Community-Based Urban Solid Waste Management
A Case Study of Suva, Fiji

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ABSTRACT

The rising solid waste generation and the change of solid waste composition to higher volumes of packaging materials have created concerning health and environmental threats in developing cities. Municipal authorities do not possess the necessary capacities to cope with current levels of solid waste generation and its increasing complexity. This often leads to inadequate solid waste services, in particular, in the poorer settlements such as low-income, peri-urban and squatter communities. With this concern in mind, this study attempted to explore effective ways for improving solid waste management in urban developing communities.

Using quantitative and qualitative data from three squatter communities in Suva, Fiji, solid waste management was studied in the context of a Pacific Island country. Household interviews, observations and informal walks were carried out in the selected communities. For the purpose of contextual knowledge, semi-structured interviews were conducted with several organisations and authorities concerned with urban development and solid waste management in Suva. This study argues that the usage of unsafe solid waste practices, such as burning, burying and dumping of waste in the approached communities, are a result of an absence of sound solid waste storage and disposal facilities, lack of awareness and knowledge, and the lack of partnerships between the communities and governmental authorities and also between communities and non-governmental organisations in Suva. Furthermore, this study argues that top-down communication caused through hierarchical structures, has created passive communities, which alone cannot manage external and internal pressures, including rising solid waste accumulation. At the same time, strained social structures due to increasingly diverse communities, pressing land issues and the disintegration of traditional networks, within the communities studied, have decreased community cohesiveness and thus the participation in communal activities, such as cleaning campaigns.

This study concludes that effective and trustful partnerships between communities and public and private agencies have to be established in order to successfully implement alternative solutions for the provision of solid waste services in urban communities. Considering the increasing heterogeneity and vulnerability of urban communities, affordable and holistic strategies, which address the root cause of rising solid waste problems, are necessary. Policy makers have to put more emphasis on the needs of the urban poor and marginalised communities in order to reduce inequalities and poverty.

This thesis is dedicated
to my beloved grandmother Elsbeth Pooch,
to my supportive parents,
Sabine and Juergen Will
and to my loving brother, Mathias Will.

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ABBREVIATIONS

ADB	Asian Development Bank
CBO	Community-Based Organisation
CLGF	Commonwealth Local Government Forum
ECREA	Ecumenical Centre for Research, Education and Advocacy
EEZ	Exclusive Economic Zone
EMA	Environment Management Act
EPR	Extended Producer Responsibility
EU	European Union
EXNORA	Excellent Novel and Radical
FLP	Fiji Labour Party
FSM	Federate States of Micronesia
FSPI	Foundation of the Peoples of the South Pacific International
GDP	Gross Domestic Product
HPI	Human Poverty Index
ISWM	Integrated Sustainable Waste Management
JICA	Japan International Cooperation Agency
MDG	Millennium Development Goal
NGO	Non-Governmental Organisation
NSWMS-IC	National Solid Waste Management Strategy Implementing Committee
NSWMS	National Solid Waste Management Strategy
NZAID	New Zealand's International Aid and Development Agency
PBC	Poly-Chlorinated Biphenyls
PCDF	Partners in Community Development Fiji
PET	Poly-Ethylene Therepthalate
PIC	Pacific Island country
PNG	Papua New Guinea
PPP	Public-Private Partnership

SDL	Soqosoqo Duavata ni Levenivnua
SIDS	Small Island Developing State
SKM	Sinclair Knight Merz
SPREP	South Pacific Regional Environment Programme
SWM	Solid Waste Management
UNCED	United Nations Conference on Environment and Development
UNCHS	United Nations Centre for Human Settlements
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organisation
USP	University of the South Pacific
VMSDFI	Vincentian Missionaries Social Development Foundation Incorporated
WCED	World Commission on Environment and Development
WHO	World Health Organisation

Chapter I: Introduction

1.1 Background and Problem Statement

Immeasurable piles of rubbish, produced daily by modern society, are currently jeopardising life on earth. Ever-increasing consumption is a status symbol of welfare nations and it has created a solid waste crisis, which needs urgent attention. Innovative technology has been introduced to facilitate the production of goods and to stimulate economic growth, in order to enhance living standards. However, the irony is that, in many developing countries, it is *exactly* these modern innovations which are partly the reason for the creation of high inequality and poor living conditions, which can, in some cases, also be life-threatening.

In particular, urban areas in developing countries are growing rapidly and this puts pressure on their basic infrastructure and services. Sustainable urban services and systems are rarely implemented and often existing services do not reach the entire population. Low-income settlements, frequently situated in peri-urban areas or on informal land, are regularly neglected by municipal authorities. In Suva, Fiji, for example, communities living on informal land are not entitled to urban services, including solid waste collection, since they do not pay city rates, due to their illegal status. The disregard of these social factors in urban management has led to growing gaps in the provision of urban services in Suva and other developing cities.

Top-down approaches and technocratic solutions have been applied in most urban development planning in developing cities and these solutions have created communication gaps and mistrust between the public, private and civic sectors. Decisions relating to the upgrading of solid waste management systems are often only short-term and they do not concentrate on the root of the problems. Lack of strong governance at state level has exacerbated the negative impact of urban growth and this has led to urban areas which lack management and control. The following quote by Schuebeler et al. emphasises an important fact regarding the management of urban services, such as solid waste management. Schuebeler et al. highlight the fact that, more than just acquiring innovative and expensive technologies, developing cities need to

establish urban systems and services, which are adapted to the country's situation and which can be used and supported by the whole population.

> It is necessary to establish sustainable systems of solid waste management which meet the needs of the entire urban population, including the poor. The essential condition of sustainability implies that waste management systems must be absorbed and carried by the society and its local communities. These systems must, in other words, be appropriate to the particular circumstances and problems of the city and locality, employing and developing the capacities of all stakeholders, including the households and communities requiring service, private sector enterprises and workers (both formal and informal), and government agencies at the local, regional and national level (Schuebeler, Wehrle, & Christen, 1996, p. 19).

This study investigates the current situation of solid waste management at the community level in developing countries. The strengths and weaknesses of existing solid waste services are examined in consideration of the technical, legislative-institutional, economic-financial and social-cultural dimensions. The study explores alternative community-based solid waste projects and outlines the positive outcomes and also the limitations. Furthermore, the factors needed for sustainable community-based projects are revealed. In view of the growing significance of Pacific cities, this research focuses on solid waste management in urban communities in the Fiji Islands. Fieldwork was carried out in three communities in Suva, Fiji, in June/July 2006, using qualitative and quantitative research methods. The case study approach was applied, in order to undertake an in-depth study of community-based solid waste management in the context of a Pacific Island country (PIC). In the following sections, the research background and the underlying problem of the research are examined. Furthermore, the research aim and questions in this study are explained and the significance of the research is emphasised. This chapter concludes by outlining the structure of the research.

1.1.1 Urbanisation and Solid Waste Management

In the last decades, urban growth and industrialisation have been perceived as a major factor for economic success (Haughton & Hunter, 1994). As 'engines of growth', cities have contributed immensely to national productivity, linking urban and rural markets (Burgess, Carmona, & Kolstee, 1997a, p. 19; Cheema, 1993, pp. 2-4). With three billion or 48% (2003) of the world's population living in urban areas, cities have become central players in national development (United Nations, 2004b, p. 3). By 2030, the

world's urban population is expected to rise to 5 billion, or 61% and 95% of this growth will be absorbed by less developed countries (United Nations, 2004b, p. 16). Rapid transformation from rural to urban societies, in developing countries, has created dramatic positive changes, in addition to negative changes for populations. On the one hand, there have been great improvements in health and education, and a generation of skilled labour has been connected to urbanised areas.

On the other hand, rapid urbanisation and the focus on economic growth have also generated a plethora of harmful aspects (Cheema, 1993, pp. 4-6). In view of a free market approach, the environmental problems (also referred to as *environmental externalities)* produced by the economy have not been internalised into the market price (Haughton & Hunter, 1994, p. 50). Under this economic system, environmental resources have been exploited, with no consideration to finite nature (Burgess et al., 1997a, p. 70). Burgess et al. (1997a, p. 66) critically reflect that "as the rates and levels of urbanization in Developing Countries have accelerated, so too have urban environmental problems." Political disregard of the severity of environmental implications, caused by urban growth, has led to "life and health threatening" situations in many developing cities worldwide (Hardoy, Mitlin, & Satterthwaite, 2001, pp. 6-7).

Rising urban populations have overstrained the financial and management capacities of municipal authorities to supply proper urban infrastructure and services (Cheema, 1993, pp. 4, 13). The introduction of an export-oriented and market-based economy has led to a decrease in social spending and public services (Burgess et al., 1997a, p. 18). This has created high inequalities and poverty in developing urban areas, which can be recognised in inadequate health services, housing facilities, water supplies and sanitation systems and unsafe waste management (Cheema, 1993, pp. 4-6; Hardoy et al., 2001, pp. 4-7). The urban poor are the most vulnerable group affected by environmental and health risks, which result from improper basic infrastructure (Burgess, Carmona, & Kolstee, 1997b, pp. 68-69; Hardoy et al., 2001, pp. 150-151; McGranahan, Jacobi, Songsore, Surjadi, & Kjellen, 2001, pp. 4-5). Infectious, chronic and social diseases occur and they are widespread, particularly in low-income settlements (Burgess et al., 1997b, p. 68).

Waste mismanagement, in terms of insufficient waste collection and disposal, is a serious burden for developing cities and it has contributed to environmental and health problems (Hardoy et al., 2001, pp. 78-79). In this research, solid waste is defined as:

> All the wastes arising from human and animal activities that are normally solid and discarded as useless and unwanted. Due to their intrinsic properties, discarded waste materials are often reusable and may be considered as a resource in another setting" (Tchobanoglous, Theisen, & Vigil, 1993, p. xvii).

Synonyms used for the term 'waste' in this text are 'garbage', 'trash', 'refuse' and 'rubbish'. Municipal solid waste can be considered as:

> Solid wastes from houses, streets and public places, shops, offices, and hospitals, which are very often the responsibility of municipal or other governmental authorities. Solid waste from industrial processes [sic] generally not considered "municipal" however they need to be taken into account when dealing with solid waste as they often end up in the municipal solid waste stream (Zurbrugg, 2003, p. 1).

Regarding the fact that this research focuses on community-based solid waste management, residential solid waste will be the matter of central concern. Residential solid waste includes food wastes, paper, cardboard, plastics, textiles, leather, yard wastes, wood, glass, tin cans, aluminium, other metal, ashes, street leaves, special wastes[1] and household hazardous wastes (Tchobanoglous et al., 2002, p. 1.3). Solid waste management is another significant term, which needs to be clarified for a better understanding of this topic. In this text, it will be related to the following definition:

> Solid waste management is a complex process because it involves many technologies and disciplines. These include technologies associated with the control of generation, handling, storage, collection, transfer, transportation, processing, and disposal of solid wastes. All of these processes have to be carried out within existing legal and social guidelines that protect the public health and the environment and are aesthetically and economically acceptable (Tchobanoglous et al., 2002, p. 1.2).

According to Cointreau (2006, p. 6), approximately 40-70% of solid waste is not collected in low-income countries. The increase in waste generation and also the *change*

[1] Special wastes such as bulky items, consumer electronics, white goods and yard wastes which are collected separately and include batteries, oil and tyres (Tchobanoglous, Kreith, & Williams, 2002, p. 1.3).

of waste composition, to more packaging materials, has hitherto challenged existing waste management systems in developing cities. In many instances, local governmental authorities have not been able to keep up with these modified solid waste streams and their harmful implications. Where solid waste is not collected, it is generally dumped in public places such as streets, along waterways or in open areas. Often, human waste is mixed with solid waste, due to lack of adequate sanitation systems. Blocked drains, as a result of uncollected waste, are common in many cities which can then lead to flooding. Bad odour and the attraction of disease vectors such as flies, mosquitoes and rats have been identified as massive problems for the local population (Hardoy et al., 2001, p. 79). The pollution of air, soil and local water, through toxic substances, have generated substantial environmental and health costs for society (2001, pp. 112-116) and the results of these costs are particularly felt by those in poorer areas, which are usually infrequently serviced.

In particular, peri-urban and informal settlements suffer from a lack of solid waste collection services and adequate disposal facilities (Cheema, 1993, p. 6; Hardoy et al., 2001, p. 82). Since collected waste is generally dumped on the periphery of these areas (Hardoy et al., 2001, p. 188), peri-urban settlements are exposed to extreme hazardous environments. The establishment of informal settlements, also called 'squatter settlements', is common in developing countries. Shrinivas (2006) defines informal settlements as "a residential area developed without legal claims to the land and/or permission from the concerned authorities to build; as a result of their illegal or semi-legal status, infrastructure and services are usually inadequate". Due to their illegality, informal settlements are often not entitled to urban services. In addition, constrained access, through lack of roads and high density of populations in the settlements, further complicates the adequate supply of urban services, such as solid waste collection (Hardoy et al., 2001, p. 82).

McGranahan et al. (2001, p. 38) point out that "poorly understood and economically externalized threats that fall heavily on the politically marginal groups, are easily ignored." Often, in the face of limited resources and capacities, political preference has been given to the demands of the wealthier and more powerful groups in society. Policy makers and international donors have long neglected the integration of environmental issues into urban planning. An absence of a strong political, administrative and legal

framework has exacerbated the lack of provision of adequate urban services (Hardoy et al., 2001, pp. 4-7).

"The notion that local environmental problems can be engineered away was a convenient fiction...Once this fiction is stripped away, one is left with a complex of environmental problems as challenging, interesting and demanding of innovation as any" (McGranahan et al., 2001, p. 5). The majority of developing countries have usually addressed urban services, such as solid waste management, by implementing capital-intensive technologies. Solid waste collection, for instance, has been conducted with expensive trucks imported from abroad. In many settlements, these trucks cannot be used, due to narrow roads (Hardoy et al., 2001, p. 225). Without considering the socio-economic, environmental, institutional and political/legal context of the country, expensive short-term solutions have been implemented, which often do not tackle the underlying cause of the problem (Van de Klundert & Anschuetz, 1999, p. 4). By demonstrating 'favour' to higher-income settlements, past political decisions have failed to improve the living conditions of the poorer communities and this has created highly unequal societies.

Public Private Partnerships (PPPs) have been considered as the solution to the incapacity of public agencies to provide adequate urban services (Burgess et al., 1997b, p. 72). PPPs involve arrangements between public agencies and formal private companies, in addition to informal and small-scale enterprises (Budds & McGranahan, 2003, pp. 88-89). Cointreau-Levine (1994, p. 2) states that "private sector participation is a possible opportunity - not a panacea." In many examples, monopoly structures have led to overpriced private services, which cannot be afforded by the low-income population (Hardoy et al., 2001, pp. 236-237). Hence, poorer groups have often been excluded from the connection to basic services, such as water, electricity supply and waste collection (Hardoy et al., 2001, pp. 237-238).

Low-cost urban services, provided by informal and small-scale private companies, have frequently been ignored by governmental authorities (Hardoy et al., 2001, p. 240). Nevertheless, because of the work of many small-scale companies in developing cities, millions of low-income families have obtained access to basic infrastructure (Solo, 1999, pp. 121-122). A study by Solo (1999, p. 122) indicates that approximately a quarter of

the population in Latin American cities are reliant on independent providers for their water and approximately half of the population uses small-scale sanitation entrepreneurs. The success of many community-based projects, in several developing cities, has revealed a significant potential in the offering of alternative solutions, which are more appropriate for low-income communities and their environment (Hardoy et al., 2001, p. 242). Many successful stories can be revealed world-wide. One example is the Civic EXNORA concept which offers a primary collection service in addition to resource recovery, to communities in Madras, India. The Zabbaleen, Cairo, Egypt, are the oldest known garbage workers in the world who provide low-cost solid waste collection and recycling services for the population (See Section 3.1.2). In both these examples, civil society has contributed greatly to the improvement of urban services, particularly, in low-income areas.

Civil society-led projects offer many benefits for the urban population: however, the sustainability of collective actions is dependent on various factors (Moningka, 2000, pp. 15-18) (See Section 3.1.2.3). One of these factors is that self-help activity "needs to go hand in hand with adequate resourcing, training, minimum standards and planned provision of collective services" (Haughton & Hunter, 1994, p. 117). In many developing countries, the pessimistic attitude of local governments towards community initiatives has discouraged the realisation of valuable collective actions (Haughton & Hunter, 1994, p. 117). On top of this, the emergence of heterogeneous and fragmented communities, in many developing cities, has negatively influenced the cooperation of civil society in the provision of basic services (Jenkins, 2001, p. 183). In the Pacific Island countries, the potential and advantages of community participation in urban services, including solid waste management, has hardly been recognised or used.

1.1.2 Pacific Islands and Solid Waste

Urbanisation has outstripped the capacities of Small Island Developing States (SIDSs)[2]. With 58% of their population living in urban areas and 25% of these perceived as squatters, SIDSs are threatened by the drawbacks of rapid urban development (Tibaijuka, 2005, p. 4). At the global conference on Sustainable Development of SIDS,

[2] Small Island Devleoping States are small island and low-lying coastal countries that share similar sustainable development challenges, including small population, lack of resources, remoteness, etc. At present, fifty-one small island developing States and territories are included in the list used by the United Nations Department of Economic and Social Affairs (Small Island Developing States Network, 2003).

in Barbados, 1994, the unique characteristics of SIDSs were recognised and, on the basis of Agenda 21 (Rio Declaration on Environment and Development, 1992), an action plan was developed, in order to achieve sustainable development in SIDSs. One of the central problems is the incapacity of SIDSs to cope with the increasing solid waste stream, which is causing numerous environmental health problems (UN Commission on Sustainable Development, 1998, para. 2-7).

The Pacific Island countries (PICs) belong to the SIDSs and they are the focus of this study. Improper solid waste management is, in addition to other issues, one of the most severe problems facing Pacific cities (Connell & Lea, 2002, pp. 173, 181-182). Urban problems, including solid waste, have long been overlooked by governments, donors and researchers in the PICs (Connell & Lea, 2002, p. 13; Storey, 2006, p. 1). As a result, urban poverty and inequality have been on the rise, which can be clearly seen in the rapid increase of squatter settlements and their lack of basic infrastructure and urban services (Bryant-Tokalau, 1995, pp. 111, 117-121). This disregard of environmental protection has led to the creation of urban areas, which "are increasingly unhealthy and dangerous places to live" (Storey, 2006, p. 4).

In the Fiji Islands, industrialisation and rapid urban growth, particularly in peri-urban and informal settlements, have generated increasing waste streams. Fiji's current solid waste management system cannot manage the produced waste volumes adequately. According to Epeli Nasome, from the Ministry of Local Government in Fiji (Commonwealth Local Government Forum, 2005, p. 45), "the problems in solid waste management stem from the ignorance of the people, ineffective legislation to address waste management, lack of partnership with the private sector to share in solid waste management and lack of resources." The usage of unsafe solid waste practices, such as the burning and dumping of waste, is often related to other social issues, such as inadequate housing and lack of roads. Peri-urban and informal settlements do not regularly benefit from solid waste collection (Government of Fiji, 2006, p. 10), which is a major problem for the development of sustainable cities in Fiji and therefore there is a need for urgent attention.

1.2 Research Aim and Questions

This thesis aims to contribute to the identification of effective ways for solid waste management, in urban communities in developing countries, in order to improve their overall living conditions.

To achieve this aim, the study will address the following research questions:

a. How is solid waste managed in urban communities?
b. What are the strengths and weaknesses of current solid waste management approaches?
c. Who are the stakeholders involved in the management of solid waste at the community level?
d. What are the stakeholders' interests, roles and responsibilities?
e. What alternatives exist for urban community-based solid waste management?
f. What are the strengths and limitations of these alternatives?
g. What are the factors needed to increase the sustainability of urban community-based solid waste management options?

1.3 Significance of this Research

Worldwide, solid waste concerns are on the rise. Ignoring the implications of unsafe solid waste practices in developing cities can result in the long-term destruction of the environment and people's health on a range of scales. Figure I-1 shows that inadequate waste management can have harmful effects on the economic output and well-being of a country. The unsafe disposal of solid waste can negatively affect natural resources, which can lead to a reduction in the quality of water, food and nutrition. This in turn can lead to health problems and decreased well-being of the population. Solid waste mismanagement can also cause a decline in the value of the tourism sector. In addition, it can have a negative effect on the social-cultural dimension of a country. All these above mentioned aspects are interrelated and therefore have to be addressed in a holistic way.

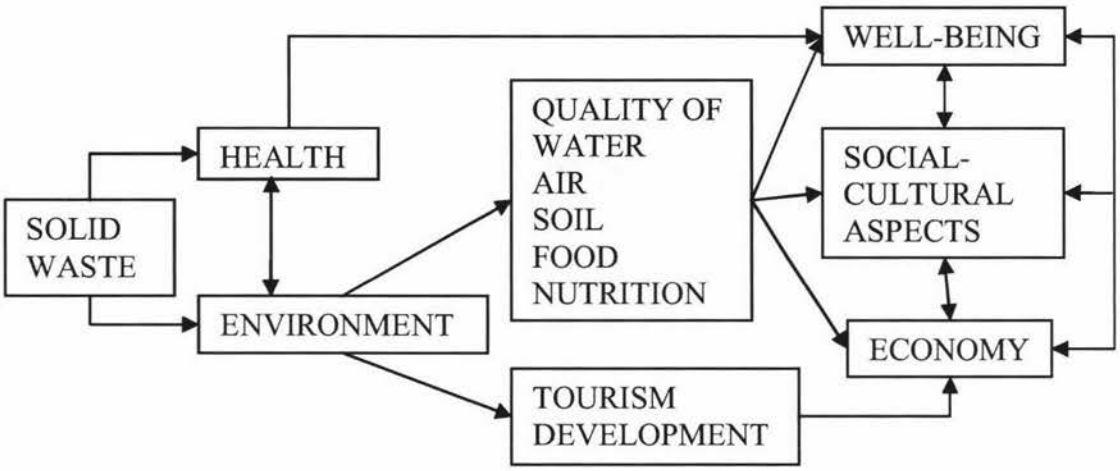

Figure I-1: Implications of solid waste
Source: Anja Will.

Together with the Millennium Development Goals (MDGs) and the United Nations Conference on Environment and Development (UNCED), adequate solid waste management has been seen as a vital objective at international level, in order to achieve sustainable development and decrease world-wide poverty. However, in many developing countries, the political agenda does not prioritise the upgrading of solid waste management systems in poorer areas. Lack of strong urban governance and a focus on technocratic solutions impede progress in the provision of urban services, such as solid waste collection and disposal, particularly in marginal communities. Furthermore, research has rarely been conducted on solid waste issues in vulnerable communities, such as peri-urban and informal settlements. This study contributes to the knowledge relating to solid waste management in urban communities, with the purpose of creating sustainable urban settlements. Agenda 21 calls for the integration of communities into the establishment of urban services, but this requires the establishment of effective partnerships between public, civic and private sector.

1.4 Research Outline

Figure I-2 illustrates how the chapters of this thesis are linked, with the intention of responding to the research questions and finally to fulfil the research aim.

Chapter I introduces the research problem and it offers background information on the research topic. It also presents the research aim and research questions, which function as significant pillars within this study. Furthermore, Chapter I highlights the significance of the research and offers a short outline of the research.

Chapter II provides a background to current urban solid waste management in developing countries, by investigating: solid waste generation and composition; waste collection and disposal systems; environmental and health implications; and waste as a resource. Chapter II also covers existing constraints on solid waste management systems, regarding the technical, legal-institutional, economic-financial and social-cultural aspect.

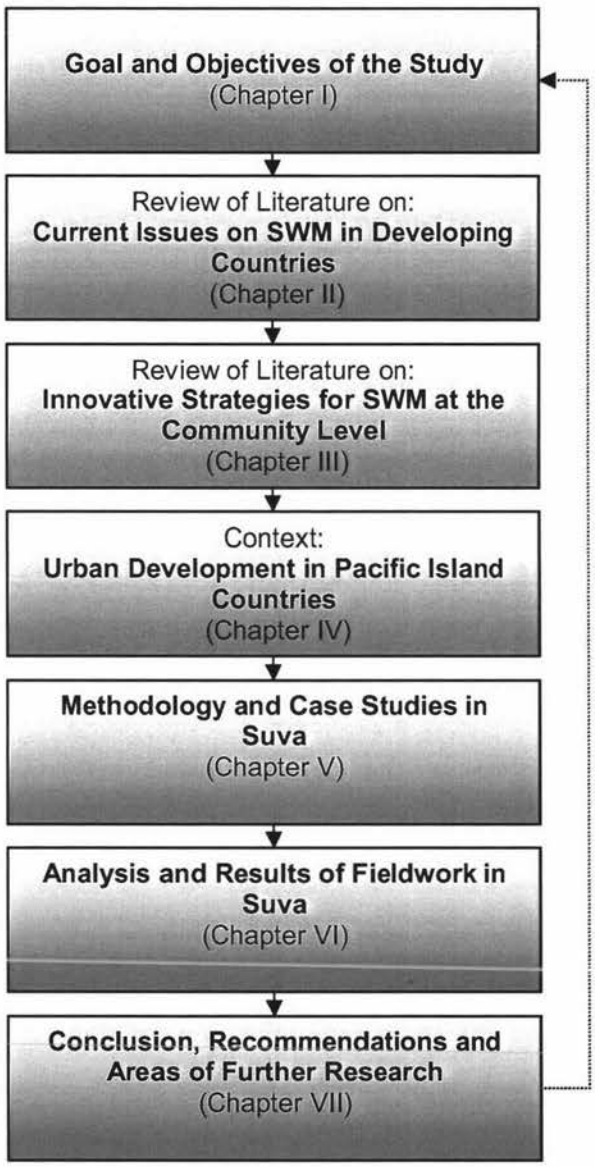

Figure I-2: Research outline
Source: Anja Will.

Chapter III focuses on community-based solid waste management, within the framework of a sustainable solid waste management approach. It reveals positive

outcomes in addition to the limitations of community-based projects and discusses the significant factors needed to sustain citizens-led solid waste services.

Chapter IV presents the background data on urban development in the PICs. Firstly, this chapter offers general thoughts based on the facts relating to the PICs. It then moves to contemporary urban issues, with a special focus on solid waste management. Furthermore, Chapter IV describes the current situation in urban areas in the Fiji Islands. It concludes with a short overview of the general facts relating to the Fiji Island, and subsequently elaborates on existing urban problems, placing a strong emphasis on solid waste management.

Chapter V explains the methodology applied in this research and delivers basic facts regarding the three case studies. Firstly, this chapter explores the theoretical standpoint of this research, which was influenced by features of hermeneutics. The importance of the preparation phase for this research is highlighted in the next section. The chapter continues by concentrating on the case study approach, which had been taken in this study and explains sampling and the units of analysis. The next sections reveals the ethical considerations, including accessing the communities and issues regarding the work with the translators. This chapter also reflects on the experiences gained through the use of quantitative and qualitative methods. This involves an explanation of the usage of semi-structured interviews, focus groups, interviews with households, observations and informal walks during the fieldwork in Suva. Adaptations of the wording of interview questions are highlighted. This chapter concludes by offering general facts relating to the three selected communities.

Chapter VI reviews, analyses and discusses the research findings from the three case studies. It includes an explanation of the current solid waste collection, disposal and storage practices, used in the selected communities in Suva. It also discusses existing attitudes towards solid waste management by public authorities and communities and reflects on its underlying causes, which derive from a social-cultural perspective.

Finally, Chapter VII reflects on the key conclusions of the thesis and makes recommendations for the improvement of solid waste management, at the community level, in developing cities. It concludes by suggesting areas for further research.

Chapter II: Solid Waste Management in Developing Countries

2.1 Current Situation of Solid Waste Management

With 70% of the world's population living in developing countries and a rapid rise in urban inhabitants, solid waste has become of serious concern (JICA, 2005, p. 11). This chapter offers an overview of the current issues relating to solid waste management systems in developing countries. The main aspects covered by this first section are the generation and composition of waste, waste collection, disposal methods and the implications on health and environment. Furthermore, this section looks at resource recovery methods often conducted by the informal sector. In the second section, the main limitations for solid waste management, within developing nations, are discussed in relation to technical, institutional, organisational and legal, financial-economic and social-cultural dimensions.

Japan International Cooperation Agency (JICA) (2005, p. 11) calls the current issue of waste management in developing countries a "critical and impending" disaster. Current solid waste management systems cannot cope with the growing quantities of waste. "Although it is essential to public health and environmental protection, solid waste management in most cities of developing countries is highly unsatisfactory" (Schuebeler et al., 1996, p. 9). The report by JICA (2005, p. 11) states that often it is not a matter of political awareness but more the lack of effective systems to deal with the ever increasing solid waste. In the past, development processes have neglected the need to upgrade urban services, such as solid waste management. End-of-pipe systems or one-way systems have encouraged the belief of 'infinite' resources amongst the population, and these beliefs have made mass consumption possible, without the consideration of safe disposal options (2005, p. 10). Environmental and health risks have been created through irresponsible and insecure handling of solid waste in developing cities, which threaten not only the local population but they also contribute to global concerns.

2.1.1 Solid Waste Generation and Composition

The generation and composition of municipal waste is determined by a country's economic activity and consumption (Cointreau, 2006, pp. 3-5). It is generally accepted that waste generation grows with an increase in wealth (Van Beukering & Gupta, 2000, p. 5). This means that, as income levels rise, so too does waste volume per capita (JICA, 2005, p. 62; UNEP, 2005, p. 5). Growing populations and expanding industries have caused a rise in the amount of solid waste produced worldwide (UNCHS, 1997, para. 1). In particular, in densely populated areas such as urban and peri-urban areas, high solid waste figures put pressure on the development of cities and towns. "One of the most important environmental problems of urbanisation is the amount of solid waste that is generated at a rate that outstrips the ability of the natural environment to assimilate it and municipal authorities to manage it" (UN Commission on Sustainable Development, 1996, para. 5).

Another trend, which can be observed, is the change of waste composition (JICA, 2005, p. 62). Developing countries used to generate mainly organic waste with a high percentage of moisture and ash. Despite the quantity of biodegradable material being still high, imports of food and changing lifestyles have introduced higher volumes of packaging materials, such as paper and plastics (Blight & Mbande, 1998, p. 13; Cointreau, 2006, pp. 4-5; JICA, 2005, pp. 62-63). In Table II-1, it can be noted that, with increasing incomes, the percentage of organic waste decreases, whereas there is an increase in the percentage of paper, plastics and other types of waste.

Table II-1: Waste composition of low, middle, and high income countries

Percentage of waste stream consisting of:	Low Income	Middle Income	High Income
Organics (e.g., food waste) and other (e.g., ash)	88	69	40
Paper and cardboard	5	15	36
Metals, glass, and plastics	7	16	24
Total	100	100	100

Note: Approximate scale only.
Source: Adapted from World Bank (1999, p. 6).

Careless and improper treatment of hazardous waste, in many developing countries, produces high risks for the urban population. Cointreau (2006, pp. 4-5) reports that, as a result of a lack of regulations and effective enforcement systems, hazardous waste, such as plating materials and pesticides from industries and bloodied bandages and cotton swabs from hospitals, are mixed up with municipal waste. The increase in dangerous waste materials, such as medical waste[3] and the contents of spray cans in municipal waste, is a critical point (JICA, 2005, p. 63). Sikabongo (2003, pp. 349-351) highlights that lack of knowledge about the handling of hazardous waste is common in developing cities. In addition, Sikabongo (2003, p. 349) critically mentions that many hazardous materials found in lower income areas are not listed by the Basel Convention (1989)[4]. This leads to the situation where policy makers, in developing countries, do not consider these lower income areas as significant enough to put in place the necessary regulations regarding hazardous waste management. As a consequence, serious health hazards evolve, in particular, amongst the urban poor (2003, p. 349).

Another critical point is that often, due to a lack of adequate sanitation systems, human faeces are combined with solid waste and these are transferred without separation to open dumps or landfills. Likewise, the contents of septic tanks and cesspits are released without treatment into open dumps (Cointreau, 2006, p. 6). The existence of hazardous and septic material in solid waste, together with the increase of packaging materials, place high demands on the collection and disposal systems of developing cities.

2.1.2 Waste Collection Systems

The collection of solid waste in developing countries is conducted either by municipal or private agencies (Hogland & Marques, 2000, p. 26). The fulfilment of basic services by municipalities generally derives from a legal interest (Schuebeler et al., 1996, p. 21). Schuebeler et al. (1996, p. 15) state that, "municipal solid waste management (MSWM) is a major responsibility of local governments, typically consuming between 20% and 50% of municipal budgets in developing countries". However, despite these high expenses, in many developing countries, existing solid waste collection services do not reach the whole urban population (Cointreau, 2006, p. 6; JICA, 2005, p. 105; Zurbrugg,

[3] Waste generated in medical services that involves risks associated with vehicles of infection, such as infectious waste or pathological waste (JICA, 2005, p. 102).
[4] Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal

2003, p. 2). Cointreau (2006, p. 6) notes that a collection rate of 30% to 60% of municipal waste is common in low-income countries. In middle-income countries, the collected waste ranges between 50% and 80%. Hogland and Marques (2000, pp. 30-31) note that, even if waste is collected by waste workers, it sometimes does not reach the official dump: instead, it is discarded in streets or used in the construction of houses.

In several developing countries, private companies have been approached to takeover services, such as solid waste collection and transport (JICA, 2005, p. 107; Schuebeler et al., 1996, p. 22). Cointreau-Levine (1994, p. 2) reviews four types of private sector participation: contracting, concession, franchise, and open competition. The author (1994, pp. 35-36) concludes that different criteria, such as cost recovery, efficiency, public accountability, finance, cost, economies of scale, etc., have to be considered, in order to decide to which degree the private sector should be involved. The integration of the private sector into urban services has potential advantages, which can be generally summarised in higher flexibility and efficiency (Van de Klundert & Lardinois, 1995, p. 13). However, the United Nations Centre for Human Settlements (UNCHS) (1997, para. 9) critically points out that, in the past, privatisation processes in urban services have only led to improvements in higher income settlements. In Mexico, for example, decentralisation of the water sector has not produced any major benefits for the population. Instead, privatisation has been perceived as "a channel for preferred treatment for capital accumulation by private entities as well as a legitimized way for the state to transfer the financial and politically charged burden of water management to non-state institutions" (Wilder & Lankao, 2006, p. 1991). Wilder and Lankao (2006, p. 1992) further suggest that privatisation processes in Mexico have focused too much on economic factors, such as cost recovery and markets and they have neglected socio-political issues, such as equity and power relations. Van de Klundert and Lardinois (1995, p. 13) highlight that meaningful contributions to urban service development, through private sector involvement, can only be achieved if public authorities maintain control and regulation over private services.

Low Coverage in Poor Areas

McGranahan et al. (2001, pp. 4-5) observe that urban poverty stands in close relation to inadequate urban services. The authors (McGranahan et al., 2001, pp. 4-5) point out that, as a result of low social status, lack of political influence and little financial means,

certain groups of the population are particularly affected by the insufficient provision of urban services, such as solid waste collection. Zurbrugg (2003, p. 2) critically explains that, particularly, low income people living in peri-urban areas with low incomes are often those that suffer the most from non-collection of wastes. This is underlined by a report from the United Nations Environment Programme (UNEP) (2005, p. 51) that states, "even when collection service is provided in poor or marginal areas, the level (i.e., quality and coverage) of service is much lower than that made available to middle- and high- income areas." This report (UNEP, 2005, p. 51) offers two reasons for this situation: firstly, the lack of infrastructure and planning, which complicates the provision of urban services; and secondly, the illegal status of many low-income settlements. Illegal settlers, also called squatters, generally do not pay municipal taxes and hence they are excluded from urban services, such as solid waste collection.

Collection and Transportation

"Waste collection and transportation constitutes the operations to transfer wastes from their source to the ultimate destination - the final disposal sites (or intermediate treatment facilities)" (JICA, 2005, p. 105). The report by JICA (2005, p. 106) defines four different form of collection which are currently applied in developing countries: door-to-door collection, kerbside collection, station collection (also referred as container collection) and bell collection (See Table II-2). The choice of a certain collection method is connected to different factors, for instance, available equipment and human resources, in addition to the amount of produced waste and the frequency of collection (2005, p. 106).

Table II-2: Collection forms and their characteristics

Forms of collection	Method	Advantages	Disadvantages
Door-to-door collection	Waste collectors visit each household and collect the waste. Equipment, other than vehicles, is often used, such as handcarts and animal carts. This method is usually combined with station collection.	Reasonably convenient for the waste generators creating many jobs, since it is labour intensive.	High labour cost. Minimal participation of waste generators in SWM.
Kerbside collection	The waste generators place the waste in front of the door of their homes. Handcarts and vehicles are used for collection. Some municipalities use containers that can be lifted mechanically and emptied into the collection vehicles.	Convenient for the waste generators.	Possibility of scattering waste and/or disfiguring the landscape, due to the use of inappropriate containers or a discrepancy between the discharge time and the collection time.
Station collection	The waste is carried to communal collection points by the residents or by door-to-door waste collectors for temporary storage. This method is also referred to as container collection if containers are placed at the collection points. Dump trucks, compactors and other vehicles are usually employed for transportation from the collection points.	High collection efficiency. Once the collection points are established, they can provide collection services in hitherto non-service areas, due to poor accessibility to individual houses.	Inadequate management of collection result in scattering of waste, thus creating unsanitary conditions. Sites for collection points may be affected by strong sunlight, torrential rain, wind gusts and animals living nearby.
Bell collection	Waste collectors call the attention of residents by ringing a bell or playing music from a loudspeaker. Dump trucks, compactors and other vehicles are usually used for this method.	High collection efficiency in rather densely-populated areas. Small amounts of litter, since there is no time lag between set-out and collection.	Inappropriate for residents who are busy or living in high-rise multi-family dwellings. Meaningless if residents are not at home. To avoid this situation, waste planners need to establish a collection schedule (collection day and time).

Source: Adapted from JICA (2005, p. 106).

Depending on income and street conditions, different ways of transporting and storing waste are used in developing countries (Hogland & Marques, 2000, p. 26). An UNEP report (2005, p. 54) states that in many Asian cities, waste is brought by residents or waste workers to communal containers. These containers are often overfull and surrounded by animals and scavengers. In order to transfer solid waste to municipal bins and to landfills, people use trucks, bicycles, handcarts and also donkeys, horses, ox carts, as well as balancing it on their heads (Hogland & Marques, 2000, pp. 26-27). UNEP (2005, p. 54) points out that compactor vehicles are rarely used in developing countries. It is only in large cities, where the infrastructure is more developed, that compactor vehicles pick up solid waste from communal sites (2005, p. 54). Due to unsafe collection and transportation facilities, waste workers face serious health risks in developing cities (Cointreau, 2006, pp. 9-10) (See Section 2.1.4). Without wearing any protective clothing, waste must be picked up by hand or shovelled up, either from the ground or from plastic bags or boxes, which often have no cover (Cointreau, 2006, p. 6; UNEP, 2005, p. 54). The incorrect storage of waste by residents complicates the collection process and this is a major source for injuries and the transfer of diseases, through human contact with waste. Closed plastic and metal containers for the storage of waste are rarely used (Cointreau, 2006, p. 6).

The capacity of municipal authorities, to provide secure solid waste containers and collection vehicles, is often constrained by a lack of financial and human resources. Table II-3 shows that, with growing amounts of waste, collection costs per year increase.

Table II-3: Waste generation and cost of waste collection in regions with different levels of economic development (2003)

Parameter	Low Income Country	Middle Income Country	High Income Country
Waste generation (kg/cap/day)	0.3	0.5	2.0
Collection cost (US$/Mg)	15 to 40	25 to 75	75 to 150
Collection cost (US$/cap/yr)	2 to 4	5 to 14	55 to 110
Income (US$/cap/yr)*	500	3,000	25,000

*Note that the average income is based on selected world development indicators, taken from the World Development Report 2000/2001 issued by the World Bank Group.
Source: UNEP (2005, p. 92).

A deficit in urban infrastructure and high densities in many cities often hinder municipalities in their efforts to supply adequate urban services to every settlement (UNEP, 2005, p. 55). Tropical climates put additional pressure on solid waste collection services, since the biological activities of organic materials are speeded up under humid conditions (2005, pp. 55, 59). Another important point, which has to be taken into consideration, is the social and religious situation of the collection service receiver (2005, p. 55). In many informal settlements, for example, the lack of space creates the need to remove emerging waste as soon as possible. In most developing countries, insufficient solid waste collection is not the only concern for residents and municipalities. Lack of electricity, access to water, adequate sanitary facilities and roads are other issues which are often seen as more essential than solid waste collection (Schuebeler et al., 1996, p. 20). As a consequence, unsafe solid waste storage and disposal practices are used by residents, which results in considerable health and environmental problems.

2.1.3 Waste Disposal Systems

Sanitary Landfill

The choice of waste disposal methods is highly dependent on a country's financial ability. In comparison to other disposal options, sanitary landfill[5] is one of the cheapest options, when taking environmental protection into consideration (See Table II-4). Since the early 1970's, industrialised countries have shifted from the use of controlled landfills[6] to sanitary landfills. On the basis of high-standard technology, sanitary landfills are subjected to strict safety and controlling regulations, in order to ensure that underground water and air are not affected by leachates and gas emissions (Cointreau, 2006, p. 3; Zurbrugg, 2003, pp. 2-3) (See Figure II-1). Leachate can be found underneath the landfill. It is produced through water, either derived from the waste itself or from external influence, such as rain and irrigation water. Landfill gas is caused by

[5] Sanitary landfill is a disposal technology where solid wastes are placed on land (typically underlain by impermeable soils) that is naturally suited to protect underground water. The site is prepared with drainage systems for contaminated seepage (i.e., leachate) from the solid waste and surface runoff and constructed with gas collection and ventilation or flaring systems. Within the landfill, each day's solid waste is formed into a cell and covered with soil to minimise water infiltration, mitigate odours and limit vector breeding. Leachate is typically treated to remove organic loadings and suspended solids (Cointreau, 2006, p. 3).

[6] A controlled (or interim) landfill has daily soil cover and perimeter drainage to minimise leachate generation: but not impermeable underlining and underdrainage, leachate treatment, and gas collection systems required of modern sanitary landfills (Cointreau, 2006, p. 3).

the decomposition of organic materials and it is mainly composed of methane and carbon dioxide (O'Leary & Tchobanoglous, 2002, pp. 14.12-14.14). Due to a lack of financial capital and skilled staff, developing countries have not been able to implement sanitary landfills to any great extent (Cointreau, 2006, p. 7; UNEP, 2005, p. 323).

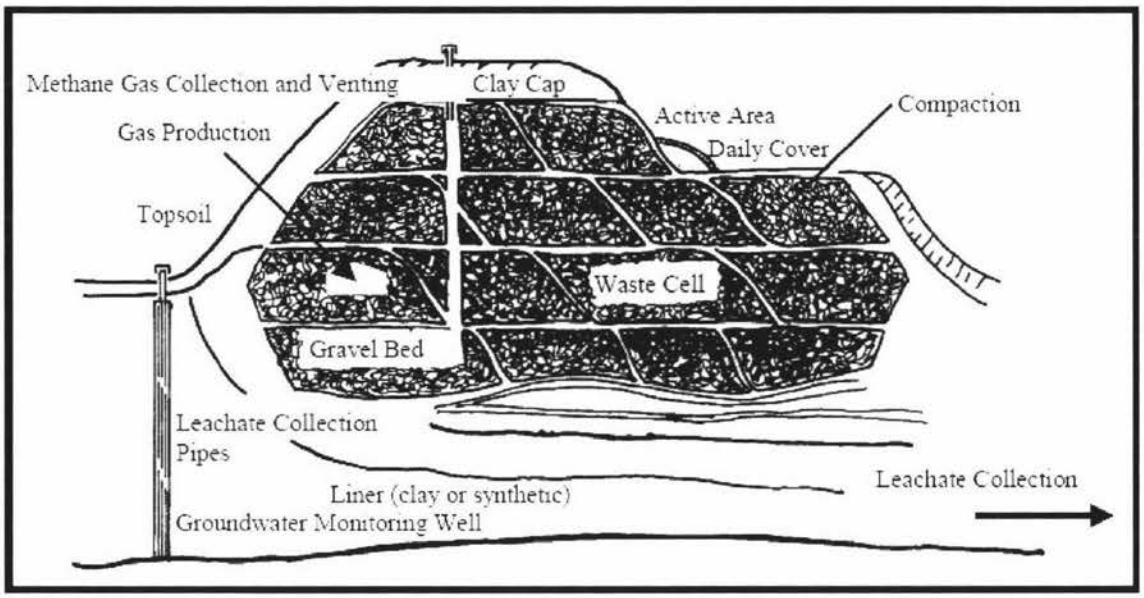

Figure II-1: Schematic diagram of basic aspects of a sanitary landfill
Source: UNEP (2005, p. 342).

Open Dump

UNEP (2004, p. 3) suggests that the major solid waste disposal method in developing countries is "some form of landfilling". In general, this means uncontrolled dumping together with the use of controlled landfills (2004, p. 3), whereas the most widespread technique is open dumping (Zurbrugg, 2003, p. 3). "An open dump is an area of land where uncontrolled deposition of waste materials occur" (McDougall, White, Franke, & Hindle, 2001, p. 299). JICA (2005, p. 117) specifies the term 'uncontrolled' by pointing to a lack of management and environmental control. In particular, in areas where waste collection is irregular or not existing, residents throw all solid waste into the surrounding environment, such as streets, canals, rivers, beaches, the sea and other public places (Hogland & Marques, 2000, pp. 30-31). This is a source of bad odour (McDougall et al., 2001, p. 299), and an attractive ground for scavenging animals, in addition to insect and rodent vectors, such as flies, mosquitoes and rats (Cointreau, 2006, p. 3; McDougall et al., 2001, p. 299). Insect and rodent vectors are responsible for the occurrence of many diseases in developing countries (See Section 2.1.4).

UNEP (2004, p. 3) estimates there are "over 200,000 open dump areas in the world that will require environmental protection and clean-up in the future." According to Cointreau (2006, pp. 8-9), open dumping is the most inexpensive way of disposing of solid waste (See Table II-4). It is three to eight times cheaper than sanitary landfilling. Hogland and Marques (2000, p. 30) point out that the low costs for dumping and landfilling are the reason that 80% of the world applies these methods. Negative short and long-term implications are often ignored, due to the cost for rehabilitating these dumps. In African countries, nearly all their entire solid waste is transferred to dumps or some form of landfills (Hogland & Marques, 2000, p. 30). With regard to urbanisation trends and growing populations in developing countries, finding a safe place for landfills becomes more and more difficult (McDougall et al., 2001, p. 302). In particular, for small states with high population densities, such as Kiribati and the Maldives, but also for Pacific Island countries, landfill siting is a contentious issue.

Table II-4: Disposal costs of alternative technologies for large cities

	Low Income Country	Middle Income Country	High Income Country
Average GNP ($/capita/y)	370	2,400	22,000
Open dumping ($/t)	0.5-2	1-3	5-10
Sanitary landfill ($/t)	3-10	8-15	15-50
Composting ($/t)	5-20	10-40	20-60
Incineration ($/t)	40-60	30-80	70-130

*Note that sanitary landfill costs are for cities with over 500,000 people or over 250 tonnes of waste per day. The cost to smaller cities could be higher, by a factor of 2 to 5.
Source: Adapted from Cointreau (2006, p. 9).

Incinerator

Another way for disposing of waste is by incineration. This is described by Brunner (2002, p. 13.13) as "the destruction of a waste material by the application of heat." It is rarely used in developing countries, since the construction and operation of incineration plants is expensive (Brunner, 2002, p. 13.13; Hogland & Marques, 2000, p. 30). Cointreau (2006, p. 8) states that the costs for incineration are five to ten times higher than for sanitary landfills (See Table II-4). In addition, because of low energy value and high moisture content of waste in developing countries, the usage of incineration is not convenient. JICA (2005, p. 111) states that additional costs often emerge through the use of supportive fuel for the incineration. A lack of financial means and skilled labour are some of the reasons for the inability of developing countries to keep up with international standards for incinerating processes (JICA, 2005, p. 111). Frequently,

incineration plants do not fulfil technical requirements (Hogland & Marques, 2000, p. 30). In addition, in many developing countries, the burning of waste is conducted in open places without any equipment. This is "the oldest technique for incineration of wastes" (Brunner, 2002, p. 13.18). It is an uncomplicated way to remove smelly dumps and to keep away insects, rodents and scavenging animals (Hogland & Marques, 2000, p. 30). The increase of waste, in the last couple of years in developing countries, challenges traditional disposal methods. Growing environmental and health risks, not only on a local but also on a global scale, cannot be neglected anymore and these risks have been widely studied.

2.1.4 Impacts on Environment and Health

"Both the amount of waste and its potential toxicity are increasing" (Thompson & Anthony, 2005, p. 116). Through either direct or indirect pathways, humans can be in contact with toxic, allergenic and infectious materials, which can then have negative effects on the human body system. This can be caused through the inhalation of contaminated air, the absorption of waste substances through skin, the eating of polluted food and the transmission of diseases through contact with animals (Pinnock, 1998, pp. 48-50). Cointreau (2006, p. 10) points out that infections, such as allergic and asthmatic pulmonary diseases, birth defects, infant mortality, together with cancer and headaches, are common diseases triggered by certain waste substances. Outbreaks of epidemics, caused by solid waste in combination with other influences, such as poor sanitation and natural events, can lead to disasters which can not only kill people but also have negative effects on tourism and trade. One example was the outbreak of the pneumonic plague in India in September 1994, which killed 56 people and created high losses in the tourism sector and exports (UNCHS, 1997, para. 8).

Air, Water and Soil Pollution

A recent report by Thompson and Anthony (2005, p. 115) relating to health effects of waste incinerators concludes that "incinerators, with their risks and high health costs, are a poor choice of technology for waste disposal." The authors (Thompson & Anthony, 2005, p. 116) explain that through the emission of "hundreds of pollutants into the atmosphere", but also through converted ash, incinerators cause long-term environmental and health problems. One example of an outcome from the emissions is acid rain, which affects all ecological systems such as forests and lakes, which in turn,

put pressure on animals and humans (Thomas, 2006, p. 44). The ash produced during the incineration process is usually disposed of in landfills, which presents a high risk for groundwater resources (Lyle, 1994, p. 135). Cancer, birth defects, and hormone disruptions are but only few diseases reported by Thompson and Anthony (2005), in addition to Thomas (2006) and these have been related to the emissions from incinerators. An important point highlighted by these authors is that many of the chemicals released through the use of incinerators has not yet been studied and particularly the effects of combined chemicals (Thomas, 2006, pp. 44-45; Thompson & Anthony, 2005, p. 116). This means that, even if developing countries invested in expensive technology in order to meet international standards, the environment and the population are still at high risk.

The effects of landfills can be distinguished in the "production of biogas, formation of leachate, and slope instability" (Ayalon, Becker, & Shani, 2006, p. 1314). As mentioned in the latter section, through chemical and biological reactions in the landfill, methane and carbon dioxide are produced, which not only create bad odour but also add to the greenhouse effect[7] (Ayalon et al., 2006, p. 1314; Huber-Humer, 2004, p. 426; O'Leary & Tchobanoglous, 2002, pp. 14.17-14.18). In particular, methane is of great concern (Thompson & Anthony, 2005, p. 138), since it has the ability to absorb 21 times more radiation than carbon dioxide (Johannessen & Boyer, 1999, p. 5). Since 1750, the atmospheric concentration of carbon dioxide has increased by 31% and methane by 131% (McMichael et al., 2003, p. 22). UNEP (2005, p. 395) states that another problem of landfill gas is the releasing of it into the soil, where it can have an explosive effect. The release of leachates into the soil and groundwater can influence the quality of water and food. UNEP highlights this fact in its report (2005, p. 376) that states "the contamination is greatest when leachate contains toxic and hazardous compounds and/or when underlying material is highly permeable." Figure II-2 illustrates the different processes regarding leachates, in connection with external factors. Leachate can be recognised in the black coloured water which drains out of waste at a landfill (JICA, 2005, p. 118).

[7] So-called greenhouse gases absorb infrared radiation emitted by the Earth's surface, the atmosphere, and clouds. Thus greenhouse gases trap heat within atmosphere. Alterations of the composition of gases can intensify the greenhouse effect, and thus can contribute to Global Warming (McMichael, Campbell-Lendrum, Corvalan, & Ebi, 2003, pp. 20-21).

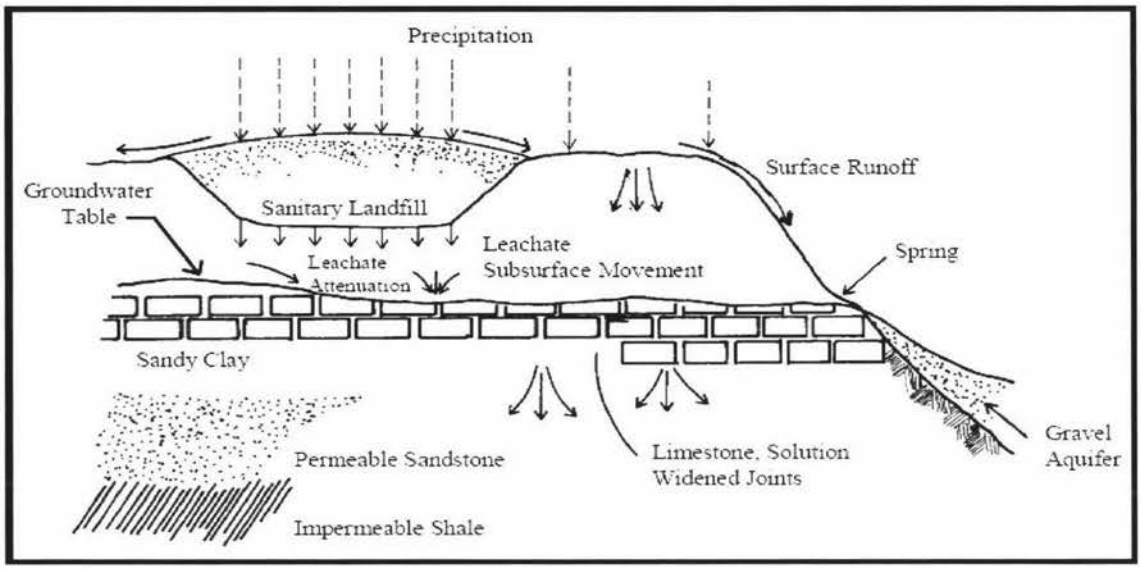

Figure II-2: Interrelation between climatic, topographic, hydrologic and geologic factors, in terms of leachate travel and groundwater contamination
Source: UNEP (2005, p. 342).

The placement of landfills in sensitive ecological environments is common in developing countries. Landslides are frequent effects, triggered by heavy rain (Hogland & Marques, 2000, p. 31), seismic movements or gas explosions (Cointreau, 2006, pp. 32-34). One tragic example occurred in Manila in July 2000, where more than 200 people became victims of a dumpsite slide in Payatas (Kyodo, 2001). Often, the closure of landfills is not undertaken properly and this can lead to the constant release of leachates and gases, which cause long-term risks for the environment and population (JICA, 2005, pp. 121-122). In some cases, closed dumps are further used by informal waste workers, as in the case of the dump site in Payatas, Manila, which was officially closed in 1995 but is still used today (Vincentian Missionaries, 1998, p. 55).

Animals as Disease Carrier

The transmission of diseases through animals is another problem, which has been related to increasing amounts of waste. Hot and humid climates provide perfect conditions for insects and rodents, such as mosquitoes, flies and rats which breed in dirty water or "in rainwater accumulated in cans, bottles, and tyres and other containers at dump sites" (Pinnock, 1998, p. 50). Frequently, uncollected solid waste causes blocked drains and channels, which then results in flooding in urban areas and this increases the emergence of insects and rodents (Cointreau, 2006, p. 3). The transfer of vector-related diseases is caused through contact with these animals. Dengue fever, Hanta Virus and Cholera are examples of these diseases (Cointreau, 2006, pp. 27-28).

The dramatic increase in waste related diseases, such as Dengue (See Table II-5) and its rapid spread to other countries is causing concern throughout world (WHO, 1997, pp. 70-71). According to the WHO (2006), 2500 million people are currently at risk from the Dengue virus. In its report, the WHO (1997, p. 5) highlights the fact that children are most vulnerable to this virus and they have a high infection rate.

Table II-5: Global reports of Dengue and Dengue Haemorrhagic Fever, 1956-1995

Time interval	No. years	No. cases	Mean no. cases per year
1956-1980	25	1547760	61910
1981-1985	5	1304305	260861
1991-1995	5	1704050	340810

Source: WHO (1997, p. 3).

Cointreau (2006, pp. 27-30) stresses that the transfer of diseases can also emerge through domestic animals, such as cows, goats, pigs and chickens, which are often found in the vicinity of waste dumps. In many cases, people are not aware of the risks and feed their animals various organs and uncooked meat. The feeding of domestic animals with human faeces and raw flesh from other animals can lead to infections, such as Trichinella Spiralis, Mad Cow Disease and Highly Pathogenic Avian Influenza. These diseases can be transferred to humans by the eating of infected, undercooked meat.

Waste Workers

Working with waste, often on an informal basis referred to as 'waste picking or scavenging', is common in developing cities. Usually, waste picking is conducted under poor conditions and with no protective clothing. Therefore people are threatened by waste-related diseases, high vibrations, noise and injuries caused by accidents with vehicles, defective equipment and the unsafe treatment of waste. Places, such as landfills and incinerators, are the most dangerous environments for these scavengers. Injuries through gas explosions, cuts, dog bites, puncture wounds and others factors are common incidents. As previously mentioned, landslides and fires can lead to disastrous situations, which can cost hundreds of lives (Cointreau, 2006, pp. 1-3, 30-35). Resource recovery techniques such as composting and recycling of different materials could reduce the waste dumped at landfills and burned in settlements and incineration plants

and hence minimise the negative effects of the growing amounts of waste in developing countries.

2.1.5 Waste as a Resource

In 1980, emerging environmental concerns, relating to contamination caused by landfills and incinerators, in addition to the dumping and burning in backyards, triggered a reconsideration of the current approach to solid waste management. In many industrialised nations, the consequence was a shift to the three Rs which stand for 'reduce', 'reuse' and 'recycle' (Leverenz & Kreith, 2002, p. 9.1). With this approach, the term 'waste' was given a second meaning, that identifies waste, not only as something which is 'unwanted' (Eduljee & Arthur, 1996, p. 340), but as a resource with a certain value. According to Garraway (2003, p. 1), the "failure to recognize this value adds to passive existence, if not monitored can create challenges that are sometimes costly and irreversible." This can be seen in the loss of many species and the destruction of sensitive ecological systems through hazardous solid waste management.

In the past, solid waste has been handled with the perception of a one-way flow system. This means that, after loosing its initial function, materials have been disposed of in landfills or burned in incinerators without preserving reusable substances such as released energy (Lyle, 1994, p. 134). The recognition, that resources are finite and that the earth is regulated by natural cycles and not by linear systems (1994, p. 133), led to the introduction of "regenerative practices" (1994, p. 136). Regenerative practices can be distinguished in reuse and environmental re-assimilation. Reuse involves two types: firstly, the direct reuse of materials and secondly, mechanical recycling which is conducted under the influence of energy. Environmental re-assimilation is based on biological processes and it includes composting, natural sewage treatment and bioremediation (1994, pp. 136-138).

Reuse and Mechanical Recycling

Recycling and reuse in developing countries is generally undertaken by the informal sector (Schuebeler et al., 1996, p. 47; UNEP, 2005, p. 131). Informal waste workers, known as scavengers, waste pickers or rag pickers, collect solid waste from streets or waste dumps and sort out recyclable wastes, in order to sell it to recycle traders, who then sell it on to the recycling industry (Hogland & Marques, 2000, pp. 23-25). The

UNCHS' report (1997, para. 6), for example, estimates that there are 40,000 informal waste workers in Calcutta and 30,000 working in Manila. In Bogota, a Latin-American city, the report (UNCHS, 1997, para. 6) counted 30,000-50,000 people, earning their money through waste. Furthermore, it is highlighted that most scavenging employment is conducted in areas with informal settlements. This is often a result of a high emergence of dumps and litter in these areas (UNCHS, 1997, para. 6). For many informal waste workers, scavenging is their only income source and often their houses are situated directly next to a landfill (Hogland & Marques, 2000, p. 24). Plate II-1 and II-2 show the famous waste dump at Payatas in Manila, where thousands of people earn their money from scavenging. As mentioned in Section 2.1.4, scavengers are exposed to high health risks, since they generally work without protective clothing. The most vulnerable groups are women and children, who constitute a high percentage of informal waste workers (UNCHS, 1997, para. 6).

Plate II-1: Janoras works every day for 11 hour on the waste dump in Payatas in Manila
Source: Baluyut (2006a).

Plate II-2: Janoras is one of 150.000 people who scavenge or recycle the 6,700 tons of garbage produced each day in Manila
Source: Baluyut (2006b).

In many countries, municipal authorities do not support the work of scavengers. Instead, they try to stop the informal workers from collecting waste. They perceive scavengers as a disturbing factor within their city and a burden on the work of formal waste workers (UNEP, 2004, p. 4). Thomas-Hope (1998, p. 5) points out that often, there is "basic competition for potentially useful garbage between the poor, who operate on an informal, usually small scale, and formal companies that collect on a large scale."

In many developing countries, scavengers perform valuable work by collecting garbage from urban dwellers and thereby decreasing recyclable waste (JICA, 2005, p. 84). In addition, their work contributes to "a large part of the economy of developing countries" (2005, p. 84). In Cairo, for instance, informal workers collect almost half of the waste

produced (Lardinois & van de Klundert, 1993, p. 14). In some cases, the work of scavengers has been acknowledged, and municipal authorities and other agencies have integrated them into the formal sector, by forming scavenging associations or cooperatives. In Quezon City (Philippines), for example, the Vincentian Missionaries Foundation and other NGOs have developed a long-term development programme, in order to encourage the activities of the scavenger households (Vincentian Missionaries, 1998). In Sao Paulo (Brazil), scavengers have created the cooperative, COOPAMARE. This organisation obtained financial support from the Economic and Social Development Bank, in order to upgrade their equipment and to improve their working conditions. One important achievement was the increase of the scavengers' incomes, by the selling of recyclable products directly to the recycling industry (Hogland & Marques, 2000, pp. 24-25).

Commercialisation of recycling, in developing countries, is difficult and, in particular, in small states, due to low economies of scale (Thomas-Hope, 1998, p. 5). For example, in Dhaka city, Bangladesh, recycling workshops are generally small and their working conditions are harsh (See Plate II-3, II-4). As pointed out by JICA (2005, p. 98), in order to be able to compete with market prices, costs are cut in every possible area. This is the reason for many health and environmental problems. In many cases, waste products, such as paper and plastics, are exported to industrialised countries, since it is cheaper to do this than to introduce new regulations and recycling plants (Thomas-Hope, 1998, p. 5). In addition, Ackerman (2005, p. 504) points out that the market for recycling is unstable. In Mexico, for instance, an increase in income levels has slowed down informal recycling activities, as a result of new opportunities in the formal sector (2005, p. 504).

Plate II-3: Informal separation and recycling in Dhaka city, Bangladesh
Source: JICA (2005, p. 98).

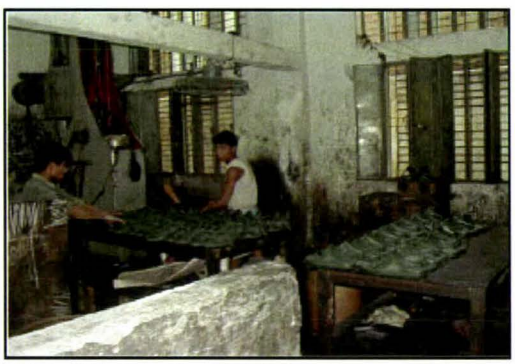

Plate II-4: A factory in Dhaka city, Bangladesh, where plastics recovered from waste are re-melted and cast into slippers
Source: JICA (2005, p. 98).

Composting

Composting is defined as "simply the enhancement of the natural biological degradation of organic matter" (Hoornweg, Thomas, & Otten, 1999, p. 25) (See Figure II-3). The outcome of the process, where oxygen plays an important role, is called composting (1999, p. 25). It is a fact that low-income countries produce mainly organic waste (Ackerman, 2005, p. 503). In many Asian countries, the use of compost as a soil conditioner, fertiliser or growth medium has always been important (UNEP, 1996, chapter 1.4.1). Materials including vegetable and fruit waste, farm waste, such as coconut husks and sugar cane waste, crop residues, such as banana skins, corn stalks and husks, yard waste, such as leaves, grass, household kitchen waste, human excreta and animal manure are all suitable for the production of compost (Hoornweg et al., 1999, p. 5). However, organics, such as wood and leather, in addition to inorganic matters such as dirt, glass and metals, are not appropriate materials for the composting process (Diaz, Savage, & Golueke, 2002, p. 12.11).

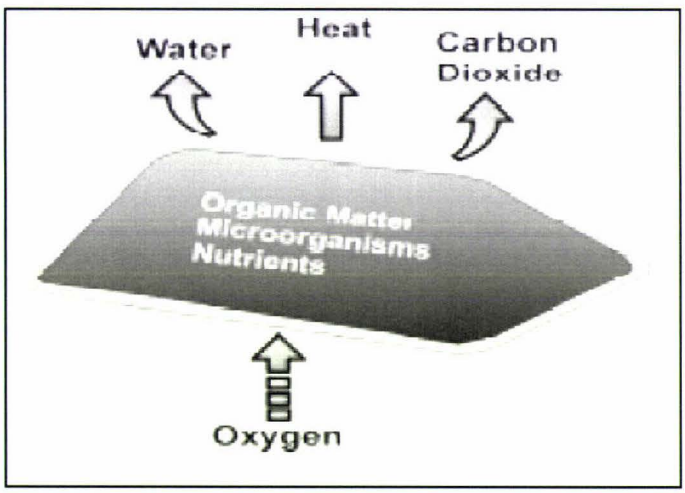

Figure II-3: Composting inputs and outputs
Source: Hoornweg, Thomas, & Otten (1999, p. 25).

Composting in developing countries is an effective way to decrease the amount of waste stored for collection and then processed by waste disposal methods, such as incinerators and landfills (Hoornweg et al., 1999, pp. 4, 11). In the long-term, composting can have positive effects on overall waste disposal costs. Hoornweg et al. (1999, p. 4) state that many countries have introduced a separated collection service for non-organic and organic waste. Another important and positive point is the reduction of methane, through the diversion of organic matters from landfills (1999, p. 10).

Nevertheless, composting also involves drawbacks. UNEP (2005, p. 168) notes that backyard processing of organic waste in developing countries is often not applicable, due to a shortage of space. In particular, in urban areas, gardening can only be conducted on a small scale, due to the often crowded conditions in towns and cities. Another disadvantage, mentioned by UNEP (2005, p. 168), is the requirement of information relating to the secure handling of organic waste. Without a certain degree of knowledge about composting, "backyard processing could degenerate into backyard 'open dumping' and roadside littering" (UNEP, 2005, p. 168). This begins with separation, which is an important process in every compost facility, in order to exclude hazardous substances that could run into surface and underground water (2005, p. 170). A report by Eaton and Hilhorst (2003, pp. 55-56) offers an example of two African cities, where farmers frequently buy unsorted waste from municipal waste workers, in order to use it as fertilisers on their fields. The consequence is that inorganic material, such as plastics and pieces of glass and also hazardous waste such as batteries, can enter the soil and water table and thereby cause contamination, which in turn can have an impact on the quality of water and food.

Other side-effects of food waste as a source for compost is bad odour and the unpleasant appearance. Poor compost facilities attract flies and rodents which is concerning, since it increases the emergence of vector-borne diseases. In addition, pests have been related to compost activities (UNEP, 2005, pp. 171-172). These points show that monitoring is important, even for residential backyard composting.

Composting on a larger scale, in developing countries, has many constraints. The UNEP (1996, chapter 1.4.1) reports a high number of failed composting operations worldwide. Composting plants, funded with foreign aid, have been introduced by donor countries in developing nations. Due to high operation and management costs, insufficient knowledge about composting and lower prices for chemical fertilisers, the establishment of composting plants has not been successful in developing countries (UNEP, 1996, chapter 1.4.1). The choice of other cheaper disposal options, such as incinerators and landfills, discourages many developing countries to promote composting (1996, chapter 1.4.1). UNEP (2005, p. 230) emphasises that, "the cost of utilising the service should be competitive with other options." Furthermore, the product 'compost' has to fulfil certain standards, which require an appropriate infrastructure, technology, legislation and a

supportive policy strategy (Zurbrugg, 2003, p. 3). Rarely can these prerequisites be realised in developing countries.

The establishment of markets for the 'compost product' requires, besides a good quality, the cooperation of the consumers, which are to a great extent the farmers in developing nations (UNEP, 2005, pp. 231-232). UNEP (2005, p. 231) points out that awareness creation and education are important tools, to inform the population about the product and to address any doubts and concerns. Nevertheless, composting "will not make large profits, nor will it solve all solid waste management problems" (Hoornweg et al., 1999, p. 13). Moreover, it should be considered "as part of an integrated solid waste management strategy" (1999, p. 13).

In several industrialised nations, integrated approaches for managing solid waste have been promoted, including resource recovery systems. However, in numerous developing countries, the focus of solid waste management activities is still on achieving sufficient waste collection and on the improvement of end disposal methods such as landfills (JICA, 2005, pp. 68-69). The following section will reveal the constraints and limitations of solid waste management systems in developing countries.

2.2 Constraints on Solid Waste Management

In many developing countries, solid waste services are ineffective and obsolete and do not cover the entire population (Hardoy et al., 2001, pp. 4-7). Zurbrugg (2003, p. 1) underlines that often solid waste plans are only for a short period and favour the interests of few influential people. Another limitation is that frequently solid waste management is focused only on technical solutions (2003, pp. 1-2). This technocratic approach repeatedly leads to the implementation of ineffective methods which do not solve the problem, but instead create even new difficulties. The following discussion is concentrated on the constraints, in terms of technical, institutional, organisational, legal, economic-financial and social-cultural matters.

2.2.1 Technical Constraints and Lack of Data

In developing countries, solid waste management has repeatedly been regarded as solely a technical issue. In many cases, expensive equipment has been bought by local

governments and financed through long-term loans from foreign donor countries. These technologies are highly developed and therefore they are capital-intensive. In addition, countries have to pay high maintenance and operation costs. The result can be that settlements with difficult access, due to poor road systems, are excluded from the collection service (Van de Klundert & Anschuetz, 1999, p. 4). JICA (2005, p. 11) concludes that, "the introduction of the experiences and technology of industrialized countries without regard for the circumstances in the recipient country has in quite a few cases ended up as the unfortunate imposition of an inappropriate system."

Another critical point is that countries generally lack the appropriate expertise to manage these new technologies and systems (Ogawa, 1996, p. 2; Zurbrugg, 2003, p. 2). Ogawa (1996, p. 2) states that there is a lack of trained engineers and people with technical and management skills at the local level. The absence of skilled staff can also be recognised in weak waste management planning (JICA, 2005, p. 13). The consequence is implemented systems and technologies which fail to improve solid waste services.

Further limitations to developing countries are the lack of data and reliable measurement systems. JICA (2005, p. 13) criticises "the collection and analysis of solid waste data are generally not given sufficient attention." In developing countries, research into topics such as urban growth and services is weak (Ogawa, 1996, pp. 2-3). Effective solid waste management requires a baseline study on the waste flow in the respective area (Van Beukering & Gupta, 2000, p. 9). The deficit of information leads to decisions that are not suitable for the circumstances in a respective country or area, and the development of solid waste management plans, which are short-term and do not encourage sustainable solutions (JICA, 2005, p. 13; Ogawa, 1996, pp. 2-3). This situation is often underpinned by a lack of an overall effective legislative and institutional framework.

2.2.2 Institutions, Organisations and Legislation

One of the major reasons for solid waste mismanagement in developing countries is the lack of urban 'good governance'. Urban good governance implies that municipalities establish a responsible and accountable political, administrative and legal system, which addresses the needs of the whole population and which encourages partnerships

between the local government, civil society and private enterprises (Hardoy et al., 2001, pp. 3-6). UNEP (1996, p. 1.3.6) stresses that low accountability for solid waste services, in government institutions and private agencies is common in developing countries and it is frequently a reason for weak performance. In developing countries, "there is often no umbrella organization to coordinate overlapping responsibilities for waste management that involve more than one agency" (JICA, 2005, p. 13). The central government, which is responsible for funding and providing a legal structure, does not in many cases even have its own department concerned with solid waste issues (2005, p. 75). Urban solid waste is managed by a few different types of institutions, each with its own systems and processes. This leads to ineffective management and contrary policies. Coordination and communication between responsible agencies and other stakeholders, including consumers and private agencies, is normally not clear (Ogawa, 1996, p. 3). This can contribute to frustration and misunderstanding between the different institutions and stakeholders, which can then hinder the implementation of reliable, solid waste services.

Besides the lack of a well-managed institutional system, regularly, "there is no integrated legal framework to deal with waste management in developing countries" (JICA, 2005, p. 13). Ogawa (1996, pp. 3-4) explains that most countries lack clearly defined roles and functions, which put in place regulations and laws, in order to facilitate the management of solid waste. In some countries, laws have been established but due to a lack of financial and human resources these laws have not yet been enforced. The implementation of an effective solid waste management system depends very much on a strong legal system and an effective institutional and organisational body. On the other hand, economic and financial factors also play a crucial role.

2.2.3 Economic-Financial Constraints

"Economic development is indispensable as an assurance of the establishment of a fiscal basis for waste management" (JICA, 2005, p. 13). Slow economic growth and scarce financial resources are some of the critical reasons for the provision of solid waste services in developing countries. Cointreau (2006, p. 7) highlights that solid waste management systems, in developing countries, are not as sophisticated as those in industrialised countries. Despite the volume of generated waste per capita being much lower, the cost of solid waste services, as a percentage of income, is much higher in

developing countries, than in developed countries (See Table II-6). Labour costs are relatively low in developing countries. However, the purchase of equipment from industrialised countries is expensive and this produces high capital outflows with additional currency exchange costs. Moreover, countries have to pay for fuel that is equal in price to that paid by industrialised countries (2006, p. 7). As a result of low economic outcomes and low financial flows, developing countries do not have the means to upgrade their solid waste management systems, to the same degree as higher income countries.

Table II-6: Global perspective on solid waste management costs versus income

	Low Income Country	Middle Income Country	High Income Country
Average waste generation (t/capita/y)	0.2	0.3	0.6
Average income from GNP ($/capita/y)	370	2,400	22,000
Collection cost ($/t)	10-30	30-70	70-120
Transfer cost ($/t)	3-8	5-15	15-20
Sanitary landfill cost ($/t)	3-10	8-15	15-50
Total cost without transfer ($/t)	13-40	38-85	90-170
Total cost with transfer ($/t)	16-48	43-100	105-190
Total cost per capita ($/capita/y)	3-10	12-30	60-114
Cost as % of income	**0.7-2.6%**	**0.5-1.3%**	**0.2-0.5%**

*Note that income is based on the 1992 Gross National Product data taken from the World Development Report 1994, published by the World Bank.
Source: Cointreau (2006, p. 8).

"Lack of capacity in fiscal planning and management" (JICA, 2005, p. 13) causes ineffective use of financial resources, and hence, hampers progress in solid waste services. One problem for developing countries is the "misallocation of funds" (Schuebeler et al. 1996, p. 40) to other sectors, which is usually rooted in the lack of liable institutions and lack of monitoring. On the other hand, introduced taxation systems and collected user charges cannot raise sufficient revenues to cover the costs of urban services, including solid waste collection. Schuebeler et al. (1996, p. 40) state, "while the economic demand for waste collection services may cover primary collection costs, it seldom covers full transfer, treatment and disposal costs, especially among low-income groups". The shift to private contractors is often seen as a solution but this can seldom improve the situation, since in many urban areas a great deal of the population is not capable of paying fees to private agencies (JICA, 2005, p. 13). Schuebeler et al. (1996, p. 40) point out that the emergence of a "vicious circle" of poor services and the

reluctance of people to pay fees is common in developing countries. This section has highlighted that financial and economic factors are of considerable significance to the improvement of solid waste management. However, in the following section, it will become obvious that, in order to create sustainable solutions for contemporary urban problems, social-cultural aspects need to be taken into consideration.

2.2.4 Social-Cultural Factors

Solid waste management "is influenced by the waste handling patterns and underlying attitudes of the urban population" (Schuebeler et al., 1996, p. 25). This again, is shaped by the social and cultural backgrounds of people (1996, p. 25). Firstly, it needs to be noted that waste management starts with consumption (1996, p. 35). Many urban areas embrace a linear metabolism "with resources being pumped through the urban system without much concern about their origin or about the destination of wastes, resulting in the discharge of waste amounts of waste products incompatible with natural systems" (Girardet, 1999, p. 125) (See Figure II-4).

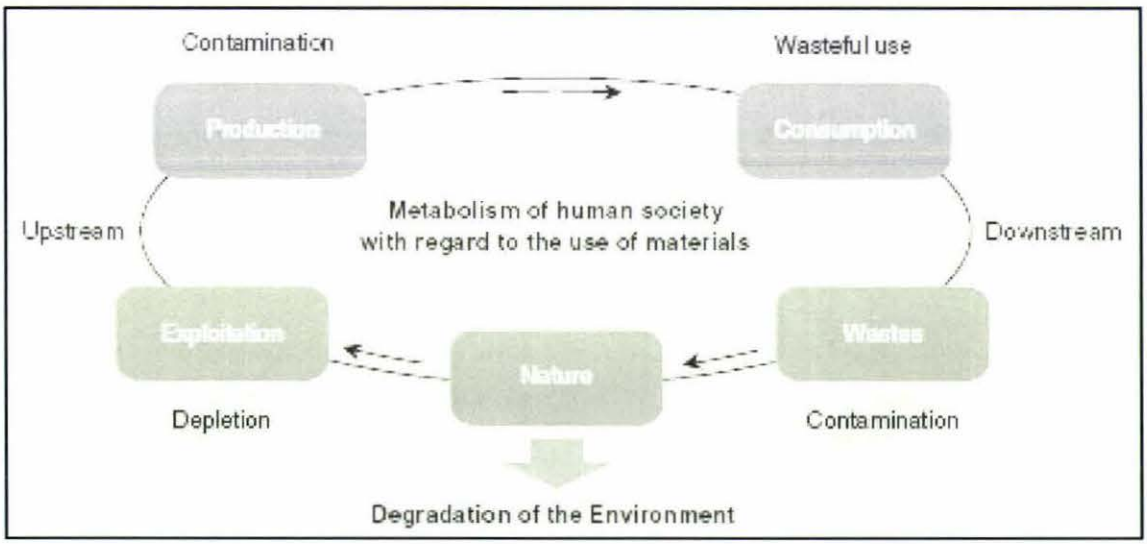

Figure II-4: Metabolism between nature and human society, in relation to the flow of materials
Source: JICA (2005, p. 10).

In various countries, this metabolism has led to a negative attitude towards waste, for instance, "in Africa waste is regarded as dirty and people are generally averse to close contact with it" (Van Beukering & Gupta, 2000, p. 6). However, religion and culture can influence the perception towards waste (Lardinois & van de Klundert, 1993, pp. 18-19). As an example, in religions where women are not allowed to leave the house, it is

generally the children who take care of the household rubbish. This negative view of waste material leads to low interest in the reduction and separation of waste and encourages behaviours such as dumping and littering (Schuebeler et al., 1996, p. 35).

The low social status of waste workers is another consequence of the negative perception towards waste (JICA, 2005, p. 14; Ogawa, 1996, p. 4). Poor working conditions and low payments are characteristics of waste related employment in developing countries. This in turn leads to frequent accidents and low motivation amongst workers (Cointreau, 2006, p. 3). The consequence is that residents are not satisfied with the service, which then reinforces their low opinion of municipal urban services (Schuebeler et al., 1996, p. 35).

Education and awareness programmes are a significant tool to influence attitudes, and hence, to have an effect on waste handling behaviours (Schuebeler et al., 1996, p. 35). In developing countries, environmental awareness and education are often not seen as a subject in schools and other educational institutions (Ogawa, 1996, p. 5). In many cases, curricula are outdated, and still teach outdated ways of solid waste handling. The UNCHS report (1997, para. 18) states that "there has been little attempt to improve the education of the general public and city officials in general." In order to reach communities, communication between citizen and public authorities is crucial. Frequently, there is a lack of partnership between the responsible actors (JICA, 2005, p. 14), which hinders addressing problems at burning places, such as those seen in informal settlements.

Informally established communities are on the rise in urban developing areas. Their illegal nature and also their physical characteristics of high density and lack of structure further complicate the provision of solid waste services. High social and cultural diversity creates heterogeneous communities (Schuebeler et al., 1996, p. 25), which develop new social dynamics and these situations are difficult for the municipalities to control and oversee. Nearly all living in peri-urban areas, these communities are exposed not only to domestic but also to industrial waste, which is dumped or burned in and around their settlements (UNCHS, 1997, para. 21). UNCHS (1997, para. 21) highlights that, "the peri-urban poor live in the most hazardous environment." Ironically,

these people are generally ignored by officials who are captives in their inflexible bureaucratic systems.

2.3 Summary

In this chapter, existing solid waste management systems in developing cities were discussed. Firstly, it was noted that increasing amounts of solid waste and the change of waste composition to more packaging materials is closely connected to urban growth, rising income levels and industrialisation. By examining applied methods for the collection, storage, transportation and disposal of residential solid waste in developing cities, this chapter revealed that municipal authorities and private companies often face difficulties to adequately address and manage solid waste problems. McGranahan et al. (2001), Zurbrugg (2003) and UNEP (2005) highlighted the common problem of exclusion of poorer communities, such as peri-urban and informal settlements. Environmental and health risks, created by lack of safe facilities and services, together with exposure to hazardous materials and human faeces mixed with municipal waste, exacerbate the vulnerability of groups, such as children, the old and sick and poor people, in addition to informal and waste workers. Alternative strategies, such as recycling and composting, identified in this chapter can create positive outcomes for urban developing cities but these strategies have to be carefully investigated and tested on a small scale.

The second part of this chapter examined existing constraints on solid waste management in developing urban areas. The focus on the use of capital-intensive technologies to solve solid waste problems was stressed as a central burden for the development of appropriate solid waste management systems. The absence of skilled and experienced staff and a deficit of data and measurement systems have resulted in poor quality urban solid waste management. The chapter further argued that a lack of strong legislative and institutional structures, in developing countries, has created low accountability and unreliable governmental and private organisations. Thus, this has produced inefficient, ineffective and uncoordinated solid waste management systems. Table II-6 indicated that, in developing countries, waste management costs per capita, based on income are much higher than in developed countries. Slow economic growth and budget deficits hamper progress in solid waste management. This chapter concluded by highlighting that a frequent problem in developing countries is the

disregard of social-cultural aspects by policy-makers. In particular, this can be seen in the rise of solid waste problems in peri-urban and informal settlements. It was noted that attitude and behaviours play an important part in shaping solid waste management in a country. Furthermore, it was explained that through education and culture, in addition to religion, negative attitudes and perceptions can be influenced positively. The following chapter will explore alternatives to conventional technocratic approaches, in order to create more appropriate solutions for solid waste management in vulnerable communities.

Chapter III: Innovative Strategies for Solid Waste Management at the Community Level

3.1 Sustainable Solid Waste Management

Chapter II examined current solid waste management practices in developing cities and revealed that conventional systems cannot address increasing solid waste problems. This chapter aims to demonstrate that "sustainable development and community participation *must* go hand in hand. You can't have one without the other" (Porritt, 1998, p. xi). Warburton (1998, p. 34) confirms that sustainable development cannot be achieved without collective action by communities. This is explained clearly by Jacobs (1995, as cited in Warburton, 1998, p. 34), who argues that "environmental goods are public goods; it is collective not individual choice which they require...individual wellbeing is dependent on the health and resilience of the things we share and must provide together." Increasing waste streams in urban areas require civic action and the search for more alternative solutions. There are different ways in which local people could be integrated into the management of solid waste. The encouragement of composting activities and the separation of waste at home and work are but two examples which if well organised, could lead to vital improvements in urban solid waste management.

In this chapter, examples from different countries are used to present alternative, self-help solutions in solid waste management and the positive outcomes and limitations are outlined. Furthermore, significant factors needed for the sustainability of community-based activities are discussed. On the basis of an Integrated Sustainable Waste Management (ISWM) approach, this chapter highlights that partnerships between the civic, private and public sectors are vital, in order to promote civic actions. According to Stewart and Collett (1998, p. 53), "partnership conceals a variety of collaborative relationships as varied and sometimes competing interests assemble consensual alliances and coalitions." However, this requires a change of behaviour and perception amongst the population, in addition to those between private and public partners. Civil society has to take over their responsibilities in shaping their own lives and environment. On the other hand, the public and private sectors need to recognise the important role of

urban communities in the provision of basic services and integrate them into urban development strategies. In many developing countries, there is evidence of some successful implementation of alternative solutions through cooperation with different partners.

3.1.1 Integrated Systems

"Aiming at sustainable development as proposed by Bruntland (WCED 1987) implies the application of an integral vision on society and the environment" (Moll, 1998, p. 14). The formulation of the 'International Agenda 21' has integrated environmental urban issues into national policies. Agenda 21 contains guidelines for sustainable policy actions, which were established at the United Nations Conference on Environment and Development (UNCED) in Rio, 1992 (United Nations, 2004a, p. 58). Chapter 21 of the Agenda offers principles towards the handling of solid waste and the treatment of sewage related issues. According to these principles, waste management should aim at an "integrated life cycle concept", which involves the protection of the environment (UN Department of Economic and Social Affairs, 2004, Ch 21, pt. 21.4).

Waste management actions in Agenda 21 are linked to the following hierarchy of objectives: a. Waste minimisation, b. Waste reuse, c. Environmentally sound waste disposal and treatment, and d. Extension of waste service coverage (UNCHS, 1997, para. 3). Many industrialised countries have shifted to an approach which focuses on the minimisation and prevention of waste (1997, para. 4). However, in developing countries, due to an absence of trustful data on waste production and waste collection and disposal, minimisation strategies have not yet been intensively implemented (1997, para. 5).

In Figure III-1 an Integrated Sustainable Waste Management (ISWM) system is presented, taking into account the guidelines of Agenda 21. The ISWM concept embraces three dimensions. These are (1) stakeholders, (2) waste system elements and (3) sustainability aspects. The first dimension considers every person and institution that has an interest in waste management. With respect to increasing social problems in urban areas, municipalities need to establish partnerships with the civic and private sectors. The second dimension involves the use of different waste collection and treatment methods, according to the country's background. The waste hierarchy is an important guideline in choosing an appropriate waste management strategy. A

significant feature of an integrated system is that it aims to connect different waste options with other systems in the society, for example, the creation of compost for agricultural or gardening purposes (Van de Klundert & Anschutz, 2001, pp. 12-15). Decisions relating to a waste management strategy must be based on economic, social-cultural, environmental, technical, institutional and policy/legal/political aspects (2001, pp. 13-14) (See Figure III-1).

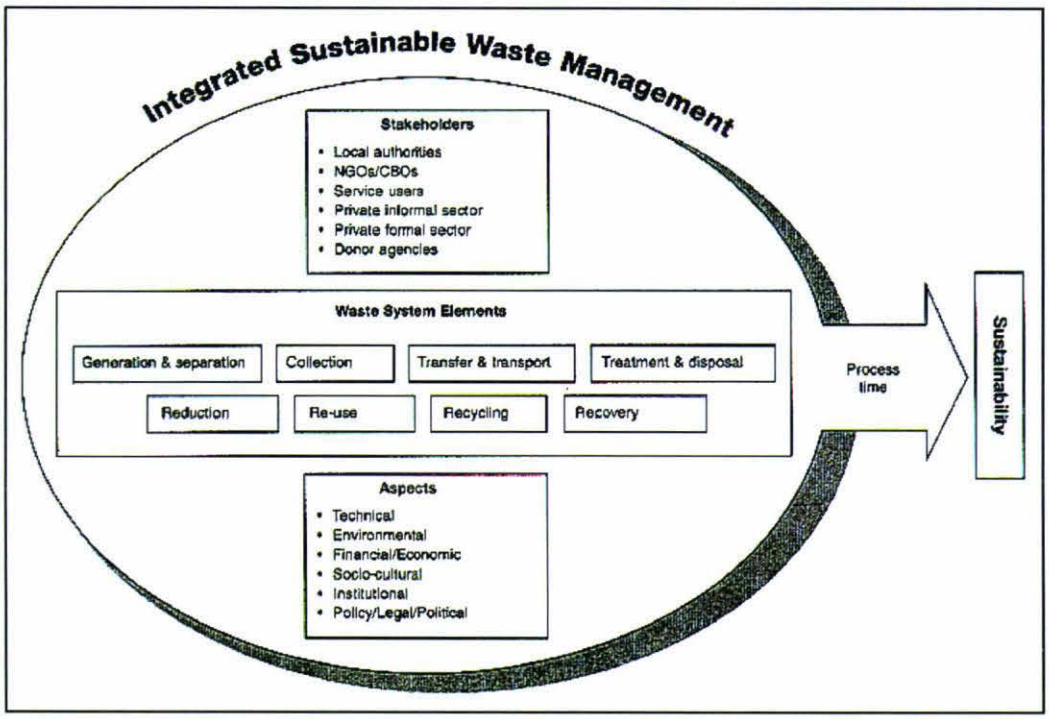

Figure III-1: The ISWM model
Source: Van de Klundert & Anschuetz (2001, p. 14).

According to van de Klundert and Anschuetz (1999, p. 12), the highest degree of sustainability is achieved when a waste management system embraces as many aspects as possible. However, in reality this implies certain trade-offs. Often the environmentally best solution is the most capital intensive one. As the discussion in Section 2.2.3 emphasised, the lack of financial means is one of the greatest limitations in developing countries. Therefore, it is important that alternative solutions, which do not depend on a high starting capital, are investigated. UNCHS (1997, para. 19) highlights the fact that "there is need to look at alternative approaches which are labour-intensive, process the waste at source, and require minimal capital investment."

A significant aspect is the involvement of communities in the provision of solid waste activities. Mungai (1998, p. 147) points out that "waste management systems that include community participation and do not require high technology and inappropriate machinery may prove to be sustainable at the community level, since income generating waste management systems can be maintained by low-income communities". According to this author, "community participation in waste disposal can be a catalyst in community development work, because it gives residents a feeling of self esteem." The next section offers insights into development projects at community level. It shows that alternative methods and techniques applied in communities can contribute to significant progress, in addressing urban issues.

3.1.2 Community-Based Projects

The provision of urban services, such as a solid waste collection, is by definition a public good (Cointreau-Levine, 1994, p. 1). Schuebeler et al. (1996, p. 27) explain that "the total private economic demand for services is considerably lower than the full value of those services to society". For that reason, public goods are mainly provided by local governments. However, due to an increasing pressure on budgets and human resources in the public sector, many governments have already outsourced parts of their urban services to private companies (See Section 2.1.2). Yet, in Section 2.1.2, it was also explained that generally it is the higher-income areas which have benefited from private contracts. Poorer settlements cannot usually afford to pay the charges demanded by private companies. As pointed out in Section 2.1.2, low-income groups often live in the peri-urban areas and they suffer the most from the ever-growing waste mountains, since this is "where most wastes, both solid and liquid, are disposed of and where industrial zones are most usually sited" (UNCHS, 1997, para. 21). The exclusion of these groups from urban services, such as solid waste collection, has long-term consequences for their health and the surrounding environment, which in turn can have a negative effect on the economic development of the country (1997, para. 21).

An important recognition, which has been integrated into the international Agenda 21, is the fact that citizens have to take part in the development of the country (See Section 3.1.1). A recent famous example is the introduction of participatory budget planning in Porto Alegre (Brazil) (Novy & Leubolt, 2005). The inclusion of civil society, in the political decision making processes, achieved significant improvements to the basic

infrastructure in Porte Alegre (2005, pp. 2028-2029). The example of Porto Alegre shows that communities can play a significant role in filling the emerging gap in the provision of urban services. Regarding solid waste management, Pargal et al. (1999, p. 1) conclude, that "trash collection is an activity in which individual action does not have much impact, so collective action is warranted."

In several developing countries around the world, citizens in low-income groups have initiated activities in their settlements, in order to organise cheap housing facilities, sanitation, access to water and electricity (Badshah, 1996, p. 16). Regarding solid waste, people have established community-based collection services, which have often been combined with recycling and composting activities. In some cases, local governments, NGOs and international donors have funded and encouraged citizen-led projects. The implementation of community-based urban services has achieved positive development in many cities.

An example, regarding the provision of urban solid waste service by marginalised people, is Cairo's garbage workers, the Zabbaleen. The Wahis, who were originally migrants from the oases, introduced the trade of garbage collection and disposal in Cairo. A group of poor Christians arrived in Cairo around 1930, searching for opportunities and a place to live. These new settlers were employed by the Wahis as garbage collectors. In Arabic, garbage collector is translated as Zabbaleen, which became the name for the waste workers. The Wahis on the other hand became the middlemen, who remained in control of the Zabaleen (Neamatalla, 1998, pp. 1-4). Today, the Zabbaleen collect "one third of the city's 10,000 tons of daily garbage" (Gauch, n.d, para. 3). In addition, they have developed an innovative system of separation and recycling, in order to trade it with recycling companies (Kovach, 2003, para. 1-2). Most of the Zabbaleen are squatters living in Moqattam, where they had to move in 1970 after being evicted from another settlement (Neamatalla, 1998, p. 4). After gaining national and international recognition, different organisations started to upgrade the settlement and support this collection and recycling system. A significant influence has been the Zabbaleen Environment and Development Programme, which was founded in 1981 in partnership with community organisations, local government, technical assistance groups and international donors (Neamatalla, 1998). The Zabbaleen system has been replicated by other countries.

In Madras (official name Chennai), India, informal waste workers have been employed by local residents as "street beautifiers" in order to collect the waste and bring it to municipal containers. The salaries of the street beautifiers and the tricycle carts are paid by contributions from residents, funds and loans. The organisation of the waste workers is undertaken by a Community-Based Organisation (CBO) called Civic EXNORA unit, which is the core of every project. The first Civic EXNORA unit was founded by Mr. Nirmal, who had been inspired on his travels by the cleanliness of Hong Kong. The name EXNORA is an acronym that expresses the underlying aim and philosophy of the organisation, which is to develop EXcellent NOvel and RAdical ideas, in order to protect the environment (EXNORA International, n.d.). Six years after the establishment of EXNORA International, almost 900 Civic EXNORAs have been recorded in Madras (UNESCO, n.d.-a, para. 5). In 1998, this number had increased to over 3000 in Madras (McDougall et al., 2001, p. 82).

Another interesting community-based project was introduced in Quito, Ecuador. In 1993, the municipal enterprise for city cleanliness implemented a pilot solid waste collecting and recycling programme in lower and lower-middle class communities. The concept of this project involved the establishment of micro-enterprises involving the residents. With carts and small trucks, household waste was collected from the kerbside and brought to the communal depot, after it had been separated by residents. The task of the municipal authorities was to transfer the waste from the communal depots sites to the landfill site and to pay the waste workers from the micro-enterprise. The selling of recyclable waste generated money for these micro-enterprises, which was generally used for the development of their communities. Control and monitoring of the generated income was conducted by neighbourhood associations (Hernandez, Rawlins, & Schwartz, 1999, p. 147). This project outlines the significance of strong partnerships between the civic, public and private sectors in the development of urban communities.

PADE[8] (Diokoul and Surrounding Districts Sanitation Scheme) is a successful project, implemented 1991, in eight low-income communities in Rufisque, Senegal. Local residents started off a programme that addressed their water, sanitation, drainage and waste problems, by using cheap local technologies. A local management committee,

[8] Programme d'assainissement de Diokoul et quartiers environnants – Urban environment sustainable improvement process programme.

consisting of the district health committee, district representatives and representatives from the local authority services, was established and this committee worked closely with the project manager and the initiator of the scheme, the international NGO ENDA[9]-Third World-RUP[10]. In the beginning, the project was financially supported by the Canadian-Senegalese Host Country Participation Fund (FCCS)[11] and the European Union (EU) (Gaye & Diallo, 1997, p. 17). However, in the course of the project, a community fund for the sanitation of the poor urban areas – FOCAUP[12] – was created and this shifted the programme to a self-financing status (1997, pp. 25-29).

The presentation of these four community-based projects is only a selection of the variety of existing and emerging activities at the local level. All over the world, civil society has started to become active and take over responsibility for its own development. This has triggered changes and improvements in social, economic, cultural and political dimensions.

3.1.2.1 Positive Outcomes

In most cases, community or citizen driven projects evolve because the provision of urban services by private and public authorities is either not sufficient or not even available. The active involvement of residents in services, such as solid waste collection, means a support for municipal agencies. In particular, in informal settlements, where people are not eligible to obtain solid waste collection, even if they are willing to pay, community activities are significant in creating affordable alternatives, principally for the low-income population. In Rufisque, the implementation of a community- led sanitation and solid waste collection scheme provided 450 households, in eight low-income communities, with a private sanitation infrastructure and 3000 households with door-to-door solid waste collection (UNESCO, n.d.-b, para. 12). This has been a great success for the communities in Rufisque, given the fact that solid waste collection was almost none existent in their area and water supply and sanitation were in poor condition (Gaye & Diallo, 1997, pp. 11-13). Another positive example is represented by the achievements of the Civic EXNORA units, which collect, per day, 18% of the garbage produced in Madras city (UNESCO, n.d.-a, para. 6).

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[9] ENDA – Environmental development action in the Third World.
[10] Relais pour le développement urbain participé – Relay for participatory urban development.
[11] Fonds de Contrepartie Canado-Sénégalais.
[12] Fonds Communautaire pour l'Assainissement de Quartiers Urbains Pauvres.

In addition to solid waste collection, resource recovery strategies, such as composting and the recycling of paper, glass and other materials have been introduced by many active citizen groups worldwide. In Madras, for example, the increase in primary collection services led to an overloading of municipal transfer stations and landfills. Civic EXNORA units reacted with a shift from merely primary collection to a zero waste management concept[13], which implies source segregation, composting of organic waste, re-segregation and recycling of inorganic waste and household waste. A zero waste centre has been established for each ward. By using bio-dung and vermicomposting[14] (also called worm composting) procedures, the organic waste is transformed into compost, which can be used for gardening, agriculture and landscaping purposes. Inorganic recyclables such as glass, plastic, paper and metal is given to recycle micro-enterprises (EXNORA International, n.d.).

The success of this approach can be seen in the reduction of waste brought to landfills and dumps. After processing the collected rubbish, only 10-15% of the garbage is brought to municipal collection points (EXNORA International, n.d.). In Rufisqe, the project has led to 90 cubic metres of water being recycled daily and three tonnes of refuse recycled (UNESCO, n.d.-b, para. 12). In this case, waste water is transferred to purification plants and mixed with the collected organic waste, in order to produce compost for urban agriculture and to establish green zones (Gaye & Diallo, 1997, pp. 15, 23-24). In Rufisque, the reduction of dumped waste, by 80%, has reduced environmental and health risks (1997, p. 22).

Improved basic urban services, such as collection and treatment of solid and liquid waste, lead to positive implications in the environmental and health aspects of local residents. The removal of waste dumps and the frequent collection of household waste decrease the emergence of scavenging animals, insect and rodent vectors, which in turn minimises vector-borne diseases such as Dengue fever (See Section 2.1.4). Through the reduction of waste emissions, such as leachates and gasses, water and air quality can be improved. In Rufisque "the scheme has improved the quality of life and health

[13] Zero waste management is a system of managing solid wastes, which strives for maximum waste recovery, through recycling and reuse, aiming at zero waste to be disposed of in dump yards and landfills (EXNORA International, n.d).

[14] Vermicomposting is the process of breaking down of organic matter by some species of earthworm. Vermicompost is a nutrient-rich, natural fertiliser and soil conditioner.

standards in the poor districts: beaches and public places are no longer used as rubbish dumps and toilets" (Gaye & Diallo, 1997, p. 23). Diarrhoea and skin disease rates have diminished, and there has been no incidence of cholera documented in this area in recent times (Gaye & Diallo, 1997, p. 24). In Cairo, the Zabbaleen have been responsible for "cutting infant and child mortality in half, instituting almost universal immunization and eradicating tetanus as a major infant-killer" (Kovach, 2003, para. 14).

High unemployment and low incomes are often related to areas with poor basic infrastructure. The economic benefit of activities, such as solid waste collection and recycling, led by communities is high. In view of the fact that most local projects are labour-intensive, a significant number of unskilled jobs are created, which presents a vital contribution to low household incomes. In Rufisque, the project produced, on average, 58 permanent employments and over 24 temporary jobs each month. This has led to an income improvement of 1.8% (Gaye & Diallo, 1997, p. 21). In Madras, the project created 1500 jobs (UNESCO, n.d.-a, para. 6).

The application of local technologies, which are often cheaper in production and maintenance than capital intensive solutions used by municipalities, is another positive outcome of the involvement of civil society in urban services. The Vincentian Missionaries Social Development Foundation Incorporated (VMSDFI) (2001, p. 80) highlights that "the poor do it cheaper and better: The fact remains that poor people can develop communities and build houses more cheaply and more efficiently than the state or any private developers can." This is the case of Rufisque, where low-cost narrow plumbing pipes have been used to upgrade the private sanitation system and residents collect garbage with horses and carts. A traditional natural method – the use of water lettuce – serves as a purification tool for waste water (Gaye & Diallo, 1997, p. 10). The whole drainage and sanitation system has been established by investing just 3-5% of the cost of the conventional methods (1997, p. 21).

The impact on knowledge and education by community-based interventions, such as composting and recycling, is another significant point. Activities, such as separating at source, recycling and composting, the establishment of local organisations to monitor the project development and the leading of recycling micro-enterprises, involve the creation of essential skills, not only for waste workers but also for participating

households. This can be underlined with a quote from a separator in a project in Quito: "People that separate garbage are educated people...As I said, that education begins at home. This way to set out the example for our children" (Hernandez et al., 1999, p. 153). New concepts are not only transferred to the next generation but also to other communities and neighbourhoods.

Through word of mouth and the media, such as local newspapers, radio and television, new ideas for local waste activities are spread to other parts of the country or even to other nations. The Zabbaleen, for instance, have served as a positive role model for citizen activism in solid waste management in many other countries. EXNORA International is another example, which has grown beyond town boundaries and inspired other settlements to take on its concept. EXNORA International (n.d.) states that "there are about 5,000 branches Civic EXNORAs, 200,000 members and a 25,000 member youth force." However, EXNORA International has not only grown geographically but other social, civic and environmental problems have been addressed, in order to improve the living conditions of residents. Aside from solid waste management, EXNORA developed new programmes which involve the cleaning of waterways in Madras City, the upgrading of sanitation systems, the planting of trees and vegetables on roofs and the creation of environmental awareness in schools (EXNORA International, n.d.). The expansion of projects, to tackle other concerns at the local level, is a positive result of successful projects.

In terms of the socio-cultural factors, increased knowledge about the effects of unsafe solid waste handling can positively change perceptions and encourage people to stop behaviours, such as the littering or dumping of waste. In the project in Rufisque, for instance, elders have used their influence to convince their community members to give up traditions such as carrying solid and liquid waste on the head (Gaye & Diallo, 1997, p. 21). The involvement in separation at source and recycling activities can cause a shift to a concept that considers waste as a resource. The awareness of this fact by the population can lead to decreased littering and thus to a cleaner living environment in communities. As in the case of Rufisque (1997, pp. 20-21), by becoming active in the provision of urban services, local people recognised their responsibility towards the development of their community.

The project in Rufisque (Gaye & Diallo, 1997, p. 21) reveals that community-based projects can modify existing social roles and, as a result of this, it creates positive benefits for vulnerable groups, such as women and children. In many countries, women and children are responsible for the storage and disposal of household rubbish. The constant contact with waste materials is dangerous for their health and particularly for children it can have dreadful consequences (See Section 2.1.4).

The creation of projects, at the local level, can generate bonds with other local organisations and communities, as pointed out by the Vincentian Missionaries (VMSDFI, 2001, p. 76): "One city's breakthrough becomes a learning opportunity for groups around the country." Not only information but also resources can be shared in a national network (2001, p. 76). Successful projects often lead to a situation where municipal authorities recognise the capabilities of their citizens and communities. For instance, in the case of Rufisque, the successful upgrading of garbage collection and sanitation by local residents convinced the political level to acknowledge the potential involvement of residents in urban development. Local authorities realised that the use of low-cost technologies were more appropriate for the circumstances of low-income communities (Gaye & Diallo, 1997, p. 23). In the next section, potential constraints and limitations on community-based solid waste projects will be examined.

3.1.2.2 Constraints and Limitations

The implementation of voluntary collective actions, such as community-based solid waste collection and recycling services, are not always successful. Often, participants have to struggle with a variety of burdens and limitations and in many cases projects stop before they are fully implemented. In Madras, for example the average life of each Civic EXNORA unit is only 3.36 years (Anand, 1999, p. 173). Long-term sustainable actions are rare because many good projects collapse, due to a lack of financial and human resources. In many cases, resistance and passivity by other community members can slow down and even stop the realisation of actions led by the local population. In Pammal, a small town in India, the collection of solid waste conducted by a women-led civil society organisation was disturbed by discrimination caused through residents. Locals were against the fact that the collectors used the municipal bins close to their houses. One member of the organisation comments (Dahiya, 2003, p. 96): "And these men, they started gheraoing (surrounding and threatening the volunteers) and using all

kind of filthy language." Resistance can lower the motivation of participants and it can also jeopardise the sustainability of the project's activities.

An underlying reason for resistance is the negative attitude by residents towards voluntary actions. Frequently, locals have the expectation that municipalities are the only responsible persons to provide urban services. This creates the situation that residents take services for granted and do not take over responsibility for the situation. In Pammal this has been experienced by a collector (Dahiya, 2003, p. 96): "[Almost] everybody, especially those who are retired from government jobs, thinks...that it is the government's duty to do the garbage clearance, or it is the government's duty to do everything for us."

A significant problem is that repeatedly residents are not willing to pay the collection fee, or they even refuse to hand over their household waste to the volunteers. For the waste workers this is difficult, since they are generally unemployed people or they only earn a small amount of money. In the recycling pilot programme in Quito, some residents did not want to give their waste to the collectors from the micro-enterprises, since they preferred to sell their recyclables to other informal waste workers and therefore keep the money for their own family (Hernandez et al., 1999, p. 156). This behaviour lowered the project's success, since less profit was gained for the benefit of the whole community.

Communities are rarely homogeneous. Riley and Wakely (2005, p. 37) identify a social shift occurring in many communities. With regard to this, Taylor (1998, pp. 165-166) reveals that, "poverty creates communities that are unsustainable...groups, living on the edge themselves, are suspicious and fearful of other groups around them, whether they are young or old, black or white." The rise of low-income settlements, with a lack of infrastructure and basic services, has created unsustainable communities. Often, informal settlements are established at the edge of cities, through people migrating to cities from rural areas, or from outer islands. This has created societies where:

> People tend to seek smaller and more restricted definitions of identity and community, leading to an increasing sense of tension and a community that is constantly being divided in terms of class, race, gender, geography, education,

> income, religion, or age. Insecurity leads to individuals and families that come and go (Ashworth, 2000, p. 257).

High social diversity in communities can be a burden for the establishment of collective actions (Schuebeler et al., 1996, p. 25). Different social backgrounds can influence the development of citizen-led projects. In the case of Quito, the resistance, by some families, to hand over recyclable waste to waste workers might have been caused by external pressure, such as unemployment and a lack of financial resources. Individual interests play an important role, particularly in poorer areas.

A survey (Pargal et al., 1999, p. 1) conducted in Dhaka, with the aim of measuring the importance of social capital regarding voluntary solid waste management systems, suggests that social capital has an important influence on collective action. In this study, social capital is equated with community cohesiveness, which is defined as "a function of factors like customary or traditional interactions and institutions, a common heritage, values, ethnic or religious background, etc." Beilharz (2002, p. 17) concludes that "high-risk neighbourhoods have low social capital". In the author's opinion, "low social capital is a barrier to participation in community activities or structures" (Beilharz, 2002, p. 18). One could argue that a lack of community cohesiveness, or low social capital caused through social diversity, can complicate the establishment of voluntary collective actions, such as solid waste collection.

Beilharz (2002, p. 17) points out that "the ability to engage people in activities for the benefit of the community can be limited by a lack of trust or confidence." In Quito, a study showed that lack of information flow between waste collectors and households created mistrust, which in turn produced a decrease in the participation rate and a turning back to traditional ways, such as non-separating, dumping and individual selling of recyclable waste to informal waste workers. This is expressed by a resident (Hernandez et al., 1999, p. 153): "We see no advantage for us in all of this. I think that the advantages are more for the managers because we do no know what they do, how they do it or why they do it." The question is: Why should people make an effort to participate for the common interest, if they do not see any benefit in it?

A problem for many local projects is the lack of capable staff. In particular, financial management is difficult for the generally unskilled workers (Anand, 1999, p. 175). This leads to another point, the problem of continuation of projects through to the next generation. Anand (1999, p. 174) reports that in Madras, some Civic EXNORA units have stopped being active, since there was an absence of people, who were willing or able to carry on the activities of the project.

Negative perceptions and a lack of support by municipal authorities is another problem, which often constrains civic provision of urban services. Warburton (1998, p. 33) critically comments that "the lack of respect and status accorded to community approaches is reflected in the lack of faith in community groups by many government institutions which, in turn affects community participants' belief in their own ability to actually change anything." This statement is supported by Beilharz (2002, p. 17) who states that "if communities have been relatively powerless for long enough, they stop expecting the situation to change." Passivity is created through a lack of recognition by governmental authorities, which can then affect the success of collective actions.

Lack of secondary collection and open spaces and long distances to transfer stations can put a great deal of pressure on community-led programmes (Anand, 1999, p. 174). The report by Anand (1999, p. 174) points out that "Civic EXNORA is basically a primary waste collection system: it cannot function if there is no secondary waste collection system." The lack of recognition of informal solid waste collection and recycling by local authorities often leads to the creation of two competing systems: on the one hand, the formal waste management system and on the other hand, informal waste workers (See Section 2.1.5). In Quito, for instance, "the municipal government viewed waste not as a resource but as a problem that needed to be addressed in a systematic way to improve local communities" (Hernandez et al., 1999, p. 155). This perception led to the policy of trying to decrease the numbers of informal waste workers, instead of incorporating them into the new recycling programme (1999, p. 155). In Cairo, the government had given a contract to a private company, in order to stop the Zabbaleen collecting waste. General Mohamed II Leben, chairman of the Cairo Cleaning and Beautification Authority (Kovach, 2003, para. 8) states that "there should be some organization to collect and get rid of this trash safely. The zabbaleen system is dangerous to public health." In order to use the potential of citizen-led projects, it is

necessary to diminish mistrust and negative perceptions amongst the key players. The subsequent section will outline the important aspects, which should be considered when aiming at sustainable civic projects.

3.1.2.3 Factors Needed for Sustainable Projects

The provision of urban services by a civil society is dependent on a strong commitment by the local population. Sustainability of projects, such as solid waste collection or recycling, is determined to a great deal by the motivation of community members. As EXNORA International stresses, "in these areas[15], it is NOT THE CONCEPT that has failed, BUT THE PEOPLE THEMSELVES. Because, a Civic Exnora is after all nothing but the people who form it" (EXNORA International, n.d.). The full dedication of the project initiators to the programme goals is significant, in order to create sustainable activities. Furthermore, it is important to convince other households of the benefits of a civic service. As it has been pointed out in Section 3.1.2.2, waste collectors frequently have to struggle against resistance by other residents. This requires patience, pertinacity and creativeness by the participants. The women-led organisation in Pammal used face-to-face discussions and a local street play to create awareness of their collection and recycling service and to encourage community members to keep the surrounding environment clean (Dahiya, 2003, p. 96).

An important fact for the success of community-based projects, such as solid waste collection, is the creation of social capital, or in other words community cohesiveness. Beilharz (2002, p. 15) points out that social capital is established by "communication, dense networks of social exchange, non-hierarchical structures and cultural norms about citizenship." As explained in Section 3.1.2.2, in communities which show a high social diversity, the realisation of collective actions can be difficult. Trust has to be established between different social groups (Beilharz, 2002, p. 15). This can be achieved by active communication between community members and by the creation of a common goal. Beilharz (2002, pp. 71-72) emphasises that trust can also grow during collective actions. The author (2002, p. 72) reflects on her experience in a three-year development project: "Trust grew from the familiarity gained by the collaborative participation."

[15] Here it is referred to the areas which are managed by unsuccesful Civic EXNORA units.

Education and the transfer of information, relating to urban issues and the implication of unsafe practices, is a vital means to increase both the awareness and motivation of people, to become participants in the development of their communities. Furthermore, it can decrease resistant processes and thus it can facilitate the implementation of community-based projects. As Elliot (n.d., cited in Edward, 1989, p. 128) critically states: "The purpose of education is to allow people to become subjects rather than objects, to control their own destinies rather than be victims of the desires and social processes of others". Beiharz (2002, p. 70) also states: "In order to work collaboratively community members needed a set of skills including the ability to plan, make decisions, communicate and resolve differences. They also needed to know how and where to obtain the resources required for their activities."

A frequent mistake by authorities and practitioners is the fact that project aims are not embraced by the local population. However, in order to improve living conditions in towns and cities, change has to come from the residents themselves. In rhetoric, 'participation' has become a buzzword, which is used for every development intervention. Yet, as Warburton (1998, p. 5) observed, in practice the involvement of communities is rare. According to Edwards (1989, pp. 126-127) the reason lies in the inability of 'experts' to listen and to learn from the people 'from below'. This is supported by Warburton (1998, p. 34), who states that, "technical expertise and new ideas and approaches will always be needed, but it must be provided by people who see themselves as the equals of those to whom they are providing it, and not as their superiors."

In particular, in projects initiated by municipal authorities or international donors, it is important that community members are integrated in a participatory way in the realisation of the project. Edwards (1989, pp. 126-127) highlights the fact that, in order to understand local problems and to find effective ways of dealing with them, it is crucial to bridge the gap to the population, by using 'participatory' or 'action' methods. An old Mexican proverb (Edwards, 1989, p. 127) "Hacemos el camino caminando" (We make the path by walking it) shows that participation by civil society in development issues is not just a modern thought, but it has been lived by indigenous people in the distant past.

A major prerequisite, for the motivation of community members to participate in the development of their community, is to achieve the ownership of project activities. Many community-based projects, initiated by international donors or municipal authorities, tend to break down after a short time. One reason for this is that authorities and practitioners fail to hand over the control of the project to the locals. In many cases, the relationship between these stakeholders is based on a financial dependency, which is created during the implementation of the project. Revolving fund concepts have been created and these have contributed to the establishment of self-sustaining community-led projects. A positive example can be found in Rufisque, where a community-owned fund has given "the population control over resources that would otherwise be dispersed and enables them to participate fully in deciding how these resources should be allocated" (Gaye & Diallo, 1997, p. 25).

The use of local technologies, instead of complicated and capital-intensive machines, is an efficient way to establish low-cost and easy applicable solutions, which can be sustained by the locals. The project in Rufisque is a good example, where traditional methods have been successfully applied, to provide affordable urban services, such as sanitation and solid waste collection. In relation to this, the UN Commission of Sustainable Development (1996, para. 24) calls attention to the fact that, "many of the most appropriate technologies are available locally in forms that can be easily and cheaply adapted to the needs." This idea is underlined by the Vincentian Missionaries (VMSDFI, 2001, p. 76) who state that, although communities in different areas face similar problems "groups in each place have developed unique approaches to solving these problems in response to unique realities."

The interrelation of different systems, such as use of liquid and solid waste for agriculture or gardening, is an important tool to create projects which correspond to a circular urban metabolism. The introduction of separation at source and recycling and composting programmes are central to making the population aware of the fact that waste can be an essential resource for other urban systems. This holistic approach can lead to the improvement of health and the environment but in addition it can lead to positive changes in social-cultural, socio-economic and political levels (Gaye & Diallo, 1997, pp. 20-25).

An important determinant, for sustainable community-based projects, is official recognition and support by local authorities. The establishment of mutual trust between public and civic sectors is vital, in order to address urban problems, particularly, the consideration of the rapid growth in informal settlements. Anand (1999, p. 162) suggests that the establishment of an institutional structure is a critical point for the success of community-based projects. He explains that, in the scope of an institutional structure, residents have the possibility to express their needs to authorities and to force them to address the community's problems. UNESCO (n.d.-a, para. 9) concludes, that in order to provide sustainable and effective service by the civil society, it is essential that officials work together with communities. Partnerships between municipalities, private companies and community organised organisations can create effective synergies which are vital to reduce urban poverty. Beiharz (2002, p. 72) points out that, "good networks and links between the community and those in authority or with funds and other resources increases the capacity of a community." In the case of Rufisque, recognition by local authorities has led to tax exemptions, in order to compensate car drivers for their work as waste collectors (Gaye & Diallo, 1997, p. 23). The pilot programme in Quito, together with the activities of Civic EXNORA is another example which shows that, particularly, primary collection services led by communities need to be connected to a well-functioned secondary collection system, provided by municipalities or private companies.

The integration of informal systems into formal systems is a crucial part in encouraging civic activities. The UN Commission on Sustainable Development (1996, para. 22) emphasises that "despite the significant role of informal sector in solid waste management, there are few attempts to capitalise on this potential." The integration of informal workers can create important benefits. Firstly, informal workers can secure their work and thus they can maintain their financial income and secondly, their involvement might improve the reputation and social status of these informal workers.

An important point to note is that partnerships between different stakeholders need to be established on an equal basis. Riley and Wakely (2005, p. 33) stress that "inclusion and power sharing are central to the ethos and success of authentic partnerships." However, the authors (2005, p. 34) also state that this is a long process, which can be achieved through "communication and negotiation", and it requires a willingness to learn by

every stakeholder. Every partner has to rethink hitherto their perceptions of the other stakeholder, in order to find more successful ways of dealing with the other side (2005, p. 35). Riley and Wakely (2005, p. 35) comment that "people generally fail to appreciate the values and perspectives of others and often fail to appreciate and effectively communicate their own, but unless this changes, understanding cannot be reached, trust cannot be built and partnerships will produce only limited result."

3.2 Summary

The purpose of this chapter was to examine alternative strategies for solid waste management at the community level. Based on Agenda 21 and on the model of an Integrated Sustainable Waste Management system, it was noted that, in order to establish sustainable solid waste systems, the creation of partnerships between public, private and civic sectors is vital. Given the fact that urban services, such as solid waste collection, is a public good, this chapter emphasised that collective actions are significant, in order to guarantee access to urban services for the whole population. By means of examples of successful community-based projects from different countries, it was demonstrated that communities play an important role in providing and improving solid waste services, such as solid waste collection and recycling in urban areas, in particular, in lower-income settlements. By using cheap local technologies, the provision of urban services by communities, can decrease environmental and health risks, can enhance income and employment opportunities and can also have a positive effect on awareness and attitudes towards environmental issues. In Rufisque, Senegal, for instance, the success of the project led to the acknowledgement, by the government, of the community's potential to provide urban services.

In addition to positive outcomes, this chapter also revealed some potential limitations of collective actions in solid waste services. It was noted that often the absence of financial and human resources can be constraining for the establishment of long-term projects. Furthermore, in many cases, project members have to struggle against resistance and passivity by other citizens. The chapter emphasised that contemporary urban communities are increasingly diverse, in terms of social structures. It was argued that high social diversity might be a cause of decreased community cohesiveness and thus for reduced collective actions. A project in Quito, Ecuador, demonstrated that a lack of information flow between the different partners in a project generates mistrust, which in

turn creates resistance and hampers the successful implementation of collective actions. With a view to the need for secondary solid waste collection, as well as financial and educational resources, this chapter highlighted the fact that a lack of recognition and support by municipal authorities can put pressure on community-based projects.

Some significant factors were discussed, that need to be in place, in order to achieve sustainable community-based projects. Basically, these factors are commitment and motivation by the population and community and a cohesiveness, which can be created through active communication and the establishment of trust. Furthermore, education and awareness building and the transfer of ownership for development activities, to the population, were also identified as important means to decrease resistance and to enhance motivation. It was suggested that the use of local technology and an integrated approach to urban issues can trigger the development of long-term sustainable urban processes. The final aspect in this chapter led back to the overall goal, which is to achieve equal partnerships between communities and public and private organisations in order to establish effective urban services. This must notably embrace the involvement of low-income, peri-urban and informal settlements and the recognition of informal waste systems. The following chapter will examine urban development issues in the context of Pacific Island countries (PICs).

Chapter IV: Urban Development in Pacific Islands

4.1 Pacific Islands

Chapters II and III outlined the existing constraints of solid waste management systems worldwide and discussed alternative ways for community-based solid waste services. The aim of this chapter is to provide background knowledge about the Pacific Island countries (PICs) and specifically the Fiji Islands, in consideration of the three selected case studies in Suva. The first part of this chapter focuses on the Pacific Islands, including basic facts, urban development issues and solid waste management. The second part embraces the same structure as in the first part: however, in this case, the attention lies on the research area of the Fiji Islands.

Growing urban populations in the PICs challenge, hitherto, development policies and perceptions. The lack of financial and human resources, together with ineffective institutions and legislation are placing significant pressure on the political, social, economic and cultural systems. This can be recognised in the rising numbers of informal settlements, the existence of old and insufficient infrastructures, the growing poverty rates and increasing environmental and health problems. The lack of adequate basic services, such as solid waste management, is a significant problem for the development of urban areas in the PICs. In the Fiji Islands, ineffective and inflexible solid waste management structures have led to mounting uncollected waste in urban centres, significantly, in peri-urban and squatter settlements. During a special pilot waste management project, conducted by the Fijian Department of Environment in one of Suva's squatter settlements, 25 truckloads of rubbish were removed from "the creek bed including debris such as tyres, tins, plastic bags and refrigerators" (Nair, 2005, p. 52). The new National Solid Waste Management Strategy (NSWMS), endorsed in October 2006, gives hope that current problems will be tackled in the near future. However, this can only be realised with the establishment of active partnerships between public, private and civic sectors, particularly in 'hot spots' such as low-income settlements, which must be urgently approached by local governments, in order to reduce existing health risks in Fiji's communities.

4.1.1 General Overview

The PICs consist of hundreds of small islands and atolls, in an area three times the size of the Republic of China. Nevertheless, the total land area comprises only 543,467 square kilometres which is 1.8% of the approximate 30 million square kilometres maritime area (Exclusive Economic Zone, EEZ)[16] (ADB, 2004a, p. 9). Many of the Pacific Islands and atolls are uninhabited. About 2.1 million people live in this region. Half of this population are under the age of 24 years. Rapid population growth, due to high fertility rates, particularly in the Solomon Islands and Vanuatu, put stress on the PICs (World Bank, 2005, p. 8).

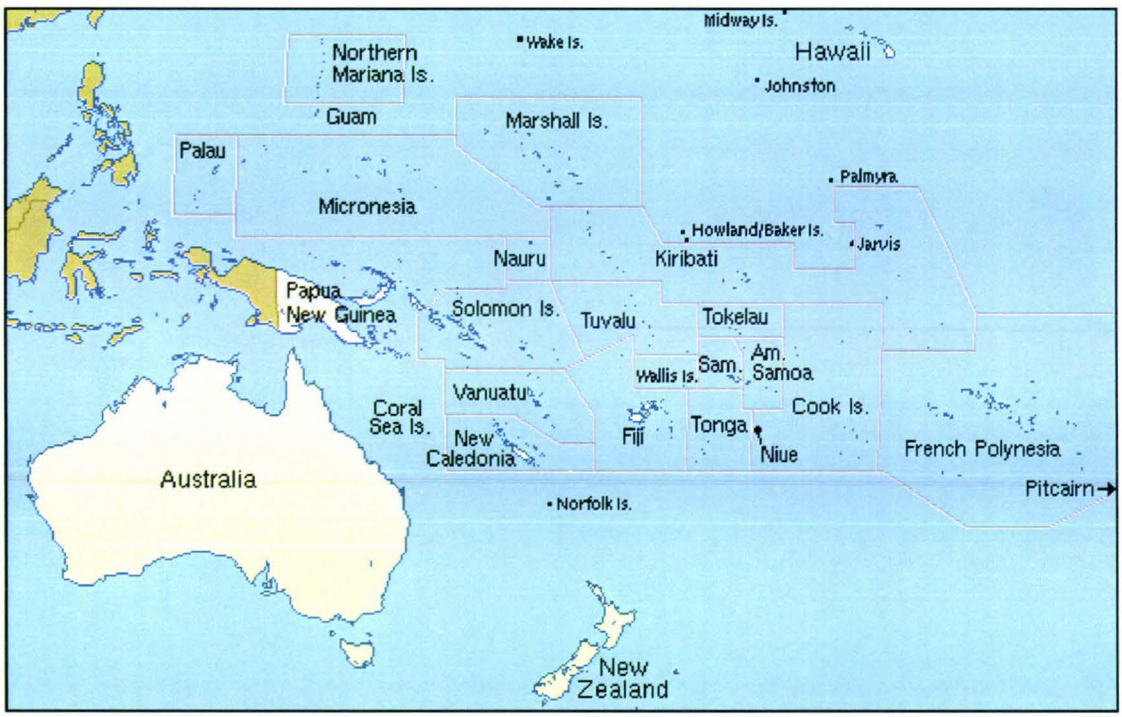


Figure IV- 1: Map of the Pacific Island countries
Source: UNESCAP (n.d.-b).

The colonial influence of countries such as Australia, Britain, France, Germany, New Zealand and the United States can still be recognised and it exists side by side with traditional systems in these PICs. Christianity, is one example, introduced by Western missionaries and it still affects significantly the islanders today (Lockwood, 2004, p. 11). Colonial policies and the pull into globalising processes have aroused violent conflicts, generally as a result of ethnic tensions, such as those in Papua New Guinea (PNG), the Solomon Islands and Fiji (2004, p. 29). Up to the present time, these tensions have had

[16] Exclusive Economic Zone is a seazone over which a state has special rights over the exploration and use of marine resources.

an effect on these countries' social, economic and political dimensions. The ethnic and bio-geographic division of the region into: Melanesia (Fiji Islands, Solomon Islands, PNG, Vanuatu, and New Caledonia); Polynesia (Cook Islands, French Polynesia, Niue, Samoa, Tokelau, Tonga, Tuvalu, and Wallis and Futuna); and Micronesia (Kiribati, Marshall Islands, the Federated States of Micronesia (FSM), Guam, Nauru, Palau and the Commonwealth of the Northern Marinas) is common (Scheyvens, 1999, pp. 48-52).

Culture plays an important role in the PICs (Secretariat of the Pacific Community, 2005, p. 1). Social networks, through extended families and a strong cohesion in many communities, have been an advantage in situations of despair or misfortune (World Bank, 2005, p. 3). Becker (1995, p. 23) emphasises that "social security and personal well-being fundamentally lie in kinship ties". Indigenous culture has not only shaped the private life of people in this region but it also has influenced decision making processes at the political and economic level (World Bank, 2005, p. 3). However, as Lockwood (2004, p. 31) and Lindstrom (1999, p. 205) state, Pacific culture and social relations have become more and more affected by global processes and exchanges with other cultures. The introduction of Western goods, for instance, has changed consumption patterns and also social values.

Land is an important asset in the PICs. Around 80% of the land is under customary tenure, which means that families or other social groups 'own' the land: in PNG, for example, 95-97% of the land is customary land. The availability of freehold land or government owned land (also called Crown land) in the PICs is constrained (Connell & Lea, 2002, p. 126; Naiker, 1999, pp. 24-26). Land tenure is a contentious subject in the Pacific Islands. On the one hand, it can be argued that communally owned land involves subsistence opportunities for Pacific Islanders and secures livelihoods. However, destructive land use practices, for example, in agriculture or logging, and the lack of investment in communal land are legitimate concerns and these concerns need to be urgently addressed (Purdie, 1999, pp. 75-77; World Bank, 2005, p. 3).

Growing populations and economic dependency on natural resources has put pressure on fragile and vulnerable environments in the PICs (ADB, 2004a, p. 14; Overton & Thaman, 1999, pp. 31-32). Overton and Thaman characterise the Pacific Islands' vulnerability as:

> Isolation and inaccessibility, small size and land scarcity, ruggedness or swampiness of terrain, drought, excessive rainfall and flooding, tropical cyclones and strong winds, mineral scarcity, water scarcity or absence of surface water resources, earthquakes and vulcanism, poor or deteriorating soils, and poor or endangered biota (Overton & Thaman, 1999, pp. 31-32).

Mining, commercial agriculture and fishing and also forestry are important economic sectors in this region. In addition, many Pacific Islanders still base their livelihoods on fishing and subsistence agriculture (ADB, 2004a, p. 9; Wartho & Overton, 1999, pp. 38-39; World Bank, 2005, p. 3). Exploitation by their own population and also by foreign companies stresses fragile ecosystems (World Bank, 2005, p. 3). Macintyre and Foale (2004, p. 159) highlight that "the urgency that people feel for immediate cash frequently overrides all arguments about sustainability and long-term profitability". PNG is an example of massive destruction of the environment through commercial mining, for the sake of economic development (Lockwood, 2004, pp. 21-22; Macintyre & Foale, 2004, pp. 155-158). In terms of environmental protection, Macintyre and Foale (2004, p. 159) point to the problem that, for example in Melanesian countries, the reaction to environmental damage is rather "phlegmatic" and slow. Thaman and Overton (1999, p. 32) conclude that, in order to ensure sustainable livelihoods in the PICs, it is necessary that global and local policies encourage a shift in human activities to a sustainable dealing with natural resources.

Long distances to foreign markets, relatively small country sizes and the high fragility of environmental resources, limit economic expansion (Bertram, 1999, p. 339; World Bank, 2005, p. 6). Based on only a few export products, such as garments, sugar, copra, fish, timber, etc., and services such as tourism, Pacific economies are in a vulnerable and weak trading position (World Bank, 2005, pp. 6-7). Therefore, international donors, such as the United States, Japan, Australia and the European Union (EU) have given financial and technical support to the economic development of the PICs (Lockwood, 2004, p. 20; Wartho & Overton, 1999, p. 41; World Bank, 2005, p. 4). Comparing the data on gross domestic product (GDP) of the last few years from different Asian sub-regions and the Pacific, Figure IV-2 shows that Pacific Island economies are placed at the very end, in terms of GDP growth. Nevertheless, a positive growth trend can be recognised since 2003, with an expected positive GDP growth of 3.4% in 2007 (See Figure IV-2).

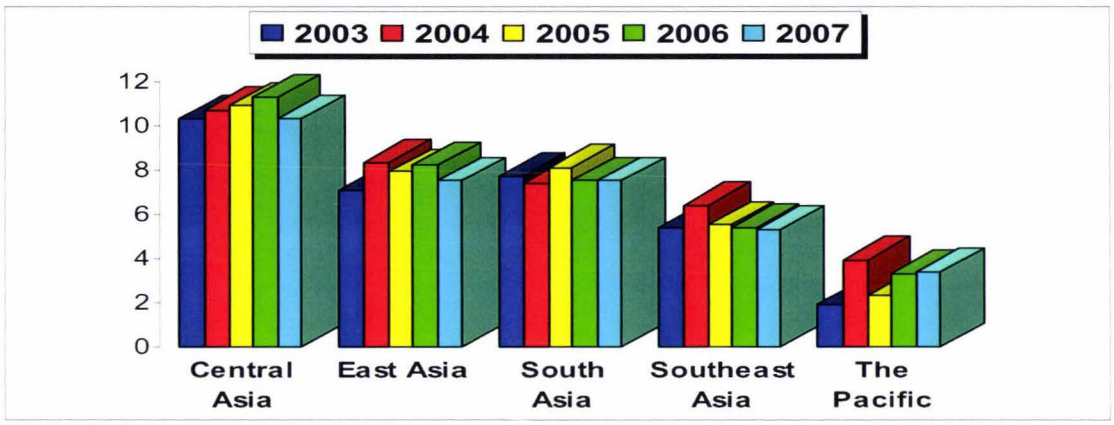


Figure IV-2: GDP growth (% per year), sub-regions of Asia and the Pacific
Source: Adapted from ADB (2006, p. 127). See Appendix 1, Table A.

According to the Asian Development Outlook Update (ADB, 2006, p. 37), growing global oil prices in 2006 had a positive influence on the two oil-exporting economies of PNG and Timor-Leste. However, this caused negative effects on inflation and balance-of-payment figures in other PICs, which depend heavily on oil imports (ADB, 2006, p. 37). Figure IV-3 indicates that, since 2004 all PICs, supported by the ADB, achieved positive growth rates. For 2007, ADB forecasts a GDP growth rate of 4% and more for Palau, PNG, Samoa, Solomon Islands, and Timor-Leste, whereas Kiribati, FSM, Tonga and Tuvalu will most likely only attain 1% or less (See Figure IV-3).

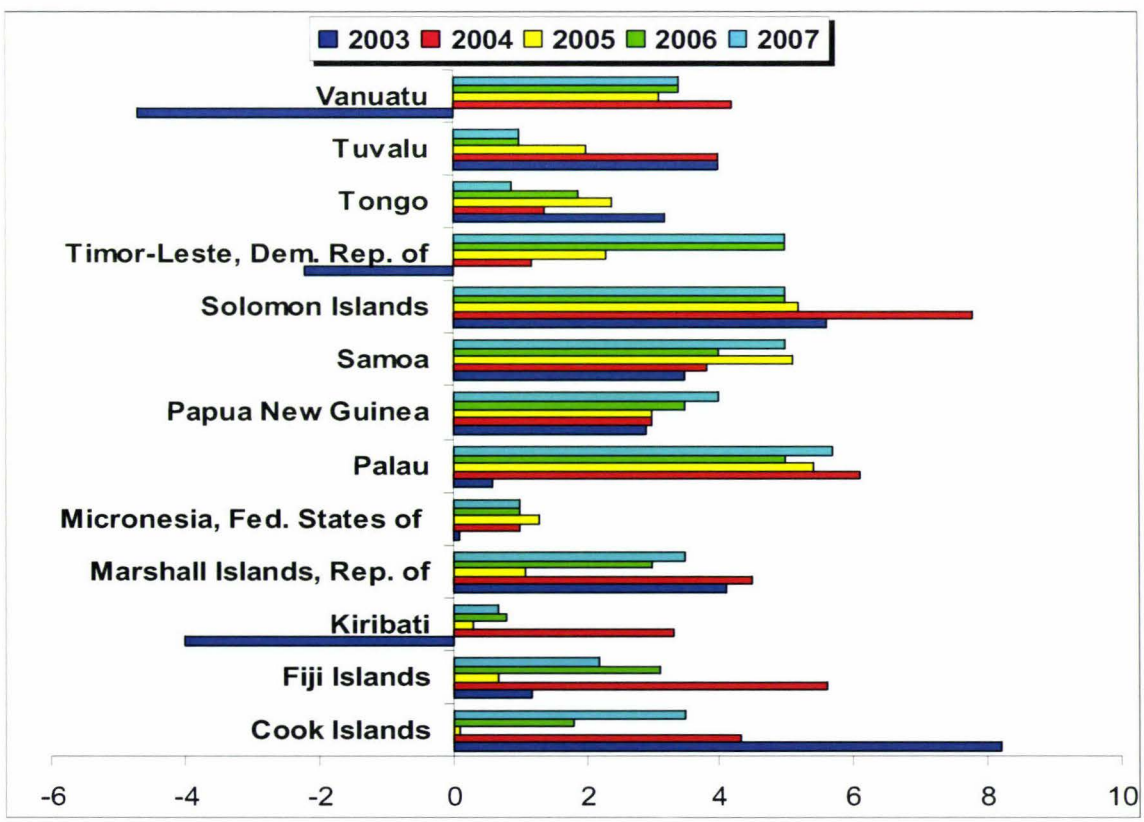


Figure IV-3: GDP growth (% per year), Pacific Island countries
Source: Adapted from ADB (2006, p. 127). See Appendix 1, Table B.

Increasing demands for imported food and consumer goods have created trade deficits, which have become a common characteristic for Pacific Islands' economies (Lockwood, 2004, p. 21; World Bank, 2005, pp. 6-7). As an example, Micronesia and the Fiji Islands showed an account balance of -15.7 and -12.7% in 2005 (ADB, 2006, p. 129). Remittances from relations living overseas are important financial sources for PICs (Bertram, 1999, pp. 347-348; World Bank, 2005, p. 6). Another important contributor to the national GDP is the tourism sector. In several PICs, such as the Fiji Islands, Vanuatu, Tonga and Samoa, tourism represents an important pillar for the economy (Wartho & Overton, 1999, p. 39; World Bank, 2005, p. 6). However, the expansion of the tourism sector also includes negative consequences, when looking at destructive processes, relating to environmental and social dimensions in these countries (Fagence, 1999, pp. 394-395; Wartho & Overton, 1999, p. 39).

Public spending takes a significant proportion of GDP in the PICs (World Bank, 2005, pp. 4-5). Lack of accountability and reliable budget management, which in some countries have been re-enforced by political instability, has in the past led to negative budget balances and high public sector debts (World Bank, 2005, p. 5) (see Table IV-I). For example in 2003, as indicated in Table IV-1, one of the highest public sector debts, as a percentage of GDP, was created by the Solomon Islands with 91.5%. The Marshall Islands followed closely behind with 86.5% of their GDP.

Table IV-1: Public sector indicators for some Pacific Island countries

	Fiji	Kiribati	Marshall Islands	FSM	Palau	Samoa	Solomon Islands	Tonga	Vanuatu
Government expenditure as a % of GDP, 2004	34.5*	150.0**	78.2	58.8	68.7	32.3	44.1	26.1	20.1
Average budget balance as a % of GDP, 1999-2003	-7.7	-3.1	8.6	-2.7	-17.0	-1.1	-6.6	-1.4	-4.0
Public sector debt as a % of GDP, 2003	57.2	26.9	86.5	25.2	19.4	54.0	91.5	47.8	37.2

Note: *Data for 2003, **Data for 2002
Source: World Bank (2005, p. 5).

Despite high spending on education and health (See Figure IV-4), governments have difficulty providing effectively these social services in the PICs (World Bank, 2005, p. 5). Low economic growth is one of the reasons that a wide gap has been created between demand and existing financial means, for public services delivery (Duncan, 2005, p. 68). However, the absence of good public governance is another significant point, which is also generating a great deal of inefficiency.

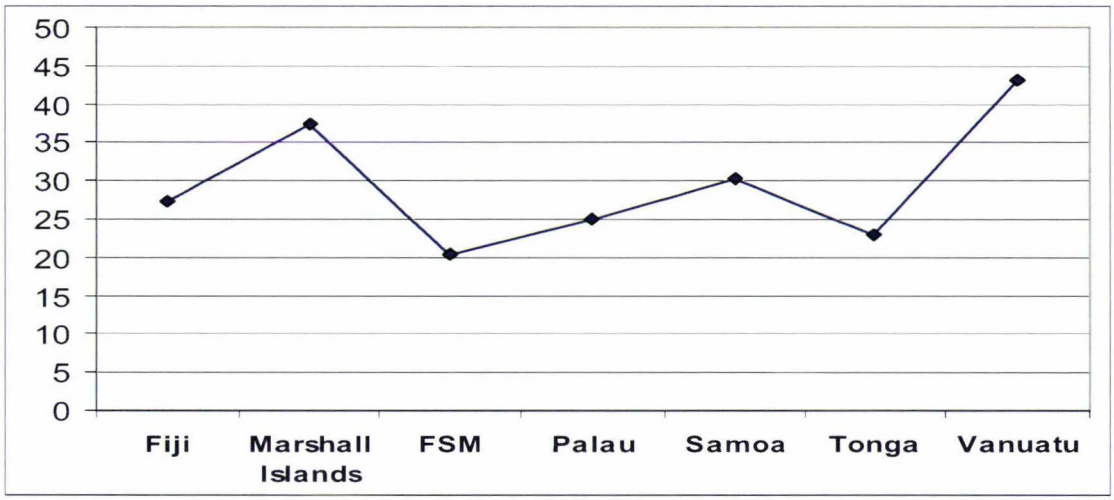


Figure IV-4: Public expenditure on education and health as a % of total public expenditure (2001)
Source: Adapted from World Bank (2005, p. 6). See Appendix 1, Table C.

Poverty (or "hardship" as it is referred to in the Pacific) has increased in the last few years in the PICs (ADB, 2004b, pp. 7-8; World Bank, 2005, p. 8). Rising unemployment and crime rates and the more frequent use of drugs are indicators of growing problems in the Pacific Islands (ADB, 2006, p. 37). The drift of high numbers of people into towns and cities is another phenomenon of this time, which has triggered changes for the rural and urban populations (World Bank, 2005, p. 8). In the next section, the implications caused by growing urban areas in the PICs will be discussed.

4.1.2 Urban Issues

In the PICs, a high population growth and an increasing rural-urban migration has put in motion urbanisation trends, which appear to be irreversible (Connell & Lea, 2002, p. 10; ESCAP, 2004, p. 4; Storey, 2006, p. 5). In Figure IV-5, it can be noted that, particularly in Melanesian countries such, as the Fiji Islands, the Solomon Islands and Vanuatu together with other PICs, the urban areas' growth rates are higher than the national growth rates.

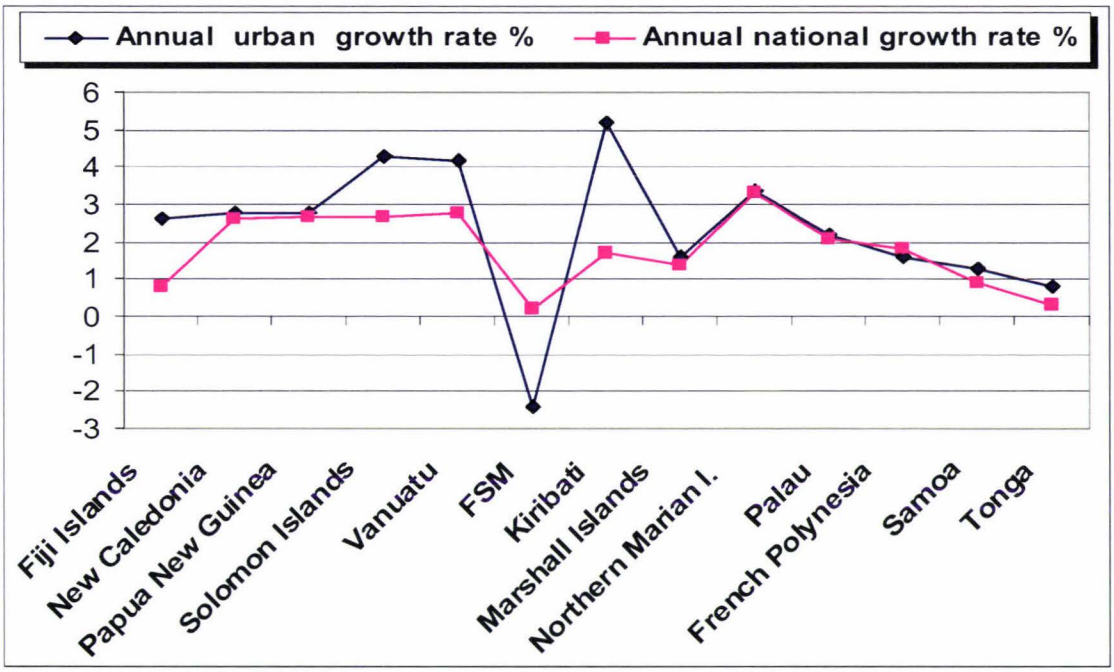


Figure IV-5: Pacific urban and national growth rates
Source: Adapted from Storey (2006, p. 5). See Appendix 1, Table D.

As Storey (2006, p. 5) indicates, with an urban population of around 40% in the PICs, urban issues will become even more significant, in terms of the implications on national development. An important reason for this rural-urban transformation in the Pacific Islands is the chance of better opportunities in the cities. Urban areas offer employment and education, in addition to a better infrastructure. However, not only 'pull', but also 'push' factors trigger the high rate of rural-urban migration. In the Fiji Islands, for instance, the expiry of land leases has forced many people to leave their homes and to search for another place to live in towns and cities. (Gounder, 2005, pp. 3-5; Storey, 2006, p. 8).

Pacific cities act as important key players in the development of their national economy (Storey, 2006, p. 1). As an example, Storey (2006, p. 10) draws attention to the Fiji Islands, which generate around 60% of its GDP in cities and towns, generally in the formal sectors, such as administrative and commercial employment. Furthermore, a significant link between the growth of urban centres and the development of rural areas has been identified, particularly regarding agricultural processes (2006, p. 10). Nevertheless, the expansion of urban areas also involves side-effects, which are reflected in high inequalities, and social and environmental destruction (Connell & Lea, 2002, pp. 11-15, 58-68; Doumenge, 1999, p. 324; Storey, 2006, p. 1).

Urban governance is one of the most pressing issues in the PICs (Storey, 2006, p. 20). A lack of financial and human resources and inefficient political and legal structures have led to weak urban planning and low accountability (Duncan, 2005, p. 84; Storey, 2006, p. 20). The deficit in data on urban poverty and other urban issues has hampered long-term planning in the urban areas of the Pacific Islands (Storey, 2006, pp. 2, 6). Furthermore, as Storey (2006, p. 2) suggests, hitherto the focus on institutions and top-down approaches has widened the gap between civil society and government and this has produced states, which are unable to manage the emerging difficulties of growing cities and towns (2006, pp. 2-3). Lack of coordination and cooperation amongst urban authorities, together with that between urban authorities and other stakeholders, such as communities, NGOs and international donors, has generated unsustainable policies (Storey, 2006, p. 21). In order to overcome urban problems, Storey (2006, p. 21) and Duncan (2005, p. 84) call for strong and effective partnerships between local government and the civic and private sectors, with a special focus on critical communities, such as peri-urban and low-income settlements. For example, the Commonwealth Local Government Forum (CLGF), based in Suva, aims to promote effective relationships between the different urban actors in the PICs (Commonwealth Secretariat, 2005; Storey, 2006, p. 21).

Increasing numbers of people living in informal settlements on the periphery of a city are the consequence of rapid urbanisation and low urban governance in the PICs (Connell & Lea, 2002, p. 59; Duncan, 2005, p. 67; Storey, 2006, p. 1). The majority of the squatter inhabitants have "no legal residential rights, no government representation, and very limited essential services" (Duncan, 2005, p. 67). One difficulty for peri-urban settlements is the fact that in many cases they are not recognised under municipal law. Duncan (2005, p. 78) mentions, that these settlements still embrace traditional leadership and social structures, based on rural origins. The expansion of peri-urban areas as "borderless places" with a high potential for dispute can be seen as a critical factor for present and future urban development in the PICs (Duncan, 2005, p. 79). Storey (2006, pp. 5-6) reports that the majority of all new houses in the Pacific Islands are informally or illegal built. One of the reasons for this situation is the incapacity of governments to provide affordable housing and basic infrastructure for low-income population (Connell & Lea, 2002, p. 152). Environmental pollution, through discharge of untreated sewage and other wastes by squatters but also by industries into highly

vulnerable ecosystems, such as mangrove swamps and coastal areas, has caused serious damages to natural resources and also to the health of the local population (Connell & Lea, 2002, p. 192; Doumenge, 1999, p. 324). Poor solid waste management, particularly in marginal settlements, is a serious problem in the PICs and this will be examined in the following section.

4.1.3 Solid Waste Management

Safe disposal of solid waste is a serious concern in the PICs (ADB, 2004a, p. 27; SPREP, 2006, p. 5). At the international level, solid waste management was identified as an important topic for sustainable development at the UN General Assembly Special Session on the Sustainable Development of SIDS, held in September 1999 in New York. Furthermore, solid waste issues were discussed at the United Nation International Meeting on the Sustainable Development of SIDS, in January 2005, held in Mauritius. Solid waste management was recognised as a key issue within the Pacific region and in collaboration with different organisations, such as Japan International Cooperation Agency (JICA), New Zealand's Aid and Development Agency (NZAID) and the South Pacific Regional Environment Programme (SPREP), a regional solid waste management strategy was formulated (SPREP, 2006, p. 5).

Urban growth in the PICs has led to increasing waste pollution. Table IV-2 shows that, except for Tuvalu, waste generation has risen in the last couple of years in all the PICs. The Fiji Islands and Samoa present relatively high waste generation levels in urban areas, when comparing their figures to the average waste generation of 0.66 kg/person/day for eight urban centres (SPREP, 2006, p. 12).

Table IV-2: Generation of waste in selected Pacific Island countries

Country	Waste Generation Past Kg/person/day (year)	2000 (kg/person/day)
Fiji Islands	Not available	0.94
Kiribati	Not available	0.33
Solomon Islands	0.38 (1991)	0.62
Tuvalu	0.60 (1996)	0.43
Vanuatu	0.60 (1996)	0.65
PNG	0.30 (1985)	0.41
Tonga	0.70 (1994)	0.82
Samoa	0.52 (1993)	0.86

Source: SPREP (2000, as cited in ADB, 2004a, p. 29).

Waste collection and disposal systems in the PICs cannot cope with increasing solid wastes in urban areas (Connell & Lea, 2002, p. 182; SPREP, 2006, p. 14). Although solid waste collection service in urban centres is more frequent than in rural areas, growing populations, particularly in peri-urban settlements, outstrip the capacities of municipalities (SPREP, 2006, p. 14). A lack of appropriate equipment for collection, a lack of safe facilities for disposal, an absence of skilled staff and limited supervision of waste management processes are reasons for the inadequate provision of solid waste services (2006, p. 14). Furthermore, a lack of strong legislative and institutional structures, limited data on solid waste management and low public awareness and knowledge about the effects of unsound solid waste handling, explicitly regarding hazardous wastes, constrain the establishment of a sustainable solid waste management system (Thaman, Morrison, Morrell, & Thaman, 2003, pp. 6-7).

Thaman et al. (2003, p. 3) note, that in the PICs waste is considered "as something that is bothersome or no longer useful and that should be discarded." A waste awareness survey, conducted by SPREP and EU, revealed that littering and illegal dumping are two of the most serious problems (A-N-D Consultants & Sinclair Knight Merz Pty Ltd, 2000, pp. 5-6). In Tarawa, Kiribati, 30% of respondents believed that solid waste can be thrown into the sea (2000, p. 18). In addition, disposal sites, such as landfills and incinerators, do not follow international standards and are often situated in sensitive places, such as mangrove swamp and lagoons (Connell & Lea, 2002, p. 182; UN Commission on Sustainable Development, 1998, para. 17). Plate IV-1 and IV-2 illustrate examples of disposal sites in the PICs. Both plates show that waste is disposed in an uncontrolled way, without considering the effects on natural resources, such as water and soil. Rising environmental and health problems, caused by unsafe solid waste handling, have increased substantially. PICs lack the facilities and knowledge to address the problem of hazardous wastes such as pesticides, Poly-Chlorinated Biphenyls (PBCs), waste oil and heavy metals (UN Commission on Sustainable Development, 1998, para. 14). Pollution of scarce water resources and sensitive coastal areas has negative consequences, not only for the local population but also for the tourism sector (ADB, 2004a, p. 27).

Plate IV-1: Disposal dump in Kiribati
Source: (Latu, n.d.)

Plate IV-2: Port Vila dump in Vanuatu
Source: (Latu, n.d.)

The increase of imported food and changing lifestyles have led to growing amounts of packaging materials, such as plastics, paper and metal (mostly cans) (ADB, 2004a, p. 29). Lack of transfer stations and local recycling facilities, limited available funds and lack of economic incentives in the PICs complicate the establishment of waste recycling systems (ADB, 2004a, p. 31; SPREP, 2006, pp. 13, 15). Waste reduction and recycling efforts, for example, in Kiribati and Tonga have been limited, due to low public awareness and economies of scale (UN Commission on Sustainable Development, 1998, para. 16). However, for example in the Fiji Islands, Coca-Cola encourages the successful collection of Poly-Ethylene Therepthalate (PET) bottles, which are then sent to Australia.

4.2 Fiji Islands

Previous sections have discussed the key issues in urban development in the PICs. This section focuses on a country from the Melanesian sub-region – the Fiji Islands. The aim is to provide background knowledge on the central themes in urban development, with specific attention to solid waste management. This section also offers the framework for the fieldwork conducted in Suva, the capital of Fiji Islands. It will commence with a short outline of general facts relating to the Fiji Islands.

4.2.1 General Overview

The Republic of the Fiji Islands embraces a land area of 18,330 sq km and the EEZ of 1.26 million sq km. The whole area is covered with 330 islands and coral atolls, of which only 105 are inhabited. A large part of the Fiji is covered by natural forests, different coastal and marine ecosystems, together with mangrove swamps and coral

reefs. Depending on these resources, Fiji has built up its society, which is vulnerable to internal and external shocks. The total population of Fiji is 824,526 (in 2002), composed of 51% indigenous Fijians and 44% Indo-Fijians. A small part of the population consists of Europeans, Chinese and Rotumans. The influence of these different cultures has developed Fiji into a multi-cultural state. Significantly, the two main communities, the indigenous Fijians and the Indo-Fijians have shaped the country's society (European Commission, 2006, para. 1).

Figure IV-6: Map of Fiji Islands
Source: MapQuest (2006).

Viti Levu and Vanua Levu are the two biggest islands in the Fiji Islands. On the east side of Viti Levu, is situated Suva, the capital of Fiji (See Figure IV-6). Approximately 90% of the population live along the coast, whereas 40% reside in urban areas (Institute of Marine Resources (USP), 2004, p. 6). A large part of the land in Fiji (80%) is customary land. Urban areas constitute 58.7% freehold and crown land and 41.3% informal, traditional and extra legal land (Storey, 2006, p. 19).

Fiji Islands was a colony of the United Kingdom (1874-1970) and became independent on the 10th of October, 1970. At the present time, the country is led by the president who is the head of the state and he must be an indigenous Fijian. He is elected by the Great Council of Chiefs, which is a traditional chiefs system. Political conflict and tension between the two main parties – the Fiji Labour Party (FLP) and the United Fiji

Party (usually known as Soqosoqo Duavata ni Lewenivnua, SDL) (Commonwealth Local Government Forum, 2006, p. 79) – have caused negative effects on the economic and social development of Fiji (European Commission, 2006). After the experience of three coups, triggered by the refusal of the Fijian party to handover power to the elected Indo-Fijian Prime Minister, a multi-party cabinet was implemented in 2006 with the victory of the SDL Party (Fiji Government Online Portal, 2006c). However, in December 2006 the military commander Commodore Voreqe Bainimarama initiated the fourth coup and forced the current government to hand over the power to the military (Fiji Government Online Portal, 2006a; Pareti, 2007 January). In January 2007, an interim government has been created in order to administer the country (Fiji Government Online Portal, 2007).

Fiji's economy is positioned as a middle income developing country (European Commission, 2006). Tourism is one of its main sectors. In 1999, tourism added approximately 16% of GDP and 22% of foreign exchange to the growth of the country. According to the Fiji Bureau of Statistics, 532,000 tourists visited Fiji in 2005 (UNESCAP, 2006, p. 70). Other important sectors are agriculture, forestry, fishing, mining and manufacturing. Sugar has been one of the most important industries in Fiji but as a result of the loss of subsidies from the EU and internal problems, such as land issues, the sugar industry is at a stage which is causing concern (World Bank, 2005, p. 36). Furthermore, Fiji's economy lost the benefit of the United States garment market quota in 2005, which led to a loss of 6,000 jobs. These external influences, in addition to internal political instability, has discouraged private investment and has led to an unstable trend of GDP growth rates in the last couple of years (Government of Fiji, 2006, p. 30) (See Figure V-7). The Asian Development Outlook forecasted a slowdown of GDP growth from 3.1% (2006) to 2.2% (2007) (ADB, 2006, pp. 39-40) (See Figure V-7).

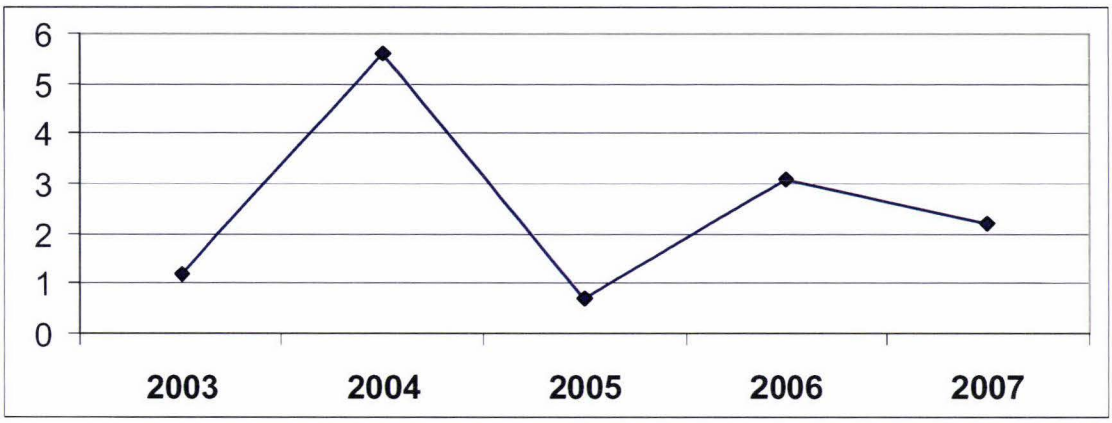


Figure IV-7: GDP growth (% per year), Fiji Islands
Source: ADB (2006, p. 127). See Appendix 1, Table B.

Slow economic growth, political crisis and fragile ecosystems set limitations on the development of a country. Fiji's Human Poverty Index (HPI) ranking dropped from 37th, in 2001, to 45th, in 2006 (UNDP, 2006, p. 284). National poverty has increased significantly from 25.2%, in 1991, to 34.4% in 2002/2003 (Ministry of Finance and National Planning, 2006, p. 6). However, Narain (n.d, cited in Gounder, 2006, p. 26) indicates that, after the coup in May 2000, approximately 40% of Fiji's households live in poverty. One of the reasons for the rise in poverty is the fact that "minimum wages are totally inadequate to maintain a reasonable living standard in Fiji" (Barr, 2003b, p. 199). Other reasons, mentioned by Gounder (2006, p. 8), are: the lack of employment; the absence of safety nets; low economic output; poor governance; and political instability. Poverty, or "hardship" as it is called in Fiji, is experienced as a "lack of or limited access to basic services such as education, health, good roads, and safe water supply" (ADB, 2003, p. 3). Urban-rural migration in Fiji has brought many opportunities to the population but, on the other hand, it has also produced side-effects, which will be discussed in the following section.

4.2.2 Urban Issues

Almost half of Fiji's population, which is close to 400,000 people, reside in urban areas (last census 1996) (See Table IV-3). The level of increase in urbanisation in the past 30 years is 12.6%, whereas a rapid change of 7.3% occurred from 1986 until the last census. After a slowdown of urban growth in the period of 1976 until 1986, from 3.2 to 2.4% per annum, Fiji's urban population grew by 2.6% per annum from 1986 until 1996. In comparison, during the same period, the whole population increased only by 0.8 % per

annum (See Table IV-3). The Government of Fiji (2006, p. 15) estimated that in the next five years nearly 70% of the population will live in urban centres.

Table IV-3: Urbanisation and urban growth in Fiji 1966 – 1996

Year	Number of people	Annual national growth rate	Annual urban growth rate	Level of urbanisation
1966	476,727	3.2	na*	33.4
1976	588,068	2.1	3.2	37.2
1986	715,375	2.0	2.4	38.7
1996	775,077	0.8	2.6	46.0

* Note: Because of extensive boundary changes in 1996, it would be extremely misleading to compare the 1956 and 1966 urban populations.
Source: Chandra (1996, p. 25) for 1966 - 1986, and for 1986 – 1996 see http://www.spc.int/demog/en/stats/2004/Pacific%20Island%20Populations%202004.xls.

Suva is the capital and also the largest city in Fiji, with an area of 2600 hectares. Through annexations of other wards, such as Muninikau, Samabula, Tamavua and Cunningham, the city has grown far beyond its original borders in the past (See Figure IV-8). With 6,500 hectares and a population of around 210,000 people, Greater Suva includes three municipalities – Suva City, Lami Town and Nausori Town – and two Rural Local Authorities – Suva and Nausori (Wilkinson, 2002, p. 11). Lautoka is another city, situated in the West of Viti Levu. Other important towns are Lautoka, Nadi, Labasa and Nausori. Fiji's urban centres contribute 60% to the economic output (Government of Fiji, 2006, p. 16). Since most land in Suva City is used for development, significant peri-urban growth is likely to occur in the future (Wilkinson, 2002, p. 11). A rapidly growing urban population has led to massive pressure on urban infrastructure in Fiji (Gounder, 2005, pp. 10-11; Wilkinson, 2002, p. 11)

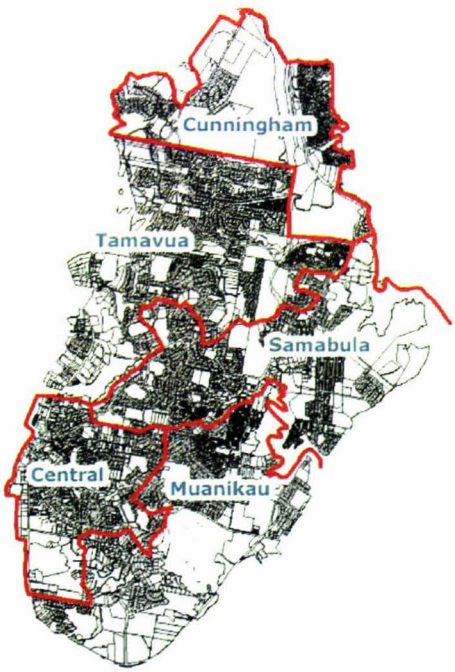


Figure IV-8: Wards of Suva

Gounder (2006, p. 7) stresses, that "poverty, which was basically a rural problem in Fiji, has become an urban problem as well since the overwhelming majority of the poor are migrating to urban areas." Since 1977, urban poverty has increased from 12% of

households, living under the poverty line, to 31.8% in 2002/03 (See Table IV-4). With a rise of 165%, between 1977 and 2002/03, urban poverty grew faster than national poverty, which only rose by 129.3% (See Table IV-4).

Table IV-4: Households in basic needs poverty, 1977 – 2002/03

	Percentage of households under the poverty line (1977)	Percentage of households under the poverty line (1990/91)	Percentage of households under the poverty line (2002/03)	Increase in poverty 1977 to 2002/03
National	15	24	34.4	129.3
Urban	12	30	31.8	165.0

Source: United Nations Development Programme and Government of Fiji (1997, p. 41), Ministry of Finance and Planning (2006).

"Urban poverty is highest in the settlements, squatter and urban village" (Gounder, 2006, p. 11). Recent surveys, from UNESCAP/POC, the Ecumenical Centre for Research, Education and Advocacy (ECREA) and academics in Fiji, have estimated that 80% of Suva's squatter settlements inhabitants fall below the 'poverty line' (Storey, 2006, p. 11). The rising number of squatter settlements, in and around the city, is the response to currently unsolved land lease issues and decreasing income opportunities (Gounder, 2005, pp. 7-9). According to a study by the Squatter Resettlement Unit in Fiji in 2003 and by UNESCAP/POC, 182 squatter settlements, with a population of 82,350, presently exist in Fiji. It was suggested that, in Greater Suva, 16.4% of the population live in informal settlements. Between 1996 and 2003, the squatter population in Suva grew by 73% (Storey, 2006, pp. 15-16). Vija Chand from the Ministry of Information (2005, p. 1) highlights that, "squatters in the recent years have mushroomed in many parts of Suva putting immense pressure on the government to supply infrastructure such as electricity, water, and sewerage and garbage collection." Vija Chand (2005, p. 1) states, that according to a survey by the government, 90,000 squatters were estimated to reside in Suva in 2006.

A study conducted by Wilkinson (2002, p. 11) shows that Suva has difficulties with the supply of adequate urban infrastructures, such as housing, water and sewerage and electricity; specifically, the squatter settlements suffer from an absence of basic services. A survey, undertaken by Wilkinson (2002, p. 16) in eight squatter communities in Nasinu, Suva, showed that "poor infrastructure was the single most common aspect of living in a squatter settlement that people were dissatisfied with." Environmental

degradation and unbearable living conditions are the result of a lack of basic infrastructures and services. Wilkinson (2002, p. 20) reflects that "poor drainage, household waste and periodic flooding must contribute to health risks in most of the squatters." In the following section, concerns regarding solid waste management in Fiji will be explored, thus offering the context for the selected case studies.

4.2.3 Solid Waste Management

Solid waste management is one of the main problems in Fiji, "with the potential to cause negative impacts on our national development activities including public health, the environment, food, security, tourism and trade" (Government of Fiji, 2006, p. 6). At the time of this study, Fiji had no sustainable waste management model in place (2006, p. 6). Population growth and increasing consumption of imported food has led to growing waste mountains (2006, p. 8). To date, waste has generally been dumped in the environment, or it has been burned (2006, p. 8). There are no policies for the disposal of materials, such as white and electrical goods, chemicals or any hazardous waste, except for a few chemicals such as asbestos (2006, p. 9). A National Solid Waste Management Strategy (NSWMS) was endorsed by Fiji's Cabinet in October 2006. The NSWMS presents the first official holistic attempt to improve solid waste management in Fiji, by involving every stakeholder within society.

4.2.3.1 Solid Waste Generation and Composition

According to a study, carried out by Sinclair Knight Merz (SKM) in 1999 (Woodward, 2000), in Lautoka and Nadi the average waste generation rate per capita is 0.94 kg/person/day, which is in total 343 kg/person/year domestic and commercial waste[17]. Compared to the average rate of 0.66 kg/person/day of the eight Pacific urban centres, it can be noted that in general Fiji's waste generation is significantly high (SPREP, 2006, p. 21) (See Section 4.1.3 and Table IV-2). The conducted waste classification in Lautoka and Nadi showed that 67.8% of the waste brought to the landfill was composed of biodegradable material. Paper followed, with 14.7% and plastics were 8.1% of the landfill. Metals, such as aluminium cans and other types, and textiles and glass together added up to nearly 3% (Woodward, 2000, p. 12). These figures indicate that the main waste produced in Fiji is biodegradable waste. As pointed out in Section 2.1.4, organic

[17] Based on four days fieldwork at the landfill only, illegal dumping and burning is not included (Woodward, 2000, pp. 10-12).

material in uncontrolled dumps and landfills can produce lasting negative effects on air, water and soil. Composting activities could reduce the amount of untreated biodegradable waste and this can enhance the lifetime of landfills.

Increasing usage of plastic bags is also of concern in Fiji (Government of Fiji, 2006, p. 12). Due to the low costs of plastic bags, the population has no incentive to search for other alternatives. The littering of plastic bags and PET bottles in public places has become a real eyesore and it is a hazard for nature and animals (Government of Fiji, 2006, p. 72). The government plans to introduce a levy on all plastic bags, in order to decrease its consumption. Furthermore, a "permit system", for the importation of plastic bottles by industries, is another idea to encourage companies to implement recycling strategies (Fiji Government Online Portal, 2006b). There are difficulties in the handling of waste, such as: motor vehicles; parts of vehicles such as batteries and tyres; scrap vehicles; derelict vehicles; white goods; and electric and electronic equipment. Currently, there are only a few private options in place for the disposal of these types of materials (Government of Fiji, 2006, pp. 14, 65-68). However, these are not linked to the public waste service system and therefore, residents generally dispose of these materials within the community environment or in other public places. Expanding industries and trade, such as mining, manufacturing, agriculture and also tourism, contribute to a great extent to Fiji's waste problem. In particular, the increasing hazardous wastes threaten the ecosystem of Fiji (Government of Fiji, 2006, pp. 13-14).

4.2.3.2 Waste Collection and Disposal Systems

Solid waste collection is conducted by either local municipalities, in their respective municipal boundaries, or rural local authorities in rural areas (Government of Fiji, 2006, p. 10). Some municipalities have contracted solid waste collection and disposal to private companies. In Suva, the city council collects household waste with compactors or covered trucks, three times per week and green waste is picked up once a month. In general, the service is paid for by the users, through a yearly rate. Since the fee for solid waste collection service is incorporated into the city or town rate, it is not transparent to the rate payers (Government of Fiji, 2006, p. 15).

A rising informal population, living in cities and towns and to a great extent in the peri-urban parts of Fiji, puts pressure on the existing solid waste management system

(Government of Fiji, 2006, p. 10). An increasing demand for services, such as solid waste collection, leads to the situation that many areas do not have any solid waste collection services. In Nadi, for instance, peri-urban settlements do not benefit from garbage collection. Since these settlements belong to the rural district and they do not pay any town rates, Nadi town council does not feel a responsibility towards these communities. On the same time, the rural local authority does not have the capacity to cover the whole rural and peri-urban population (Government of Fiji, 2006, pp. 10, 73). Many settlements, particularly communities that do not have the benefit of solid waste collection, dispose of their waste through burning, burying or dumping it into creeks, rivers and other places. An UNESCAP/POC study of informal settlements in Nasinu, Suva, indicated that approximately 52% either burn or bury their waste and 21% dump it in a nearby river or throw it in another nearby place (Wilkinson, 2002, p. 20).

One of the central problems is that many residents living in squatter settlements do not pay any garbage fees, since they do not pay city or town rates. A pilot project in Nasinu Town was introduced, which demands a separate garbage fee from residents (Lingam, D.[18], interview: June 21st 2006). The introduction of a separate garbage fee could lead to the following positive outcomes: firstly, it could contribute to an expansion of solid waste collection services, since households who live on illegal land can then pay for garbage collection and by this become eligible to benefit from solid waste services; secondly, another possible positive consequence is the fact that many squatter residents, who have benefited in the past from solid waste services at no costs, could now be charged by municipalities, which in turn will positively affect the municipal budget.

Unclear responsibilities and scarce financial funding limit responsible authorities, when they try to keep up with managing the increasing solid wastes. Problems, such as inefficiencies, irregular and inadequate collection, lack of facilities, late arrival of collectors and incompetent handling, decrease the quality of the current solid waste collection service (A-N-D Consultants & Sinclair Knight Merz Pty Ltd, 2000, pp. 72-74; Government of Fiji, 2006, p. 15). On the other hand, mistreatment of garbage collectors by the public, the use of inappropriate bins and bags and straying animals are some of

[18] Director of Housing, Squatter Settlement and Landfill in Suva, Fiji

the difficulties faced by garbage collectors (A-N-D Consultants & Sinclair Knight Merz Pty Ltd, 2000, pp. 73-74; Government of Fiji, 2006, p. 77).

Without being sorted or segregated, all waste collected by public and private agencies in Fiji is brought to twelve different waste dumps around the country (Government of Fiji, 2006, p. 16). Seven of these sites contaminate mangrove swamps, situated next to the dump, with dangerous leachates. There is only one sanitary landfill in Fiji, which was opened on October 1st, 2005 in Naboro, after the closing of the 60 year old dump in Lami (Fiji Government Online Portal, 2005c, 2005e). In July 2005, a breakout of a serious fire at the Lami Dump, generated probably by emissions from biodegradable material, threatened the residents living close to the dump (Fiji Government Online Portal, 2005b). This event made aware of the urgency of the need for a new sanitary landfill. Furthermore, the Tamavua-I-Wai River and the mangrove swamps adjacent to the dump were investigated by scientists from the University of the South Pacific (USP). The scientists discovered sediments and shellfish contaminated by metals from the disposal site (Naidu & Morrison, 1994, p. 126). In addition, the smell and appearance of the dump was an unpleasant welcome for visitors coming to Suva. The replacement of the old Lami Dump had taken six years. During this time 17 land sites were investigated (Kumar, 2003, p. 1). The scarcity of land in Fiji made it difficult to find a suitable area of land for a new landfill. With financial support from the EU, the rehabilitation of the old Lami Dump is planned to be finished in June 2007 (Lingam, D., interview: June 21st 2006).

The new Naboro Landfill, that serves Suva and the towns Nasinu, Lami and Nausori, was funded by the Government of Fiji and the EU. The location is just outside Suva on a 130-acre land area (Delegation of the European Commission for the Pacific, 2005). Opened to ISO 14001 standards[19], this new landfill is operated by a New Zealand Company H.G. Leach (Fiji Government Online Portal, 2005a). Dr. Ridolfi, Head of the Delegation of the European Commission for the Pacific (Delegation of the European Commission for the Pacific, 2005) emphasised, that the success of the Naboro Landfill project depends on the consumers' willingness to pay. Dr Ridolfi points out, that fees must cover not only operational costs but also future expansion costs, in order to

[19] ISO 14001 = International Standards for Environment Management Systems (BSI, 2002).

guarantee sustainability of the landfill. However, this involves the increase of solid waste management fees paid by the users. To secure the coverage of operational and future costs of the new Naboro landfill, more flexible and effective charge systems have to be introduced in Fiji. Population groups, such as informal and poor communities must be included in these decision-making processes. The introduction of a garbage fee separated from the general city rate in Nasinu (Suva) can be considered as a first attempt to integrate the informal living households in the solid waste management system. Apart from landfills, it is vital to upgrade also other waste disposal options such as incinerators, which are used in hospitals, schools and the quarantine department, in order to avoid long-term negative implications on environment and health (Government of Fiji, 2006, p. 72).

4.2.3.3 Implications on Health and Environment

The implications of uncontrolled dumps and open burning on health and the environment can influence Fiji in different dimensions. In particular, in rural areas and urban squatter settlements, where solid waste is either only irregular or not collected at all, scarce resources, such as water and soil, are polluted by careless disposal of waste (Government of Fiji, 2006, p. 72). The contamination of resources including water, air and soil through leachates and toxic emissions, such as dioxin and furans (Government of Fiji, 2006, p. 82), can lead not only to an adverse impact on food supplies but also to an increase of vector-born related diseases such as Dengue and Cholera (See Section 2.1.4). Both factors can decrease the work force and thus hinder the country's development.

In addition to dumping, the littering of waste is another severe problem in Fiji. In the Waste Awareness Baseline Survey (A-N-D Consultants & Sinclair Knight Merz Pty Ltd, 2000), littering has been identified as the most serious problem which needs immediate action. The destruction of environmental sensitive sites, such as mangrove swamps and corals can negatively influence the whole ecological system. Considering that nature is one of the most precious qualities of Fiji, a decrease in the attraction for tourists could be a severe consequence, which in turn could negatively affect the economic development of Fiji. However, it has to be noted, that at the same time, the increasing number of tourists in the last couple of years has also put additional pressure on the

poor waste management system and thus on the environment of the country. In the following section, the limitations of solid waste management in Fiji will be examined.

4.2.3.4 Constraints on Solid Waste Management

A lack of technology and skilled workers is one of the main limitations for the development of sustainable solid waste management in Fiji (Lingam, D., interview: June 21st 2006). The disposal of complex solid waste materials requires high quality technologies, which are expensive and rarely available in Fiji. Waste disposal facilities, such as incinerators and landfills, do not meet international standards. The new Naboro landfill is the first sanitary landfill in Fiji which has been constructed according to international guidelines. Lack of education and training of waste workers and also of citizens, about secure storage and disposal of solid waste, is another point which limits the implementation of sustainable solid waste management systems: specifically, an absence of knowledge about the sound storage and correct disposal of hazardous materials, such as medical waste, generates risks for the local population (Government of Fiji, 2006, p. 69), and for waste workers.

Furthermore, Fiji is hampered by a lack of data and research for solid waste management (Lingam, D., interview: June 21st 2006). As explained in the Draft of the NSWMS (Government of Fiji, 2006, pp. 60-63), research and surveys were conducted by different institutions, such as the Department of Environment, the University of the South Pacific, Fiji School of Medicine and others. However, most of this work is unpublished and it is not accessible to the general public (Government of Fiji, 2006, p. 60). In addition, different information levels have been noted between rural and urban areas (Government of Fiji, 2006, p. 50). One of the reasons for this situation is the lack of communication and cooperation between responsible institutions and an absence of coordination amongst key agencies. Weak enforcement of regulations and laws and insufficient institutional capacities has created poor solid waste management systems.

As discussed in Section 2.2.2, an efficient legislative framework is vital, in order to establish a sound solid waste management system. In Fiji, there have been a few laws and decrees created to manage solid waste. However, due to weak enforcement, most of this legislation has no effect on the waste handling of the population and organisations. Monitoring processes are rare in Fiji, since fines incurred for offences are generally

lower than the costs for controlling the activities (Government of Fiji, 2006, pp. 41, 48). In addition, low fines only have a marginal affect on the behaviour of people (Government of Fiji, 2006, p. 48). In some cases, legislation has not been updated and thus it does not relate to the present concerns. One example is the lack of producer responsibility in Fiji. There are no economic instruments in place to internalise external costs into the manufactured price (Government of Fiji, 2006, p. 49).

There are four main pieces of legislation which regulate solid waste management matters in Fiji: the Public Health Act, the Fijian Affairs Act, the Litter Decree and the Environment Management Act (EMA). One critical aspect is that there is a lack of clear responsibility caused through the repetition of various topics in the different decrees and laws (Government of Fiji, 2006, p. 41). Inefficiency and confusion is created, which in turn complicates the enforcement of the regulations.

In 2005, the EMA was put in place. It is a comprehensive law, which aims to implement sustainable development in the country, through the establishment of efficient "legal and institutional mechanisms" (UNESCAP, 2003). The content of this Act has been influenced by other Environment Acts from industrialised countries, such as the United Kingdom, New Zealand and Northern Ireland. Fiji has been encouraged by the success of these countries and hopes for the same achievements. The EMA offers some significant policies regarding solid waste management. However, in an interview with Joshika Samujh, Director of the NGO Vanua Hara in Suva[20] (Interview: July 5th 2006), it became clear that the implementation of the EMA is a gradual process, which first of all requires the realisation of other significant factors, including the education and training of the population and staff about the content of the Act, in order to create general awareness. Another important issue is the need for effective regulations which can enforce the EMA. UNESCAP shares this critical viewpoint. According to UNESCAP (n.d.-a, para. 15), a lack of positive attitude by the population but also by public authorities towards the EMA and in general environmental processes is another factor which needs to be overcome, in order to be successful in the implementation of this vital Act.

[20] Vanua Hara NGO – Providing Legal Protection and Awareness in Fiji and Region.

The implementation of legislation requires effective working institutions and organisations. In Fiji, there are four key actors involved in solid waste management, and they have been given power by past laws and Acts. These key actors are the Ministry of Health, the Department of Environment, the Ministry Fijian Affairs and the Ministry of Commerce. According to legislation, these departments and ministries embrace different roles. One of the roles for all key players is the monitoring of solid waste management in their respective area of duty (Government of Fiji, 2006, p. 47). However, often a lack of human resources in Fiji's ministries and departments limits the realisation of roles, such as monitoring processes and thus the enforcement of regulations and Acts. As an example, Table IV-5 shows the ratio of health inspectors to the population size, in several urban areas in Fiji. Health inspectors are responsible for "implementing, monitoring and enforcing the Litter Decree and the Public Health Act", which furthermore includes health education in schools and communities, in addition to the organisation of clean up campaigns and awareness programmes (Government of Fiji, 2006, p. 80). It can be noted that the ratio is very high (See Table V-5). The deficit of human resources gives an explanation for the incapacity of health inspectors to discharge their tasks.

Table IV-5: Ratio of health inspectors to population size

Town/City Council	Ratio
Suva	1: 25,000
Lami	1: 20,000
Sigatoka	1: 10,000
Nadi	1: 8,000
Lautoka	1: 20,000
Ba	1: 15,000
Tavua	1: 5,000
Nausori	1: 10,000

Source: Government of Fiji (2006, p. 80).

Fiji faces not only a lack of human resources, but also scarce financial resources, due to slow economic growth and lack of investment in the country. With regard to the fact that solid waste management is capital-intensive, this puts constraints on the implementation of new systems and on the expansion of services, such as solid waste collection and health inspections.

The lack of financial assets is a critical point in the development of solid waste management systems (See Section 2.2.3). As discussed in Section 2.2.3, although

developing countries produce less waste than industrialised countries, their costs for solid waste services, per capita on a yearly basis, is much higher. As mentioned previously, in Fiji, for example, high-quality technologies are not available and they have to be imported at a high price. Rising oil prices put an additional pressure on solid waste collection services, which are mostly managed with old trucks. Due to unstable and low economic development and also ineffective budgeting and high public debts (See Section 4.1.1), it is difficult to upgrade solid waste management systems. Drawing attention to the taxation system and the low number of fee payers in Fiji, it becomes obvious that present revenues cannot cover all the cost of the current solid waste management services. Added to the lack of financial resources, a deficit in education and awareness raising programmes are some other factors which affect the finding of solutions for Fiji's existing solid waste problems.

In 2000, SPREP and EU carried out a Waste Awareness Baseline Survey in Suva, as part of the Pacific Regional Waste Awareness and Education Programme. It revealed that, even though the general level of education is high, there is a lack of knowledge regarding the implications of uncontrolled waste, hazardous waste and waste as a resource (2000, p. 70). The major reasons for this situation were identified as a lack of face-to-face education and awareness raising programmes and a deficit in community-based participatory waste projects (2000, pp. 71-72). Most education and awareness building programmes were conducted through the mass media and they did not seem to reach the whole population. The study points out that, in order to change attitudes and behaviours, "waste education has to move more towards being specific, contact-orientated, activity related and community based" (A-N-D Consultants & Sinclair Knight Merz Pty Ltd, 2000, p. 72).

"The changing of human behaviour is a complex issue" (A-N-D Consultants & Sinclair Knight Merz Pty Ltd, 2000, p. 74). The A-N-D and Sinclair Knight Merz study (2000, pp. 74-75) reveals that, in order to promote behavioural changes in people, various means have to be applied in combination with each other. The study (2000, pp. 74-75) suggests a hierarchical usage of the following tools: motivation through awareness and education; availability of practical viable alternatives; incentives; awards and recognition; and legislation and enforcement. It is important to note that, in the last couple of years, various governmental and non-governmental organisations have

implemented programmes and undertaken surveys, in order to expand and improve Fiji's education in environmental issues. However, the current environmental situation shows that these actions have to be more intensified. Often, certain groups within the population are excluded from programmes and information, which then leads to the situation that "people are not responsible for their actions and fail to take ownership" (Government of Fiji, 2006, p. 58). It is a significant role of local governments to encourage citizens to take over responsibility and to support municipalities in the provision of urban services. Partnerships between public, private and civic stakeholders are vital, in order to create change in solid waste management and to ensure that peri-urban, squatter and low-income settlements can benefit from solid waste services. Fiji's The Government of Fiji has made an effort to create a National Solid Waste Management Strategy (NSWMS), to counter solid waste problems from a holistic point of view. The next section will offer an overview of Fiji's NSWMS and it will discuss some of its elements.

4.2.3.5 National Waste Management Strategy

Past governmental activities were generally concentrated on the treatment and disposal of solid waste. However, the ratification of the International Agenda 21 at the UNCED (See Section 3.1.1) and the commitment to the Millennium Development Goals (MDGs) has caused a shift to the *minimisation at source* approach in Fiji (Government of Fiji, 2006, p. 22; Nair, 2005, p. 52). In 2005, the establishment of the EMA offers a legal basis for the implementation of an efficient NSWMS. The Pacific Regional Waste Management Strategy, initiated by SPREP, set up the framework for Fiji's NSWMS (SPREP, 2006b). With the support of waste forums and working groups, different stakeholders, such as industry, NGOs, academia and other stakeholders, investigated central concerns relating to solid waste management in Fiji and from this an action plan was created. This action plan is planned to be realised in the next three to five years. The National Solid Waste Management Strategy Implementing Committee (NSWMS-IC) will monitor the achievements of this action plan (Government of Fiji, 2006, pp. 7-8).

The NSWMS is based on the vision to "develop a fully informed nation committed towards responsible solid waste management" (Government of Fiji, 2006, p. 22). In order to realise this vision, different objectives were identified, which are summarised in

the following text. Through increased responsibility towards waste management, increased understanding of the adverse effects of current solid waste handling and increased "public awareness and participation in waste minimization and recycling initiatives", communities shall contribute to the realisation of the vision (Government of Fiji, 2006, p. 23). In addition, industries and businesses will have to find alternative ways to avoid waste generation and "take responsibility for their products throughout its life cycle" (Government of Fiji, 2006, p. 23). These objectives are underpinned by the application of the ISWM model, which "involves using a combination of techniques and programs to manage the waste stream" (See Section 3.1.1) (Government of Fiji, 2006, p. 27), together with the following guiding principles (Government of Fiji, 2006, pp. 23-25):

1. Sustainable Development (waste management that considers social, economic and environmental factors) (See also ISWM model, Section 3.1.1)
2. Precautionary Principle (Precaution should be applied where there are threats of serious or irreversible damage)
3. Polluter-Pay Principle (Those causing pollution should pay for the cost of cleaning up the environment)
4. Life Cycle Principle (The environmental impact of a product during its entire life cycle should be considered and not be shifted from one life cycle phase to another)
5. Extended Producer Responsibility (EPR) (Producers/importers take over responsibility for the environmental impact of their products)
6. Waste Hierarchy (Ranking of available waste management options according to environmental benefits) (explained in the next paragraph and See Figure IV-9)
7. Consultation and Equal Opportunity (Government at all levels will consult and work with people and organisations throughout the development and implementation of the waste management strategy)

The realisation of these principles requires the establishment of effective policies. A "comprehensive legislation committed to the management and minimisation of waste" is vital, in order to achieve solid waste management objectives. The enforcement of existing laws and Acts, in addition to the implementation of regulations for dangerous wastes, such as medical waste but also scrap materials and white goods, is important, in

order to protect the environment and health of Fiji's population (Government of Fiji, 2006, p. 27). The introduction of economic instruments is another significant means, which is aimed at internalising environmental costs into the product price and promoting the polluter-pay principle (2006, pp. 27-28). However, regarding the fact that a great deal of solid waste problems evolve in low-income areas, it is necessary to find affordable solutions for marginal population groups. Education and awareness is another element which needs to be increased in Fiji, in order to make sure that all citizens support the vision of the NSWMS (2006, p. 28). The last essential policy is the focus on a waste minimisation strategy. This involves that a mix of different waste management options taken from the waste hierarchy can be used, however, with an emphasis on the avoidance and reduction of waste (See Figure IV-9).

Figure IV-9: Waste hierarchy
Source: Government of Fiji (2006, p. 28).

Different key issues were identified during the analysis of the current solid waste management system by working groups of Fiji and these were grouped into four programme areas (See Table IV-6). The key issues, illustrated in Table IV-6, include the implementation of the necessary policies and guiding principles, which were discussed in the previous paragraph. On the basis of these key issues, an action plan was outlined, in order to define activities which need to be carried out by national and local government, private institutions and citizens (Government of Fiji, 2006, pp. 32-34). The NSWMS-IC will monitor and review the conducted action plan activities and its implications on a six monthly basis (2006, p. 34).

Table IV-6: Key issues for Fiji's strategic solid waste management action plan

1. Direct Measures • Waste Minimisation • Infrastructure, Services & Collection Systems • Improving Final Disposal, Monitoring and Litter Control
2. Policy Development & Advocacy • Legislation, Regulation & Institution
3. Capacity Building & Awareness Raising • Research & Development • Information, Education, Awareness and Community Programmes
4. Incentives for Change • Efficient Pricing & Economic Instruments

Source: Adapted from Government of Fiji (2006, pp. 32-33).

Under programme point three in Table IV-6, the integration of communities into solid waste management is addressed. Pointing to the experiences of fieldwork in the three communities in Suva (See Chapter VI), it can be noted that the involvement of citizens, particularly from peri-urban, squatter and low-income groups, is crucial for the development of a sustainable solid waste system. The establishment of effective partnerships between local government and communities and also between the private sector and public and civic sector is necessary to overcome existing constraints and limitations and to create innovative solutions for Fiji's solid waste management.

4.3 Summary

Chapter IV provided contextual knowledge about the study area of this research and explored contemporary issues in urban development. The chapter commenced with a short overview of the general geographic, demographic, social-cultural and economic facts of the PICs. In many Pacific Islands, the urban population is on the rise. Section 4.1.2, highlights the fact that several Pacific countries, notably in the Melanesian region, showed at the last census (1996) a faster growing urban growth rate than that of the national growth rate. It was also noted that urban growth offers opportunities for the Pacific Islands' population, such as higher skills through education, employment and infrastructure. However, rapid urbanisation in many PICs has led to social, environmental and health problems. It was stressed that one of the reasons for this situation is the absence of effective political, legal and institutional structures. Top-down approaches have created communication gaps between private, public and civic sectors and this has hindered the establishment of active partnerships. Increasing numbers of squatter and peri-urban settlements is the outcome of governmental failure to provide affordable housing solutions. Concern was expressed about the

environmental and health damage, which is occurring as a result of a lack of basic infrastructure and services, especially in the vulnerable settlements of the Pacific Islands. In Section 4.1.3, it was pointed out, that existing solid waste management systems in the Pacific Islands cannot manage the increasing solid waste quantities. Weak solid waste services jeopardise the unique natural ecosystems of this area and also the present and future livelihoods of people in the Pacific countries.

Section 4.2 focussed on the Fiji Islands, which provided the context for the detailed study of three communities in Suva (See Chapter VI). After outlining basic facts, the section directed attention to the examination of problems in the urban areas of Fiji. The chapter highlighted the fact that with 46% of the population living in urban areas and an urban growth rate of 2.6% per annum (1996) (in comparison: national growth rate 0.8%) (See Table IV-3), urban areas have increasingly become the centre of attention for national development.

Suva, for example, has expanded far beyond its borders. Despite positive implications for urban areas, poverty is on the rise, as indicated in Table IV-4, poverty increased by 165%, from 1977 to 2002/03. This can be recognised in the growing peri-urban and squatter population in Suva and other Fijian towns and cities. Lack of basic infrastructure and services has limited sustainable urban growth in Fiji. Section 4.2.3 stressed, that Fiji has no adequate solid waste management system in place. Lack of facilities, financial and human resources and the absence of an effective legislative-institutional framework are the main reason for this situation. Section 4.3.3 emphasised that more flexible and alternative solutions for peri-urban and squatter settlements need to be explored. The chapter concluded by explaining the key elements of the recently endorsed NSWMS. A significant fact, implemented in the strategic action plan, is the establishment of partnerships and the involvement of communities in solid waste management. The following chapter will outline the applied methods of this research and introduce the three case studies.

Chapter V: Methodology and Case Studies

5.1 Introduction

This chapter is divided into three sections. In the first part the theoretical standpoint and approach taken in this research is revealed. This is underlined with an interesting theoretical perspective, called hermeneutics. Then, it follows a reflection on the preparation phase of this research and the introduction of the case study approach. This leads to the discussion of ethical issues, including the researcher's experiences accessing the selected research sites and the work with a translator and assistant in the communities. The second part lays emphasis on the methods used in this research. Quantitative and qualitative methods, including semi-structured interviews, focus groups and interviews with households, in addition to observations and informal walks, are discussed by using examples from the field. Adaptations of question wordings, made during the fieldwork, are highlighted and explained. The last part of this chapter offers a concise description of the three communities selected as case study sites for this research. An overview of the main features including, for example, location, demography, and ethnicity, will close this section.

This research is based on a multiple case study approach, which involved the conduction of fieldwork in Suva, the capital and largest city in Fiji. Over a time frame of five weeks, quantitative and qualitative research methods were applied, in order to gather information and data from different stakeholders. Prior to the fieldwork, a literature review was carried out, to obtain background knowledge about the topic and study area. This also helped with the planning of the practical research part and the decision concerning appropriate research methods. Participants in this study were representatives of international, regional and local organisations, in addition to the residents of three selected urban communities in Suva. In a circular or spiralling research process, an understanding of the research topic has been developed. The researcher's own experience and background has influenced the collection and analysis of information, but it did not interfere or stop the creation of new ideas and theories.

5.1.1 Positionality of Researcher

The approach taken in this study was influenced by the theoretical approach of hermeneutics, which is defined by Ezzy (2002, p. 24) as "the art and science of interpretation." The first important feature of this approach, used in this study, is the fact that the researcher accepts that it is never possible to obtain all the information about a topic (Ezzy, 2002, pp. 24-25). As pointed out by Ezzy (2002, p. 25), "the researcher is never finished exploring, searching, examining and theorising." This leads to the introduction of the *hermeneutic circle* (Ezzy, 2002, p. 25) (See Figure V-1), which is "a dialectical process that leads from universal to particular and back again" (Fairfield, 2000, p. 40). In other words, in the form of a continuous spiralling process, the researcher is involved in interpreting pre-existing knowledge and theories and his/her own discoveries, in order to explain certain phenomena (Ezzy, 2002, p. 25; Fairfield, 2000, pp. 38-39).

The hermeneutic circle uses both the deductive and inductive method (Rubin & Babbie, 2007, pp. 27-28; Tashakkori & Teddlie, 1998, pp. 24-25). Firstly, in this study, information and theories were extracted from the literature (deductive). This followed the collection of data and information from the field, which could not only be interpreted with the help of pre-existing theories, but which also led to new conclusions and frameworks (inductive).

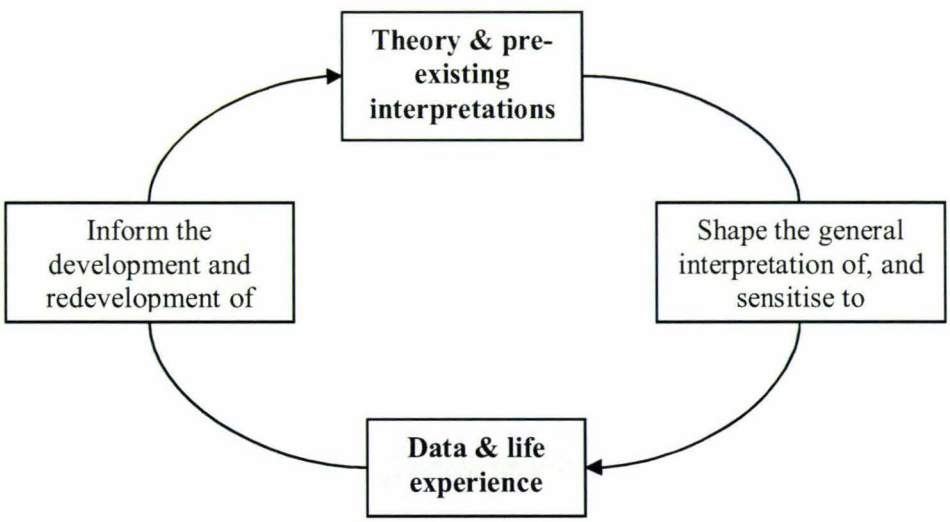


Figure V-1: Hermeneutic circle
Source: Ezzy (2002, p. 26).

Ezzy (2002, pp. 26-27) and Baronov (2004, p. 125) highlight the fact that the researcher exerts an influence on the interpretations of the research findings, with her/his own perceptions and ideas. However, this does not mean that the researcher's perspective dominates the entire research. Moreover, it is "an ongoing circular process of moving between one's own perspective and the perspective of the other person" (Ezzy, 2002, p. 27). This implies that the researcher is able to listen and is open to new realities (2002, p. 30). Enthusiasm and flexibility are central in this research process. However, it must be understood that this study does not provide absolute knowledge. Not only context can change and thus can alter developed theories, but also individual interpretations and ideas can change over time (Baronov, 2004, pp. 126-127).

5.1.2 Preparation of Fieldwork

The preparation process of this research included a comprehensive literature review, the design of fieldwork questions, an appropriate methodology plan and the contemplation of ethical issues. The establishment of contacts, via emails to important key persons, were vital for the stay and research work in Suva. Careful preparation of the practical research part was a necessary step, particularly having in mind the limited time-frame of only five weeks in the field. However, experiences from this study showed that, although preparation is vital, prior fieldwork planning can be easily disrupted by unforeseen events in the field. Therefore, flexibility and an open mind were significant aspects for the stay in Suva. Spontaneous interview opportunities, for instance, the offer by the NGO ECREA to attend a workshop in one of Suva's squatter settlements, Jittu Estate, contributed significantly to this field work. During these six days of workshop, the first case study was identified (Community of Lalilagi), and the first twenty-one interviews with households were conducted. Furthermore, it brought a great deal of insight into the work of a local NGO with squatter communities. Five days of sickness, caused by flu, changed the whole interview plan. However, a positive attitude helped to overcome the flu and to arrange new appointments with the community and the other stakeholders in order to finish the fieldwork in time.

"A fundamental part of any study is a thorough knowledge of the area in which the research is to be carried out and a familiarity with other research on the same or related topics" (McQueen & Knussen, 1999, p. 20). A literature review is not only important for creating understanding of the research topic, but moreover, it is important to

critically examine the available information, in order to discover knowledge gaps and new ways of looking at the research field (Yin, 2003, p. 9). Therefore, as emphasised by McQueen and Knussen (1999, p. 25), "flaws in a theory" and "limitations in the way a study has been carried out" can inspire new research questions and hence it can be the basis for the development of new knowledge. Solid waste management in developing countries has often been addressed by a technocratic approach. Therefore, a large amount of literature concentrates on the technical level of solid waste services. In Chapter III, alternatives for community-based solid waste management were identified. However, it has to be noted that, generally, only successful community projects are recognised by the literature. There is only a small amount of information relating to the solid waste situation in peri-urban and urban low-income and squatter settlements. Solid waste management in vulnerable urban areas in the Pacific Islands have hardly been examined by the literature.

Generally, secondary materials, such as books and newspapers were collected, in addition to official documents from different development aid organisations and from the Fiji Government. These gave valuable insights into the current situation of solid waste management systems in developing countries and revealed current constraints on the systems. However, it also showed innovative approaches to solid waste management at the community level. Since the fieldwork was carried out in a country unknown to the researcher, prior background knowledge was obtained concerning the study area. From this information, research questions, methods and ethical considerations were developed, which will be discussed in the subsequent text. The research questions were based on the investigation of three communities in Suva. This is called a case study approach, which set the framework for this study.

5.1.3 Case Study

In this research, three communities in Suva (Lalilagi, Namadai, and Muanivatu) were examined as case studies, in order to fulfil the research aim. The basic facts pertaining to the communities are described in Section 5.3. Yin (2003, p. 13) defines a case study as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident." The first part of the definition underlines the significance of contextual thinking, when researching social phenomena. The case study was used as a "research

strategy" (Yin, 2003, p. 1) which aimed at embracing, not only technical factors of solid waste management, but also the social dynamics, which have an important influence on solid waste handling (See Section 2.2.4, 3.1.1). Frequently, (and this is expressed by the second part of Yin's definition), research phenomenon and context are intertwined and therefore they are difficult to separate. For instance, the fact that solid waste problems arise regularly in squatter and peri-urban areas demonstrates that solid waste issues need to be explored by examining the whole context of a community. Concerns about ownership of land and lack of financial means, for example, are both factors which influence the provision of solid waste services and facilities. The case study approach was helpful when considering the complexity of solid waste issues. The choice of all three communities was purposeful and this will be discussed in the following section.

5.1.4 Unit of Analysis

Schram (2003, p. 107) points out that a "case study involves the exploration of a 'bounded system', something identifiably set within time and circumstances." In other words, the 'case' which is to be investigated needs to be specified, by drawing border lines around the matter of interest. This is also described as the process of finding the "unit of analysis" (Miles & Huberman, 1994, p. 25; Yin, 2003, pp. 22-28) with the help of different selection criteria. A purposive sample was the outcome of this selection process (Chambliss & Schutt, 2006, p. 101). In this study, a "multiple-case design" (Yin, 2003, p. 46) was applied. This involved the conduction of three case studies. The units of this analysis and hence the focus of this research, were three communities in Suva. In the following text, the criteria, which were used to select the three communities, will be explored.

Firstly, it was important to clarify the term 'community'. As pointed out by Warburton (1998, p. 18), "it is in some senses a myth – with different meanings in different contexts and to different people." In this study, the researcher took on the explanation of Warburton, which suggests that:

> Community is not a thing, it is a dynamic process in which a shared commitment creates and recreates community through action by people who are aware and committed to the principle of working together for a better life and world...[it is] an aspiration rather than a definition, based on certain types of (caring) relationships in a shared place (Warburton, 1998, p. 19).

This explanation offers important aspects, which could be used to identify a community. In short these elements are: a dynamic process led by actions and shared commitment, which is based on principles and certain types of (caring) relationships in a shared place. Having identified the term community, it was then important to find criteria to set boundaries around the communities. Firstly, for this purpose, geographic borders were examined. The fact that this research focused on urban communities, led to the exclusion of rural settlements. The settlement border was important to identify: however, in reality, these borders are often invisible and fluid. Therefore, other more explicit boundaries needed to be identified. This led to the second step: the identification of social factors. Residents of a settlement do not only live in a community just because of the place but also because of relationships, including family and friends and also values and religion. In the Pacific Islands, which includes Fiji, kinship is very important (Lindstrom, 1999, p. 198; Sillitoe, 2000, p. 241). During fieldwork, it was recognised that many households belonged to the same family and interviews revealed that people had moved to this particular place, in order to live together.

The third criterion for the selection of the communities was their ownership of the land. As discussed in previous chapters, solid waste problems are on the rise, especially in squatter settlements, which often do not benefit from solid waste services. For this reason, this research focussed on communities that were established on squatter land. The illegal or quasi legal status of squatter settlements implies, in many cases, a poor provision of basic services (Shrinivas, 2006). Added to this, people living in these communities often lack financial means, which means that, even if they were able to own the land, they probably could not pay for the recurring costs of basic services such as solid waste collection. The researcher considered these settlements as critical for the development of new urban areas. The next section will explain the subunits of the selected communities.

5.1.5 Embedded Subunits and Sampling

After identifying the boundaries of the three cases, it was necessary to define the "subunits" (Yin, 2003, p. 42), which were represented in this study by the households of each selected community. A household is described in this research as, a flat, house or other living unit, which is separated from another household by walls. According to

Table V-1, in total 67 households were interviewed. In every community, approximately 20 households took part in the study – one member from each household. Namadai was the only community in this study that consisted of a squatter community and an upgraded legal section. In order to see if the upgrading of compounds in Namadai had affected solid waste handling, nine interviews were carried out in the developed part of Namadai. Furthermore, Table V-1 indicates clearly that more women than men participated in this research. This is because interviews were conducted from the morning until early afternoon, when most men were away from the house and working. In some cases, the husband of the participant attended the interview, but it was mainly the women who answered the questions. The ethnic distribution showed a high percentage of Fijian families, less Indo-Fijian households and only a few participants came from other Islands, such as Rotuma, Bau and Kiribati.

Table V-1: Sample of the study, interviewed in June/July 2006

	Lalilagi		Namadai I Squatter Area		Namadai II Upgraded Area		Namadai I+II Whole Community		Muanivatu		Total
	W	M	W	M	W	M	W	M	W	M	
15 - 30 Y.	7	1	3	0	3	0	6	0	6	1	21
30 - 50 Y.	7	3	14	1	5	0	19	1	6	2	38
> 50 Y.	1	1	1	2	1	0	2	2	0	2	8
Total	15	5	18	3	9	0	27	3	12	5	**67**
Fijian	16		7		15		22		14		**52**
Indo-Fijian	3		2		6		8		1		**12**
Others	1		0		0		0		2		**3**

Source: Fieldwork (2006).

According to Yin (2003, pp. 42-43), the households represent "embedded units", which provide additional knowledge, in order to understand the context of the research case (Yin, 2003, p. 46). Important for the use of embedded units is the need to "return to the larger unit of analysis" (2003, p. 45). In other words, the "phenomenon of interest" (2003, p. 45), which was, in this case, the handling of solid waste at the community level, had to remain the central focus of this research.

The embedded units or households were generally selected by random sampling. In one case, however, participants were additionally contacted by using a snowballing technique. Random sampling was carried out by simply counting houses in the settlement. Since this research was based on a case study strategy, which puts emphasis

on "complexity" and "uniqueness" (Schram, 2003, p. 107), the requirement of a sample, which represents the whole population, was not given. In the words of Yin (2003, p. 10) "case studies, like experiments, are generalizable to theoretical propositions and not to populations or universes...your goal will be to expand and generalize theories (analytic generalization) and not to enumerate frequencies (statistical generalization)." Nevertheless, given the fact that quantitative methods were also applied, random sampling offered the assurance that quantitative information could be generalised, from the sample of the subunits to the whole community. This leads to the question of sample size of the subunits.

In view of the fact that the selected communities included, on average, 30 – 130 households, a sample size of around 20 households was considered to be sufficient, in order to present usable statistical data for the quantitative part of this study. However, since the usage of qualitative methods put more emphasis on the research object and available resources (Patton, 2002, pp. 244-245), a sample size was chosen more on the basis of research goals and time constraints.

5.1.6 Ethical Issues

"Ethical considerations are inseparable from your interactions with study participants in the field" (Schram, 2003, p. 137). This study was conducted with the awareness that applied research methods must keep to the Code of Ethical Conduct for Research, Teaching and Evaluations involving Human Participants, developed by the Human Ethics Committees of Massey University (2005). For that reason, "the physical, psychological and emotional well-being of participants" was a number one priority (Ruane, 2005, p. 18). Nevertheless, the researcher in this study took a post-modern view, which implies that decisions in the field could be made flexibly, according to the respective situation (Scheyvens, Nowak, & Scheyvens, 2003, pp. 140-141).

Before every interview, a short introduction relating to the researcher's background, either by the researcher herself or by the translator was carried out, in order to create trust and a good interview atmosphere. Information about the content of this study, its purpose and an explanation of the participants' rights followed. Amongst these included the right to withdraw from the interview at any time during participation, and the right to refuse to answer any or all of the research questions. Oral consent was obtained

before each interview. The participants were considered as "co-workers" (Ruane, 2005, p. 21), which means that equality and voluntarism were key principles in the research process. This implies that the participants' privacy was protected, by respectful treatment, through the "promise of anonymity" (Ruane, 2005, p. 24) and the "promise of confidentiality" (2005, p. 25). Due to a low risk evaluation by the University's Human Ethics Committee, only people over 15 years of age were allowed to take part in this study.

An important ethical question, before and during fieldwork, was the issue of benefits for the participants. Miles and Huberman (1994, pp. 292-293) stress, that a research project can involve an unbalanced relationship between researcher and participants. Not only did the participants offer their valuable time, but they also sometimes shared personal information with the researcher. A frequent question, often asked by participants at the beginning of the interview, was whether the findings of this study would improve the situation of their community, or even their household. It was explained to the participants that the findings could probably not change their situation in the short-term, but certainly in the long-term it was possible that the study could offer inspiration for decision-makers. As suggested by Scheyvens et al. (2003, p. 155), research findings can inform other people and organisations and lead to changes.

Another emerging issue, during this fieldwork, was the difficulty of keeping an equal "power relation" (Scheyvens et al., 2003, p. 149) between the researcher and the participants. Generally, this difficulty evolved from the fact that the researcher came from a developed country. Knowledge about the researcher's origins encouraged some participants to place expectations on the researcher. For example, some participants asked for financial support and others thought that the researcher could help them to get a job in New Zealand or Germany. In order to overcome these imbalances, the researcher engaged the participants in a short conversation about her home country and her situation and made them aware that she was not able to fulfil their expectations.

Scheyvens et al. (2003, p. 151) advise that equal power relations can be created by "placing ourselves in positions in which our informants are comfortable". During the interviews for this research, participants from the three communities were often sitting on the floor. Instead of taking the provided chair, the researcher also sat down on the

floor with the participants. This made it easier for the researcher to look into the eyes of the participants when talking and hence it facilitated the creation of trust. After finding out that many participants had their origins in rural areas, the researcher talked about her own experiences of living in a village with her grandmother. This was a useful topic to establish again trust and acceptance between the researcher and the participants, since it showed a common interest. Another ethical concern was related to cultural norms and beliefs which needed to be respected. The next section will highlight some of these rules and it will explain how communities were accessed.

5.1.7 Access to the Communities

Accessing a community in Fiji often requires the permission of the community leader. A *sevusevu* ceremony, which involves the drinking of *yaqona* – also called *kava* – is conducted, to welcome the new visitor (Secretariat of the Pacific Community, 2005, pp. 39-40). The researcher was expected to bring a little root or powder of kava to the communities and present it as a gift to the leader for the welcoming ceremony. Kava plays an important part in the Fijian culture. In two of the research communities, the position of leader no longer existed. In just one community, the researcher had the opportunity to present a small bag of kava to the leader's wife: however, a welcoming ceremony was not conducted, since the community leader was at work. The adherence to a dress code was vital, in order to show respect and to be accepted by the community members. The researcher was advised by her Fijian friends to wear casual long trousers and shirts which covered the shoulders. Shoes had to be removed before entering the participants' homes. After shaking hands for greeting, the participant and the researcher took place on the floor and started the interview. Some participants offered a cup of tea and biscuits. In a few houses, however, since interview time was constrained, the researcher had to politely refuse the offer.

In two of the communities studied, contact was established through the Ecumenical Centre for Research, Education and Advocacy (ECREA). A workshop concerning social analysis, held by ECREA for one week, offered the opportunity to select the first community for this research. Semiti Qalowasa, Coordinator of the Economic and Social Justice Programme at ECREA, was the facilitator responsible for the workshop. Semiti Qalowasa introduced the researcher to the participants taking part in the workshop.

These were generally residents from the community of Lalilagi in Jittu Estate, but there were also other members present from other communities in different settlements. Qalowasa explained the content and purpose of this research to the community members and invited them to take part in two focus groups. This was an excellent opportunity to build up a relationship with the community members. Added to this, the workshop allowed insights into the work of a local NGO within a squatter community. The workshop showed that squatter communities in Suva are facing various problems, which includes land and basic infrastructure issues and also disputes between Indo-Fijians and Fijians. Furthermore, the researcher experienced during this workshop and during the interviews the community members' strong connection to religion.

ECREA also organised contact with the community of Muanivatu, which became the second case study of this research. One of the community workers introduced the researcher to the community leader's wife, who became the translator and assistant. She supported the researcher with translations during the interviews and gave explanations to general facts relating to the community of Muanivatu.

A connection to Camari Koto, who worked for the University of the South Pacific (USP) as a lecturer in the Geography Department, offered the researcher to conduct research in her settlement, Namadai in Namadi Heights. Camari Koto also helped to make contact with a friend of hers, who then became the translator and assistant during research in this community. Namadai is divided into an upgraded part and a squatter part. Research was generally carried out in the squatter area: however, nine interviews were conducted in the developed area, for comparison purposes. In the next section, more details will be revealed relating the nature of the work with the interpreters.

5.1.8 Work with an Interpreter

Cooperation with interpreters and assistants was a valuable tool in this research. The first interviews, conducted in Lalilagi without a translator or assistant, showed that insufficient knowledge about the community and its people complicated the conduction of this study. This became particularly obvious in the selection process for the participants. Without the support of an assistant, orientation was difficult within the community. Therefore, in the first community, the participants were chosen through a snowball sampling. Another reason for working with a translator was the issue of safety.

The translators were paid on a daily basis. Advice regarding the rate for the translators was given by Camari Koto, who had already gained experience in research work in Fiji.

The decision to work in the second and third communities, with a translator was helpful to the outcome of this research. In both cases, the translator was a resident of the research community. This resulted in advantages and disadvantages. At first, it can be noted that cooperation with a translator and assistant, living in the research community, meant easier access to the households. The translator also presented the connection between the researcher and the participants. Given the fact that the researcher was an absolute stranger to these communities, the support of the translator gave confidence and security. Since both translators had lived in the research communities for a long time, they could also contribute background knowledge about the researched settlement. Furthermore, the presence of the translator, during walks through the community and interviews with the residents, facilitated the research process and also addressed the issue of safety. Although most of the community members spoke English very well, it was sometimes necessary to translate questions into Fijian and then the responses back into English. In particular, older people were often more comfortable giving their answers in Fijian.

The fact, that both translators were resident in the researched communities also had, in some cases, some side-effects. This can be explained by the often close relationship between the translator and the participants. In the situation where participants were introduced as family members, it occasionally happened that the translator tried to help participants by prompting them with the 'right' answer. In order to gather responses, which were free of bias, the translator was politely asked to avoid 'leading' the participants' responses.

Another observation, during the research, was that both translators were more comfortable to enter a Fijian than a non-Fijian household. However, since almost all non-Fijian participants spoke English fluently, this did not influence the interviews. In a few cases, the conduction of an interview at a non-Fijian household was carried out without assistance, whilst the translator preferred to wait at a neighbour house. To conclude this section, it must be highlighted that the support of a translator for this research was, except for a few disadvantages, significant. The next section will discuss

the methods used during the fieldwork and explore the benefits and drawbacks for this research.

5.2 Quantitative and Qualitative Methods

The study applied a combination of quantitative and qualitative methods. "Qualitative methods are used to explore the meanings of people's worlds – the myriad personal impacts of impersonal social structures, and the nature and causes of individual behaviour" (Brockington & Sullivan, 2003, p. 57). In contrast, quantitative methods capture information from participants, in numbers which are measurable and standardised (Patton, 2002, p. 14). In order to obtain a "comprehensive and multifaceted understanding" (2002, p. 14) of the researched subject, it was important to combine quantifiable data with meanings and interpretations gained by qualitative research. In the words of Miles and Huberman (1994, p. 40), "we have to face the fact that numbers and words are *both* needed if we are to understand the world."

In this research, quantitative and qualitative methods were used to complement each other. Through triangulation, methods were applied to gain quantifiable data and information from the households, which could be generalised to the whole community. On the other side, qualitative information, such as behaviours, attitudes and perceptions towards solid waste handling, were obtained, in order to gain a deeper knowledge about the matters of interests. Methodological triangulation was an important tool, which offered not only a better understanding of the research subject (Patton, 2002, p. 248), but it also enhanced the validity of the research (Yin, 2003, p. 99). For that reason, interviews with community members were generally structured in such a way that the research questions started with a quantitative enquiry and this was then followed by a qualitative question (See Section 5.2.3 and Appendix 2, Table F). This structure turned out to be successful. In particular, for questions which addressed the participants' opinion and attitude, such as questions 13-18 (See Appendix 2, Table F), qualitative responses enriched the findings by explanations and descriptions. The analysis of the findings showed that, without having used qualitative questions for some topics (e.g. questions 13-18, see Appendix 2, Table F), the underlying reasons for existing perceptions and behaviours could not have been identified. The main methods used in this research were semi-structured interviews, focus groups, structured interviews with

households, informal walks and observations. In the following text, the central points of applied methods, that were important for this fieldwork, will be highlighted.

5.2.1 Semi-Structured Interviews

With the help of an "interview guide" (Rubin & Babbie, 2007, pp. 122-123) a range of different stakeholders, who were involved either in the facilitation of solid waste management in Suva or in the provision of general urban development assistance, were interviewed. The interview partners, who were contacted, are listed in Appendix 2, Table E. All organisations were located in Suva, which made it straightforward to schedule two or three meetings on the same day.

The aim of these interviews was to find out the stakeholders' interests, responsibilities and roles, regarding the management of solid waste in Suva. The meetings revealed interesting background information relating to the waste management system, but it also showed different perspectives and views on the waste management services in Suva, held by international, regional and local donors in addition to and governmental authorities. Furthermore, urban issues in general were discussed, and these brought a great deal of contextual insights and helped to position solid waste management as a critical issue in urban development.

Using semi-structured interviews, for the consultations with stakeholders, was valuable for the following reasons. Prior to every interview, topics were outlined, in order that the interview stayed focused on the interview subject. This increased the researcher's confidence and thus smoothed the progress of getting the conversation started. Depending on the response of the participants, questions could be expanded and added. By using this approach, subjects of interests could be examined in detail and new perspectives could be discovered. However, on occasions, when the interview partner started to drift away from the topic, the researcher had to politely intervene and lead the dialogue back to the original topic or onto a new direction. Notes were taken by hand and completed immediately after each meeting or during the evening on the same day, in order that important thoughts and information could be recalled, which might have been unable, for some reason, to record during the interview. The impression was received that all of the interview partners enjoyed the meetings. The following sections

will discuss the researcher's experiences in the usage of different research methods during fieldwork in the three communities in Suva.

5.2.2 Focus Groups

Only two focus groups were conducted in the first community. The first focus group was carried out with ten women from Lalilagi, in Jittu Estate and the second focus group involved five men from the same community. Viriseta Asioli, a community facilitator working for the NGO ECREA, acted as translator and assistant. The location of the focus group was the meeting house of the community. This group meeting involved a ranking exercise and a focus group discussion. The main role of the group meeting was to build up a relationship with the community members and to introduce the researcher to the participants.

The aim of the ranking exercise was to find out about current problems and also to gather information regarding the background of the community. The first task, the ranking exercise involved the outlining of current concerns and difficulties within the community, by the focus group participants. In the next step, the participants were asked to rank these concerns by: a) the current importance for them; b) their willingness to pay for the issue; and c) their anticipation of the importance of these concerns in four years time. The ranking exercise was followed by a focus group discussion on solid waste disposal practices in the community and an invitation for them to offer ideas for improvement. These group discussions were based on five closed-and open-ended questions:

1. Do you think that waste is a problem in your community?
2. What types of waste are of great concern in your community?
3. Do you talk about waste in your community?
4. What could the community do to improve waste handling?
5. What could public authorities and other organisations do to improve waste handling?

Viriseta Asioli, the assistant, translated the questions put to the group in both exercises, into Fijian and then translated their responses and the following discussion back into English. The group exercise was a useful tool to build up a relationship with residents in the community and to gain an insight into the circumstances of the settlement. The

ranking exercise revealed the participants' existing worries, which helped to place solid waste problems in perspective to other, sometimes more concerning, issues. The group discussion provided information on solid waste handling which, by reviewing the responses, raised ideas and questions for the following individual interviews. However, despite these positive outcomes, focus groups were not used in the next two communities. One of the difficulties observed in the focus group was that some residents took the lead in the discussion and this obscured the opinions of other group members. Furthermore, it was difficult to encourage people's interest in a group meeting, without actually knowing the residents beforehand. Time constraint was another reason which led to the decision to approach the following communities with an alternative rapport building technique. As discussed in Section 5.1.8, a translator was used in Namadai and Muanivatu, in order to facilitate access to the community and to establish trust between the participants and the researcher.

5.2.3 Household Interviews

The conduction of 67 interviews with individual households, in three communities in Suva, was a key method and these interviews were of great value for this research. In every community, one member each from approximately 17 to 30 households took part in the interviews. Every interview involved open- and closed-ended questions (See Appendix 2, Table F). The use of closed-ended questions was important to gather quantifiable and thus comparable responses. Open-ended questions were used to "understand and capture the points of view of other people without predetermining those points of view through prior selection of questionnaire categories" (Patton, 2002, pp. 20-21). The use of open-ended questions added valuable information and gave significant insights into the attitudes and perceptions of the participants. As McQueen and Knussen (1999, p. 108) point out, the challenge of open-ended questions is the process of analysing and interpreting the findings, since this can be difficult, due to a missing structure.

Interview questions were well prepared in advance before going into the field and therefore they embraced a more or less fixed structure, in order to be able to compare interview responses. Nevertheless, the integration of open-ended questions left space for spontaneous ideas for new questions, which could evolve out of the conversations. Frequently, quantitative responses were investigated more deeply, through the

subsequent usage of a qualitative question (open-ended). After the first interviews, it was recognised that, in order to answer the research questions, the usage of open-ended questions needed to be intensified. For example, in the first community, many residents stated that they burned and buried their household waste in the community environment, even though the Suva City Council collected household waste three times per week, from the main road outside the settlement. The results of the first interviews did not give any explanation for this behaviour. In the following communities the researcher applied more open-ended questions, in order to fill the identified research gaps and to gather more information about the underlying reasons for certain behaviours and attitudes. This recognition brought highly valuable information to this study. Chapter VI will show that the application of a combination of open- and closed ended questions led to a comprehensive understanding of solid waste problems in the three communities and it also helped to answer the research questions outlined at the beginning of this study (See Chapter I).

The increase of more open-ended questions also involved some difficulties. In many interviews, participants were not very responsive to open-ended questions. It was considerably easier to obtain responses for closed-ended questions, where the participants only had to decide between 'Yes' and 'No'. For example, the researcher asked the participants to state some of their ideas for the improvement of waste management in their community. Participants seemed to find it hard to respond to this question. In many cases, answers had to be prompted and questions had to be rephrased, in order to encourage the participants to answer the question.

Only assumptions relating to the reasons for this experience can be offered here. On the one hand, it could be linked to the fact that the researcher in this study was seen as an outsider by the participating community members. This might have created the situation that participants did not feel comfortable enough to talk freely. Another reason could be that the questions were too difficult, or that participants had not previously thought about this topic. The already mentioned cultural differences could also have played a role. Barr (2003a, p. 1) speaks from a "culture of silence" which is embraced by the society of the Fiji Islands and which influences the daily lives of people living in this country. Communication in Fiji can be characterised by a top-down approach enforced by traditional leader structures (Barr, 2003a, p. 1). To speak to a stranger about

problems concerning their communities might not be seen as appropriate in these communities.

After the interview, participants were asked to state their level of agreement and disagreement to certain statements, regarding topics which had already been addressed in prior interview questions (See Appendix 2, Table G). The findings of this exercise were then compared with the interview responses. Some participants had difficulty understanding the purpose of the exercise and the meaning of the different levels of agreement and disagreement. However, with the help of the translator, problems were quickly clarified. An interesting recognition was that the repetition of subjects in the form of another exercise revealed, in some cases, strong reactions and contradictory findings. Several participants started to discuss and to question their own ways of dealing with solid waste. Feelings, such as embarrassment, were expressed by laughing about their own waste disposal methods. For instance, the statement, "Waste can be thrown into a river, sea or other public places" (See Appendix 2, Table G), caused embarrassment, particularly in Muanivatu. In this settlement, residents generally threw their solid waste into the mangrove swamps adjacent to their community, since the Suva City Council did not provide solid waste collection. Some participants even changed their minds and gave a different response to certain statements. For example, approximately 10% of the 67 interview partners modified their opinion to the question of whether they thought their community had a problem with solid waste. During the first interview, many of these people denied that the community had a problem with waste, but then they agreed to this fact in the agree/disagree exercise. The reason for this might be embarrassment, but it could also be that people had realised during the interview that dumping and littering of solid waste did cause problems for their communities.

The final exercise of each interview was to rank the current concerns of the participant (See Appendix 2, Table G). The ranking exercise was similar to the one conducted during the focus groups in the first community (See Section 5.2.2); with the exception that ranking question c)[21] was not included. Furthermore, prepared cards were used for

[21] Ranking question c): The participants' anticipation of the importance of their suggested concerns in four years time.

the interviews with individual household members, which facilitated the exercise (See Plate V-1, V-2).

Plate V-1: Ranking exercise with a participant in Lalilagi

Plate V-2: Cards used in the ranking exercise

Possible concerns, such as access to land, lack of toilet facilities, lack of water, etc. were noted on these cards (See Plate V-2). Participants could choose suggested concerns from the cards, but at the same time they could add other issues. The cards also helped to explain the exercise, which then created more time to focus on the actual ranking. The following section will discuss the usage of observations and informal walks during the fieldwork.

5.2.4 Observations and Informal Walks

In addition to research interviews, information was collected through observation of the residents and communities' environment. Informal walks were useful means to get to know the area and to observe solid waste handling in the community. Waste disposal sites, litter, solid waste collection points, etc. could be identified and photographs could be taken. The presence of a translator, on two of the research communities, was a great advantage, since the translator provided the researcher with explanations and background knowledge during the fieldwork period. In the first community, informal walks were generally carried out alone. As already explained, due to orientation and safety issues, this approach was changed when walking in the other communities.

During interviews with community members, photographs were taken of storage and disposal facilities and other interesting objects or situations, which came up in the conversation. By observing the participants, behaviours, such as the burning and littering of solid waste, could be experienced, and this could then be compared to the

interview responses. In addition, participants could explain techniques, such as dumping or composting, by showing the researcher the disposal sites. In Chapter VI, this visual material will be used to illustrate and emphasise the findings from observations and responses of the participants. Sometimes, observations brought different insights into subjects and contradicted the participant's previous statements. In these cases, it was helpful to show interview partners the specific finding and then to check with him/her about their previously stated opinion.

Another important technique was to observe the behaviour of participants during the interview. The interpretation of the participants' facial and body expressions was a significant tool, firstly to find out whether they were willing to take part in this research and secondly, to help understand their reactions and responses to the interview questions. Although many of the participants spoke fluent English, cultural differences led to some confusion at the beginning and made the research challenging. Patton (2002, p. 391) notes that, "cross-cultural inquiries add layers of complexity to the already-complex interactions of an interview". The presence of the translator was valuable in these situations in order to clarify and to overcome these cultural differences.

To keep track of developments in the research outcomes, field notes were a vital component of this fieldwork (Patton, 2002, p. 302). Given the fact that no tape recordings were used in this research, it was helpful to keep a diary relating to the interviews and impressions experienced in the field. Reflection on conducted interviews was a useful tool to discover if the research questions and methods revealed the required information. In particular, research in the first community brought a number of changes and new ideas for making the approach to the following communities. In the course of this research, interview questions were altered slightly, due to either unsuccessful responses, or the recognition by the researcher, that the question was not appropriate in the context of the community. In some cases, whole questions had to be removed and replaced with new questions. The following section will examine the wording of the interview questions used and will reveal adaptations, which were made during the fieldwork.

5.2.5 Wording of Questions

This study showed that language and the structure of sentences in an interview are significant tools and these can have a great influence on the outcome of the research. As stressed by Bailey (1994, p. 113), "question wording can greatly affect the answers received." Clear language and a simple phrase structure were important, in order to transfer the message across to the participants. The choice of words had to be carefully made, to ensure that participant and researcher share the same understanding of the question's content. To a large extent, the choice of words was determined by the researcher's perspective. Bailey (1994, p. 111) highlights that this perspective can sometimes differ from the participant's view, due to geographical, cultural and generational differences. As an example, many participants had difficulty identifying the meaning of terms such as, *uncontrolled waste*, *dangerous waste* and *segregated waste*. This knowledge gap might be rooted in poor environmental education in Suva's schools. Furthermore, it might reflect the discrepancy between the Western and the Fijian approach to solid waste management. Rewording of these expressions was a necessary step, to clarify meaning for the participants, in order to ensure a response. In the next section, the researcher will introduce three selected communities, which were the focus of this study.

5.3 Introduction of Case Studies

The research was carried out in three communities, situated in different parts of Suva[22]. These varied in size, population number, geographical conditions and level of development stage. At the time of this research, two of these communities, namely, Lalilagi and Muanivatu were situated in squatter areas. The community of Namadai was in a transition status – from an illegal to a legal settlement – and it still included a strip of squatter land inhabited by approximately 40 squatter families. The legal recognition of the ownership of the land had an influence on the provision of services, such as solid waste collection, access to water, electricity and other basic facilities. In both squatter communities, basic services had scarcely been provided. One of the reasons was that the residents in these settlements did not pay any city rates. Included in these rates were a property tax and a fee for basic services. The amount of the property tax depended on the size and market value of the owned land. Since residents of squatter settlements did

[22] See map at the end of Section 5.3, the communities are marked as follows: A) Lalilagi, B) Namadai, C) Muanivatu.

not possess a legal ownership of the land, they did not pay for services and thus officials did not feel they are responsible for these settlements (See Section 4.2.3.2).

The Ministry of Local Government and Urban Development of Fiji (former Ministry of Local Government, Housing, Squatter Settlement and Development) had started to conduct upgrading projects in squatter settlements in and around Suva (Fiji Government Online Portal, 2005d). In several development steps, the government had created access to tar sealed roads, electricity, water, street lights, fire hydrants and footpaths. At two of the research sites, upgrading of the settlements had already been started and this had included the relocation of a major part of the inhabitants. The relocation of people is a critical and contentious subject. One of the reasons can be seen in the fact that, in some cases, families have lived in the settlement for over 25 years. The move to another settlement means that the majority of people have to give up the benefit of nearby educational and health facilities, employment and other services such as supermarkets. In and around Suva, squatter settlements have been growing rapidly in the last couple of years (See Section 4.2.2). People have rejected the idea of searching for other living opportunities and instead they want the convenience of staying in a cheap or free place, bearing in mind the increased rents in and around the city.

In the following section, the three communities selected for the case studies will be introduced. Data on location, size, demography and ethnicity will be provided, in order to give a short overview of the basic facts. Furthermore, background information relating to land status and the development processes will be included in addition to a description of the communities' connection to basic services, such as water, electricity and solid waste collection.

5.3.1 Community Lalilagi

The community of Lalilagi[23] resides in one of the biggest squatter settlements in Suva. This settlement, called Jittu Estate, is situated in Samabula Ward adjacent to Grantham Road on the east and the Hooker Estate on the west, with Ratu Mara Road at the north and the Suva Housing Authority to the south. Jittu Estate was established approximately 45-50 years ago. The whole settlement consisted of approximately one thousand

[23] See map (mark A) at the end of Section 5.3.

households (Fiji Government Online Portal, 2005f). Taking an average number of five members per household, a total population of five-thousand people lived in Jittu Estate at the time of this study. The settlement of Jittu Estate was owned by the state. Lalilagi is situated adjacent to the newly constructed Gaji road (See Plate V-3). Different ethnic groups, composed of 60% Fijians, 40% Indo-Fijians and people from the islands around Fiji, such as Rotuma or Bau, lived in cramped, cheap metal houses. There were scarcely any secure footpaths (See Plate V-4), and the drains were full of liquid and solid waste, creating a bad odour. Some people cultivated a few vegetables and flowers for subsistence. A church and a meeting hall provided a place for people to come together and socialise.

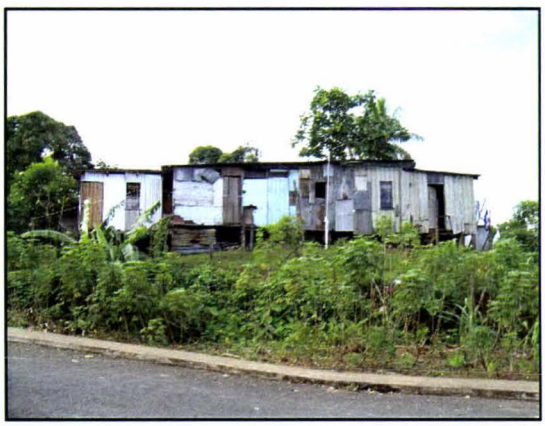


Plate V-3: Lalilagi in Jittu Estate - taken from the main road

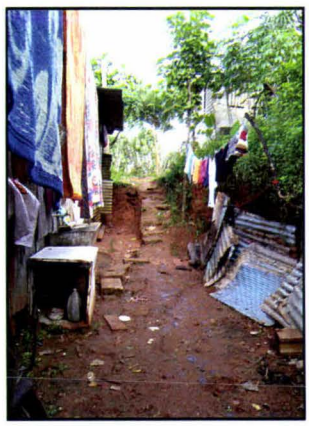


Plate V-4: Narrow and insecure pathways inside Lalilagi

Jittu Estate is one of the squatter settlements, which at the time of this study were subject to an upgrading process by the Ministry of Local Government and Urban Development. After the completion of this development project, only 504 families will have the opportunity to buy a piece of the subdivided land in Jittu Estate (Fiji Government Online Portal, 2005f). This means that approximately half of the families, that lived in this settlement before the development project will have to be resettled. The provision of basic services was insufficient; in particular, water and electricity were rare in this settlement. However, residents benefited from a solid waste collection, even though they did not pay for this service. Suva City Council collected solid waste three times per week from the main road.

A study was carried out in Lalilagi, over a time frame of four days. Access to the community was made possible through the support of the NGO ECREA. Two focus groups and twenty individual household interviews were conducted. Random and snowball sampling were used to select research participants. Experiences from research in this community helped to improve applied approaches and methods.

5.3.2 Community Namadai

Namadai[24] is situated in the centre of Namadi Heights in Tamavua Ward, adjacent to Salato Road in Suva (See map B). Tamavua is a high cost residential suburb of Suva. At the time of this study, approximately 130 households lived in this community with approximately 65% Fijians and 35% Indo-Fijians. The area covered approximately 15 acres of freehold land. In the past, this land belonged to the landowner, Ram Bharos, who gave settlers the chance to reside on this land for a cash payment. Later, the Methodist Church of Fiji bought the land on behalf of the settlers and in October 1993, work started to upgrade the infrastructure. In 1997, the project was taken over by the Government and it was then handed over to the Namadai Land Purchasing and Housing Co-operative. The upgrading process was still ongoing. At the time of this study, most of the residents had bought subdivided land and they had started to build their houses. However, the settlement still had a small strip of squatter land, and it was planned to transform this into a highway (See Plate V-5, and map Appendix 3). Approximately 40 households lived on this land in temporary shelters. Some of them had already bought a piece of land and were just waiting for the construction of their houses, but others could not afford to buy land in the new developed area. Residents of the squatter area complained about insufficient basic services such as water and electricity. Solid waste collection was carried out by the Suva City Council, three times per week: not all residents paid for the service. People living in the squatter strip had to walk to the main street to place their rubbish for collection, since trucks were not able to drive through the squatter part (See narrow pathways in Namadai, Plate V-6).

[24] See map (mark B) at the end of Section 5.3.

Plate V-5: View of the squatter area of Namadai

Plate V-6: Inside the squatter area in Namadai

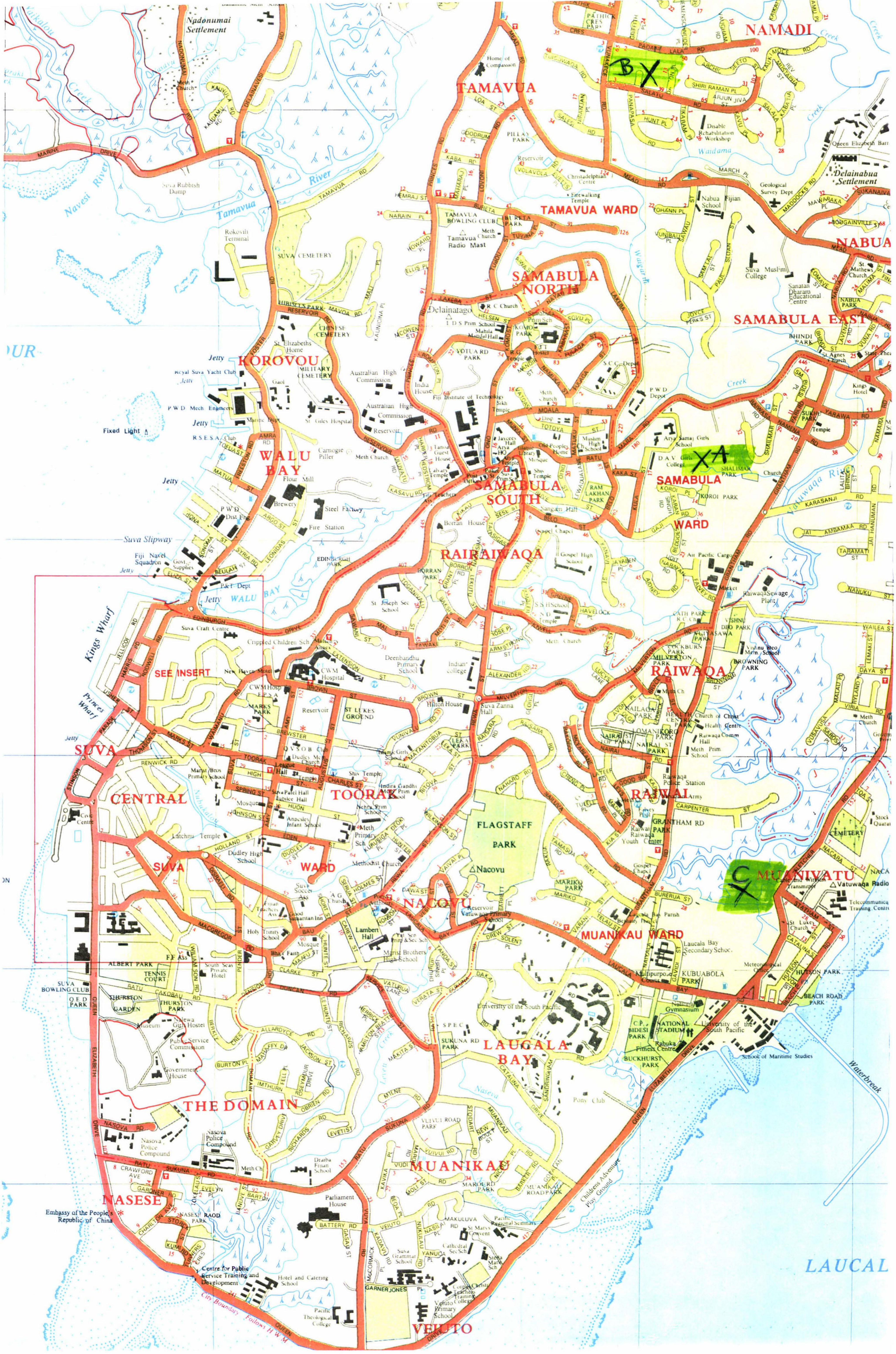
With the support of Camari Koto, a lecturer at the Geography Department at the University of the South Pacific in Suva, who was also a community member of Namadai, research was conducted in a time period of three days. The random selection of twenty-one individual households, for interviews, was the main fieldwork method. The focus was placed on the squatter part of the settlement. However, in order to obtain insights into the waste handling of households, who lived in a developed area and paid for urban services, nine residents from the upgraded households were also interviewed. A translator attended these interviews.

5.3.3 Community Muanivatu

Muanivatu[25] is a small community situated opposite the Vatuwaqa cemetery, along the southern section of Fletcher Road, opposite Statham Street and close to USP (See map C). Since 2005, in this community, 32 households (108 people) had lived on a small piece of land belonging to the Suva City Council. (Fiji Government Online Portal, 2005d). Observations showed that approximately 16% Indo-Fijians and 84% Fijians lived in this community. Since the land had been earmarked for future recreational purposes, residents will need to be resettled in the near future (Fiji Government Online Portal, 2005d). It was the smallest community of the three research sites. However, the residents did not live in close proximity, as experienced in the other two squatter settlements. Nevertheless, since the area was part of a wetland, the community environment was often wet and muddy, thus it created a dirty and unbearable place to live.

[25] See map (mark C) at the end of Section 5.3.

The provision of basic services such as water, electricity and sanitation facilities was a serious problem in this community. Although waste workers from Suva City Council passed the community three times per week, solid waste was not collected. Residents did not pay any city rates and hence they did not pay for services such as water and solid waste collection. A study was carried out for two days, with the assistance of the community leader's wife. The researcher conducted 17 individual household interviews with randomly selected households, in addition to observations of environment and the participants during the interviews. The following section will provide a summary of the main points of this chapter.



Nadonumai Settlement
Vaikalou Creek
MARINE DRIVE
Navesi River
Suva Rubbish Dump
Tamavua River
TAMAVUA RD
Rokovili Terminal
SUVA CEMETERY
HIBISCUS PARK
CHINESE CEMETERY
St Elizabeths Home
KOROVOU
MILITARY CEMETERY
Gaol
Royal Suva Yacht Club
P.W.D. Mech. Engineers
Marine Dept
St Giles Hospital
Australian High Commission
Fixed Light
R.S.E.S.A. Club
WALU BAY
Carnegie Piller
Meth Church
Flour Mill
Brewery
Steel Factory
Fire Station
P.W.D. Dist Eng.
Suva Slipway
Fiji Navel Squadron
Govt. Supplies
P&T Dept
Jetty
WALU BAY
EDINBURGH PARK
EDINBURGH DRIVE
Suva Craft Centre
Kings Wharf
Princes Wharf
SEE INSERT
Crippled Children Sch
New Haven Motel
CWM Hospital
Maternity Annex
SUVA
CENTRAL
TOORAK
WARD
SUVA
Civic Centre
Marist Bros Primary School
Dudley High School
Latchmi Temple
Mosque
Anncdey Infant School
ST LUKES GROUND
Reservoir
MARKS PARK
Holy Trinity School
ALBERT PARK
SUVA BOWLING CLUB
Q.E.D. PARK
TENNIS COURT
THURSTON GARDEN
THURSTON PARK
Museum
Nalewa Girls Hostel
Public Service Commission
Government House
THE DOMAIN
Nasova Police Compound
NASESE
Embassy of the People's Republic of China
NASESE RAOD PARK
Centre for Public Service Training and Development
Hotel and Catering School
City Boundary Follows H.W.M.
Pacific Theological College
Parliament House
Draiba Fijian School
Suva Grammar School
VEIUTO
Veiuto Primary School
Corpus Christi Teachers Training College
Stella Maris Sch
Cathedral Sec Sch
St Marys Convent
Pacific Regional Seminary
MUANIKAU
MUANIKAU ROAD PARK
Childrens Adventure Play Ground
LAUCALA BAY
University of the South Pacific
Pony Club
SUKUNA RD PARK
S.P.E.C.
NACOVU
Vatuwaqa Primary School
Lambert Hall
Marist Brothers High School
FLAGSTAFF PARK
Nacovu
MUANIKAU WARD
Laucala Bay Secondary School
KUBUABOLA PARK
National Gymnasium
NATIONAL STADIUM
C.P. BIDESI PARK
Rabuka Fitness Centre
BUCKHURST PARK
School of Maritime Studies
Waterbreak
LAUCAL
MUANIVATU
Vatuwaqa Radio
Telecommunica Training Centre
St Lukes Church
HUTSON PARK
BEACH ROAD PARK
Meteorological Office
CEMETERY
RAIWAI
Raiwaqa Police Station
Salvation Army
RAIWAQA
BROWNING PARK
Raiwaqa Sewage Plant
Market
Health Centre
Meth Prim School
RAIRAIWAQA
Gospel High School
St Joseph Sec School
Deenbandhu Primary School
Indian College
Suva Zanna Hall
SAMABULA SOUTH
SAMABULA WARD
SHALIMAR PARK
D.A.V. Girls College
Arya Samaj Girls School
SAMABULA NORTH
Delainatago
Fiji Institute of Technology
TAMAVUA WARD
TAMAVUA
Home of Compassion
PILLAY PARK
Tamavua Radio Mast
Christadelphian Centre
Firewalking Temple
NAMADI
Disable Rehabilitation Workshop
Waidama
Nabua Fijian School
Suva Muslim College
Geological Survey Dept
Delainabua Settlement
Queen Elizabeth Barr
NABUA
SAMABULA EAST
Sanatan Dharam Educational Centre
Kings Hotel
Vatuwaqa River
QUEEN ELIZABETH DRIVE
GRANTHAM RD
LAUCALA BAY RD
RATU SUKUNA RD
MEAD RD
BX
XA
CX

5.4 Summary

This chapter discussed the approaches and methods used during the research. It commenced by outlining the standpoint taken in this study, which was defined as hermeneutics. It was explained that hermeneutics offers a flexible approach, which underlines the complex nature of the investigated phenomenon. Figure V-1 highlighted that research was conducted in a circle, combining existing knowledge with new data and information. After discussing the positionality of the researcher, the chapter revealed that careful preparation for a fieldwork trip, including a literature review and planning the stay and research in the field was significant. However, it was also stated that, although planning was important, reality often brought situations into the field, where flexibility and spontaneous ideas were vital, in order to take up opportunities or overcome negative situations.

The next point of this chapter demonstrated that the research was based on a case study approach. Three communities were selected as the focus of attention in this study, whereas the households of these communities functioned as subunits to enrich the research findings. By using Warburton's (1998) explanation, the term 'community' was defined. In addition, geographic and social factors and the ownership of land were used to draw boundaries around the selected communities in Suva. Table V-1 indicated that 67 households took part in this study: one member from each household. There followed some ethical considerations which stressed the high priority given to the participants' well-being. Keeping an equal power relationship, by creating trust between the participants and the researcher, was identified as a critical issue.

Contact and access to the communities was established with the help of ECREA, a local NGO and Camari Koto, a lecturer from USP. Cooperation with the interpreter was of high value. Since both translators were residents of the research communities, their appearance during the interview helped to build up a trusting relationship with the interview participants and it also helped in the gathering of background knowledge about the residents and their settlement.

The chapter then shifted to a more detailed discussion relating to applied research methods. Through triangulation of quantitative and qualitative methods, the researcher aimed at creating a valid picture of the research phenomenon. General background

knowledge about solid waste management and urban issues in Suva was obtained through semi-structured interviews with different public and private stakeholders. The chapter also highlighted that the use of semi-structured interviews was useful, since it offered the opportunity to deepen topics of interests by including spontaneously research questions. Generally in the communities, interviews with households, observations and informal walks were applied. The chapter explained that, two focus groups were conducted only in the first community. The use of focus groups was described as valuable but due to time-constraints and other drawbacks they were not used again in the other two communities. By using a combination of open- and closed-ended questions, valuable findings were revealed, which contributed to information received from the initial research questions. However, the chapter pointed out that the participants had difficulty responding to open-ended questions.

The interviews included an agree/disagree exercise and a ranking exercise, which were useful to gather background knowledge and to check the validity of the interview responses. Observations of community residents and their environment, made during informal walks and interviews, revealed storage and solid waste disposal practices and behaviours in the community. In some cases, the observations contradicted the previous interview responses made by the participants. The chapter also pointed out that, due to cultural and educational reasons, some research questions were difficult to understand for the participants. Therefore, changes in the way of phrasing the questions were made, in order to improve comprehension.

The third part of this chapter introduced the selected communities of Lalilagi, Namadai and Muanivatu and provided contextual facts relating to the settlements. All three communities were originally developed on squatter land. Basic services were poor in each community. Nevertheless, the chapter noted that, in Lalilagi and Namadai, solid waste collection was provided by the Suva City Council, although scarcely any residents paid fees. Only the community of Muanivatu did not benefit from a solid waste collection. In the following chapter, the findings from the fieldwork in the selected communities in Suva will be analysed and discussed.

Chapter VI: Results and Analysis

6.1 Solid Waste Management in Three Communities in Suva

Proper collection, disposal and storage of solid waste are actions which contribute to a clean and healthy environment in a community. In the past, household waste was mainly composed of biodegradable material, which was used for compost or to feed domestic animals. Burning and burying were other common methods used to manage solid household waste. However, as pointed out in Section 2.1.1, as a result of a change in the waste composition to more packaging materials, such as, paper, tin cans and plastics, many of the traditional disposal methods are no longer appropriate. Open burning and the burying of waste leads to environmental and health risks, which can have adverse effects on the local population (See Section 2.1.4).

Section 2.2 highlighted that, due to a lack of financial and human resources but also due to an absence of a strong institutional-legislative framework, municipalities in developing countries have difficulties coping with the increase in waste amounts. UNEP (2005, p. 51) highlights the unequal provision of urban services and states that, particularly low-income and peri-urban areas suffer from inadequate solid waste collections. In many cases, settlements have frequently been established in an informal and unplanned way. The high increase of density in these communities and their lack of infrastructure results in a heavy burden on municipal urban services.

For this study, fieldwork was carried out in three communities in Suva, Fiji. In Chapter IV, the applied research methods and experiences from the field were explained. In addition, a description of the three research sites can be found in Section 5.3. In each community, approximately 20 individual interviews were conducted and informal walks were taken through the community, in order to gather information about how those communities handled their solid waste. In total, 67 residents were interviewed, involving one member of each household (See Section 5.1.5).

The following analysis is based on these observations and quantitative and qualitative data. This chapter is divided into three sections. The first section offers an overview of the current situation of solid waste management in the three communities in Suva and

reveals its weaknesses and strengths. It includes solid waste collection together with disposal and storage methods. The second section examines the attitudes of participants towards solid waste handling and their level of awareness. The participants' perceptions are linked to the social background of the community. The reasons for the community's low capacity for dealing with the problem of solid waste are investigated. The third part of this chapter reveals a selection of ideas for possible actions, to improve the current solid waste management at community level. The key point is that public-private-civic relationships need to be established, in order to find appropriate solutions.

6.1.1 Collection

Regular solid waste collection is vital for the management of solid waste in communities. In Suva, the study area for this research, solid waste was collected three times per week (Monday, Wednesday and Friday) by the Suva City Council. Many settlements did not benefit from this service. In particular, the rising numbers of illegal settlements, the so-called squatter settlements, did not generally benefit from collection services. One reason for this is that illegal settlements did not pay city rates, which include urban services. Another problem can be seen in the fact that settlements were often inaccessible for the municipal collection vehicles, due to a lack of well-maintained roads. Settlements on the fringe of the city might also have been neglected by municipalities, due to distances, which made the collection expensive. Constraints on financial and human resources limited the ability of the Suva City Council to serve every household.

The communities in this study had been developed on informal land, which has therefore influenced the quality of urban services. In Lalilagi, solid waste had only recently started to be collected by the Suva City Council, since the construction of a new road next to the settlement. In this community, residents either put their rubbish into plastic bags on the pathway next to the road (See Plate VI-1, VI-2), or they threw it into the few waste care containers, which had been provided by the Suva City Council. Interviews revealed that community members did not pay a collection fee and hence by law they were not entitled to the provision of these urban services.

Plate VI-1: Rubbish bags at the main road in front of Lalilagi

Plate VI-2: Green waste and other waste have been put onto the pathway to be collected

As seen in the case of Lalilagi, residents in Namadai benefited (three times per week) from a solid waste collection by the Suva City Council. However, in Namadai the main areas of land had already been subdivided and sold to the squatters. Therefore, at the time of this study many residents in this community paid for urban services, and therefore they were entitled to solid waste collection. The construction of a new road next to the developed area had made door-to-door collection possible for residents living near to this road (See Plate VI- 3, VI-4). Nevertheless, this collection only applied to a few residents since most residents did not live directly near this road.

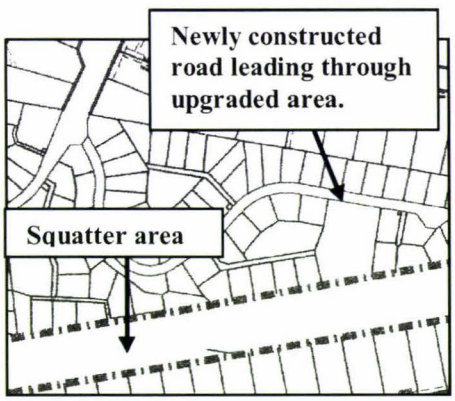


Plate VI-3: Part of map of Namadai

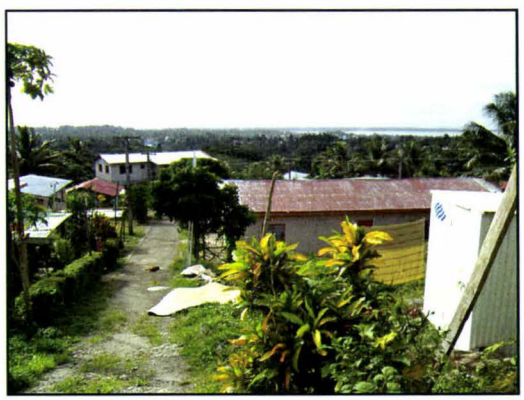


Plate VI-4: Newly constructed road through Namadai

People living in the squatter area of Namadai, illustrated in Plate VI-3, had to bring their waste to the newly constructed road. As demonstrated in Plate VI-5 and VI-6, a narrow pathway connected the squatter area with the main road and the upgraded land plots. Since the Suva City Council trucks were unable to drive through the squatter area, due to a lack of suitable roads, people put their waste either at the kerbside at the main road, or they threw it onto the wooden platform at the entrance of the squatter settlement (See Plate VI-6). Residents in the squatter area did not pay for urban services, unless they had already bought a piece of land in the newly developed area.

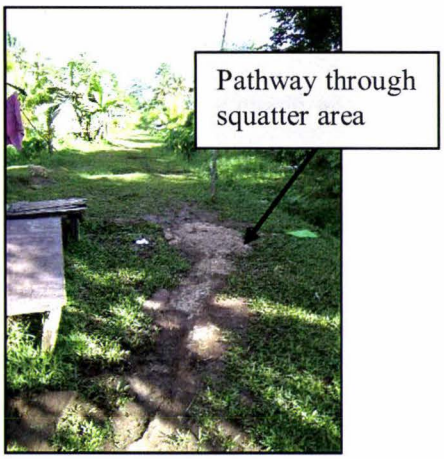


Plate VI-5: Pathway through the squatter part of Namadai

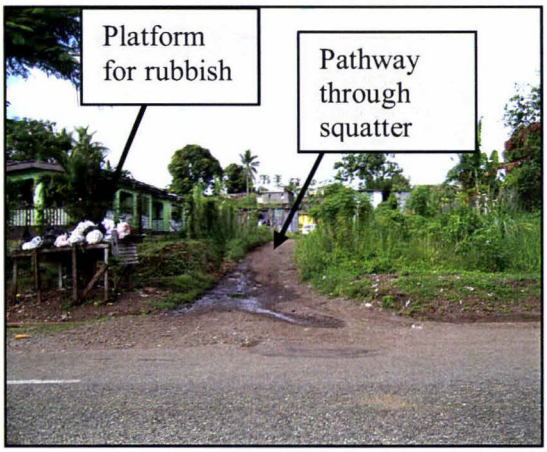


Plate VI-6: The entrance to the squatter part - on the left side is the wooden platform for rubbish

Muanivatu did not benefit at all from Suva's solid waste collection system. Although the community was situated next to the main road and the Suva City Council passed the settlement three times per week, community members had to deal with their solid waste on their own. Only two participants revealed, in individual interviews, that they put their rubbish bags onto the main road, pretending it was rubbish from rate payers living on the other side. As in the case of Lalilagi – and to some extent Namadai – the residents of Muanivatu did not pay for urban services.

Interviews indicated that the majority of the participants used existing solid waste collection services. However, in all three cases, kerbside collection was the most commonly used form (See Section 2.1.2). This means that residents had to walk to the nearby main street outside the settlement, in order to put their rubbish next to the road. Collection points were not distinctly marked, except in the case of Namadai, where a wooden platform for waste had been placed at the main road. In Lalilagi, the Suva City Council had provided skip containers, which could also be used by the residents. Door-to-door collection was only conducted in Namadai for residents living next to the newly constructed road. Some participants complained, during the interviews, about the fact that they had to walk so far to take their rubbish to the collection points. As a consequence, many residents used, in addition to the collection service, other ways of disposing their rubbish. These methods, which were often easier and more convenient for the residents will be discussed in the following section.

6.1.2 Disposal

Communities with irregular or no solid waste collection have to find other ways of dealing with their solid waste. As explained in Section 2.1.3, open dumping is one of the most commonly used methods in the cities of developing countries. Referring to the definition in Section 2.1.3, "an open dump is an area of land where uncontrolled deposition of waste materials occurs" (McDougall et al., 2001, p. 117). Interviews and observations revealed that in all three communities, dumping was frequently used to dispose of waste. In Muanivatu, where solid waste was not collected by the Suva City Council, the majority of participants stated that they used the mangrove swamp next to the community as a dumping place for most of their waste (See Plate VI-9). However, dumping, as a common waste disposal technique, was not just unique to communities without solid waste collection services. Interviews and observations revealed that uncontrolled dumping of waste was also a common occurrence in Lalilagi (See Plate VI-7) and Namadai (See Plate VI-8). Although the number of participants in Lalilagi and Namadai, who stated that the dumping of rubbish was in much smaller amounts than that in Muanivatu, from the observations it can be assumed that the official amount of rubbish dumped was much higher than the figures obtained in this research.

Plate VI-7: Waste dump in front of house in Lalilagi

Plate VI-8: Waste dump in front of house in Namadai

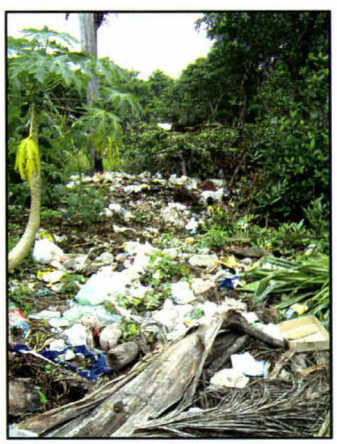


Plate VI-9: Waste dump in the mangrove swamp in Muanivatu

The dumping of waste is not only an aesthetic issue but it can also have negative effects on the environment and health of the local population. Referring to the risks of landfills, discussed in Section 2.1.4, it can be noted that, due to chemical and biological processes in the dump, gases such as methane and carbon dioxide are created, which are responsible for bad odours. The leachates produced can contaminate soil and

groundwater, which can then affect nearby rivers and fresh water sources. Another problem of waste dumps is the fact that light materials can be displaced by wind and storms, and then remains as litter on the ground within the community area.

As explained in Section 2.1.4, uncollected waste, in the form of dumps and litter, attracts scavenging animals and rodent vectors, such as flies, mosquitoes and rats. Wet conditions can provide convenient breeding places for the creation of vector-related diseases, which can be easily transferred to humans. The existence of flies, mosquitoes and rats was observed in all three case studies: not only in the outside environment near waste dumping places, but also inside the houses of some community members. These animals were a constant nuisance for everyone living in the households. Swampy grounds and frequent rain was common in all three communities which can increase the likelihood of the development of vector-related diseases. Due to constrained access to water in all three communities, residents stored water in open buckets and bottles. It can be noted that this type of action can exacerbate the creation of vector-related diseases.

In addition to dumping, another popular disposal method in these communities was to burn and bury household waste. Observations and interviews indicated that residents from all three communities burned garden waste, together with paper, plastics and other flammable waste. Waste dumps were set on fire during the day (See Plate VI-11), and during the evening hours (See Plate VI-13). A participant from Lalilagi pointed to the problem that *"people burn everything with plastics and leaves"* (See Plate VI-14). As pointed out in Section 2.1.4, the emission of dangerous gases can have negative implications on the health situation of residents living next to the burning dumps. In particular, vulnerable residents, such as children and sick or old people are at high risk. Spreading fires is another problematic consequence of burning waste. Remainders of burned materials could be found on the ground of settlements (See Plate VI-10). This was not only an eyesore, but also a health hazard for everyone living in these communities, especially the children.

Plate VI-10: (top) Remainders of burned waste in Lalilagi
Plate VI-11: Burning of waste in front of a participant's house in the upgraded part in Namadai

Plate VI-12: Incinerator in Lalilagi

Plate VI-13: (top) Burning of waste in the evening - in front of a participant's house in the squatter part in Namadai
Plate VI-14: Waste dump frequently set on fire in Namadai

Lalilagi even had a small incinerator, which had been delivered by the Health Department and the incinerator could be used by every resident (See Plate VI-12). A participant explained that this was a good way for community members to dispose of their waste. It can be noted that the use of the incinerator had the advantage that the fire could be controlled and was unlikely to spread. However, as pointed out in the previous paragraph, emissions produced by burning waste might have negative implications on community members' health (See Section 2.1.4). Shifting end disposal methods, such as incineration into communities cannot be considered as an alternative. Community members did not possess the technology and knowledge to control the produced emissions. Municipal authorities need to take on their role as providers of urban services, in order to create healthy waste disposal solutions.

The burying technique did not have widespread use, compared to the burning technique. However, it was still a common method to dispose of waste in all three communities: except in the upgraded part of Namadai. Some participants stated during interviews that they dug a hole in the ground and put glass, tins, cans and plastics inside and covered it up with soil. Often, the holes of pit toilets were used to dispose of broken glasses. One participant said that she buried glass, because it was much safer for children to run around, when the ground was free of sharp material. In the upgraded part of Namadai only one participant stated that burying was a way for him/her to dispose of household

waste. The risk of burying waste in the soil is significant, since it can lead to underground water contamination. The future exposure of buried materials through soil erosion is another problem, since the materials remain as litter on the ground.

As emphasised in Section 4.2.3.1, the major component of solid waste in Fiji is biodegradable waste (more than 65% of the weight) (Government of Fiji, 2006, p. 10). According to a study of the Western dumps in Fiji, 60% of the waste is organic material (Government of Fiji, 2006, p. 65). In the communities researched in this study, organic material, such as food scraps and garden waste, constituted a large part of household waste. As discussed in Section 2.1.5, this could be reduced through recycling and composting. The majority of participants indicated that they used food scraps, including the peelings from cassava, potatoes and other vegetables, for the purpose of making soil fertilisers for their gardens (See Plate VI-15-17). The most common technique was to spread the leftovers directly over the plants (See Plate VI-15). However, due to limited space in the settlements, the cultivation of vegetables and flowers was only conducted to a small extent. Composting is a good alternative to the disposing of organic waste in urban communities. Nevertheless, in Section 2.1.5, it is mentioned that a lack of knowledge about backyard composting can lead to bad odour, the attraction of animals and the creation of contaminated leachates. A thorough separation of waste materials into organic and inorganic waste is vital, in order to avoid environmental and health risks.

Plate VI-15: Cassava plants in between rubbish in the squatter part of Namadai

Plate VI-16: Compost pile belonging to a participant in the upgraded part of Namadai

Plate VI-17: Garden and compost in the squatter part of Namadai

Another method for disposing of leftovers was to feed them to domestic animals. Many participants stated that they gave fish and meat bones and other food leftovers to dogs, cats and birds. Some community members in Muanivatu stated that they fed their leftovers to a pig, which was being raised in the community.

As mentioned in Section 2.1.1, the drift to a Western way of life and an increase in the number of industries has changed waste composition in developing countries. Fiji is one of the countries which have heavily embraced a "consumerist lifestyle" (Government of Fiji, 2006, p. 10). In order to satisfy the new needs of the growing population, food has been increasingly imported. This has given rise to the disposal of large amounts of packaging materials, such as PET-bottles and paper. Fiji only has a few recycling operations in place, which collect paper, aluminium and glass and plastic bottles (Government of Fiji, 2006, p. 94) (See Section 4.2.3).

Interviews revealed that the majority of the participants sold plastic and/or beer bottles and/or aluminium. In all three case studies, the selling of recyclable waste was conducted on an individual basis. Only a few families collected together and shared the profit. Generally every household or family had its own way of approaching separation and selling. Some people stored their recyclable material next to their house in big plastic bags, which were provided by the Coca Cola firm. Participants stated that after a certain amount of time they sold the recyclable waste, either directly to recycling companies or to intermediaries (See Plate VI-18-24). The intermediaries were mostly young boys, who picked up the bags from the settlements, in order to sell it onto the recycling industries (See Plate VI-21). Many of the participants stated that selling recyclable waste was an option to increase their household income. However, some participants described this activity as difficult and not economically viable. They preferred to give their bottles to neighbours or throw them away. The disposal of recyclable waste, through the use of private markets, by Fiji's households is still in the development process. This is also because the capacities of recycling operations are not sufficient enough to cover the whole population and there is a lack of linkages to public waste collection services (Government of Fiji, 2006, p. 94).

Plate VI-18: (top) A participant in Lalilagi collects coke bottles and brings them to the factory
Plate VI-19: A young woman in Muanivatu shows collected aluminium cans

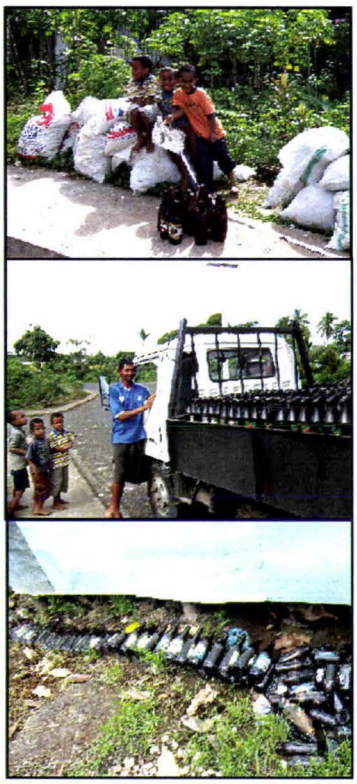


Plate VI-20: (top) Young boys are waiting for the truck, in order to sell the empty beer bottles.
Plate VI-21: (middle) Middlemen in front of Namadai buy beer bottles from the settlements and bring them to the factory
Plate VI-22: Beer bottles stored next to the house

Plate VI-23/24: A participant in Muanivatu collects recycable waste and brings it to the factory

The reuse of plastic bottles and other types of waste such as glass, for water, oil, kerosene, tea and juice storage, was common amongst the participants in this research. Some participants pointed out that they could not sell plastic bottles, since they needed them for storage of their water (See Plate VI-25). The reason for that was the unreliability of the water in these communities so, as a result, residents filled up bottles and buckets with water each morning. As already discussed, open bottles and buckets containing water can be a source of vector-borne diseases.

Plate VI-25: Households filled water in coke bottles to be prepared for the closing of the tabs

A serious problem in the communities was the unsafe disposal and storage of construction materials, such as vehicles, scrap metal, tyres and white goods. Fiji has no

regulations in place which control the handling of these materials. Only a few companies have developed strategies to integrate recycling methods into their industries. Re-usable parts of cars can be brought to Western Wreckers (Government of Fiji, 2006, p. 70), but the car bodies generally remain in the communities. Scrap metals (Fiji) Ltd. takes certain types of non-ferrous metal (Government of Fiji, 2006, p. 94), and Waste Recyclers (Fiji) Ltd. takes some white goods (Government of Fiji, 2006, p. 92). During the fieldwork, public collection services did not have any developed recycling systems for these materials; the items usually remained in the back yards of the communities and took up valuable space (See Plate VI-26-28). The release of hazardous substances is a danger for the environment and residents and especially for children, who use these materials as play toys.

Plate VI-26: White goods, such as fridges in the back yards of the squatter part of Namadai

Plate VI-27: Used car in the back yard of the squatter part of Namadai

Plate VI-28: Building materials in the back yard of the squatter part of Namadai

6.1.3 Storage

A lack of safe storage facilities for solid waste produces health risks for residents and waste workers (See Section 2.1.4). For the communities studied, unsafe storage was identified as a severe problem. Only a few residents kept their household refuse in a proper plastic or metal bin with a lid. The majority used plastic bags or open bins to store their household waste (See Plate VI-29, 31). This usually leads to litter on the roads which needs to be picked up (See Plate VI-30).

Plate VI-29: Solid waste collection point at the main road in Namadai

Plate VI-30: A resident in Namadai picks up waste from the ground

Plate VI-31: Bins without cover used by a participant

A problem created, through unsafe storage of waste, was the attraction of animals, such as dogs and cats and also flies and mosquitoes. In Lalilagi and Namadai, participants stated that, particularly at waste collection points, straying animals were attracted by open plastic bags full of waste. One of the participants from Lalilagi explained that the problem was that residents *"do not put waste in time"* at the collection points. Instead, people put their plastic bags full of household waste on the pathway, either a few hours before or after the official waste collection. This produced a flow of waste onto the pathways and at the side of main roads (See Plate VI-32-34), which gave scavenging animals time to remove the food leftovers (See Plate VI-32).

Plate VI-32: Waste collection day in Namadai - dog rummages in the rubbish at the collection point next to the main road

Plate VI-33: Waste collection day, at the main road next to Namadai - the side of the road is littered with waste

Plate VI-34: Small pathway to the squatter settlement is full of used nappies

The provision of storage facilities by public authorities usually depends on existing financial capacities. Within the communities studied, Lalilagi was the only area provided with skip bins, which were situated along the main road. One participant complained that after two days the skip bins provided were already overfilled. The capacity of the bins was not sufficient enough for the number of users. A resident of Lalilagi explained that people from other areas dumped their waste into these skip bins. This put additional pressure on the waste management in this area. Nevertheless, the skip bins offered a cleaner possibility for the settlement to dispose of its rubbish.

The availability of skip bins is dependent on funding. In Suva skip bins were not provided for every community. Instead, other alternatives were provided, such as a wooden platform at the main road next to Namadai. Residents from the squatter settlement could leave their waste on this platform for collection (See Plate VI-35). A few residents from the upgraded part of Namadai had copied this idea, and they had constructed smaller versions for their own household waste (See Plate VI-36). The

construction of the platform was an attempt to keep the environment clean and free of scavenging animals. However, there remained the problem of waste being littered throughout the area and its eventual exposure, due to weather.

Plate VI-35: Wooden platform for the rubbish of the squatter area in Namadai

Plate VI-36: Small plastic (left) and wooden platform (right) constructed by households living in the upgraded area in Namadai

Solid waste collection is one of the core elements of waste management systems in developing countries. The analysis revealed that Lalilagi and Namadai benefited from regular solid waste collection by the Suva City Council, although the majority of the residents did not pay any fees. The settlement of Muanivatu, however, was not provided with any solid waste services. The dumping, burning and burying of waste were common waste disposal techniques used in all three communities. Literature showed that the latter waste disposal methods can have negative effects on the local environment and the health of the residents (See Section 2.1.4). The lack of safe storage facilities for household waste and other materials, such as scrap metal, tyres and white goods put additional pressure on the community's wellbeing. Innovative solutions, such as composting and recycling were only conducted to a small extent and generally on an individual basis. After investigating the current solid waste system in the three communities, the following text will focus on the residents' attitudes towards solid waste management.

6.2 Attitudes towards Solid Waste Management

As pointed out in Section 2.2.4, the attitudes and behaviour patterns of residents are significant for the success of solid waste management in an urban community. This in turn, is influenced by social and cultural factors. This section presents some of the attitudes towards solid waste handling, expressed by community members. Furthermore it looks at the social-cultural background of these communities and attempts to give explanations for certain perceptions and waste handling patterns.

6.2.1 Awareness

In order to investigate the level of awareness in the communities, households were asked if they saw solid waste as a problem in their community. Figure VI-1 presents the results from this question, using percentages. In total, approximately 77% of all participants gave a positive response (=Yes). In Muanivatu, where 94% identified solid waste as a problem, participants characterised their community as *"disgusting"*, complaining about the dumping of rubbish in mangrove swamps, behind their houses and in drains. One participant said, *"keep environment clean, take waste to proper rubbish dump, because it will spoil our health"*. In Lalilagi, 80% of the participants stated that solid waste was a problem. One participant said that in his/her opinion it was a *"big problem"*. Another person saw it as *"pollution"* and complained about dogs that carried waste around. Another participant became really vehement and responded: *"Oh Yes, it is a problem"*, when he pointed to the high number of mosquitoes and flies in the community. A woman stated *"it looks bad outside...people have to be educated about the disadvantages of rubbish"*. In Namadai 66% of all participants recognised solid waste as a problem. Participants complained about the bad smell produced from *"too much waste lying around"* and from *"the main road where plenty of dogs spread around waste"*. One participant stated that the community looked *"disgusting"*, since *"people throw waste around"*. Many people pointed to the connection between the occurrence of diseases and unsafe waste handling.

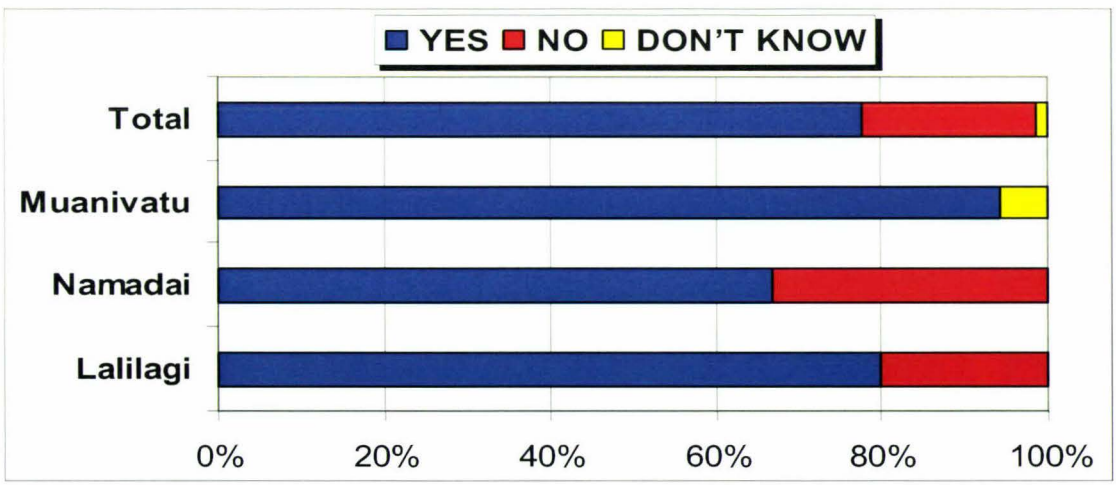


Figure VI-1: Percentage of participants who saw solid waste as a problem in their community
Source: Fieldwork (2006). See Appendix 4, Table H.

Findings gained from the in-depth questionnaire[26] showed that around 43% of all participants felt very strongly about the implications of thoughtlessness and unsafe handling of solid waste in their settlement (See Appendix 4, Table K, Q1). Around 91% of all participants were aware of the fact that waste should not be thrown into the surrounding environment (See Appendix 4, Table L, Q6). Furthermore, 98% agreed that littering and uncontrolled rubbish produces negative effects on health (See Appendix 4, Table N, Q10).

A simple form of back yard composting was used by approximately 73% of the participants (See Appendix 4, Table K, Q3). Another positive point to note is that the majority of participants sold recyclable waste, such as plastic bottles and aluminium cans to a factory or to middlemen, in order to increase their income. Reusing of plastic bottles or other types of waste was undertaken by nearly 94% of the participants (See Appendix 4, Table K, Q2). However, it must be said that the reuse of plastic bottles for the storage of water was generally undertaken by the participants because of the unreliability of tab water. Nevertheless, the application of reusing and recycling methods showed that community members recognised the value of certain types of waste.

The data presented suggest that residents were aware of the fact that their current type of solid waste handling produces environmental and health problems for their community. However, interviews and observations revealed that the majority still applied traditional, solid waste disposal methods, such as burning, burying and dumping within their communities. In the following paragraphs, reasons for the application of traditional disposal methods, identified in the communities studied, are explained. Summarised, these reasons can be pointed out as: Lack of disposal facilities close to the participant's house, carelessness, and a lack of knowledge relating to the consequences of using unsafe waste disposal methods.

In-depth questions revealed that approximately 83% of all participants agreed that some types of waste could be burned in the community (See Appendix 4, Table M, Q7). One of the participants from Lalilagi mentioned that bad weather, such as rain, was often a

[26] Participants were asked to state their agreement or disagreement to a statement (See Appendix 2, Table G and Section 5.2.3).

reason not to bring the rubbish bags to the collection point but instead he dumped or burned it close to his house. Another explanation was provided by participants from Namadai, who stated that it was just easier to burn or to bury waste or to dispose it on a waste dump near to their house, especially, if it was late in the evening. One of the participants from Namadai said that he/she sometimes burned waste, in order to decrease the weight of the rubbish bag that the participant had to carry to the collection point. Long walking distances to the collection points, due to the lack of roads in the communities was often a reason for many participants to use traditional disposal techniques, such as burying or burning, instead of taking the waste to the collection points.

Interestingly, it was not only communities, without regular or even irregular solid waste collection that used unsafe disposal methods, such as burning, burying and dumping. Those unsafe methods were also carried out by households that benefited from a regular solid waste collection. Interviews with participants in the upgraded part of Namadai revealed that every participant burned waste from time to time. This included not only garden waste but also paper and other flammable wastes. Some of the participants explained that, due to miserable road conditions, the Suva City Council did not pick up the rubbish from their steps. Therefore, participants used traditional methods, which were more convenient for them. Surprisingly, the burning and burying of waste was even conducted by households who benefited from a door-to-door collection, three times a week.

In addition, during walks through the communities, plastics, paper and other types of waste were found littered on the ground; in particular, used nappies contributed to a smelly and hazardous environment in the settlements (See picture next to text). As stated in Section 2.1.1, a common problem in developing countries is the mix of faecal waste with other types of waste. Approximately, 77% of all participants agreed that faecal waste, such as nappies, can be mixed with other wastes (See Appendix 4, Table M, Q9). One participant explained that, in the past, people used reusable nappies. However, she also mentioned that these days it is easier for the residents to buy disposable nappies and just throw them together with other

waste in a bin or plastic bag. The mix of household waste with faecal waste is problematic since animals can be attracted, which in turn can transfer diseases to residents (See Section 2.1.4).

The lack of facilities for the disposal of hazardous materials, such as batteries, paints or chemicals, presented a significant potential risk for the local population (See Section 2.1.1). The burning or burying of hazardous materials in the community could create dangerous emissions, which could affect residents' health. The use of organic waste mixed with hazardous materials for composting could also lead to the contamination of food (See Section 2.1.5). In theses communities, 47% of the participants agreed that dangerous waste can be mixed with other waste (See Appendix 4, Table M, Q8). Their lack of knowledge about proper storage and disposal of hazardous waste is concerning. Although, many participants stated that they rarely used products containing hazardous materials, it was obvious that increasingly, products with hazardous substances could be found in the communities studied. A serious problem, mentioned in Section 2.1.1, is that low-income settlements are often overlooked by politicians, in terms of hazardous waste management (Sikabongo, 2003, p. 349). At the time of this study, the disposal of hazardous materials in Fiji was only poorly managed (See Section 4.2.3.1).

In addition to knowledge gaps, the careless attitudes, embraced by community members, was another problem recognised during this research. Several participants complained, during the interviews about the careless treatment of household waste in their communities. A participant from Lalilagi explained that some people *"do not care"*, *"they throw rubbish everywhere"*. Another participant from Muanivatu admitted *"we do not keep the environment clean"*. From the same community, a resident explained that, due to muddy conditions in the settlement, it made no sense to clean up the community, since after a short time it just looked dirty again. Although participants were aware that their current solid waste handling resulted in risks for their community life, unsafe storage and disposal practices were common in all three case studies. An important factor, to help increase awareness of these risks is to enhance the communities' knowledge about sound solid waste management.

6.2.2 Education

Education is an important factor, which can change certain behaviours and attitudes. In Section 3.1.2.3 it was argued that education and the transfer of information can increase awareness and therefore it can motivate people to take over responsibility towards the development of their lives. Research in the communities showed that a lack of understanding and knowledge about sound solid waste management and also relating to the effects of unsafe disposal methods existed. The burning and burying of waste, for instance, was still accepted and generally, it was positively perceived by the participants. For example a participant suggested burying all cans, tins and glass bottles: *"put empty tin in hole, and put some stones over it"*.

In this research, every participant agreed that children should learn how to manage waste and the effects of uncontrolled waste, when they were at school (See Appendix 4, Table O, Q13). One participant, from the squatter part of Namadai, felt very strongly about the lack of education concerning environmental issues. She admitted: *"we did not teach our children"*. According to her, society, particularly parents were responsible to teach their children to *"pick up waste, even if it is not theirs"*. She underlined that children need to be taught to use their common sense and not to litter the environment.

Participants revealed that courses at Fiji's schools still encouraged students to use solid waste disposal methods, such as burning and burying. These practices have then been transferred to the younger generation and presented as basic knowledge for communities. Razia Zariff from the Department of Environment confirmed this information (Interview, June 4th 2006). Zariff explained that, due to scarce human and financial capacities, current curricula were not up-to-date on sound solid waste handling practices. Furthermore, Zariff emphasised that the change of national curricula was a long and difficult process, which would take time. The failure of policy makers, to implement environmental issues in formal educational institutions, is a problem for the development of sustainable urban communities. Schools represent important formal institutions which can affect positively attitudes and perceptions of young children. Without having updated the schools' core curriculum, awareness raising programmes, initiated by governments, can only achieve minimal effects.

6.2.3 Community Cohesiveness

Keeping the environment clean and organising proper solid waste management in a community requires collective actions (Pargal et al., 1999, p. 1). In Section 3.1.2.3, community cohesiveness was identified as an important factor for the realisation of collective actions, such as solid waste collection. Furthermore, it was argued that high social diversity in a community can negatively influence community cohesiveness, which in turn can lead to a decrease in the potential for collective action. In Section 3.1.2.3, it was stated that communication is a significant tool to build up trust between community members and to regain community cohesiveness. Riley and Wakely (2005, p. 35) stress that "the better the level of communication and understanding in a partnership, the more it can achieve." Active communication in a community is important, in order to solve conflict and promote change.

In this research, participants were asked whether they talked about the problem of the improper handling of solid waste with other community members. Figure VI-2 illustrates the result of each community.

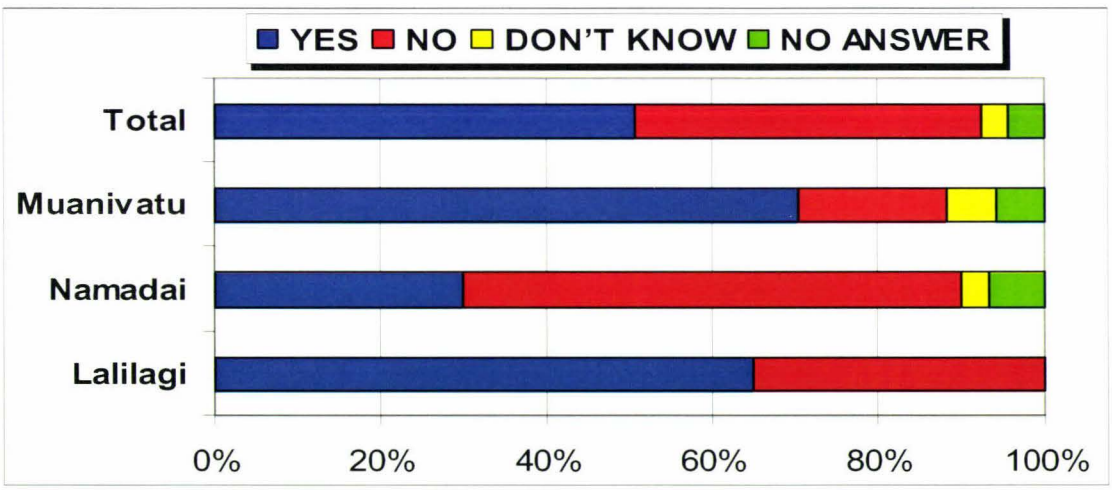


Figure VI-2: Percentage of participants who talked about solid waste in the community
Source: Fieldwork (2006). See Appendix 4, Table I.

According to Figure VI-2, approximately 50% of all participants stated that they talked about solid waste in their community. On the other hand, approximately 41% said that they did **not** talk about waste at all with other community members. Looking at each community, different trends can be identified. In Muanivatu and Lalilagi, over 65% of the participants in each settlement stated that they talked about waste in their

community. In Lalilagi 35% and Muanivatu, 17% of the participants stated that they did **not** talk about solid waste. In Muanivatu approximately 5% did not answer this question. In Namadai, approximately 30% of the participants said that they talked about waste in their community, whereas approximately 60% disagreed. In this community approximately 6% did not answer this question.

The latter figures were analysed, in connection to the outcomes of the question about whether participants saw solid waste as a problem in their community (See Appendix 4, Table J). Results are presented in Figure VI-3. In total, 75% of the participants, who said that waste was a problem in their community, stated that they talked about it with other community members. For each community the following figures are valid: Lalilagi = 68%, Namadai = 40% and Muanivatu = 75% (See Figure VI-3).

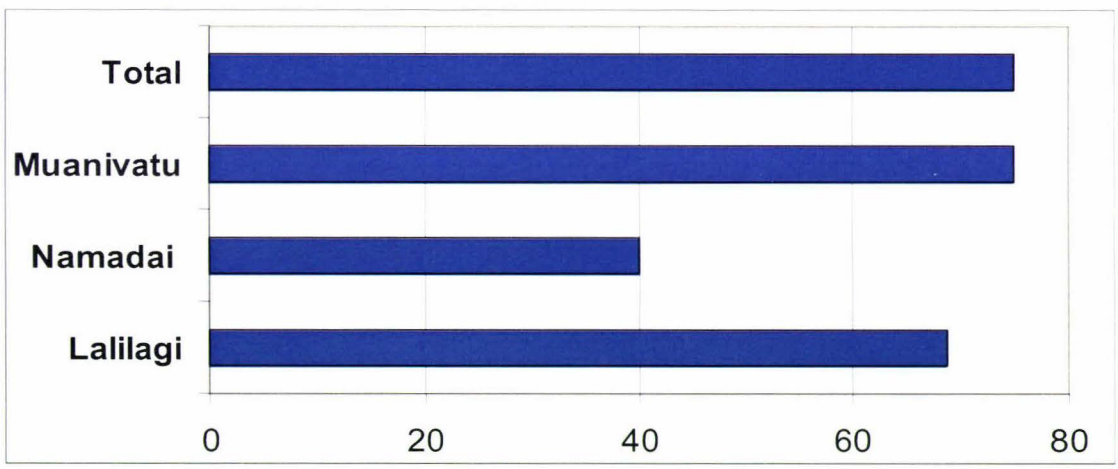


Figure VI-3: Percentage of participants who saw solid waste as a problem and talked about it
Source: Fieldwork (2006). See Appendix 4, Table J.

The figures suggest that the majority of people, who thought that solid waste was a problem for their community, communicated their opinion to other community members. Namadai is an exception and it shows, with only 40%, a low percentage of people who stated that they talked about the issue of solid waste handling (See Figure VI-3), even though they saw it as a problem for their community. The reason for this could lie in the fact that Namadai's community was divided into an upgraded part and a squatter part, which therefore created inequality, particularly when people could not afford to buy a piece of the upgraded land. This social diversity and inequality in turn could have had a negative influence on communication. Although the data shows that, in the other two communities, many people talked about solid waste, qualitative data

revealed that the quality of the communication was poor, and discussions had not led to any improvements. The meaning of the term 'talking' depended on the interpretation of every participant. It could have meant to 'chat', 'complain', 'discuss'. It was, therefore, important to find out 'with whom' the participants shared their opinion. It could have been an informal chat with a neighbour, a complaint or even a discussion in a community meeting.

In all three communities, the majority of participants revealed that their way of talking about solid waste in their community was to complain about litter and the careless storage and disposal of solid waste. A participant from the upgraded part in Namadai stated that he/she talked about littering with other community members but *"they do not care about it"*. In her eyes, to talk about the handling of solid waste was *"wasting time"*. Generally, complaints were made in an informal way, through chats with neighbours and other residents. Community meetings were another forum for communication within the community. In Muanivatu, a meeting was held once a month concerning general community issues but no further actions had been taken to address improper solid waste handling. In Lalilagi, participants explained that a church group met regularly and that sometimes they brought up the issue of solid waste, in particular, the problem of littering and dogs but no actions had yet been initiated. In Namadai, there was a church group but it rarely discussed issues such as solid waste. It can be noted that, even though many participants stated that they talked about solid waste, this communication had not initiated any actions. In the following paragraphs possible reasons for this situation are examined.

Barr (2003a) points out, that communication in Fiji has often been practiced by a top-down approach. According to Barr (2003a), a "culture of silence" has been created throughout the past, where "people are meant to obey blindly whether they like it or not. It is operative in the family, in education, in the village, in the church and in the nation as a whole". Barr (2003a) comments that people "wait for those in authority to say something or give directions for something to be done. They are not meant to take the initiative themselves." This attitude has created passive and dependent communities in Fiji that are not actively involved in community life, unless other people, generally community leaders give the orders to do so. In the communities studied, interviews showed that many participants embraced the latter mentioned attitude. Generally this

was expressed by the participants by saying that someone else from the community should take the lead in the settlement and should start initiating projects to improve the community, including cleaning campaigns. The Community Health Worker of Lalilagi made it clear that, in order to activate change, they first needed to *"build a community"*. She added that it was important to *"get some strong men and women"*, and *"to choose the right person"*. In her opinion, the community was only able to promote change through the leadership of some powerful people. The *"right person"* needed to be found who could stand up and bring the community together.

This 'culture of silence', as referred to by Barr (2003a), has been enforced through external pressures, such as rapid urbanisation and fast social changes in urban settlements. High social diversity has led to the disintegration of traditional structures and social networks and to the emergence of tensions between different social, religious and ethnic groups. The Community Health Worker of Lalilagi stated that, many people did not talk about problems such as waste handling because *"people come from different islands"*. This underlines the fact mentioned in Section 3.1.2.2, that communities consisting of a great deal of migrants coming from different places, show generally low community cohesiveness and hence these communities have difficulties to establish collective activities.

In the communities studied, in particular, difficulties between Fijians and Indo-Fijians were common. Fijians were usually the highest number in a community. This higher proportion might have been intimidating for many Indo-Fijians. Furthermore, it is also possible that Indo-Fijians were perceived by some community members as a burden on the community. The following examples will show that, due to the breakdown of traditional structures, such as leadership or community meetings, hitherto collective actions had decreased or had stopped in all three communities.

Muanivatu was the only community, from the three case studies, which had a community leader and conducted regularly community meetings. The other two communities had no official community leaders. Parts of the community got together in church groups. Since different religious groups lived in the community, people got together in their own social groups, which in turn might have enforced the decrease of community cohesiveness (See Section 3.1.2.2). In all three settlements, participants

stated that the community used to have clean up campaigns. However, at the time of this study, no communal cleaning activities could be identified, except in the squatter part of Namadai, where some young Indian residents cleaned up parts of the community every Sunday. According to some participants from Lalilagi, a youth group used to regularly clean the community in the holidays. The Community Health Worker in Lalilagi explained that the community members used to clean up the community and plant flowers and vegetables along the road, but these days *"strong men and strong women are all gone"*. Since the community no longer had a strong leader, these activities had stopped. Another participant from this community stated that *"leaders do not talk to people hard enough"*. It was not clear which leader this participant referred to but, given the fact that other participants stated that this community only had a church leader, it must be assumed this was the leader mentioned. In Muanivatu, a participant stated that the community used to have a waste committee. In Namadai, a participant from the squatter area explained that, in the past when they had a community leader, people were told off by the leader and got the order to clean up the community.

The fact that all three communities had been established on squatter land, was a destructive influence on community cohesiveness and hence on collective actions. Many participants revealed that, in view of the fact that they lived as 'squatters' in this settlement, they felt they had no right to make complaints or encourage other people to change their behaviour. In the community of Namadai, one participant, living in the squatter area, stated that the community's illegal status was a reason for not talking about waste. This participant's reaction to the question, about whether he/she thought that the community could do something to change the situation with solid waste was as follows: *"I cannot do much"*. The disregard by urban service providers due to the illegal status of these communities has created a negative and passive attitude on the part of the participants.

The passive attitude of these communities was enforced by the lack of a relationship with governmental authorities. The absence of willingness to work with communities, in particular with informal settlements, had created a gap between the public and civic sector. This could also be seen in the lack of partnership between NGOs and the communities. Participants mentioned that they had the feeling that governmental officials and organisations such as the Suva City Council and the Health Department did

not invested enough time to find out about the community's problems. Participants revealed that there was an absence on personal meetings and discussions by public organisations and NGOs. Communities were made to victims of bureaucratic decisions, which were taken without any consultation with them. The technocratic approach of many municipalities, to subjects such as solid waste management, did not focus on the underlying causes for the created problems. For example, Lingam stated that separating at source and recycling will be promoted in the near future through media and that transfer stations will be constructed to encourage recycling by public solid waste collection services (Lingam, D., interview: June 21st 2006). However, this research showed that communities were still struggling with the implications of unsafe waste disposal methods, through dumping, littering, burning and the burying of waste in the community. The question arised during this research: Why do Fijian's governmental authorities spend funds on the establishment of recycling systems, when many settlements do not even benefit from a solid waste collection service? Policies in Fiji Islands should prioritise on improving the present facilities and solid waste collections in communities.

Another important point is that governmental authorities have frequently not recognised that, in order to establish safe solid waste handling in communities, a holistic approach has to be taken. The ranking exercise conducted, during fieldwork in the three communities, revealed that issues, such as access to land, electricity, water, etc. led the ranking list of concerns in these communities. Even though solid waste was one of the main visible concerns in the communities studied, it has not such an immediate and devastating effect as, for instance, the scarcity of water or land. Therefore, the problem of solid waste was not considered as a high priority. However, concerns, such as the lack of land, affordable housing and the lack of basic infrastructure cannot be seen as separate from solid waste management. As a consequence, governmental authorities must initiate programmes which encourage a holistic view on urban problems, bearing in mind the interrelations between different basic needs.

6.3 Ideas for Improvements

This last section outlines ideas for the improvement of solid waste management at the community level. Participants were asked to think of possible actions which could be

taken by community members and also by municipal authorities, in order to improve solid waste handling.

6.3.1 The Role of Communities

Section 3.1.2 highlighted the importance of civic actions in the provision of basic services. It pointed out that civil society has a significant role to play in the development of growing cities. Around 98% of the participants agreed to the statement that communities must take actions to improve waste handling (See Appendix 4, Table N, Q11). A common opinion in all three communities was the fact that change could only be promoted through traditional structures, through leaders or other strong community members.

At the same time, the majority of the participants agreed that appropriate solid waste handling begins at an individual level. Participants stated that every resident should take care of her/his own compound and therefore contribute in their own way to a clean environment. Specifically, ideas for better storage and disposal of solid waste were stated by many of the participants. Some people said that they would like it if community members placed rubbish properly at the main road and used proper bins with a lid. In the upgraded part of Namadai, the participants suggested that more platforms should be constructed for solid waste at collection points, in order to keep dogs away from the waste.

One participant from Lalilagi had the idea that people should separate their waste, instead of putting it all together in one place. He pointed out that leaves should not be placed together with plastics. This would prevent people from burning toxic material, which could have a positive effect on the air quality. However, waste separation must be encouraged by solid waste collection providers. People must see a benefit in this action: otherwise, very few people will make the effort to engage in the separation of waste.

The use of leftover food as garden compost was seen as another option to decrease waste in the community. Although, constrained by the scarcity of land in the cramped settlements, composting is a positive idea to keep for future times, after the undertaking of development processes, such as subdivision. In Muanivatu, where solid waste was not collected at all by the Suva City Council, participants mentioned that the community

must stop throwing rubbish into the mangrove swamps. Suggested alternatives were to purchase an incinerator, or to create a proper waste dump for the community. One of the participants mentioned that it would be good to categorise different types of waste and put it into separate containers. It must be noted that communities without any solid waste collection have only limited possibilities to improve this situation on their own. The implementation of tools, such as an incinerator, a proper dump, or even containers, involves the use of financial means, which are often not available to these communities. In addition, the complexity of present household waste in the communities requires technical knowledge that, generally, can not be provided by the residents.

A frequently stated answer, given by participants, was that community members should get together in meetings and discuss current problems related to solid waste management in the community. A resident from the Muanivatu community said that community members should wake up and again start to be responsible for their environment. This was also expressed by a participant from Lalilagi, who said that *"the community should help each other"*. Community members suggested regular cleaning campaigns and the creation of committees for solid waste management, in order to keep the community clean.

Some participants suggested traditional techniques and methods, which could possibly solve problems in the short term, but which could not create long-term improvements. For example, participants from Lalilagi suggested burying all cans, tins and glasses. The creation of simple waste dumps and the burning of waste were also expressed suggestions, as a way to dispose of solid waste. One participant from Muanivatu stated: *"help each other to burn rubbish"*. This shows that a lack of knowledge about proper waste handling existed, which needs to be addressed, with the support of responsible authorities working in the public and private sectors.

Barr (2003a) critically points out: "Things will only begin to change when the people discover how to speak for themselves." As pointed out in Section 6.2.3, the influence of hierarchical structures has created communities which are passive and dependent on traditional structures such as leadership. Urban communities need to realise that some traditional structures are not appropriate in this day and age, for the requirements of present communities. New structures have to be established, which enable residents to

get involved in collective actions, with the aim of improving their community's well-being. Partnerships with the public and private sector are vital, in order to overcome barriers and to create sustainable solutions.

6.3.2 The Role of Public and Private Agencies

As highlighted in Section 3.1.2.3, partnerships with public and private agencies are important, in order to address urban poverty. The success of collective actions depends to a high extent on the recognition of the problem by local authorities. Examples showed that, in particular, civic actions in solid waste management require the advice and support of public and private organisations.

In this research, nearly all the participants agreed that it is important to involve the public and private sector and thereby create clean communities (See Appendix 4, Table N, Q12). One basic idea was the provision of regular solid waste collection. In Muanivatu, for example, solid waste collection was identified as a number one priority, since this community did not benefit at all of a solid waste collection service. In the other two communities, participants suggested that the frequency of the solid waste collection service should be increased. A participant from Lalilagi said that the collection truck should come every day. In Namadai, people demanded door-to-door collection. One participant highlighted that old and sick people often could not manage to bring their waste to the collection points, due to the long distance from their houses. The supply of skip bins and the construction of platforms for solid waste was another idea for bringing the community's waste under control and keeping the surrounding environment free of litter and animals.

A common constraint, which was discussed in Section 2.2.3, is the lack of financial resources in developing countries. In order to be able to increase collection services, funds have to be available for local authorities. It was mentioned, that often lower income groups cannot afford to pay waste collection fees, particularly charges by private companies. The research showed that around 71% of the participants were willing to pay at least 2 FJD per week for waste collection (See Appendix 4, Table L, Q4). As Lingam pointed out in the interview (June 21st 2006), it is vital that residents pay for urban services. However, affordable solutions have to be found, in order to reduce inequalities identified in this research. In Section 4.2.3.2, it was mentioned that a

separate garbage fee was introduced in Nasinu, Suva, as attempt to include informal settlements into the solid waste management system.

In order to promote change, there needs to be close cooperation between communities and responsible agencies. One participant stated that it is important to establish a connection with the Suva City Council and Health Department. More consultation and advice from public and private agencies were two main points expressed by the participants. This could be in the form of workshops or regular visits from people working in the Suva City Council and Health Departments. Information could be exchanged and this would educate residents in the proper handling of solid waste. The construction of street lights, the cutting of grass and a supply of gloves, garbage bags and forks, to clean up the community, were mentioned by participants as ways of supporting them. Another idea was the enforcement of stricter laws and higher fines for littering within the communities. Support for this initiative came from 60% of participants, who agreed that people should be fined if they dropped litter (See Appendix 4, Table L, Q5).

6.4 Summary

This chapter presented the findings of the fieldwork conducted in June/July 2006, in three communities in Suva. It began by exploring the strengths and weaknesses of the current solid waste collection, disposal and storage methods applied in the selected settlements. Based on interview responses and observations, it was revealed that, due to the inaccessibility of all three communities, municipal solid waste services did not manage to cope with the solid waste produced by the community members. It could be noted that, in two of the case studies, solid waste was mostly picked up from a main road outside the settlement and in Muanivatu the inhabitants did not benefit in any way from solid waste service. This chapter demonstrated that many community members applied unsafe solid waste disposal practices, such as the dumping, burning and burying of waste inside their community. Together with unsafe storage of household waste and special wastes, such as construction materials, tyres, scrap and white goods, which could be observed in the back yards, this chapter argued that unsound solid waste management in all three communities could lead to environmental and health risks in the future.

With a view to the importance of social and cultural factors in managing solid waste, this chapter examined attitudes towards solid waste management, expressed by the community members and public authorities. Figure VI-1 indicated that in all three communities, the majority of the participants recognised solid waste as a problem for their community. Furthermore, the in-depth interview revealed that participants were aware of the negative implications produced by litter and dumping. A positive development, noted in this chapter, was the usage of some regenerative practices, such as composting, and the collection and re-selling of recyclable wastes. However, these efforts were only conducted on an individual basis on a small scale, since at the time of this study Fiji did not have an integrated recycling system in place.

Interviews and observations revealed that the lack of storage facilities and the long distances to the collection points resulted in the majority of the participants disposing of their solid waste inside their community by using unsafe practices. Carelessness and lack of knowledge were other recognisable reasons for these practices, for example, the fact that even some of the community members, who benefited from door-to-door collection, still burned and buried their waste close to their houses. Another important point, noted in this chapter, is that 47% of all participants agreed to the mixing of hazardous waste with other household wastes. Furthermore, it was pointed out that formal education in Fiji is not up-to-date on environmental issues, such as sound solid waste management. Regarding the high importance of formal education, it was deduced that the improvement of formal education in environmental issues must be a number one priority in order to create awareness amongst Fiji's urban communities.

This chapter examined the connection between community cohesiveness and the current solid waste problem. It noted that, although many participants stated that they talked about solid waste problems in their communities, no major collective action for improvements could be revealed. Responses from community members reiterated that the absence of strong community leadership and a lack of regular community meetings diminished the willingness of people to initiate collective actions and to keep the community clean. Barr (2003a), for example, observed that communication in Fiji can be characterised by a top-down approach, which has created dependencies towards people in authority. The disintegration of social networks and traditional structures in the communities, caused by increasing social diversity and illegal housing arrangements,

has decreased community cohesiveness and hence the establishment of collective actions.

It was also revealed that a lack of relationships being forged with governmental and municipal authorities, together with private organisations, was a reason for an absence in collective actions which could support urban services in Suva's communities. It could be noted that there was a reluctant attitude by governmental authorities in Fiji to work face-to-face with communities, in particular, with peri-urban and informal settlements. A significant point, revealed in this chapter, is that governmental authorities must recognise solid waste management as being interrelated with other urban issues, such as water and land scarcity and that policies need to focus more on the root of the problems.

The chapter concluded by critically outlining some ideas for improving solid waste management in the three case study communities. In-depth interviews indicated that the majority of the participants agreed that community members must take the initiative, to enhance the quality of solid waste handling in their communities. Participants offered various solutions, from traditional practices, such as burning and burying, to more sustainable alternatives such as separation at source and composting and recycling. However, many participants highlighted that a key requirement for collective action must be the improvement of communication between community members and an increase in community-cohesiveness. As this chapter demonstrated, private as well as public agencies need to support communities by firstly, providing a strong legislative-institutional framework, and secondly by engaging in an active relationship with community members. The following chapter will outline the central conclusions of this thesis and it will demonstrate the implications for urban areas in Fiji Islands and other Small Island Developing States (SIDSs) regarding solid waste management in addition to the general situation for developing cities world-wide. The next chapter will also examine areas for further research.

Chapter VII: Final Discussion and Conclusion

7.1 Introduction

This thesis aimed to reveal effective ways for solid waste management in urban communities in developing countries. The following research questions were identified in order to achieve this aim.

a. How is solid waste managed in urban communities?
b. What are the strengths and weaknesses of current solid waste management approaches?
c. Who are the stakeholders involved in the management of solid waste at the community level?
d. What are the stakeholders' interests, roles and responsibilities?
e. What alternatives exist for urban community-based solid waste management?
f. What are the strengths and limitations of these alternatives?
g. What are the factors needed to increase the sustainability of urban community-based solid waste management options?

Rapid urbanisation and industrialisation has led to pressure on existing urban infrastructure and services, including solid waste management. Municipal authorities have difficulty coping with the increase in solid wastes. In particular, poorer groups such as peri-urban and squatter settlements, which are on the rise, suffer from a lack of basic services, such as solid waste collection. Fieldwork in three case studies in Suva, Fiji provided important insights into solid waste management at the community level in vulnerable urban communities. By means of interviews with residents, international donors, local NGOs and governmental authorities, the current strengths and weaknesses of solid waste management in Suva could be examined and this led to the formulation of possible strategies to improve solid waste services at the community level.

7.1.1 Solid Waste and Fiji Islands

The absence of sound solid waste management in Small Island Developing States (SIDSs) has threatened scarce natural resources and human health. In addition to

urbanisation, exploding tourist numbers put additional pressure on the capacities of solid waste management. High density, populated towns and cities, limited space, a shortage of human and financial resources and a lack of institutional-legislative framework are limiting factors for the ability of SIDSs to implement safe solid waste management systems (UN Commission on Sustainable Development, 1998, para. 2, 10-11).

Since 1994, when the Programme of Action for the Sustainable Development of SIDS was formulated, the Pacific Island countries (PICs) have laid a strong emphasis on solid waste management. A regional solid waste management strategy was developed, which needs to be implemented at national levels (SPREP, 2006). Recycling programmes have been initiated; however, due to a lack of public support and lack of markets, only Fiji and Niue have experienced some success in this area. Composting might be a good alternative to amend low nutrient soils in the Pacific region. Nevertheless so far, considerable composting programmes have not been set in place (UN Commission on Sustainable Development, 1998, para. 16). Waste minimisation strategies have been encouraged in a few countries, such as Samoa, which has implemented a deposit-refund system for beer and soft drink bottles and the Federated States of Micronesia, which has put into action a deposit refund system for cans (UN Commission on Sustainable Development, 1998, para. 18). However, waste disposal methods, such as landfills and incineration are still poorly controlled and result in major damage to the environment and local health. In particular, the disposal of toxic waste, such as pesticides, PCBs, waste oil and heavy metals, is a considerable problem in the PICs (UN Commission on Sustainable Development, 1998, para. 14, 17).

In Fiji, rapid urbanisation and the growth of industries and trade has challenged the current solid waste management system. Solid waste generation is not only rising but materials, such as plastics and paper have gained in proportion (See Section 4.2.3.1). A change in consumption patterns has also led to a greater variety of waste materials in household waste, and in turn to different requirements for solid waste handling and treatment. The emergence of hazardous materials and the mixing with municipal waste produces high risks for Fiji's local population and environment.

Fiji's solid waste management is still focused on the upgrading of end disposal methods, such as landfills and incineration and the improvement of solid waste collection. Slow economic growth, political instability and budget deficits are all factors which have negatively influenced the implementation of a sustainable solid waste concept (See Section 4.1.1). Lack of financial and human resources and also the absence of a strong institutional-legislative framework have hampered municipalities in the need to provide adequate solid waste service. This situation has been exacerbated by an increase of informal and peri-urban settlements in Fiji (See Section 4.2.2).

Insufficient solid waste collection is a problem in urban areas. The capital, Suva, has grown far beyond its borders, in the last couple of years. This has led to higher demands on solid waste services and an increase in solid waste management costs. In particular, the rise of informal settlements and communities on the fringe of the city has put pressure on municipal authorities. Longer routes and the lack of well-maintained roads have increased transportation and maintenance costs. The unwillingness and incapacity of many residents to pay for solid waste collection has created a lack of funds for upgrading processes and thus it has discouraged municipalities to provide services.

As a result of high density, lack of structure and absence of roads, the three communities studied were inaccessible for solid waste collection vehicles. Therefore, solid waste was collected from main roads next to the settlement. Collection points were generally not marked. This led to the situation that residents placed their rubbish bags randomly at the roadside. There was only limited provision for skip containers outside the settlements, due to a lack of financial means and often the size of the skip was not sufficient for the volume of waste. Door-to-door collection was only available for few households in Namadai due to the new constructed road. The poor physical nature of informal settlements was a limitation for the provision of proper solid waste collection.

The fact that many residents living in informal settlements do not pay for solid waste collection is another point, which limits the capacity of Fiji's municipalities to provide adequate services. In Muanivatu, for instance, residents did not have the benefit of a solid waste collection, since they did not pay city rates which include a solid waste collection fee. However, for some settlements, as in the case of Namadai and Lalilagi, municipalities provided a solid waste collection service without charge. This

inconsistency in the payment of city rates and hence in the payment of fees for urban services increases pressure on the municipal budget, and re-enforces free-rider behaviour.

Nevertheless, research showed that many residents in informal settlements were willing to pay for solid waste collection (See Appendix 4, Table L, Q4). However, the charge system in Fiji did not provide any alternatives for squatter residents. This presents a loss of potential funds, which could be used for the upgrading of solid waste services. More flexible user pay systems have to be developed, in order to include low-income groups and illegal settlements in the provision of basic services such as solid waste collection. A possible option could be the implementation of a separate garbage fee. At the time of this study, this idea was being piloted in Nasinu, a town in Fiji.

Inadequate solid waste collection leads to an accumulation of waste inside urban settlements. In places such as Muanivatu, where no solid waste collection was provided, residents generally dumped their waste into nearby creeks, drains, watercourses, and the nearby mangrove swamps. However, the application of unsafe disposal techniques, such as the burning, burying and dumping of solid waste was also common in communities that benefited from a regular solid waste collection. A reason for this occurrence was often the long walking distance from their houses to the collection points. Many residents found it easier and more convenient to burn, bury or to dump their solid waste close to their house. In the case of Lalilagi, the Health Department even had provided an incinerator for the community to burn their waste.

The large amount of biodegradable waste, such as food scraps and garden waste in the communities, were used by many residents for the enrichment of soils for gardening purposes. Composting presents a great alternative to reduce organic materials in the waste stream and thus to expand the lifetime of landfills (See Section 2.1.5). However, due to limited space in urban informal settlements, the realisation of safe back yard composting and gardening is limited. Lack of knowledge about composting facilities and processes is often a reason for the creation of leachates, and toxic emissions, which produce bad odour and attract animals in the communities.

The rise in packaging materials, PET-bottles and paper within communities has led to the introduction of market-led approaches for solid waste management in Fiji. Few recycling operations for paper, aluminium, glass and plastic bottles have been put in place. Interviews showed that many residents collected and sold recyclable waste, together with other family members, or on an individual basis (See Section 6.1.2). The majority stored the bottles in large plastic bags and brought it either directly to the factories or sold it to informal waste workers. These workers acted as middlemen between the factory and the residents. The shift to recycling options is still in the development process. Until the present time, only a small proportion of the population has been covered by recycling services and there is still a lack of linkages between public and private services. However, the potential of regenerative methods, such as recycling and reuse is increasing, in view of the growing volumes of recyclable waste and also the growing demand by residents, who see the financial benefit in this activity.

A serious problem in the selected communities in Fiji was the unsafe disposal and storage of construction materials, vehicles, scrap iron, tyres and white goods. Since there were no regulations in place relating to the handling of these materials at the time of this study, only a few private companies offered take-back services. The public sector had no developed recycling system for these materials in place. As a consequence, residents generally disposed of and stored these materials in their back yards in the settlements. The disposed objects took up a great deal of space, which produced extra pressure for the already very densely populated communities. In addition, the release of hazardous substances, by these materials, can create risks for the environment and the local population.

The end disposal of solid waste inside urban settlements produces risks for the environment and the health of residents. Participants lacked significant knowledge about safe treatment of solid waste, in particular, hazardous waste and the implications of solid waste practices, such as burning, burying and dumping. Toxic emissions and leachates, produced through waste handling, such as dumping and burning, lead to contamination of air, soil and groundwater. This in turn, has negative effects on the human body system (See Section 2.1.4). The use of unsafe storage facilities and the creation of litter and bad odour are aesthetic issues, which could cause environmental and health problems. Scavenging animals and rodent vectors, such as flies, mosquitoes

and rats, attracted by uncollected waste, were a constant nuisance in the communities. These animals are responsible for the occurrence of vector-related diseases (See Section 2.1.4). Swampy ground and poor basic infrastructure re-enforced the implications of uncollected waste. Current solid waste handling, in informal settlements in Suva, produced a threat for the well-being of all residents, particularly for vulnerable groups, such as children, sick and old people. Municipalities should not encourage do-it-yourself practices, such as the burning of household waste. Instead, they should stop residents from using unsafe solid waste disposal methods and promote the use of municipal collection services.

An important recognition is that attitudes and behaviour patterns had an important influence on solid waste management in urban communities in Fiji. In these communities, the majority of the residents were aware of the fact that current solid waste handling produced negative effects on their environment and health. However, the lack of disposal facilities close to their houses encouraged many residents to use - in their eyes - 'easier' and more 'convenient' methods, such as burning, burying and dumping. A serious problem revealed during walks and interviews was the mixing of hazardous materials with other household waste. Again, this could be explained by the lack of alternatives for residents to dispose of these materials separately. The lack of knowledge about sound solid waste handling and a careless attitude were other reasons, which were underlying causes for the use of unsafe waste handling practices.

Education can increase awareness, close knowledge gaps and change established behaviours and attitudes (See Section 3.1.2.3). Furthermore, it can motivate people to take over responsibility for their environment. In Fiji, two main problems existed: firstly, there was a lack of up-to-date environmental education at schools. Research showed that courses at school, for example still promoted disposal methods, such as burning and burying inside the community (See Section 6.2.2). This was enforced by the second factor, the transfer of negative perceptions and risky behaviours from the older community members to younger generations, and the other way around. Consequently, a vicious circle has been created. This has been set in place by Fiji's policy makers who have not addressed environmental issues in a holistic way. The irony becomes obvious. For example, the Government of Fiji spent money on recycling and litter campaigns to teach the society new behaviours, but at the same time, important formal educational

institutions did not provide creditable knowledge about environmental issues. In order to create sustainable communities and responsible citizens, policies have to focus on upgrading the knowledge foundation of the society.

In situations where public authorities have difficulty providing proper solid waste services, support by civil society becomes vital. In order to encourage collective actions, communication is seen as an important tool to build up trust and to initiate change (See Section 3.1.2.3). In Fijian communities, a communication gap between community members was identified. Complaints and discussions by the community members regarding the community's solid waste problem had not led to any imminent actions to improve current solid waste handling in the community. Two important social-cultural factors which influenced this situation were identified in this study; firstly, communication in Fiji has generally been practiced through a top-down approach. Barr (2003a) explained that the creation of a 'culture of silence', which is embraced by the whole country, has created passive communities which are dependent on strong social networks and traditional structures, such as leading characters in the community. During the fieldwork, it was noted that traditional structures such as community leaders played still an important role for many participants. Quite a few community members indicated that the initiation of activities, such as communal cleaning of the community or the conduction of community meetings was a duty of the community leader.

Secondly, the disintegration of traditional structures and social networks, through rapid urban growth and population changes within the community, might have been the reason for the decline of collective actions (See Section 3.1.2.2). In the communities studied, it was noted that only Muanivatu had a community leader and conducted regularly community meetings. In the other two communities, only church meetings were recognised. In particular, in Lalilagi, it was revealed that the influx of people coming from different areas had created a relatively high social diverse community, which in turn had led to a breakdown of traditional structures and networks such as leadership and communal meetings (See Section 6.2.3). This collapse of traditional community structures and networks has led to a passive attitude by several community members. This passive perceptions within the community might have been a reason for the decrease in community cohesiveness and hence for the reduction in collective actions.

The fact that all three communities had been established on informal land was also identified as a possible cause for the existence of poor solid waste services in the settlements and for low motivation by community members to participate in collective actions (See Section 6.2.3). In Section 6.1.1, the problem was highlighted that people living on informal land generally do not pay for urban services in Fiji. For that reason, they are not entitled to benefit from solid waste collection by municipalities. The absence of urban services in these communities leads to a lack of important basic needs. Furthermore, the disregard by urban service providers produces a negative attitude within the community. In the communities studied, participants expressed that because they were living on informal land, they had no rights to initiate collective projects in the community.

Furthermore, being a 'squatter community' involves tensions between community members, in addition to that between community members and governmental authorities. This in turn, re-enforces the decrease in community cohesiveness and thus the basis for collective actions. For example, in the communities studied, disputes between Fijian and Indo-Fijian families were recognised. Furthermore, many participants stated that they felt a gap towards the responsible organisations, such as the Suva City Council and the Health Department but also governmental officials. Again, policy makers have created a downward spiral. The emphasis on hierarchical structures, at all levels in the country, has created a passive and inflexible civil society, which is reliant on only few powerful groups or people. The disintegration of this structure, through external pressures, such as growing informal settlements and increasing poverty has produced a collapse of traditional community structures and has reduced community cohesiveness. For that reason, communities face difficulties to deal with the repercussions of urban change. To make things worse, politicians and governmental authorities have neither the capacity nor inclination to address the drawbacks of urban development in Fiji.

Lack of relationships between communities, the public sector and NGOs has created a communication gap which negatively affects the development of sustainable urban communities. The reluctance by governmental authorities and NGOs to work with vulnerable communities, such as peri-urban and informal settlements, has enforced a passive attitude on the part of the communities. The lack of trust in community groups,

to take over a role in urban development has created, within the communities, a feeling of being powerless and disillusioned. Bureaucracy and technocratic approaches has limited the flexibility of the public sector to interact with communities. The alienation from civil society, of governmental authorities, has led to decisions which do not present a holistic approach. Solutions have been offered which fail to address the root of the problem and which, instead, create new problems.

7.2 Recommendations

The involvement of civil society into urban development is necessary, in order to create sustainable communities. Collective actions by communities, particularly in informal and peri-urban settlements, are significant, in order to improve basic urban services and thus to enhance communities' well-being. However, this requires a social change, which has to be promoted by policy makers and public authorities. Initially, governments need to provide a strong institutional-legal framework. Accountable government institutions and private agencies are important for the realisation of better performance in urban services and thus in the establishment of trust on the part of citizens. Coordination and communication between responsible organisations is vital, to implement effective solid waste management and to offer a reliable picture to the population. The enforcement of laws and regulations and the establishment of monitoring processes are necessary, so that institutional roles and responsibilities are defined and there are legal tools to control solid waste management. High risk groups, such as low-income settlements, need to be included in these policies, for example, the elimination of hazardous materials in communities must be prioritised. In Fiji, the Environment Management Act (EMA) from 2005 presents a comprehensive framework to aim at sustainable development, including solid waste management. However, successful implementation depends on the enforcement of regulations and laws.

Awareness and knowledge about proper solid waste management, at the local level, must be increased in the first place, through updated educational institutions. At the same time, an exchange of information has to be initiated between communities and the public and private sectors, through consultations, meetings and workshops with communities. In close cooperation with communities, alternative ways must be found to implement safe solid waste handling in communities. This must include a shift from unsafe disposal within the community to methods such as composting, reuse and

recycling. The upgrading of solid waste collection services must be a high priority. The use of cheap local technology can be promoted by public authorities. One example is the construction of wooden platforms at collection points, in order to reduce scavenging animals. The implementation of flexible and affordable solutions for communities is important if urban inequalities are to be reduced.

Partnerships between civic, public and private sector are important for solving urban problems. However, they need to be based on trust, which can only be created through open communication and negotiation. Hitherto, perceptions towards the other partner have to be changed, so that equal relationships can be created. Holistic approaches need to be taken to understand the communities and the root of problems. Social change and an increase of community cohesiveness are important, in order to strengthen a community's ability to take part in their own development. Critical population groups in developing towns and cities, such as informal communities, peri-urban or poorer settlements, have to be put in the centre of attention by policy-makers in order to create sustainable cities.

7.3 Areas for Further Research

This study focused on only three communities in Suva, Fiji Islands. Further study, which could consider different cultural backgrounds, may well be worth conducting in other urban areas in the Pacific Island countries. This research concentrated on small island states and therefore future research, in larger developing cities, may reveal further knowledge regarding the management of solid waste management in urban areas.

The case studies in this research represented squatter settlements in urban Suva. Further work could be carried out in peri-urban and low-income non-squatter settlements.

The focus of this study was communities. A detailed study could be undertaken, relating to the potential for the private sector to provide affordable solid waste services. Furthermore, informal participation in solid waste management may be worth investigating, in order to use valuable synergies.

This present thesis provided an analysis of solid waste management in developing cities. It revealed the strengths and weaknesses of community-based solid waste management

and offered recommendations for more effective strategies in providing solid waste services in urban communities.

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Appendices

Appendix 1: Facts on Sub-regions of Asia and the Pacific

Table A: GDP growth (% per year), Sub-regions of Asia and the Pacific

Sub-regions	2003	2004	2005	2006	2007
Central Asia	10.3	10.7	10.9	11.3	10.3
East Asia	7.1	8.3	7.9	8.2	7.5
South Asia	7.7	7.4	8.1	7.5	7.5
Southeast Asia	5.4	6.4	5.5	5.4	5.3
The Pacific	1.9	3.9	2.3	3.3	3.4

Source: Adapted from ADB (2006, p. 127).

Table B: GDP growth (% per year), Pacific Island countries

Pacific Island Countries	2003	2004	2005	2006	2007
Cook Islands	8.2	4.3	0.1	1.8	3.5
Fiji Islands	1.2	5.6	0.7	3.1	2.2
Kiribati	-4.0	3.3	0.3	0.8	0.7
Marshall Islands, Rep. of	4.1	4.5	1.1	3.0	3.5
Micronesia, Fed. States of	0.1	1.0	1.3	1.0	1.0
Palau	0.6	6.1	5.4	5.0	5.7
Papua New Guinea	2.9	3.0	3.0	3.5	4.0
Samoa	3.5	3.8	5.1	4.0	5.0
Solomon Islands	5.6	7.8	5.2	5.0	5.0
Timor-Leste, Dem. Rep. of	-2.2	1.2	2.3	5.0	5.0
Tongo	3.2	1.4	2.4	1.9	0.9
Tuvalu	4.0	4.0	2.0	1.0	1.0
Vanuatu	-4.7	4.2	3.1	3.4	3.4

Source: Adapted from ADB (2006, p. 127).

Table C: Public spending on health and education (2001)

	Fiji	Marshall Islands	FSM	Palau	Samoa	Tonga	Vanuatu
Public expenditure on health and education as % of total public expenditure.	27.2	37.5	20.3	24.9	30.3	22.9	43.1

Source: Adapted from World Bank (2005, p. 6).

Table D: Pacific urban and national urban growth rates

Pacific Island Countries	Annual urban growth rate %	Annual national growth rate %
Fiji Islands	2.6	0.8
New Caledonia	2.8	2.6
Papua New Guinea	2.8	2.7
Solomon Islands	4.3	2.7
Vanuatu	4.2	2.8
FSM	-2.4	0.2
Kiribati	5.2	1.7
Marshall Islands	1.6	1.4
Northern Marian I.	3.4	3.3
Palau	2.2	2.1
French Polynesia	1.6	1.8
Samoa	1.3	0.9
Tonga	0.8	0.3

Source: Adapted from Storey (2006, p. 5).

Appendix 2: Interview Partners and Questionnaire

Table E: Formal (semi-structured) interviews

Person	Role/Organisation	Date
Alastair Wilkinson	UNESCAP/EPOC – Regional Office, Suva	14 June 2001
Kirk Yates	NZAID, Suva	14 June 2006
Thomas Gloerfelt-Tarp	ADB – South Pacific Sub-Regional Office, Suva	15 June 2006
Camari Koto	Lecturer, USP, Department of Geography, Suva	15 June 2006
Manoranjan Mohanty	Lecturer, USP, Pacific Institute of Advanced Studies in Development and Governance, Suva	16 June 2006
Mari Fatiaki	Live and Learn NGO, Suva	16 June 2006
Lionel Gibson	FSPI, Suva	16 June 2006
Semiti Qalowasa	ECREA, Suva	26 June 2006
Dharam Lingam	Director of Housing, Squatter Settlement and Landfill, Suva	(1) 21 June 2006 (2) 27 June 2006
Kanayathu Koshy	Pacific Centre for Environment and Sustainable Development, Suva	27 June 2006
Razia Zariff	Ministry of Environment, Suva	4 July 2006
Joshika Samujh	Vanua Hara NGO, Suva	5 July 2006
Fulori Nainoca	PCDF, Suva	5 July 2006
Patrina Dumaru	USP, Institute of Applied Science, Suva	6 July 2006

Table F: Questionnaire for interviews with households

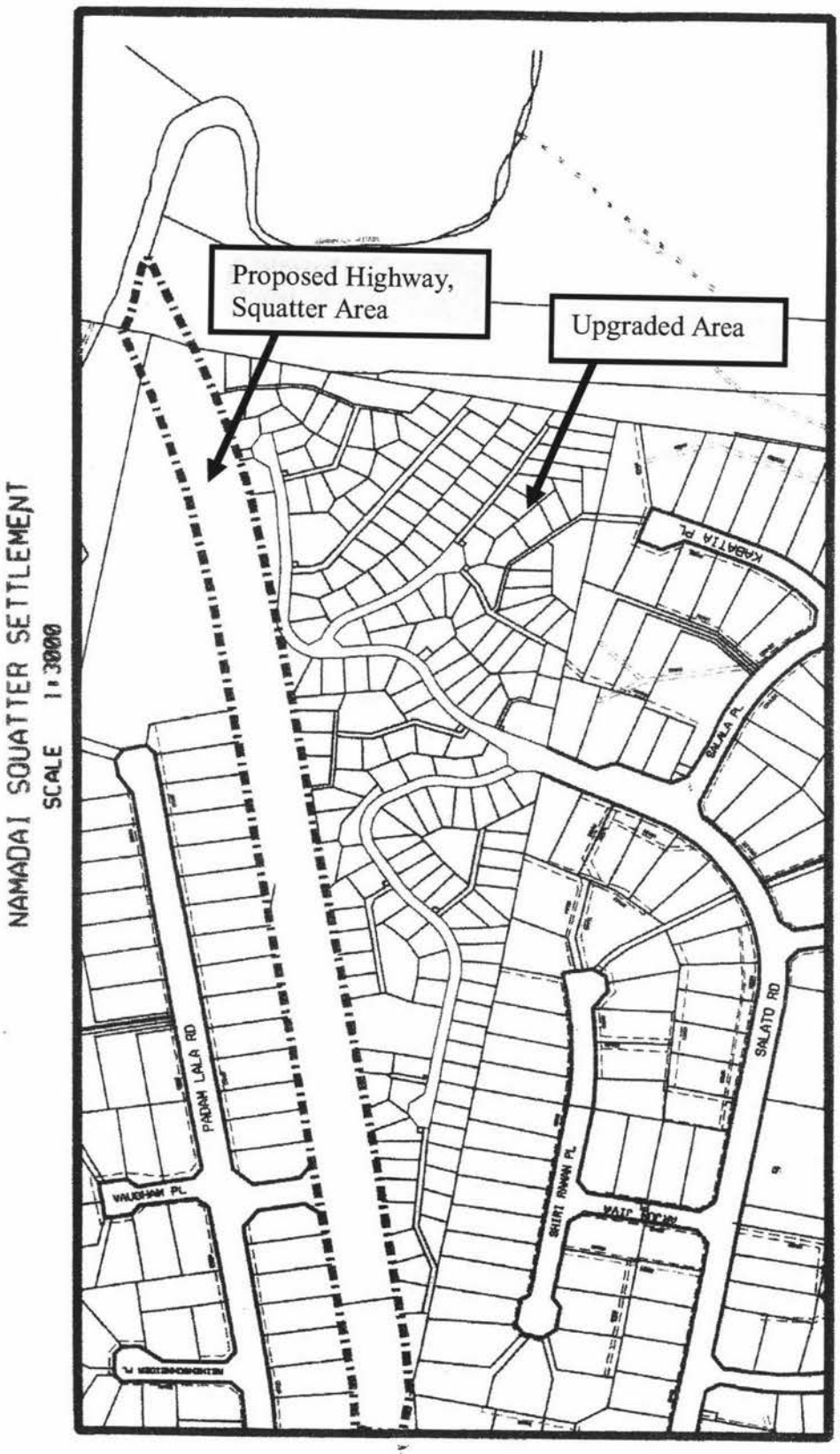
QUESTIONS	NOTES		NOTES (WHY? WHY NOT? HOW?, etc.)
Situation of household I. **(1) How long have you lived here?**			
Handling of waste at household **(2) How many plastic bags with rubbish per week?**			
(3) What do you put in this bag? What else do you do with these different types of waste…?	**Food/garden**		
	Cans/tins		
	Plastic		
	Glasses		
	Papers		
	Nappies/faecal matter		
	Batteries/paints		
(4) Does your family reuse plastic or glass bottles or other types of wastes?	**YES**	**NO**	**Why? Why not?**
(5) Do you sell your bottles or plastics to someone?	**YES**	**NO**	**How much do you get per month for the bottles? To whom?**
(6) Where do you put the general rubbish?	**Main road? Dump? Collection point?**		**Please show:**
(7) Do you know of any special location for different wastes, such as food or plastics, in your community?	**YES**	**NO**	**Where? Who collects this? How often?**
(8) Is your rubbish collected by the council?	**YES**	**NO**	
(9) How many times per week?			
(10) Do you pay for the collection service?	**YES**	**NO**	
(11) How much is the charge?			

(12) What do you think of this charge?	HIGH		OK / LOW	
Key waste issues and concerns (13) Do you think that waste is a problem in your community?	YES		NO	Why do you think this? Explain please:
(14) Is waste a problem in other communities?	YES		NO	
(15) Do you talk about waste in your community	YES		NO	What do people say? What do you say? When do you say it?
(16) Do you think waste is the responsibility of:	Community	Individual	Outsiders	Why?
Solutions (17) What do you think the community could do to improve waste handling and environment in your community?				
(18) What do you think public authorities and other agencies could do to improve your situation with waste?				
Situation of household II. (19) Do you own this land?	YES		NO	Who owns it?
(20) Do you intend to live here for the next 5 years?	YES		NO	If no, why not? Where do you want to go instead?
(21) How many people live in your household?	Female		Male	
(22) Is this number always the same or does it change?	Same		Change	
(23) How old are household members?	<30	30 – 50	>50	
(24) Do the children go to school? Do they learn about waste there?	No	Tert. / Sec. / Prim.		What do they learn about waste?
(25) Did you learn about waste at school?	YES		NO	What did you learn?
(26) Where does your family get their income from?				

Table G: In-depth questions and ranking exercise

In-depth questions:	Do you agree or disagree?					Please rank these issues by a) your current concerns; b) which you would pay for;		
(1) Waste is a problem in my community.	Strongly agree	Agree	Don't know	Disagree	Strongly disagree	Transportation		
(2) My family uses plastic or glass bottles again.	Strongly agree	Agree	Don't know	Disagree	Strongly disagree	Finding House to Rent		
(3) My family uses food scraps for the garden.	Strongly agree	Agree	Don't know	Disagree	Strongly disagree	Access to Health Facilities		
(4) I would pay two Dollars per week for waste collection.	Strongly agree	Agree	Don't know	Disagree	Strongly disagree	Food		
(5) People should be fined if they drop litter.	Strongly agree	Agree	Don't know	Disagree	Strongly disagree	Clean Environment		
(6) Waste can be thrown into a river, sea or other public places.	Strongly agree	Agree	Don't know	Disagree	Strongly disagree	WASTE		
(7) Waste can be burned.	Strongly agree	Agree	Don't know	Disagree	Strongly disagree	Access to Education		
(8) Batteries/paints, chemicals can be thrown into the general rubbish bag or waste dump.	Strongly agree	Agree	Don't know	Disagree	Strongly disagree	Access to Electricity		
(9) Faecal wastes, such as nappies, can be thrown into general rubbish bag.	Strongly agree	Agree	Don't know	Disagree	Strongly disagree	Access to Land		
(10) Litter and uncontrolled rubbish causes problems for our health.	Strongly agree	Agree	Don't know	Disagree	Strongly disagree	Toilet Facilities		
(11) My community must take action to improve the handling of waste.	Strongly agree	Agree	Don't know	Disagree	Strongly disagree	Access to Water		
(12) Outsiders, such as the public sector (City Council, health department), private sector, NGOs, must support my community to keep environment clean.	Strongly agree	Agree	Don't know	Disagree	Strongly disagree			
(13) Our children should learn at school how to manage waste and about the effects of uncontrolled waste.	Strongly agree	Agree	Don't know	Disagree	Strongly disagree			

Appendix 3: Map of Namadai in Namadi Heights



Source: Fiji Lands Department.

Appendix 4: Quantitative Data of Study

Table H: Question 13 of household questionnaire (See Appendix 2, Table F)

Do you think that waste is a problem in your community?								
	Lalilagi		Namadai		Muanivatu		Total	
	Frequ.	Percent	Frequ.	Percent	Frequ.	Percent	Frequ.	Percent
YES	16	80	20	66.7	16	94.1	52	77.6
NO	4	20	10	33.3	0	0	14	20.9
DON'T KNOW	0	0	0	0	1	5.9	1	1.5
TOTAL	**20**	**100**	**30**	**100**	**17**	**100**	**67**	**100**

Table I: Question 15 of household questionnaire (See Appendix 2, Table F)

Do you talk about waste in your community?								
	Lalilagi		Namadai		Muanivatu		Total	
	Frequ.	Percent	Frequ.	Percent	Frequ.	Percent	Frequ.	Percent
YES	13	65	9	30	12	70.6	34	50.7
NO	7	35	18	60	3	17.6	28	41.8
DON'T KNOW	0	0	1	3.3	1	5.9	2	3
NO ANSWER	0	0	2	6.7	1	5.9	3	4.5
TOTAL	**20**	**100**	**30**	**100**	**17**	**100**	**67**	**100**

Table J: Linkage between Question 13 and 15 taken from household questionnaire (See Appendix 2, Table F)

	Lalilagi	Namadai	Muanivatu	Total
Percentage of participants who see solid waste as a problem **and** talk about it.	68.7	40	75	75
Frequency	11	8	12	39

Table K: In-depth-Questions 1-3

	Q1: Waste is a problem in my community.		Q2: My family uses plastic or glass bottles again.		Q3: My family uses food scraps for the garden.	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	29	43.3	7	10.4	5	7.5
Agree	27	40.3	56	83.6	44	65.7
Don't know	2	3.0	0	0.0	0	0.0
Disagree	8	11.9	4	6.0	17	25.4
Strongly disagree	1	1.5	0	0.0	1	1.5
Total	**67**	**100.0**	**67**	**100.0**	**67**	**100.0**

Table L: In-depth-Questions 4-6

	Q4: I would pay 2$ per week for waste collection.		Q5: People should be fined if they drop litter.		Q6: Waste can be thrown into a river, sea, or other public places.	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	3	4.5	17	25.4	1	1.5
Agree	45	67.2	43	64.2	3	4.5
Don't know	3	4.5	0	0.0	2	3.0
Disagree	12	17.9	6	9.0	42	62.7
Strongly disagree	4	6.0	1	1.5	19	28.4
Total	**67**	**100.0**	**67**	**100.0**	**67**	**100.0**

Table M: In-depth-Questions 7-9

	Q7: Waste can be burned.		Q8: Batteries / paints, chemicals can be thrown into the general rubbish bag or waste dump.		Q9: Faecal wastes such as nappies can be thrown into the general rubbish bag.	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly agree	5	7.5	0	0.0	2	3.0
Agree	51	76.1	32	47.8	50	74.6
Don't know	3	4.5	3	4.5	2	3.0
Disagree	8	11.9	23	34.3	10	14.9
Strongly disagree	0	0.0	9	13.4	3	4.5
Total	**67**	**100.0**	**67**	**100.0**	**67**	**100.0**

Table N: In-depth Questions 10-12

	Q10: Litter and uncontrolled rubbish cause problems for our health.		Q11: My community must take action to improve the handling of solid waste.		Q12: Outsiders, such as public and private sectors must support my community to keep the environment clean.	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
Strongly agree	16	23.9	20	29.9	14	20.9
Agree	50	74.6	46	68.7	52	77.6
Don't know	0	0.0	0	0.0	0	0.0
Disagree	1	1.5	1	1.5	1	1.5
Strongly disagree	0	0.0	0	0.0	0	0.0
Total	**67**	**100.0**	**67**	**100.0**	**67**	**100.0**

Table O: In-depth-Question 13

	Q13: Our children should learn at school how to manage waste, and about the effects of uncontrolled waste.	
	Frequency	**Percent**
Strongly agree	21	31.3
Agree	46	68.7
Don't know	0	0.0
Disagree	0	0.0
Strongly disagree	0	0.0
Total	**67**	**100.0**