>1.53</td>
</tr>
<tr>
<td>1992</td>
<td>2,785,072</td>
<td>259,458,989</td>
<td>1.07</td>
</tr>
<tr>
<td>1993</td>
<td>2,623,141</td>
<td>272,673,354</td>
<td>0.96</td>
</tr>
<tr>
<td>1994</td>
<td>5,320,586</td>
<td>290,319,063</td>
<td>1.83</td>
</tr>
</tbody>
</table>

Source: Based on information from the PCR (1995)

As for the contribution of TLP to the total costs of MSWM, Figure 9.51 below shows that during the period from 1990 to 1994, the tax covered less than 20.0 percent of the costs, ranging from 8.32 to 18.90 percent. In other words the cost recovery rate is very low in the provision of MSWM in Recife.

Figure 9.51 - TLP in Relation to the Costs of MSWM - 1990 to 1994

<table>
<thead>
<tr>
<th>Year</th>
<th>TLP (US$)</th>
<th>MSWM Costs (US$)</th>
<th>TLP / MSWM Costs (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>3,186,403</td>
<td>22,087,709</td>
<td>14.42</td>
</tr>
<tr>
<td>1991</td>
<td>3,889,745</td>
<td>20,535,884</td>
<td>18.90</td>
</tr>
<tr>
<td>1992</td>
<td>2,785,072</td>
<td>28,715,080</td>
<td>9.69</td>
</tr>
<tr>
<td>1993</td>
<td>2,623,141</td>
<td>31,519,125</td>
<td>8.32</td>
</tr>
<tr>
<td>1994</td>
<td>5,320,586</td>
<td>32,483,801</td>
<td>16.38</td>
</tr>
</tbody>
</table>

Source: Based on information from PCR (1995)

Bartone et al. (1991), in the study of four Latin American cities has found variable ratios of self-financing in the provision of MSWM, most of them much higher than in Recife, as shown in Figure 9.52.
It has been highlighted in section 8.3 that the collection of TLP in Recife presents several problems which are related to the fact that it is billed and collected together with the IPTU, being exposed to the same exemptions and problems as the property tax. It is estimated by the municipal administration that around 60.0 percent of the users of MSWM are billed for TLP every year and the information regarding the actual payment of the tax is not available.

In this research a tentative assessment of the proportion of the users who pay for MSWM has been carried out. Due to the sensitivity of the issue the respondents were asked whether they had been billed - rather than whether they had paid - for TLP and whether they knew the approximate value of the tax. Nonetheless, the results of these questions must be treated with caution, since respondents are not always willing to provide the real answer to questions related to fiscal issues.

This research has found that 76.1 percent of the respondents had been billed for TLP in 1993. The remaining 23.9 percent declared to be exempt, as shown in Figure 9.53.
Figure 9.53 - Households Billed for TLP in Recife - 1993

<table>
<thead>
<tr>
<th>freq</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>324</td>
</tr>
<tr>
<td>No</td>
<td>102</td>
</tr>
<tr>
<td>Total</td>
<td>426</td>
</tr>
</tbody>
</table>

Regarding the distribution of those who had been billed for the TLP in Recife in relation to the two areas of study, Figure 9.54 shows that in the privately served area, 83.9 percent of the households declared to have been billed for the services, whereas the figure for the publicly served area is 61.4 percent.

As for the income levels of the respondents, this research has found that the percentage of households that had been billed for TLP in 1993 ranges from 40.0 in the group that earn less than 1 MW to 100.0 percent in the group that earns 10 MW or more. These results are consistent with the exemption policies of the municipal administration.

Figure 9.54 - Household Billed for TLP by Income Level by Delivering Company - 1993 (%)

<table>
<thead>
<tr>
<th>Billed Households</th>
<th>0-1 MW</th>
<th>1-3 MW</th>
<th>3-5 MW</th>
<th>5-7 MW</th>
<th>7-10 MW</th>
<th>10 MW+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private</td>
<td>50.0</td>
<td>77.4</td>
<td>100.0</td>
<td>87.0</td>
<td>92.8</td>
<td>100.0</td>
</tr>
<tr>
<td>Public</td>
<td>25.0</td>
<td>57.8</td>
<td>84.6</td>
<td>66.7</td>
<td>80.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>40.0</td>
<td>67.3</td>
<td>95.1</td>
<td>80.0</td>
<td>89.4</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Considering the differences between the two areas of study, evidence suggests that in both areas the groups which present the lowest percentage of households that had been billed for TLP are those who earn less than 1 MW per month: 50.0 and 25.0 percent.
to the privately and publicly served areas respectively. These results are also consistent with the results of the archival records survey, since a greater proportion of poor households live in the publicly served area.

According to the household survey, in Recife of those who declared to have been billed for IPTU and TLP in 1993 only 2.1 percent knew how much they had been charged for the MSWM services. In the area served by the private sector, of those who had received the bill, only 3.6 percent knew the value of the TLP. For those served by the public sector, the percentage of the householders who knew the value of TLP was 1.0 percent.

9.7 Comments on the Findings

The previous sections have reported the main findings of this research in relation to the four variables considered in the study: accessibility, quality, productivity and costs of MSWM services to the private sector. This section provides comments that may useful in the interpretation of these findings.

The first comment is related to the analysis of accessibility to MSWM services. Two aspects have been measured: coverage and level of service. Regarding coverage, it has been found that the service is not accessible to the whole of the population in Recife. The official figure provided by the municipal administration in relation to the coverage of MSWM services in 1993 is 96.3 percent. The household survey has found a similar, although slightly smaller, number: 94.8 percent.

However, it must be highlighted that these figures only reflect the percentage of the population that has access to any type of MSWM service. When the households were asked about the amount of the produced SW that was actually placed for collection, this study found that only 79.5 percent of the population had all their SW collected by the MSWM service. In other words, the coverage of the services at the standard
The Privatisation of Municipal Solid Waste Management in Recife, Brazil

level suggested in the PDCR (the City Master Plan) is much smaller than the official figure. Furthermore, there is an important percentage of the population that, although having access to MSWM services, still dispose of part of the SW produced by the household at inappropriate sites.

The fact that the above situation is more usual in the publicly served area (27.1 percent) as compared to the privately served area (16.2 percent), raises an important point that must be taken into account in the interpretation of this and other findings of this study: the specifics of the two areas of study. As has been previously highlighted, there are differences regarding the physical aspects and the population of these areas. Such differences do not affect the level of comparability between the two areas, however, they exist and deserve some comments.

The area served by the public company presents more difficulties in physical accessibility, due to its topography and more deficient infrastructure. Moreover, the population has a lower level of income, which is usually associated to a lower level of education, particularly environmental education. These topographic and demographic differences between the two areas of study may partially explain the relative inefficiency found in the public sector, not only in relation to accessibility but also productivity and quality of services.

The lower coverage at the standard level as defined by the PDCR presented by the public company illustrates one such case. It may be interpreted as an indication of the superior performance of the private sector, but it also reflects problems associated with the conditions of domestic storage of wastes in low income housing and, perhaps, a lower level of environmental concern in the publicly served area.

These characteristics of the area and population served by the public sector also play a role in the differences in accessibility between PAR. The worst served areas are
precisely those that present more difficult topography, and lower level of income. Such areas are more common in the part of the city served by the public sector.

In the quality assessment, this research has also found evidence that the private sector presents a superior performance. The four aspects which were found to explain the level of users' satisfaction in the city were: cleanliness, quietness, frequency and reliability. The findings of this study show that reliability and frequency have proved to be the aspects which most influence the level of users' satisfaction with MSWM services, since the staff and equipment of the public sector are quieter, as compared to the private sector, and the level of cleanliness is similar in the two areas of study.

Reliability seems to be the most relevant aspect, since the values of R and lambda were the highest among those of the four explanatory variables considered in the logit model used in this research, as shown in section 9.4.3. This is to say that the higher reliability of services presented by the private sector is the main reason for the higher level of users' satisfaction in the privately served area.

Two aspects of the results related to quality of services must be highlighted:

(i) First, the difference in quality of services between the two areas of study is smaller than was to be expected on the basis of the strong claims made by several commentators about the greater concern of private sector managers with the provision of services and goods in accordance with the needs of the users, as presented in the literature review (Chapter Two). Indeed, alongside productive efficiency arguments, the claims related to the higher level of service quality are the commonest in the privatisation debate.

Two comments are pertinent: in the non-scheduled interviews the managers in the private company have argued that there is excessive regulation by the public sector, which limits their managerial decisions. Therefore, this small difference in service
quality between the two areas of study may be interpreted as a result of the level of
regulation by DLU in relation to the service provided by ENTERPA.

Another element that may be associated with this finding is the lack of competition
found in the provision of MSWM services in Recife. A large part of the arguments
pro-privatisation is based on the belief that the benefits introduced by privatisation are
the consequence of a greater level of competition in the production of goods and services. Therefore, as already pointed out, privatisation without competition is
claimed by many authors to be fruitless in terms of increases in the quality of service
provision.

(ii) Secondly, the differences between the two areas of study must, again, be taken into
consideration in the interpretation of this result. A population with a higher level of
income and education, such as the one served by the private sector, is expected to be
more rigorous in the assessment of service quality, as compared to a poorer and less
educated population, which present a lower level of citizenship awareness and deal
with many other difficulties regarding housing and infrastructure conditions, as is the
case of the publicly served area.

These differences are also relevant in the interpretation of the fact that the private
sector has shown a superior performance in regards to frequency and reliability of
services. In the privately served area 97.1 percent of the population consider the level
of reliability of services as high or satisfactory. The figure in the publicly served area
is 92.8, as shown in Figure 9.33. In the interpretation of these findings, however, one
must bear in mind that the reliability and frequency of services are aspects that have
strong links with the topography and conditions of physical access to the area to be
served, not only in MSWM but also in many other infrastructure services.
Regarding **productivity**, the claim of many commentators about the difficulties in finding data about productivity of infrastructure services provided by the public sector in developing countries was found to be true in this study.

Nonetheless, the comparison between the performance of the two companies has shown that both equipment and labour productivity are superior in the privately served area. The private sector has a smaller staff and serves a larger population, as compared to the public sector (Figures 9.38 and 9.39). Examining the distribution of workers among the four main functions in MSWM, the evidence indicates that the private sector has more workers in operational functions than the public sector does, whereas the public sector has more people in administrative, maintenance, and monitoring and support functions, as compared to the private sector: in the private company 90.5 percent of the staff have operational functions, whereas the figure in the public sector is 70.8 percent. The number of workers in administrative, maintenance and support functions in the public sector is 4.3 times larger, as compared to the private sector. In operational functions, the staff in the public sector is 1.6 times larger.

These figures show that the productivity of labour in the privately served area is substantially higher than it is in the publicly served area. The above figures may also be interpreted as evidence of overstaffing and inadequate distribution of personnel among functions in the public sector. However, in relation to this proposition, it is important to highlight that the form in which the private sector has been involved in the provision of MSWM services in Recife implies that the public sector is accountable for all MSWM services in the city, including those provided by the private sector. That is to say that the public sector regulates, plans and monitors the activities of both, private and public sectors.

This characteristic is reflected in the figures about labour productivity. They suggest that the labour productivity based on total staff presents much larger difference between sectors than does the labour productivity based only on operational staff.
Considering tons collected per worker-hour, for instance, the productivity of the private sector is 2.6 times higher than the public sector. However, if only operational staff is considered in the assessment, the figure drops to 1.8 times for collectors, and 1.5 times for drivers. In terms of population served per worker-hour, a similar fact occurs. Considering the total staff, the evidence indicates that the private sector worker serves approximately 2.6 times more people, as compared to the public sector. Again, the difference in productivity between sectors based on operational staff is much smaller: private collectors serve 1.7 times more people than collectors in the public sector.

At any rate, labour productivity is higher in the private sector. The relevant point that the figures above highlight is that part of the inefficiencies attributed to the public sector may be the consequence of the additional roles performed by the public sector due to the presence of the private provision of services, such as regulating, planning and monitoring the activities performed by the private sector.

Regarding equipment productivity, the private sector also presents a better performance. It has a smaller and more homogenous vehicles fleet, as compared to the public sector. The private company uses more compactor trucks, whereas the public sector uses more open top trucks and tractors. Compactor trucks present higher productivity, as compared to open top trucks, however, the latter are more appropriate to areas where the topography presents problems, such as hilly areas, or where accessibility is limited by unpaved and narrow roads. Therefore, it is quite clear that due to characteristics of a large part of the area it serves, the public sector is forced to use vehicles that present lower levels of productivity to ensure the accessibility to services.

Other aspects also influence the level of equipment productivity. The fact that, in Recife, the percentage of vehicles in operation in the private sector is higher than the percentage in the public sector also plays a role in explaining the difference in
productivity between sectors. The percentage of vehicles in operation is usually associated with the age and capacity of the fleet, quality of preventive maintenance, and quality of roads in the collection routes. In all these aspects the private sector presents advantages as compared to the public sector, as shown in section 9.5. These facts suggest that the equipment and labour productivity of MSWM services are influenced by the specifics of the area and population served, as is the case with service quality and accessibility.

The last comment on the evidence found in this study is in regards to the costs of MSWM services to the public sector. It has been highlighted in Chapter Two that a supposed decrease in the costs of goods and services provision is one of the main reasons for the involvement of the private sector in these activities, particularly in municipal administrations. In developing countries, the pressing budgetary problems encountered by municipalities push governments into introducing privatisation policies in infrastructure service provision, counting on the release of resources to finance activities such as health and education.

However, the evidence found in this research do not support the claims that the involvement of the private sector reduces the costs of MSWM to the public sector. In fact, in the five year period considered in this research (1990-1994), the costs of MSWM in Recife have increased approximately 47.0 percent, a very significant amount. The impact of these costs on the municipal expenditures has also increased over the same period, from 7.9 percent in 1990 to 12.5 in 1994.

Moreover, the comparison of unit costs of MSWM services to the municipality indicates that there is only a marginal difference between the private and public sectors: US$ 53 and US$ 51 respectively. This difference (3.8 percent) is considered particularly small when the much larger difference in productivity between sectors is taken into consideration. Furthermore, the costs of privately provided services have increased in the period from 1987 to 1994, and at present costs of MSWM services
to the municipal administration in Recife are higher than those of other similar cities in Latin America and in the country.

Therefore, the evidence about costs of MSWM in Recife found in this research calls into question many of the arguments in the privatisation debate, since higher productivity is usually directly associated to lower costs and, therefore, lower prices. The figures above have made it clear that this is not necessarily true.
CHAPTER TEN - CONCLUSIONS

10.1 Overview

This research has achieved its general and specific objectives set out in Chapter One, as well as proving the hypothesis established in Chapter Six. First, it has provided a detailed description of the current practice of MSWM provision both in the private and the public sectors in Recife, Brazil, examining institutional, financial and operational aspects. Secondly, this research has compared the performance of both the private and the public sectors in the provision of MSWM in Recife in relation to the four main objectives of MSWM provision discussed in Chapter Four: accessibility, quality, productivity and costs to the municipal administration.

According to the concept of efficiency used in this research, the comparative analysis of the performance of the private and public sectors has been carried out in two steps: first, the main objectives of service provision have been established, incorporating the points of view of the main actors involved in MSWM service provision and consumption; secondly the performance of both sectors has been analyzed in relation to these objectives. In so doing, the four hypotheses established in Chapter Six have been tested:

(i) The private sector provides a higher level of accessibility to MSWM services in Recife;
(ii) The private sector presents a higher level of quality in the provision of MSWM services in Recife;
(iii) The private sector presents a higher level of productivity in the provision of MSWM services in Recife;
(iv) The costs to the municipal administration of MSWM services provided by the private sector are lower than the costs of the public sector in Recife.

The analysis of the evidence found in this research indicates that sub-hypothesis (i), (ii) and (iii) have been proved. As a result, the fundamental hypothesis of this thesis:
The involvement of the private sector improved the efficiency of MSWM in Recife, Brazil - has been demonstrated in relation to the main interest of three of the four actors considered in this research: the users, nonusers and operators of MSWM. The results of this research do not demonstrate sub-hypothesis (iv), which relates to the primary concern of the municipal administration: the lowering of MSWM costs to the public sector, as further discussed in section 10.3.

10.2 Critical Analysis of the Research

This section examines the successes and shortcomings of this research. First it discusses the site where the research has been carried out, highlighting the specific characteristics that justified its choice and influenced the research analytical framework and methodology. Secondly, it examines the analytical framework in relation to the purposes of the research. Thirdly, it discusses the methods of data collection. Fourthly, it examines the methods employed in the analysis of the data collected during the fieldwork stage.

10.2.1 The Research Site

The city of Recife, Brazil, proved to be a good case for the examination of the privatisation of MSWM services. As described in Chapter Five, in 1984 the municipal administration contracted a private company, ENTERPA, to provide MSWM services in approximately half the city while the remaining areas continued to be served by the public company, DLU. This situation created the right conditions for a comparative study of the performance of the private and public sectors in providing MSWM and to the assessment of the implications for the different groups of society of involving the private sector in this activity.

Although the proportion of the city that is served by the private sector has been extended over the years, it has been done to allow more poor neighbourhoods to be
covered by the private company, which only made the city more adequate for a comparison between sectors. For the purposes of this research the city has been divided into two study areas, a privately served area which corresponds to approximately 55.0 percent of the City and a publicly served area corresponding to the remaining 45.0 percent.

The operational procedures of specific MSWM services in these two areas have different degrees of similarity, therefore the methodology used in this research has been designed to ensure that comparisons have been carried out only in those cases where similar services are involved, preserving the reliability of the research findings.

10.2.2 The Analytical Framework

The analytical framework used in this research succeeded in its purpose of organizing the data collected in the field work from different sources and through distinct data collection methods, allowing the comparisons between the private and public performance to be feasible and reliable.

The main characteristic of the methodology used is the triangulation approach, which has been employed as a means to strengthen the validity and the reliability of the research results. It has been used in the data collection stage, which used several sources of data and different methods of collection, and during the data evaluation and analysis. Although ensuring reliable and robust findings, the triangulation approach may introduce a certain degree of complexity in data management, which happened in this research. The clarity of the analytical framework proved to be crucial to the research inasmuch as it organized the data and guided the analysis process, leading to clear and concise findings.

The variables used to express the research problem and the hypothesis constructed to summarize the research questions are essential parts of an adequate analytical
framework. In this research they have proved to be appropriate and compatible with the instruments of data collection and measurement. This compatibility enabled the researcher to successfully draw the conclusions of the study summarized in the next section.

10.2.3 Data Collection Methods

Three methods of data collection have been used in this research: archival records survey, household survey and non-scheduled interviews. The use of different methods aimed at strengthening the validity of the data collected, since they have been chosen in relation to each different source of data. The evidence from the delivering companies and from the government has been collected through archival records surveys and through non-scheduled interviews with managers and other decision makers. Data from the experts, politicians, and community leaders has been collected through non-scheduled interviews. Evidence from the users of MSWM services has been collected through a household survey.

Although extra attention had to be given to the process of data evaluation and management, the use of different methods and sources in the collection of data has proved to be a good methodological decision because it provided a basis for testing the reliability of the instruments of collection, in other words of the data itself. It also proved relevant in the data analysis process since the findings from different surveys could be compared within the same research, providing solid grounds for the conclusions.

10.2.4 Data Analysis Process

The triangulation approach adopted throughout this research meant that different methods have also been used during the analysis of the data. Not only have different processes been used to analyze data from different surveys and to test different
hypothesis, but distinct methods have been used to analyze the data collected from the users, through the household survey, to test the hypothesis that relates to the quality of MSWM services.

This approach provided greater reliability to the results of this research, since the consistency of the findings could be tested against the results achieved through different methods based on the same set of data, as well as with the results of other studies carried out in similar contexts. The level of accuracy and reliability of these findings therefore may be assumed to be higher than those that are based on single-method analysis.

10.3 Discussion of the Main Research Findings

This section discusses the research findings reported in Chapter Nine, in terms of their interpretation and relevance. It examines the main results of this study, reflecting back on the theory addressed in Chapter Two, Three and Four, and on the existing empirical studies. In so doing, the section highlights the implications and significance of the results of this research for knowledge about the privatisation of infrastructure services in developing countries, particularly municipal solid waste management.

The first part of the research results, presented in Chapter Eight, is self-explanatory since it consists of a description of the MSWM services provided in Recife, both by the public and the private sectors. This set of findings is significant because not only does it contribute to remedying the deficiency found in the literature of studies addressing the provision of MSWM services in the developing world, but the lessons that can be learnt from this description are also relevant for the privatisation decision in many other municipal administrations in the developing world.

The second part of the findings regards the testing of the four sub-hypotheses presented in Chapter Six. This section discusses these findings, which are related to
the differences between the private and the public sectors in accessibility, quality, productivity and costs of MSWM services to the municipal administration.

10.3.1 Accessibility to Services

In this research, two aspects of accessibility to MSWM services have been analyzed: coverage and level of services. The evidence suggests that the coverage of MSWM services in Recife may be considered high (94.8 percent), when it is measured on the basis of the percentage of the population that has access to a regular MSWM services. However, when coverage is measured according to the standard level of service defined by the City Master Plan (a house-to-house service that collects all the waste produced by the household, three times per week) the figure drops to 79.5 percent. Three relevant finding of this study, therefore, are:

(i) the coverage of MSWM services in the city, at the standard level is much lower than the official numbers show;

(ii) there is a large percentage of the population (approximately 15.5 percent) who, although having access to MSWM services, still dispose of the domestic wastes at inappropriate sites;

(iii) the amount of uncollected wastes left in inappropriate sites every day in Recife may be as high as 275 tons.

The reasons for this fact seem to be related to two factors: difficulties in storing the wastes within the housing unit, and lack of reliability of collection operations.

The results of this study support the claim of many commentators in the literature that the poor are the most hit by the lack of adequate infrastructure services in cities of the developing world. It has been found in the household survey that, in Recife, there is
a link between low income levels and lack of MSWM services. Moreover, those areas which present topographic problems are the worst served by MSWM operations, and they are mostly occupied by low income groups. This link is also present in relation to the level of services: the poor are the majority of the population that is served by stationary bins and collective pickup points.

These findings indicate the need to expand MSWM services in cities of the developing world for efficiency reasons, since the productivity of cities is lowered by poor infrastructure, but also for greater equity among the different groups of the society.

In relation to the comparison between sectors, the private sector has proved to be superior in terms of accessibility of MSWM services, as compared to the public sector. This point cannot be overestimated, since the lack of access to infrastructure services, as pointed out elsewhere in this thesis, is one of the most pressing problems facing the cities of developing countries at the end of this century. This is in accordance with the arguments of privatisation advocates, to whom the involvement of the private sector in infrastructure service provision introduces new financial resources that can be used to expand services to unserved areas, or to improve the level of provision in poorly served parts of the cities.

10.3.2 Quality of Services

In terms of quality of MSWM services, it is important to highlight that this is the first study in Brazil that defines which are the aspects of service provision that most influence the user's perception of service quality, based on a household survey. In other words, this is the first study that provides a set of relevant aspects of service provision selected by the users, rather than by the providers of the service. This research has also found an order of priority of these aspects, demonstrating that reliability of services is the most important one, followed by cleanliness, quietness and frequency of services. These results have been tested by a logit model used in the
statistics analysis, and by logical inference based on other results of the research.

These findings provide important information to the planning and control of MSWM services in Recife and similar cities. However, the theoretical relevance of this and other results of this research must also be emphasized, since they challenge many propositions presented in the literature on the issue of privatisation, and call into question the results of other empirical studies.

For instance, in regard to the quality assessment, the evidence found in this study indicate that, although the performance of the private sector is superior to that of the public sector, the difference is much smaller than was to be expected from the arguments of privatisation advocates, presented in the literature review. The results show that, in terms of cleanliness and frequency, the difference is only marginal, and the quietness of publicly provided services is even higher than that of the private sector. Therefore, of the four main aspects of service provision, only reliability presents any significant difference between sectors in the quality assessment.

These results also challenge the precepts of the property rights school, since the commentators associated with this school argue that the private sector is more able to provide services of a higher quality, as compared to the public sector, due to its higher productivity and its consumer-oriented culture. This culture is believed to be the consequence of both the competitive environment, where the private sector usually operates, and the greater accountability of private sector managers. These two aspects, still according to those commentators, contribute to the greater concern with the consumer's satisfaction that the private sector is claimed to present. Therefore, they believe that privatisation policies not only increase productive and allocative efficiency, but also empower consumers, by widening their choices.

However, the small difference in service quality between sectors found in this study does not support these theoretical claims. In fact, these findings may be interpreted as
an indication that the supposed superior quality of privately provided services may be overestimated in the arguments of the privatisation adherents.

10.3.3 Productivity of Services and Costs to the Public Sector

The findings of this study are the most intriguing in relation to the costs of services to the public sector, since a large number of commentators in the literature present the reduction of costs in service provision as one of the strongest arguments in favour of privatisation policies. In fact, this seems to be the main reason why municipal administrations introduce such policies in infrastructure service provision. However, the results of this research challenge this belief, particularly the precepts of the property rights school.

This study has found that the costs of the services provided by the private sector are only marginally lower than the costs of publicly provided services: US$ 51 and US$ 53, respectively. Moreover, the costs of services to the municipality in Recife have increased by approximately 47.06 percent between 1990 and 1994. The evidence also shows that the costs of MSWM in the privately served area have increased in the period from 1987 to 1994.

All these findings challenge the arguments of privatisation theorists, especially those of the property rights school. This is particularly true when one takes into consideration the evidence of this study about the much greater productivity in the private provision of MSWM services in Recife, as compared to the public sector. It has been highlighted in Chapter Two that the greater accountability of managers in private companies leads to the development of the superior management skills that characterize the private sector, according to the adherents of the property rights school. As a consequence of this better management, the productivity in the private sector is higher, resulting in lower prices to the consumers. However, the findings of this study show that the benefits of the higher productivity in the provision of MSWM services
in the privately served area, in Recife, are not reflected in the costs of these services to the municipal administration.

Therefore, a most important conclusion of this research is that higher levels of productivity - which are assumed by many commentators to be inherent to the private sector - do not necessarily lower the costs of privately provided services to the government. This conclusion challenges one of the main arguments for the introduction of privatisation policies, particularly in developing countries.

The evidence found in this research also challenges the main precepts of the property rights school, since it may be interpreted as an indication that competition plays a rather more important role in lowering MSWM costs to the public sector than does the ownership of the company that provides the service. In other words, these findings suggest that the relevance of property rights to the costs of infrastructure services to the public sector may be much smaller than is claimed by the theorists of this school.

By the same token, this proposition strengthens the position of those who argue that competition, rather than ownership, is crucial in improving efficiency in the production of infrastructure services. Therefore, they also strengthen the position of those MSWM commentators, such as Bartone (1992), who argue that privatisation forms that strengthen the contestability of markets are superior to those that only introduce changes in the ownership of the companies, from the public to the private sector.

Another aspect raised by the findings of this study is that there are aspects of the implementation process that seem to play central roles in the definition of the level of costs of MSWM provision to the public sector. The findings of this study suggest that among the main ones there are: the form that the involvement of the private sector takes in practice, the capacity of the public sector to assess and negotiate adequate prices, and the adequate monitoring of the private provision of services.
In other words, the findings of this research suggest that the benefits that may be introduced by privatisation policies in the provision of MSWM are very much influenced by the way in which the private sector is involved in the activity. This proposition suggests that the planning and management of the implementation of privatisation policies deserve especial attention of policy-makers. It also suggests that, in the implementation process, it is crucial to provide the public sector with the technical and political capacity to pursue the objectives of the government, and society at large, in the relationship with the private sector.

Another relevant aspect of the findings of this research is that they call into question the generalizability of the results of studies carried out in developed countries to the developing world. It has been highlighted in Chapter Four that studies such as those of Donahue (1989) and Stevens (1980), have found that costs to private sector in developed countries were much lower, as compared to publicly provided services. In the USA, for instance, the costs were 10 to 30 percent lower than to public monopolies. In cities researched in England and Wales, costs to private sector were 22.0 percent lower than to the government. In Canada, a study showed that privately provided collection services had costs 41 percent lower than those of public monopolies.

In developing countries, however, although some experiences with contracting out of MSWM have occurred, to date, there have been no comparable studies to allow firm conclusions about this proposition. Nonetheless, commentators such as Cointreau-Levine (1994) suggest that contracting out for MSWM services holds the greatest promise to developing countries as a way of lowering costs to the public sector. The findings of this research do not support this belief, making it clear that the pure involvement of the private sector in MSWM service provision is an insufficient condition to determine a reduction in the costs of services to the public sector.
10.3.4 Efficiency in Service Provision

Finally, it is important to highlight the relevance of the innovative approach to efficiency used in this research. The classic concept of efficiency refers to two types of efficiency: productive and allocative. However, in practice, most studies that assess efficiency in the provision of infrastructure services are concerned only with the ratio of inputs and outputs, with the dollar cost of each unit produced, or other measures of productive efficiency.

The reason for this approach is usually the methodological difficulties in measuring allocative efficiency in the provision of different infrastructure services, since allocative efficiency is a much wider concept, as compared to productive efficiency. Its quantification varies according to the different standpoints from which it may be assessed. Such standpoints differ, depending on many factors, such as the type of analysis that is carried out, or the type of service that is evaluated. In other words, there is no such thing as a general allocative efficiency function that may be used to measure all infrastructure services.

The concept of efficiency used in this research succeeded in overcoming this methodological difficulty. Based on the work of Le Grand, this concept incorporates but goes beyond the classic economic concept of efficiency. It defines the level of efficiency of a service in relation to the extent to which the primary objectives of its provision have been achieved. Therefore, this concept of efficiency allows allocative efficiency of services to be measured in relation to a wide range of parameters, which are defined during the specification of the primary objectives of the service provision.

In sociological terms, the contribution of this approach is that it allows the assessment of efficiency in service provision from the point of view of as many social actors as the practical constraints of the study permit. In this research, the efficiency of MSWM services has been measured in relation to the primary concerns of the four main actors.
involved in the provision of MSWM services: the providers, the users, the nonusers and the municipal administration.

10.4 Future Studies

The management of the vast quantities of municipal solid waste generated by urban communities is a very complex process. A variety of social, political, economic, environmental, and technical factors are involved in this activity. Although this research aimed at an integrated and comprehensive approach to the subject, due to its nature it has focused its in-depth analysis on the four aspects selected in the analytical framework. This means that several issues that have been touched upon in this research call for further examination.

Three issues in particular, which are central to the subject matter of this research - the privatisation of MSWM services in developing countries - justify further studies, and are discussed as follows:

- Costs of MSWM services in developing countries. Studies addressing this issue would contribute to the formation of a body of knowledge that can provide a sound basis for the decision on ways to improve the efficiency of services, including the involvement of the private sector in service provision.

- The creation of simple and feasible institutional structures to assess the performance of the private provision of MSWM. Studies addressing this issue would enable municipal administrations to insure that benefits are introduced to all groups of society involved in the provision and consumption of these services.

- The creation of financial and regulatory mechanisms to involve the private providers of MSWM in the efforts to minimise solid waste generation. Such studies would avoid the risk that benefits introduced by privatisation serve as an encouragement for a
greater generation of solid wastes.
APPENDIX 1 - LOGISTIC REGRESSION MODEL

In the quality analysis carried out in this research the dependent variable can have only two values - satisfaction occurring or not occurring. Therefore a particular type of multivariate statistical technique has been used - logistic regression analysis. Logistic regression models, also known as logit models, require far fewer assumptions than discriminant analysis or multiple regression analysis.

Logit models have two special features. First, unlike multiple regression analysis, the mathematics of the logit model guarantees that the estimated probabilities will always lie within the logical bounds of 0 and 1. In general, if the estimated probability of the event is less than 0.5, it is predicted that the event will not occur. If the probability is greater than 0.5, it is predicted that the event will occur. Secondly, the probability of an event occurring does not increase linearly with a unit change in the explanatory variables, but it approaches zero at a slower and slower rate as the value of an explanatory variable gets larger and larger (Gujarati 1992).

In logistic regression, the parameters of the model are estimated using the maximum-likelihood method. This means that the coefficients which make the observed results most "likely" are selected. The estimation of parameters is carried out through an iterative algorithm, since the logistic regression model is non-linear (Norusis/SPSS 1994).

The model used in this research had a total number of 434 unweighed cases; however 133 cases were rejected because of missing data, which include those 22 households who did not have services and the 24 who refused to answer the questionnaire. A number of 29 outliers has been identified. These were the cases in which answers to questions 9, 10 and 11 in the questionnaire were hybrids. This means that the value of the dependent variable (level of users' satisfaction) was not clear. Some might argue that all these 29 cases should be ignored, however, it is argued in this research that they reflect a broad view of satisfaction or dissatisfaction. As a result of this
consideration, only 16 cases have been ignored, which correspond to those hybrid cases which did not fit in the model, as measured by the Logit Residual (LRE) statistic. Where the LRE value was equal or superior to 2.0 the case was removed from the analysis. Therefore the total number of selected cases in the logit model was 285.

Nine aspects of service delivery were considered in the model, as discussed in Chapter Seven. By using the method of Forward Stepwise Selection a model was estimated, which included only four of these variables: reliability, cleanliness, quietness and frequency of the services. The other aspects of service delivery were removed from the model since they did not yield sufficient explanatory power in relation to the level of users' satisfaction.

The Forward Stepwise Selection method starts out with a model that contains only the constant. At each step, the variable with the smallest significance level for the score statistic is entered in the model. Then, all variables which have been entered are analyzed to verify if they meet removal criteria. If no variables meet removal criteria the next eligible variable is entered into the model. If a variable is selected for removal and the resulting model has already been considered, variable selection stops. Otherwise, the model is estimated without that variable and the remaining variables are again examined for removal. The process continues until no variables can enter or be removed from the model or until a previously considered model is found (Norusis/SPSS 1994). The criterion for the removal of variables from the model used in this research is the likelihood-ratio (LR) test, which is based on the maximum-likelihood estimates.

The variables in the equation were categorical. The answers to the questions in relation to the level of reliability, cleanliness and quietness were grouped into three categories: "high" (3), "satisfactory"(2) and "low"(1), which have been coded 0, 1 and -1 in the model. Frequency answers were grouped into two categories, "non-
The signs on the coefficients presented in Figure A1 indicate that high values attributed to these variables are associated with a high level of satisfaction. This is consistent with the assumptions of this research.

Logit regression analysis of interval variables produces a single equation for the probability of an event occurring, which can be written as:

\[ \text{Prob (event)} = \frac{1}{1+e^{-z}} \]

where

\[ Z = B_0 + B_1X_1 + B_2X_2 + \ldots + B_pX_p \]

In this research, categorical variables were used, therefore the model produced a set

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>S.E</th>
<th>Exp (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency (1)</td>
<td>-1.05</td>
<td>0.43</td>
<td>0.35</td>
</tr>
<tr>
<td>Cleanliness (1)</td>
<td>-4.21</td>
<td>8.68</td>
<td>0.01</td>
</tr>
<tr>
<td>Cleanliness (2)</td>
<td>1.34</td>
<td>4.35</td>
<td>3.81</td>
</tr>
<tr>
<td>Reliability (1)</td>
<td>-1.05</td>
<td>0.56</td>
<td>0.35</td>
</tr>
<tr>
<td>Reliability (2)</td>
<td>-0.31</td>
<td>0.33</td>
<td>0.73</td>
</tr>
<tr>
<td>Quietness (1)</td>
<td>-1.52</td>
<td>0.76</td>
<td>0.22</td>
</tr>
<tr>
<td>Quietness (2)</td>
<td>0.26</td>
<td>0.42</td>
<td>1.29</td>
</tr>
<tr>
<td>Constant</td>
<td>-4.85</td>
<td>4.39</td>
<td></td>
</tr>
</tbody>
</table>

Note: (-) not applicable
of equations, which correspond to the all the categories of each question. To assess the probability of satisfaction in each area of study, 54 equations were used, which results are in Figure 9.30 in Chapter Nine. Besides assessing the level of users' satisfaction, the logit model estimated in this analysis has also been used to select the aspects of service delivery relevant to the users' satisfaction, as discussed in section 9.4.3.2.

Attention now turns to the steps taken to ensure that the model fits the data collected in this research. The goodness of fit of a logistic regression model may be assessed by various methods. In this research the method used to assess how well the model classifies the observed data was the Classification Table, shown in Figure A2:

<table>
<thead>
<tr>
<th>Observed</th>
<th>Predicted</th>
<th>Percent Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>80</td>
<td>51</td>
</tr>
<tr>
<td>1</td>
<td>15</td>
<td>139</td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This classification table shows that the model presents a tolerably high chance of correctly predicting satisfaction both to 0 and 1 responses. Furthermore, the 76.84 percent accuracy is achieved fairly equally across 0 and 1 observations. These figures indicate that in this aspect the model fits the data.

The other way of assessing the goodness of fit of the model is to examine how "likely" the sample results actually are, considering the parameter estimates. The probability of the observed result, given the parameter estimates, is called the likelihood. Usually the measure employed to assess how well the estimated model fits the data is -2 times the log of the likelihood (-2LL), since the likelihood is less than
1. A model is considered good when the likelihood of the observed results is high (Norusis/SPSS 1994)

The goodness of fit of the model used in this research with all the independent variables has also been assessed. For the model in this research, the value of -2LL is 280,738, which is smaller than the -2LL for the model containing only a constant. According to Figure A3, the goodness of fit statistic is 272,942, which is a satisfactory result.

**Figure A3 - Goodness of Fit Statistics of the Model**

| -2 Log Likelihood (constant included in the model) | 393.23 |
| -2 Log Likelihood (four independent variables included in the model) | 280.74 |
| Goodness of Fit | 272.94 |
| Model Chi-Square | 112.49 |

The Model Chi-Square statistics in logistic regression models is comparable to the overall F test for regression. In this model, the model chi-square is the difference between -2LL for the model with only a constant and the -2LL for the complete model, therefore it tests the null hypothesis that all the coefficients in the model, apart from the constant, are zero. The result shown in Figure A3 indicates that collectively the independent variables have explanatory power in relation to the dependent variable, the level of users' satisfaction.

The Improvement statistic represents the change in -2LL between successive steps of building the model. It tests the hypothesis that the coefficient for the variables added at the last step are 0. In the Forward Stepwise Selection Method used in this research the improvements represent the changes that the introduction of each variable brought into the model. This was used in the selection of predictor variables. The improvement
The chi-square test is comparable to the F-change test in multiple regression (Norusis/SPSS 1994). The improvement statistics are presented in Figure A4 to follow.

**Figure A4 - Improvement Statistics**

<table>
<thead>
<tr>
<th>Variable Added to the Equation</th>
<th>Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliability</td>
<td>59.27</td>
</tr>
<tr>
<td>Cleanliness</td>
<td>29.22</td>
</tr>
<tr>
<td>Quietness</td>
<td>16.30</td>
</tr>
<tr>
<td>Frequency</td>
<td>7.70</td>
</tr>
<tr>
<td>All the Above</td>
<td>112.49</td>
</tr>
</tbody>
</table>

As discussed in Section 9.4.3.2, a new variable - the delivering company - was introduced in the model in order to measure whether the model was biased towards the public or the private sector. It tested whether there is any other aspect in service delivery, other than those already examined, that yields significant explanatory power in relation to users' satisfaction. The figures to the variable were:

- score = 1.85;
- significance = 0.17;
- R = 0.00.

This result indicates that the model is not biased towards the public or the private sector. The difference between the level of users' satisfaction, therefore, can only be explained by the performance of the sectors in relation to the reliability, cleanliness, quietness and frequency of MSWM provision.
COVERING LETTER

8 March 1994

Dear...........................

The administration of the City of Recife is conducting research on the issue of Municipal Solid Waste Management in your street. This research aims to assess your level of satisfaction with the provision of these services and to develop ways to further improve them.

You have been chosen to be interviewed through a random method of selection. The interview will last about 15 minutes and your answers will be treated confidentially, being used only for the purposes of the research. The interview will be conducted by ...........................................................

If you have any query regarding the survey, or if you wish to make any comment, please do not hesitate to contact me at Empresa de Manutencao e Limpeza Urbana da Cidade do Recife - EMLURB, Av. Gov. Carlos de Lima Cavalcanti No 9, Derby. Telephone number 2215991.

I would like to stress the importance of your participation for the success of the research and thank you for your valuable cooperation.

Yours sincerely,

...........................................................

Fatima Furtado
Research Coordinator
The Privatisation of Municipal Solid Waste Management in Recife, Brazil

INTERVIEW INFORMATION SHEET

Questionnaire Number: □□□□

Interviewer number: □□

Interviewer Signature: ............................................................................

Address: ...............................................................................................

Telephone: □□□□□□□□□

Sector: □□□ RPA □□

Service Operator: 1. Private □ 2. Public □

Use of the Building: 1. Commercial or mixed □ 2. Residential □

Other Items:

<table>
<thead>
<tr>
<th>Call</th>
<th>Date</th>
<th>Time</th>
<th>N</th>
<th>R</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<tr>
<td>3</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Status Code:

1. Not at home / No contact (N)
2. Refused (R)
3. Mentally / Physically incapable (I)
4. Completed interview (C)
The Privatisation of Municipal Solid Waste Management in Recife, Brazil

QUESTIONNAIRE

SECTION A

1. What type of solid waste collection service is available at your home?

1  Door to door collection
2  Stationary bin  (go to Question 6)
3  Other. Please specify.................................................................
4  None  (go to Question 8)
5  Don't know

2. What type of vehicle is used to collect the solid waste from your house?

1  Compactor truck
2  Open top truck
3  Tractor
4  Handcart
5  Sledge
6  Other. Please specify.................................................................
7  Don't know

3. How many times per week is the solid waste collected from your house?

1  Every day
2  Three times per week
3  Other. Please specify.................................................................
4  Don't know
4. In which part of the day is the solid waste collected from your house?

1. Morning
2. Afternoon
3. Evening/night
4. It varies
5. Don't know

5. Where do you place the solid waste to be collected?

1. On the public pavement
2. Within the property grounds
3. In the communal solid waste storage facility
4. Other. Please specify
5. Don't know

6. Where do you store your solid waste before it is collected/taken to the stationary bin?

1. Bin *(metal, plastic, rubber, wood)*
2. Plastic bag
3. Other. Please specify
4. Don't know

7. What part of the solid waste your household produces is collected by the available waste collection service? *(show card A)*

1. The total amount *(go to Question 9)*
2. Almost the total amount
3. Half of the total amount
4. Less than half of the total amount
5. None
6. Don't know
8. What do you do to the remaining solid waste?  
(show card B)

1. Dump in a vacant plot
2. Dump in the sea, river or other water streams
3. Dump in the slopes, pits, gullies, or lowlands
4. Pay someone to dump it
5. Bury
6. Burn
7. Recycle (donate, sell, use as animal food, fertilizer or otherwise re-use)
8. Other. Please specify ...................................................................................................
9. Don’t know

SECTION B

9. How much of a problem is MSWM for your household?  
(show card C)

1. A big problem
2. A small problem
3. It is not a problem
4. Don’t know

10. The following is a list of the most frequent problems in solid waste collection. According to your experience in this street, what do you consider to be the main problem with this service?  
(show card D)

1. Frequency
2. Failure in following the schedule
3. Cleanliness of the street after the service
4. Quietness of the staff/equipment
5. Cleanliness of the equipment
6. Distance of pick-up point
7. Other. Please specify ....................................................................................................
8. None
9. Don’t know
11. Now, considering public cleansing, please indicate which of the following is the main problem faced by the service in this street.

(Show card E)

1  Frequency
2  Failure in following the schedule
3  Cleanliness of the street after the service
4  None
5  Don't know

12. Sometimes the crew fails to deliver the service at the scheduled time. Please indicate which of the following answers best describes how often it happens in this street.

(show card F)

1  Usually
2  Occasionally
3  Seldom
4  Never
5  Don't know

13. In relation to quietness, how would you rate the equipment used in the MSWM service in this street?

(show card G)

1  Very noisy
2  Noisy
3  Satisfactory
4  Quiet
5  Very quiet
6  Don't know

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14. Still in relation to quietness, how would you rate the MSWM service crew? 
   (Show card G)

1. Very noisy
2. Noisy
3. Satisfactory
4. Quiet
5. Very quiet
6. Don't know

15. Regarding spillage, how would you rate the solid waste collection service? 
   (Show card H)

1. Very dirty
2. Dirty
3. Satisfactory
4. Clean
5. Very clean
6. Don't know

16. Do you know where the solid waste in Recife is disposed? 
   (go to Question 19)

1. No
2. Yes

17. Where? .............................................................................................................

1. Correct
2. Incorrect
18. In environmental terms, how do you consider this facility?
(show card I)

1 ☐ Very good
2 ☐ Good
3 ☐ Poor
4 ☐ Unacceptable
5 ☐ Don't know

19. Have you ever made any complaint regarding public cleansing services?

1 ☐ Yes
2 ☐ No (go to Question 22)
3 ☐ Don't know (go to question 22)

20. How did you do it?

1 ☐ By phone
2 ☐ By mail
3 ☐ Spoke to the delivery crew
4 ☐ Went to the MSWM administration, personally
5 ☐ By other means. Please specify..............................

21. Did you get any response?
(show card J)

1 ☐ Yes. Immediately
2 ☐ Yes. After a short time
3 ☐ Yes. After other complaints
4 ☐ Yes. After a long time
5 ☐ No
6 ☐ Don't know
22. Do you pay IPTU?

1 □ Yes
2 □ No

23. Do you know how much you pay for the public cleansing services?

1 □ Yes
2 □ No

SECTION C

24. Sex of the respondent:

1 □ Male
2 □ Female

25. In your last birthday, in which group did you fit in?

(show card K)

1 □ 18-24 years
2 □ 25-29 years
3 □ 30-39 years
4 □ 40-59 years
5 □ 60 years or more
26. What is your occupation?

1  ○  Trader
2  ○  Public servant
3  ○  Self-employed
4  ○  Trade employee
5  ○  Businessman
6  ○  Senior manager / Liberal professional
7  ○  Industry worker
8  ○  Odd job man
9  ○  Unemployed
10 ○  Domestic servant
11 ○  Housewife
12 ○  Retired / Pensioner
13 ○  Other. Please specify .................................................................

27. Which group best describes your monthly family income?
   (show card L)

1  ○  Less than 1 MW
2  ○  1-3 MW
3  ○  3-5 MW
4  ○  5-7 MW
5  ○  7-10 MW
6  ○  10 or more MW

28. How many people are there in your household?  □ □
APPENDIX 3 - OFFICIAL INTERVIEWS

State Government:

- Member of the State Parliament

Secretariat of Planning

- Head of the Directorate of Environment

Municipal Government:

- Member of the Municipal Council

Secretariat of Urban Planning and Environmental Development

- Secretary of Urban Planning and Environmental Development
- Head of the Directorate of Environmental Development
- Head of the Directorate of Urban Control
- Head of the Directorate of Budget

Secretariat of Finance

- Head of the Directorate General of Taxation

Secretariat of Public Works and Infrastructure

- President of Empresa de Manutencao e Limpeza Urbana (EMLURB)
- Technical Advisor to the President of Empresa de Manutencao e Limpeza Urbana
The Privatisation of Municipal Solid Waste Management in Recife, Brazil

- Deputy Head of the Directorate of Administration and Finance
- Head of the Directorate of Urban Maintenance
- Head of the Directorate of Urban Cleansing (DLU)
  - Head of the Department of Planning and Operational Support
  - Head of the Department of Urban Cleansing and SW Collection
  - Head of the Department of Equipment Maintenance
  - Head of the Department of Administrative Support
  - Technical Advisors (2)
  - Head of the Division of Final Disposal
  - Head of the Division of Special Programmes
  - Head of the Division of Private Sector Supervision
  - Drivers (2)
  - Collectors (2)
  - Sweepers (4)

Private Sector

ENTERPA Engenharia Ltda.

- Head of the Coordination of Recife
- Head of the Urban Cleansing Department
- Head of the Solid Waste Collection Department
- Head of the Equipment Maintenance Division
- Head of the Personnel Division
- Drivers (3)
- Collectors (3)
- Sweepers (3)
Experts

- Mr Jose Carlos Mello
- Mr Ruy Rego
- Mr Bertrand Alencar
APPENDIX 4 - ORGANISATIONS SURVEYED

State Level:

Companhia Pernambucana de Recursos Hidricos e do Meio Ambiente (CPRH)

Secretariat of Planning (SEPLAN)
  • Directorat of Environment

Metropolitan Level:

Fundacao de Desenvolvimento Metropolitano (FIDEM)
  • Directorat of Environment
  • Grupo de Estudos de Limpeza Urbana (GELURB)

Municipal Level:

Secretariat of Infrastructure
  • Empresa de Manutencao e Limpeza Urbana do Recife (EMLURB);
    • Directorat of Urban Cleansing
    • Directorat of Administration and Finance
    • Directorat of Maintenance and Operations
    • Technical Advisory Chamber

Secretariat of Urban and Environmental Planning
  • Directorat General of Budget
  • Directorat General of Urban and Environmental Planning
Department of Information and Projections

Department of Environmental Planning

• Directorat General of Coordenation and Environmental and Urban Control

Secretariat of Finance

• Directorat General of Taxation

Private Organisation:

Empresa de Engenharia Ltda. (ENTERPA) Coordenation of Recife

• Department of Urban Cleansing

• Department of Solid Waste Collection
REFERENCES


The Privatisation of Municipal Solid Waste Management in Recife, Brazil


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REGO, R., 1994, *Municipal Solid Waste Management: Guidelines for Decision-Makers in Developing Countries*, (draft). London School of Hygiene and Tropical Medicine, London.


