

**The Robert Gordon University  
Aberdeen Business School  
MBA in Strategic Management**

# **Understanding the competitive environment of construction and demolition waste management sector in Recife – Brazil (a case study)**

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To my mother, *Maria Ivette* (67),  
to my sister and business partner *Cláudia* (41),  
and to my niece *Amanda* (10),  
three generations of the best we have got in our family: joyful, generous, brilliant, and  
powerful women!  
To them my admiration, gratitude and love, forever!

*The author*

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*City of Recife, Brazil*

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## ABSTRACT

The C&D (construction and demolition) waste collection and haulage services in Recife, the capital city of the State of Pernambuco, Brazil, are provided by micro private enterprises. It is the only waste management service which is fully privatised (since 1998) and which operates within a highly competitive, fragmented, industry.

Customers hire the C&D waste collection and haulage services by simply making a phone call, as service providers play within an open competition market. However, the market is very much characterised by the existence of numerous non-complying or illegal firms, due to poor regulation enforcement, no entry barriers and to the fact that customers are price sensitive, and they usually hire the C&D waste collection services regardless the legal status of the firm. The outcome is illegal dumping and unfair competitive business environment.

The purpose of this case study is to identify the forces which drive competition within the C&D waste collection industry in Recife, using Michael Porter's Five Forces Model as an analytical framework. The research was mainly sourced by the views and thoughts of a group of the C&D waste collection firms in Recife, the expertise and experience of academic researchers, waste management local authority's officers among others, and by secondary sources (articles, reports, and academic research studies).

The analysis has shown that the collective strength of three out of the five competitive forces (the bargaining powers of customers, the rivalry among existing competitors, and the threat of new entrants) is very much influenced by the illegal operations of the non-complying firms.

Strategic options to the C&D waste collection and haulage firms include: low-cost strategy (reducing costs while increasing efficiencies); differentiation (focussed on value-added, quality services); and vertical integration (into the implementation and operation of C&D waste disposal facilities, a major bottleneck within the industry). Key recommendations are based on cooperative, integrated or articulated action among the industry's firms and stakeholders and knowledge management.

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## ACRONYMS

ABRELPE	Brazilian Association of Waste Management Private Enterprises
ADEMI-PE	Real State's Association of the State of Pernambuco
C&D	Construction and demolition
CEPIS	Pan-American Centre of Sanitary Engineering Studies
CICA	Confederation of International Contractors' Association
CONAMA	National Environment Council (Brazil)
CPRH	Environment Control Agency (State of Pernambuco)
EMLURB	Waste Management Local Authority (City of Recife)
EU	European Union
IBGE	Brazilian Institute of Geography and Statistics
ISWA	International Solid Waste Association
LIMPURB	Waste Management Local Authority (City of São Paulo)
PAHO	Pan-American Health Organisation
PBQP-H	Brazilian Quality and Productivity Programme for the Habitat
SEBRAE	Brazilian Support Agency to Micro and Small Enterprises
SIERESP	C&D Waste Collectors Association of the State of São Paulo
SINDUSCON-PE	Contractors' Association of the State of Pernambuco

SINDUSCON-SP	Contractors' Association of the State of São Paulo
SME	Small and medium-sized enterprises
UFPE	Federal University of Pernambuco
UnB	University of Brasilia
UNDP	United Nations Environment Programme
UNEPTIE	United Nations Environment Programme/Division of Technology, Industry and Energy
UPE	State University of Pernambuco
US-EPA	Environment Protection Agency – United States of America
USP	University of São Paulo

## PART I PURPOSE OF THE RESEARCH AND METHODOLOGY

### 1.0 Introduction

#### 1.1 C&D waste collection services in Recife: is it business or not?

Recife, the capital city of the state of Pernambuco, Brazil (Figure 1.1) has been built on top of marshy lands, patiently covered with demolition debris, for more than 450 years. In fact, new land has been conquered to water bodies due to the continuous dumping of what we name nowadays as C&D (construction and demolition) debris or waste in order to “create” a suitable soil for housing and other urban demands.

**Figure 1.1 Map - South America. Location of the city of Recife, NE Brazil**



Source: Adapted from: [www.bugbog.com/maps/south\\_america\\_map.html](http://www.bugbog.com/maps/south_america_map.html)

What for one may be a nuisance, can be quite useful to another. In Recife, as in many other cities in Brazil, it is still common to see “*demolition debris is given*” roughly written on a piece of wooden board, placed in front of construction works. Those who are interested on the material just pick it up and take it away with them, free of charge.

Demolition debris pick ups and transportation to the needy sites could be done by any means: on the back of a donkey, with push carts or small trucks. This is still true in the so called informal sector, especially in the urban periphery of large and medium-sized cities or in small towns. Therefore, one would get rid of the C&D waste by simply offering the debris to those who would be in the position to pick it up and take it away.

The concept of formal, paid, C&D collection service however, is relatively new in Recife. And it was only very recently, in 1998, that the municipality of Recife passed a law (Municipal Law No. 16.377/98, complemented by the Municipal Decree No. 18.082/98) establishing that C&D waste volume which exceeds 0.30m<sup>3</sup> or 300 litres should be collected by private firms, hired by the waste generator. The C&D waste quantity generated above that limit was estimated of about 16 thousand tons per month (Jornal do Commercio, 1999), which would represent the potential market size for the private collection and haulage firms in the city of Recife alone.

Since then, C&D waste collection and haulage firms have come to and gone out of business. A more regulated business environment, with clear rules and stated responsibilities, helps to define the boundaries between public and private sectors on the provision of C&D waste management services. Many firms, stimulated by the new regulations, the very low entry barriers and the perspective of what was thought to be a profitable market, started their operations. However, poor legislation enforcement, lack of information (public or customer awareness) and having to compete with several non-complying firms, among other factors, have contributed to the vulnerability of C&D waste collection sector business environment in Recife.

## **1.2 Overall aim**

The present research aims to understand the C&D waste collectors/haulers' competitive environment in the city of Recife, Brazil, while providing a critical analysis of its main driving forces, thus evaluating to what extent they impact business competitiveness. The research is expected to propose a set of broader strategic actions in order to contribute to the ongoing stakeholders debate towards the development and implementation of suitable C&D waste management policies in the city of Recife.

## **1.3 Specific objectives**

- To provide a broad view of the C&D waste management industry current situation worldwide, in Brazil and in Recife in particular, with emphasis on the provision of C&D waste collection/haulage services;
- To identify the main factors which compel small and medium-sized entrepreneurs to start a C&D waste collection and haulage business in the city of Recife;
- To identify the possible causes of business premature closure or the reasons why entrepreneurs decide to quit C&D waste collection/haulage business in Recife; and
- To evaluate the C&D waste collectors' business environment in Recife through the assessment of the forces which drive competition, using Michael Porter's Five Forces Model as a conceptual, analytical framework.

## **1.4 Main reasons to conduct the research**

Solid waste management is on the agenda in Brazil at the three public policy levels: national, regional and local. The cross-sector nature of waste management industry has demanded a more integrated approach to its development. Therefore, environmental, social, technological, economic and political aspects should be taken into account, particularly in policy formulation and implementation. Waste management policy should also be integrated with water resources management, environmental management (pollution prevention, cleaner production and resource management), urban development, economic development, sanitation, and public health policies.

New waste management policy laws and service provision regulations are imposing several restrictions while re-defining business environment which, in principle, help to create more prospects to private sector participation. In fact, privatisation of waste management service provision, as well as other public services, is a strong trend in Brazil. This is particularly the case of C&D waste collection/haulage services in Recife, which until very recently was formally dominated by the public sector, although informal - and now irregular - collection/dumping arrangements are more traditional, popular and city-wide spread, at very low price.

Competing, and moreover, surviving, in such a business environment is certainly a major challenge to regular, formal C&D waste collection firms. Strong efforts to guarantee regulations enforcement and taking out of market illegal players, are crucial to a fair, competitive business environment, say the industry's entrepreneurs (Jornal do Comercio, 2002a). Other factors, however, should also be taken into account and their possible impact evaluated. That is the purpose of this case study.

## **1.5 Research dissertation structure**

In order to provide a comprehensive presentation of data collected, the results of analysis and the case study conclusions, the author organized the dissertation in five main sections:

- ***Part I Purpose of the research and methodology***, which comprises the first three chapters covering the introduction to the case study's broad aim and specific objectives, the literature review and a brief description of the adopted research methodology;
- ***Part II Understanding the industry overall business environment***, composed of another three chapters (4, 5 and 6) which bring a great deal of very relevant information from recent studies and research in Brazil as well as from other published sources such as journals, reports and newspaper articles on the present situation and trends of C&D waste management industry worldwide. Chapter 6, *C&D Waste Management in Recife*, also presents the synthesis of the

unstructured interviews which the author undertook with six C&D waste collection entrepreneurs in Recife, early in 2002, and sets the scene for the industry environment analysis on the following chapter.

- ***Part III Understanding the forces which drive a competitive business environment*** comprises chapter 7 which presents the analysis of the C&D waste collectors' industry structure and competitive environment in the city of Recife, using Michael Porter's Five Forces Model as a conceptual and analytical framework.
  
- ***Part IV Lessons learned for future progress***, presents the final conclusions from the analysis and provides some recommendations.

## 2.0 Literature Review

### 2.1 Secondary sources researched

A literature review (or literature survey) is “*the documentation of a comprehensive review of the published work from secondary sources of data in the areas of specific interest to the researcher*” (Sekaran, 2000 – Glossary, page 421).

Finding specific, published information on C&D waste collection/haulage sector is not an easy task as there is very little written on this topic. Most of the previous, published work from secondary sources is related to C&D waste management as a whole, with much of the emphasis on waste reduction measures or on recycling of construction waste and demolition debris. Very little attention is given to the role of C&D waste management’s main agents (local governments, architects and engineers, building contractors and C&D waste collectors). Rather, the focus has been mainly on technological, environmental and sometimes economic aspects of C&D waste generation, recycling and final disposal.

From the international experience, some interesting, though general information was obtained from articles published in electronic journals (such as *Waste Age* and *World Wastes*) and from international agencies’ reports (like the International Waste Management Association-ISWA, the Pan-American Health Organization-PAHO and the United Nations Environment Programme-UNDP). The major contribution of these sources was to provide a snapshot of the C&D waste management issues and trends worldwide, particularly in North America, Europe and Latin America.

However, the most significant contributions from secondary sources to the purpose of this case study were found in recent, Brazilian academic researches (master’s and doctorate theses, and technical papers presented at seminars). Section 2.2 ahead highlights these contributions to the present research study. Another important source of information was the existing legal apparatus (laws, decrees, and regulations), both at national and local levels.

## 2.2 Relevant information on C&D waste management business in Brazil

In Brazil, the shortage of reliable data and information on the generation, management and final disposal of C&D waste contrasts with the economic importance of the construction industry, which is responsible for 15,5% of the country's GNP (Schneider, 2003 and John et al, 2003).

It is recognized, though, that some academic effort has been done over the past 5-10 years, including studies on C&D waste generation rates, public policies for its adequate, sustainable management, new recycling technologies and market development to introduce new recycled building materials (such as crushed concrete as aggregate in road paving).

Nevertheless, very little has been researched, discussed and published about C&D waste management as a private business: its major characteristics, size, economic importance, social and environmental impact, main driving forces, opportunities, threats and future trends. When it comes to private C&D waste collection and haulage business in particular, a key agent in any C&D waste management system, it is quite common to see news and reports highlighting the most negative aspects of it. In other words, C&D waste collectors are frequently pointed out as true villains, either in construction or in waste management industry, and also as they are perceived by the public in general. Here is an example:

*"I think that the City Council should take a radical attitude and definitely ban those containers from the streets",* says Ms. Deize Silva, a citizen of the city of São Paulo, after crashing her car into a C&D waste skip (Jornal da Tarde, 2001).

A recent research (Araújo, 2000) has pinpointed several problems related to C&D waste skips. It is interesting to note that Araújo identifies both the construction industry and the municipal solid waste management system at the crux of the problem. Banning the C&D skips (Figure 2.1) from the streets is not a solution in itself. Rather, Araújo suggests a series of measures, ranging from minimization of waste generation (from project design to its implementation) to waste recovery and recycling, updating of norms and

regulations and environmental education – to C&D waste generators, haulers, as well as construction/municipal solid waste managers, technicians, and workers.

**Figure 2.1 C&D waste skips: most used container for collection/haulage services**



Source: photos taken by the author of this research study in the city of Recife

Schneider (2003) suggests that the existence of a large number of illegal C&D waste haulers in the city of São Paulo is stimulated by the waste generators who look for the lowest price when it comes to hire a collection service. The immediate consequence is illegal dumping and attraction to illegality the once formal, legal firms which can not cope with such an unfair competitive environment.

It is estimated that there are nearly 700 C&D waste collection and haulage firms in the city of São Paulo alone. Among those, between 1999 and 2002, only 559 were licensed to operate. In 2003, this number lowered to just 363 firms. Schneider, however, is not conclusive in his research on the possible reasons which drive C&D waste collection firms either to give up business or to decide to operate illegally in São Paulo.

On the other hand, Pinto (1999) has largely contributed to the debate nationwide showing the lack of information about C&D waste in technical documents which have supported the design and implementation of solid waste management plans. In his study, Pinto also demonstrates the effective generation rates of C&D waste in Brazil, the impacts of these wastes to the urban environment and to local economies, due to the present management model (the “*corrective approach*”). As an alternative, Pinto proposes a new methodology (the “*differentiated management approach*”), focussed on sustainable recycling of C&D waste through waste prevention measures, efficient waste recovery at low cost, environmental consciousness and responsibility, plus active participation of all agents, public and private ones.

Pinto also devotes a chapter of his research study to briefly describe the general characteristics of C&D waste collection and haulage firms, based on direct observation in six Brazilian cities.

In a technical paper, John & Agopyan (2001) also refer to the C&D waste collection services as a business, based mostly on the findings of Pinto (1999) and data from SIERESP, the C&D waste collectors association in the State of São Paulo. According to their estimates, the C&D waste collection’s potential business size in the city of São Paulo alone ranges between US\$25-35 million a year.

In “*Strategies for Innovation in Construction & Demolition Waste Management in Brazil*” John et al (2003) cover issues like the attractiveness of illegal dumping, which is very costly to local authorities, *versus* the present C&D waste management policies. They show that “*management policy based entirely on regulation of C&D waste transport and landfilling is not in itself enough to control illegal dumping*”. Besides, the authors present a set of C&D waste management standards which are currently being developed in Brazil as well as further research needs in this field.

Adopting an environmentalist approach, Blumenschein (2002) analyses certain aspects of the application of the Integrated Solid Waste Management system (ISWM) concept to the construction industry. The author presents her findings of an exploratory study regarding the potential use of environmental policy instruments (information systems, direct regulations, economic instruments, etc) to the construction industry in Brazil, based on the Dutch experience. It is an interesting attempt to integrate environmental issues concerned with construction industry to those in the solid waste management industry.

Carneiro et al (2004), who are all members of the Environmental Research Centre of the Polytechnic School of the University of Pernambuco (UPE), present their findings of the studies they have carried out in the past two years on C&D waste management within the Metropolitan Area of Recife. The focus of the studies has been mainly on the assessment of the environmental impacts caused by construction industry as well as on the alternatives to mitigate them. In addition, the level of awareness of these impacts by the stakeholders or agents of this industry (civil engineers in charge of construction sites and C&D waste collectors) and their knowledge about legal aspects related to C&D waste management are also assessed.

The master's thesis developed by Alencar (1999) is an outstanding contribution to understanding the *public vs. private* relationship in the provision of municipal solid waste management services within the city of Recife. In his study, Alencar confirms the hypothesis that the *public vs. private* relationship in the waste management sector changes and is redefined in time, in a dynamic and cyclical way, as a function of the interests and conflicts which are inherent to both dimensions. It is remarkable the historical background on the provision of garbage collection and disposal services in Recife since 1500 to present time, covering aspects such as types of contracting out those services, institutional responsibilities and legal framework. In a chapter about the recent privatisation of 100% of municipal solid waste management services in Recife (since 1997), Alencar highlights the group of C&D waste collectors as the first and only one which operates under local government permission within a free, highly competitive market, where customers directly hire the services.

And finally, Costa Leite (1997) reinforces the privatisation trend in Municipal Solid Waste Management in Latin America and states that the solid waste business management capability within a public organisation is limited by bureaucracy and legal constraints while within a private firm it is largely limited by the characteristics of its competitive environment.

### **2.3 Reference text to industry environment and structural analysis**

As it was stated in section 1.3 above, one of the specific objectives of this research study is to evaluate the C&D waste collectors' business environment in Recife through the assessment of the forces which drive competition, using Michael Porter's Five Forces Model as a conceptual, analytical framework.

The Brazilian edition (Porter, 1986) of Porter's "*Competitive Strategy*", originally published in 1980 by Free Press/Macmillan Publishing, was used by the author of the present case study as a reference text in order to conduct the analysis of the C&D waste collectors' industry structure and business environment in the city of Recife.

The book provides the necessary methodology or analytic tools to understand any industry structure (in this case, C&D waste collection services, a fragmented industry) and its competitive environment from the perspective of the five forces which drive competition: the bargaining power of buyers, the threat of new entrants, the bargaining power of suppliers, the threat of substitutes and the intensity of rivalry among competitors.

According to Porter, an industry's structure (rooted by its economic and technologic characteristics) is reflected within the level of intensity of those five forces (Porter, 1986 – page 25). In different industries, different forces will be more predominant than others which will then shape competition. This is the arena in which competitive strategy should be defined.

The characteristics, components, and rationale of the Five Forces approach to industry competition are presented in Part III of this research report (chapter 7), as well as the analysis of the C&D waste collection sector in Recife, using Porter's model.

### 3.0 Research Methodology

#### 3.1 Choosing among research strategies and methods

*How* competitive is the business environment in which C&D waste collectors/haulers play in the city of Recife? *What* are the forces which drive competition within this sub sector of the C&D waste management industry in Recife? According to Creswell (1997), when attempting to address to questions which start with *How* and *What* the researcher is involved in a qualitative type of study. In contrast, a quantitative research asks *Why* and look for a comparison of groups or a relationship among variables with the intent of establishing an association, relationships or cause-effect.

A qualitative research “*is an inquiry process of understanding based on a distinct methodological tradition of inquiry that explores a social or human problem. The researcher builds a complex, holistic picture, analyse words, reports detailed views of informants, and conduct a study in a natural setting (...). A qualitative inquirer relies on views of participants and discusses their views within the context in which they occur to inductively develop, from particulars to abstractions, ideas in a study*” (Creswell, 1997 – pages 254-255).

Also, a qualitative research applies what is known as *ethnographic methods*, an approach which emphasizes the “*analysis of subjective accounts which are generated by getting inside situations and involving the investigator in the everyday flow of life. This approach generates qualitative data and minimum structure*” (Gill & Johnson, 1997 – page 8). This broad approach opposes to what is known as *positivism*, which relies on the highly structured methods and has as its basis a hypothesis testing process (deductive approach) using standardized instruments and controls and most usually generating quantitative data.

A comparison of research methods was presented by Gill and Johnson (1997), based on the works of Burrell and Morgan (1979), which “*discriminate between different methods in terms of their relative emphasis upon deduction (nomothetic methods) or induction (ideographic methods), their degree of structure, the kinds of data they generate and the forms of explanation they create*”. The different research methods are

presented in a continuum, from laboratory experiments (an example of a nomothetic method) at one end to ethnographic study (an ideographic method) at the other (Figure 3.1):

**Figure 3.1 A comparison of nomothetic and ideographic methods**

Nomothetic methods emphasize:	vs.	Ideographic methods emphasize:
1. Deduction	vs.	1. Induction
2. Explanation via analysis of causal relationships and explanation by covering-laws (etic*)	vs.	2. Explanation of subjective meaning systems and explanation by understanding (emic**)
3. Generation and use of quantitative data	vs.	3. Generation and use of qualitative data
4. Use of various controls, physical or statistical, so as to allow the testing of hypothesis	vs.	4. Commitment to research in everyday settings, to allow access to, and minimize reactivity among the subjects of research
5. Highly structured research methodology to ensure the replicability of 1, 2, 3 and 4 above	vs.	5. Minimum structure to ensure 2,3 and 4 (as a result of 1) above


  
**Laboratory experiments, Quasi-experiments, Surveys, Action research, Ethnography**

\* etic: A form of analysis which relies upon explanations that impose an external logic or frame of reference upon subjects so as to explain their behaviour (Gill & Johnson, 1997 – page 177)

\*\* emic: A form of explanation of a situation or events that relies upon elucidation of actors' internal logics or subjectivity (Gill & Johnson, 1997 – page 177)

Source: Adapted from Gill, J. and Johnson, P. (1997) *Research Methods for Managers*. 2<sup>nd</sup> Edition. Paul Chapman Publishing. London. Page 37

With regard to *validity* of a research findings, Gill & Johnson suggest a set of four major evaluation criteria so as to help the researcher to be aware of some strengths and weaknesses of different available methods to conduct a study (Gill & Johnson, 1997 – pages 128-129):

*“1. Internal validity: this criterion refers to whether or not what is identified as the ‘causes’ or ‘stimuli’ actually produce what have been interpreted as the ‘effects’ or ‘responses’;*

*2. External validity: generally, this criterion refers to the extent to which any findings can be generalized or extrapolated beyond the immediate research sample or setting in*

which the research took place. The matter of external validity is often subdivided into the following:

a) *Population validity: it concerns the extent it is possible to generalize from the sample of people involved in the research to a wider population;*

b) *Ecological validity: it is concerned with the extent to which it is possible to generalize from the actual social context in which the research has taken place and data thereby gathered, to other contexts and settings. This is also related to the issue of how artificial or atypical the research setting is relative to ‘natural’ contexts typical of normal, everyday life.*

3. *Reliability: this criterion basically refers to the consistency of results obtained in research. To satisfy this criterion it should be possible for another researcher to replicate the original research using the same subjects and the same research design under same conditions”.*

When applying these evaluation criteria to the ‘continuum’ of research methods presented before – from laboratory experiments to ethnographic studies – Gill & Johnson arrive at the following findings (Table 3.1):

**Table 3.1 Application of the evaluation criteria to research methods**

Research method	Evaluation criteria			
	Internal validity	External validity		Reliability
		Population	Ecological	
1. Ideal/Laboratory experiment	****	*	*	****
2. Quasi-experiment/ Action research	***	**	***	***
3. Surveys	**	****	**	****
4. Ethnography	*	**	****	**

Key: \*\*\*\* Very high/High    \*\*\* Relatively high    \*\* Relatively low    \* Very low/Low

And finally Creswell (1997) points out eight reasons for conducting a qualitative research. Among these reasons, two fit perfectly on the purposes of the present study:

- *“Use a qualitative study because of the need to present a detailed view of the topic: the wide-angle lens/distant panoramic shot will not suffice to present answers to the problem, or the close-up view does not exist”, and*
- *“Employ qualitative approach to emphasize the researcher’s role as an ‘active learner’ who can tell the story from the participants’ view rather than an ‘expert’ who passes judgements on participants” (Creswell, 1997 – page 17).*

With the support of these general, methodological guidelines, and bearing in mind the nature and content of the research ‘problem’ as well as the extent of the available resources (time and data), this is clearly the case of undertaking a qualitative approach to the present research study.

### **3.2 Case study: a way of conducting a qualitative inquiry**

Case study is a method of conducting a qualitative research about contemporary, real life events upon which the researcher has very limited or no control at all. In a case study the boundaries between the phenomena and the context is not very much clear and multiple sources of evidence are used. (Schneider, 2003, in reference to the works of Robert Yin, 1989).

According to Sekaran (2000), the nature of a case study can be either exploratory, descriptive or hypothesis testing:

*“The case study, (...) is also a method of solving problems or for understanding phenomena of interest and generating additional knowledge in the area. The nature of the study - whether it is exploratory, descriptive or hypothesis testing – depends on the stage to which knowledge about the research topic has advanced. The design decisions become more rigorous as we proceed from the exploratory stage, where we attempt to explore new areas of organizational research, to the descriptive stage, where we try to describe certain characteristics on the phenomena on which interest centres, to the hypothesis testing stage, where we examine whether or not the conjectured relationships have been substantiated and an answer to the research questions has been obtained.” (Sekaran, 2000, page 123).*

Clearly, this research falls into the category of an *exploratory case study*, since very few studies have been conducted on the field (C&D waste collectors' competitive, business environment in a developing country right after the privatisation of collection/haulage and disposal services), and extensive preliminary work, including several interviews, was done to obtain an overall picture of the phenomena and understand what is going on.

However, and to a certain extent, this research presents some aspects of a *descriptive case study* as the author attempted to describe main characteristics of the phenomena (factors or forces which influence the dynamics and competitiveness of the C&D waste collection/haulage industry environment in the city of Recife). Also, setting the scene or the context was done with the support of some available data (from similar environments in other regions in Brazil, as a general reference).

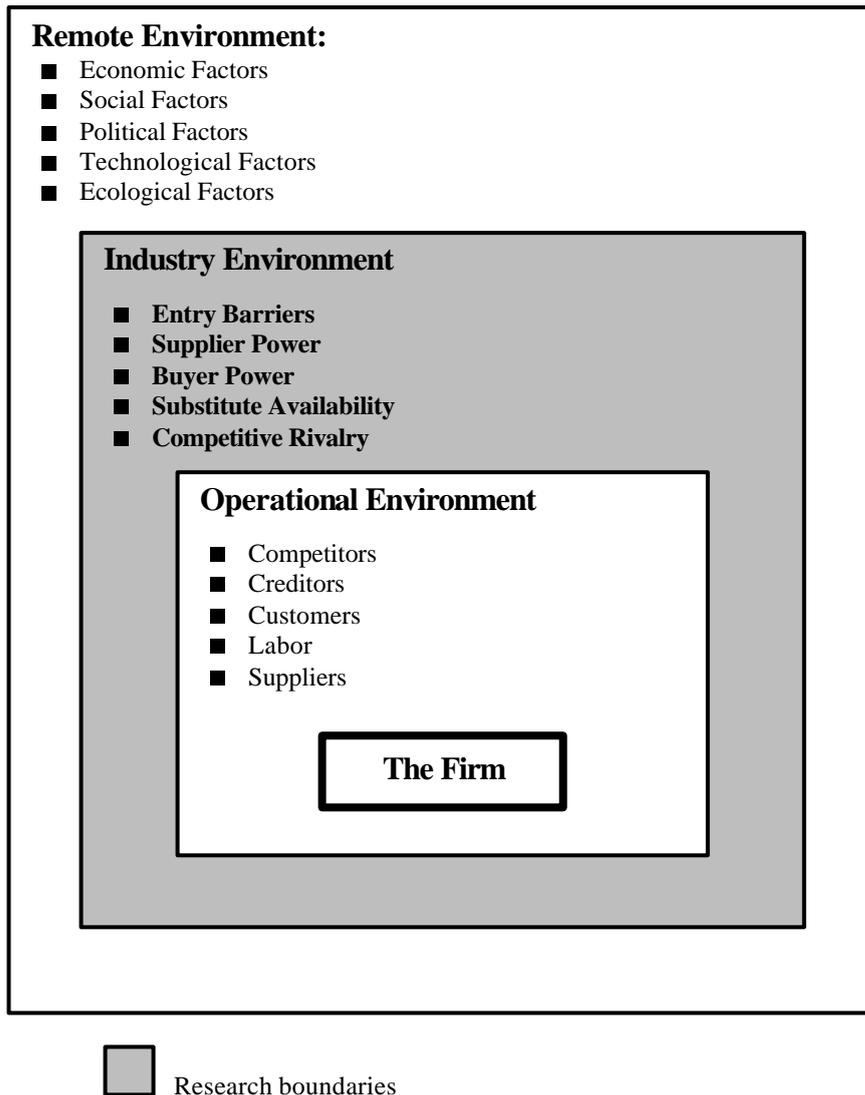
Finally, a widely accepted conceptual framework was used to proceed with case analysis (Porter's Five Forces Model) in a holistic approach, that is, "*where the researcher examines the entire case and presents description, themes and interpretations or assertions related to the whole case*" (Creswell, 1997 – page 250).

### **3.3 Research boundaries**

The research boundaries of this case study will be restricted to evaluating and understanding the industry environment in which C&D waste collection firms play in the city of Recife. The focus of the analysis will not refer to the relationship between a single or specific firm and its industry environment but to the profile of the C&D waste management industry environment as a whole, as an attempt to figure out its general characteristics and its impact or influence on the firms' competitive strategies design and implementation. As stated by Porter (1986), the industry environment exerts a great deal of influence on defining the rules of the competitive game as its forces affect all of the industry firms. The key issue is how each firm will respond to that.

Pearce & Robinson (2000) have suggested a graphical representation of the interrelationship between the firm and its remote, its industry and its operating environments (Figure 3.2).

**Figure 3.2 The firm's external environment**



Source: Pearce, John A., Robinson, & Richard B. (2000). *Strategic Management – Formulation, Implementation and Control*. Seventh Edition. Page 72. McGraw-Hill International Editions.

According to the authors, ‘a firm’s external environment consists of three interrelated sets of factors that play a principal role in determining the opportunities, threats and constraints that the firm faces: the remote, the industry and the operating environments.

- the **remote environment**, comprises factors originating beyond, and usually irrespective of, any single firm’s operating situation (economic, social, political, technological and ecological factors);

- *the industry environment*, comprises factors that more directly influence a firm's prospects (entry barriers, competition rivalry, the availability of substitutes, and the bargaining power of customers – or buyers – and suppliers);
- *the operating environment*, comprises forces that influence a firm's immediate competitive situation (competitive position, customer profiles, suppliers, creditors and the labour market).

*These three sets of factors provide many of the challenges that a particular firm faces in its attempts to attract or acquire needed resources and to profitably market its goods and services*". (Pearce & Robinson, 2000 – page 106).

Pearce & Robinson also sustain that Porter's Five Forces Model (which deals with the industry environment's factors) is a "*well defined, analytic framework which helps strategic managers to link remote factors to their effects on a firm's operating environment*" (Pearce & Robinson, 2000 – page 84).

### **3.4 Data collection methods**

Three major strategies were adopted during the data collection step of the research development:

- Extensive literature search through the internet, with emphasis on specialized journals (*Waste Age* and *World Wastes*, mainly), newspaper articles, international environmental agencies reports and relevant academic research. National as well as local environmental and/or solid waste management legislation, with especial attention to C&D waste management regulations, have also been reviewed.
- Unstructured interviews with 06 (six) of the 20 (twenty) registered firms which are licensed to operate C&D waste collection and haulage services within the boundaries of the city of Recife. Each interview took approximately one hour and 30 minutes and it was aimed to obtain the entrepreneurs' vision about the five forces driving industry competition (Figure 3.2 was used during the interviews to illustrate the research boundaries, limited to the industry environment). It was also

an opportunity to investigate the reasons which motivated each entrepreneur to enter the C&D waste collection business, as well as to obtain updated, general information, about their operations (number of trucks, containers, employees, service prices, market share - corporate or individual households, for example - date of starting operations, and previous businesses or professional occupations/experiences).

- Unstructured interviews were also conducted with members of the technical staff of EMLURB, the municipal solid waste management agency in Recife; of CPRH, the State of Pernambuco environmental agency; with a researcher and lecturer of the Centre of C&D Waste Recycling Studies at the University of São Paulo (USP); with a researcher of the Environmental Research Centre at the Polytechnic School of Pernambuco (University of Pernambuco – UPE); with the president of SIERESP, the C&D waste collectors association in the State of São Paulo; and with the Environmental General Attorney, from the Public Ministry of the State of Pernambuco. The main objective to conduct these interviews was to obtain these stakeholders' views about the current C&D waste management public policies and business environment, both in Recife as well as in São Paulo, the biggest urban centre in Brazil, whose experience has very much influenced the debate towards the development of the first national regulation on C&D waste management.

Clearly, the benefits from the triangulation among these three major data collection methods enabled a better balance of possible “*trade-offs*” from the intrinsic strengths and weaknesses of each method.

## **PART II UNDERSTANDING THE INDUSTRY OVERALL BUSINESS ENVIRONMENT**

### **4.0 C&D Waste Management: a Sector Common to the Construction Industry and to the Waste Management Industry**

#### **4.1 The construction industry: general characteristics and market structure**

*“However, growth or otherwise, construction is still seen as a somewhat ‘dirty trade’ as it produces some undesirable by-products” (Price, 2000)*

One of the most important players in the global economy, the construction industry accounts for 10% of GNP worldwide (a total annual output of US\$3,000 billion) and it is estimated that it employs 111 million people, the largest industrial employer, as it is responsible for 28% of total industrial employment in the whole planet. Typically, 90% of the workers are employed in micro firms (of less than 10 people) and 75% of the total workforce within the construction industry are in developing countries (CICA, 2002).

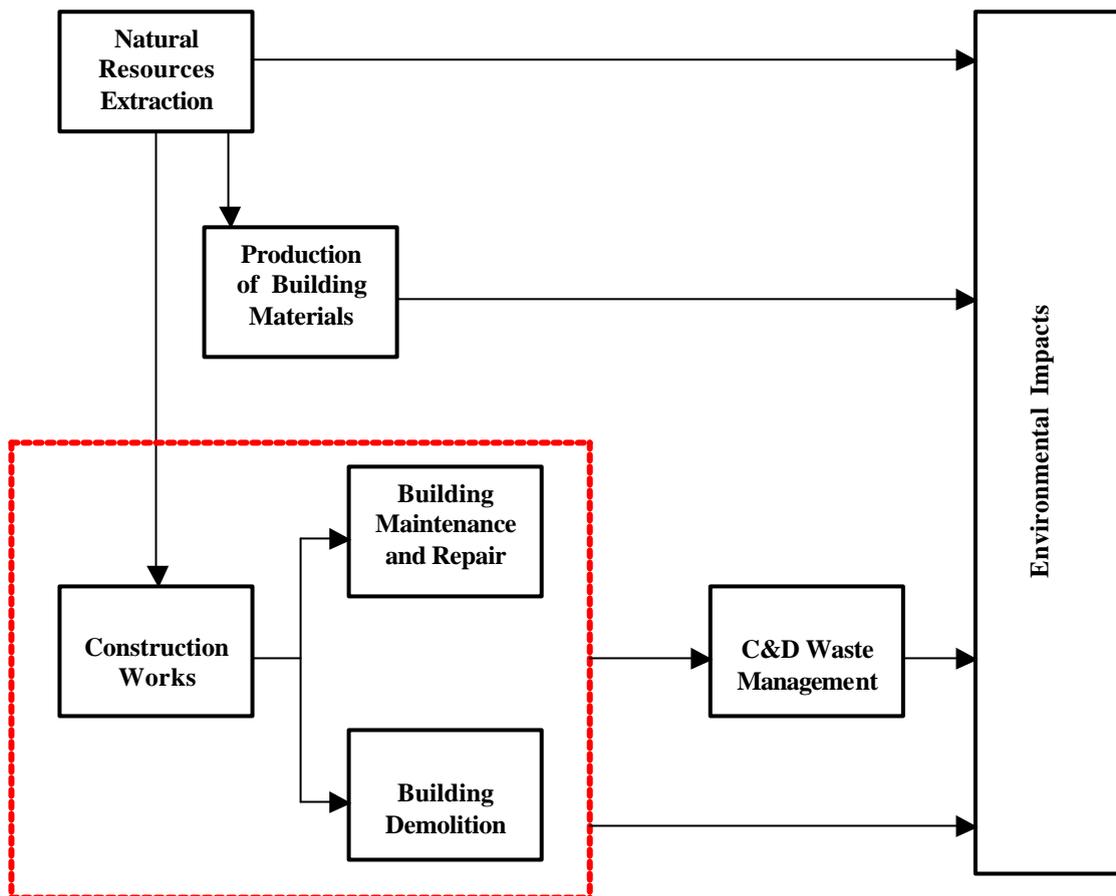
In Brazil, the construction industry represented as much as 15,5% of the GNP in 2002 (John et al, 2003). According to data of 1998, the Brazilian construction industry directly employed 3.5 million people in that year and was responsible for another 13.5 million indirect jobs (Blumenschein, 2002). These figures confirm the multiplier effect that the construction industry has on the entire economy. It is estimated that nearly 20% of all employment in the world may be connected to construction industry or its related activities somehow (CICA, 2002).

The construction industry continues to be fragmented, with consolidation of larger firms and ever-increasing number of small firms; in fact, 97% of all firms are SMEs (less than 500 employees) and 95% out of these are micro firms - *“the larger firms tend to act as project managers, assuming responsibility for larger contracts in their role as general contractors while outsourcing much of the work to SMEs, acting as sub-contractors”* (CICA, 2002 – page 14). Competition is intense; profit margins are narrow (2% or less)

which can easily turn into significant losses, although the construction industry still shows an adequate return on capital.

Along its entire production chain, the construction industry is responsible for significant environmental impacts: from land occupation and extraction of raw materials (in developed countries alone, the construction industry accounts for up to half of all raw materials taken out the earth's crust, by weight – CICA, 2002), to energy-intensive processing of raw materials into manufactured goods, transport activities, construction works (including building works, renovation and maintenance - R&M, and demolition) and the generation and disposal of wastes (Figure 4.1).

**Figure 4.1 Construction industry chain**



Source: Schneider (2003). Adapted from Put, J. (2001) "Recycling of C&D waste: success factors". Paper presented at the C&D Waste Recycling and Technical Norms Workshop. São Paulo, August, 2001.

It is interesting to note that construction needs in developing countries is related mainly to the provision of new infrastructure, roads, housing, social facilities (schools and hospitals), etc. In developed world, however, the balance of building activities is quite rapidly shifting from new construction to renovation and maintenance works. Typically, R&M accounts for one third of all construction activity in Europe. Some countries estimate that R&M already represents up to 50% of total construction activity and is still rising (CICA, 2002). This clearly influences the composition and quantities of C&D waste generated in each region of the world, with different impacts on C&D waste management activities.

Recent efforts of the construction industry (particularly in developed countries) are now concentrated on measures to promote waste minimisation as well as the reduction of the amount of C&D waste going to landfills or illegal dumping sites through the implementation of environmentally-sound waste reuse and recycling activities. Aiming at set targets also in the social and economic dimensions to sustainable development, the construction industry expects to achieve the “*sustainable construction*” status worldwide, in the near future (CICA, 2002). An outcome of sustainable construction is what is known as sustainable building which combines “*architectural design and engineering with ecological knowledge in order to build and renovate structures that are not only functional and aesthetically pleasing, but are also efficient, healthy, and have the least impact on the environment*” (Vitulli et al., 1998). To fully achieve sustainability in its triple dimensions (social, economic and environmental), the construction industry still faces the following challenges (CICA, 2002):

- *Social aspects: to continuously upgrade the workers’ skills as well as to improve health and safety programmes at construction sites;*
- *Economic aspects: to involve contractors increasingly in optimising the design of construction projects (key word: flexibility);*
- *Environmental aspects: to introduce life-cycle based environmental schemes in order to evaluate the impacts of construction products and materials; to reduce the amount of waste, increasing reuse and recycling; to introduce environmental product declaration schemes; to reduce GHG (greenhouse gases) emissions in the built environment; over longer term, to consider including environmental criteria with product standards.*

## 4.2 The waste management industry: general characteristics and market structure

*“Waste is the other side of the coin from production: it is material lost to the productive economy – together with the energy invested in manufacturing and transporting the materials and products which become waste”*

(Local Government Management Board, 1993 – first draft - page 51)

Like the construction industry, the waste management industry is labour-intensive, highly competitive and still remains fragmented, although consolidation has been observed in recent years, particularly in North America, Europe and to a certain extent in Latin America, where privatisation of the operations has been a strong trend in recent years. In Brazil, for example, it is estimated that 65% of the urban population (that is, 110 million inhabitants) are served by just 40 private waste management firms (Costa Leite, 1997). The waste management industry is still characterised by inconsistent and non-comparable data as well as the absence of common terminology, of parameters and monitoring standards (ISWA, 2002).

The waste management industry can be classified as one of the environmental domains of pollution management sector which, in turn, is part of what is known as eco-industry. According to OECD/Eurostat, the eco-industry is defined as *“activities which produce goods and services to measure, prevent, limit, minimise or correct environmental damage to water, air and soil, as well as problems related to waste, noise and ecosystems. This includes cleaner technologies, products and services that reduce environmental risks and minimise pollution and resource use”* (European Commission, 2002).

It is estimated that the total global environmental market is worth about 550 Bn Euro, giving the EU approximately one third of the overall eco-industry market worldwide (183 Bn Euro). Table 4.1 below presents the sectors and sub-sectors which comprise the eco-industry market in the European Union, including their expenditures in 1999.

According to the same source, the United States' environmental goods and services market accounted for another one third (estimated to be worth 180 Bn Euro) of the global eco-industry market, followed by Japan (84 Bn Euro) and Canada (36 Bn Euro).

**Table 4.1 Environmental domains comprising the EU eco-industry market**

Eco-industry group or sector	Environmental domain ( or sub-sector)	Total expenditure in 1999 (Bn Euro)
Pollution Management	Air pollution control	15
	Waste water treatment	48
	<b>Waste management industry</b>	<b>47</b>
	Remediation and clean-up of soil/groundwater	3
	Noise and vibration control	2
	Environmental monitoring & instrumentation	3
	Environmental research & development	2
	Public environmental administration	4
	Private environmental management	2
	<b>Sub-total (*)</b>	<b>127</b>
Resources Management	Water supply	33
	Recycled materials	14
	Nature protection	7
		<b>Sub-total (*)</b>
	<b>Total</b>	<b>183</b>

(\*) sub-totals may not sum due to rounding

1ECU = 1.2US\$

Source: Adapted from European Commission (2002) "Analysis of the EU eco-industries, their employment and export potential". Final report commissioned by DG Environment to Ecotec Research Consulting Ltd. (in www.ecotec.com).

From the above table, the waste water management and the waste management sub-sectors represented each nearly 40% of total expenditures in the pollution management group in 1999 (that is, 48 Bn Euro and 47 Bn Euro, respectively).

In terms of employment, the waste management industry accounted for 52% of all direct jobs in the pollution management sector in Europe in the same year (that is 760,300 direct jobs, including both operating and investment related jobs). In Brazil, it is estimated that nearly 400,000 people (including both civil servants from local authorities and private firms' employees) are directly involved with the provision of waste management services (ABRELPE, 2003).

After Rio's World Summit in 1992 and the advent of Agenda 21, it was agreed there should be a global move towards a more sustainable waste management practice. In broadly terms, this would require the waste management industry players to (ISWA, 2002):

- *minimise generation of waste by achieving changes in production and consumption patterns;*
- *maximise recovery and reuse of recycling of waste, including bio waste and composting;*
- *promote environmentally sound waste disposal.*

More than a decade later, the waste management industry still faces the challenge of decoupling waste generation from economic development and consumption growth. Another challenge is to cope with the effects of rapid urbanisation: *“many of the most rapidly growing conurbation and mega-cities are located in developing countries, where funding is still a critical issue”* (ISWA, 2002). It is widely recognised though, that progress has been made in recycling and resource recovery as well as in safe disposal of wastes (landfilling and incineration with or without energy recovery), particularly in industrialised regions.

In terms of policy approaches, the European Union is primarily driven by environmental objectives and by the establishment of a hierarchy of preferred waste management practices which emphasises waste reduction measures and resource recovery thus reducing landfilling to a minimum. In the United States, however, the approach is more economically oriented, based on cost-effective analysis which, in turn, prioritises landfilling. Other industrialised countries either adopt “European type” or “North-American type” approaches, depending on several factors such as the cost and availability of suitable areas for landfilling, for example (ISWA, 2002).

While industrialised countries are “fine-tuning” their waste management systems, developing economies still face problems of access to adequate technology and capacity building as well as to funding, and still lack proper legal framework or, when it exists, it is antiquated and/or not enforced. In fact, sectoral diagnosis conducted by the Pan-American Health Organization – PAHO in Latin America pointed out that the waste management sector in the region is characterised by the lack of national policies and plans and by the poor support given to local authorities which are ultimately responsible for service provision. This is translated into operational inefficiencies and weaknesses at institutional, managerial and financial levels (Acurio et al, 1997).

### 4.3 C&D waste management: brief notes on recent international experience

*"I think it is an edge. You can't survive in this industry without being innovative"* says Tony Colismo, from *Artistic Waste*, a C&D waste collection firm in Iowa, USA (Dunson, 2000)

Driven by the dynamics of both the construction industry and the waste management industry, the C&D waste management sector is also a direct function of economic development and consumption patterns. Stringent environmental regulations over the construction and the waste management activities together with the need, in both industries, to continuously reduce costs, operate more efficiently and still make profit in a highly competitive environment, are factors which strongly favour the growth and development of C&D waste management business opportunities.

Definition of what is C&D waste or debris and its composition vary from place to place. In the United States, for example, almost every state has its own definition. The US-EPA defines C&D debris as *"waste that is generated from the construction, renovation, repair and demolition of structures such as residential and commercial buildings, roads and bridges. Overall, C&D waste is composed mainly of wood products, asphalt, drywall, and masonry; other components often present in significant quantities include metals, plastic, earth, shingles, insulation, and paper and cardboard"* (World Waste Staff, 1996).

Precise figures on C&D waste generation are not available. In the United States the generation of building-related waste (that is, which excludes soil, stones, asphalt and land clearing waste) is estimated to account for 18%-25% (in weight) of the country's total waste stream (Turley, 1997), and it represents around 136 million tonnes per year, with an average generation rate of 463 kg/person/year (US-EPA, 1998). The European Union estimates a generation of 188 million tonnes per year of "core" – or building-related - C&D waste, which represents an average rate of 502 kg/person/year (European Commission, 1999).

For the purpose of this research study the term C&D waste refers to building-related waste which, regarding its source, arises from construction sites, renovation and

maintenance (R&M) of existing buildings, and demolition. Typically, C&D waste management practices include landfilling (together with municipal solid waste, or in a specific C&D waste facility – also known as inert landfill) and materials recovery for recycling. To illustrate this, table 4.2 below presents C&D debris estimates in the United States, by source and management practice:

**Table 4.2 C&D waste estimates: generation by source and quantities by management practice – United States (1996)**

C&D waste generation estimates (1996)			C&D waste management practice (1996)		
Source	Mtonnes	%	Type	Mtonnes	%
Construction	11	8	Recycling	25-40	20-30
R&M	60	44	C&D landfill	45-60	35-45
Demolition	65	48	MSW landfill	40-55	30-40
Total	136	100	Total	136	100

Source: Adapted from US-EPA (1998) “*Characterization of building-related construction and demolition debris in the United States*”. Report EPA-530-R-98-010. Prepared by Franklin Associates.

It is widely accepted that most experts both in USA and in Europe agree on the following points (Douglas, 1996):

- *C&D waste is a huge space consumer;*
- *Some of the materials, like asbestos, are toxic.* In fact, a study conducted at Illinois University in the United States in 1993 identified 60 possible components in C&D waste stream which may be hazardous contaminants, from acetone and lead-based paint to waterproofing agents. (Freeman, 1994);
- *Landfills are overloaded;* and
- *Tipping fees continue to rise.*

In addition to these, C&D waste can be a significant source of environmental and public health problems when it is littered or dumped in illegal sites, particularly in poor urban areas (alongside roads, river valleys, etc), with severe impacts on surface drainage and landscaping. Moreover, illegal C&D waste dumping sites may allow the illegal dumping of other wastes, including organic matter, which will then attract rodents and insects.

The solution to all those shortcomings points out to C&D materials reuse and recovery for recycling. Since increasing quantities of C&D waste are constantly being generated, it seems there are sufficient economic and financial reasons to go for recycling. Measures to promote the reuse and recycling of C&D waste have been taken both in industrialised and developing countries worldwide. Significant recycling rates – over 75% - have been achieved in the European Union (notably in Denmark and in The Netherlands). According to the Dutch experience (which has already achieved the 90% recycling target), the main factors which lead to high C&D waste recycling rates are the following (Ministry of Housing, Spatial Planning and the Environment, 2001):

- *separation at source;*
- *a healthy market for recycled products;*
- *financial incentives, such as the landfill tax; and*
- *the ban on landfill.*

On the other hand, there are factors (usually the same as many other traditional recyclables) which may limit recycling of C&D waste. These include, among others, low landfill tipping fees (this is the case in Brazil, for example); lack of suitable and reliable data on quantity and composition of C&D waste; lack of sound business plans and previous experience on running this type of business; usually high start-up and operating costs of recycling facilities; reluctance of contractors and other potential customers to use recycled C&D materials as alternative products; and the fragmented nature of C&D waste management industry.

Nevertheless, there seem to be several on-going efforts to encourage C&D waste recycling and promote “*green building*” initiatives. In the United States, both governmental bodies and NGOs are conducting studies and pilot projects to better understand and increase recycling of C&D waste stream (US-EPA, 1998). States like California, Illinois and Iowa have offered grant money for innovative C&D waste management practices. An example is given in Box 4.1 below (Dunson, 2000):

#### **Box 4.1 Incentive for innovative C&D waste management practice**

*Beginning in 1996 as a demonstration project funded by grant money from the Iowa Department of Natural Resources, Artistic Waste found Des Moines's construction boom as a great revenue source. The state was offering grant money for innovative waste reduction programmes, and builders needed their debris hauled away.*

*"Des Moines area has better profit margins for C&D waste because of a tremendous amount of residential construction", says Artistic's president, Tony Colismo. So as an incentive to home builders and other contractors to sign collection agreements, Artistic began offering a C&D recycling programme with cost based on the residential dwellings' total square footage.*

*"This is a really unique programme, especially for home builders that are constructing multifamily units or track housing where the neighbourhoods of 500 homes are being developed during a two- to three-year period", Colismo says. "We evaluate the type of homes builders are building, including amenities. From there, we use a formula to determine how much waste we'll take from the house".*

*During construction of a typical home, Colismo estimates half of the waste stream can be recycled. Instead of placing a roll-off container for the contractor and his subs to discard of their waste, Artistic provides smaller bins for segregating different materials. Grant money from the state was used to purchase a specially designed truck equipped with a crane to load material.*

*Once segregated, Artistic's collection personnel transport separate loads of wood, metal, concrete and cardboard to Central Recycling, a privately owned recycling and landfill facility in Des Moines. "Between what we do and what Central does, we can get close to 70 percent waste diversion from home builders," Colismo says.*

*Debris is generated throughout construction, which keeps Artistic busy. "Home-building occurs in phases," he explains. "During the framing stage, for example, there's a lot of wood waste. Toward the end of construction, when most of the amenities are being installed, there's a lot of cardboard. Good builders understand the idea of stockpiling and sorting waste streams because there's an economic incentive to recycle". Carelessness resulting in contaminated loads comes at a price - with Artistic assessing an extra handling fee*

*Obviously, construction is a seasonal business, which in Iowa typically begins in April and continues until the first freeze. However, Colismo notes that when the building stops, "C&D goes away, which warrants higher margins. While nothing is recession-proof, residential construction always will continue. It's just a matter of how much and how often".*

*Source: Dunson, Cheryl (2000). "From rubble comes reward". Waste Age, Feb 1, 2000*

A good C&D waste recycling operation is by definition a high-tech or medium-tech separation facility. Low-tech seldom can move enough tonnage to make the recycling profitable. In some areas, however, where labour is not expensive a facility emphasizing labour-intensive operations might be just as successful as high-tech ones (Colley, 1998).

It is widely recognised that firms solely specialising in collection and haulage services will continue to start their operations, due mainly to the pretty low entry barriers.

However, the ideal C&D waste operation is vertically integrated recycling: *“vertical integration gives the operator control over every aspect of the recycling process, minimizing cost and maximizing profits. The facility uses the recycled materials to create finished product”* (that is, value-added, alternative materials or products). *“This process keeps the facility’s aftermarket free from external control”* (Colley, 1998).

Moreover, small C&D waste businesses should invest in flexibility of their operations, and personal contact with customers, tailoring services to each customer’s need: *“If I were a small, independent hauler, I would be thinking ahead; educating myself on my local market and on industry trends and technology; talking to my customers and thinking as creatively as I can about the services I offer. In addition, I would try to develop a five-year plan, just like the big companies do”* says Carl Hornberg, vice president of sales and marketing for National Serv-All, Indiana, USA (Anonymous, Waste Age, 1997).

## 5.0 C&D Waste Management in Brazil

### 5.1 C&D waste: a nuisance in Brazilian urban areas and a nightmare to building contractors

Public awareness regarding C&D waste-related problems is very recent in Brazil. Two main factors have attracted the society's attention since the early 90's:

- the environmental effects from illegal dumping of wastes in the urban areas such as flooding, landscape pollution, traffic obstruction, and the proliferation of disease vectors (rodents and insects); and
- the economic impacts represented by building materials wastage in the Brazilian construction industry. *“A landmark was a national diagnostic on materials wastage rates in building sites”* (in 1989, according to Blumenschein, 2002). *“This research revealed very high wastage rates and received broad coverage by the media, and increased the awareness within the construction industry chain as well as among authorities and consumers”* (John et al, 2003).

In Brazil, the generation of C&D waste has accompanied the rapid urbanisation process since early 60's and the illegal dumping of debris, and its consequences, is one manifestation of it. C&D waste has largely been used as a backfill of expanding urban areas for new property developments. Many of those initiatives proved to be chaotic to the urban environment, sometimes even tragic, since there were no licensed projects and occupation took place in an uncontrolled way. In the city of São Paulo, a shanty town which was built on top of C&D dumped debris area collapsed, killing 14 people (John & Agopyan, 2001).

Precise statistics on the generation of C&D waste in Brazil are not available. According to the National Survey on the Provision of Sanitation Services for the year 2000 (Brasil, 2002), 85% of the Brazilian cities provide C&D waste collection services somehow. Quantities are not known because C&D waste, when regularly disposed of, is frequently mixed up together with municipal solid waste stream.

However, several recent academic studies have produced relatively accurate estimates on the generation of C&D waste which accounts for the largest amount of municipal solid waste (in mass), ranging from 40% to 70% (Pinto, 1999). In general terms, it is accepted a per capita generation rate of 500kg/year for Brazilian cities, which means an estimated total of 68.5 million tons/year nationwide (John et al, 2003).

It seems that the largest source of C&D waste is small, private building works (including renovation and maintenance). According to the estimates of the Construction Industry Association in the State of São Paulo, 25% of the C&D waste are produced at large contractor's building sites and 75% at small works (SINDUSCON-SP, 2003). In a survey with 102 C&D waste collectors of six Brazilian cities, it was found that an average of 52% of their loads come from small construction works, many of them informal or "do-it-yourself" jobs (Pinto, 1999).

Construction rather than demolition is the main source of C&D waste in Brazil. This becomes evident when taking into account a number of factors: increasing number of licensed projects and new construction works (due mainly to the impact of inflation control measures), increase in the production and consumption of basic building materials such as cement, sand and other concrete aggregates, bricks, wood, and steel bars (Pinto, 1999). For this reason, it is crucial to know the wastage of building materials at construction sites. In Brazil, systematic studies have concentrated on multi-family residential buildings: *'it must be highlighted though, under the present scenario, there is no room for construction business firms to continue dealing with soaring percentages of materials wastage and depletion of natural resources, either for economic circumstances or environmental reasons'* (Pinto, 1999). The Brazilian experience so far indicates that the average materials wastage is between 20%-30%, depending on the building technology, although some entrepreneurs (notably in the State of Paraná) argue that the right figure should be about 3,33% only (Blumenschein, 2002).

Nevertheless, it is interesting to observe that although survey methodologies may vary from one study to another the building materials with larger wastage rates are those which participate most in the average composition of C&D waste generated in building

sites: mineral C&D waste 65%; wood 13%; plastics 8%; other 14% (Pinto, 1999; John et al, 2003).

## 5.2 C&D waste management model: current practices and trends

The Federal Constitution of 1988 defined the role of national, state and local governments, clearly stating the boundaries of exclusive competence of each level and the situations where a joint, articulated and integrated action is expected or required. A major outcome of the new constitution was the empowerment of local government and its related authorities. Under this principle, municipal solid waste management was defined as of exclusive competence of local level authorities.

The following municipal organic laws after 1988 reaffirmed the exclusive competence of local governments in solid waste management while defining local authorities' functions and responsibilities (planning, regulation, enforcement, supervision and service provision, directly or by permission/concession, from collection to disposal).

C&D waste management is part of municipal solid waste management. C&D waste is often included in the definition of the composition of municipal solid waste stream, sometimes under the category of *public waste* (when the generator is not clearly identified – that's the case of illegally littered or dumped wastes) or *special/bulky waste*, when the source is known.

Historically, the Brazilian experience on C&D waste management has shown the lack of technical, financial and moreover managerial capacity of local authorities to deal with the problem. The usually, widely “adopted” management model is what is known as “*the corrective approach model*”, which is characterised by “*a set of non-waste preventing, continuous, and costly activities with no adequate outcomes and therefore profoundly inefficient. The corrective approach is nurtured by the “inevitable” illegal dumping of C&D waste and it is likely to prevail as far as dumping or landfilling areas are available next to generation areas*” (Pinto, 1999).

The corrective approach is cyclic, in what seems to be a “tacit agreement” among key players: C&D waste is generated citywide; waste generators and/or hired formal or

informal collectors/haulers provide waste transport to the nearest “suitable” place where it is disposed of (illegal dumping); the local authority identifies critical dumping sites and clean them up. This can be a costly operation as heavy machinery/equipment like front loaders is frequently used. In the city of São Paulo, removing illegally dumped C&D waste and transporting it to regular landfills costs nearly US\$ 19 million/year, according to local authority reports (John et al, 2003). In the year 2000, nearly 120,000 illegal dumping sites were identified in the city of São Paulo but only 25 people or firms were found responsible and fined for that infraction (Schneider, 2003).

Coping with ever increasing quantities of C&D waste is another major challenge. In the city of São Paulo the available, regular disposal facilities to C&D waste (two inert landfills – one privately owned and a public, free of charge landfill; two transfer stations and two transfer and sorting units) can handle up to 5,000 tons daily. However, the estimated C&D waste generation rate in the city of São Paulo alone is about 16,000-18,000 tons/day (Schneider, 2003). Yet, estimates show that as much as 80% of the total generated debris are illegally dumped either in the city of São Paulo itself or in the outskirts of nearby cities within the metropolitan area (Folha de S. Paulo, 2002).

Most local authorities have specific regulations to C&D waste collection and disposal which, in general, are poorly enforced. *“The Brazilian experience shows that a policy based only on regulation of C&D waste transportation and landfilling is not totally efficient in controlling illegal dumping. The policy has to be complemented with a network of transfer stations, which cuts down the transportation costs, making illegal dumping less attractive”* (John et al, 2003). This is the rationale behind the so called *“differentiated approach model”* (Pinto, 1999), which is defined as a set of new concepts of public service strategies to C&D waste management aiming at:

- the establishment of a widely spread network of suitable facilities (transfer stations, transfer and sorting units) to attract the maximum possible amount of C&D waste generated both by small and large generators;
- providing C&D waste recycling facilities in a permanent, ever-improving basis;
- changing present cultural and behaviour patterns regarding generation rates, collection and disposal methods and resistance to the use of recycled products in building works.

Some cities in Brazil have moved from the corrective approach to the differentiated approach to C&D waste management with interesting results. That is the case of Ribeirão Preto and Santo André in the State of São Paulo, Belo Horizonte (State of Minas Gerais) and Salvador (State of Bahia). The key feature is recycling, which gradually is attracting the attention of local government managers. Those municipalities have invested in C&D waste mills to reduce volume and to produce new, alternative building materials at relatively low cost. Most of these materials are used in paving works by the same local authorities (Pinto, 1999).

The new national policy on C&D waste management (CONAMA resolution 307), if properly enforced, is expected to contribute to change the dramatic environmental situation nationwide while clearing the pathway for future business opportunities within the sector. It is based on principles of no generation and of a hierarchy of C&D waste management, with a strong emphasis on materials recovery and recycling and a ban on landfilling C&D waste in municipal solid waste sanitary landfills. Box 5.1 below presents a summary of the main aspects of resolution 307.

#### **Box 5.1 National policy on C&D waste management - CONAMA Resolution 307**

*In the year 2000 the National Council on the Environment (CONAMA) created a task force made up of representatives from the construction industry supply chain, including universities and research centres, and environmental NGOs to jointly discuss and elaborate a national directive on C&D waste management. The resolution was approved in 2002 (CONAMA resolution 307) and should be fully implemented and put in force by July 2004.*

*The main aim of the resolution is to reduce C&D waste generation, reduce illegal dumping, and promote recycling. The proposed C&D waste management model is based on stakeholders co-responsibility and it states that:*

- *Dumping C&D waste in sanitary landfills is prohibited;*
- *Local authorities are responsible for operating C&D waste management schemes which should be able to handle wastes from both low volume generators and high volume generators;*
- *Each construction or demolition site must submit a C&D waste management plan of operation to local authorities; and*
- *Material producers, building contractors and C&D waste transportation firms are co-responsible on managing C&D waste.*

Source: Adapted from John et al (2003) "Strategies for innovation in construction and demolition waste in Brazil". PCC-USP. São Paulo

The identification of the social costs of C&D waste mismanagement as well as material wastage high rates were a milestone, as they both raised public awareness to the problems and enhanced the debate within the productive chain (John et al, 2003). The society, organised in task groups, technical commissions or committees, with the active participation and support of its representative bodies (industry associations, universities, research centres, etc), has been looking for long-term, sustainable solutions, in partnership with the public sector. Here are some examples of successful Brazilian initiatives:

- In 1997, the “*Entulho Bom*” project, implemented in the city of Salvador (State of Bahia), involved the participation of the university, the city’s waste management local authority, a federal investment bank, and the state technical and scientific research center. The project’s aim was to use recycled C&D waste in the production of low cost, alternative building materials to low income housing schemes and infrastructure, in order to contribute to local sustainable development. In the year 2000 the project was recognised as one of the 100 world’s “Best Practices and Local Leadership Programme”, promoted by the United Nations.
  
- In 1998 the Brazilian Quality and Productivity Programme for the Habitat (PBQP-H) was created. *“It brought together representatives of all branches of the construction supply chain, including public agencies, and researchers. This program succeeded in creating a new approach within the construction supply chain. One of the successful results was the introduction of a quality management system in building companies that was adopted by a large number of companies nationwide”* (John et al, 2003)
  
- In the year 2000 the *‘Environmental Chamber of the Construction Industry of the State of São Paulo* was created. *From this initiative, a Technical Group on Construction and Demolition Waste was formed. This group comprising representatives of the local authorities, environmental agencies, building contractors, materials producers, C&D waste transportation companies and researchers, has been successful in preparing draft standards and promoting municipal and state regulations on different aspects of C&D waste management, including transfer station operations and C&D waste landfill design and operations”* (John et al, 2003).

### 5.3 Characteristics of the C&D waste collection and haulage sector

C&D waste collectors have always been present in urban areas. Individuals and, more recently, specialised C&D waste collection firms are crucial players within the sector. In Brazil, the general characteristics and business profile of those agents are changing very rapidly together with the increasing demand for C&D collection and disposal services, particularly in larger urban areas. Nevertheless, in small urban centres, a variety of C&D waste collection service equipment is still found, from a donkey or horse-pulled cart to tipper trucks and more frequently now, roll-offs (“brooks” type) which haul skip containers. Figure 5.1 below presents the most common C&D waste collection equipment in Brazilian cities.

**Figure 5.1 C&D waste collection and haulage equipment:  
Roll-offs (“brooks” type) and skips**



source: [www.mirassolimplementos.com.br](http://www.mirassolimplementos.com.br)



source: [www.mirassolimplementos.com.br](http://www.mirassolimplementos.com.br)



source: [www.mirassolimplementos.com.br](http://www.mirassolimplementos.com.br)



source: [www.tratortec.com.br](http://www.tratortec.com.br)

It is interesting to note that until the late 80's there was only one national supplier of this type of equipment in Rio de Janeiro. By 1999 there were about 14 suppliers, most of them located in São Paulo, selling their products nationwide (Pinto, 1999). This coincided with the period in which a great number of C&D waste collection start-ups were registered, motivated by recent municipal regulations on this type of activity in major urban centres, such as São Paulo and Recife, for example, and the very low entry barriers. With an initial investment of as little as US\$10,000 one can start his/her own C&D waste collection firm.

Nevertheless, C&D waste transportation and management, both legal and illegal, is a profitable business. The revenues of this industry are estimated to reach up to US\$130 million/year in Brazil and they are around US\$40 million/year in the city of São Paulo alone. In this metropolitan area the price for removing and dumping a C&D waste 4m<sup>3</sup> skip container can be as much as US\$25 (John & Agopyan, 2001; John et al, 2003). The entrepreneurs, however, argue that the figures of total revenues may sound like big business but the cost structure of the service is perverse, leaving an extremely narrow profit margin, if any (president of SIERESP, the C&D waste collection association of the State of São Paulo – personal contact). Operational costs directly related to transport (fuel, roll-off maintenance and repair, and equipment depreciation) may represent up to 54% of total costs, excluding profit and assuming the disposal costs are zero (Schneider, 2003). In São Paulo, every C&D waste collection firm which updates its registration annually is allowed to dispose of their loads at the public owned disposal facilities, free of charge.

The C&D waste collection sector is highly fragmented. In the city of São Paulo there are around 700 C&D waste collection firms, which are responsible for, roughly, 2,000 waste removal trips each working day. Among them, just 363 were registered at LIMPURB, São Paulo's waste management local authority by January 2003 (Schneider, 2003). Most of the registered firms (59%) are small (up to 50 skip containers per firm), 36% are medium-sized (51-150 skips) and just 5% of them are large firms (more than 151 skips). The number of employees is not known. If it is considered that all of the C&D waste collection firms which operate in São Paulo (legally or not) are micro enterprises (less than 10 workers) the total workforce may reach up to 7,000 people.

From 2000 until 2003 there was a 35% decrease in the number of registered firms at LIMPURB. Registration is compulsory, according to local authority regulations, but the lack of enforcement capacity gives room to non-complying firms to operate freely, which enables the establishment of an unfair competitive business environment to legal, registered ones. Why do firms do not update their registration records? According to Schneider (2003) it is likely to be for one of the following two reasons:

- either the entrepreneur has decided to quit business; or
- he or she has decided to play as the vast majority, that is, illegally.

Some other limitations or constraints to continue running this type of business include:

- customers hire the lowest possible price collection/disposal services, regardless the status of the firm (formal or not) and where the waste is going to be disposed of. Exceptions occur with construction enterprises which are undertaking quality certification process (ISO 9000) and/or are environmentally responsible, and are not likely to cause damage to their image;
- long haulage distances from waste generation centres to disposal facilities, with a major impact in operational costs;
- inefficient regulation enforcement capacity by LIMPURB as well as lack of qualified supervisory staff;
- high exit barriers – one willing to quit business will inevitably lose money.

Although these factors reflect the experience of the C&D waste collectors in city of São Paulo they are not exclusive or intrinsic to the reality of that city; rather, they illustrate (using a magnifying lens due to the scale of the problem there), what is going on in several other Brazilian urban centres.

In order to cope with those shortcomings and still make profit, many C&D waste collectors have gone into diversification of their businesses. Some of them deal with construction works or demolition activities or provide collection and haulage services to other waste generators (usually inert, industrial, non-toxic or bulky wastes). Groups of C&D waste collectors in São Paulo are interested in operating the transfer and sorting units, thus helping to overcome one of their business' major bottlenecks, the shortage of

suitable and near disposal facilities within the city's boundaries (president of SIERESP – personal contact).

Going for recycling C&D waste (vertical integration) seems not to be considered as a short-term business opportunity to C&D waste collectors in Brazil yet. C&D waste recycling is very much perceived as a local government activity. In fact, most of the recycling plants are operated by local governments which have adopted the so called “differentiated approach model” to C&D waste management. However, the existence of a comprehensive set of research results demonstrating the economic and technical feasibility of C&D waste recycling in Brazil, together with the enforcement of resolution 307, it is expected that new business opportunities will be envisaged by the private sector, including the C&D waste collection firms, in the near future.

Nevertheless, a potential business rival to C&D waste collectors is the demolition sector (there are 100 demolition firms in the city of São Paulo), which already collects and hauls demolition waste as part of their job. Some of these firms are specialising in construction debris management and deconstruction techniques (which recover most of the materials from the demolition site for commercial purposes) and are making money out of the demolition waste, particularly from fashionable, old building elements (windows, doors, columns, staircases, etc).

Finally, some groups of C&D waste collectors are very much concerned with their businesses' present problems (surviving in a highly competitive environment and premature death of newly-born firms) and future trends. Therefore, they are organising themselves into enterprises' associations. The C&D waste collectors association of the State of São Paulo – SIERESP was the first one in the country and it was founded in 1988. At the moment, it counts with 110 members and has played a pro-active role in several forums and committees (SIERESP, 2003). In Florianópolis, the capital city of the State of Santa Catarina, 32 entrepreneurs created, in 2001, a C&D waste collectors' task group with the help of the *Entrepreneurship Programme* of SEBRAE, the Brazilian support agency to micro and small enterprises. Their aim was to find innovative ways to stay in business and discuss C&D waste management alternatives (A Notícia, 2001).

## **6.0 C&D Waste Management in Recife**

### **6.1 The C&D waste management service in Recife: general overview**

Recife is the capital city of the State of Pernambuco (Figure 1.1) and it is the political, economic and financial centre of Recife Metropolitan Area. With a population of 1,5 million people, Recife covers an area of 221 km<sup>2</sup> by the Atlantic Ocean and its territory, mostly flat, is characterised by the serpentine course of two main rivers and dozens of bridges. The marshy lands, mainly at the both rivers' mouth, have been backfilled with debris (known as "*metralha*") since the mid 1500's when the city was founded by the Portuguese conquerors and later by the Dutch invaders in the 1600's until nowadays, and it has become a cultural aspect in the history of the urban expansion of the city.

However, the interest in C&D waste management in general and as a business opportunity in particular became more evident from 1998 when the local authority passed a law followed by a specific decree on C&D waste collection, transportation and disposal services. Since then, research studies, debates and group works have been going on, involving all stakeholders, and often supported by media coverage, particularly during the discussion process which took place nationwide for the elaboration of CONAMA resolution 307. Another stimulus to enhance the interest in C&D waste-relate issues has been the relatively growing concern on the impacts on urban environment, public health and the economy caused by illegal dumping.

The municipal solid waste management sector is, to a certain extent, fairly regulated in the city of Recife. The broad sector policies are expressed in the city's Organic Law, of 1990, which was then incorporated to the city's Development Master Plan, of 1991. The other legal instruments which are now in force at local level are shown in Table 6.1.

**Table 6.1 Municipal solid waste management in Recife - regulatory framework**

<b>Regulatory instrument</b>	<b>Content</b>
<b>Municipal Law 14903/1986</b>	■ establishes the penalties and sanctions (fines) over the acts against public cleansing
<b>Municipal Law 16377/1998</b>	■ modifies and complements Municipal Law 14903/1986 regarding the provision of municipal solid waste collection and transportation services
<b>Municipal Decree 18082/1998</b>	■ regulates C&D waste collection, transportation and disposal services
<b>Municipal Law 16478/1999</b>	■ requires the correct segregation and identification of the wastes generated in hospitals and health care units
<b>State's Law 12008/2001</b>	■ establishes the solid waste management policy and guidelines in the State of Pernambuco

This regulatory framework has been defined by Alencar as “*static and limited*” as it often presents difficulties to competition, creates entry barriers to private firms, generates distortions, and does not allow qualitative outcomes in terms of economic, operational and political-institutional indicators (Alencar, 1999). In fact, this can be highlighted, for example, by the “*continuous and inevitable non-complying attitude (poor control, enforcement and supervision) of local authorities and their managers regarding the legal instruments put in force*” (Pinto, 1999). An alternative to this model is the “*dynamic and participatory*” approach, which requires a fully proactive participation of society and local authority in public service regulation’s discussion, development and enforcement processes (Alencar, 1999).

There are situations, however, that market may influence regulation. In 1994 there were only four private firms in Recife which provided C&D waste collection and disposal services directly to customers, freely, with no regulation at all by the local authority. It was only in 1998, when already 12 firms were in the market, and the inevitable problems caused by service externalities (traffic congestion during pick-up operations, car accidents involving skips, pavement obstruction with skips, etc), that the city councilors decided to pass a law to regulate this growing business activity (Alencar, 1999). It was then the first time in Recife that this type of regulation took place,

allowing the legal organisation and operation of an existing waste collection/disposal service thus creating the conditions to future business opportunities.

At the time of the city's C&D waste management service regulation, in 1998, it was estimated by the local authority that a total amount of 16,000 tonnes/month of debris would be solely collected by the recently-regulated firms, as it represented the waste generated by large sources (that is, more than 0.3m<sup>3</sup> of C&D waste per construction or demolition work). That would mean the municipality would have an economy then of approximately US\$300,000 monthly which would be re-invested in the improvements of garbage collection services in low-income areas of Recife (Jornal do Comercio, 1999). This could be an indication of the potential market size at that time, although these figures refer only to the amount of C&D waste which was effectively being collected by the municipality, within the adopted "corrective approach" management model (Pinto, 1999), still in practice nowadays in Recife. And whether or not the savings were used to improve low-income waste management system, one will never really know, since there is a lack of effective and transparent social control instruments.

The C&D waste management service in Recife has been the first (and the only) municipal public service sector to fully operate in the market, in open competition with several service providers. Customers choose the C&D waste collection firm at the Yellow Pages™ and hire the service by just making a phone call. Other municipal waste management services are provided by a couple of private firms, contracted out in a service concession regime, after a public bidding process. Very recently, a health care waste management private firm was authorised to sell its services to the local medical community but so far it has been operating under private monopoly.

Just one year after the regulation of C&D waste management sector, the number of firms jumped from 12 to 19, clearly motivated by the new regulatory framework, as well as by the very low entry barriers and by the feeling that it was an easy job to do. According to a municipal waste management local authority officer, this number soared up to as many as 27 firms (Elizabeth Jucá – personal contact). Some of them had their origins in the transport and construction industries; others were born out of the idea of making money fast, with a small start-up investment. However, very early those firms experienced the consequences of poor regulation enforcement as they had to compete

with numerous illegal, clandestine service providers at one side and with the local authority at the other since its contractors did not respect the C&D waste collection limit of 50 litres/day, produced by small sources (according to the regulation, a generator should contract a C&D waste collection firm if he or she generates more than 50 litres/day; below that limit, the municipality, through its solid waste contractors, would collect the debris, free of charge).

Like in other Brazilian cities, customers in general are interested in hiring the lowest possible price service, regardless of the legal status of the firm and where the waste is going to be disposed of. Only very recently it has been observed that this behaviour is gradually changing, notably with larger generators such as construction enterprises which are involved in the implementation of total quality management programmes, for example. A recent survey conducted by researchers of the Polytechnic School of Pernambuco with a sample of 25 construction firms in the Metropolitan Area of Recife pointed out that 52% of them choose a C&D waste collection and disposal service firm based on the lowest price criterion. Other criteria are: prompt pick-up service (26%), quality of service (11%) and previous recommendation from another construction firm (11%) (Carneiro, F. et al, 2004).

As environmental awareness increases, public pressure over the effects of illegal dumping (particularly flooding, in a flat city at sea level with no drainage system) has made the Public Ministry to take action. In 2002, all legal, regular and publicly known C&D waste management actors (including the collection firms, the municipality and the environmental control agency) were officially notified by the Public Ministry, urging them to play their roles and avoid illegal dumping. No clandestine agent was required to do the same.

So far, the municipality has not done much regarding the illegal dumping problem, except for improving corrective collection of C&D waste. The number and location of illegal dumping sites are not known, although surveys conducted by the Polytechnic School of Pernambuco have so far identified 154 areas in the metropolitan centre (Recife, Jaboatão dos Guararapes and Olinda), usually located alongside major access roads, with an estimated volume of disposed of debris between 5m<sup>3</sup> and over 200m<sup>3</sup> (Carneiro, F. et al, 2004). These figures are likely to soar, as the pilot project is carried

on. The situation tends to get worse as, by July 2004, according to resolution 307, debris will not be allowed to be dumped at sanitary landfills. Muribeca landfill, which is the only authorised area for C&D waste disposal in Recife, is also the only facility where municipal solid wastes are disposed of.

The municipality is conducting preliminary studies to identify suitable areas for C&D waste-only dumping areas within the city's boundaries (a difficult task, since there is a lack of adequate space for that in Recife, as well as the NIMBY - *not in my back yard* - effect). Nevertheless, it seems that the municipality is still skeptical about the cost-benefits of C&D waste recycling and the production of alternative building materials, despite the several research studies and successful international and Brazilian experiences which strongly recommend further investment in this waste management approach (Fabiana Carneiro – personal contact).

The regulation itself has proved not to be effective to guarantee fair business environment, since it is not properly enforced. As a result, most of the firms which have started their operations motivated by the new regulatory framework had to quit business in less than two years. Firm acquisitions and more often equipment (roll-offs + skips) buy-outs dominate the market now in Recife. It is difficult to be precise how many firms are now in active operation in the city as the official register records of both the local waste management authority and the environmental control agency present conflicting data. According to the market, however, there are 20 legal firms at the moment in Recife, but just 12 to 14 of them are effectively competing fiercely, while struggling to survive.

The largest market of C&D waste collection firms in Recife is represented by the middle-upper class multifamily buildings construction works. It is interesting to note that their market is not restricted to the city of Recife but to what is known as the metropolitan centre (Recife, Jaboatão dos Guararapes and Olinda), a conurbation with a population of 2.7 million inhabitants.

Estimates on C&D waste generation and market size in Recife are inaccurate. Using the average generation rate proposed by Pinto (Pinto, 1999) of 500kg/person/year, one would obtain 750,000 tonnes/year or 62,500 tonnes/month for the city of Recife. It

seems to be quite excessive, as recent, though preliminary studies which are being carried out at the Polytechnic School of Pernambuco estimate a generation rate of 216,000 tonnes/year or 18,000 tonnes/month (Fabiana Carneiro – personal contact).

From his research work, Pinto has also found that the C&D waste generation corresponds to 41%-70% (in mass) of total municipal solid waste stream (MSW) (Pinto, 1999). According to the National Survey on Sanitation Services (Brasil, 2002), Recife collects 1,376 tonnes of MSW daily (or 41,280 tonnes/month). Since the collection rate corresponds to a service coverage of 90%-99%, one may assume, for estimate purposes, that the collection rate is equal to the generation rate. Therefore, it is possible to roughly estimate that the C&D waste generation rate in Recife may range between 17,000 tonnes/month (41% of total MSW) and 29,000 tonnes/month (70% of total MSW). These figures sound more reliable, as they are closer to the Polytechnic School's recent findings. Nevertheless, this is clearly an area which demands further investigation.

In the end, it seems to be true, according to the experience of Recife, that the *“environmental and economic impacts are a direct consequence of the lack of adequate disposal solutions which contributes to the perpetuity of the so called corrective approach, where public managers drive their decision-making and attitudes relying on deep misunderstanding of the real waste generation rates while treating important stakeholders as if they were potential non-complying agents”* (Pinto, 1999).

## **6.2 C&D waste collectors in Recife: their views and thoughts**

The purpose of this section is to present the findings of the semi-structured interviews which were conducted by the author of this research study in early 2002 with six of the most dynamic C&D waste collection firms in the city of Recife at that time. The main objective of the interviews was to understand the reasons why the entrepreneurs decided to start this type of business and how they perceived their business competitive environment. Each interview took approximately one hour and a half and it was done with the person directly responsible for the firm. Recent findings based on the systematic research work which is being carried out at the Polytechnic School of Pernambuco have contributed to highlight some important aspects and are also presented below.

Table 6.2 presents the brief operational profiles of the six selected C&D waste collection firms. Except for firm “A”, which also carries out road paving services and other waste collection services, all the others may be roughly classified as micro firms (up to 10 workers). In terms of numbers of skip containers, and according to the classification adopted by the city of São Paulo, two of the firms are medium-sized (from 51 to 150 skips) and the other four are considered to be large firms (more than 150 skips). It is interesting to note that, according to this criteria, there were only 2 large firms among the nearly 400 registered firms in January 2003, in the city of São Paulo, the largest C&D waste management market of the country (Schneider, 2003).

**Table 6.2 A sample of selected C&D waste collectors operational profiles (Recife, 2002)**

Firm	Operations start-up	Total employees (1)	Roll-off drivers	Roll-offs	Skip containers	Average service price (US\$) (2)
“A”	1995	52 (*)	42 (*)	10	200	17
“B”	1997	10	08	04	220	16.5
“C”	1997	10	05	08	240	17
“D”	1997	06	02	04	117	17
“E”	1998	14	08	08	220	17 - 21
“F”	2000	05	03	03	65	14 - 18

(1) Administrative + operational workers, including the roll-off drivers

(2) Prices refer to one skip-load to be picked-up in up to 7 days. Prices as of February 2002.  
US\$1 = R\$2.4

(\*) Including the personal who work in garbage collection services and road paving services

Accurate information of firm’s revenues is not available. However, the researchers at the Polytechnic School of Pernambuco estimate a revenue per firm of approximately US\$9,000 per month, based on average 18 trips per day of 5m<sup>3</sup> (6.8 tonnes) each, at the price of about US\$20 per load (Fabiana Carneiro – personal contact).

Firm’s operational costs structure is as follows (Carneiro et al, 2004):

- transport or haulage-related costs: 41%
- workforce 25%
- administration 27%
- tipping fee at Muribeca landfill 7%

The focus of the interviews was very much limited to identifying the characteristics of the C&D waste collection industry environment in Recife, mainly its driving forces. Therefore, the interview checklist does not refer to each firm's performance within this competitive environment, rather, it looks for the entrepreneurs views and thoughts along a timeline from his/her business start-up to the present moment and the identification of possible future trends. Table 6.3 below presents a summary of the entrepreneurs' responses.

**Table 6.3 C&D waste collection business environment in Recife: the views and thoughts of the entrepreneurs (2002)**

Interview checklist	Entrepreneurs' comments and views
<p><b>Professional background</b></p>	<ul style="list-style-type: none"> <li>■ retired lawyer in the financial sector and drinking water supplier</li> <li>■ public transport industry entrepreneur for 20 years</li> <li>■ retired bank manager</li> <li>■ economist, specialist in shipping, trade and finance</li> <li>■ road paving and demolition service provider for 25 years</li> <li>■ former lorry retailer</li> </ul>
<p><b>Motivation to enter the business</b></p>	<ul style="list-style-type: none"> <li>■ searching for innovative business field and be the first, leading player; two strong business appeals: logistics + environmental industry</li> <li>■ very low entry barriers</li> <li>■ attracted by a report on Gazeta Mercantil (a leading Brazilian business newspaper) and an article at PEGN (a magazine devoted to small business opportunities), both highlighting the good prospects in C&amp;D waste collection activity</li> <li>■ has identified the business opportunity out of the bad quality service provided by existing firms</li> <li>■ personal interest on environmental/waste management issues</li> <li>■ perception of the growing trend in solid waste business opportunities for the private sector (due to recent privatisations of public services operations);</li> </ul>
<p><b>Previous knowledge of the business market</b></p>	<ul style="list-style-type: none"> <li>■ almost none, except for the personal experience with C&amp;D wastes while renovating own place; did not make a market research or a business plan; firstly decided to enter business; then visited previous, successful experiences in Brazil and in Europe to learn more about it</li> <li>■ none, except for some personal contacts with already established firms.</li> <li>■ <i>"If I were to start all over again, I would not go for this business, although there are no secrets in running this type of business"</i></li> <li>■ trips to Salvador, São Paulo and Belo Horizonte to learn more about C&amp;D waste management before starting business</li> </ul>
<p><b>Customer profile vs required services</b></p>	<ul style="list-style-type: none"> <li>■ small generators: service convenience + price (self-esteem-related issue: the family's renovated or new home);</li> <li>■ large generators: lowest price / lowest price + quality/prompt service</li> </ul>

Table 6.3 - Continuation.

Interview checklist	Entrepreneurs' comments and views
<b>Your firm's strengths /market niche</b>	<ul style="list-style-type: none"> <li>■ focus on small, private generator + added value on quality service and customer awareness (competitive advantage)</li> <li>■ 24-hour service, seven days a week</li> <li>■ focus on large generators (construction sites)</li> <li>■ same day pick-ups; weekends/evenings pick-ups</li> </ul>
<b>The rationale behind C&amp;D waste business</b>	<ul style="list-style-type: none"> <li>■ in Brazil, the C&amp;D waste issue is often associated to urban environmental problems (flooding, vector attraction; landscape pollution) while in Europe it is focussed on natural resource shortage and depletion (economic focus). <i>"Business opportunities arise from shortage. If there is no shortage, there is no business"</i></li> <li>■ to balance logistics and environmental requirements in a profitable way and still provide a good service</li> <li>■ fragmented industry; almost perfect competition</li> <li>■ in Recife, among the 20 existing, legal firms, only 10-12 of them effectively dispute market share, and three of them adopt quite aggressive marketing strategies</li> </ul>
<b>Business' major problems</b>	<ul style="list-style-type: none"> <li>■ fierce and unfair competition, including illegal, non-complying firms, and a highly subsidised competitor (EMLURB, the waste management local authority) which is a small customer supplier</li> <li>■ lack of national C&amp;D waste management policy and specific regulations at local level (that is, before June 2002)</li> <li>■ lack of legislation enforcement</li> <li>■ lack of local authority's supervision and control which should ban non-complying competitors and avoid illegal dumping in favour of a better quality service and business environment</li> <li>■ the local culture of filling up marshy lands with C&amp;D waste without any technical guidance, which favour illegal dumping + flooding problems</li> <li>■ major operational inputs are US-dollar international-trade indexed (tires, fuel and roll-offs parts)</li> <li>■ difficulties in obtaining access to credit to new equipment investment</li> <li>■ lack of capital/credit to invest in companies' acquisitions</li> <li>■ difficulties in obtaining the service operation license from the State's environmental control agency and the registration license from the waste management local authority, due to excessive bureaucracy (03 months minimum)</li> <li>■ extremely narrow profit margins</li> <li>■ difficulties in transferring operational costs to customers</li> <li>■ long haulage distance from C&amp;D waste generation centres to the only authorised disposal facility (Muribeca landfill - 15 km)</li> <li>■ waiting time in queue at the entrance (scale) to Muribeca landfill</li> <li>■ inexistence of decentralised disposal facilities, close to C&amp;D waste generation areas</li> <li>■ failure on the creation of a C&amp;D waste collectors association in Recife</li> <li>■ premature death of business (some firms quit business just after 1 or 2 years of operation)</li> <li>■ lack of managerial and market knowledge (<i>"business adventurers"</i>)</li> </ul>

Table 6.3 – Continuation.

Interview checklist	Entrepreneurs' comments and views
<p><b>Business' major opportunities</b></p>	<ul style="list-style-type: none"> <li>■ Public Ministry' pressure over the sector's stakeholders, urging them to assume their roles and responsibilities in the C&amp;D waste management, is a major contribution to public opinion's awareness as well as an opportunity to raise service prices, flattened by inflation rates, the long haulage distances, and moreover by the effects of unfair competition</li> <li>■ recent initiatives which enhance the debate on C&amp;D waste management issues (PBQP-H, task groups and technical commissions at national, regional and local levels)</li> <li>■ the implementation of CONAMA resolution 307</li> <li>■ possible opportunities in recycling C&amp;D waste business in the near future (although some entrepreneurs believe recycling is likely to be a public sector investment, at least in a first moment, when recycled product quality and demand are still very low within Brazilian construction market)</li> </ul>
<p><b>Short-term strategies</b></p>	<ul style="list-style-type: none"> <li>■ diversification (other waste collection/haulage services, demolition, drainage cleaning, etc)</li> <li>■ to increase haulage productivity (twin-skip roll-offs and larger capacity skips – up to 7m<sup>3</sup>) in order to reduce operational costs</li> <li>■ to increase profit margins by providing industrial waste collection services</li> <li>■ consolidation (through acquisitions) + increase profit margins</li> </ul>

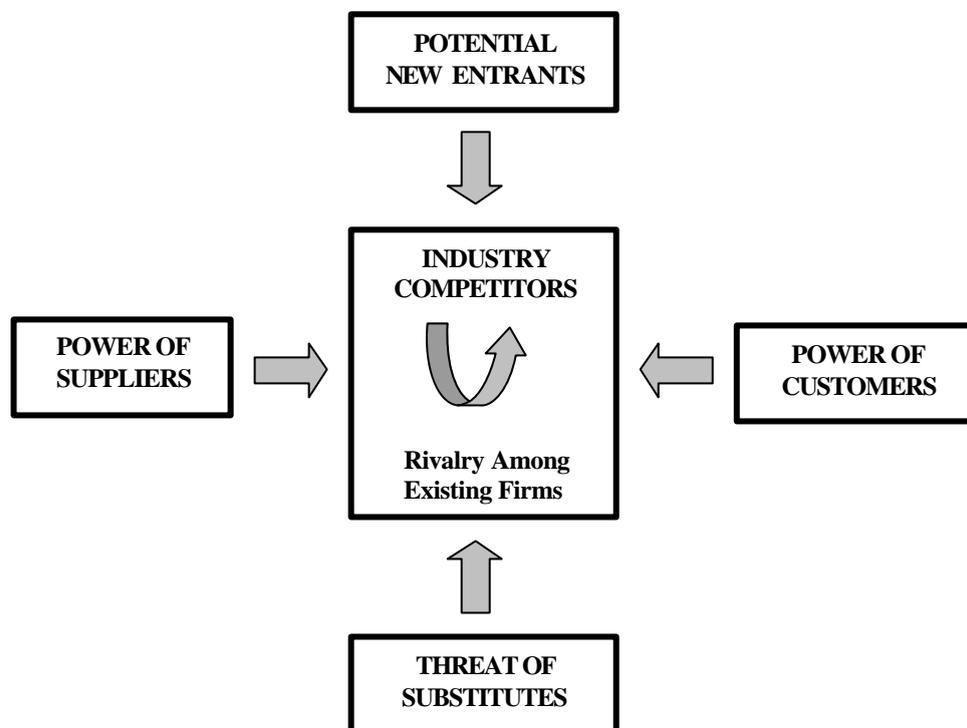
### PART III UNDERSTANDING THE FORCES WHICH DRIVE A COMPETITIVE BUSINESS ENVIRONMENT

#### 7.0 Evaluating the C&D Waste Collectors' Business Environment in Recife: an Application of Michael Porter's Five Forces Model

##### 7.1 The forces which drive industry competition

In the spring of 1979, Professor Michael Porter published an article in the Harvard Business Review in which he explained the forces that shape competition in an industry (Pearce & Robinson, 2000). According to Porter, the state of competition in an industry depends on the following five basic forces: threats of potential new entrants, threats of product substitutes, bargaining power of customers or buyers, bargaining power of suppliers and rivalry among existing firms (Figure 7.1).

Figure 7.1 Driving forces in industry competition



Source: Adapted from Porter, M. E. (1986). *Estratégia Competitiva – Técnicas para Análise de Indústrias e da Concorrência*. Page 23. Editora Campus. Rio de Janeiro.

It is the collective strength of these forces which determines the ultimate profit potential of an industry. If the collective strength is intense, “*no company earns spectacular returns on investment*”; if it is mild, “*there is room for quite high returns. The weaker the forces collectively, however, the greater the opportunity for superior performance*”. Porter also adds that “*whatever their collective strength, the corporate strategist’s goal is to find a position in the industry where his or her company can best defend itself against these forces or can influence them in its favour*” (Porter, 1986 – pages 22 and 24). A brief description of each of Porter’s five forces is presented below, followed by Table 7.1 which points out the factors or determinants that shape these forces :

- **Threat of new entrants:** it is determined by the existence of entry barriers (capital requirements to start a business, economies of scale, access to distribution channels, customer loyalty to existing brands, etc) combined with the expected level of reaction from entrenched firms to newcomers. “*If barriers to entry are high and a newcomer can expect sharp retaliation from the entrenched competitors, he or she obviously will not pose a serious threat of entering*” (Porter, 1986 – page 25).
- **Threat of product substitutes:** the pressure exerted by new, substitute products or services can limit the potential of an industry, both in earnings and growth. “*The more attractive the price-performance trade-off offered by the substitutes, the firmer the lid on the industry’s profit potential*” (Porter, 1986 – page 39).
- **Bargaining power of customers (or buyers):** powerful buyers are those who demand higher quality and service (value-added products or services) at lower prices, “*and play competitors off against each other – all at the expense of industry profits*” (Porter, 1986 – pages 40 and 41).
- **Bargaining power of suppliers:** powerful suppliers are those which are able to raise their prices or reduce the quality of purchased goods and services. In situations where suppliers are few in number and more concentrated than their buyers (which are fragmented), or their products are unique or differentiated, for example, they can exert considerable influence in price, quality and conditions.

- **Rivalry among existing firms:** rivalry among existing competitors usually takes place under the form of ‘*jockeying for position*’ (Porter, 1986 – page 34). Common tactics are price war, introduction of new products and marketing promotions.

**Table 7.1 Determinants of the driving forces in industry competition**

<p>■ <b>DETERMINANTS OF POTENTIAL ENTRANTS THREAT (Entry Barriers)</b></p>	<ul style="list-style-type: none"> <li>- economies of scale</li> <li>- proprietary product differences</li> <li>- brand identity</li> <li>- switching costs</li> <li>- capital requirements</li> <li>- access to distribution channels</li> <li>- absolute cost advantages</li> <li>- government policy</li> <li>- expected retaliation</li> </ul>
<p>■ <b>DETERMINANTS OF SUPPLIER POWER</b></p>	<ul style="list-style-type: none"> <li>- differentiation of inputs</li> <li>- switching costs of suppliers and firms in the industry</li> <li>- presence of substitute inputs</li> <li>- supplier concentration</li> <li>- importance of volume to supplier</li> <li>- cost relative to total purchases in the industry</li> <li>- impact of inputs on cost or differentiation</li> <li>- threat of forward integration relative to threat of backward integration by firms in the industry</li> </ul>
<p>■ <b>DETERMINANTS OF SUBSTITUTION THREAT</b></p>	<ul style="list-style-type: none"> <li>- relative performance of substitutes</li> <li>- switching costs</li> <li>- buyer propensity to substitute</li> </ul>
<p>■ <b>DETERMINANTS OF BUYERS POWER</b></p>	<ul style="list-style-type: none"> <li>■ <b>Bargaining leverage:</b> <ul style="list-style-type: none"> <li>- buyer concentration vs. firm concentration</li> <li>- buyer volume</li> <li>- buyer switching costs relatively to firm switching costs</li> <li>- buyer information</li> <li>- ability to backward integrate</li> <li>- substitute products</li> <li>- pull-through</li> </ul> </li> <li>■ <b>Price sensitivity:</b> <ul style="list-style-type: none"> <li>- price/total purchases</li> <li>- products differences</li> <li>- brand identity</li> <li>- impact on quality/performance</li> <li>- buyer profits</li> <li>- decision makers’ incentives</li> </ul> </li> </ul>
<p>■ <b>RIVALRY DETERMINANTS</b></p>	<ul style="list-style-type: none"> <li>- industry growth</li> <li>- fixed (or storage) costs/value added</li> <li>- intermittent overcapacity</li> <li>- product differences</li> <li>- brand identity</li> <li>- switching costs</li> <li>- concentration and balance</li> <li>- informational complexity</li> <li>- diversity of competitors</li> <li>- corporate stakes</li> <li>- exit barriers</li> </ul>

Source: Adapted from Pearce, J. A., & Robinson, R.B. (2000). *Strategic Management - Formulation, Implementation and Control*. Seventh Edition. Page 86. McGraw-Hill International Editions.

The analysis of the competitive environment of the C&D waste collection sector in Recife (presented in section 7.2 ahead) identifies which of those determinants, and to what extent, contribute to the collective strength of the basic five forces within that industry.

## **7.2 The collective strength of the Five Forces within the C&D waste collection industry in Recife**

Using Porter's Five Forces Model as an analytical tool, it is possible to identify the most prominent factors which influence and shape the competitive environment within the C&D waste collection industry in Recife. The analysis of the impact of each of those five forces in that specific business environment is presented as follows:

■ **Threat of new entrants:** new entrants to the C&D waste collection business in Recife are attracted by the very low or almost inexistent entry barriers, especially in terms of capital requirements. In practice, there are two types of new entrants to this business:

- the regular, legal firms, which are stimulated by market demand prospects, associated to the advances in the regulatory framework (this was particularly the case in 1997-98, when a municipal law was passed with the purpose to regulate the provision of C&D waste collection services by the private sector and, to a certain extent, contributing to create opportunities to launch new businesses), and
- the numerous illegal service providers, who take advantages of the poor inspection and regulations enforcement by the local authority. Moreover, customers can not tell which C&D waste collector is legal or not, and where the waste is going to be disposed of is not an issue to them. These factors promote illegal dumping and fierce price competition, since the illegal debris collectors usually charge their customers less than the legal ones.

There is also a strong belief that running this type of business is relatively easy but the lack of managerial skills soon prove that it is not really true. Legal newcomers who can not cope with such unfair competitive environment usually quit business in less than two years. The entrenched firms are aware of the causes of the premature death of new entrants and probably that is why they do not deliberately retaliate,

since they believe the market itself will be in charge of that. Nevertheless, illegal newcomers continue to be an important issue. Therefore, the threat of new entrants is a significant force in this business environment.

- **Threat of service substitutes:** so far, there is no substitute to C&D waste collection service the way it is provided nowadays and it seems not likely to have any new substitute in the near future. There is possibly some room for the provision of a differentiated C&D waste collection service to small generators, using alternative types of debris containers (like “big-bags”, for example, instead of the metal skips). However, this type of service still has to be regulated by the local authority which, in turn, provides small generators’ collection services, free of charge, according to present regulations (for a waste volume of less than  $0.3\text{m}^3$ ). The threat of substitutes is not a significant competitive force in this case study context.
  
- **Bargaining power of customers:** the customers of C&D waste collection services in Recife are quite price sensitive and they hire the services regardless of the legal status of the firm – what matters is the lowest possible price to collect and haul the largest possible amount of waste. Some larger customers, like the major construction firms, also demand better quality service, especially prompt waste pick-ups. As the construction industry is increasingly reducing materials wastage in building sites, the demand for C&D waste collection and disposal may slightly drop initially, although demand for differentiated C&D waste management services may arise (such as mixed materials collection or segregation of the wastes at source, facilitating their handling, collection and disposal, including recycling), as CONAMA resolution 307 is fully implemented and enforced nationwide. The bargaining power of customers is one of the most relevant competitive forces in the C&D waste collection industry in Recife.
  
- **Bargaining power of suppliers:** since C&D waste collection firms are very small (usually just the owner or family-run business, with less than 10 employees) and highly fragmented, the bargaining power of suppliers can play a relatively important role in the collective strength of the five forces which drive this industry competition. Collection vehicles and parts, roll-off equipments (“brooks” type), as well as tyres are mainly manufactured by multinational, concentrated industries, located in the São

Paulo-Rio de Janeiro area but which count with sales representatives in Recife and in the major cities in the whole country. Metal skips can be bought either from local or south-eastern manufacturers (one C&D waste collection entrepreneur in Recife manufactures his own metal skips). Nevertheless, many of the C&D waste collection firms start business with second-hand vehicles, roll-off equipments and skips which are purchased at reasonable prices in the local market. As they get well established in the market, they gradually begin to invest in new collection vehicles and skips, provided they have access to credit.

■ **Rivalry among existing firms:** according to Michael Porter, the intensity of rivalry is due to a number of factors and most of them are directly related to this present case study (Porter, 1986 – pages 34 to 36):

- *competitors are numerous or are roughly equal in size and power:* this is true both for legal and illegal competitors; the exception is the local authority, a subsidised competitor, which provides C&D waste collection to (not so) small generators;
- *industry growth is slow:* C&D waste collection services depend on the dynamics of the construction industry, which is a function of the macroeconomics in the country. Besides, only very recently the debates on C&D waste management as a whole have begun;
- *the service lacks differentiation:* every competitor provides the same type of service to any customer;
- *fixed costs are high:* and there are no economies of scale;
- *capacity normally is augmented in large increments:* this has particularly occurred every time a new regulation is put in force, which has attracted new businesses to the track;
- *the rivals are diverse in strategies, origins and “personalities”:* it was seen that the backgrounds and previous experiences of the C&D waste collection entrepreneurs in Recife are quite different; there are both legal and illegal players in the same competitive business arena; and at present, individual firm’s strategies range from expanding capacity to diversification.
- *exit barriers are high:* no one can quit a C&D waste collection business without losing money.

In conclusion, the tripod of forces which contribute mostly to shape the competitive environment within the C&D waste collection industry in Recife is represented by the *threat of new entrants*, the *bargaining power of buyers* and the *rivalry among existing firms*. It is interesting to note that the strength of all these three forces is very much influenced by the existence of illegal service providers, which ultimately characterise the unfair competitive business environment.

The outcome of such a model is quite clear: illegal dumping, with its environmental, public health and economic impacts, as well as regular businesses premature shut-downs, which result in job losses and reduction in tax revenues. It's a no-winner game.

### **7.3 The degree of fragmentation of the C&D waste collection industry in Recife**

Like the construction and the waste management industries, the C&D waste collection/management industry is highly fragmented. According to Michael Porter, a fragmented industry is “*an important structural environment in which no firm has a significant market share and can strongly influence industry outcomes*” (Porter, 1986 – page 187). Another characteristic in this competitive environment is the great number of small and medium-sized enterprises (SME), weak bargaining power when dealing with suppliers and customers, and the absence of market leaders which can influence the industry as a whole. “*The outcome can be marginal profits*” (Porter, 1986 – page 200)

Some industries are traditionally fragmented (lack of resources, abilities or strategic views to consolidate, for example), but there is a number of economic reasons which drive fragmentation. Porter presents a dozen different basic economic causes to industry fragmentation, and if just one of them occurs within any fragmented industry it suffices to impede its consolidation (Porter, 1986 – page 195).

Table 7.2 below presents the analysis of the basic economic causes to fragmentation within the C&D waste collection industry in Recife. The analysis shows that eight out of the twelve economic causes occur in this case study's industry structural environment, which confirms its fragmented nature.

**Table 7.2 Basic economic causes to industry fragmentation**

<b>Economic causes of fragmentation</b>	<b>Yes (X)</b>	<b>Comments in relation to the case study</b>
■ No significant entry barriers	X	Start-up investment is very low (as little as US\$10,000); there are no technological or patent barriers; access to brand new or second hand equipment suppliers (roll-offs and metal skips) is not a problem. Some difficulties may arise in access to credit both to newcomers and entrenched competitors.
■ Absence of economies of scale or experience curve	X	The cost to collect, haul and disposal of 10 skips of C&D waste is 10 times the cost of a single one; possible economies of scale if using a twin-skip roll-off in haulage operations.
■ High transport costs	X	Transport-related costs represent as much as 41% of a C&D waste collection firm's total costs.
■ Irregular or seasonal service selling	X	C&D waste collection services depend heavily on the dynamics of the construction industry which, in turn, is a direct function of GNP growth levels.
■ No size advantage when dealing with suppliers and customers	X	Customers look for the lowest possible price, regardless the size of the C&D waste collection firm.
■ Diseconomies of scale in important aspects	X	Small firms may have an advantage over big ones in terms of the local, rigid control of indirect expenses since the manager is the firm's owner. In Recife, all C&D waste collection firms are small and directly managed and controlled by their owners.
■ Market different needs or demands		It does not seem to be the case, since all firms in Recife provide the same type of service to their customers, due mainly to local authority's requirements (roll-off + metal skip).
■ High level of service or product differentiation		See the comment above.
■ Exit barriers	X	Very high. One deciding to quit business should be aware of losing money, especially when selling skips to a competitor or to metal scrap dealers, in both situations at a very low price. Besides, shutting down a business in Brazil takes long and it is costly, due to bureaucracy.
■ Local regulations	X	The existence of just one official or legal disposal facility located at 15 km far from the customers' base has led to illegal dumping. The situation tends to get worse as from July 2004 a national ban on C&D waste disposal at landfills will be in force (CONAMA Resolution 307) and so far the local authority has not yet come up with an alternative disposal facility in Recife.
■ Government ban to industry concentration		It does not seem to be the case.
■ Novelty		It does not seem to be the case.

Note: The letter (X) has been placed where a basic economic cause of fragmentation was identified within the C&D waste management industry in Recife

It is worth highlighting two of the basic economic causes to fragmentation which were identified in the C&D waste collection industry in Recife: the entry and exit barriers. “Although these barriers are conceptually different, one is usually related to the other”, when an industry analysis is carried out (Porter, 1986 – page 38). Figure 7.2 illustrates how these barriers are related to each other and the respective outcomes in terms of long-run profitability. The grey area represents what happens within the C&D waste collection industry in Recife: risky, low returns as a result of very low entry barriers and high exit barriers, that is, the least preferable situation.

**Figure 7.2 Barriers and long-run profitability**

		Exit Barriers	
		Low	High
Entry Barriers	Low	Stable, low returns	Risky, low returns
	High	Stable, high returns	Risky, high returns

Source: Adapted from Porter, M. E. (1986). *Estratégia Competitiva – Técnicas para Análise de Indústrias e da Concorrência*. Page 39. Editora Campus. Rio de Janeiro.

#### 7.4 Possible strategic options to C&D waste collection firms in Recife

According to Michael Porter, the strategic challenge to cope with fragmentation is to become one of the most successful firms within the industry while obtaining quite a modest market share. “Business strategists in fragmented industries pursue low-cost, differentiation or focus competitive advantages” (Porter, 1986 – page 200).

- *Low-cost firms usually excel at cost reductions and efficiencies* (through reductions in overhead and administrative expenses, maximise economies of scale, and use sales volume techniques to boost earnings);
- *Differentiation strategies are designed to appeal to customers with a special sensitivity for a particular product attribute*. The idea is to offer a service or product

which stresses that particular attribute above other product qualities which are in the market in order to gain customer's loyalty, thus being able to charge premium prices;

- *Focus strategy (either low-cost or differentiation)* attempts to meet the needs of a particular market or customer segment which is either ignored or under appreciated by other competitors within the industry (Porter, 1986 – pages 50 to 53).

Most of the C&D waste collection firms in Recife seem to pursue a low-cost strategy, usually by just reducing operational costs while trying to increase service sales, particularly to large waste generators (major construction firms), and struggling to stay in business, despite the effects of price war and unfair competition. One of the firms, however, has chosen a differentiation, focus strategy, to attend the collection service demand of small generators who produce more than 0.3m<sup>3</sup> of debris (usually from middle-upper class home renovations) that, according to the law, should hire a C&D waste collection private service. After seven years in the market and having consolidated its brand identity (people usually use the firm's brand name when referring to a metal skip), the firm decided to quit business. One of the reasons was the unfair competition with the waste management local authority, a subsidised competitor, which collects and hauls C&D waste produced by small generators, free of charge, regardless the waste volume.

Another goal to be achieved in coping with fragmentation is to neutralise the impact of the most powerful competitive forces. Again, within the business environment of this case study, the three main competitive forces - *threat of new entrants*, the *bargaining power of buyers* and the *rivalry among existing firms* - are closely related to the existence of illegal collection service providers. Neutralising these forces requires, beforehand, adequate and effective measures to combat or eliminate illegal competitors.

The implementation and proper enforcement of CONAMA resolution 307 is probably an opportunity to achieve a much healthier business environment, since the municipality, the generators and the collectors are all required to be co-responsible for the C&D waste management, from waste production to its safe disposal. In fact, CONAMA resolution 307 sets up the guidelines of a new scenario in which C&D waste collection firms are no longer just waste collectors and haulers but also stakeholders

within a municipal C&D waste management system, with clear responsibilities and a say. Therefore, communication and information-sharing among stakeholders play a vital role in raising consciousness towards co-responsible and cooperative action against illegal dumping and ultimately, unfair competition.

In general terms, and under the present circumstances, the C&D waste collection firms in Recife should consider and carefully evaluate the following possible strategic alternatives:

- ***Low cost strategy***, not only based on expenses reductions but with emphasis on improving overall business efficiencies, both at administrative and operational levels. Key issues of this posture are: low overhead, tight cost control, minimum wage employees, and a high degree of professionalism into managerial operations. This is a combination of what Porter has defined as “*bare bones/no frills*” and “*tightly managed operations*” competitive advantage strategies within fragmented industries (Porter, 1986 – pages 200 and 203). Based on his own experience, Stan Levine, the vice president of Potomac Disposal, Rockville, USA, has once said: “*efficiency is going to be the key issue in collection operations because our industry is so competitive. Efficiency means being able to make each pick-up at the lowest possible cost and still do a good job. Collect the waste, collect it efficiently and try to stay in business*” (Merrill, 1998).
  
- ***Focus on quality, differentiated services*** (value-added or specialised services) which require C&D waste management knowledge or expertise. C&D waste collection firms may expand their service portfolio by getting specialised in demolition or deconstruction services, on-site materials sorting and recovery, and even the design and implementation (including training) of the *C&D waste management projects* which are now required of larger construction works in order to obtain their building licenses from the municipality. This does not mean “doing everything for everyone” but offering quality services to the firm’s focal customers or its market niche.
  
- ***Vertical integration*** into the implementation and operation of C&D waste disposal services, according to the requirements of CONAMA resolution 307: C&D waste/inert landfills and recycling units. The lack of suitable C&D waste disposal

facilities in Recife has been a major bottleneck to the development of this business industry. So far, the C&D waste collection firms have relied on only one disposal facility, owned and operated by the local authority, and located far from the major C&D waste generation areas. Experience has shown that the C&D waste collection industry benefits from a number of decentralised disposal facilities, thus diminishing the pressure over transport-related costs, increasing efficiencies, while avoiding illegal dumping. Investments in disposal facilities could be done by a single C&D waste collection firm, a group of them, in joint venture with construction firms (to implement and operate a C&D waste recycling unit, for example), or even in partnership with the municipality. The project of federal law which establishes the rules of public-private partnerships (PPP) is now being discussed in the Brazilian Congress and it can be a helpful instrument to promote private investments in public infrastructure.

These, however, are suggested broad strategies, based on the findings from the analysis of the C&D waste collection industry competitive environment in Recife and taking into account the main characteristics of its fragmented structure. The purpose of these strategies in the context of this case study is to highlight three areas of major concern to the industry: to increase business efficiencies, to offer value-added/quality services on C&D waste management, and to guarantee access and control to suitable disposal facilities. The formulation of specific business strategies to individual firms will also depend on the operating environment and internal analysis of each firm, which are not the subject of the present research study.

## **PART IV LESSONS LEARNED FOR FUTURE PROGRESS**

### **8.0 Conclusion and Recommendations**

#### **8.1 Conclusion**

This research study is probably the first attempt to identify and understand the forces which drive competition within the C&D waste collection business environment in Brazil, that is, in the city of Recife in particular. Most of the works in this field emphasise the economic and technical aspects of C&D waste recycling as a feasible alternative to illegal dumping, a significant urban environmental problem in Brazilian cities. References to C&D waste collectors are peripheral to those research works or reports, and usually highlight general operational data such as estimated number of existing firms, types of collection vehicles used, service prices charged, etc.

The research boundaries of the present study were limited to the industry environment, which is situated between the remote and the operational environments of a firm's external environment. Since the purpose of the study was not to investigate any firm's individual business performance (which is a quite commercially sensitive subject), the willing cooperation of the entrepreneurs who agreed to be interviewed was much above the author's expectations. As a result, the interviews became an extraordinary piece of qualitative information, which was the main input to this case study analysis.

In fact, the interviews and personal contact with entrepreneurs, academic researchers, and other related agents, both in Recife and in São Paulo, have mostly contributed to the overall understanding of the dynamics of the C&D waste management industry as a whole and the collection/haulage sector in particular. The greatest benefit from this data collection method was the access to meaningful and different (sometimes even conflicting or contradictory) views and perceptions of the problem. Yet, and to a certain extent, entrepreneurs in Recife share similar opinions with their counterparts in São Paulo; the same takes place among academic researchers and local authorities' officers in both cities. The pitfall, however, was the author not having conducted interviews with C&D waste collection service customers. Their impressions were solely got from newspaper articles.

The findings of the present research study have confirmed the unfair competition as a critical issue within the C&D waste collection business environment in Recife. Coping with that, in a highly fragmented industry, and still being able to make a profit, is an enormous challenge and many of the new entrants (attracted by virtually no entry barriers) usually quit business very soon. The research also identified the forces which drive competition within that business environment and evaluated the collective strength of those forces, based on the works of Professor Michael Porter. The influence or impact of the existing illegal firms over the performance of those driving forces (*bargaining power of customers, rivalry among competitors, and threat of new entrants*), validates the unfair competitive environment which takes place within the C&D waste collection industry in Recife.

If no immediate, effective action is taken by the local authority and the Public Ministry to track and ban the illegal C&D waste management service providers, the new business opportunities which may arise out of the implementation of CONAMA resolution 307 will erode at their very beginning. Also, non-complying local authorities should be punished according to the legal apparatus which are in force.

On the other hand, the legal C&D waste collection firms should organise themselves and play a much stronger, collective role, as true stakeholders. Larger customers, like major construction firms, are increasingly becoming aware of their expected roles as co-responsible agents within a municipal C&D waste management system. The challenge, still, is to raise awareness among small customers and the public opinion at large.

A necessary measure to be taken, or a gap yet to be filled, is to identify, quantify and characterise the business practices of the existing illegal players within the C&D waste management industry in Recife (also in Olinda and Jaboatão dos Guararapes, both in the centre of the metropolitan area). So far, there are no rough estimates or preliminary studies available, and yet those illegal firms continue to set the rules of the game.

## 8.2 Recommendations

There are two ways which may contribute to the development of the C&D waste management industry in Recife in the perspective of a healthier business environment: cooperative, integrated or articulated action, and knowledge management. The following recommendations are likely to respond to that:

- The C&D waste collection entrepreneurs in Recife should consider creating their business sector association as an empowerment instrument, especially taking into account that other stakeholders within the city's C&D waste management system already have their representative bodies. The association could not only represent the interests of its associates, either as a pressure or lobbying group, but could also contribute to collect, handle, monitor and share information about the C&D waste management industry performance, for example. Moreover, the association can be an important communication channel with customers and suppliers;
- The C&D waste collection firms should permanently invest in acquiring and sharing the latest, most updated or state-of-the-art information about their business environment worldwide (that is, the C&D waste management industry, from waste reduction or prevention to its disposal, and not just sticking to collection issues), including planning, managerial and operational skills, new technologies, regulatory frameworks, new customers demands and the supply of products or services, institutional arrangements (public-private partnerships, etc), community-related issues, economic and financial aspects (incentives, return of investment, access to credit, etc), and health, safety and environmental matters. Knowledge management is an important tool to anticipate future business opportunities.
- The municipality of Recife, as the city's C&D waste management system coordinator should play its leading role in partnership and close collaboration with the system's stakeholders (service customers, contractors and waste collectors) particularly in the design and implementation of the Municipal Integrated C&D Waste Management Plan, required by CONAMA resolution 307, and of its complementary planning, operational, regulatory, and economic instruments;

- Further studies are needed about the provision of C&D waste management services in Brazil, with emphasis on the operational environment and internal analysis of the service providers;
  
- There is also a clear need for the development of research studies about the C&D waste management industry in Brazil, taking into account the economic, institutional, social and environmental dimensions altogether, within a sustainable development approach, following the trends in construction and waste management industry worldwide.

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