Waste Matters in Planning

An Analysis of the Spatial Implications of Solid Waste Management in the City of Cape Town

Simba Chitapi

Dissertation presented as part fulfilment of the degree of Masters of City and Regional Planning
In the School of Architecture, Planning and Geomatics

University of Cape Town

October 2013

Cover Image: '*A view of the Mountain from Visserhok landfill*' by Mark Lewis

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Acknowledgements

I would like to extend my heartfelt thanks to:

My supervisor Tania Katzschner, for always being willing to guide me through my research process. Her level of engagement with my research always provoked deeper thought on my part while her encouragement calmed me in times of stress;

My family for their endless support and encouragement—especially my Dad, Hope for his financial support and my sister, Rudo for her magnificent editing;

My classmates for a thoroughly engaging, enjoyable and intensive two years.

Abstract

Urban planning has traditionally been involved with the management of space, creation of place. It is a profession concerned with coordinating relationships between society and nature to foster development which improves all lives especially those of the poor. As such, planning synthesises the concerns of many different fields. Solid waste management however seems to has not been sufficiently appreciated in terms of its spatial implications.

Planning literature does not engage substantially with issues around solid waste management. However, through the many allusions to waste and by investigating solid waste literature spatial issues emerged. Indeed, the literature unveiled two overarching themes: First, urban waste can no longer be hidden from waste generator by exporting it to the hinterland. Following on from this, a decentralisation of waste management facilities is pivotal in achieving the participation and fostering the cooperation necessary to create cyclical urban waste flow.

Thus beginning with the premise that solid waste concerns are poorly addressed by planning, this dissertation investigates the reason this has transpired in Cape Town and proposes planning interventions that would begin to engender change. After conducting a spatial analysis of the City, engaging urban professionals in conversation, statistical analyses of waste flows, and reviewing the policy relationship between solid waste and spatial planning analysing, it emerged that the oversight of solid waste in planning is rooted in an uncertainty of how to address solid waste concerns. The utility of people-infrastructure relationships, the way in which urban functions relate and the link between regulatory planning policy have been underestimated in in their capacity to effect waste minimisation.

In light of this, policy and spatial interventions are proposed; these aim to harness the potential of people and to increase the functionality of infrastructures. These interventions aspire to dissolve the spirit of deference—planning to SWM; citizens to SWM; urban to hinterland—evident in urban solid waste management. If successful, these interventions should challenge urban perceptions of waste such that waste is no longer the responsibility of 'the other'; through recognition of waste's utility a sense of personal responsibility may develop. So, once planning as a profession 'owns' waste management as a key concern, planning can contribute to changing perceptions.

CONTENTS

List of Abbreviations

ANT	Actor-Network Theory
BANANA	Build Absolutely Nothing Anywhere Near Anyone
CID	City Improvement District
CoCT	City of Cape Town
CTSDF	Cape Town Spatial Development Framework
CTZS	Cape Town (Integrated) Zoning Scheme
DEA	Department of Environmental Affairs
DEADP	Department of Environmental Affairs & Development Planning
DEAT	Department of Environmental Affairs & Tourism
DWAF	Department of Water Affairs and Forestry
EfW	Energy from Waste
EIP	Eco-Industrial Park
EPA	(United States) Environmental Protection Agency
EPWP	Extended Public Works Program
FFC	Financial and Fiscal Commission
GIS	Geographical Information System
GVA	Gross Value Added
GVA	Gross Value Added
IEZ	Integrated Environmental Zoning
ISIS	Integrated Spatial Information System
IWEX	Integrated Waste Exchange
IWM	Integrated Waste Management
IWM	Integrated Waste Management
IWMF	Integrated Waste Management Facility
IWMP	Integrated Waste Management Plan
LUMA	Land Use Management Act
MRF	Material Reclamation Facility
MSA	Municipal Systems Act
MSE	Metropolitan South-East
MSW	Municipal Solid Waste
NGO	Non-Governmental Organisation
NIMBY	Not In My Back Yard
NIMET	Not In My Elected Term
NWMS	National Waste Management Strategy
PSDF	Provincial Spatial Development Framework
RDP	Reconstruction and Development Program
RSA	Republic of South Africa
RTS	Refuse Transfer Station
RWS	Regional Waste Site
SAPRO	South African Plastics Recyclers Organization
SARS	South African Revenues Service
SDF	Spatial Development Framework
SMME	Small, Medium and Micro-sized Enterprise
SPLUMA	Spatial Planning and Land Use Management Act
StatsSA	Statistics South Africa
SWM	Solid Waste Management
SWP	Solid Waste Plan
tpd	tons per day
UDZ	Urban Development Zone
UN	United Nations
UNEP	United Nations Environmental Program
WC	Western Cape
WWTW	Waste Water Treatment Works

City vs city
In this dissertation, 'City' refers to the City of Cape Town Municipality while 'city' refers to the municipal area.

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Introduction

Men came together in cities in order to live.
They remain together in order to live the good life.
– Aristotle, *Politics*

"In a way," writes Njoh (2012: 167), "garbage and sanitation are similar to death. Like death, both issues are inescapable, but unpleasant to discuss. Hardly anyone considers trash and excreta issues that can or should be broached at the dining table [even though the dining table will eventually give rise to both]." Yet the fact remains that matters of waste—and excreta which are not the focus of this document—must be dealt with for human settlements to remain habitable. However, as these issues remain unresolved, the promise of the good life in Aristotle's maxim recedes into the background of the mind and ends up a memory as distant as the contents of last week's rubbish.

Meanwhile, the world continues to hurtle towards a greater urban future. Accompanying this trajectory is a level of affluence unparalleled in history. The result is that principle by-product of urban life, namely municipal solid waste (MSW), is increasing faster than the rate of urbanisation. Today's urban resident generates about 1.2 kg daily – an increase of 87.5% from a decade ago. Worse still, this is set to increase a further 18% in the next ten years. Perhaps most alarmingly is that the wave of waste is projected to increase most dramatically in the Global South where the mass consumerism which precedes waste is growing (World Bank, 2012). In fact, Larry Summers, former chief economist and vice-president of the World Bank rather outlandishly asserted that "countries in Africa are vastly under-polluted" (quoted in Enwegbara, 2001: 7).

Perhaps these alarming rates occur because the impacts of solid waste on the urban form are subtle. For some the effects of this rubbish go virtually unnoticed; waste management is merely a weekly chore which begins and ends at the end of the driveway. But the honeymoon is over. As landfills fill up, suburban sprawl swallows up cheap land, incinerators choke the air and solid waste management (SWM) costs soar up to 5-fold in some countries, the one-way flow of waste will eventually cease and the problem will affect everyone tangibly. For some—the urban professional, the environmentalist or the slum dweller—the effects are already obvious and improving SWM constitutes an "urgent priority" (World Bank, 2012: vii). Waste essentially presents a theoretical challenge: Urban metabolisms are too linear and must be closed into sustainable loops (Swilling et al, 2012). For others still, waste presents a more pernicious and immediate threat: Mounting waste volumes create insalubrious environments that are literally a matter of life and death. Thus, the particulars of solid waste management have both spatial impetus and spatial

consequences which must be investigated.

For as long as there have been human settlements, there have been waste management considerations (Nadi et al, 2009). These considerations, presenting themselves as challenges, are becoming particularly apparent now firstly because more people than ever before are living in cities. All these people, together with their environs, are elements of a system which—like any other—has inputs, outputs and by-products. Secondly, many cities are becoming increasingly affluent. With this increase in wealth, consumption graduates from mere adjunct to urbanism and comes to define the very ideological cogency for urbanism (Miles, 2010). Thus cities have become incredibly resource intensive. Thirdly, urban space perpetuates a fragmentation between cause and effect. One of the benefits of urbanism is the convenience it offers. In so doing, actions are divorced from their consequences—disconnected in time and space—such that the repercussions (read: waste) of contemporary urban consumerism occupy a separate space to that of consumption. What is being dealt with therefore in the case of urban waste is a sort of 'spatial embeddedness' (Zukin, 1990) where excessive and unidirectional waste streams constitute the manifestation in urban space of an inappropriate ideology.

In effect, the system is broken and the days of symptom soothing need to end. The 'fixes' are going to have to be more holistic; "focussing on urban form and lifestyle choices may yield broader benefits" (World Bank, 2012: x). Since form and function exist as reciprocation founded in some particular epistemology, the opportunity exists to redeem (not in the monetary sense but rather in the sense of value) urban spaces from wastefulness. So part of what will be investigated in this document is the extent to which individuals, explore and express their own agency in an environment in which the consequences of extravagant wastefulness are often never directly encountered.

1.1 Values Statement

This dissertation concerns impact of waste on urban planning. However, planning "is only defensible as an activity if [carried out in the belief] that it will deliver a future that is '*better*' than that which would result without [planners' intervention]" (Campbell and Marshall, 1999: 476, emphasis added). Furthermore, since it is widely believed that ends do necessarily justify the means, the process of planning and the role of the planner has become the subject of much of contemporary planning theory (Fainstein, 2005). This personal focus, in conjunction with a suite of possible interpretations of what constitutes 'better', demonstrates that planning cannot be value-neutral. In addition, cities are the sum of such wide range of concerns that planning "cannot avoid working with simplification and reductions" (Schönwandt, 2008: 139). The result is a limited perception of reality as selectively 'filtered' by planners through their own set of values. Therefore, this section describes and justifies the environmental ethic and planning values which form the foundation of the arguments contained in this document.

Environmental Ethic

Perusing environmental (conservation) literature reveals three overarching ontological perspectives: anthropocentricism, biocentrism and ecocentrism. These eco-political philosophies are based on underlying social and ecological theories and differ in the manner in which they perceive nature and mankind (MCRP, 2013).

Anthropocentrism views humans as "the central fact of the universe" and therefore the lone seats of intrinsic value and thus the sole reason for maintaining ecological integrity in cities (Oed.com, 2013a). However, the dynamics of power relations favour certain groups such that anthropocentrism falsely appears to be the actions of a few for the benefit of many while actually being the imposition of regulations

on many for the benefit of the few (De Jonge, 2004).

Meanwhile, biocentrism extends inherent value to all species asserting that "nature is valuable on its own, without considering the [specific] needs of human beings." While "nature" here does include humans, they are not central (Acosta, 2010: 10). Biocentrism favours scientism—that is "*the conviction that empiric-analytic science is the only valid way of knowing*" (Eckersley, 1992: 51). To this end, anthropological observations are typically weighted less significantly than scientific findings. However, even the best biocentric arguments bespeak anthropocentricism (Acosta, 2010).

The third eco-political paradigm is ecocentrism which stands in contradistinction to both biocentrism and anthropocentrism in that it is fundamentally holistic. Based on the philosophy of "internal relatedness", an ecocentric ethic recognises that ecosystems are webs of interconnectedness and interdependence between the biotic community and the abiotic environment (Eckersley, 1992; Leopold, 1949). Ecocentrism "seeks to guarantee the continued existence and survival of species and ecosystems, as groups and as life networks" (Acosta, 2010: 11).

In addition, ecocentrism emphasises the "reciprocal interplay between dominant images of nature (whether derived from science, philosophy, [and/or] religion) and the dominant images of society" (Eckersley 1992: 51). In other words all perspectives—scientific, sociocultural or otherwise—are valid. Subsumed within this ecocentric ethic is the realisation that humans are part of nature (Schumacher, 1973). Yet, at the same time, people are different. Inasmuch as it is necessary to acknowledge unity with 'nature' it cannot be ignored that human beings have superior intellect and, more importantly, morality (De Jonge, 2004). The onus therefore rests on people, most of who now live in cities, to address the linearity of the urban metabolism.

Theoretically, an ecocentric ethos simultaneously circumvents the problems of anthropocentrism while incorporating the virtues of biocentrism. The compromise is that the de-compartmentalisation of the ecosphere creates a more fluid and intricate framework which becomes more difficult to utilise (Katzschner, 2008). It remains, however the best approach given its emphasis on the relationships which constitute ecosystems.

Since this document deals with the closing of urban metabolism with a focus on solid waste, the ecocentric ethic is appropriate on two fronts. The first is captured in Ramsey's poem the *Law of the Land* (Farmer's Weekly, 2012: 5; emphasis added) when he notes that *"*This is the law of the land, my son*, to take, you've got to put back".* Thus the urban environment, which Harvey (1996) proposes is a part of the natural environment, should have a metabolism that reflects the bigger circular metabolism of Nature which comprises webs of interconnectedness (Swilling et al, 2012). The Second, as Harvey (1993: 31) observed it, "is [that] in practice, [it is] hard to see where 'society' begins and 'nature' ends" and so the issue of urban solid waste is a socio-ecological struggle about "social… and material regulation" (Jahn, 1991: 54 – translation Keil, 1995).

Planning Values

Newman and Thornley (2011) designate planning as a function which is primarily the responsibility of the state whose role is to "set the parameters" in which development and appropriate urban functionality can happen. This is achieved through "[establishing] policy, strategy, and implementation programmes [while the actual] mechanics of implementation [may] lie elsewhere" (Cupido, 2012).

Historically, justification for planning was sought in the production of a desirable outcome with little

consideration of the process itself (Fainstein 2005). Fainstein (2010: 57, emphasis added) argues that this "theoretical weakness arising from the *isolation of process from context and outcome*" continues to bedevil the modern planning processes. Good planning necessarily considers the interrelatedness of process, context and outcome and always asks: "What are the background conditions that facilitate and constrain planning for a just city" (p. 57)?

Fainstein's (2010) concept of a just city incorporates three central principles: democracy, diversity and equity. These principles themselves suggest a link between "democratic processes and just outcomes" (Fainstein, 2010: 24). Thus, planning should provide choice in the final outcome (diversity). By seeking to address different groups appropriately (equity), planning should give all citizens "the right to the city" (Lefebvre, 1968). This right (democracy) views the city as a collective public resource (Healey, 2002) from which all residents should be able to benefit even as they contribute to its wealth (Lefebvre, 1991; Purcell, 2002). For Fainstein (2010) however, democracy and diversity are "lesser value[s] than equity" (p. 68) since planning cannot assume that "citizens are good judges of their own interests or the public good" (p. 30). This accords with Dewar's (2011) allusion that perhaps the only requirement to achieve real participation in planning is to provide choice in the outcome.

In light of these conceptions of planning, this document subscribes to Fainstein's idea that a 'better' city is in fact a just city. Furthermore, many have stated explicitly that the just city is, by definition, the ecologically sustainable city. Thus 'just city' planning provides both an appropriate outcome for and process of urban planning (Fainstein, 1999).

1.2 Problem Statement

There is a paradox between the growth of urbanisation and the sustainability of urban life. Part of this paradox is manifest in the urbanite's incognisance of the wastefulness linear material flows. Yet the gravity of the situation has not been fully grasped by all. Where it has been understood, there is often a gap between the recognition of the problem and a willingness and/or ability to respond. Many cities are no longer just racing towards ecological disaster but are already teetering on its cusp (World Bank, 2012). Pollution, climate change, resource depletion and ecological productivity are but a few of the consequences of the lifestyle of linearity. The constant flow of people into the city coupled with rising inequality and poverty, the dangerous situation is brewing. To be sure, waste *mis*management is not the exclusive or even principle culprit yet it can, if dealt with appropriately shift the conversation of urban sustainability from mere rhetoric into reality.

However, waste management is a "derived demand" of sorts; it is seldom carried out for its own sake. Rather, its value lies in the desire to continue a consumptive and convenient lifestyle (Banister, 2008: 73). (The irony of course is that this convenience does not extend to all urban residents.) Poor SWM—or simply excessive waste disposal—has significant 'downstream' consequences on health, local and global environment and economy; the costs of these, both financial and otherwise, pale in comparison to those that would have resulted from more ecologically sound practices in the first place. Therefore a good waste management regime minimises waste which implicitly requires an urban form that supports (or rather promotes) such reduced waste.

Generally, municipal SWM falls completely within the ambit of local governments and is often their largest single budgetary item (World Bank, 2012). So, since the city government has the legal clout and local knowledge, it is perfectly positioned to effect change and must therefore be proactive in finding waste management solutions. To this end, the City of Cape Town (CoCT) has two principle waste management documents which lay out its waste management strategy: the Integrated Waste Management Policy (IWMP)

(2006) and the Solid Waste Management Sector Plan (SWP) (2013 draft). The former discusses (rather non-committedly) producing a Zero Waste Plan by 2022 per the Polokwane Declaration (RSA, 2001) while the latter declares that a multi-sectoral approach, "in terms of planning, infrastructure, facilities, incentives and disincentives" (CoCT, 2013a: 4), is required to achieve its ultimate goal of augmenting economic activity while improving human and environmental health. Setting aside the contested ideas of zero waste for the moment, it is encouraging that planning and 'spatial' challenges are acknowledged in the Solid Waste Management Sector Plan, however poorly they may be addressed. At the same time, the Cape Town Spatial Development Framework (CTSDF), whose principle aim is to provide a "vision of the desired spatial form and structure of Cape Town" barely addresses issues of waste—its avoidance, reduction and overall management (CoCT, 2012a: 1).

Thus the question is:

How can various metropolitan planning tools (both in terms of spatial and regulatory policy and settlement design) contribute toward a closed-loop solid waste metabolism in Cape Town?

Its shortcomings notwithstanding, the City does have several waste reducing initiatives underway throughout its jurisdiction (CoCT, 2013a). All of these have a spatial impact and often a spatial impetus. But these efforts amount to little more than 'shifting deck chairs on the Titanic'. The system as a whole requires overhaul and the undergirding ideology needs to be challenged. And, as Buckminster Fuller said, "You never change anything by fighting the existing reality. To change something, build a new model that makes the old model obsolete" (quoted in Dennis & Urry, 2009: 9). The potential of solid waste management to initiate a real positive change in the urban future seems to have been overlooked. After all, space is the physical manifestation of the big forces—environmental, social and economic—and the relationships and priorities they engender (Star, 1995; Urbanized, 2011). Solid waste management can therefore be a proxy for these forces either in collision or in harmony.

In one way then, this document is about the way in which waste is manifested—that is ideologically produced—in response to a particular socio-spatial environment. In effect then, the document's principle concern is the choreography of waste flows in space and place and how this can be more mellifluous. It ruminates on the tensions of an urban environment in which both citizens and authorities are evermore aware and yet paradoxically, evermore apathetic.

A subsidiary question then is:

How can these tools move off paper and into the real world mobilising individuals and institutions and space into a 'virtuous cycle' with no 'waste'—in the traditional sense?

1.3 Goals and Objectives

This dissertation aims to address the situation on several fronts. First, it analyses the spatial impacts of waste and identifies potential drivers towards the preparation of a 'Zero Waste Plan'. The purpose of such a plan would be to guide the City in the management of wastes so as to eliminate the need for landfilling and incineration. Second, it suggests ways to reconcile the City's spatial goals (per the CTSDF) and its solid waste management objectives (delineated in the SWM Sector Plan and IWMP). Finally lays out some implementation tools whose aim is to aid in the transformation of ideologies and their associated actions

1.4 Scope and Limitations

This research looks at solid waste management in metropolitan planning in Cape Town. Investigating the sociotechnical systems that make up the metropolitan SWM regime and the attitudes these systems engender, the study covers the entire area of the City of Cape Town metropolitan municipality shown in Figure 1.1. The time allocated for research is limited to five months which affected the extent to which participation—from professional, technicians, and residents—was possible. In effect then this is secondary research with most conclusions inferred by collation, synthesis and analysis of existing research. The use of secondary data is necessitated because the collection of appropriate primary data from across the entire range of sources is a virtually impossible in the allotted time. However none of these limitations are expected to impinge on the efficacy of the research.

1.5 Document Structure

This document is divided into five chapters. Chapter 2 discusses the research methodology employed for this study; Chapter 3 is the literature review while Chapter 4 forms the analysis; Chapter 5 looks at the strategic interventions that might improve the status quo and suggests an implementation strategy.

CHAPTER 2: Methodology

Chapter 2 of the document describes the research methods employed in the study. It describes the methods and provides justification for the use of these methods for the purposes of this research. It discusses the use of various research techniques and considers how these are relevant for particular research questions and sub-questions. Importantly, it investigates some of the inherent and contextual weaknesses of the methods and techniques and discusses how these are mitigated in the research effort.

CHAPTER 3: Literature Review

Chapter 2 comprises a critical review of the literature around urban form and the forces that influence solid waste management. It is a theoretical analysis that explains how the urban environment should function and observes how the current waste management methodologies have spatial implication and roots. Exploring some contemporary literature and theoretical texts that examine the relationship between waste management and urban development, the chapter examines ideas that have been adopted in attempts to promote less wasteful cities.

CHAPTER 4: Analysis

Structured in two parts this chapter undertakes a critical analysis of solid waste management and spatial planning in Cape Town. Part A discusses the policy environment governing planning solid waste management and engages in a discourse analysis of the CTSDF and the IWMP. Part B investigates the spatial context of Cape Town with a SWM perspective and explores the spatial dimensions of the City's SWM regime.

CHAPTER 5: Intervention and Implementation

Chapter 5 is an attempt to address the linear urban flows from the perspective of urban spatial policy. It presents ideas on how to facilitate circular 'waste' flows. It proposes two levels of intervention: metro-scale strategies and area-based initiatives. Considering the lack of synchronicity between the waste and spatial policies, it proposes subtle policy amendments and it lays out strategic sites for implementation of spatial propositions. Finally, it presents an implementation strategy.

Source: adapted from Google Earth and GIS data

[Figure 1.1: City of Cape Town Municipality]

CONCLUSION

This part concludes the dissertation. It summarises and reflects on the findings and presents recommendations for further study.

3
Research Methods

This chapter briefly discusses the research methodology adopted in solving the research question. It sets out the research methods and techniques to be used to effectively answer the research question. In addition, it seeks to provide a motivation as to why the combination of case study with an actor network theory (ANT) approach was adopted and why integrative research (that is mixed methods) was used. (The difference between methodology and methods is explained in Textbox 2.1.)

Structured in three parts, the chapter begins with a description of the overarching research methodology. Next, it discusses the integrative research and then proceeds to describe the techniques and tools utilised throughout this inquiry. Finally, it illustrates and describes the actual process of the research.

2.1 Methodology: Case Study

This dissertation is concerned with the fruitful marriage of urban planning and solid waste management. The use of a specific city grounds theory around urban metabolism and SWM in a Global South reality; at the same time, it provides insights into how to approach waste issues in the context of vast inequality. Known as case study, the purpose of this type of research is to gain "an understanding of the whole"—that is, the global challenge of waste management—"by focusing on a key part" (Gerring, 2007: 1). Comprising "more detail, richness, completeness, and variance" the case study allows the formation of a more nuanced and intricate understanding of a specific environment (Flyvberg, 2011).

Case study nevertheless "occupies a vexed position" and often has its utility questioned (Gerring, 2004: 341). Defined as "an intensive study of a single unit... for the purpose of understanding a larger class of *similar* units," a case study

Textbox 2.1

Methodology vs Methods

Research methodology is a way in which a research problem is systematically solved. Research methods on the other hand are the tools and techniques which constitute part of the research methodology. In essence then, research methodology has a broader scope encompassing both the actual methods and the logic behind their selection.

Source: Kothari, 2004

provides knowledge which, although not always generalizable, is often transferable (Flyvbjerg, 2011; Gerring, 2007: 37, emphasis added). In a sense, it is a filtered learning (and teaching) process in which the *key* principles and ideas are extracted and transferred for application elsewhere.

Cape Town has a head-start on the rest of the continent in terms of wealth, consumption and inequality and, as the rest of the continent is turning to tourism as an economic driver, is already one of the continent's most visited cities (Hedrick-Wong and Choog, 2013; UN-Habitat, 2011). So, the flows and sociotechnical structures unveiled in Cape Town, may yield principles and ideas that could be carried to other parts of the country or indeed continent.

Admittedly though, this transferability was less of a priority in this dissertation than developing better planning approaches for Cape Town's own SWM concerns. Therefore, case study was adopted to assuage the impact of 'cookie-cutter' solutions through context-specific research. Indeed this case study resists generalisations by focussing on the "functioning specific" or "bounded system" of the Cape Town metropole (Stake, 2008: 119-120). However, applying semantic scepticism, Flyvberg (2011: 301) asserts that carrying out a case study is not a methodological choice so much as a "choice of what is to be studied". Consequently, it is best to describe at this juncture the particular approach adopted in this research.

Given the nature of the proposed research question—that is a question of actors, networks and agency—the study will have an imbedded actor-network theory (ANT) approach. ANT is an approach to social theory and research which proposes a "*flat* ontology". This means that it considers entities as part of social networks (Dudhwala, undated: 5). It is a "diaspora that overlaps with other intellectual traditions" and is therefore more of an approach to research than a method *per se* (Law, 2007: 2).

ANT endows humans and material elements with analytic equality. "It tells stories about 'how' relations assemble or don't" developing a sensibility for the 'messiness' inherent in the interactions between things and people (Law, 2007: 2). ANT suggests that society cannot exist merely as social entity devoid of the influence of the material world; society is as much a product of material interactions as the material are of social interactions and thus, the flows, structures and intensities (agency) of the various material and people (actors) influence the overall institutional and organisational patterns of social networks (Law, 1992). This reciprocation helps to reconcile a hitherto divorced perception of waste and society which is central to this research.

Influenced by post-structuralism, ANT is inherently relational invoking a sense of ownership over space which Buser (2012) asserts is because metropolitan spaces are not abstraction but are tangible realities shaped by the intentional actions of specific actors and agencies. It is this ownership, espoused by ANT, which facilitates a deeper exploration of how individuals express their own agency in space with particular regard to solid waste. Moreover, ANT dismisses the misconception of artefacts as socially neutral fabrications (Dodson, 2009). Ultimately, ANT is useful because it considers "both [the] restricting and enabling implications" of social and technical waste infrastructures and allows a holistic research process (Orlikowski and Robey; 1991: 154).

2.2 Research Methods: Mixed Methods

This research project adopts mixed methods. Burke Johnson et al (2007: 123) analyse a variety of definitions of 'mixed methods' ultimately offering the following definition:

> "Mixed methods research is the type of research in which a researcher or team of researchers combines elements of

> qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration."

This definition is useful since it does not mention mixing only the methods but allows the freedom to choose what is mixed (fields of study, techniques). Since this project represents the amalgamation of what seem to be two separate fields, namely urban planning and solid waste management, mixing methods lends itself to producing more rigorous research. Notwithstanding this apt definition, the term *integrative research* is preferred because it better encapsulates this idea of integration (Burke Johnson and Onwuegbuzie, 2004).

Logistics planning is a key element of solid waste management and logisticians typically employ integrative research (Denzin and Lincoln, 1994). Integrative research is important for the triangulation of ideas through various independent methods (e.g. anecdotal and statistical) (Burke Johnson and Onwuegbuzie, 2004). Inasmuch as solid waste can be quantitatively problematic, it is equally problematic from a sociocultural perspective. Thus, the inevitability of mixing methods and disciplines emerged in the process of research.

By combining methods, integrative research 'unclouds' the inherent bias in any particular method and hones in more accurately on the reality by investigating the evidence from several angles. In so doing, serious omissions in the research design phase were unearthed and paradoxes (or assumptions) revealed. Essentially, integrative research 'flexibilises' the entire research process (Frankel et al, 2005: 202). In Schwandt's (2000) words:

> "*All research* is interpretive, and we face a multiplicity of methods that are suitable for different kinds of understandings. So the traditional means of coming to grips with one's identity as a researcher by aligning oneself with a particular set of methods (or being defined in one's department as a student of "qualitative" or "quantitative" methods) is no longer very useful. If we are to go forward, we need to get rid of that distinction." (p. 210, emphasis added)

This logic influenced the decision to engage in integrative research. Thus, despite choosing methods on the basis of the research question, there was intentionality in method variation to create a holistic picture. Solid waste is more than a statistical, logistical, technical and economic challenge. It has real, tangible implications that affect social perceptions of space and place and influences how people interact with each other and their surroundings.

2.3 Research Techniques

As discussed above, this dissertation represents integrative research. That is, mixed methods are used to collect and analyse information. Techniques vary from qualitative to quantitative. The point of departure for the research project is a critical assessment of the literature around planning and SWM.

A literature review seeks to understand and appreciate different viewpoints and debates within the literature. It frames the foundation of the analysis by pointing to key issues to consider and feeds into interventions proposed. The literature review includes studies of other cities which have employed innovation to constrict their solid waste metabolisms. These precedent reviews point to spatial and policy cues which may assist this document's own proposals.

The case study proper begins with a discourse analysis of Cape Town's SWM and spatial planning policy. The most rudimentary definition of discourse analysis is an interpretation of documents which delves "beyond their sentence[s]" by also considering at their language and socio-political contexts (Schiffrin et al, 2001: 1). Used here, its purpose is not to impugn policy altogether but rather to work towards its amelioration by discovering inverted logic as well as gaps and inconsistencies in related policy (Wilson,

2001). Insights gleaned from this process are important because policy consistency is particularly important when discussing the CTSDF which is supposed to represent a holistic view of the city's future. Furthermore, 'spatialisation' of the ideas and precepts in the waste management documents is also important. The discourse analysis does also consider how the analysed documents 'talk' to each other. However it does have the pitfall of misinterpretation; to temper any such misinterpretation, it is important to try interview those involved in document preparation or those who use the documents as guides in their professions.

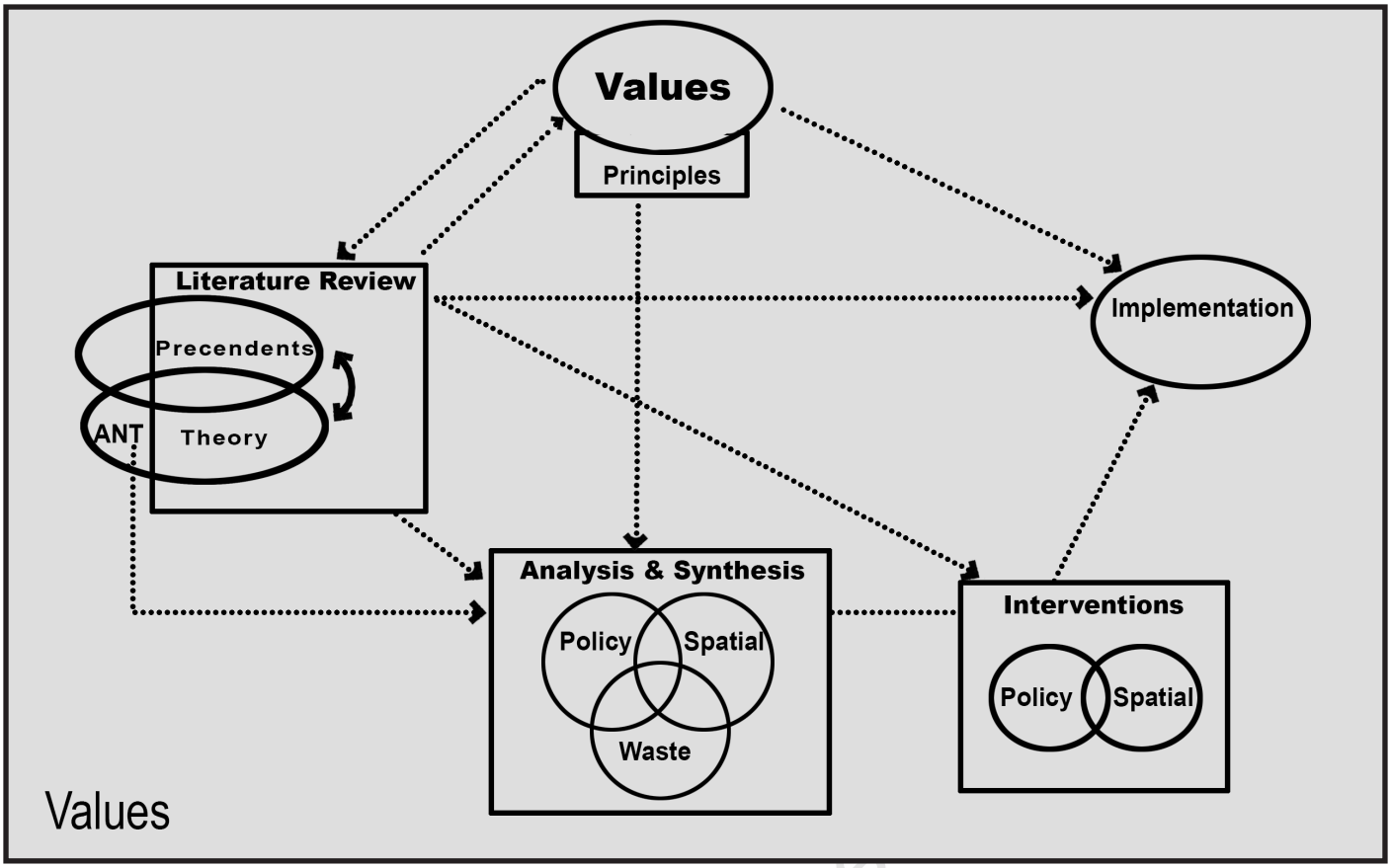
By inviting the input of professionals to critique policies in hind sight, interviews—or perhaps more appropriately conversations—are intended to complement the discourse analysis. These also served as an information source in their own right. A variety of persons are engaged in dialogues including employees from non-governmental organisations (NGO), residents, solid waste and spatial planning professionals from the Cape Town and beyond. These conversations also augment spatialisation techniques such as mapping and geographical information systems (GIS) analyses.

Mapping, aerial photography and GIS serve as an important means of spatialising and analysing the data and are used to determine the appropriateness of the spread of the solid waste facilities in the (Shamshiry et al, 2011). The combination of these techniques provides situational context and analytical depth to understand not just the status quo but an appreciation of how it arose. However, while these techniques are great for analysing technical systems, they do not speak to social systems which are discovered through conversation and observation and analysing organisations' structures. These social perspectives are combined with statistical data and provide insight into the reasons behind the observed waste flows (logistics).

Statistical analyses are based on secondary data obtained from the City of Cape Town. This data is used to decipher waste sources and quantities and what the spatial implications of these might be. Also important in this data is not just the source and quantity but also the composition and quality of the waste. The efficacy of using secondary data is always questionable but inspection and assessment of all waste from all sources by individuals is neither possible nor necessary since the City does this already. Furthermore, it is in the City's best interest to keep accurate, true and up-to-date records and thus is deemed a trustworthy source of information. Moreover, the use of multiple sources from academic research and consultant reports, works to corroborate city data.

2.4 Process

Figure 1 is a flow chart illustrating how the research process is conceptualised. The point of departure is to investigate and appreciate a researcher's own values which themselves are based on a specific set of immutable principles. These values permeate every aspect of the research process effectively serving as a backdrop for the entire process. As shown in the diagram, the research is an iterative process with 'forward' progression often reflecting back to effect an adjustment of previous stages in the research process.



[Figure 2.1: The iterative nature of the research process. Notice that value formation is a specific element of the research process and then these values form the backdrop of the research.]

4
Literature Review

This Chapter is structured in two parts. The first discusses the urban planning and solid waste management literature to draw out a better understanding of the impacts each field has on the other. To achieve this, planning discourses are viewed with a keen focus on waste while waste issues are considered in terms of their spatial impact. The second part looks at some international precedents of how different international cities with different challenges have addressed their solid waste management concerns and considers what impact this has for urban planning.

At this juncture it seems relevant to note that for the remainder of the dissertation, the term urban planning refers to both spatial (forward) and regulatory (land-use) planning. Spatial planning anticipates long-term changes and then attempts to articulate logical and flexible development path that promote a more sustainable and equitable future (Capetown.gov.za, 2013s). Regulatory planning on the other hand essentially refers to land-use management which is expressed in urban zoning schemes which contain land-use rights and restrictions for different land areas in cities (Capetown.gov.za, 2013l). The two work in unison and spatial planning imperative should eventually be reflected in regulatory planning policy. Similarly, regulatory planning should be sufficiently robust to facilitate harmonious settlements but not so rigid to hinder spatial planning aspirations.

PART A: THEORY AND LITERATURE

The point of departure for this part is to define some key concepts that will be used throughout and consider their implications for waste. Direct links between form and waste have not directly been deciphered in much planning literature. Therefore, the section continues with a review of the history of urban solid waste management this is followed by an appraisal of the three main approaches to solid waste management. Following this is a discussion of how the use of these coupled with the dominant urban morphologies has perpetuated lifestyles of linearity [in which a culture of deference prevails because of a crippling of actants' agency). Then, this section looks at some approaches to urban SWM that have borne the desired outcome of waste flow reduction. Finally it considers the implications of all this for urban planners.

3.1. Defining Key Concepts Present in the Literature

The planning profession is awash with "weasel words" which serve to imply innovative thinking about the urban realm (Watson, 2004). These "empty signifiers" are not characteristic of planning and Gunder and Hillier (2009: 1) observe that their "looseness" results in interpretational ambiguity which itself can yield unpleasant and unintended consequences. To diminish the likelihood of such misunderstanding, this section defines some terms commonly used to describe the nature of cities. It considers meaning of environmental and planning concepts that occur throughout the literature and establishes their meanings as perceived in this dissertation.

3.1.1 Sustainability

Sustainability has emerged as the dominant "'catchall' master signifier of humanity's diverse (environmental) concerns and responses" and now represents some sort of destination for spatial planners and society at large. Gunder and Hillier (2009: 136) argue that some urban imperatives—particularly social justice and economic viability—have been forced to bow to the hegemonic predominance of sustainability. In stark contradiction, Goodland (1995) implies that environmental sustainability is a precondition from which these others flow. Thus the issue of what sustainability is and achieves is open to debate.

On its own, the term 'sustainability' implies indefinite continuance; as such, it is the logical goal of human settlements. The 'triple bottom line' model notes three main forces—environmental, social and economic—that shape the world and the imperative to safeguard their sustainability (Earth Days, 2009). *Our Common Future* (also known as the Brundtland report; WCED, 1987) defines (environmental) sustainability as "meeting the needs of the present without compromising the ability of future generations to meet their own needs." This has come to be the most politically palatable view of sustainability. Bruegmann (2006: 148) rejects this 'classic' definition because it "rests [too] heavily on the dubious assumptions of limits to growth". He asserts that the supposition that the resources to be utilised in the future are the same as those used today is essentially an affront to human ingenuity. In the same breadth however, he alludes to finitude of the Earth's resources and so ironically, it is precisely the prudence Bruegmann (2006) reject that renders this definition so apt. However, this simplistic eschatological conception of sustainability belies the scientific reality (à la thermodynamics) that "'sustainable' cannot mean 'forever'" (Daly, 2002: 40). Daly's (2002: 2) worthy contestation is that utility, which forms the foundation of this definition, is neither measurable nor "something that we can bequeath to the future".

Rather, sustainability is something that should be conceived in terms of sustaining physical throughput.

In other words, the natural capital (see Textbox 3.1) of the system must remain intact by ensuring that the ecosystem is able to maintain entropic flow from nature's sources through the 'anthroposphere'[1] and back to nature's sinks (Daly, 2002).

Textbox 3.1: Natural capital

Natural capital is the capacity of the ecosystem to yield both a flow of natural resources and a flux of natural services. Keeping natural capital constant is often referred to as "strong sustainability" in distinction to "weak sustainability" in which the sum of natural and man-made capital is kept constant. (Daly, 2002: 39)

Fortunately, the two approaches—utility vs. throughput—are not mutually exclusive. In fact when considering waste flows and overall urban metabolism, both perspectives are necessary. First, utility[2] as a basis encourages frugal consumption (and thus minimises opportunities for waste production) while throughput is the impetus for efficiency and efficacy in dealing with the now reduced waste output. And, as Daly (2002: 11) himself asserts, "'frugality first'…, induces efficiency as a secondary consequence [while] 'efficiency first' does not induce frugality—it makes frugality less necessary". From this, arises the idea of sustainability as a 'fuzzy concept'; it becomes clear that its "[lack of] conceptual clarity [makes it] difficult to operationalize" (Markusen, 1999: 870). Fuzziness notwithstanding, sustainability as this document subscribes to it is defined in textbox 3.2. These definitions are deemed easier to operationalize in reweaving the symbiosis that has been forgotten in human-nature relations and can help in the generation more sufficient and more liveable cities for all.

Textbox 3.2: The Triple Bottom line of sustainability

Environmental sustainability is the circumspect use of resources by reserved extraction and throughput so as not to diminish natural capital for future or present generations or inhibit ecological functionality.

McKenzie (2004) defines ***social sustainability*** as occurring when "the formal and informal processes, systems, structures and relationships actively support the capacity of current and future generations to create healthy and liveable communities. Socially sustainable communities are equitable, diverse, connected and democratic and provide a good quality of life."

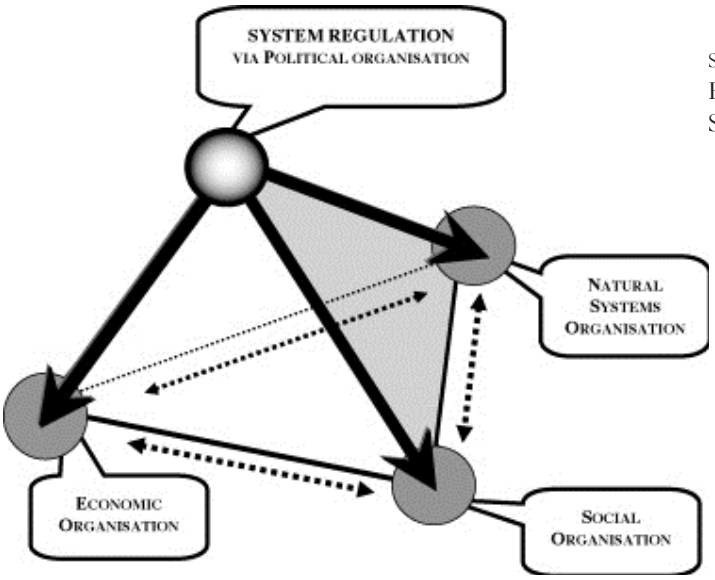
Meanwhile, the US President's Council on Sustainable Development captured, what is possibly, the best definition of ***economic sustainability*** in its cognisance of humans and the environment: "Economic growth can and should occur without damaging the social fabric of a community or harming the environment" (Doane and MacGillivray, 2001: 3.1.1). (It must be noted that Dennis Meadows' assertion that, "The entire discipline of economics [is doomed because it] is based on the assumption that output is going continue to grow; living standard is going continue to grow and so forth" should not be altogether disregarded (Earth Days, 2009).)

However, O'Connor (2006) alerts that the 'triple bottom line' approach is itself, insufficient. With his tetrahedral model of sustainability, O'Connor (2006) presents a novel way of conceptualising sustainability which is particularly appropriate in the discourse of urban waste and metabolism. This model augments the triple bottom line with the "demarcation of a fourth fundamental category of organisation" (p. 285) (see Figure 3.1). This fourth element of sustainability, the political sphere, is responsible for the regulation of the *economic and social spheres* and thus of relations with (and within) the environmental sphere. It is this

1 Anthroposphere here is not meant to convey a human-nature split but rather to collapse, socioeconomic activity and the affected natural processes into one term.

2 Utility reminds us that societal actions – regardless of intention – can reverberate through time. We are experiencing this today with global warming whose perpetuation waste has played a role in (Costanza *et al*, 2007).

category that positions planners squarely in the midst of the conversation sustainability conversation. In fact, as illustrated by Figure 1 "it is meaningless [ignore governance or even] to treat any sphere or interface in isolation from the others" (p. 286). So the conception of sustainability in this dissertation has environmental sustainability as its priority but understands that this is pointless without social and economic sustainability which implies the need for organisational sustainability. In addition, this model has inherent compatibility metabolism metaphor to follow. Much like the human body's 'central governor' which regulates physiological metabolism, the political organisation plays a critical role in managing urban metabolism (Noakes, 2001).



Source: O'Connor, 2006
Figure 1: Governance for sustainability: the interdependent "Four Spheres".

3.1.2 Metabolism

Metabolism is the metaphor used to conceptualise urban socio-ecological processes. As the ecological ramifications of ruggedly economistic urban development assert themselves more, urbanisation is returning to its roots as a process of "socio-metabolic transformation" (Heynen et al, 2006: 3).

Gandy (2004: 373) describes metabolism as "an assemblage of material flows" with a bio-physical emphasis on homeostatic and circulatory dynamics. This means that metabolism considers the inputs and outputs (including waste) of the urban system and implores that these neither overburden natural sources in provision—frugality—nor overwhelm natural sinks in absorption—efficiency. In other words, the ideal urban metabolism aims to maintain some sort of steady state beyond the urban 'boundary'. This idea positions the dissertation well to respond to the increasingly globalised spatial relationships on which the vitality of contemporary cities depends. Urban metabolism is thus defined as "the sum total of the technical and socioeconomic processes that occur in cities, resulting in growth, production of energy, and elimination of waste" (Kennedy et al, 2007: 44).

From its conception, urban metabolism has always had practical intentions (Kennedy et al, 2007; Wolman, 1965); one major implication its effect on urban design principles (Oswald and Baccini, 2003; Baccini and Brunner, 1991). In his seminal conceptual framework, Gasson (2007: 2) condemns the linearity of contemporary urban metabolisms which he contends result in "ecological overshoot" by failing to accommodate nature's regenerative and (re)absorptive capacities. Moreover, linear metabolism undermines cities' inherent resilience to adversity.

3.1.3 Urban Form

One of the most comprehensive conceptions of urban form is that proposed by Pizarro et al (2007). This multi-dimentional idea of urban form conceives cities as more than just physical entities. It might not be obvious at this point, but each of this has implications for the way waste is perceived, collected,

processed or even avoided in the first place. Throughout the remainder of this chapter, this will become clearer. The dimensions are:

1. Urbanism which is concerned with the human experience of the city in term of the intensity, frequency and variety of activity and people;

2. Images and identities considers the "qualitative aspects of urban form" including perceptions and virtual representations;

3. Urban morphology describes the spatial organisation, densities and patterns of settlements (see Textbox 4.3);

4. Social ecology involves the spread of population groups;

5. Dynamics of the public realm comprises the distribution, configuration and accessibility of public facilities and spaces; and

6. Scale and pace of development.

This dissertation however will pay closest attention to the urban morphology.

Textbox 3.3: Urban Morphologies
Dispersed city – continued low density suburban development of populations, housing and jobs; infrastructure investment dominated by road transport.
Compact city – increased population and density of an inner group of suburbs, with associated investment in public transport.
Edge city – increased population, housing densities and employment at selected nodes within the city; increased investment in orbital freeways linking the edge cities.
Corridor city – a focus of growth along linear corridors emanating from the central business district (CBD), supported by public transport infrastructure.
Fringe city – additional growth is predominantly on the fringe of the city.
Source: Newton, 1997

3.1.4 Waste

As mentioned several times already, waste is and inevitable consequence of human life and society. By its most basic definition, waste is "the *useless* by-products of any… process" (Oed.com, 2013, emphasis added). Solid waste includes household, commercial, industrial and institutional waste. It primarily consists of biodegradable organic materials and inorganic materials which are non-biodegradable (Pinderhughes, 2004). Unfortunately the proportion of inorganic materials is increasing to include 'white' goods like refrigerators and stoves and 'brown' goods like tires and batteries. All these release toxic materials into the environment (Pinderhughes, 2004). Ojeda-Benitez et al (2000) make an interesting distinction between waste and refuse. For them, waste may be undesirable but is something of value while refuse (perhaps making a play on the double meaning of 'refuse') is something useless and unwanted.

However, there are notions of zero waste. Zero waste is "an ideal" to aim towards (Haider, 2013). It is a somewhat contested concept which is not founded in materialist presuppositions. So-called *Zeronauts*—those who push the boundaries of zero waste—theorise that others will soon follow them in their

endeavours because motivation is contagious (Elkington, 2012). "Zero waste is just another term for a collective understanding, manifest in daily acts, that on a finite planet there is no "away" to throw things" (Alternet, 2012).

3.2 Positioning the Discourse in History

3.2.1 A Brief History of Solid Waste

The very nature of civilisation mandates solid waste management however rudimentary. In fact as far back as Biblical Israel, the burial of waste has been a specified means of disposal (Lemann, unknown; Deuteronomy 23, vv12-13). But as settlements have grown in wealth, population and intensity "refuse [has become] primarily an urban blight" (Melosi, 2004: 1). Therefore, the approach also been to remove waste out of urban to the hinterland (Wilson, 1976).

Wilson (1976) observes that different civilisations adopted different means to deal with wastes. For example, the ancient Minoan civilisation on Crete between 3000 and 1000 BCE placed solid wastes in large pits which were intermittently covered with layers of earth. Meanwhile, the Romans persisted with dumping discards anywhere well into the 19th century. On the other hand, medieval German cities required wagons bringing food into cities to take waste out to the country. Similarly, towards the end of the Middle Ages, Londoners were required to export rubbish. This tradition persists today and has become a global norm.

The industrial revolution introduced a new way of life which made the solid waste problem become more acute (Hickman, 2003). In the 1890s, city officials in the United States (US) observed that the "complexities of modern urban life" rendered the private collection and disposal of solid wastes impractical (Melosi, 2005: 23). In fact, "the means resorted to by a large number of citizens would be very amusing were it not such a menace to public health" (p. 23). As a result, refuse disposal—then carried out primarily by dumping—moved from the realm of individual responsibility to communal concern. Eventually, it would make the leap to municipal competence (Hickman, 2003). In Europe, waste management had fallen under the municipal ambit as far back as 1506 and innovation had already birthed new innovations (Wilson, 1976).

The first purpose built refuse incinerator opened Nottingham, England in 1874 (Wilson, 1976). One American doctor, still reeling from the horrors of open dumping, called the cremation of garbage "a great sanitary device" while another brazenly declared that with incineration "we have [finally] secured a means of entirely destroying these substances [wastes] and their power to do evil" (Melosi, 2005: 39). The spatial implications were soon felt as residents' complaints of the noxious smoke and unyielding stench forced the closure of most American incinerators after less than 30 years in service. The Americans returned to landfilling now aided by motorised technologies to cart waste further from cities (Hickman, 2003). Meanwhile in Europe where space was at a premium, incineration remains an important means of waste disposal (Jofra Sora, 2013).

This relationship between space and waste was noted by the Greater London Council (1969) which observed that "as [London's] population density rose and pressure on land within the urban area increased a street system evolved, [t]he pattern of refuse disposal changed accordingly." In a similar vein, the disparity between the levels of commitment to street cleaning versus municipal trash collection in the late 19th century can be attributed to spatial forces: While 70% of US cities engaged in the former in the 1890s only 24% had adopted the latter (Melosi, 2005). This clearly demonstrates that streets were not only the arteries of the city but also the "living room of society", accessible by all residents and were a priority. So,

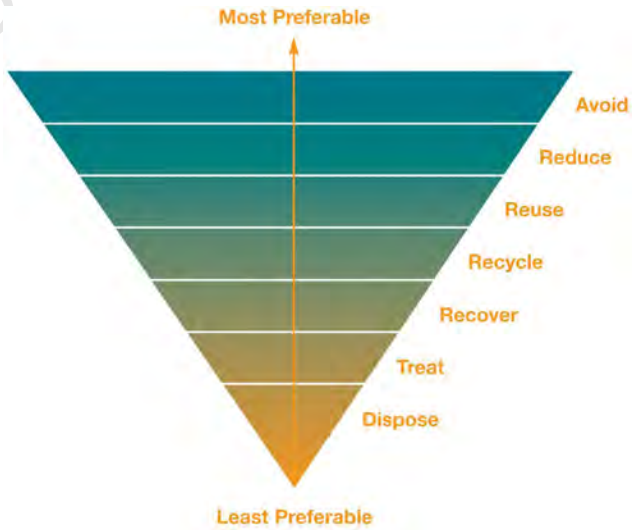
generally speaking, dense urban areas have tended to be more rigorous in waste reduction means (Owen, 2009).

Wilson (1976) opines that ancient cities have only been able to yield their secrets because an entrenched culture of reuse meant discards tended to bear some longevity. In fact, even the most "unpromising wastes could find [profitable] uses if the requirement of removal and disposal was sufficiently strong" (p. 123). This metabolic 'cyclicity' is a common theme throughout the historical. Composting—only later understood as a methodology—serves as a case in point (Wilson, 1976). At the turn of the 20th century, kitchen scraps were often fed to pigs and chickens. Whatever remained would be turned into the soil (Trembley, 1972).

Slowly though, as population densities increased further, refuse graduated from mere nuisance to local health problem; its most recent migration is to its status as a global environmental concern. Melosi (2005) notes that cities have asked the tough questions for a long time: Should residents separate themselves? What is salvageable/ recyclable? How do we make the best use of technology? Still, the answers remained elusive. As a result, "if *convenient* utilitarian methods of disposal were unavailable, most cities ignored the more complex alternatives and resorted to dumping their refuse wherever space allowed" (p. 34). For all intents and purposes, this continues today.

3.3 Contemporary Approaches to Solid Waste Processing

To adequately understand the spatial implications of waste, the specific means of waste processing must also be investigated. Solid waste management has six functional elements; these are, in chronological order: generation; storage and processing at the source; collection; transfer and transportation; treatment and transformation processes; and finally disposal (Tchobanoglous et al, 1993). In most cities, particularly in the global south, these six elements are abbreviated to four, namely generation, collection, and transportation and disposal (Nadi et al, 2009). This discounted schema is attributed primarily to financial and technical barriers although capacity and urban morphology issues do play a role. There are three main ways to deal with waste in its final form: landfill, incinerate and recycle. In 1997, 95% of waste disposal worldwide occurred by landfilling. Over a decade later, this figure remains quite inflated with as more than 75% of global waste ending up in landfills (UNEP, 2011).



Source: envirocentre.ie
Figure 3.2: The Waste Hierarchy

The solid waste hierarchy (see Figure 3.2) is the generally accepted norm for conceptualising the ideal means of solid waste processing and disposal. In essence, the hierarchy is a based upon considerations of the finitude of resources. It implicitly means that 'things' ought to be "produced sparingly or not at all" (McLaughlin and McDaniel, 2013: 117).

3.3.1 Landfill

Landfills are an "engineered [and all-encompassing] method of disposing of solid wastes on land" (Pinderhughes, 2004: 62-63; White et al, 1995). Against the backdrop of sustainability though, landfills—

particularly with energy reclamation—are the ultimate way to squander the earth's finite resources (Nahman, 2011), and in accordance with the hierarchy of waste should be the last means of disposal (Swilling et al, 2012). As White et al (1995: 3) stated it, "putting waste into holes in the ground certainly smacks of inefficient management of materials".

Meanwhile, the environmental concerns around landfilling abound. Principle among these is the external cost in air, soil and groundwater emissions (Nahman, 2011). While rigorous technical specifications mitigate the worst of these, even the best measures have been demonstrated to be relatively short-lived (Lechner et al, 2002). In addition, landfills produce methane, a greenhouse gas considerably more potent than CO2. However, this particular short-coming has been harnessed through landfill-gas-to-energy schemes (McLaughlin and McDaniel, 2013).

Still, little can be done to curb the social perceptions of landfills which are generally considered to visual and olfactory impediment, however untrue this may be. Moreover, landfills often attract noise, vermin, spew dust and increase traffic volumes in their vicinities. These 'disamenities' are essentially nuisances associated landfill and seldom pose any demonstrable health risks (Nahman, 2011). It is no surprise then that landfills are most often situated in proximity to poor communities (Engledow, 2007). But that can be misleading; landfills are generally located outside cities for financial and social reasons. Ultimately then, landfills, with their consumptive use of land are a spatial expression of the economic reality of cheap land.

Nadi et al (2009: 18) describe landfills as "fuzzy spatial objects… with indeterminate boundaries". It is within this 'fuzzy' space that landfill exert their economic disbenefit. For example, Nahman (2011) has shown that property values decrease as a function of proximity to landfill within a certain radius. This accords neatly with Star's (1995) relational thinking injunction to "think of space as an arrangement of priorities." But, this surely reflects poor prioritisation principles; this is effectively the spatialisation of environmental indifference. Additionally, landfills reduce the quality of the urban morphology. They lack "permeability" from one side to the other and provide harsh "edges" to the neighbouring settlement (Lynch, 1971). However, McLaughlin and McDaniel (2013) note the potential value in topographically featureless landscapes where they provide relief.

These apparent design flaws are redeemable as demonstrated by landfills which have been converted post closure into recreational purposes (McLaughlin and McDaniel, 2013). Given the location of landfills on the extremities, who is expected to use these facilities? Moreover if located in poor areas, does the new use reflect the neighbouring communities? Even if the argument of settlement growth is posited to what extent would the growth constitute urban sprawl if it reached the landfill site? Sometimes, decommissioned landfills are used to extend settlements but this requires special engineering precautions, long-term planning and necessitates that solid waste engineers and urban planners work together collaborate to consider the long term vision.

Landfill mining is relatively new trend in environmentalism. First described in 1953, its principle aim is to reduce the landfill's airspace and/or remediate poor design (Enviroalternatives.com, 2013). In an unexpected twist of fate, decommissioned landfills could now serve as secondary sources of recyclable materials, soil and renewable energy (obtained by incineration) (Webb, 2010). Should this catch on, landfill would have essentially become rather inefficient waste store (White et al, 1995). Yet it remains useful for the purpose of righting past wrongs. In addition, landfill mining can liberate urban land to be "redeveloped for some other [more] suitable purpose" (van der Zee et al, unknown). It is however only a real problem where the landfill sites have not been restored for some other use.

Planning generally struggles to engage with landfills; it seems that this is because it is often assumed will be far away from people and activity. Whenever it does tackle the issue directly, however seldom, it tends to focus on local impacts without cognisance of the impacts to the larger system. Purcell (2009: 153) contends that this is a good thing because it counteracts the common-good approach to planning which often disempowers the most vulnerable foisting upon them the most undesirable land uses under the auspices of "everyone's best interest". "Such a requirement," he continues, "is really quite perverse, and even punitive, in the context of a history of injustice" (p. 153). This provides a strong motivation for planning seriously to look beyond the landfill.

3.3.2 Incineration

Developed as a more efficient method of waste disposal (Pinderhughes, 2004), incineration burns and sterilises solid waste reducing its volume by up to 95% (Hjelmar, 1996). In this way, incineration was also a reaction to economic stimuli—high land prices. In addition, incinerators are often designed to generate electricity. However, this is a potential deterrent to reduced urban metabolism as incinerators compete with waste minimisation and diversion tactics (Pinderhughes, 2004).

Gasification is a different technology to incinerator but offers similar energy recovery potential and purportedly has fewer desirability consequences for its immediate neighbours because the facilities are compact and less intrusive (Belgiorono, 2003). Yet, both technologies are as 'fuzzy' as landfills; both induce traffic, noise, odours and the potential for pollution. The advantage of gasification is that it could "easily" be incorporated into industrial areas where they would consume the homogenous waste to which they are most suited (Belgiorno, 2003: 10).

Health concerns are the biggest concern for residents near incinerators. While some research has linked the toxin build up to incineration (Health Alert, 2001), there is a general consensus that the risk is low (Roberts and Chen, 2006; Rushton, 2003). In any case, there is generally less aversion to incineration than landfilling possibly because it is less unsightly (Campbell, 2000). Subsequently, planning literature is almost completely silent about municipal incineration. Where mentioned, it is discussed as an add-on to landfilling not a stand-alone option.

3.3.3 Material Reclamation

Material reclamation is a generic term used in SWM to refer to processes that reinstate some value to the waste. The main two processes are recycling and composting.

Recycling

Recycling is "to process (waste) so as to convert it into a [re]usable form" (Oed.com, 2013). Recycling in one scheme that has received much attention; subsequently there are several available recycling options available. The means vary from split-bag kerbside recycling schemes to recycling drop-off centres to regular recycling drives. In many cities wastes are taken to material reclamation facilities (MRF) which sift through waste and siphon out recyclable materials.

A clean MRF sorts recyclable commingled wastes (from separate-at-sort schemes) according to agreed specifications before shipment to end-user manufacturers. A dirty MRF on the other hand accepts mixed MSW, separates recyclables and then further sorts these according to the specifications established by end-user manufacturers. The balance is sent to other disposal facilities. TO maximise economic costs, these facilities are often combined with refuse transfer centres. Dirty MRFs have two main disadvantages: the first relates to a compromise in the integrity of the recyclables. For example, paper-the most abundant element in MSW-is contaminated and thus cannot be fully 'revalued' (RMCT, 2003). Secondly, this means

of sorting absolves the consumer of any responsibility regarding metabolic cognisance.

Composting

Composts are decomposed organic matter recycled for use as fertilisers and soil amendment (Sotamenou and Parrot, 2013). Miller (1992) lists and describes three major applications for composting: production of compost for agriculture and horticulture; the production of a substrate for mushroom growth; and the treatment of organic wastes. This order almost suggests that the waste treatment qualities of composting are secondary to the consumptive opportunities composting presents. Thus, composting is a potentially monumental aide in urban metabolic reduction.

It seems then the potential of composting to promote resilience (through urban farming) seems to have been underestimated (Mhindu et al, 2013). However, there is reciprocity between the urban farming and composting (Sotamenou and Parrot, 2013). The promotion of one requires the uptake of the other at least in the initial stages. Composting even has the potential to induce relational symbiosis between the city and its hinterland.

However, there is no consensus in terms of scale the best scale for intervention. For example, in composting, both Dhaka's decentralised model and San Francisco's municipal food composting programmes have succeeded thus far (Zurbrugg et al, 2005). Large scale composting presents rigorous technical specifications and governance implications (McLaughlin and McDaniel, 2013). In reality, the ideal probably incorporates a variety of scales driven by municipal influence.

The challenge that confronts these modes of waste 'disposal' is competition from other forms of disposal as mentioned above. Secondly is that material reclamation is an intentional process that requires effort, both individual and corporate (or at least institutional). So, Price (2001) asserts that "social credit" gained from implementing waste minimisation strategies is the same as that from recycling the same materials, but requires more effort and more lifestyle changes. Yet, recycling engenders a "feel good factor" which is difficult to replicate as a significant motivator for self-initiated waste reduction (Price and Joseph, 2000). Stating the obvious, McLaughlin and McDaniel (2013: 118) note that "one cannot recycle more than one generates" and so, the goal, since in theory recycling deals with waste (which itself is a generally undesirable by-product of existence), should not be to recycle more but to recycle less *as a result of consuming less*.

3.3.4 Consequences

The overarching theme in the way urban waste is managed is an overriding 'out of sight, out of mind' mentality. No matter the specific means, there is a deliberate distanciation of waste from source. Amid the prevailing culture of convenience, urban spaces are designed such that consumption is the embodiment of urbanity – consider the high street, the cultural district or even the urban parks – while waste is expelled from the city limits. Moreover, individuals' responsibility is deferred with the onus of closing the loops falls squarely on City government who increasingly employ technology to eke significance out of urban waste. Subsequently as populations and affluence increase, technology enters to facilitate and then mitigate the effect of urban profligacy. The result is cities linear metabolisms as they lose the SWM battle of minimising economic cost while maximising environmental benefits without discomforting social norms (White et al, 1995). Huxley's (1938: 268) words are almost prophetic of today's waste crisis:

"We are living now, not in the delicious intoxication induced by the early successes of science, but in a rather grisly morning-after, when it has become apparent that what triumphant science has done hitherto is to improve the means for achieving unimproved or actually deteriorated ends."

In a sense, Huxley is cautioning against the unencumbered use of technology. Technological gains must be met with a commensurate shift in urban mentality. The fact that up to now, technologies primarily promulgate linearity—or at least fail to discourage excessive consumption—is not helpful.

In his book, *To Save Everything, Click Here: The Folly of Technological Solutionism*, Morozov (2013) begins: "Have you ever peeked inside a friend's trash can? I have." (In other words, have you ever 'unhidden' your neighbours waste? Would you like yours exposed?) This is monumental if the message of the book is applied to the urban waste problem. Solutionism—the main concern of the book—questions how problems are defined because this implicitly determines how 'solutions' will be conceived. This approach castigates the questioner who asks in isolation: "How can we reduce waste?" It even criticises the more holistic question: "How can we close metabolism?" Rather it forces urban dwellers to consider that *they* might be the problem—how they build their cities, how they circulate materials in their cities, how should they interact with the non-built (not non-urban) environment and how they expect to contribute to their cities. Without such considerations, SWM and urban planning continues to side-steps the problem. The patchwork of methods investigated above fail to penetrate to the crux of the issue; that modern cities have insatiable appetites.

So the patchwork remains; patchy in its application, patchy in its results. Individual householders often have the option for more 'sustainable' means of SWM but would have to shoulder the financial burden and/or alter their lifestyle significantly (Price, 2001; Belgiorno, 2003). So, some authorities have turned to the default of our time; with capitalism firmly embedded into the neoliberalised human psyche, pay-as-you-throw (PAYT) strategies have seen considerable success by turning waste into a consumable whose cost is "directly equitable to units utilised" (Price, 2001: 343). The ethics, or ironically sustainability of this in the long-term, is questionable.

Hence there is still much debate around *how* cities should actually respond to the challenge and *who* must take charge (Belgiorno, 2003). Meanwhile, the urban form continues to reflect wastefulness. The reliance on the self through the use of private infrastructure—most notably the freestanding home and the automobile—propagated a propensity for apathy towards civic affairs (Varnelis, 2008). Perhaps there is a case to argue that the ruggedly individualistic 'American Dream' (or its less extravagant cousin RDP dream) have contributed to an indifference towards the individual's contribution to the whole. Through the historical survey above, it was clear that much of the metabolic cyclicity was a consequence of both individual and corporate intervention.

3.4 Of Form and function and Agency

In Chapter 1, the following assertion was made: urban form is determined by urban function (and vice versa); the function people require determine the form of the thing that does it while the form things adopt shapes the function we attribute them. So that if we can find function—the value in waste—then we can change the form—where we put waste. The task then is figuring out how we as humans derive and decide on function—i.e. figuring out what we value (our agency). McHarg (1971) is not so convinced by this reciprocation. He asserts rather boldly that "form follows nothing—it is integral with all processes" (p. 173). In effect this accords with the above argument in which 'function' is not an isolated element but a relationship we project with our surrounding.

Newton (1997) presents the 'Re-Designing Cities' motif which plans for compact and energy efficient cities. One of the principle elements of achieving this is to create settlements that "[use] less space overall" than the current model (Birkeland, 2008: 46).Thus the 'Re-designed city' has policy which focus

specifically on lowered urban metabolism through redirecting material flows *within* the city itself (Newton, 1997). This introduces the concept of ecological footprint. Ecological footprint is the measure of the amount of physical space a settlement (or person) requires to sustain its livelihood.

Birkeland (2008: 46) however, observes that denser living arrangements requires a corresponding increasing the "city's 'ecological base"'. In other words, the public estate—parks, public spaces and facilities—must be grown. However, it is not enough to simply increase public spaces; this increase should met by the multiple use of spaces to accommodate both natural and social functions. This sharing of space might impact people's desire to care for spaces more. In a sense then, compaction must be accompanied by dispersal in that higher density types can be used to provide larger open spaces (Bamford, 2008).

And so, cities must move from "spatial minimisation to spatial amplification" (Birkeland, 2008: 43). Harmonised densification is one way to achieve this McHargian enhancement of space. Another of the ways this is achieved is by "capturing regional synergies" (Corder, 2008: 317). Industrial symbiosis seeks to achieve this symbiosis by fostering mutually beneficial relationships between proximate entities. In these relationships proximity means that resources can be traded—or cascaded such that one industry waste are used as input by another.

It is true that cascading (and where possible the accompanying clustering) can arise naturally under economic forces without the input of urban planning (forward) (Gertler, 1995); yet without the input of urban planning (regulatory) its manifestation is limited (Desrochers, 2004). However, city planners and SWM professionals must wrestle dissenters who argue that eco-industrial symbiosis is completely 'unplannable' and must be allowed to occur naturally by market processes (Desrochers, 2004; Gibbs and Deutz, 2007). This is precisely the point. Master planning is passé and to plan an entire eco-industrial park from scratch is not the business of the planner. Rather, through strategically crafted and spatially targeted policy, the planner by "reducing the mental [and physical] distance between the companies" can massage symbiosis into existence (Gibbs and Deutz, 2007: 1689).

Corder (2008) records a three-step process for identifying and evaluating synergistic opportunities:

1. Some 'preliminary assessment tool' must be used to list potential synergies;

2. A more specific 'input-output tool' generates registers that enable relationships to develop; and

3. A 'screening tool' to assess the quality of interactions in terms of overall sustainability, feasibility and ease of implementation.

It is not self-evident that symbiosis-like production systems would be sustainable in every case, as the background assumptions for political promotion of eco-industrial parks suggest (Lehtoranta et al, 2011) but since planning is inherently idealistic, it stands to reason that within context where it seems feasible then is can be pursed.

3.5 Multidimensionality and Complexity of Municipal SWM

The modern city's solid waste metabolism has become a strange paradox. Waste has become simultaneously more prevalent (through increases in population, affluence and technology), less obvious (through distanciated disposal), and at the same time less personalised (through the expectation that its processing

is solely a municipal responsibility). Out of mind, out of sight has the all too real potential to become out of mind out of sight. At the same time, though, "[a]s important as the question of [waste] is today, the emphasis on quantity—on [waste] reduction—obscures its relationship with the qualitative value of things." (Mostafavi, 2013: 320). Produced by society, processed by economics and impacting the environment, waste is by nature a complex and multifaceted urban concern.

Like all urban issues, waste is subject to the complexities of urban governance system. Price (1996) argues that the support structure for implementing recycling and waste reduction policies should be based at the municipal level. In the Netherlands, Local Authorities tend to adopt an interventionist role, promoting and supporting coordinated activities, with a common goal of achieving first local and then national level targets. The municipality is seen as the most appropriate level for strategic intervention sufficient local level knowledge to effective infuse national imperatives with household abilities (Cullinan, 2010). Specific responsibility is allocated to key actors and players within the waste management sector, and far from fragmenting waste management within the local area, the coordinating and managerial role of the Local Authority ensures that everyone is operating within the same framework (Price, 1996).

Ladd (1991: 299) describes solid waste management as a crisis mired in "socio-political controversy". Privatisation has a lot to answer for in this regard; increasingly, MSWM is occupying this grey semi-private space where a public function is provided by a private firm (Swilling, 2006). It's not that cities have no control; rather they abdicate their operational responsibility without surrendering their managerial authority. (This arrangement is more correctly known as contracting-out municipal services.) Privatisation is perhaps the most divisive issue in MSWM. Theoretically, business acumen should drive efficiency but, as noted above (see sustainability definition) this does not necessarily translate into frugality from the urban metabolism perspective. So, while Begley (2011) and The World Bank[3] (2011) support municipal privatisation of SWM, many more (see Fahmi, 2005; Samson, 2003; Whitfield, 2002) insist that its adverse effects – ranging from ecological indifference to social inequity – far outweigh it beneficial attributes and should at least be approached with caution (Martin, 2001; Rozsa and Geary, 1997).

Meanwhile, planners are left to navigate through the ethics of exclusion and imposition that privatisation in particular and SWM in general can provoke (Campbell, 2012). They must mediate the "conflicting rationalities" that embody the siting of run-of-the-mill SWM facilities like landfill sites. Popper (1981) describes four ways used by American planners to site Locally Unwanted Land Uses (LULUs). The four land use strategies employ zoning to distribute LULUS within a given jurisdiction. First, LULUs can be concentrated (or agglomerated) in areas that are unlikely to attract dissent. One advantage of this is the potential for agglomerated activities to feed off each other (Florida, 2008). The danger thought is in creating 'no-go' zones in the city. Secondly, dispersal can be used to spread uses approximately evenly across the area. This is seen as an antidote to exploitation of the vulnerable and an end to entire neighbourhoods being metaphorical and literal wastelands. Moreover, it potentially promotes community level resilience (Kennedy, 2006). Randomisation is a third strategy which seemingly sites LULUs haphazardly. To be sure, approval would be subject to certain City and national statues but the processes would be largely market-driven (Popper, 1981). This strategy is particularly risky; how will a city council react to proposal which directly contradict the City's spatial strategy? The fourth measure is retrospective and accepts the LULUs placement provided certain on-site mitigation measures are in place or added.

These institutional dynamics are a prelude to the tensions that exist in the lower echelons of individual communities and households. Ladd (1991: 299) suggests that technologies – landfills, refuse transfer station, recycling bins – have an impact on "traditional values". For example, increasing waste receptacle capacity is often met by a concurrent increase in the amount of waste deposited Belgiorno, 2003). Thus

3 Interestingly, Rabkin (2013) has said that The World Bank is "neoliberalism incarnate".

the shift has tangible (often adverse) implications on the health of the biosphere.

The backlash to this ailing environment manifests in community collaboration as NIMBYism – Not In My Back Yard-ism – and at one extreme and BANANA – Build Absolutely Nothing Anywhere Near Anything – at the other. Nimbyism is generally a fruitless process as characterised by claims and counterclaims whose sole purpose is to refute the credibility of the other party or to obviate the weakness of your own position. BANANA, on the other hand, is often illogically anti-development and posits no alternatives (White et al, 1995).

Planners must play a conciliatory role and alert people to the obvious – that unless their lifestyle changes drastically (or ceases altogether) the project must be built. Freudenburg and Grambling (1990: 2) implore planners not to ignore these "impacts that take place before the first shovel of dirt is turned". To this end, the hypothetical situations, planning and probing which often incite "pre-implementation anxieties" (expressed as NIMBY and BANANA) should be re-appropriated into conversations about waste and minimisation (Ladd, 1991: 300). Meanwhile the political expression in the face of controversy tends to be procrastination. Incumbent politicians bury their heads in the sand and ignore the problem only to pass the baton on to the next leader. White et al (1995) term this tactic NIMET – Not In My Elected Term.

Mostafavi (2013: 328) contends that we must find more ways, not only to deal with our waste but to use it forensically "for traces, clues of what we are doing to ourselves. What kind of foods are we consuming, for example, and in what manner?" In a sense, he asserts that the adage we are what we eat is probably more appropriately framed we are what we waste. Thus media will play an important role in closing urban metabolisms and re-inculcate a "waste not, want not" culture (Valentine, 2013).

Like location influences influence cities' prosperity, so too does it exert its influence over the way in which wastes are dealt with and perceived. Discussing the global south in general and Africa in particular, Abdoumaliq Simone (2008) writes:

While it is clear that the pursuit of structured plans, development agendas, rational decision-making, require economic supports and political will often lacking in impoverished societies, the apparent provisionality of African urban life also masks the degree to which residents capitalize on some of the most elemental facets of "cityness" itself… whereas planning discourses center largely on defining, consolidating, and articulating a given position to others, the urban game for many Africans is to become nodes of gravity that draw attention not by standing still and defending niches, but by an ability to "show up," make oneself present, no matter the circumstances, in a kind of social promiscuity.

In other words, as Miraftab (2009) and Roy (2009) propose, 'informality' is a legitimate means of planning insofar as its collaborative/participatory and insurgent aspects produce novel and ingenious solutions to the quandaries of urban life. To be sure, informality has been a cause of much of the solid waste concerns (World Bank, 2012) yet in other cases informal areas stand as a shining example of the virtues and values of closing metabolic loops (Guardian.co.uk, 2007; Nytimes.com, 2011b).

But people are more than mere cogs in the process of solid waste. In daily life, people ipso facto produce waste. More than that though, they are actively involved in expunging this waste from their vicinity. In effect then, people constitute a significant part of the solid waste infrastructure. Simone (2008) concurs, extending his notion of infrastructure to the activity of people in the city. If infrastructure is "collection[s] of discrete, inter-related [and inter-relating] parts" bundle together to form networks then people fit squarely in this ambit (Dewar and Todeschini, 2004: 11). The conjunctions of people, practices, objects

and spaces become an infrastructure – a platform that allows the "flow" (PCCIP, 1997: 8) of human energy. While it is easy to dismiss the idea of people as infrastructure, Simone (2008) astutely notes that their need to generate a concrete outcome albeit through agents of multiple identities outweighs the "enforcing of modulated transactions among discrete population groups" (p. 79). So, planning must embrace this conceptualisation and attempt to effect changes in the *social* infrastructures that influence people to REDUCE, reuse and recycle.

Planning must overturn Le Corbusier's (1927: 11) notion that that it is the engineer who "puts us in accord with universal law" (p. 11). We cannot simply 'build our way out' of this situation. Guy and Marvin (2001) challenge the planning psyche which up until now has been to separate the technical systems that facilitate resource flow from the social systems of consumption and influence. Instead, they posit a new paradigm which views these not as two distinct systems but rather as inextricably interdependent technical networks with various technical social, economic, environmental and political linkages.

3.6 Planning for Waste

Mumford (1997:239) refers to the utilities that are vital to the functioning of the city as the "invisible city." Indeed, it is often only noticed when it breaks down. Until this point, planning has by and large avoided the issue of waste or at least skirted around it. Planning tends to proselytise the need for waste management to comprise a significant part of municipal planning but stops short of proposing means to approach the issue. In a sense then, SWM is invisible in the planning profession. The time is now for it to emerge from the insignificance. To do so, planners should adopt three approaches.

First, planners must realise that their speculative spatial design is a prerequisite to catalyse radical policy that embedded in the vision of sustainable and resilient metabolically astute cities (Mostafavi, 2013). For example, "density and wise land use" are important (Valentine, 2013: 317); however, ultra-high density is not necessarily conducive to urban liveability and may in fact serve to undermine sustainability efforts through excessive distanciation of waste from source or otherwise.

Legitimate planning devices exist to combat the urban form's propagation of linear metabolism. For example, planners' ability to influence – if not directly control – the relationships between architectural vernacular and contemporary additions can influence urban metabolism (Valentine, 2013). As Owen (2009) alludes, planners should consider the entire picture so that an individual building's admirable qualities do not override its overall integration with the system's sustainability. In this way the complicity of ruggedly individualistic architecture in urban metabolic linearity is limited. Integrated Environmental Zoning (IEZ) exists inter alia to reduce source outputs and protect the integrity of natural sinks (Miller, 1997: 147). This correlates with the goals of urban waste metabolism.

Second, planners need to grow their understanding of other disciplines and their capacity to respond to the range and diversity of approaches to urban SWM. Otherwise, the approach to the city remains somewhat "anaesthetised" (Mostafavi, 2013: 325). Thus, the "blurring boundaries—real and virtual, as well as urban and rural" (p. 327) is critical because it infers "greater connection and complementarity between various parts of a given territory" (p. 327). In other words, there interventions and transformations in a specific area have considerable implications beyond its *perceived* physical extent. This requires simultaneous considerations of multiple scales—both small and large—to define the governance under which a more cohesive regional planning could ensue.

With a multi-angled view, the fragility of the planet and the finitude of its resources no longer present as

"technical legitimation[s] for promoting conventional solutions". Rather, they foster novel solutions with "the capacity to incorporate and accommodate the inherent conflictual conditions between ecology and urbanism" (Mostafavi, 2013: 320). One theme running through all the approaches that have borne fruit is that the garbage is removed from the realm of the unknown and unseen and thrust into the light of everyday experiences. To this end, Mostafavi (2013: 328) says "If we don't see the garbage of our age, both literally and metaphorically, then we are not confronting the reality of what that garbage actually says about us."

Third, planning for waste should produce flexible systems. Bateson (1972) discussed the tension between the need for flexibility and the difficulty in achieving it. For Bateson, flexibility—of systems, ideas, or actions—conjured up tightrope walking in which the essence of stability is in the constant adjustment from one extreme of instability to another. This is called "economy of flexibility"; the dynamic interrelationship between flexibility and entrenched habits – habits that must be exposed to their own instability and variation – that produces the ecological conceptions as constantly evolving processes. Thus planners are charged to employ spatial interventions to challenge formed habits. Hence, a tool like IEZ, appropriately adapted for the purposes of SWM is ideal.

In a similar vein, informality, which by its very nature challenges rigidity, is not something to be shunned as much as embraced. While collaborative planning has elevated community participation from en vogue to invaluable, informality is not always fully appreciated. Informality takes many shapes and forms and should not be exclusively associated with the infrastructural 'black-holes' of many shanty towns worldwide. 'Limited tolerance' is an unconventional example of informality, relies on the expiration of a person's capacity to endure a given inconvenience. Beyond a certain level, alternative arrangements are made (Varnelis, 2009).

Drawing on the works of psychologist Mihaly Csikszentmihalyi, Florida (2008: 159-160) observes that place "gives us something to which we can belong, providing a sense of pride and attachment [and offering] characteristics by which to define ourselves and a physical and figurative space in which to live". It's a means to the end of cultivating, asserting and expressing the *individuality* from which human happiness derives. So, planners today must also recognise the resourcefulness of human nature (manifest in informality). 'The Plan' is not the be all and end all. As such, solid waste infrastructure must be flexible both in its provision and its utility of its outcome. This harks back to the earlier notion that real participation in planning is to provide choice in the outcome. Place gives people an environment to adopt and make their own.

In effect, then, the production of urban waste cyclicity is depends on traditions of (technical and social) knowledge as well as the flexibility to respond to variable networked externalities (Mostafavi, 2013). "Somewhere along the way, people got the misguided notion that the only way to have a good life is to consume" (Valentine, 2013: 316). More likely, though is that the good life is actually about experience and consumption is merely a proxy for experience. Perhaps the task for planners is to catalyse the appropriate cultural shift. As the priorities of economics and ecology stubbornly begin to coalesce (Valentine, 2013), there is finally an opportunity to take action. Cities can move past wasteful indulgences to the mind-set that they are part of nature and there is "no waste in nature" (Harvey, 1996; Swilling et al, 2012).

3.6.1 Waste Redefined

Hjelmar (1996: 359, emphasis) submits that "[a]ny disposal strategy should *reject* the inherent properties of the waste" – that it is useless. Pinderhughes (2004) suggests several substitute words for waste; one

of these is 'misuse' which he observes provides important insight into the effects of our perceptions of waste. Urban planners must wake up to the reality that the nature has limits which are about to be exceeded (Acosta, 2010). The limits are the rate of extraction of resources in relation to the in the rate of return of waste for reabsorption (Pinderhughes, 2004). With that in mind, Pinderhughes proposes a shift from *waste disposal* to *materials management*. In effect then, Hjelmar's (1996) injunction misguided because it misunderstands the value of so-called wastes.

Furedy (1992) goes one step further calling for a paradigmatic shift from "resource management" toward "resource recognition". Sustainable resource recognition – or more prosaically waste management – necessitates a reduction in waste production and distribution by enhancing the value of waste through resource *redirecting* functions (Pinderhughes, 2004). The result is that waste as an urban resource is a terminological conundrum. Contrary to the prevailing economistic ethic, waste cannot be a resource that is increasingly consumed. Rather, waste must be a resource whose very generation is systematically minimised. Therefore, the real challenge is to strategise an urban space which promotes waste reclamation, promotes waste reduction and finally adapts to minimal waste generation.

Waste can no longer be something to be banished from the city limits at the first opportunity (Mostafavi, 2013). "Accomplishing this will require *deep* economic, social, and cultural transformations" (Pinderhughes, 2004: 68, emphasis added). As Cupido (2012) has said, "in [planning]… the principle of stewardship is profound"; a perspective captured in the truism sometimes ascribed Native American Chief Seattle: "We do not inherit the earth from our ancestors; we borrow it from our children".

PART B: PRECEDENTS

This part discusses four completely different precedents. Each has important considerations regarding the treatment of waste and space in the urban realm. One in particular draws attention to the multi-sectoral approach that solid waste management necessitates.

San Francisco

California, United States of America
37°42′30″N 122°16′49″W

Source: UN-Habitat, 2010

"Where no city has gone before..." (Atlernet, 2012)

San Francisco is the administrative and financial capital of the Western US. Located in a dramatic topographical setting, the city (proper) covers an area of about 122km2 and has a population of 835000.

The Solid Waste Story

As part of its commitment to the precautionary principle, the city adopted a multi-sectoral approach to reducing waste to landfill. Beginning in 1999, the city passed a mandatory recycling and composting ordinance. Launched under 'The Fantastic 3' motif, bins citywide come in threes—blue for recyclables, green for organic waste and black for landfill waste. The three bin system confers two advantages. It harnesses the potential of both organics and non-organics and by introducing the system citywide, it invites residents' participation both at home and away from home (Alternet, 2008).

The city has no landfill and discards must be transported between 85 and 97km to landfill. Thus to encourage separation of recyclables (which are processed by city business), the Administration offers steep discounts for collection of separated wastes. Also, the San Francisco was strategic; it upgraded its collection vehicle fleet in line with its waste minimisation goals. Generators segregate materials and *split-chamber* trucks simultaneously pick up trash and recyclables. This means that the number of collection trips need not double (or triple for the collection of different waste streams. As a means of continually spreading the message, city trucks serve as marketing billboards with. Meanwhile the City's Strategies to Address Greenhouse Gas Emissions clearly discuss the importance of built form and waste.

Source: UN-Habitat, 2010

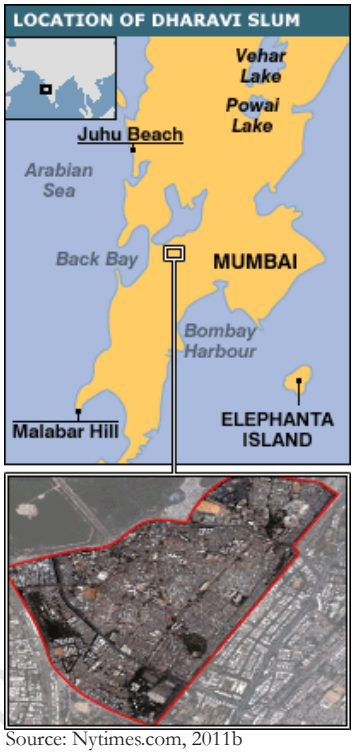
'Zero waste or darn close'.

In San Francisco, ordinances were passed banning superfluous packaging and promoting that all foodstuff should come in recyclable or compostable packaging. Furthermore the city is supportive of efforts to impose stricter regulations regards waste generators' responsibility for their waste (UN-Habitat, 2010)

DHARAVI

Mumbai, Maharashtra, India, Asia
19°02′38.4″N 72°51′23.0″E

"It's difficult to find something here that is not recyclable." (Moore, 2012)



Source: Nytimes.com, 2011b

The Solid Waste Story

Over 1-million people reside in Dharavi, once Asia's largest slum (The Times of India, 2011). Dharavi traces its origins to the late 18-th century when it was a fisherman's village. It is a magnet for migrants particularly those from other parts of India and, interestingly has always been considered by authorities as unfit for inhabitation due to its swampy nature (Nandy, 2010). Today, Dharavi is now at the heart of Mumbai's recycling industry which employs over 200 000 people with an annual economic output of over £700-million (Guardian.co.uk, 2007). In a way, Dharavi "could be called a self-created special economic zone for the poor" (New Nytimes.com, 2011b). To be sure a "scavenger mentality… and sheer necessity" has driven this grassroots effort but the fact remains that it is not only lucrative industry (at least versus the alternative—unemployment) but also an integral part of the city's economy (Moore, 2012). Indeed, almost every industry in Mumbai has some linkage with one of the 15 000-single room enterprises in Dharavi or the people who live there (Patel and Arputham, 2007).

Yet Dharavi still exists on the margins. Few businesses pay taxes and few residents have formal title to their land. But with its prime location at the centre of Mumabi, Dharavi's future has hung in the balance since the 1970s with numerous policies aimed at ousting the poor to accommodate the rich (Nytimes, 2011a). More recently, the government conceived to create a World-class enclave of high-rise apartments in which to house the poor from Dharavi and elsewhere (Roy and Roy, 2010). The potential effects of such a spatial change are as yet unclear (Nytimes.com, 2011a). But, there is a general consensus that this would in fact create a true slum out of what is today a centre of innovation and entrepreneurship (Patel and Arputham, 2008).

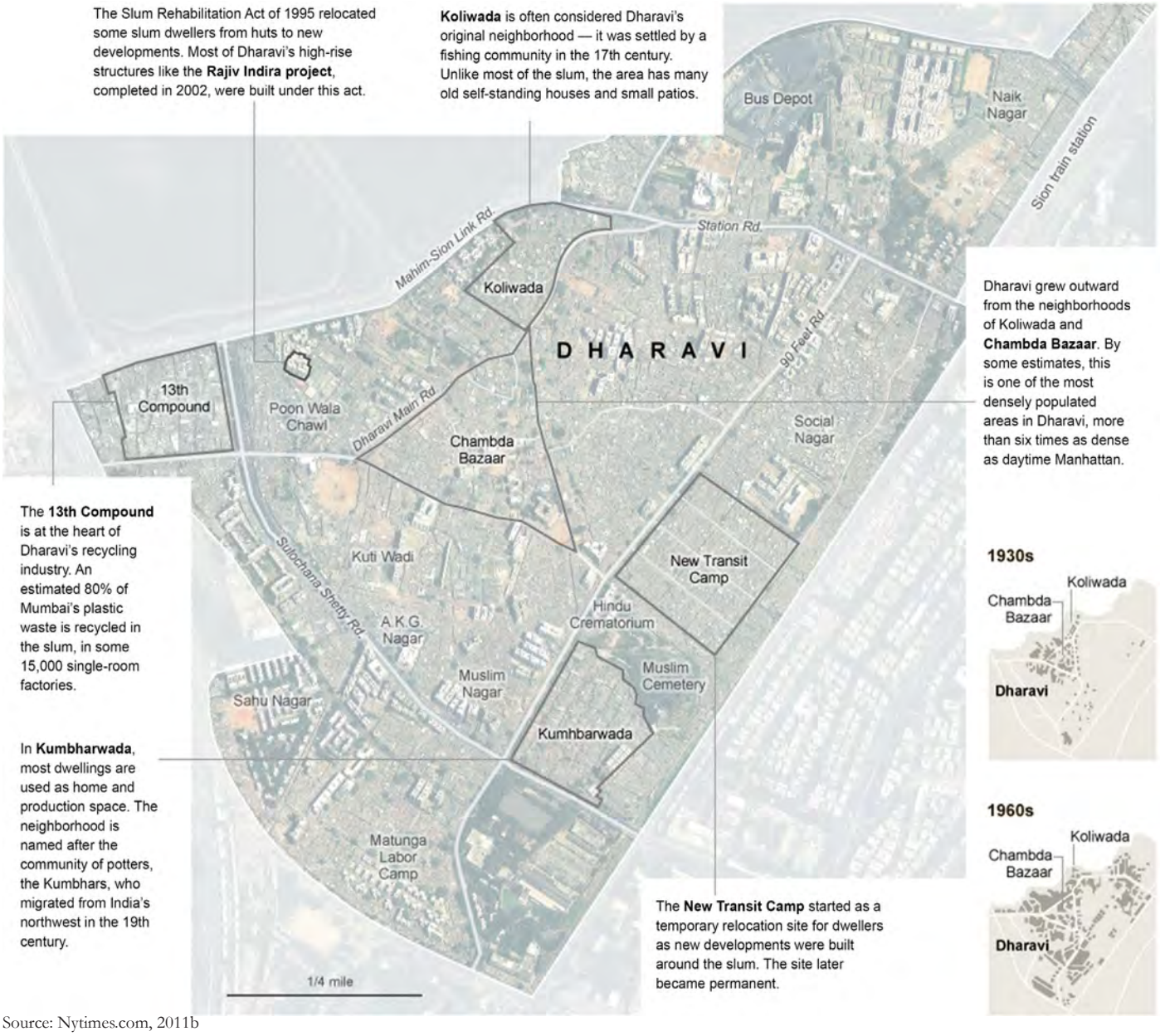
Mindful not to glamorise poverty , architect and urban planner, Matias Echanove acknowledges that "nobody is saying Dharavi is a paradise" (Nytimes.com, 2011b). Rather, the government must understand social dynamics that create the economy, so that interventions ameliorate and not destroy what already exists. It is interesting that in the public outcry and academic furore that followed the press release which called for Dharavi's redevelopment, the overwhelming sentiment was an appeal to consider the people and enterprises of Dharavi (Patel and Arputham, 2007; 2008).

Source: CNN, undated
[The flow of material through Dharavi.]

Lessons in Waste

Dharavi has shown that not only is waste beneficial but it can provide a means of livelihood—survival—for the urban poor. Moreover, having gained international status, some Dharavi residents are extending their influence and revenue generating potential through to the virtual world with various online campaigns and documentary features appealing to the global market for uptake of their recycled goods

(Byron, 2012). For planners, the lesson comes in the reality that informality and the higgledy-piggledy set up of informal settlement can hide industriousness and mutually edify and environmentally beneficial relationships. Therefore before planning away such informality, planners need to seek out opinions of residents and to seek ways to encourage industrial potential to manifest in activity. Dharavi, however has the advantage of being located quite centrally in terms of the Mumbai spatial economy. It also illustrates that in the context of high unemployment, the best 'solutions' are those which are labour intensive.



Source: Nytimes.com, 2011b

Kalundborg Industrial Symbiosis

Zealand, Denmark
55°41′N 11°6′E

Source: adapted from Wikipedia.org

Kalundborg Municipality's network is the most celebrated and published example of industrial symbiosis. Beginning in the in 1961 when Statoil refinery's developers funded a city-built water pipeline from Lake Tisso (to save the city's limited groundwater supplies), subsequent collaborations arose through market forces as collaborators effectively self-organised (Chertow, 2000). In a sense then it is "a non-project made by a non-organisation" (Christensen, 2006). Kalundborg remains the best-known example of industrial symbiosis.

The Primacy of Partnership

The symbiosis has developed incrementally over five decades and, critically, is not in stasis, but rather is a dynamic system in which exchanges of different types are constantly sought (Chertow, 2000). Such dynamism resulted from latent "industrial potential" – that is several large companies, each with inputs and outputs and economic and environmental standards to meet, operating in the vicinity (Christensen, 2006; Kalundborg Symbiosis, 2013). In this way, Kalundborg has illustrated that the needs of individual companies are of primary importance. Yet the flourishing of the individual company has been so interleaved with the network. Indeed even as various businesses increase outputs, change inputs or alter processes, the make-up of the symbiosis adapts accordingly and the spirit of symbiosis perseveres (Chertow, 2000).

The Pattern of Exchanges at Kalundborg

The material exchanges in the Kalundborg amount to 2.9 million tonnes annually and significantly increase both environmental and economic efficiency (Chertow, 2000). At the heart of this network of exchange arrangements is the Asnaes Power Station, the largest power plant in Denmark whose water, heat and solid by-products are used by as many as six other companies (Jacobsen, 2006). Today, there are over thirty exchanges of water, energy and solid by-products between Kalundborg Municipality and eight other companies: Novo Nordisk, Novozymes, DONGEnergy, RGS90, Statoil, Gyproc, Kalundborg Supply and KaraNoveren. Furthermore, several agricultural firms, from fertiliser manufacturers to pig farmers are part of the symbiosis (Ellen MacArthur Foundation, 2013). Thus, the diversity of industry is enormous and exchanges are continually discovered and adopted. Benefits are measured either as positive flows by marketing and selling a by-product or obtaining feedstocks at prices below those for virgin materials or as savings relative to standard pollution mitigation measures (Ehrenfeld and Gertler, 1997).

Industrial Ecology Paradise

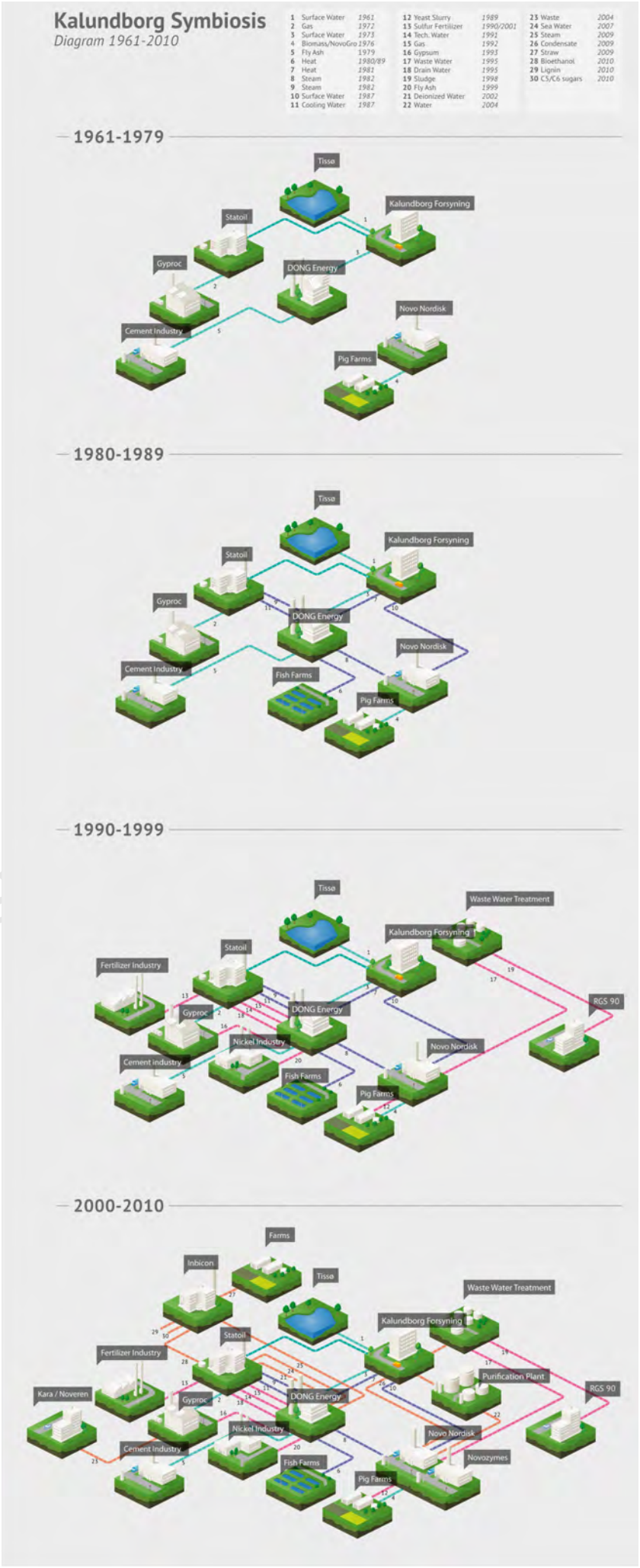
Much of the fear of industrial symbiosis is the 'lock in' effect (Gibbs and Deutz, 2007). It is interesting then to note that pharmaceutical company Novo Nordisk self-elected to rely 100% on the Statoil refinery when it commissioned a 3.2-km pipeline in a 1982 system upgrade, 6 years after it first entered the symbiosis. Cost recovery took two years (Ehrenfeld and Gertler, 1997).

The Scaffolding that Supported Kalundborg Symbiosis

The point of departure in encouraging Kalundborg-esque symbiosis is to create awareness and willingness, both of which precede feasibility (Christensen, 2006). An often overlooked aspect is that

symbiosis developed in response to economic and environmental factors as companies sought to minimize the cost of compliance with new, stricter environmental regulations. Thus the role of environmental policy is important. However, "the Danish regulatory system is consultative, open, and flexible". This flexibility requires that regulations be in the form of performance standards rather than technology standards which stifle innovative reuse and recycling (Ehrenfeld and Gertler, 1997: 75). But in addition to economic and environmental incentives, there has to be the basic chemical and technical compatibility for exchanges to occur (Jacobsen, 2006). These necessitate some sort of social compatibility between firms.

Christensen (2006) says that the challenge faced by other attempts at industrial symbiosis is in communication. Part of Kalundborg's success can be attributed to its small size which proved advantageous because communication and trust pre-existed any partnering attempts. Industrial symbiosis is more about relationships than technical systems (Gibbs and Deutz, 2007). Thus, "the story of Kalundborg is mainly a story of self-governance" and to mimic it requires the creation of a system of semi-autocracy (Boons and Janssen, 2004: 352).



Source: Symbiosis.dk

DHAKA

Bangladesh, South Asia
24°40'–24°54'N 90°20'–90°30'E

Source: UN-Habitat, 2010

Basic Facts

With a population exceeding 12-million, greater Dhaka in Bangladesh is one of the largest cities in the world. It is also one of the fastest growing (3% per annum) and densest averaging 19 178 inhabitants/km2 its 365km2 municipal area (Afroz et al, 2010; UN-Habitat, 2010).

The Solid Waste Story

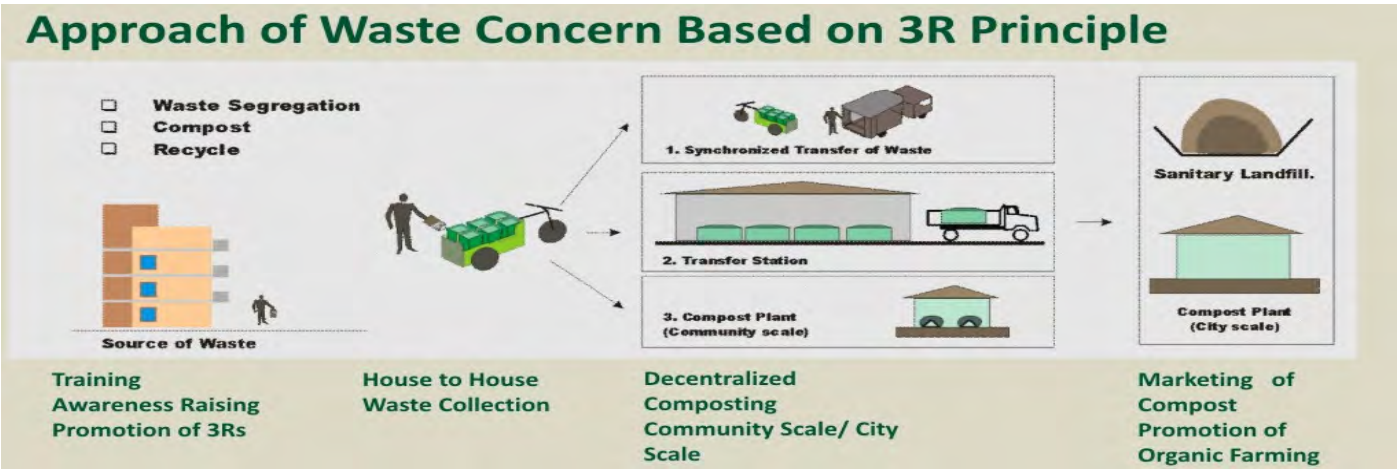
Main Driver

Intensifying urban activity in an increasingly dense city generated more waste per unit area (Matter et al, 2013). Much of the inorganic waste in Bangladesh is not perceived as waste and through multiple, complex informal and formal networks it is reused and recycled (UN-Habitat, 2010). In fact, Dhaka recycles 15% of its waste—that's virtually all the recyclables—creating 120 000 formal and informal jobs (about 2% of the central city's population) saving the city over US15-million annually in disposal (Waste Concern, 2009). On the other hand, only recently has the value of organic waste—about 70% of MSW—come to light (UN-Habitat, 2010; Waste Concern, 2009). Thus, unable to collect all the city's waste and realising the value of organic waste, the Dhaka City Corporation (DCC), the entity that manages the city, eventually ceded part of this duty and public-private partnership (PPP) was birthed (UN-Habitat, 2010).

Organisational Structure

Waste Concern is a waste management and recycling company operating out of Dhaka, Bangladesh since 1995. Comprising of both 'for profit' and 'not-for-profit' arms, the company was founded under the motto "Waste is a Resource" (Wasteconcern.org, 2013). Waste Concern has operated several compost facilities in Dhaka.

In 2006, the DCC signed a 15-year concession with WWR Bio Fertiliser Bangladesh, Ltd . Under this agreement, the first composting project to register under the United Nations Framework Convention on Climate Change (UNFCCC). Given the conditions of the concession granted to WWR Bio Fertiliser Bangladesh, Ltd, the initiative is not a traditional public-private-partnership (PPP) because there is no risk-sharing government partner; rather it is more of a public-private cooperation agreement (UN-Habitat, 2010).



Infrastructural Investment

To divert waste organic waste from Dhaka's two main disposal sites, Matuail sanitary landfill and Aminbazar landfill, the project developed a large 'decentralised' compost plants (UN-Habitat, 2010). With an ultimate target of three large-scale compost plants, the first compost plant opened in November 2008 (Waste Concern, 2011a). The 130-tonne-per-day capacity and is located 25 km outside Dhaka City on land owned by the project whose own collection network transports waste to the compost plant free of charge. Because the plant is not fully mechanised, it generates employment and, by producing compost which is cheaper than synthetic fertilisers, assists poor farmers (UN-Habitat, 2010).

This large-scale facility follow small- and medium-scale compost facilities that Waste Concern has set up in Dhaka since its inception (Waste Plan, 2011b). Decentralisation arose from a recognition that in many developing countries, attempts at composting have generally been centralised and mechanised which has yielded poor quality compost and subsequent plant abandonment. Moreover, decentralisation reduces transportation costs and involves local residents' active participation. It is suited to contexts where local government has land it can allocate (Waste Concern, undated). Table xxx illustrates some of the differences between centralised and decentralised facilities as they have been experienced in developing countries.

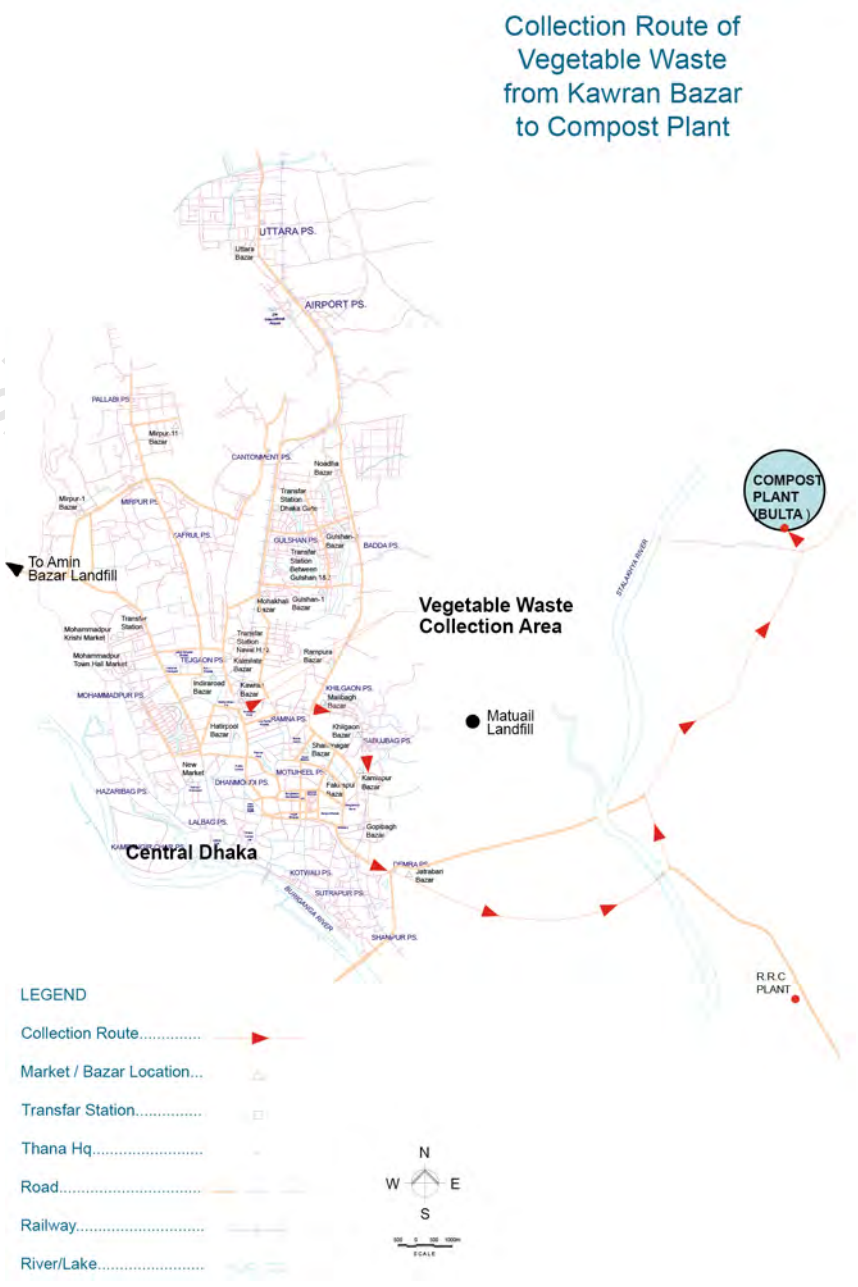
Community-scale

Where individual households lack the space for storage of organics onsite, community-based, decentralised composting integrated with primary collection of pre-separated solid waste is employed (Afroz et al, 2010). Waste collection in Dhaka is mainly on a door-to-door basis by micro-entrepreneurs who transfer waste to designated points of processing or transfer (Waste Concern, 2009).

Large scale

Large-scale facilities serve some households and large vegetable markets. Waste is generally collected by trucks and transported to the facility on the fringes of the city (CNN, 2012). Innovative financing

Harnessing the potential of the Kyoto Protocol's Clean Development Mechanism (CDM) , Waste Concern was able to finance their operations while reducing the city's greenhouse gas (GHG) emissions. The Table illustrates the financial genius of the scheme whose income stream comprises the proceeds from both compost and certified emissions reduction (CER) sales. The CDM project simultaneously reduces the burden on the municipality (infrastructure and operational capacity) while providing jobs for the



urban poor, and investing in the local 'fertiliser' industry (UN-Habitat, 2010).

Large-scale centralized composting system	Decentralized composting system
Depend on highly mechanized technology.	Simple technology and labour intense.
Large investments for advanced machineries.	Low capital cost and locally available materials.
High operation and maintenance costs and a high degree of specialized skills to operate and maintain.	Comparatively less maintenance costs and low level skills required.
Less interaction and involvement of the residents.	Having the residents separate their own waste reduces the volume of solid waste earmarked for disposal, increases the value of recyclables, and enhances the environmental awareness of the community.
Transportation cost is high as all waste needs to be transported to disposal facilities often located far from the city.	Reduces the costs for transportation.
Quality of compost is poor due to large quantity of unseparated waste with high risks of contamination.	Quality of compost is good because waste is efficiently separated twice and risks for contamination are minimized.

Lessons in Waste

Waste Concern also assists in marketing of the compost (UN-Habitat, 2010) by liaising with fertiliser companies and farmers. The ripple effect has expanded the fertiliser industry and stimulated waste related entrepreneurialism as well as influenced behaviour shifts. Dhaka's waste management regime has illustrated several key issues. First, there is a need to consider scale when contemplating waste. Adopting both a decentralised (viz. local small- and medium-scale composting) and centralised (viz. large-scale compost facilities) provides a level of participation that accommodates all needs. In addition, the entrepreneurs drove the process since the city administration realised that it could not meet the challenge. Finally the focus of the existent waste streams proved fruitful.

Conclusions

Waste management hitherto has essentially been waste disposal and how this is the outcome of a discourse that has been unaware—or has wilfully persisted in being unaware (i.e. ignored)—of the ways in which the linearity of urban flows have created a 'truth' and a culture of convenience which is wholly unsustainable. There are subtle ways in which waste ideologies have come to influence urban form (which is multifaceted with intangible aspects), how this has impacted (and been impacted by) the public realm. But, the 'solution' lies in a multi-disciplinary approach to closing the metabolic loops and reconfiguring the ethic of society to a principle of inclusive urbanism (which means including people as well as the realities of urban living in the faces of people). The approaches need, above all to be cognizant of the different circumstances of different urbanites (i.e equitable). Moreover it must integrate people into the system and promote sustainability by making provisions for the given waste streams.

4
Analysis

This chapter looks at the state of urban planning in Cape Town from a solid waste persective. Structured in two parts, the chapter begins by describing the policy enviroment in which which SWM and urban planning are practised in South Africa and then in Cape Town. Policy is the course of action of a governmental body, which translates into strategies, tools, or other public decision (Helfand and Loomis, 2001). It commonly involves setting goals and objectives; and developing instruments of a regulatory, economic, and informational/voluntary nature. The second analyses Cape Town's spatial, economic and environmental state with a keen eye of the implications of this for SWM. Finally, the chapter discusses the specifics of Cape Town's SWM processes.

PART A: POLICY REVIEW

4.1 Overview of the National SWM and Spatial Planning Policy

This section discusses the state of SWM in South Africa with the purpose of illustrating its implications for municipal planning departments. Urban spatial planning in South Africa has been described as reactive (rather than pre-emptive), "too broad [and] too utopian", contradictory to (higher policy and influential trends) and bereft of infrastructural considerations (Todes, 2008: 9; Harrison et al, 2008, Watson, 2002). This last assertion is supported by a City of Cape Town SWM official who observed that spatial planning in the city has in the past overlooked solid waste considerations despite the critical importance of SWM as a bulk infrastructure (Muller, 2013). Perhaps this oversight is reflective of planning's uncertainty regarding its ability to respond appropriately to issues of municipal solid waste.

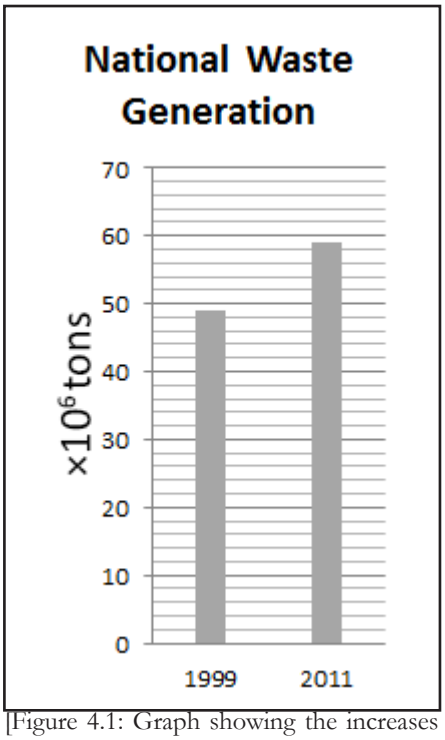
The South African Constitution (RSA, 1996), which has been lauded the world over, places great significance on the environment. Contained within its Bill of Rights is a clause denoting the right of everyone—both present and future generations—to "have the environment protected" (s. 24b). The clause immediately preceding this one records the right "to an environment that is not harmful to their health or well-being" (s. 24a). This anthropocentric tendency—that is placing people first—filters down to lower level policies as discussed later. Much of this Constitutional progressiveness is ceremonial and not reflective of the realities on the ground (King and O'Brien, undated). This effect is particularly evident in SWM and its emphatic focus on "basic service" delivery—a concept whose very definition requires reconsideration.

Until 2009, the now largely repealed Environmental Conservation Act (No. 73 of 1989) was the main body of legislation governing waste management in South Africa and was quite focussed on disposal. The *White Paper on Integrated Pollution and Waste Management Policy* outlined a new direction for waste in the country—one inclined decidedly towards minimisation and one giving urban areas greater priority (DEAT, 2000). Today the principle body of legislation concerning solid waste is the National Environmental Management: Waste Act (58 of 2009) (henceforth referred to as the Waste Act) which defines and categorises waste. Promulgated in term of the Waste Act, the National Waste Management Strategy (NWMS) (RSA, 2010) normatively adopts the waste hierarchy discussed in Chapter 3 where disposal is a last resort that follows waste avoidance and efforts to close metabolic loops. The intention of this legislative process was to move away from the idea of "end-of-pipe" waste solutions (e.g. landfilling and incineration) towards a more integrated and regenerative approach to waste management. Despite producing some admirable SWM policy, in practice this has not been translated into action because policies have a tendency to undercut each other.

For example, in accordance with National Government's Policy on Free Basic Services (FBS) municipalities are expected to provide indigents with free basic municipal services that include weekly refuse removal. However these services funded by (refuse) tariffs, levies, rates and taxes accrued by a municipality from its residents. The problem is that those who qualify for the FBS are also those least likely to pay the abovementioned fees and consequently municipal coffers struggle to fund the running of these very (refuse) services (FFC, 2012). As a case in point, in 2010, 48.5% of the total refuse removal was provided to FBS consumers; so, almost half of the Western Cape's refuse collection was delivered to customers for free—an incredibly high portion (StatsSA, 2011). This is but one example that speaks to why only a few of the waste reduction goals presented by the NWMS have been implemented.

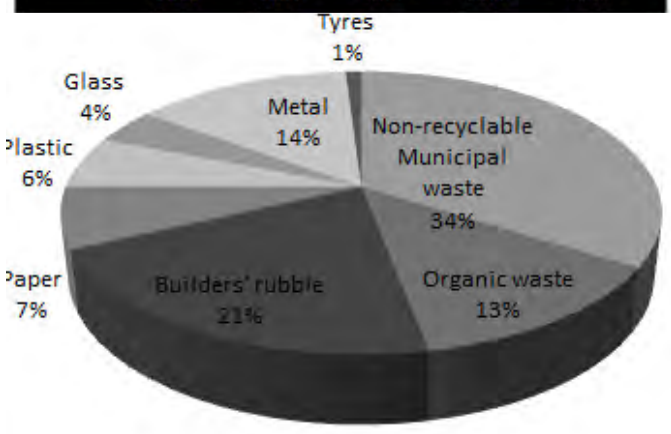
However, there is some positive change in the national-level SWM sphere with calls to re-evaluate perceptions of value from the "limited financial perspective"—i.e. the staunch focus on using waste solely as an economic driver—to a broader view which considers, environmental implication, equity, the appropriate application of the Bill of Rights to SWM (FFC, 2012). To this end, the recent amendment to the NWA tweaked the definition of waste so that "any portion of waste, once re-used, recycled [~~and~~] or recovered, ceases to be waste" (National Environmental Laws Amendment Act (14 of 2013)). The intention here is clearly show that waste need only undergo one of the processes before ceasing to be waste. In response, urban SWM networks must be adapted to engender this changed perspective and reflect it into the urban spaces used by residents.

Unfortunately though, the NWMS—progressive as it is—does not explicitly mention the importance of urban planning in achieving its goals. However, it does allude to planning in the delineation of some of the key strategies citing urbanisation, ageing infrastructure and a lack of municipal foresight as causes of the waste problems. Despite the aforementioned reduction-focused waste policies, SWM generation in South Africa is increasing year-on-year. Figure 4.1 illustrates that general waste generation has increased from 49-million tons in 1999 to over 59-million m^3 in 2011, a 20% increase (DEAT, 2012). Municipalities seem to be consistently rising to the challenge as the number of consumer units receiving 'basic' SWM services also increases as shown in Figure 4.2 (StatsSA, 2013). Only a third of general waste produced nationally is non-recyclable (see Figure 4.3). But waste *disposal* is yet to diminish in prevalence with 90% of the 108 million[1] tons of all waste generated each year sent to landfill. So the country is on the brink of a serious landfill airspace shortage (FFC, 2012).



[Figure 4.1: Graph showing the increases in waste generation.]
Source: DEAT, 2012

[Figure 4.2: Graph showing increases in the number of consumer units receiving basic services from municipalities: 2008-2012.]
Source: StatsSA, 2013



Source: DEAT, 2012
[Figure 4.3: Graph showing the composition of general waste in South Africa in 2011.]

In spite of this, waste disposal

1 General waste is anything that is neither a liquid nor a hazardous type of waste. Most MSW is general waste with the balance of national waste coming from mining and agriculture.

mitigation strategies are beginning to bear fruit. Critical elements of the policy as outlined in the NWMS include the waste information systems, waste minimisation, recycling, capacity building and education and awareness (Simelane and Mohee, 2012). These strategic goals should be reflected in municipal planning which itself ought to naturally take keen cognisance of solid waste.

Oddly though, in the *Policy Brief on Solid Waste Management*, the FFC (2012) bucks the global trend by advocating for the regionalisation of SWM activities versus the 'both-(centralisation)-and-(decentralisation)' discussed in Chapter 3. Nevertheless its suggestion is valid because it is a basis in closed-loop thinking with economies of scale as the impetus for centralisation. Unfortunately the FFC (2012) also offers laudatory comments on the gradual adoption of incineration by some of the metropolitan municipalities (e.g. City of Johannesburg and eThekwini). The problem with incineration in general is that, scrubbers notwithstanding, it transfers a spatially containable solid waste problem into a more expansive air pollution problem. The *Policy Brief on Solid Waste Management's* main concern is to advocate for full cost accounting with respect to SWM. It concludes with three main suggestions for future policy that relate to SWM:

1. Government should take greater advantage of the opportunities for job creation in the solid waste sector by enhancing the incentive structure for municipalities to create 'green' jobs through labour-intensive service delivery approaches.
2. The DEA should delay implementing the policy on the regionalisation of solid waste landfills until the fiscal risks and benefits for municipalities are better understood and adequate decision-support measures for municipalities are in place.
3. Government should encourage the expansion of access to solid waste services to poor communities while strengthening the policy framework for the provision of free basic refuse removal services.

This dissertation subscribes in part to all three of these suggestions albeit with a different understanding of their implications. Furthermore, it proposes the addition of another suggestion: To integrate solid waste more overtly into spatial planning policy.

With the new legislation (SPLUMA), much of the power which previously sat at provincial level is devolved to the local municipality. However, for certain applications that may have a 'regional' or 'provincial' planning interest, the new Spatial Planning and Land Use Management Act (SPLUMA) warrants—or rather necessitates—a 'double dip' approval by both municipality and province (Rhodes, 2013). This has implications for the siting of landfills should the city's future SWM plans continue to guide it down this path. So, the new legislation adds a new, more complicated dimension to an already cluttered legal framework in municipal spatial planning.

Schedule 4B of the Constitution delineates powers of "municipal planning" to local municipalities. This is expressed in the Local Government: Municipal Systems Act (No. 32 of 2000) (MSA) (particularly section 26)[2] which initiates the Integrated Development Plan (IDP) and gives effect to the SDF and its application. In terms of Schedule 5B of the Constitution, SWM is a municipal competence. This finds expression in section 78 if the MSA deals specifically with service delivery; it is this piece of legislation which gives effect to the municipal management of solid waste. With this backdrop an analysis of the CTSDF, IWMP and the SWP is cogent.

2 Local municipality autonomy has further been bolstered by the well-documented case of *City of Johannesburg Metropolitan Municipality v Gauteng Development Tribunal and Others* (2010) which effectively delegitimised any arguments that would suggest that province has a right to involve itself in municipal planning functions.

Table 4.1: A selection waste-related comments on the final CTSDF draft submitted as part of the public participation process]

Ref. No.	Contact	Organisation	Comment Summary	City of Cape Town Response
Comment Theme: The Natural Environment				
73.3	Kim Kruishaar	Independent Environmental consultant living in the Far South Peninsula	Need to promote a new culture of sustainable living and of sustainable development. Eg rain water tanks, waste management and urban agriculture.	Policy P30 & 31 have been edited to address this concern
86.04	Geoff Neden	Far South Peninsula Community Forum	SDF doesn't adequately address environmental issues. *No real policies to minimize wasteful consumption*.	Former policies P30 & P31 have combined as Policy P30 and been edited to address this concern within the parameters of the SDF. A number of other City departments are charged with the responsibility of protecting and managing the use of natural resources and they have/ are drafting the necessary By Laws, strategies and concerns raised by the author.
Comment Theme: Urban Growth Management				
32.2	Keith Featherstone	Nuclear Division, ESKOM	Reserves the right to comment on the proposed airport and regional landfill sites because either of these may pose an external hazard to the KNPS.	Authors comment noted, this was also discussed in meeting on 9th/02/2011.
61.6	Frank Wygold	Cape Environmental Trust (CAPTRUST)	Omission - absence of mention of making land available for responsible handling of municipal solid waste	It is the City's view that the land fill sites near Melkbosstrand and Kabaskraal will both be needed in the long term. This is why the Melkbosstrand site is shown on the Map 5.4 and 6.1. The EIA process underway will determine which site is developed first.
96.1	Simon Liell-Cock	Far South Peninsula Community Forum	The Draft SDF Technical Report correctly highlights the problems but does not, in our opinion, adequately address them. The Report favors development with the emphasis on densification but fails to provide solutions in respect of the enormous scarcity of environmental resources. New development, densification, industrial activity and the unknown variable growth are considered inevitable and in some cases even desirable, yet *there are no real policies in place to ensure the systematic minimization of wasteful use of the environmental resources and no emphasis on minimizing their consumption*.	Approximate 48% of the municipal area has been set aside for the protection of various kinds of natural resources. In order to be able to accommodate urbanisation a more compact form of development is essential. It has been estimated that if we continue with the current model/ approach to development we will reach the outer limits of the municipal boundary within 50 years.
Comment Theme: Integrated Development				
82.01	Simone Lilienfeld		Sustainability: SDF is "business as usual". Doesn't outline any strong policies. Need radical changes to the way the city operates in the face of challenges of climate change, waste reduction and addressing Apartheid spatial patterns. Need stronger policies and measures to promote Densification, mixed use development and water use reduction.	Policy statements include reference to use of resource efficient and sustainable technologies and development practices and the introduction of development bylaws and policies on sustainable resource use.

Source: adapted from CoCT, 2010

4.2 Cape Town Policy Environment

This section critically assesses the urban policies in the Cape Town which are relevant to the discussion of solid waste management in this dissertation. More specifically, it undertakes, discourse analysis of the Cape Town Spatial Development Framework (CTSDF) and the Cape Town Integrated Waste Management Plan (IWMP) and considers how this two documents support and contradict each other. In addition, it parses Solid Waste Management Sector Plan (SWP) in the context of these two main documents and illustrates the disconnect evident between the planning and urban solid waste management.

Cape Town Spatial Development Framework

The CTSDF is the city's main statutory tool to promote appropriate spatial development in the city in terms of achieving its environmental, social and economic goals which are noted in other policy documents. The CTSDF itself has no legally binding power but rather should be seen as a means to the end of the specific goals that the city desires for its future (CoCT, 2012a). It attempts to do this by feeding several spatial development principles into three broad strategies which contain specific spatial policies that guide urban development. It is conceived to be valid for a period of about twenty years with regular reviews.

Spatial Principles in the CTSDF

The CTSDF lists spatial development principles several of which are particularly important insofar as they relate to SWM. First is the call to "work harmoniously with nature [and] reduce the city's ecological footprint…" (p. 3). The concept of ecological footprint was touched on in Chapter 3 and applies quite directly to SWM because of the impact of transportation of wastes to disposal sites as well as the means of disposal employed. Moreover, this principle has implications for the relationship the city and its wastes have with the hinterland; is there a way to harmonise the waste flows with the functions of nature especially as they occur in Cape Town's rural surrounds? This relational thinking is further reflected in the principle which "encourage local, national and international connectivity [so as to] improve urban efficiency" (p. 3).

To this end, the SDF, in the context of the "threats of climate change and dwindling [global] resources" (p. 9), "adopt[s] a precautionary approach to the use of resources [by] switching to sustainable patterns of resource use and [mitigating] negative development impacts" (p. 3). Yet at the same time, the section on *Natural and Cultural Environmental and Resource Capacity* (p. 22) fails to consider the possibility of solid waste as a potential resource; indeed, the entire document does not even mention composting and only scarcely refers to reduction, reuse and recycling. At least the notion of waste is not completely lost; but it seems to only be considered insofar as it impinges on the urban consumption capacity as seen with wastewater treatment capacity and water pollution. So that inasmuch as solid waste reduction is earmarked as something important and reusing and recycling are regarded as good objectives, the current linear metabolism means waste concerns do not influence development plans the way wastewater treatment capacity does. Perhaps this needs to change.

Accordingly, the CTSDF seeks to "promote cross-sectoral planning, budgeting and growth management approaches" (p. 3). In so doing, a broader view of the immaterial (behavioural, economic) and material (infrastructure) forces that shapes the city surface. In this regard, "providing a stronger link between regulatory processes (zoning schemes) and spatial plans and policies" (p. 3) is particularly cogent.

In summation, the principles of the SDF are robust and reflect strong integrated thinking. However, from a SWM point of view, they translate poorly into the strategies and policies that follow. This sentiment

was expressed numerous times in response to the final comment for drafts (see Table 4.1) yet the City despite its prevarications failed to incorporate citizens' concerns for waste adequately in the final CTSDF as shown in the following sections.

Assessment of the CTSDF Strategies

The CTSDF contains there overarching strategies that the City believes reflect its desired growth path. These strategies are:

> Key Strategy 1: Plan for employment and improve access to economic opportunities
> Key Strategy 2: Manage urban growth and create a balance between urban development and environmental protection
> Key Strategy 3: Build an inclusive, integrated, vibrant city

Strategy 1 exists to find ways to leverage the city's spatial form so as to improve access to economic opportunities. Waste presents multiple means to effect such an improvement as is demonstrated in the chapters to follow. Part of this imperative is to transcend only creating "urban cores" and move towards facilitating relationships both within and between such cores. In a way then, it draws out the value of small businesses while its 'both-and' approach to the informal and formal economies is promising. As Simone (2008) has observed, the idea that informality is a prelude to (Western-esque) formality is a fallacy.

The strategy's focus on niche production and the creation "mutually supportive system of economic areas" (p. 51) demonstrates quality strategic thinking. This speaks directly to the core of metabolic loop closure. Moreover, implemented with the proper cross-sectoral planning and land use policies, such areas have the potential to both attract and subsequently support investors, thereby supporting the much needed proliferation of small medium and micro-sized enterprises (SMMEs).

Strategy 2 focuses quite specifically on the effect of the urban form on the environment. Contained within this strategy is a focus on urban compaction for the purpose of promoting sustainable resource use. It observes that planning must be intentional in its coordinating of and budgeting for compact growth. However, the City's own credibility is crippled in this regard by legal processes that undermine its planning initiatives. This is seen most clearly by the urban edge which has proven more suggestive than even transiently immutable (Heritagesa.org, 2013).

Unlike the previous strategy, this one is stronger in its integrated disposition as it draws out the importance of 'cross-border planning' (p. 49). This particular aspect is critical especially with respect to commodities like food and energy, the bulk of which are imported. While Cape Town may have the capacity to be virtually self-reliant for produce, a persistent culture of convenience and the penetrative force of globalisation mean that agricultural sources will likely remain for the foreseeable future. This is not a critique; rather it is an observation which contends that supporting these supplementary sources is in the city's own interest.

However, the looming global reality of climate change may require this outsourcing perspective to change. In this regard, the strategy does well to call for adaptation measures which reflect this in adaptive urban infrastructure and urban livelihoods (and lifestyles). Whether the policies within the strategy adequately address climate change remains doubtful. Indeed one comment on the final draft states that the "SDF is 'business as usual' [with regards to sustainability] and doesn't outline any strong policies". This general sentiment is reflected in many other comments and does not seem to have been addressed in the final document.

Strategy 3 endeavours to "build an inclusive, integrated, vibrant city" (p. 49). A focus on materials

management is crucial here because it necessarily has spatial implications and harbours the capacity to foster inclusivity. For example, keeping composting local where densities are low and demonstrably linking the production of food with the composting of food waste in some of the more agriculturally-inclined areas may increase the general realisation that food wastes have productive capacity.

The most potent recognition of this strategy states that:

> "The quality of the city's built form must be enhanced, and good urban design which orders the relationship between people, urban space and the built, cultural and natural environment should be promoted." (p. 49)

Its strength as far as this dissertation is concerned lies in its capacity for application to SWM and how closed-loop thinking should be reflected in an "enhanced" urban form. The urban form should not simply mitigate negative environmental effects of urbanism; rather, à la McHarg (1971), it should enhance urban-nature relationships. Moreover through reference to various actors—both biotic and abiotic—and their interactions, it acknowledges the multidimensionality of the urban systems. Implicit in this is the ability of space to help or hinder the agency of various actors. More specifically, it conveys the idea that people, individually and collectively, must be active participants in the 'zero waste' mission.

Waste Specific Policies of the CTSDF

By the City's own estimation, the most important spatial policies, as far as SWM is concerned, are policies 24, 30 and 31; this is gleaned from responses to comments on the draft CTSDF and direct reference to SWM in the policies themselves (CoCT, 2010a; CoCT, 2012a). Other policies can be applied to SWM and the waste minimisation goals of IWMP but these have yet to be applied to the solid waste. Most of the policies that relate directly to SWM in the CTSDF are found under strategy 2 which deals with the City's spatial response to environmental considerations. This strategy aims to "create a balance" between the pressures of urban development—population, affluence (and lifestyle) and physical extent—environmental protection.

Policy 24 aims to "Direct urban growth away from hazardous areas/ activities" (p. 67). For SWM, this manifests in guideline P24.1 which posits that "no inappropriate urban development should be permitted in… solid waste disposal sites and wastewater treatment buffer sites" (p. 67). This particular policy makes sense but illustrates the perception of waste and the modes of treatment of waste: Waste—although something that has its origins in our immediate surrounds—is not something that can be dealt with in proximity to urban development. There is little consideration of whether this should be the case. This needs to be challenged so that the production of 'dead zones' dissipates. To this end, planning requires reform within itself so that it can influence changes in urban mental landscapes.

With Policy 30, the City aims to "promote a culture of sustainable development and living" (p. 75). In order to achieve this, the City should encourage sustainable practises by both public and private sectors so as to "support the recycling of water and waste materials" (p. 75). Although waste recycling is a step in the right direction and can eventually result in a reduction in waste generation, the City's goal of waste minimisation should really be stated explicitly and not merely inferred if synchronicity between urban policies[3] is to be induced. In this regard, the City's response to a comment which suggests that Policy 30 is "short on detail" (see Table 4.1) is inappropriate. The City asserts that the CTSDF is a spatial plan with spatial strategies and that further detail would be necessarily non-spatial. This is a fair point. But it is important to remember that urban form is not exclusively spatial; subsequently, spatial planning by necessity must invite other 'non-spatial' policies as means to its end. In other words, since urban

3 Although this should be true of all policy, the reference here is specifically to the relationship between the IWMP and SDF which gives effect spatially to the IWMP (and other policies).

life occurs in space, every non-spatial policy is imbued with a spatial implication. Thus in deferring its responsibility to address waste management concerns, planning is failing to consider all the potential drivers of the spatial change.

The fact that the Western Cape Government deems it within its own *spatial* purview (see Textbox 4.1) to discuss consumption minimisation in some detail serves as an indictment of the this omission from the CTSDF. Waste recycling is explicitly delineated as part of this objective. Indeed the Provincial Spatial Development Framework (PSDF) makes some very practical spatial suggestions which the CTSDF fails to highlight or even mention.

Finally, Policy 32 is the City's attempt to "support appropriate development and activities in rural areas, and in and around unique and culturally significant rural settlement" (p. 75). The fact that solid waste *disposal* sites are specifically included within the ambit of such 'appropriate' rural development is evidence of the continued of the out-of-sight-out-of-mind mentality that pervades South African waste perspectives. To

Textbox 4.1: The PSDF takes a stance on waste management

Objective 9 of the PSDF is to "minimise consumption of scarce environmental resources". As part of this objective the Western Cape Government DEADP (2009) adopts several strategies in the PSDF to combat lifestyles of linearity and constrict consumption. Below is a selection of strategies and the associated policies that illustrate how a consciousness of issues of waste can be approach in a SDF.

"STRATEGY: Enforce new building codes that require the reduction of water and energy consumption, and the use of renewable building material wherever possible;
POLICY
RC24— There should be an assessment of the demand and its locations, and supply and its locations, of all non-renewable building materials e.g. stone, cement, lime, and sand, in the Province. (G)
RC25— The use of renewable building materials should be made mandatory where appropriate; i.e. on one to two storey buildings. (G)
RC26— Urban development may not be located on or near the sources of building materials identified under RC24 until they have been exploited and extraction sites rehabilitated. (M)
RC27— Re-use of materials should be promoted and incentivised. (G)"

DEADP further spatialises this strategy by observing that although sand mining resources are reasonably plentiful, further sand mining would have to occur farther from construction sites which has transportation and thus cost and emissions implications. Suggesting a means of implementing the above strategies is aimed to require 10% of all new appropriate (under RC25) buildings to be built from renewable resources. The most pertinent policy yielded states:

"RC33— Waste separation at source should be encouraged i.r.o. all domestic households and institutions and businesses including high density and multi-storey buildings. **Initially only organic (vegetable and plant matter) and inorganic (usually dry, cardboard, glass, plastic, paper, builders') waste should be separated**. (G)"

Despite these strong strategies and policies regarding waste, the PSDF makes suggestions regarding waste to which this dissertation cannot hold. It alludes that landfilling may persist and that where is does, it may be "more widespread" as in even more far flung than presently.

Source: DEADP, 2009, emphases added

be sure, disposal is not the same as management[4] but considering this 'exportation' mentality, together with the sparse inclusion of other waste minimisation and reuse/recycling imperatives in the CTSDF, the sense that issues of solid waste is neither a spatialising factor nor a localised concern seems to emerge.

On its own, each strategy in the CTSDF provides a broad basis for positive spatial intervention. Read together, the strategies strengthen each other and illustrate mindfulness of integrated thinking. Notwithstanding, this admirable interaction, the strategies and policies contained within them are still regarded as the weakest aspect of the CTSDF's treatment of the solid waste. The result then is that the competing agendas—or as Watson (2003) terms them, "conflicting rationalities" emerge. The question that arises is how can these conflicts be re-appropriated, redirected and harmonised into symbiosis?

The Overall Solid Waste Perspective in the CTSDF

The SDF's view of waste is probably best described as inconsistent. On the one hand the document is strong on its consideration of environmental concerns (including sparse references to consumption and waste reduction). On the other hand, it is rather blasé in tackling these issues directly and sometimes even contradictory in its message about waste. For example, it observes that "large landfill sites consume a substantial amount of land not only for their operation, but also in buffering areas where potentially hazardous limit residential and other uses" (p. 21). In effect, the CTSDF views landfills as mere urban waste receptacles which result in need for 'dead' space. There is no attempt to challenge the idea of landfills as anything but a necessary evil.

By its very omission from list of "key sectoral policies and their relation to the objectives of the CTSDF" the IWMP is determined to be a secondary urban policy. The inference is that waste management, and by extension a more cyclical urban metabolism, are lesser priorities than transport, economics, housing and cultural heritage all of whose prime policies and plans are reflected in this list. Although this dissertation argues the importance of the SWM in planning, the extent of this importance is not under consideration here; this omission undermines the strength of the City's own commitment to its objective to move towards zero waste—a feat which necessarily requires spatial planning—as asserted by the SWP.

At the same time, in an interesting and potentially useful twist, waste minimisation is noted as an imperative which occupies the intersection of the economic development strategy—itself a "key sectoral strategy"—and the CTSDF. The IWMP itself is only mentioned in a list of the relevant infrastructure plans. This seems like a subtle declaration by planners that waste is either not a real priority or that they are unsure how to incorporate waste concerns into spatial plans and policies. In fact, Crowther (2013) observes that the first 2012 CTSDF is the first of Cape Town's spatial documents to make even a weak reference to waste disposal in the demarcation of two potential regional landfill sites. So the SDF's hot-and-cold (although mostly cold) references to waste and its management are representative of the tenuous relationship between planning and waste management described in the chapter 3.

Integrated Waste Management Plan

The IWMP is the Cape Town's principle solid waste management guideline. In it, the SWM Department's strategy for IWM and Service Delivery is outlined. It also presents the rationale for waste minimisation and explains its policy provisions for waste minimisation.

Defining waste minimisation as any activity that prevents or reduces waste generation the IWMP minimisation section then proceeds to describe the mechanisms the City aims to adopt to achieve this. Subscribing to the Pareto Principle (see Textbox 4.2), the IWMP places the burden of responsibility

4 The suggestion here is that managerial functions of solid waste—sorting, recycling, storage—are allowed to occur in the urban edge but final disposal may not. The larger argument is that the need for disposal should be minimal.

Textbox 4.2: Pareto Principle

The Pareto Principle--also known as the 80/20 rule, or perhaps more tellingly, the law of the vital few states that approximately 80% of the impacts of some process arise from 20% of the causes. This principle has been found to be applicable in fields as diverse as economics, software engineering and occupational health & safety (Bunkley, 2008). In solid waste manaagement, it puports that 80% of waste is derived from 20% of the population/activity--or at least that the bulk of urban waste comes from a minority group (CoCT, 2006).

on generators to carry out minimisation. (The IWM by-law which came from application of the IWMP reflects this perspective.) However, it is clear that the City must facilitate their participation. Nevertheless, the City's role as facilitator remains quite emphatic.

Indeed, the IWMP is very heavily skewed in targeting organisational and institutional structures. Figure 4.4 is a word cloud that illustrates 'conceptually' the weight of the City's own involvement in application of the tenets of the IWMP. Many of the IWMP's goals and strategies appeal to increasing capacity within the governing and managerial structures, focussing the roles and responsibility of various actors (individual and agencies) and making practical functional adjustments so as to streamline the service in lower tier jobs. There is also a bent towards monitoring and evaluation of the department's own performance as well as of the need of the city.

An acknowledgement of the multifarious nature of waste management issues, the IWMP recognises that separation-at-source, the next best thing after avoidance, reduction and reuse, requires "commitment [from] and support by all stakeholders. Rather astutely, the IWMP is clear that different needs require different approaches. In this equity fold, it lays out some ideas for spatialising different waste needs. For example, it discusses formation of waste clubs in areas where "enhanced service[s]" are provided and the provision of accessible waste drop-off sites. In addition, it discusses different infrastructural approaches for industrial/commercial areas and high/low residential areas.

The IWMP is a "good roadmap" that the City is slowly implementing with varying levels of success; it is a document that is consistently used as a guideline for SWM decisions and which has yielded the generally positive results (Dittke, 2013).

Source: created on Wordle.com using data from the IWMP.

[Figure 4.4: A word cloud of the IWMP, with the size of the words corresponding to the number of times they were used in the document. After waste, council, management, service(s) and derivatives of 'provide' are prominent. Neither residents nor participation register. Source: created on Wordle.com with data from IWMP]

Solid Waste Management Sector Plan

The SWP (CoCT, 2013: 2) exists to "give effect to the strategies [of the IWMP]: to manage and minimise waste, to ensure sustainable and affordable services [and] comply and meet the objectives of the National Waste Management Strategy per the National Waste Act." To its credit, the SWP explicitly calls on the all-encompassing planning profession to play a critical role in the process. In fact, the SWP itself alludes well to the spatial nature of SWM, differentiating between the quality, quantity and density of waste produced in various socio-economic brackets. Notwithstanding its well-crafted focus on waste minimisation, the SWP does have some normative shortcomings[5].

In seeking to "augment economic activity and minimise the effects of waste human activity and environmental health", the SWP (CoCT, 2013: 4) illustrates reversed logic that seems to permeate governmental priorities. How can economic augmentation precede the integrity of environmental health? In a sense, this ordering gives credibility to Peck and Teller's (1994: 292) prognosis that neoliberalism is "part of the problem, not part of the solution". Yet the aversion to neoliberal ideals must not be a disability that draws attention from waste minimisation.

However, the issue runs deeper than word order. Waste is seen as an impedance on both human activity and environmental process; it apparently offers little or no opportunity to augment either of these urban element. At the same time, economics, the priority of a prevailing neoliberal ethic, must not be allowed to suffer. Perhaps, then there should be a shift which views the environmental processes as equally 'prioritisable' as the economy such that waste must present the opportunity to augment *both* of these. As McHarg (1971) argues, urban professionals are duty bound to seek more than merely the minimisation of disadvantageous impacts of urban life; indeed the there is a legitimate expectation for planners to maximise of the positive impacts of urban life the external environment and on people.

People and public culture are necessary means to the abovementioned dual purpose of waste. However, the role of social infrastructures is not expressed clearly in the SWP which attributes the decline in the waste growth rate to "partnerships linked to the alternate technology solutions" (p. 6); nor does it make reference to future plans that include social articulations in the network. There is little focus on socio-technical networks and the principle means of dealing with solid waste seems to focus on points of technological intervention. There is ample opportunity to integrate people into the network so as to allow people and industries to discover their own agency insofar as they relate to waste and to each other.

Summary of Policy Review

Waste is by and large an unpleasant element for elected officials to deal with. However, South Africa's strong environmental legislation tradition has provided a strong foundation on which the policy governing municipal SWM can rest. The result is strong waste-related policy in Cape Town. Indeed the waste minimisation section of the IWMP is a tour de force. Its main shortcoming is that it doesn't explicitly call on urban planning for assistance. Nevertheless, it has strong spatial cues from which urban planners—if interested—can carry forward into spatial and regulatory policy that promotes the movement towards ends the IWMP sets out to achieve. Similarly the integrated waste management by-law birthed by the IWMP is robust and appears to be applied with increasing efficacy (Dittke, 2013).

However, the planning has not been faithful in seeking out the waste-specific spatial cues and translating them into spatial policy. Despite substantial environmental considerations, issues around waste are so sparsely represented in the CTSDF. Where they are, waste concerns are not granted agency but relegated to mere observer. In effect, Cape Town planning policy renders waste a subject without a predicate.

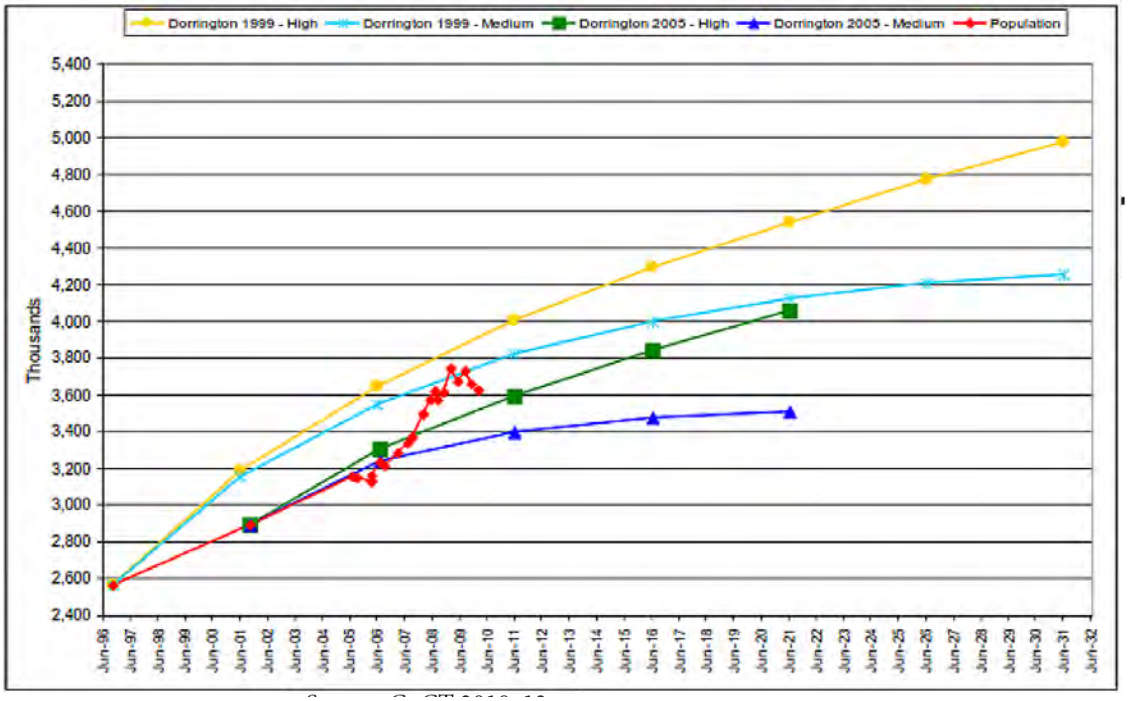
5 To be fair, these shortcomings which focus heavily on economics are probably more reflective of a greater overarching neoliberal ethic than the SWP itself.

PART B: SPATIAL & WASTE ANALYSIS

4.3 City Profile

This section provides a contextual overview of Cape Town. Its purpose is to couch the analysis (and later the intervention) in the present demographic and spatial reality of Cape Town. It briefly considers the Cape Town's place in the region and describes the present urban form and structuring elements of the city. Finally, it illustrates urban nature relationships in the city with a key focus on waste metabolism.

Established in the 17th century by Dutch settlers, Cape Town is the oldest city in the Republic. The municipality covers an area of 2461 km^2 and has a population of 3.74-million (StatsSA, 2012). Shown in Figure 4.5, this population is expected to increase to between 4.2 and 5 million in the next 20 years (CoCT, 2010). Such a population growth has immediate consequences for the provision[1] of SWM services for the City.



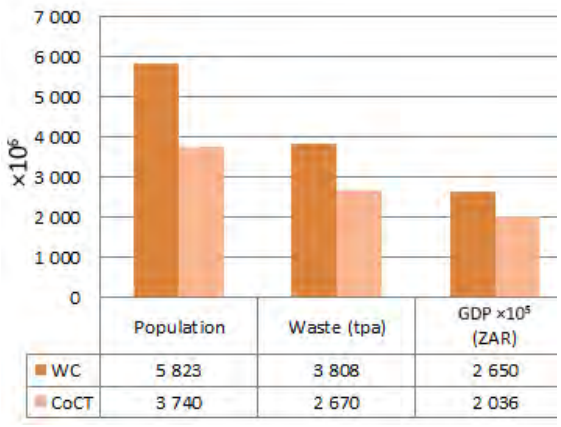
[Figure 4.5: Population projections for Cape Town to the year 2030.]
Source: CoCT, 2010

City in a Region

Commonly referred to as 'The Mother City', Cape Town is of immense national importance economically, environmentally and culturally. Cape Town is the legislative capital of South Africa and the administrative and economic centre of the Western Cape (Province). It has a good international reputation and ambience and its cultural heritage and universities are renowned beyond South Africa. For many, it is an attractive place to live, work and visit. For many more though, its urban form makes daily life a challenge as witnessed in the recent service delivery protests (Felix, 2013).

As South Africa's second most populous, Cape Town also boasts the country's second biggest economy (after Johannesburg) and can be attributed 11-13% of the national gross domestic product (GDP) (RSA, 2007). Within the Western Cape, Cape Town has the largest economy (over 70% of provincial GDP), biggest population (about 65%) and produces the most waste as shown in Figure 4.6 (Capetown.gov.za, 2013; StatsSA, 2012). As a result, Cape Town is at the heart of the PSDF.

1 Use of this term will be discussed in greater detail later in the document.

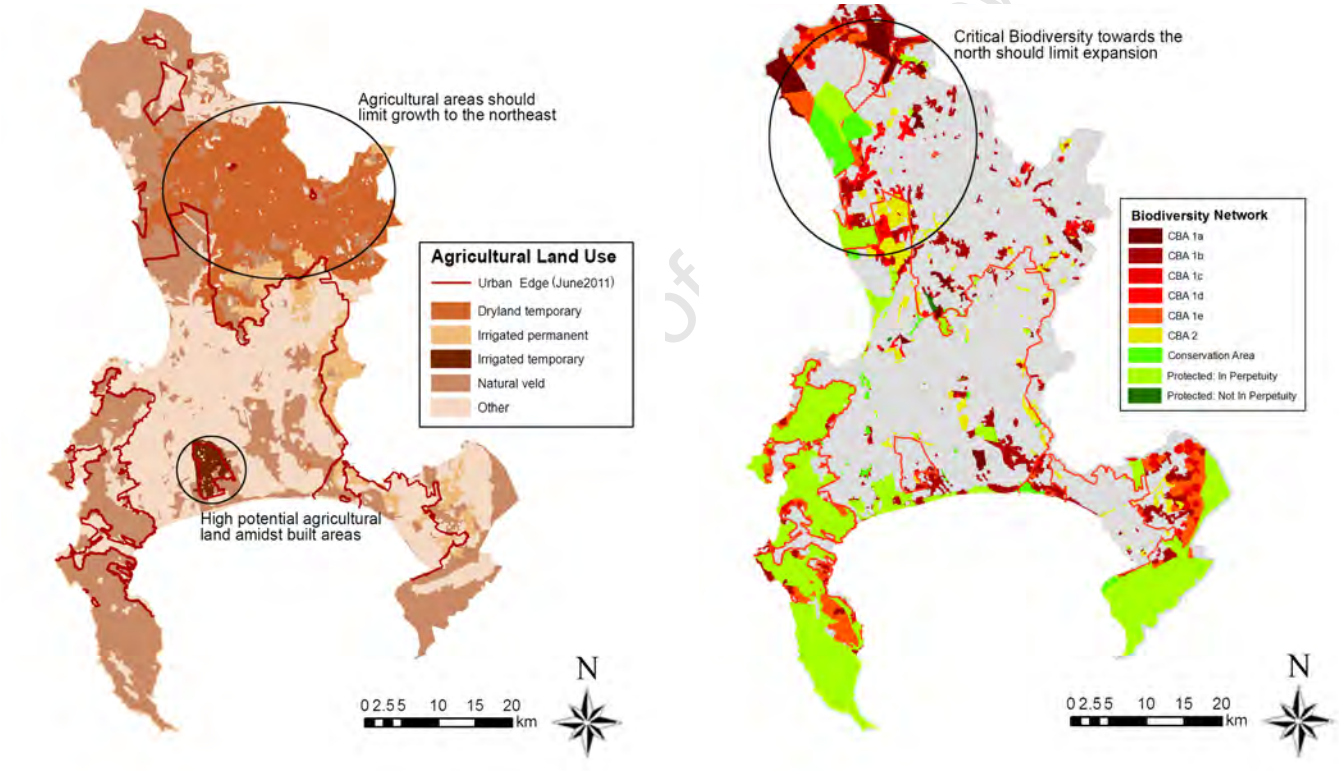


[Figure 4.6: The Dominance of Cape Town in the Western Cape.]
Source: Capetown.gov.za, 2013; StatsSA, 2012

Socioeconomic, environmental and developmental spatial form

Environmental context

With its dramatic natural setting, Cape Town presents a unique challenge to human settlement. Urban development is constrained by topography; limited by the sea; influenced by a concern for prime agricultural land and unique biodiversity. Technically, it should also be informed by underlying geology; large portions of the city's, shown by Figure 4.7, population (on the Cape Flats) inhabit areas which arguably should never have been settled (Anderson and O'Farrell, 2012). Worse still, some of these areas with high water tables are the sites of the city's major current and historic waste landfills—as well as several of its illegal dumpsites—some of which had to be upgraded to comply with environmental standards especially to prevent leaching (Ferrara et al, 2008; Hikinbotham, 2006).



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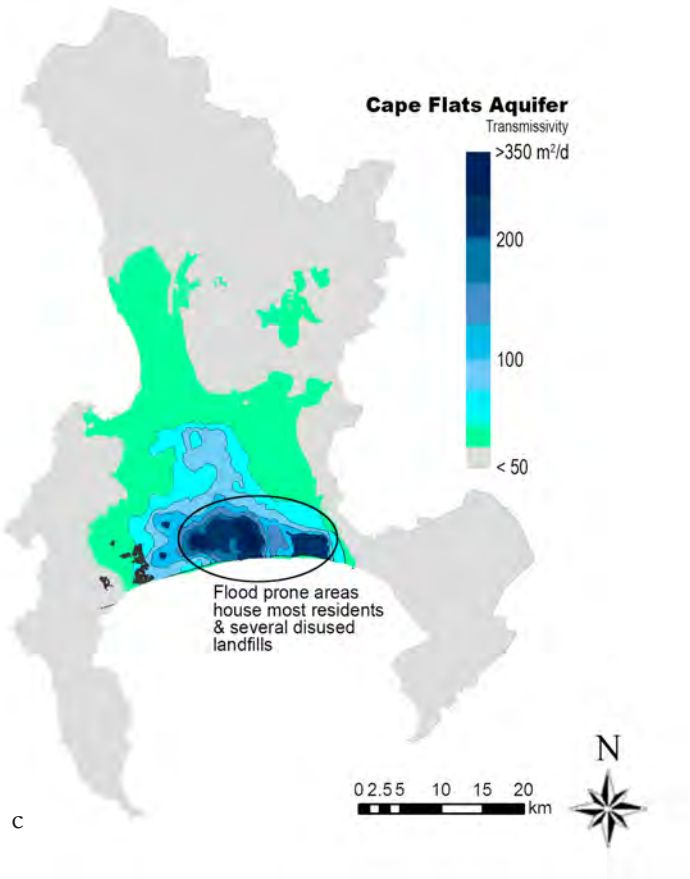
[Figure 4.7: The environmental limitations to spatial expansion in Cape Town. (a) high potential agricultural land in the south and to the north. (b) critical biodiversity areas abound particularly towards the north...

Socio-historical context

Apartheid planning in South Africa developed Cape Town into a city spatially segregated along the lines of race and class. The reconstruction and development programme (RDP), an overarching socioeconomic policy framework implemented by the post-apartheid government, which was largely influenced by modernist

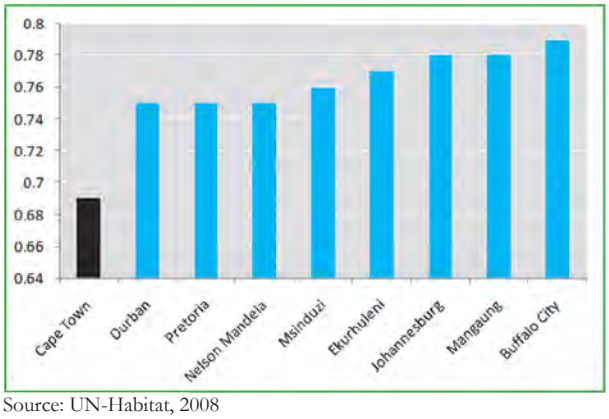
(Figure 4.7) ... (c) many neighbourhoods in the metropolitan south east lie above a very shallow water table and flood regularly.]
Sources: GIS data, Maclear, 1995; Adelana, 2010



c

planning ideals has resulted in urban forms which are stridently individualistic[2] and have unwittingly perpetuated this apartheid inequity. In fact due to their fragmented form and extraordinarily low densities, a 2008 United Nations (UN) report declared South African cities the most inefficient and by implication, unequal in the world (UN-Habitat, 2008).

Cape Town, as shown by its Geni coefficient which is a marker of urban inequality, emerges as the most dysfunctional in this regard (see Figure 4.8). This is because the modernist ethos (originally promulgated in South Africa by an apartheid philosophy which had eerily similar values) had an "overriding concern with separation" for the purpose of creating more hygienic and structured urban environments (Dewar and Todeschini, 2004: 13). With separation as its central value, Modernism incorporated the automobile into its urban functionality to distanciate functions such waste disposal from all other functions.



Source: UN-Habitat, 2008

[Figure 4.8: Cape Town is the most unequal city in South Africa as suggested by its Geni coefficient (The lower the value of the coefficient, the greater the level of inequality.)]

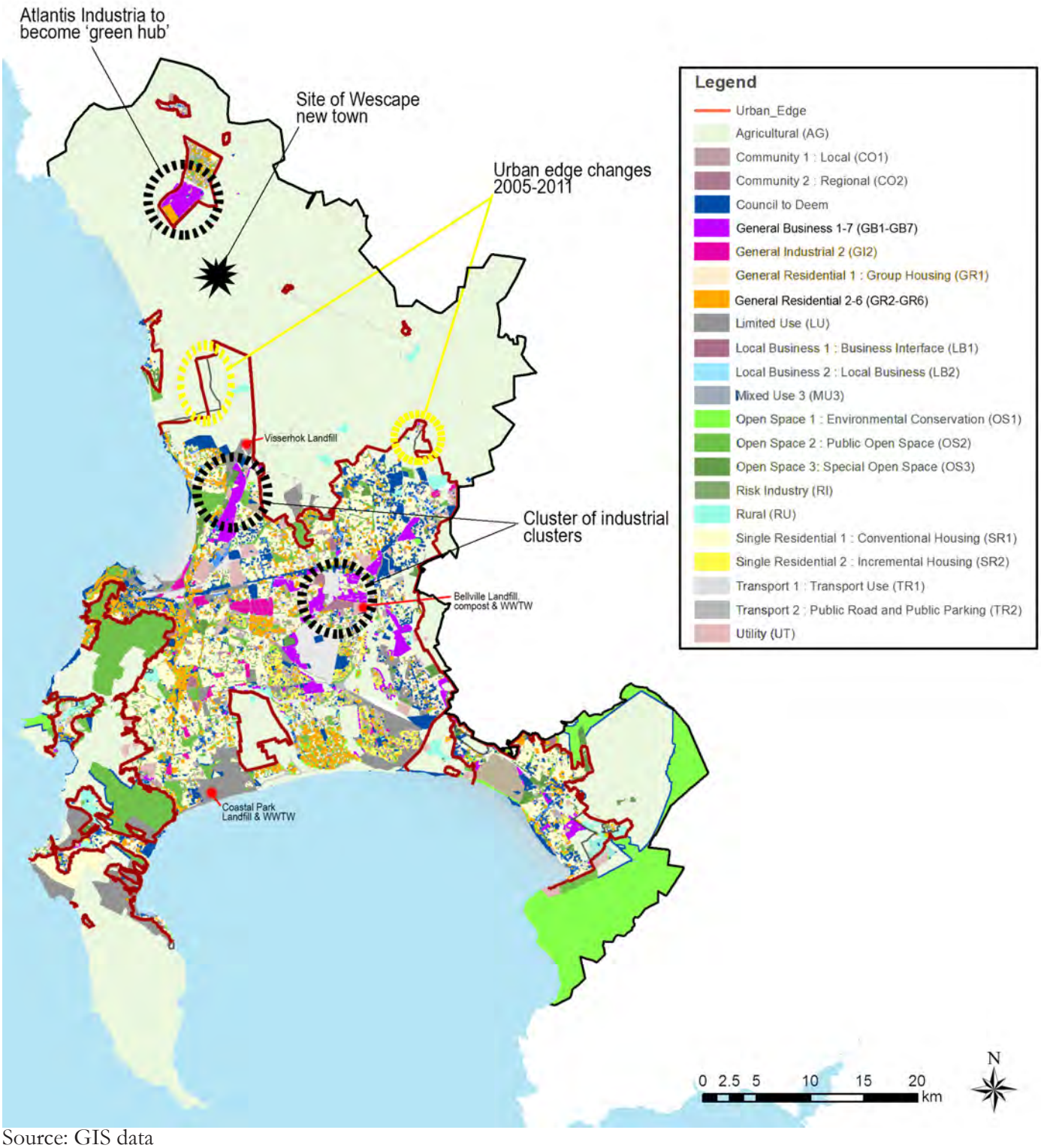
Having expanded historically along railway corridors interspersed with activity nodes newer development seems to follow road routes (specifically the M3 towards the south, the N1 towards the northeast and more recently the R27 northwards along the West Coast). Interestingly, many of the landfill[3] sites which were once at the extremities have now been consumed by the ever sprawling city (see Figure 4.9). This observation raises a question: Is there a link between this sprawl and the distant siting of landfills? It

2 The irony here is that the RDP programme is of many policies, strategies and implementation programmes that have led some to call South Africa a quasi-welfare state (de Bruin, 2010; Doneva, 2010).

3 Landfilling was and is the main method of disposing of solid waste in the city.

Source: adapted from Gasson, 2001

[Figure 4.9: The expansion of the city's physical footprint consumes distant landfills many of which were operational by the 1970s.]



Source: GIS data

[Figure 4.10: Land use in Cape Town.]

seems unlikely, but given the pressure for development and the de facto flexible urban edge[4], this may not be as outrageous as it initially appears. In fact it is interesting as shown in Figure 4.12 that at the end of each of the city's three main growth arms lies one of the landfills in use.

Land Use, economic and developmental context

Until recently Cape Town had 27 zoning schemes each a remnant of the erstwhile municipalities that comprised the now defunct Cape Metropolitan Area. The new Cape Town zoning scheme (CTZS) (Figure 4.10) is the legal document recording the land-use rights (including regulations and rules) on properties within the City's jurisdiction (Capetown.gov.za, 2012). Meanwhile, a recently implemented Integrated Spatial Information System (ISIS), which provides a holistic land management system incorporating both the transactional and GIS attributes of properties enhances the value and application efficacy of the CTSZ (Capetown.gov.za, 2011). Promulgated in 2012 the CTZS was implemented from March, 2013 as part of the City's "efforts towards building an Opportunity city" (Capetown.gov.za, 2013). Simpler, more uniform and much shorter than the previous schemes, CTZS is without an overall waste perspective. For example, the term 'utility service' refers to:

> "a use or infrastructure that is required to provide engineering and associated services for the proper functioning of urban development and includes a water reservoir and purification works, electricity substation and transmission lines, stormwater retention facilities, and a waste-water pump station and treatment works, but does not include road, wind turbine infrastructure or transport use" (CoCT, 2012: 115).

Solid waste management is neither explicitly included or exclude. (As a 'non-reticulated' infrastructure waste is generally excluded from so-called engineering services.)

Combining the aforementioned CTZS with economic analyses shows that Cape Town is a monocentric city with most of its economic dominance in the city centre and surrounds (CoCT, 2010). However in recent years, growth has been more dispersed with a disproportionate amount occurring in high-income suburban centres. To combat this "selective deconcentration" and to refocus investment into these increasingly rundown or divested centres, the city has designated two urban development zones (UDZ) in Bellville and in the city centre and some surrounding neighbourhoods (see Figure 4.11) (Sinclair-Smith & Turok, 2012: 391; Capetown.gov.za, 2013).

UDZ is an initiative by National Government administered by the South African Revenues Service (SARS) that provides tax incentives for new sector-led developments in municipally-specified urban regeneration areas (Capetown.gov.za, 2012). These tax incentives apply to costs incurred in establishing business in the area. For the purposes of the UDZ incentive "cost" is defined in section 13*quat* in the Income Tax Act (No. 58 of 1962) as:

> "the costs (other than borrowing or finance costs) actually incurred in erecting, extending, adding to or improving a building or part thereof and includes any costs incurred…
> (c) in respect of structures or work directly adjoining the building so erected, extended, added
> (iii) means of waste disposal for that building or part" (SARS, 2009)

Of particular interest is the overlap of the UDZ with city improvement districts (CIDs) shown on Figure 4.11 because a survey of several area applications for several CID candidates reveals that solid waste management concerns feature prominently. Textbox 4.3 recounts how the Central CID has already implemented waste minimisation strategies. A CID is a geographically defined area whose ratepayers enter into a legal contract with the Municipal Council for supplementary service provision. Funded by a property rates levy, CIDs are meant to prevent urban degeneration by facilitating investment. Cape Town has 21 CIDs and as many as 20 more showing (Cityimprovement.co.za, 2009). Where this UDZ-

4 The urban edge is not the immutable force it should be; rather it is constantly being expanded sometimes at the behest of the City as it flouts its own planning policy (Capetown.gov.za, 2013; Davis, 2013; Heritagesa.org, 2013; Iolproperty.co.za, 2013).

Source: adapted from City improvement.co.za, 2009

[Figure 4.11: The location of the two UDZ and the CIDS in the metropole.]

Textbox 4.3: Waste minimisation in the CCID

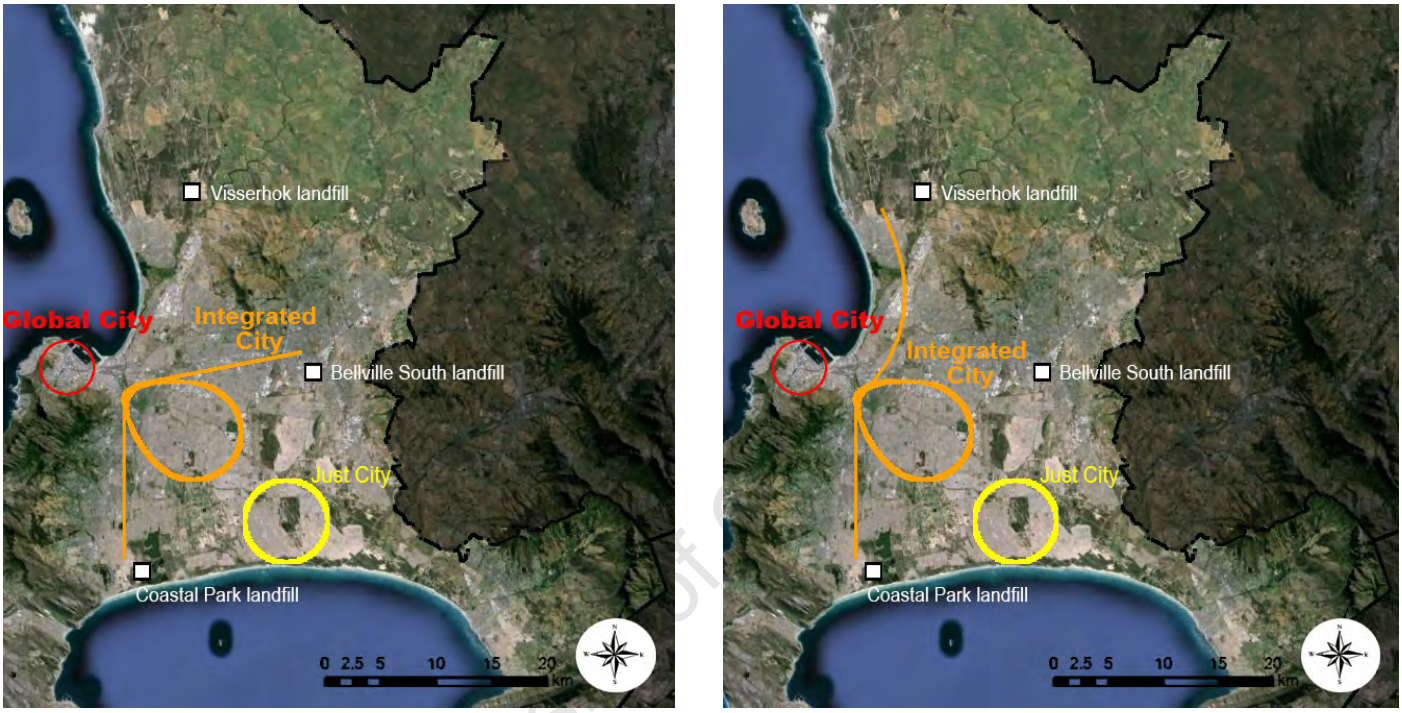
Realising the economic potential of waste minimisation, the Central City Improvement District (CCID) partnered with recycling collection service Luk4Junk in 2011. The deal saw 58 of the 60 tonnes monthly street waste sent to recycling centres. The 97% decrease effectively reduced the CCID's landfill waste bill from R30 000 to R2000. Moreover, Luk4Junk recruited more staff after the partnership. Hence, the recycling industry, when it is labour intensive also creates jobs. In fact, according to a city sustainability consultant, the recycling creates between seven and ten employment opportunities for every one job opportunity that opens up.

Source: Cameron, 2012

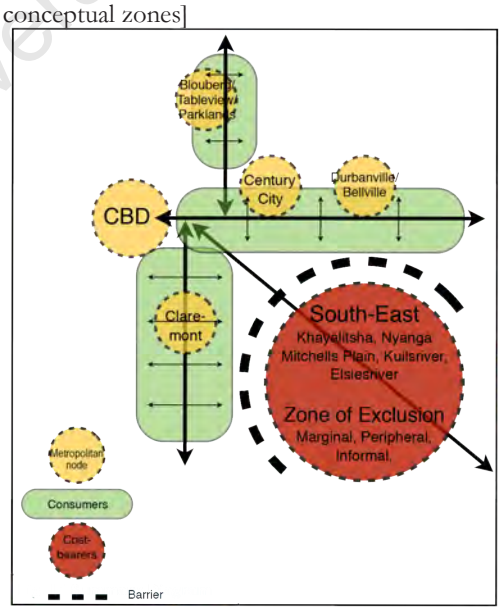
CID overlap occurs provides interesting waste management possibilities driven by both infrastructural interventions (viz. UDZ) and social willingness (viz. CID).

Synthesis

Overlaying these perspectives of the city, it emerges that the metropolitan southeast (MSE) is rather bereft of investment. Thus, the city can be conceptualised as shown in Figures 4.12 and 4.13. The city can be divided into three general areas: the *global city*, situated at its historic, economic, cultural and touristic core is the centre of influence; the *integrated city* extends along two (or three) urban corridors and centred on an industrial, commercial and residential core; and the *just city* where the most Capetonians live in above average densities, with fewer economic opportunities and more assertive environmental hazards.



[Figure 4.12: The city of Cape Town in three conceptual zones]



Source: Simone Lilienfeld

[Figure 4.13: A conceptual synthesis of Cape Town's spatial form]

Often forgotten is Atlantis which effectively stands as a testament to the power of apartheid planning. But, the Atlantis Revitalisation Framework (2012) proposes Atlantis, which is located strategically en

route to Port of Saldanha Bay, as a 'green' hub. According to *West Cape News* (2012) "several firms" have expressed interest in setting up shop in Atlantis. This comes as a surprise since the economic downturn was particularly detrimental to Atlantis whose industry was already somewhat unstable (Haynes, 2013). Noble as this is, this proposal is conceived to occur in conjunction with the heavily criticised Wescape development (Capetown.co.za, 2012; Nicholson, 2013).

Urban-Nature Relationships

Ecosystem services provided by natural, functioning ecosystems and their biodiversity underpin the Cape Town's IDP. What this should do is give effect to policies and practise that in turn support the ecosystem services. Two of the IDP's seven strategic areas specifically discuss ecosystem services: First developing sustainable urban infrastructure and services (which ought to include waste together with an explicit reference to people as participants in services and infrastructure not mere recipients of it) should be a priority. Secondly, the development of integrated human settlements which not only protect but also reflect nature's restorative and regenerative qualities is a municipal responsibility (CoCT, 2007). In effect, there needs to be a greater realisation that "as much as ever the state of the City's ecology and the wellbeing of its society are entwined" (Anderson and O'Farrell, 2012: 35).

As a city, Cape Town's identity is inextricably linked to nature—consider: 'Cape of Storms'; 'Two *Oceans* Marathon'; or even how "Capetonians orientate themselves with the Mountain". As noted in the CTSDF, the city's skyline is not dominated by the built environment but rather by the Table Mountain (CoCT, 2012). Moreover, the spread of the city has been influenced greatly by its natural surrounds as noted earlier. In addition, Cape Town is regarded as one of the best cities for an 'outdoor' life (BBC Travel, 2013). Yet, inasmuch as there exists acknowledgement that quality public open space is a precondition for social sustainability (Southworth, 2010), the city's urban form does not always reflect this relationship with nature appropriately. And so, while the city has numerous readily available natural areas they are not necessarily readily accessible which has major implications of people's own perceptions of nature and their role within it as illustrated by the story in Textbox 4.4 (Anderson and O'Farrell, 2012).

In effect, the urban form does not lend itself well to promoting residents' participation in closing the solid waste metabolism. But Cape Town is the most creative city in South Africa—an accolade reflected by a general consensus that the city is South Africa's best run city—which means ample creative capital to rethink its urban systems, including waste (Business Day Live, 2013; Finweek, 2012). Even so, time and again on various platforms such as *Future Cape Town*, *Silicon Cape*, and *Creative Cape Town*, which reflect the urban consciousness, SWM is relegated to the zone of lesser importance as people struggle with or perhaps wilfully ignore the issue this altogether unpleasant yet pressing issue. Planning can no longer afford such an oversight; together with other non-planning tools at its disposal (no pun intended), urban planning must thrust waste issues into the social consciousness.

Textbox 4.4: Lady on a Train

Having just purchased a chocolate from a hawker on the train, a Metrorail employee sits down to enjoy her treat. As the train begins its roll out of Plumstead station, she finishes the chocolate reaches up and tosses the chocolate wrapper out the window.

Intrigued by this disregard for proper conduct another passenger—a young man—asks, not to smite the woman's actions, but out of seemingly genuine interest, "Would you do that at home?"

Feeling indicted the woman voices her contempt towards the questioner's invasion into her affairs and then curtly offers, "No."

Unsatisfied with this response and perhaps a little agitated at the situation—that is the litterbug's assertion that the questioner had no right to challenge her actions—the young man presses further asking why it was okay to throw the wrapper out the window if she wouldn't 'litter' at home.

"I did nothing wrong. I can't drop it in the train because people use this space but out there it disturbs no-one. Besides, it'll be cleaned," the woman reasons, her patience wearing thin.

Still the young man pressed deeper asking, "What if I walked past your house and tossed my rubbish into your yard?" (Presumably he had reasoned that in his hypothetical, he was using the street and besides, it'll be cleaned by someone in the lady's yard.)

In a final act of defiance, the woman, now at the end of her tether, declared, "I would *klap* [smack] you." Getting up, she said, "Leave me alone and go fetch it if you like it so much out there."

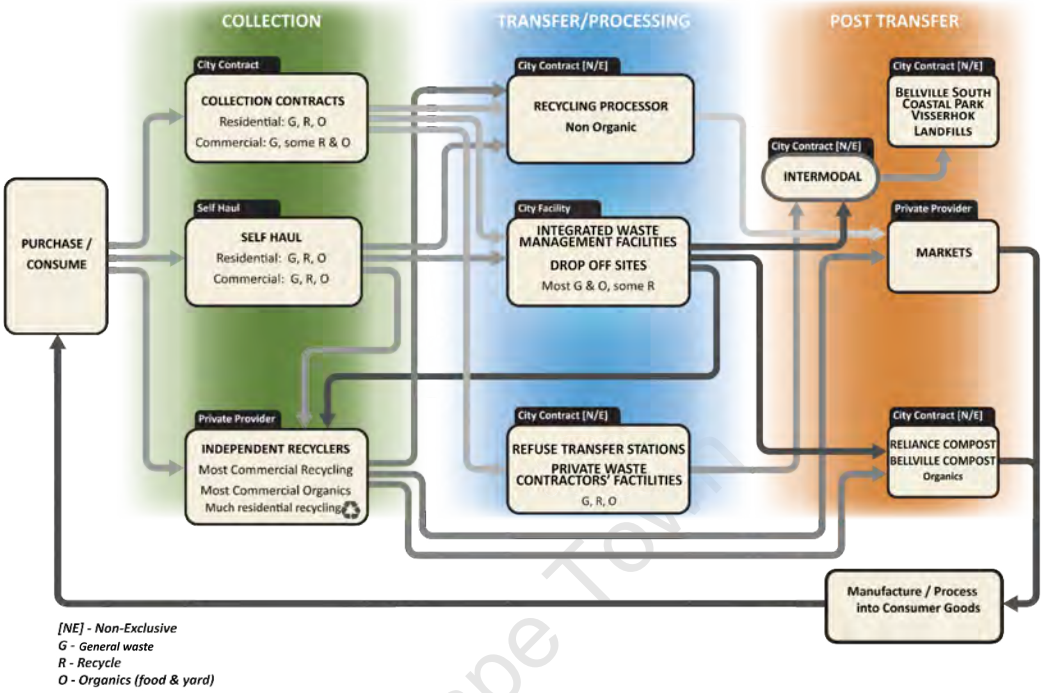
This woman's responses elicit at least two responses for the urban planner. First, it demonstrates that in issues of waste the burden of responsibility is often outsourced. Second and perhaps more difficult to see, it raises the question: Has planning been so overly concerned with 'planning for people' that it has neglected to plan for relationships? In planning for people the concern with work, play and live failed to consider how people interact with and perceive their surroundings thereby may have creating a contrast between valued spaces and isolated spaces in way not otherwise expected. Part of this dichotomy is manifest in this woman's propensity to exult in her own autonomy. She asserted 'ownership' over certain valuable spaces for which she had a responsibility while other spaces became totally irrelevant. For planners thinking about waste, the take-home is this: There needs to be a sense in which the lines between these valued and isolated spaces become blurred so that waste is not something excommunicated from each person's own space and into the abyss.

To be sure this woman's indifference to littering may be an isolated incidence; equally, it may indicate a cultural norm. Indeed one solid waste professional encountered in the course of research suggested that certain local area cleaning programs perpetuate the waste problems by hiring only local people to clean the rubbish that they themselves have generated and then discarded improperly.

Source: researcher's observation, 2 September 2013

4.3 Cape Town's Solid Waste Management System

Cape Town's SWM network reaches to every household and business in the city. Figure 4.14 depicts the movement of waste streams through the system. A network of public and private service providers collects, transfers, processes and landfills the city's discards. As mentioned previously, landfilling is the dominant mode of solid waste management in Cape Town. This is done at the City's three landfill sites.



[Figure 4.14: Cape Town's SWM system illustrating the three main phases: collection, transfers and post-transfer.]
Source: adapted from Seattle City Council, 2011

4.3.1 Waste Collection Practices

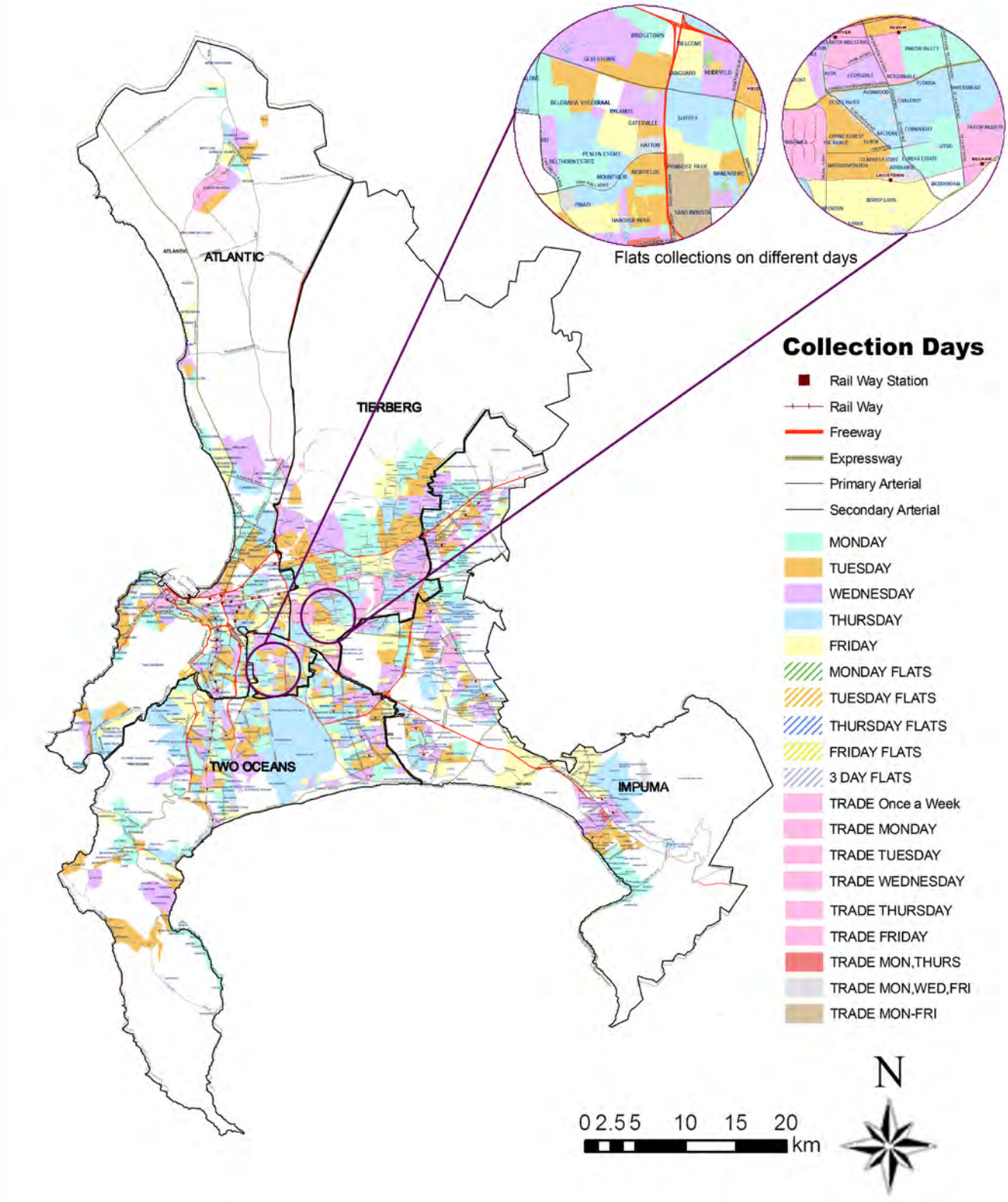
The first stage in the delivery of so-called 'basic services' is collection which has a spatio-temporal aspect illustrated by Figure 4.15. Interestingly, the city differentiates between the housing typologies in the collection of waste. According to StatsSA (2012) 94.3%[1] of Cape Town's 1.068-million households are serviced by weekly refuse collection which is contracted out to various companies including WastePlan and Wasteman. Waste can also be taken to one of twenty-five waste drop of centre around the city where up to 1.5 tonnes can be deposited free of charge each day (Capetown.gov.za, 2012).

It is difficult to establish the quality of the collection service but conversations with municipal SWM employees suggest that collection is generally reliable with only a few complaints of kerbside misses or skip misses. In the 2011/12 financial year the collection fleet was upgraded with the purchase of 53 vehicles which replace some as old as 16 years and at a total cost of over R100-million. These have been rolled out to each of the four collection areas (Capetown.gov.za, 2012). The notable aspect is that the fleet does not appear to be dual collection (i.e. with separate compartments for different waste types). Collected wastes are transported either directly to landfill or to one of three refuse transfer stations (RTS).

4.3.2 Split Bag Collection

Having launched its initial separation-at-source pilot for residential waste in 2002 in the Peninsula neighbourhood of Marina da Gama, the City implemented another five pilots, marketed under the Think Twice brand, in 2006/07 financial year (Capetown.gov.za, 2011). Shown in Figure 4.16, the now expanded programme services approximately 220 000 households (nearly 25% of the formal service points) with and overall participation rate of 67%. All the areas shown in Figure 4.16 are medium-to-high income areas. In total, Think Twice diverts less than 1% of waste generated with the remainder of diversion is from chipping greens and builders' rubble at various city facilities (Coetzee, 2012).

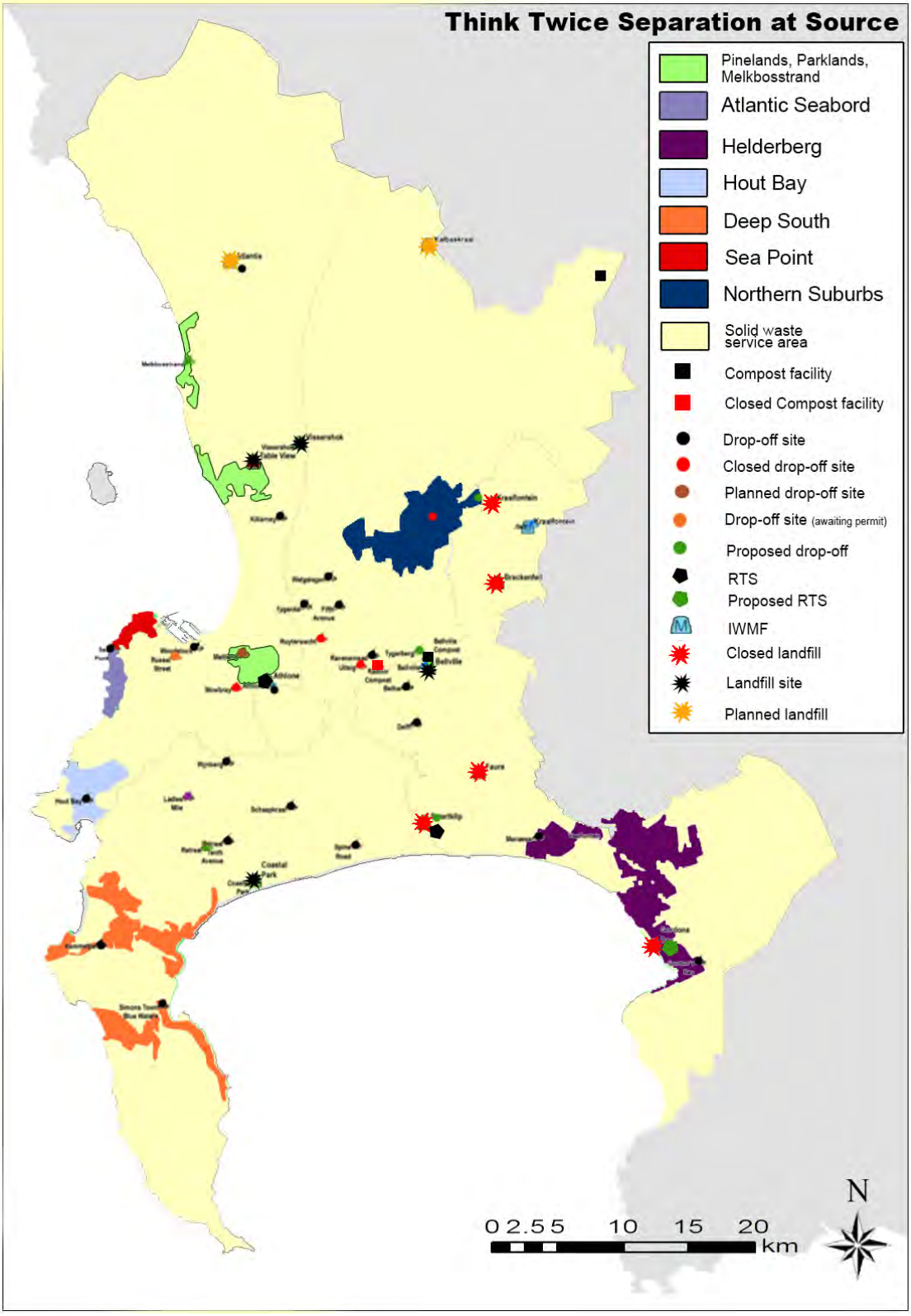
1 It is unclear whether this figure includes households whose communal refuse facility is removed weekly.



Source: Capetown.gov.za, 2012

[Figure 4.15: MSW Collection service areas by days of collection.]

The participation rates shown in Table 4.2 belie the simultaneous success and 'failure' of Think Twice. Uptake rates were found to be high in medium to high income areas while the absence of an economic incentive in failed to captivate interest in low income. However, in the latter areas, some residents harnessed the newfound awareness of their wastes value to intercept the benefits of recycling themselves; hence the Think Twice was not an absolute failure here (Coetzee, 2012). Despite the potential for success, Think Twice is too expensive for city-wide implementation attracting prohibitively high star-up costs for contractors (CoCT, undated).



[Figure 4.16: Think Twice split bag collection areas. All the areas serviced are middle- to high-income areas.]
Source: Coetzee, 2012

Table 4.2: Comparative Success Rates of the Think Twice Split Bag Project
(Source: Coetzee, 2012; CoCT, undated)

Area	Waste diverted (tpm)	Participation %
Pinelands/Parklands/Melkbostrand	225	86
Atlantic Seaboard	200	96
Helderberg	350	62
Hout Bay	150	96
Deep South	125	75
Seapoint/Greenpoint/Mouille Point/Three Anchor Bay (complexes, flats, hotels, restaurants)	230	62
Northern suburbs	450	59

4.3.3 Waste Processing and Disposal Facilities

The CoCT is currently operating three landfill sites to accommodate approximately 1.7-million tons of waste requiring disposal annually in the metropole. Prior to 2003 the City operated six landfills, three of which, namely Brackenfell, Faure and Swartklip have closed. Meanwhile Bellville South landfill's amended Record of Decision prescribes closure in 2013 or when the Regional site becomes operational—the latter seems unlikely because designation of the regional site is proving exceedingly difficult. Similarly, the Vissershok North site, an expansion of one of the remaining three landfills, cannot be utilised until the squatters occupying the site have been relocated (CoCT, 2012h). Some of the decommissioned landfill sites are to be rehabilitated and used as open space areas once subsidence is complete engineering and landscape activities are complete while others may (or have been) converted into refuse transfer stations (Capetown.gov.za, 2011).

Supplementing refuse processing capacity, the city has three RTS. RTSs serve as waste transit points where distances to landfill exceed economic viability for the refuse collection service providers. Waste is rather offloaded at these sites and compacted into 20-ton trailers which are transferred via rail or road to landfill sites. All these facilities—decommissioned, current and potential—are located in Figure 4.16.

Coastal Park Landfill

Located off Baden Powell Drive in Strandfontein/Muizenberg, Coastal Park has a footprint of 75 hectares (ha). Waste compaction at the site is 800-900km/m^3 so that, when full, the final landform will be 35- 45m above ground level. It is expected to be operational until 2016-2022 (Capetown.gov.za, 2011).

Vissserhok Landfill

Situated along Frankdale Rd (off N7 adjacent to Morningstar), Visserhok covers an area of 117ha and will rise 65m above ground once closed. Visserhok North (awaiting permit) is expected to increase Cape Town's landfill capacity 18-million m^3 providing another 6-9 years of airspace. Visserhok can be expected to last until 2024 (Aurecon Group, 2010; Capetown.gov.za, 2011). Waste from all the RTSs is transported to Visserhok for final disposal because Visserhok has the greatest remaining capacity. (Wastes from areas in the immediate vicinity of the other two landfills have priority disposal at those sites to minimise transportation costs now and into the future.)

Bellville South Landfill

Bellville South landfill is located along Sacks Circle, Bellville Industrial. Rising 35m above ground level, half the 60ha site is filled to capacity and the landfill permit stipulates the site closes in 2013 (Capetown.gov.za, 2011). Bellville is also the location of the city's remaining compost facility after Radnor was closed due to poor quality compost and the cost of repairs (Coetzee, 2012).

Athlone Refuse Transfer Station (ARTS)

Located along the N2 freeway between the neighbourhoods of Pinelands, Langa, Hazendal and Bridgetown, ARTS is the most central refuse facility in the city. From here, 50 compacted waste containers are transported by rail to Visserhok landfill site every night after 19h00 (Knight Hall Hendry, 2000; Capetown.gov.za, 2011).

Swartklip Refuse Transfer Station (SRTS)

Situated at the site of the old Swartklip landfill, 40 containers are transported by road from here to Visserhok landfill site (capetown.gov.za, 2011).

The Kraaifontein Integrated Waste Management Facility

This multipurpose facility serves as a waste drop-off site, materials recovery facility (MRF), a RTS and a green waste chipping area. Commissioned in September 2010, and handling up to 1000 tons of general waste per day, it is the first integrated waste management facility in South Africa providing employment for 60 people from adjacent communities (CoCT, undated). This waste is also landfilled at Visserhok (Capetown.gov.za, 2011).

Drop-off centres

Cape Town's numerous waste drop-off centres allow self-haul loads of up to 1300kg (1.3 tons) of general household or garden waste to be disposed of for free. Some facilitate the recycling of residential special waste including motor oil, cans and metal, paper, cardboard, glass, plastic, electronic waste (known as e-waste), builders' rubble and polystyrene. Non-recyclable and non-reusable waste is then transported to the landfill for disposal (Capetown.gov.za, 2011).

Figure 4.16 illustrates that drop-off sites are not spread evenly throughout the city. To be sure, they are located throughout the city but the some areas have a notably higher concentration than others. These concentrations of drop-off sites are not directly reflective of higher consumption rates although it is interesting that the industrial core has a significant number of drop-offs in its vicinity. The SWP (CoCT, 2013) states rather arbitrarily that waste drop-off centres have a captive radius of 7km. The *Report on the Recycling Strategy in the City Bowl* (CoCT, 2011) reveals that this is based from international standards in several developed nations. In effect, this distance implies the need for vehicular mobility to utilise these centres. Be that as it may, there remain significant portions of the population that are not within this range undermining people's ability or even desire to be active participants in waste diversion. That said, since the basis of their existence is recycling, certain thresholds are required for fiscal viability and thus—since waste avoidance is technically the greatest priority à la waste hierarchy—the question of the need for more such centres arises.

The 'missed approach' with drop-off centres reveals a bigger issue

The RTSs and waste-drop off sites illustrate two similar yet very different metabolism philosophies. While both apparently promote a 'cradle to cradle' attitude (CoCT, 2011), drop-offs invites participation from citizens while RTSs (the ones which practise material reclamation) enforce participation with less effective results. The RTS-cum-MRF allows the recovery of some wastes (by a 'dirty') process effectively facilitating partial loop closure while the drop-off centre which is in closer proximity to a greater population and is accessed directly by users facilitates a smaller and more effective loop since generally has a greater recovery *rate*. Moreover, the drop-offs encourage active involvement by individuals and business. (Weight-for-weight, recovery at RTSs and drop-off-sites may be comparable due to the scales of operation.)

Dittke (2013) believes these efforts to make metabolic loops smaller and more circular are important and insofar as they yield frugality according neatly with the twin frugality-efficiency definition of sustainability. However, RTSs and drop-offs are not a final solution either. As seen on Figure 4.17, wastes from the three RTS must still travel at least 28km to landfill from RTSs and hence transport comprises at least 60% of SWM costs contributing generously to the city's carbon emissions in the process (Haider, 2013).

Meanwhile, not all drop-offs recover all recyclable waste types and thus serve as glorified refuse transfer sites[2]. Either way, implementation of drop-off sites is complicated. In the 2011 *Report on the Recycling Strategy in the City Bowl* the need to densify the network of drop-offs and mini-MRFs in central Cape

2 This is perhaps overstated since drop-off sites do not accept waste that they do not handle. Again, the onus is on the user to then find where to dispose of his waste appropriately with the guidance of the drop-off site management.

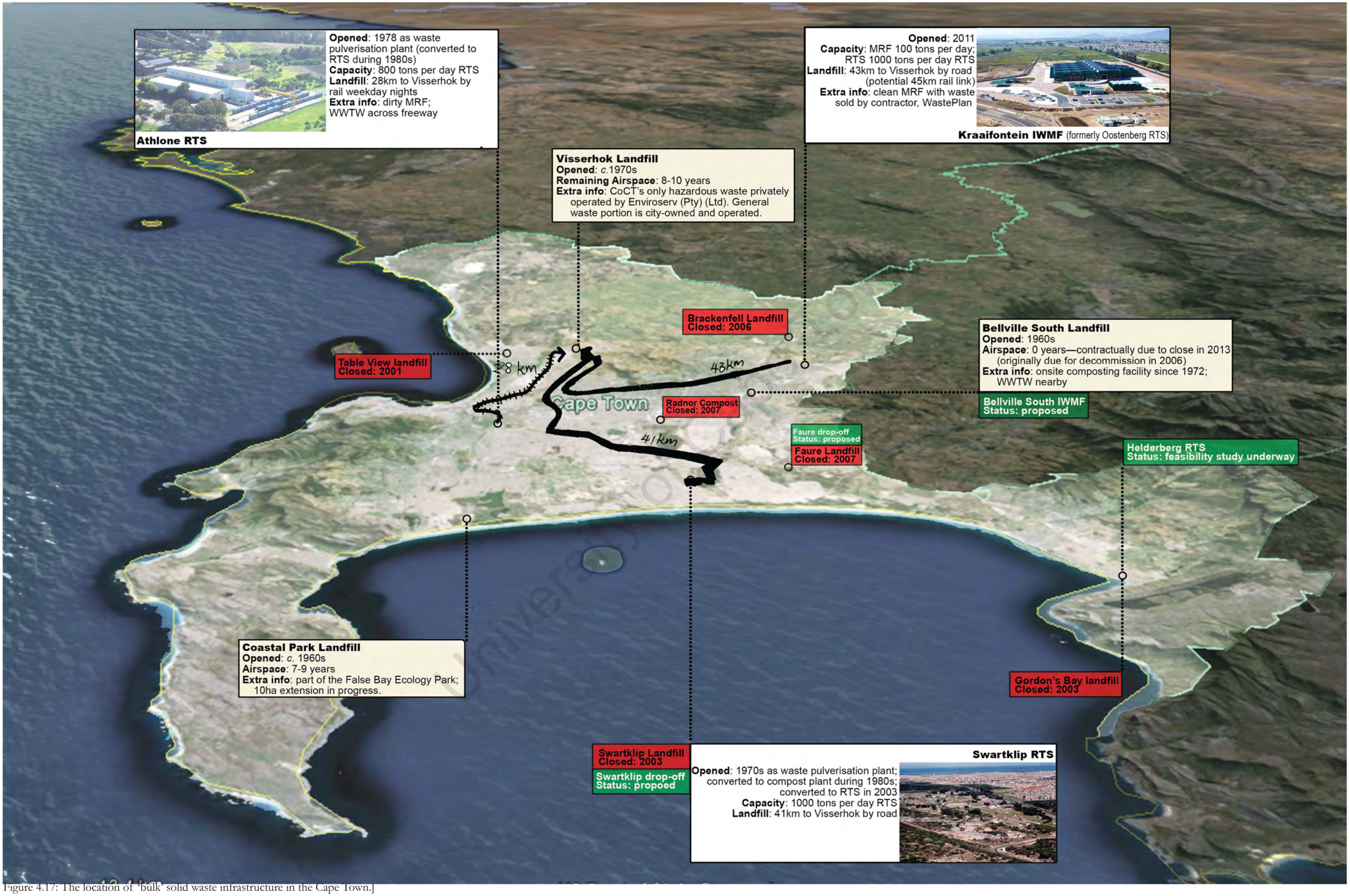


Figure 4.17: The location of 'bulk' solid waste infrastructure in the Cape Town.]

Town emerged. The deficiency of vacant City-owned land of adequate size (500m^2–4000m^2) prevented the establishment of sites in the central city (CoCT, 2011). With the density and compact development of the city, the proposed sites may still have been too large in scale.

It was within the context of the aforementioned recycling strategy report that a communication between a spatial planner and a SWM professional revealed something that emerged in the process of this research: Not only is planning ill-equipped—or rather uncertain of how—to address issues around solid waste but, the SWM profession is not exactly clear on what it requires or desires from planning beyond zoning permission. In response to the request for comments, an official from the spatial planning and urban design department (SPUD) writes:

> "In principle, and from a pure efficient land utilisation perspective, the proposed Mini-MRF on erf 8292 (space under the bridge) is viewed as positive in that impact on potential development opportunities or key public spaces is minimised… [but the SPUD] branch would encourage the Solid Waste Management Department to ensure that investigation into the zoning and permissible uses in relation to this site is conducted so that land use regulatory aspects are taken into account in terms of the process forward, should this be necessary" (van Eeden, 2011: 1).

This response shows three things. First that the underlying view of waste is that it hinders development and that as far as possible it should be hidden. Secondly, the comment illustrates a notable trait of SWM. Informal conversations with solid waste SWM professionals, in the course of this research suggest that land use rights and zoning permissions are the greatest concern for municipal SWM in Cape Town. This segues into the final element exposed by this comment. By placing the burden of responsibility for confirming land-use rights on the SWM directorate, the commenting planner effectively distances planning facilitatory role it has in solid waste management.

4.3.4 Harnessing the Power of People as Infrastructure

Throughout Cape Town's SWM strategies, there is little discussion about the role that people play in the solid waste infrastructure with only a few loose references to the employment potential of recycling. People not only produce waste but store it onsite, facilitate and perform collection, oversee processing and execute disposal. In a sense then, they are an integral part of SWM infrastructure and SWM has begun to recognise this. The two principle examples of the City making harnessing the power of people are the Integrated Waste Exchange (IWEX) and WasteWise.

WasteWise is the City's waste minimisation awareness program designed to encourage discussion and action among Capetonians. Seeking to foster behavioural change and nurture and culture of responsibility the program has information packets available for schools, businesses and the general public (Capetown.gov.za, 2012). As part of WasteWise, the City has a 'GreenZone' initiative operating in sub-councils 5, 12 and 18 comprising of mid-to-low income, mid-density neighbourhoods. Community facilitators are trained to help build and coordinate enduring tripartite partnerships between communities, schools and businesses. The GreenZone initiative has encountered difficulty navigating tension within communities and responding appropriately to nuanced differences between communities. Consequently it has only been mildly successful (Jeffares & Green Consulting, 2012).

IWEX is the City's free online system connects waste generators with users seeking certain wastes (Capetown.gov.za, 2012). Open to all legal persons, IWEX demonstrates innovative use of virtual technologies and certainly has a place in any SWM regime; however, it is (in retrospect) also indicative of a disjuncture between spatial planning and SWM. Without obvious spatial directives and land-use regulations catering to frugal and efficient resource use SWM has been left to its own devices. Interestingly, the IWMP refers to IWEX as an "Industrial Waste Exchange"; either the IWMP contains a Freudian slip

indicative of the real intention behind IWEX—that is to combat industrial wastes as a priority à la Pareto Principle—or the City's SWM retreated to an ostensibly less combative and apparently more progressive "integrated" approach.

Missing the Point of People

At this point, it is now evident that the City has implemented a variety of infrastructural 'solutions' to encourage waste minimisation. These approaches apply a 'both/and' approach seeking on one hand to capture user interest and effort (viz. drop off sites and IWEX) and on the other to eke out minimisation targets through post-collection recovery efforts (viz. two MRFs). At the same time, there are several initiatives focusing particularly on influencing behavioural change. This two-pronged approach is both important and necessary but if the efforts are not carefully aligned, they might miss the point.

Textbox 4.4 relates a story illustrating how such a mismatch has already occurred. This gap between hard infrastructures and users, perceived in terms of ANT, creates a set of actors without a network into which to articulate. This dissolution of agency not only disempowers people but also restricts the utility of hard infrastructures discounting the value the investments.

4.3.5 Waste Flows and Statistics

To meaningfully intervene in waste management, knowledge of the flows of waste materials across the city is needed. Figure 4.19 shows the solid waste catchment areas and the proportion of waste flowing through each of these. The boundaries are not fixed; their fluidity arises as a response to circumstantial

Textbox 4.5: An Actor without a network

Simon is a student at the University of Cape Town residing in Kenilworth. To get to school each day he walks to the Claremont public transport interchange where he boards the free shuttle service to campus.

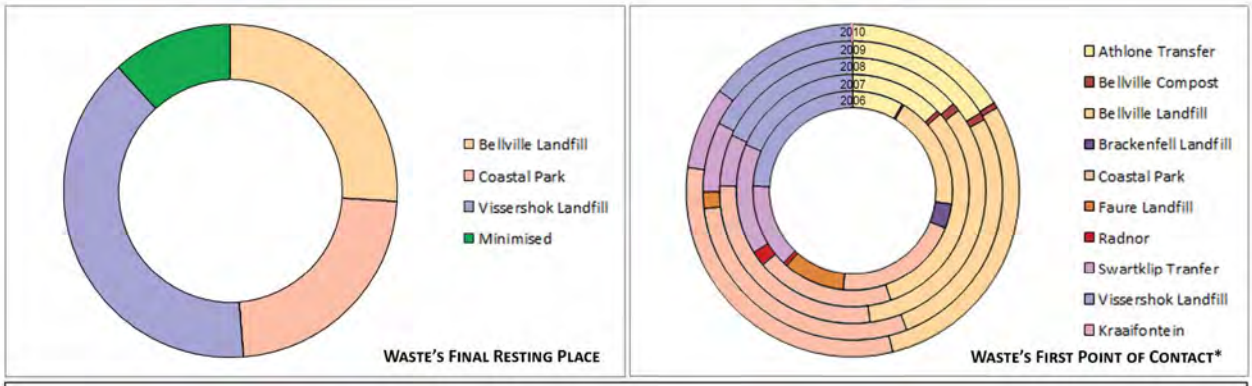
Having recently completed several weeks of community service in a Cape Town township, he has developed a sensibility to environmental issues and decides to start separating recyclables from waste that he and his housemates produce. Beginning with paper, plastic and glass he asks his housemates to separate waste accordingly while he looks for a recycling bin nearby.

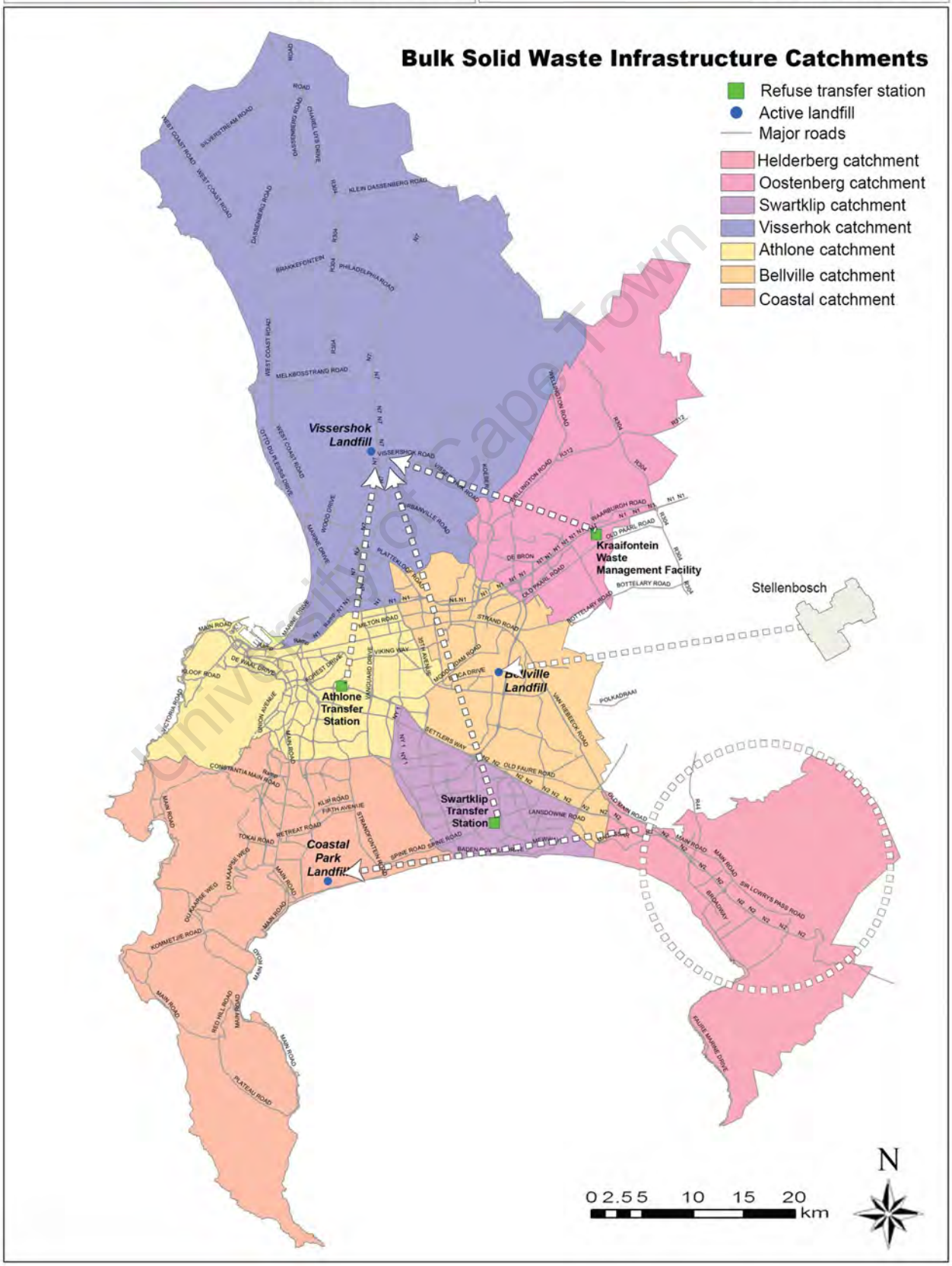
Three weeks pass and although their bin is only half full when the garbage truck rolls past each week, the recyclable rubbish is accumulating in their townhouse's small backyard. In this time, Simon has been unable to find a recycling point in his area, and having searched the City of Cape Town website finds that his nearest drop-off site is in Wynberg about 3km away; but Simon doesn't have a car and the drop-off is not along a public transport route. His investigations also reveal there is no privately run recycling in his part of the neighbourhood. Meanwhile his Capetonian friends tell him that their parents pay for their weekly recycling collection. Simon is not an environmental zealot but rather an ordinary citizen conscientised by recent event to make a positive lifestyle change. Thus his perseverance is finite. His efforts to do the right thing have encountered so much resistance that they have gone to waste.

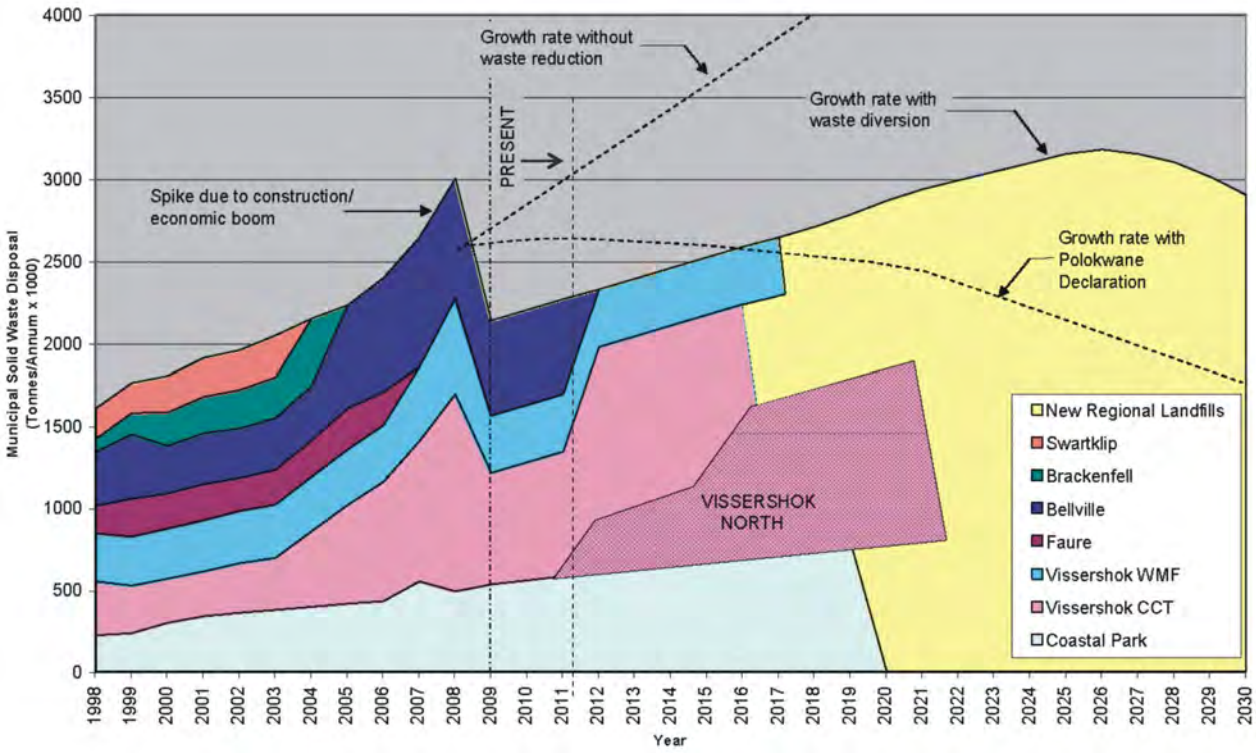
Eventually, Simon gives up and orders his housemates to 'cease and desist' because their efforts are futile. The three boys return to their prior nonchalance throwing all their discards into one receptacle which returns to overflowing by collection day each week. The unfortunate part of this story is that Simon passes four bus stops, a park, a service station and a car park on his 10-minute walk to the Claremont public transport interchange yet encounter not a single opportunity to satisfy his desire to recycle.

Source: researcher's observations, March-April 2012

[Figure 4.19: solid waste catchments.]
Source: adapted from Jattiem, 2013 and CoCT data, 2013
*data only availble up to 2010 unlike other data up to 2013







Source: CoCT, undated

[Figure 4.20: The airspace challenge.]

factors ranging from site maintenance (and thus capacity constraints) to financial considerations (Muller, 2013). Figure 4.20 shows projections of future landfill capacity considering the effects of applying minimalist waste minimisation strategies as well as the more ambitious 'zero waste' goal introduced in the Polokwane Declaration. Interestingly it assumes new landfills will come online timeously as is seldom the case (Haider, 2013).

Visserhok landfill, as the waste recipient for waste from RTSs, admits more than 40%[3] of the city's waste. Coastal Park and Bellville receive 31% and 29% respectively with the latter also admitting some waste from Stellenbosch Municipality whose own airspace is low and is periodically interrupted by infrastructural failures (Haider, 2013). Waste from the Helderberg catchment, once deposited at Swartklip and Faure under the four areas model, is now sent to the nearest landfill which is Coastal Park (Jattiem, 2013).

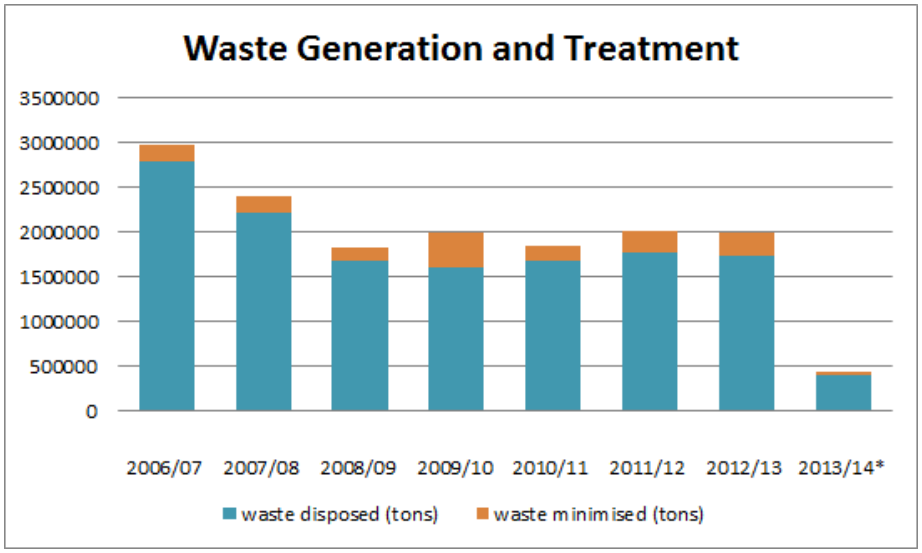
This reveals that waste generation is closely linked to economic stability as shown by population analysis of the waste catchments. Despite having the smallest physical catchment area, Swartklip RTS covers the highest population admitting the wastes of approximately 29% of the city's residents. Yet Swartklip RTS which processes the transfer of wastes of the city's poor in the MSE contributes less than 10% of the waste while Helderberg and Coastal Park catchments, about 6% of the population and generally considerably wealthier contribute 31% of the waste.

Similarly, Figure 4.21 illustrates dramatic effect of the global economic downturn on the volume of waste generated in Cape Town a decrease in waste-to-landfill. The decrease seen in 2007/08 is in small part due to effort waste minimisation efforts of the City and in large part because of the adverse economic climate brought about by the global financial crisis of 2007/08. Evidence of this is seen in the increase in 2010/11 as the economy begun to recover (Haider, 2013). (2009/10 shows a dramatic waste diversion which is not maintained; this can be speculatively attributed to the 2010 FIFA Soccer World Cup held in South Africa.) This leaves planners and SWM professionals with the challenge of uncoupling economic

3 It is important to note that waste proportion indicated for Vissershok landfill reflects what enters the site via weighbridge. Wastes from RTSs enter elsewhere and are recorded once (i.e. at the RTS of origin) (Muller, 2013).

growth and waste generation.

Source: CoCT data, 2013



[Figure 4.21: The changes in waste generation in Cape Town: 2006-2013.]

Figure 4.22 demonstrates the extent of influence held by economic activity on waste generation; it illustrates that 'business areas' produce more than half the city's waste with the balance from 'residential areas'. This is useful information for planners; the caveat is that this distinction is difficult even in the mostly segregated spatial environment and will become even more complicated to decipher as urban intensification and densification increase (SWP, 2013). Meanwhile, the content of waste (shown in Figure 4.22) is perhaps of greater concern in that it shows how deeply construction practices influence waste generation. Moreover these contents, similar to the national averages contain mainly recyclable or organic matter. Unfortunately, Cape Town does not have statistics of specific waste types (Muller, 2013). Hence it is difficult to know the exact amount of organic/compostable waste. However, one estimates suggests 45 -54% of waste may be divertible organics at a cost third to landfilling[4] and reclamation of builders' rubble (CoCT, undated).

Source: CoCT, 2013

[Figure 4.22: The waste sources and waste types in Cape Town.]

4.3.6 The Future of SWM Infrastructure

In considering the future of SWM in Cape Town, several infrastructural interventions emerge. The City is investigating the construction of a 960tpd RTS to service the Helderberg catchment (CoCT, 2012h). Similarly, Coetzee (2012) has suggested the potential for an IWMF at the site of the Bellville South landfill after it is decommissioned while new drop-off sites are continually considered. There is no clear evidence

4 The true cost of landfilling is disputed.

for major investments in composting, EfW or any other smaller-scale waste diversion or minimisation infrastructures. Also, the city is in the rather protracted final stages of identifying a regional waste site (RWS) (i.e. landfill).

Despite declarations to the contrary, the future of SWM in the city remains firmly ensconced in a reliance on landfilling. Under recommendation from Wright-Pierce (1999), the City appointed technical consultants to "identify and assess potential landfill sites *as close as possible* to Cape Town" (Crowther, 2013, emphasis added). The twenty-nine shortlisted sites (from a total of 75) strongly suggest that out-of-sight-out-of-mind was very much in play (see Figure 4.23). While this is conceivably a simplistic view, given the biogeochemical, logistical and legal considerations of landfilling, it may be that these very considerations are established around such a distanciation framework.

Still, the development of any landfill is a lengthy process. Attracting anywhere between thirteen and eighteen specialist studies and falling victim to perhaps the most vociferous NIMBYism and politicking, it can be as many as fifteen years from the time of conception until the first piece of waste is disposed of in a landfill (Haider, 2013). So, thirteen years after the search for the RWS commenced, the city remains in limbo as neither of the final two sites, Kalbaskraal and Atlantis has been chosen as the designated site (DEADP, 2013).

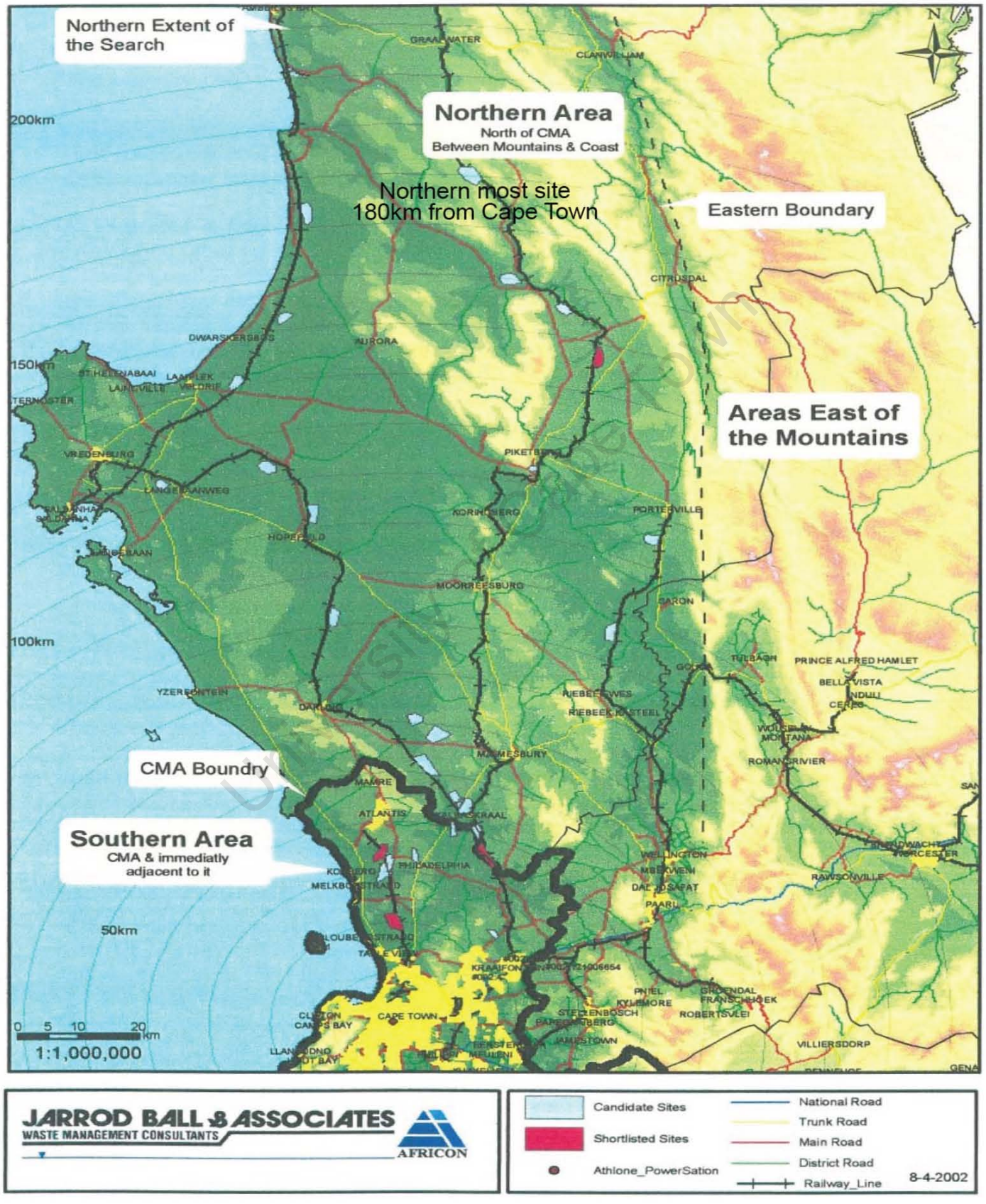
Each site has its advantages and disadvantages. From a transport perspective, Atlantis would be marginally (1-3%) more expensive but all things considered, Kalbaskraal is approximately 6% more expensive over 30 years (Aurecon, 2010). Ultimately though, when biophysical conditions, socio-economic sustainability and environmental health are factored in, the Atlantis site emerges as the favourite (Crowther, 2013).

In terms of the cumulative socio-economic, biophysical and environmental health impacts, the Atlantis site is preferred over the Kalbaskraal site. It is better supported by planning/ policy provisions and is more closely aligned with the "urban fringe" land use set forward in the PSDF (2009). Kalbaskraal, on the other hand, is surrounded by productive agricultural land and the regional landfill site would thus introduce a new, inappropriate land use. Furthermore, the Kalbaskraal site is of greater significance with respect to food security/conservation of key agricultural areas through the current, and anticipated, strategic agricultural investment in the area. Yet the Atlantis community has historically been a symbolic (social) landfill. Hence, the objection to the development of the RWS at Atlantis is principally, political with some legal imperatives (Malan and van der Merwe; 2006, 2012). Thus politicians are content to adopt a NIMET approach.

There have been suggestions to circumvent the political ill-will by designating both sites as the chosen sites for a minimum total of 60 years of landfill potential. The problem is that this does not really solve the problem of which site to use first and undermines the message of frugality with respect to landfilling. What the RWS drama actually does is unearth the larger problem of SWM in Cape Town: Because landfilling is expected even if only as a last resort; and because landfilling arguably requires the least citizen activation (and is therefore easy); and because landfilling can easily leapfrog other waste management alternatives in the municipal endeavour to fulfil the 'basic services provision' mandate, SWM tends to put most of its resources into landfilling. In a sense then, the RWS debacle should begin the conversation of what should comprise basic services as far as SWM is concerned.

Capetonians have a legitimate—or at least legislated—expectation to have their waste removed (which is not the same as treated or processed). Subsequently, there is a general ambivalence towards waste minimisation (in exchange for nothing more than a 'you-are-a-good-citizen' nod). In fact the tone of the

SWM department's homepage on the City of Cape Town website suggests that most of the effort (and therefore success) of waste minimisation has hitherto been a result of its own efforts. The irony is that while may in fact be true, spatial planning which has effectively ignore SWM until recently is an indirect driver waste minimisation. In stalling the decision for the RWS, SWM has impetus to make current landfills last longer. Yet, the lack of collaboration means land-use decisions which could better facilitate waste minimisation efforts are largely unconsidered.



Source: adapted from Crowther, 2013

Figure 4.: The northern drift of Cape Town's waste woes. Alarmningly the northernmost site considered was 180 km from Cape Town.

4.4 Evaluation

In term of the three core traits discussed at the end of Chapter 3, the Cape Town's waste system can be summarised thus:

Equity

The main focus of solid waste management is Cape Town involves the heavy use of centralised facilities. In general centralisation favours the previously advantaged in that the disadvantaged generally bear the cost for the lifestyles of the rich. This has been observed with wastes cast previously to the metropolitan southeast and the drive to move north. With the dominant focus still on landfilling despite movements towards a more cyclical waste management regime, this inequity seems poised to continue. This is reflected somewhat in the recent 'poo protests' which suggest that the consumers can no longer defer the responsibility for dealing with their wastes to the poor or faraway.

Sustainability

The present means of waste management are unsustainable on an economic, social and environmental level. Recalling the tetrahedral conception of sustainability, and the governmental element needed to hold sustainability, Cape Town is well positioned. Within planning there is an overall sense that the environment is important while SWM is innovating to minimise waste. However, without working together, these worthy endeavours are not reflected in other aspects of sustainability and allow the lifestyles of linearity to persist. For example, the cost of landfilling (less than R300 per ton) does not fully account for external costs (de Wit, 2012). For example, the Haider (2013) argues that the total costs of landfilling are not commensurate with the land values (before landfilling).

Meanwhile the excessive landfilling of organics produces methane gas with is not harnessed as EfW. Moreover, the transport costs and emissions for transporting wastes not only to landfills but to distant RTS and drop-offs are considerable. That said, the facilities represent a positive move towards greater decentralisation. They create employment which landfilling cannot. However, with greater pre-collection sorting and pre-production material accounting even more jobs care available (Dittke, 2013). This require a shift from end-use solutions towards proactive solutions that empower actors to access the network and self-initiate frugality.

Integration

There have been few attempts to integrate urban systems in Cape Town from a SWM perspective. Whiele progress is being made it is there is people have not been integrated into the purpose of metabolic reduction. There needs to be a move towards focusing on sociotechnical networks. Meanwhile urban planning has not engaged its management tools (regulations, CID, zoning) effectively and its visionary aspects (CTSDF, UDZ do not discuss waste. Rather it defers waste concerns to the SWM directorate.

5
Intervention

Chapter 4 illustrated how the tenuous relationship between planning and waste manifests itself in insufficient spatial planning (for waste) in Cape Town. It demonstrates how innovative thinking and robust policy falls short of its potential because links between waste and planning are only alluded to rather than deliberately aligned. Also, the City's spatial planning imperatives are arguably quite environmentally sound despite an economistic bias. The result is that an overemphasis on the economy has left SWM to fend for itself as far as its spatial manifestation is concerned.

At the same time, SWM has set very ambitious goals. However, without the explicit support of urban planning these goals face significant challenges in coming to fruition. In a way, if the city is not pro-minimisation in all its spheres it is ipso facto anti-minimisation. This, as argued in Chapter 4, is reflected in a waste approach whose aspirations are overly mechanised and technologised without an adequate focus on personal responsibility (especially given the socioeconomic disparities in the city); the effect is not waste minimisation at source but rather waste minimisation at sink, a goal which is both noble and necessary but ultimately insufficient.

This Chapter offers modest policy and spatial interventions which could assist in making the city's zero waste goal more of a coordinated effort between spatial (forward) and regulatory (land-use) planning and SWM. It is an attempt at reimagining what a zero waste Cape Town could look like in space using zero waste as a key structuring element for various element of the urban form. An overarching idea in this dissertation is the necessity for a multiplicity of approaches to addressing the challenges of urban waste. Thus interventions contained herein, though ostensibly antagonistic, are actually synergistic and reflective of the much wider reality of uncertainty that plagues the urban futures. (This statement will become clear as the chapter progresses.)

The chapter is structured into two parts: The first is a presentation of three motifs developed from gleaned from literature and contextual analysis. It offers strategic and macro-scale concepts, it draws on the city's spatial structure and proposes ways to improve coordination between producers and consumers. Then it presents local level initiatives that could operate through partnerships between the City and NGOs and community groups. Drawing on precedents, it bases suggestions on local contexts with similar challenges. It is critical to remember that this chapter does not represent some redrawing of the Cape Town SDF; nor does it represent a prescriptive master plan. Rather, by presenting spatial concepts, principles and ideas, it aims to illustrate that SWM considerations can be implemented intentionally (and more rigorously) into the City's urban planning agenda. Thus the second part the chapter, which presents an implementation

strategy, places greater emphasis on institutional responsibilities than expected timescales. It discusses who should do what and suggests broadly when.

The interventions have four overarching goals:
- Explicitly illustrate the link between planning & waste and bring waste into the planning agenda;
- Bring waste from hidden recesses of the city into plane sight such that its usefulness becomes evident;
- Challenge the inefficient production methods and laisser-faire consumption patterns at the core of the problem; and
- Stimulate participation and innovation in metabolic processes

PART A: POLICY & SPATIAL INTERVENTIONS

5.1 Metro-Scale Imperatives

The CTSDF is the city's metropolitan level document for spatial planning thus this section aims to inform the SDF by means of drawing SWM-based spatial interventions that could be discussed in the CTSDF. More specifically, it will link these concepts to some of the CTSDF's current proposals and illustrate not only how they relate to waste but also to other imperatives of the SDF. In so doing, it provides an idea of how the "stronger link between regulatory processes (zoning schemes) and spatial plans" (CoCT, 2012a: 3) can be achieved. Each motif is substantiated and then ways in which it could possibly manifest in policy are presented.

5.1.1 Cluster Functions and Cascade Resources

The concept of clustering was described briefly in Chapter 3. To recapitulate, clustering refers to the agglomeration of relatable functions together. Traditional (read: modernist) land-use planning which still influences—albeit to a small extent—the Cape Town Zoning Scheme (CTZS), emphasises the compatibility of proximate functions; in a sense so does clustering in that it advocates that nearby land uses directly support each other in the uses of each other's wastes (read: by-products). The most appropriate scale for such clustering is a matter of debate among professionals and academics.

Effective clustering requires a second element which, although it follows the first, provides the impetus for clustering in the first place: cascading. Although resource cascading can occur under purely economic forces its manifestation is limited without the intervention of urban planning (Desrochers, 2004). Thus the onus is on Cape Town's planners—whose self-proclaimed goal is to "guide [both] public and private development to ensure the best possible outcome for [the city's] inhabitants" (CoCT, 2012: 1)—to lay the foundation, together with SWM for such symbiosis to manifest. This is done by the application of spatially targeted policy which facilitates clustering then rewards the subsequent cascading.

As already established land use functions in Cape Town are spatially. This segmentation has manifest in a difference of land uses and a different spread of commercial and industrial activity. In a sense then, the city already has symbiotic potential. Ideally, policy should reflect this potential. Moreover Figure 4.10 (in chapter 4) illustrated a variegated land use pattern particularly around industrial sites. Remembering that Gibbs and Deutz (2007) observe that clustering is more likely to occur—or rather easier to facilitate—in brownfield rather than greenfield sites, these industrial areas are ideal locations to promote industrial symbiosis through policy that encourages and supports environmentally conscious commercial and industrial activity.

Unfortunately, the arguably the most formidable challenge to industrial symbiosis is a matter of semantics. Gibbs and Deutz (2007) describe a situation in which the legal definition of hazardous waste (defined nationally) prevented its recycling and thus inhibited industrial symbiosis. Subsequently companies wishing to cascade may be in contravention of legislation. While this is a serious impediment, the new definition of waste provides hope in its broader conception of the meaning of waste (National Environmental Laws Amendment Act (14 of 2013); Dittke, 2013). Either way, the Waste Act is not prohibitive in its directive for hazardous waste treatment while Cape Town's own by-law in s. 1(*d*) provides the following caveat which can be leveraged in the application of industrial symbiosis policy:

> "(i) a by-product is not considered waste; and
> (ii) any portion of waste, once reused recycled and recovered, ceases to be waste"

Industrial symbiosis is about more about relationships than infrastructure (Gibbs and Deutz, 2007) and so the city should not be overly concerned with commitments it may be perceived to have vis-à-vis infrastructure provision when drafting policy that encourages industrial symbiosis. Indeed, the Integrated Waste Exchange (IWEX), a virtual form of infrastructure has already given the waste minimisation a head start but a more nuanced strategy needs to be applied to bring about cooperation through forced resource recognition.

The focus of this intervention is commercial and industrial activity. The reason for this is twofold. First, industrial and commercial areas yield more than half of the city's waste material (see Figure 4.22 in chapter 4). The second reason follows directly from the first and is based on the Pareto Principle to which the IWMP subscribes; commercial and industrial areas are the most prolific in terms of waste and their compliance to regulations is easier to monitor. Making this very point, Dittke (2013) asks rather provokingly: "Do you choose to get a handful of big waste generators and tell them how to do things: to reduce waste by cleaner production and environmentally intelligent product design… Or would you like to focus on teaching 3-million uninterested, uneducated people to not throw out their [trash]?"

Recommendations

- Apply IWEX exclusively to institutions and have it as means for the publishing of regular trade material flows instead of a system for any individual to access once of. There may be another means for the trade of once off waste products.

- Amend the CTSDF to also reflect this new idea of what "a mutually supportive system of economic areas" (CoCT, 2012a: 51). As an example of how such an amendment might look, see Table 5.1 below which shows a change to a policy under Strategy 1 of the CTSDF.

Table 5.1: Example of Possible CTSDF amendments to reflect clustering

PROMOTE INCLUSIVE, SHARED ECONOMIC GROWTH AND DEVELOPMENT			
POLICY STATEMENT	WHAT THIS MEANS/REQUIRES	POLICY GUIDELINES	RELATED LEGISLATION
Policy 4 Encourage area specialisation and the development of a diverse mutually supportive system of economic areas	The City will recognise the importance of providing a range of economic environments, and support the development of differentiated economic areas performing specialised (and not necessarily competing) roles by: • supporting the further intensification of business services, financial, information and technology, office and retail functions in Bellville CBD / Tygervalley and prioritising the revitalisation of the Voortrekker Road area; • supporting the development of a Bellville improvement district; • planning for sustainable growth of the Cape Town CBD within the limits presented by its location and the assets and resources that make it an attractive investment location; • supporting the clustering of economic sectors, such as tourism, finance and business services, conferencing and information and communications technologies in the Cape Town CBD, and creative industries in the central city's 'east city' precinct; and • encouraging the development of submetro and district urban nodes as high-order retail and service areas. [additions] • encouraging proximate businesses to support each other in the use of by-products otherwise destined for disposal; • promoting the establishment of enterprises that seek to connect waste generators with potential material resource users or other endeavours that promote frugal resource use.	P4.1 Encourage land use intensification within metropolitan, sub-metropolitan, district and local nodes in line with applicable policies, [~~the relevant zoning scheme~~] and the District SDPs [additions] P4.2 Adapt zoning scheme to reflect promotion of resource frugality	• Draft Cape Town Densification Policy (2010) • EOZ Management Plan (To be prepared) [additions] • Community Improvement District by-law • Cape Town Integrated Zoning

Source: adapted from CoCT, 2012a

Policy Manifestations

1. Direct industrial activity so as to harness intellectual and innovation potential

Figure 4.11 (chapter 4) highlights two such areas each of which confers developmental advantages that might encourage development of industrial symbiosis clusters. Culemborg is in proximity to the Cape Town UDZ and sits between two CIDs and is close to Cape Town's creative area and the financial capital of the central city. The area designated Unibell contains two large tertiary institutions, and is in proximity to the Parrow CID and Bellville metropolitan node. Moreover the area which contains the Bellville South landfill has already experienced being at a focal point of the city's waste management regime.

These areas may prove fruitful for several reasons. In the case of Culemborg, the proximity to financial capital has shown a degree of correlation with the formation of eco-industrial parks. In addition, both sites contain some brownfield and some greenfield-among-brownfield development. Also, both areas are near universities which can be considered "fully vested 'anchor' institutions" that confer a developmental influence on the urban form (Gaffikin and Perry, 2012: 717). Meanwhile, universities are moving from being "enclaves" to more fully engaged urban institutions whose "interdisciplinary capacity of universities… permits a multidimensional civic participation" and serves as robust platform

for collaboration to manifest from mere rhetoric (Gaffikin and Perry, 2012: 718; Rodin, 2007). This access to research, innovation and intellectual capacity should yield more than it has thus far in the way of evaluating the potential recycling ability of manufacturing technologies already in place. Should this be done, the need to invest in additional equipment—which could reduce the economic benefit of using a raw material substitute—is decreased.

2. Leverage UDZ investments for waste minimisation

Infrastructures for waste management are part of the UDZ allocation. Thus by targeting UDZ areas (perhaps through density and IEZ overlays as described below) the City could incentivise diversion through self-initiated cascading efforts by businesses particularly during construction. Because new developments in UDZs should receive remuneration for costs incurred complying with waste infrastructure requirements (for example onsite waste separation facilities) in their development zones, this regulatory imposition should not be a disincentive for investment. In fact, in today's 'enviro-conscious' climate this should give businesses the environmental 'edge' without the financial cost.

3. Implement CID waste management strategies

Using the business acumen of CIDs which are already clustered the waste assessments (see below) could be used as a point of departure for waste cascading. With waste assessments mandatory part of the commitments of the management body of the CID should entail waste minimisation and diversion strategy.

4. Make institutional baseline waste assessments mandatory

As a necessary element for all the above policy suggestions, waste assessment serves two basic purposes: First, it analyses the quality and quantity of waste generated by the institution and second assesses current and any potential waste minimisation efforts in terms of cost benefit (EPA, 1993). Essentially the waste assessment is meant to demonstrate where waste minimisation could save (or even make) an organisation money.

Table 5.2: Methods for Carrying out a Institutional Baseline Waste Assessment

Method	Strengths	Limitations
Records Examination (hauler records)	• Should provide accurate data on waste generated	• May not yield information about waste contents • Depends on external information source
Records Examination (purchasing records)	• Tracks major potential wastes from point of origin • Can be more accurate than waste sorting for small or low-volume or seasonal items	• Might not yield full picture on actual *waste* generated • relies on centralised company purchasing system
Facility Walk-through	• Considers actual processes that yield waste and allows interaction with workforce • Provides qualitative information about waste	• May not be representative if conducted once • May fail to yield waste quantities
Waste sort (Facility wide)	• Provides waste generation estimates for entire facility • provides qualitative information on each waste component	• Requires significant implementation effort • Provides no qualitative information on how or why wastes are generated

Source: adapted from EPA, 1993

Carrying out a waste assessment need not be a costly task. Methods are simple (see Table 5.2) and are generally quick to complete. The waste assessment is based on the notion that urban policy is meant to empower; while the assessments (see addendum) themselves would be mandatory and unequivocally demand businesses to consider waste minimisation and diversion strategies, the decision to enact these becomes the prerogative of the organisation. (This hands-off approach may be changed in the future to provide greater incentives for acting upon the findings of the waste assessment.) These mandatory instruments (which have voluntary outcomes) contribute to increased information availability, facilitation and assistance. In so doing they help organisations to perceive economic advantages in environmental outperformance even where the social and economic context does not favour going beyond compliance (Costa et al, 2010). This information would be made available on an IWEX-like database particularly for businesses operating within densified nodes or clustered industrial thereby further facilitating resource cascading.

5.1.2 Densify Urban Form and Intensify Activities

Based on the strategic densification nodes identification discussed in the City of Cape Town Densification Policy (CoCT, 2012), this strategy follows directly from the first. However, while Strategy One focuses primarily on industrial and commercial activity, this strategy applies mainly to mixed-use and residential areas. Chapter 3 observed that reduced per capita waste generation often (not always) accompanies densification; density must be intentionally leveraged to achieve the desired waste minimisation by directing minimisation efforts at elements within these nodes.

Strategic densification manifests in diversified and intensified urban nodes which present cascading opportunities; increased residential bulk provides the economies of scale collection of recyclable and compostable material and the ability to consolidate waste streams for the efficient most financially and environmentally economical infrastructural resources.

Densification is not a panacea for waste problems; as a commenter on the CTSDF draft observed, "there are various cumulative impacts associated with compaction and densification [which include] Solid waste" (CoCT, 2010). Thus density monitoring and evaluation measures prescribed by the Densification Policy should be observed. Additionally, regulatory tools can be adjusted to compensate for any potential disamenities of compaction.

For example, 'tweaking' of the CTZS to allow certain types of waste processing industries to operate within densified zones. While densification provides a scale that makes certain large scale minimisation efforts (viz. recycling) viable, to sanction decentralised entrepreneurial waste beneficiation within these nodes militates against the spirit of economic growth embodied in the CTSDF and undermines the city's commitment to waste minimisation because centralisation compounds waste 'hiding' which is counterproductive in waste minimisation. Thus waste-specific regulation could be used to encourage resident participation and 'unhide' waste.

Recommendations

- Amend the CTZS definition of 'utility services' as follows (amendment emboldened):

> "'**utility service**' means a use or infrastructure that is required to provide engineering and associated services for the proper functioning of urban development and includes a waste separation and materials recovery centre, water reservoir and purification works, electricity substation and transmission lines, stormwater retention facilities, and a waste-water pump station and treatment works, but does not include road, wind turbine infrastructure or transport use."

- Amend the CTSDF to show how reflect the leveraging of density for waste reduction. Table 5.3 shows and example of how, under Strategy 2 of the CTSDF the city can "promote a culture of sustainable development and living" (CoCT, 2012a: 76).

Table 5.3: Example of Possible CTSDF amendments to reflect resource efficiency in dense areas

MAKE EFFICIENT USE OF NON-RENEWABLE RESOURCES			
POLICY STATEMENT	WHAT THIS MEANS/REQUIRES	POLICY GUIDELINES	RELATED LEGIS./POLICIES
Policy 30 **Promote a culture of sustainable development and living**	The City should: • Encourage the public and private sector to utilise sustainable practices and technologies that assist in reducing carbon emissions, reduce energy and water demand, promote public transport and support the recycling of water and waste materials. • Adopt an integrated approach to energy and water demand management. • Introduce and/or support the introduction and implementation of development by laws and policies on sustainable resource use. Specific action/s • Prepare / finalise land use management guidelines that take the visual, noise and safety impact of sustainable technologies e.g. wind generators into account.	P30.1 Use passive solar design principles when assessing building plans and layouts i.e. consider the maintenance of interior thermal comfort throughout the sun's daily and annual cycles whilst reducing the requirement for active heating and cooling systems. P30.2 Promote green buildings in line with relevant guidelines	• National Building Regulations • Draft Green Building Guidelines (2008) • Proposed by-law on the installation of solar water heaters in all new developments
	[additions] The City should: • Use densification to facilitate reduced per capita resource use and waste production through the application of waste generation regulators to dense areas • Facilitate resource cascading linkages between various enterprises	[additions] P30.3 Facilitate express building approval processes for applicants that use more than the stipulated minimum of recycled material P30.4 Determine such a minimum P30.5 Mandate onsite separation of builders rubble P30.6 Begin process of banning builders rubble from landfill	[additions] • Possible by-law on building site material resource management and procurement

Source: adapted from CoCT, 2012a

Policy Manifestations

1. Mandatory on-site waste separation for certain (residential) development types

Figure 4.15 (in chapter IV) shows that SWM in Cape Town already has a differentiated approach to different building types albeit within a small part of the city. Thus there is an opportunity to integrate this SWM approach into the CTZS scheme by requiring mandatory waste separation for high density buildings, housing estates and business parks thereby reducing waste-to-landfill. Figure 5.1 which shows the areas zoned "general residential" illustrates the spatial extent of the application of such a measure. Overlayed on this figure are the Think Twice collection areas to illustrate how this separation-at-source could increase its catchment by the implementation of this policy potentially increasing its economic viability. Multi-unit dwellings and complexes are admittedly trickier to start with than single residential

units but the higher densities where these are located may prove beneficial. Besides, the Think Twice program has already made headway in these wealthier single residential areas. Now the focus should turn to consolidating efforts.

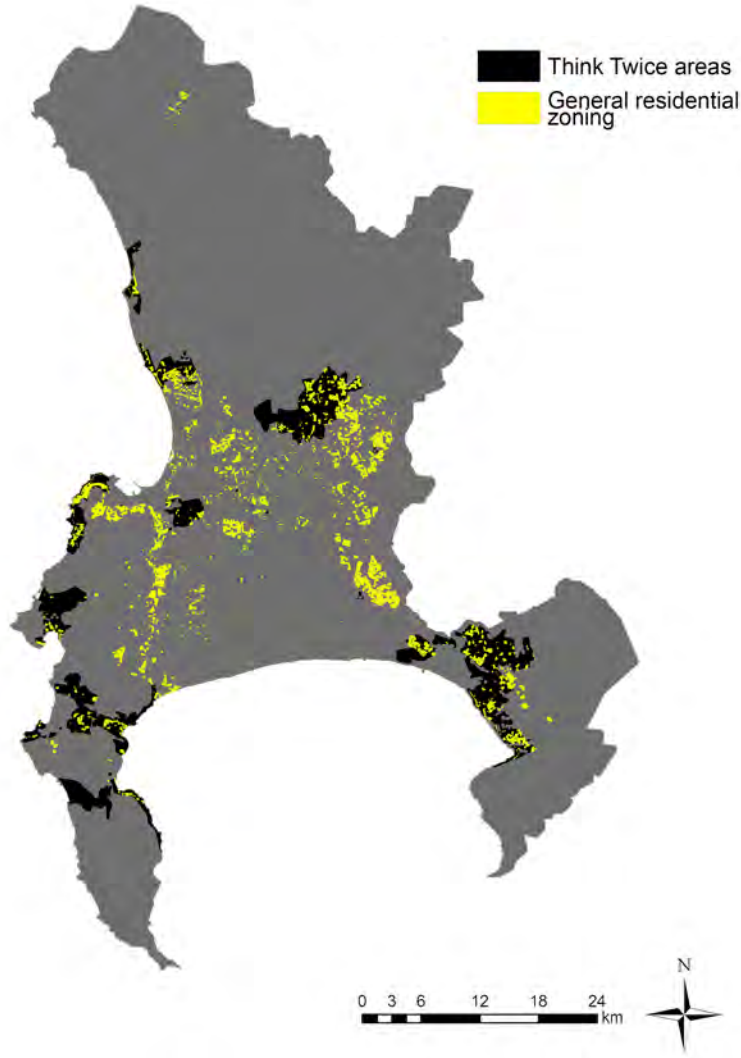
2. Adjust expectations for the land-use rights in densified centres

Within the density overlay, adjust land-use rights so as to allow for decentralised waste entrepreneurialism. Recovery of certain waste products may be classified as "noxious trade" by the CTZS and therefore prohibited from land use rights. The selected approach has three prongs:

- Apply a density overlay which stipulates areas where density increases are desired.
- Include in the consent use rights of the density overlay the amended definition of 'utility services'
- Stipulate environmental standards that must be adhered to within the density zone

3. Solid waste overlay zone

Alternatively to (or perhaps concurrently with) No. 2 above, a virtual overlay zone could be applied as a means of integrated environmental zoning (IEZ). This coalesce SWM's IWEX and spatial planning's ISIS to map generators and users. Cape Town's application of innovative technologies is second-to-none in South Africa (think of ISIS, SAP) and this would reflect this creativity. Such an act while not a deliberate means of clustering is nonetheless useful. The IEZ could is a management tool that can be used by both SWM and urban planning to see which areas are the best performers in waste minimisation provided the system is consistently updated. Functioning like the zoning viewer on the City of Cape Town website, the IEZ, would display information about properties zoning as well as information about waste generated as collected from baseline waste assessment.



[Figure 5.1: The general residential zoned areas for which mandatory on-site waste separation must be accommodated. Notice that the Think Twice areas begin to be linked.]
Source: GIS data, Coetzee, 2012

5.1.3 Reconceptualise Infrastructure

Hitherto, solid waste infrastructure has been limited macro-infrastructures, namely landfills, refuse transfer stations and solid waste drop-off sites with 7km radial catchments (CoCT, 2013). By and large this focus continues. Yet there is a general trend towards smaller networks. Moreover, waste minimisation evidentially relies quite significantly on waste sociological and behavioural changes. Thus, this strategy envisions the use of seemingly unrelated urban elements to 'unhide' waste, bring it into the public domain and resist the large networks.

The focus for planning is to assist SWM to achieve its ends by conceptualising the functionality of Cape Town's infrastructure and infrastructural agents in a new way. This integration of infrastructures not only exposes metabolic processes to the consumer but increases urban efficiency through resource coordination.

Policy Manifestations

1. Localise waste drop-off sites and facilities: Establish train stations as material resource centres

Chapter 4 showed that the railway plays an integral part of the Cape Town's SWM system. In addition, the railway penetrates most industrial zones while Metrorail transports over 600 000 commuters daily. With the appropriate management, the integration of transport and solid waste management could utilise waste-conscious commuters and station-proximate business to bring pre-separated wastes to deposit as at the railway station material resource centres.

Conventions and institutions of today's world are often based on materialist—that is linear—assumptions. As spaces of interruption—that is interruption of the discourse of deference and the culture of consumption—railways material resource centres can be viewed as sites whose role is to allow for the articulation of alternative discourses in car-dominant and consumption-heavy Cape Town. As such, they could send important signal and develop an important reputation in communities to align society with the post-materialist worldview purported by sustainability.

Moreover, stations as material resource centres can address issues and challenges beyond waste. For example, Jane Jacobs (1961) asserted that heightened street activity has a positive net effect for urban safety due to increased presence of witnesses to any given event—the so-called 'eyes on the street'. So stations can become anchors whose increased activity increases safety. As such, stations can become places that promote the 'right conduct' which was so evasive for Simon (in Textbox 4.5).

Figure 5.2 illustrates that if every railway station were used as a material collection centre, the effect would be to instantaneously increase the number of drop off-sites and have the potential to service more people in closer ranges distances of less than the 7km presented by the SWP. Furthermore material resource centres serves as a continuous marketing strategy inviting the participation of individual residents and residences whose combined micro-efforts makes a macro-difference.

Piggybacking of mass transit conveys other advantages. With adoption of innovative infrastructures, this system could streamline the transport of materials to processing facilities since; passengers deposit wastes in the daytime while at night-time cleansing crews aggregate materials and the train completes one journey to a (more) central processing facility. (Such an approach is commensurate with current SWM

spatio-temporal processes of transporting wastes from RTS to landfill at night.)

Employing this multi-use approach at transport exchanges, park-and-rides and train stations converts mere public transport resources (and in a few cases retail resources) into urban (material) resource centres. Dissenters will argue that turning public transport into waste sites undoes the advances made in the promotion of public transport. This argument undercuts itself because first, it assumes that waste processing and transfer is necessarily a dirty and wholly unpleasant business (which says more about the dissenters and their waste than anything else). Second, it attempts to deny SWM the opportunity to reduce its own environmental impacts—one of the main driving forces behind the public transport revolution. In the broader conversation about sustainability, reciprocity and conviviality are important values; so to dissent without offering alternatives undermines any credibility in the discourse of urban sustainability.

2. Use parks as a means of spreading and enacting compost message

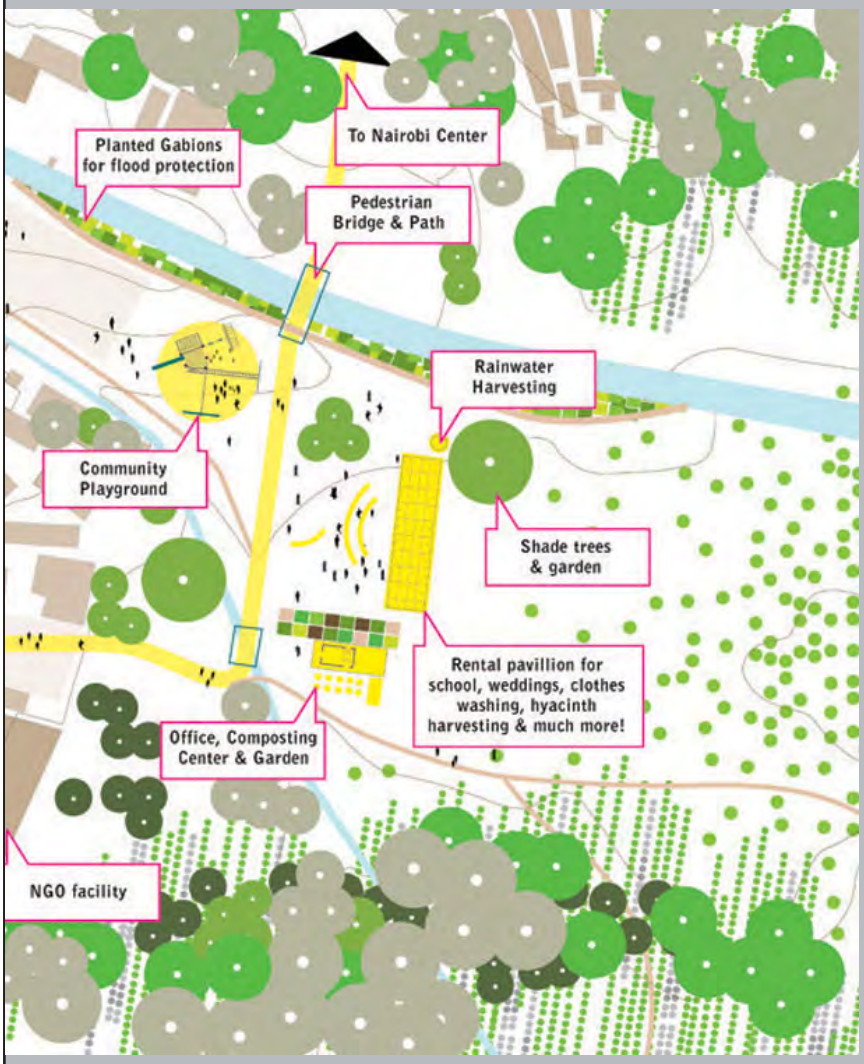
As indicated in the Cape Town IDP the city's open spaces should not only protect but also reflect nature's restorative and regenerative qualities (CoCT, 2012). In this regard, recreational infrastructures like city parks should also be seen as production spaces. To this end, local produced compost should nourish the lawns and gardens and patrons should be aware that their food scraps have contributed to their city's beautification.

Through a 'liberisation' of policies relating to urban agriculture, city-owned and appropriately-zoned areas could be used to develop food gardens with the condition that make use of compost and serve as educational or recreational facilities. Where properties do not belong to the City, such productive uses ought to be encouraged. To achieve this, additions to the city parks by-law to allow urban agriculture are needed. Moreover, the City's amended urban agriculture policy (currently under production) should clearly connect to solid waste managements' composting initiatives unlike its predecessor. In so doing, the coalescence of recreational open space and productive open space can create more vibrant public open space. Textbox 5.1 illustrates how such local level interventions were adopted in the context of a densely populated slum in Kenya.

This model opens the door to decentralisation of composting facilities. With communities now actively involved in separating organic wastes, the potential for local processing and use of food wastes arises. In partnership with the City, small-scale compost facilities can be set up.

Textbox 5.1: Productive Public Space

Kibera is a slum in Nairobi, Kenya and like many slums has a waste management problem. As a solution, the community partnered with Kounkey Design Initiative (KDI) in 2006 to develop a new type of public space, so called productive parks. The productive parks are meant to provide open space, generate income for locals and systematise waste collection in a regenerative way. They are divided into three zones: an open community area with a children's playground functions like a regular recreational park; agricultural zones support water hyacinth and kale cultivation; and a third, fenced-off area holds compost barrels thereby providing a site for the disposal of refuse (80% of which is compostable) and a bank of toilets to improve sanitation concerns. The toilets too are used to produce compost. Local apportion and manage land themselves. Each enterprise contributes a percentage of their profits (from the sale of crops or compost) to a site maintenance fund.



Source: Dac.dk, 2013; Engineering for Change, 2012; Kounkuey.org, 2013; Unslumming Kibera, 2013.

This precedent illustrates four things. First, it demonstrates how open spaces can serve as more than just recreational spaces and that waste need not be a hindrance to spaces. Second, it highlights that wastes have value and shows that appropriately targeted waste management systems yield beneficial results. (This is a reference to the recognition that 80% of the waste in Kibera is organic and thus interventions need to target the existent waste streams.) Third, integration of sanitation and solid waste streams to produce composts demonstrates a commitment to a holistic approach. Finally, each park services about 250 households which maintains manageability and encourages tangible involvement while maintaining sufficient productivity. At a cost of US$10 000 (about R100 000) each, the parks use local employees for their construction. To date, three have been constructed, each 15-minutes' walk from the next.

3. Reconsider conceptions of 'waste' and 'basic service' 'provision'

Regardless of the abovementioned caveat the waste by-law should be amended to reflect the Waste Act's amended definition of waste. This small issue of semantics feeds a larger conversation about what constitutes waste and how waste can be given value. Textbox 5.2 demonstrates how one organisation is working to dramatically disrupted society's conception of waste. This example shows how Fureda's (1992) 'resource recognition' approach integrated urban priorities—disaster management, housing, and SWM.

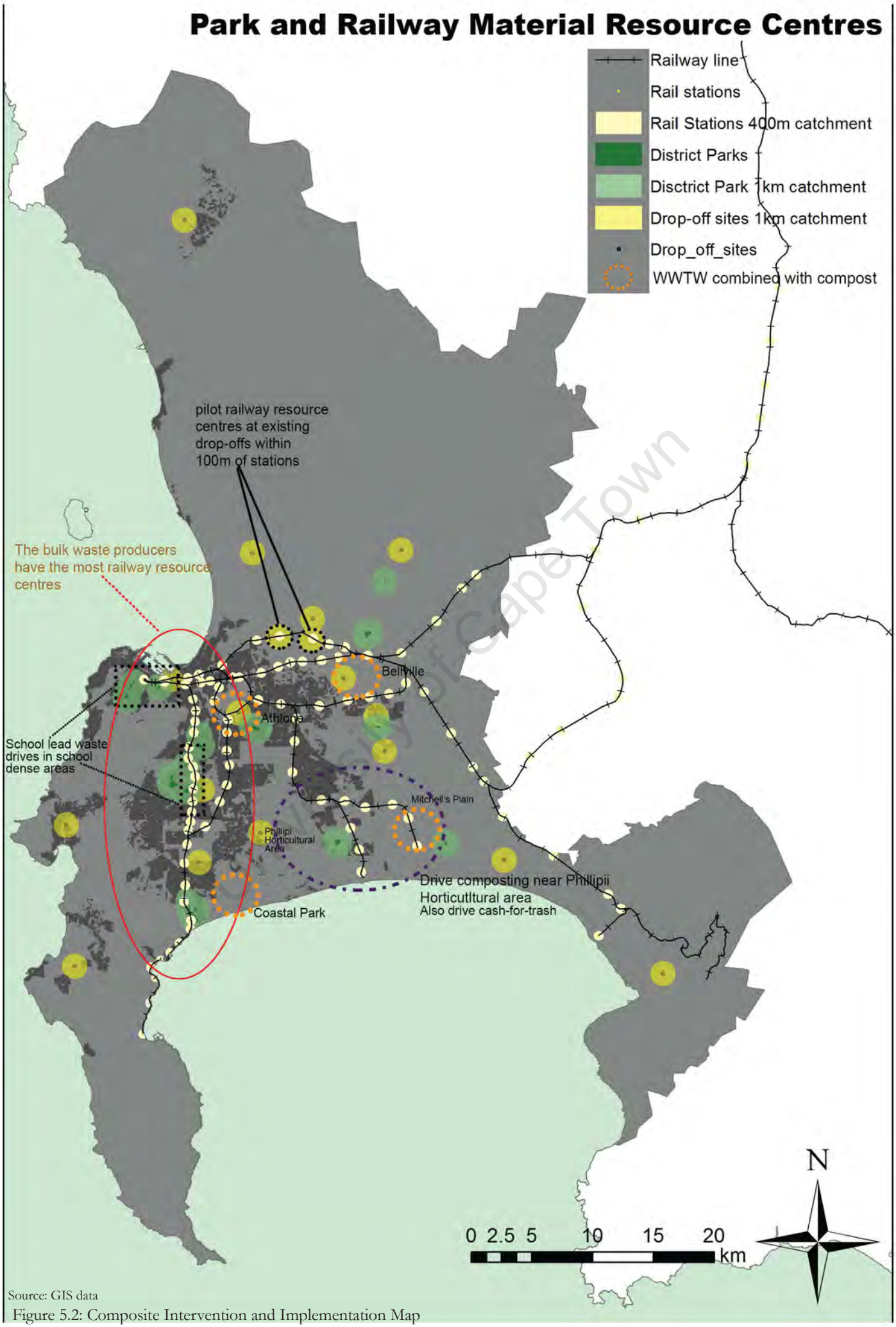
The conception of basic service provision needs radical transformation. The concept of service provision feeds the entitlement mentality that plagues South Africa. Rather, the City should emphasise that while it remains committed to providing services there is a shift required from basic service provision to basic service participation. This then drastically changes the idea of basic services in waste; instead of merely referring to refuse collection, the term 'basic service' now means establishing access to several means of disposing of wastes such that they are either immediately reused (cascading) or recycled or composted. In a sense then, the term basic service delivery itself needs to be reclaimed from its collection-focus.

Textbox 5.2: Instead of waste, it becomes a house!

Gulbahao is a research organisation working out of karachi, Pakistan. The project deals with two main concerns for the moderns city: reducing waste and increasing need for housing. Gulbahao helps people in poor communities make homes from waste! According to Nargis Latief, director of Gulbahao, the homes are "modular, weatherproof, low-cost and [are] put up in just a matter of hours". Gulbahoa works with local factories to collect unwanted, clean, non-biodegradable waste or use waste pickers to retreive similar waste from landfill sites. The waste is shredded and packaged into "bricks" which are then used to construct dwellings. The chandighars or silver homes were conceived as a disaster management response and continue to contribute significantly to Pakistan's disaster response. Costing less than US$300 (about R3000) each, construction of the silver provides jobs to a few.

The lesson of the chandighars is that necessity is the mother of invention and that conceptions of the uselessness of waste are mostly completely unfounded. It illustrates how in the wake of disaster, the sense of entitlement that may have invited derision—using rubbish to build a home—evaporated and gave way to reason and refuse reuse.

Source: Gulbahoa.org, 2013; CNN, 2013



Source: GIS data

Figure 5.2: Composite Intervention and Implementation Map

4. Integrate urban waste functions

Michael Rouse, President of the World Water Association has said:

> "If we started sanitation again from scratch...we would not do it the way we do now. Instead of flushing and piping all the waste away, we would collect the solids once a week like household rubbish, take it to a central depot and compost it. Eventually it would be used as fertilizer, itself a bonus in the developing world, which would be able to cut down on expensive chemical fertilizers."

Although this dissertation takes exception to the notion of the necessity of weekly household rubbish collections what can be subscribed to is the consolidation of different waste streams for the greater good. Thus, areas around waste water treatment works (WWTW) should be the first sites identified in the search for 'appropriate' land for decentralised compost facilities. Figure 5.2 Locates the WWTW in the city and highlights potential starting points for the amalgamation of sanitation beneficiation and composting given their proximity to present waste facilities.

5.2 Local-Scale Initiatives

The following proposals are ideas which are conceived to make up metro policy but which have very specific local level implementation.

1. Investigate the feasibility of citywide cash-for-trash systems

As established in Chapter 4, for most SWM professionals the challenge of informal settlement is that the refuse collection trucks cannot access each dwelling for the removal of waste. Meanwhile, the expectation of most residents is that they should one day have the RDP-based one-house-one-plot model. En route to this the morphology of many informal settlements is being changed in the process of 'reblocking' to create the order desired.

However, the precedent from Dharavi (see Chapter 3) shows that sometimes well-meaning attempts to improve living environments can themselves metastasise into something virulent. Thus externally-initiated reblocking (although often carried for non-waste reasons) has the potential to sterilise settlements and quash the potential for ingenuity. Rather the city should support waste entrepreneurs. Cash-for-trash systems like Swop Shop and Trashback (see Textbox 5.3) don't aim to change the organic settlement pattern. Rather, they appeal to the behavioural changes. The value of both systems is that they stimulate the local economy.

For urban planning, facilitating the establishment of such endeavours includes the identification of land near or in low income areas for these to be established. An alternative to these initiatives is to encourage entrepreneurial local residents to venture into waste reclamation themselves. For planning the task remains the same here: to assist residents to identify land for use should their own private properties be insufficient.

2. Link waste management and food security

A previous strategy advocates local urban densification. However, the entire city cannot be subject to uniform densification; subsequently an alternative approach is required for less dense area. These, rather than using large infrastructures must receive the support to keep materials close to the sites of

generation. Keeping refuse processing local has several functions. First it limits the carbon emissions that would result from multiple collection trips to collect different waste streams. Second it militates against the psychological ambivalence that often results from distanciated, centralised facilities impose on me. Keeping resource management local may aid in developing personal responsibility and pride in all communities.

In many African countries—and arguably globally, backyards are more than aesthetic resources; whether as a primary or supplementary source, they serve as food gardens for urban families. As part of the drive to make feedback loops smaller, this strategy encourages home composting and community composting linked to gardening. Food gardening should be encouraged in sparsely populated areas especially in neighbourhoods with more arable soils. Figure 5.2 highlights parts of the city in which this can be adopted.

Textbox 5.3: TrashBack ***Uphinda-phindo!***

This project incentivises members of disadvantaged communities to manage their own waste through recycling. *Uphinda-phindo* is an isiXhosa expression which loosely translates to "to repeat", or the action of doing something over and over again. It encompasses the TrashBack's philosophy which promotes behavioural shift towards reuse and recycling.

How does it work?

As it is currently run, the incentive scheme rewards top collectors for their efforts. A set volume of recyclables is brought into exchange centres and the participant is issued with a certain number of points. These points are registered under their personal profile on the *Uphinda-phindo!* system.

Participants that have the most points at the end of each collection period (currently set to run from Wednesday to Wednesday) are guaranteed a reward, with a predetermined number of rewards available for each collection period. The points of the rewarded Top Collectors are reset to zero, while the points of those who are not rewarded are carried over to the next collection period.

Rewards:

TrashBack *Uphinda-phindo!* rewards are distributed using TrashBack's unique voucher system, which is enabled through the Broccoli Project which uses mobile and biometric technology to track participants points which are then redeemed in the form a secure voucher. These vouchers can be redeemed at various selected local businesses and informal traders within the community, thereby ensuring that:

1. Participants are rewarded with beneficial items, such as food and clothing.
2. Rewards help stimulate the local economy by being redeemable only locally.

Rewards consist of food, clothing, shopping vouchers, travel vouchers, stationary, airtime and high school textbooks.In summation, *Uphinda-phindo!* allows community members to translate rubbish into rewards, and reconceptualises people's perceptions of rubbish.

Results:

TrashBack Uphinda-phindo! was launched September 3, 2011 in Imizamo Yethu township, Hout Bay. From the launch date to February 9, 2012 415m^3 of recyclables were collected. The 576 registered participants comprise one seventeenth of IY's population and the 1019 rewards exchanged added R16 475 to the local economy, which is equivalent to a basic monthly salary for 1.46 people.

(Source: Broccoliproject. org, 2010; TrashBack, 2012)

PART B: IMPLEMENTATION

For Cape Town to achieve the resource recognition and materials management network described above, an implementation strategy is required to drive the adoption of the various strategies. This part of the Chapter lays out such a strategy. It draws out key stakeholders in the processes, assigns them task which should ultimately lead to the intended goal. It also describes the policy and/or legislative implementation vehicles and delineates a timeframe in which the issues should be handled. As earlier in the chapter, the timeframes are suggestive; short-term refers to a times within (the next) 2-3 years in cognisance of tender processes and municipal budgeting. Medium-is based on the runtime of integrated development plan (under which the CTSDF is continually reviewed) and is thus 5-10 years (two IDP cycles). Long-term represents a timeframe more inclined to the CTSDF and is 10-20 years.

Organised in order of priority actions (each of which is briefly justified), the implementation describes government and non-government actors and their roles in achieving the interventions proposed. To recapitulate, the motifs are as follows:

1. Cluster and cascade
2. Densify and Intensify
3. Reconceptualise infrastructure

PRIORITY 1 – SHORT TERM

Conduct a Fiscal and Operational Feasibility Study for the Collection of Source-separated Organics and Recyclables from multi-unit dwellings

Before organics can be banned from landfill and before the city can market the importance of separated (organic) wastes, SWM must first understand how it will implement the separate collection of (organic) wastes, and at what cost. To be clear, while this dissertation advocates a move from a collection-only SWM focus, the separation-at-source must precede any reduction in refuse removal. In effect, 'participation begins at home'; once the culture of separation is instilled drop-off is the next logical step en route to overall reduction. (Besides the installation of mini-drop offs is likely to be a much more protracted and litigious process.)

Simultaneously, the (Constitutional) legality of the amending the CTZS to include regulations around SWM needs to be investigated. Legally, the zoning scheme cannot remove rights previously held by properties and thus a thorough examination of the legal ramifications of such an amendment is required. In addition, the Waste by-law should also be amended to priorities organic waste separation.

City of Cape Town Actors

- **SWM directorate**
  - Produce Feasibility report
  - Operation Strategy (provided the report returns positive results)

- **Planning and Building Development Management Directorate (P& BDM)**
  - Report demonstrating the abovementioned legal consequences
  - Roadmap for the CTZS amendment to mandate 'general residential' separation-at-source and enforcement plan (provided legality of CTZS amendment is established)

Non-Government Stakeholders

- **Resource reclamation and material processing private sector firms**

- **Western Cape farmers unions**
  Separated organics will be processed into compost. Some understanding of the uptake rate is needed.

- **Property developers**
  In the long run, certain infrastructural requirements (perhaps a communal compost storage bin) may be legislated in by-laws for multi-unit complexes.

- **Property owners associations**

- **National Association of Managing Agents (NAMA): Western Cape Chapter**
  NAMA is a non-profit organisation that advocates for the concerns of the sectional title schemes property owners and homeowners' associations.

Implementation vehicle

Local Government: Municipal Finance Management Act (56 of 2003) which requires a period of advertising for goods and services.

PRIORITY 2 – SHORT TERM

IMPLEMENT INSTITUTIONAL WASTE ASSESSMENTS AT BUSINESSES, NGOS, GOVERNMENT DEPARTMENTS, INDUSTRIES AND ACADEMIC INSTITUTIONS

Once the mechanisms and costs of separation-at-source have been established, institutional waste assessments can be carried out. The reason this follows the priority is to give institutions an extra choice in their material management strategies. For some, self-driven cascading efforts will prove beneficial while for others, it may prove to be a financial handicap. Thus allowing the added option of using municipal services for the collect source-separated materials increases the agency of individual organisations while still achieving minimisation targets.

City of Cape Town Actors

- **SWM directorate**
  - Reassignment of IWEX from dual use by private persons and organisations to exclusive use by organisations
  - Uploading of waste assessment data onto IWEX database with link to ISIS
  - Monitoring of the rate of adoption of material separation and quality of compliance
  - Set up a task force to process waste assessments

- **Spatial Planning and Urban Design directorate**
  - Integration of major waste generators' by-product material inventory (from IWEX) into the ISIS system

Non-Government Stakeholders

Private sector entrepreneurs

These must be encouraged to establish small scale material processing enterprises

All institutions—schools, universities, hospitals;
All businesses—commercial, agricultural, industrial; and
All organisations—NGOs, non-profit organisations

Implementation vehicle

City of Cape Town IWM By-law (2009) which places the burden of responsibility of waste generators to ensure appropriate processing of their waste materials.

PRIORITY 3 –MEDIUM TERM

Form a Think Tank unit focusing on the industrial symbiosis around Unibell and Culemborg

Departing somewhat from the previous two priorities this strategy focuses attention on the development of resource cascading in the two areas identified on Figure 4.11, namely Culemborg and Unibell.

City of Cape Town Actors

- **Economic Development directorate**
  Derive financial incentives

- **Spatial Planning and Urban Design directorate**
  Advise on land-use restrictions and potential

- **SWM Directorate**
  Act as solid waste liaison to describe the role SWM can play

- **Other directorates of the Utilities Services Department (electricity, sanitation and water)**
  Infrastructure and engineering services liaison

- **Development Facilitation Unit**
  Liaison with provincial government

Other Government Stakeholders

- **Council for Scientific and Industrial Research**
  South Africa's leading scientific and technology research, development and implementation organisation (Csir.co.za, 2013). It also awards academic scholarships.

- **Department of Environmental Affairs (DEA)**

- **National Research Foundation**
  An autonomous national body which serves as the intermediary between National Government and research institutions (Nrf.ac.za, 2013). It also provides funding for academic pursuits.

- **Wesgro**
  The official investment and trade promotion agency for the Western Cape which facilitates foreign and local investments and establishes strategic partnerships (Wesgro.co.za, 2013).

- **Western Cape DEADP**

Non- Government Stakeholders

- Finance houses

- Tertiary institutions (especially Cape Peninsula University of Technology and the University of the Western Cape)

- Bellville industries

- Parrow Industrial CID

Working in collaboration, the idea is that these agencies can together achieve the following which may ultimately lead in the direction of industrial symbiosis projects:

- Establish a university internship program with local industries in/near the defined zones.

- Increased academic research in industrial symbiosis and the embodied recycling potential of existent infrastructures and technologies

- Relationship building between firms in the vicinity

Implementation vehicle

Mayor's Special Project's program; Public-private partnerships; Centre for Development Enterprise.

PRIORITY 4 – SHORT-TO-MEDIUM TERM

BEGIN COMPOSTING PROJECTS OF ALL KINDS CITYWIDE AND BAN FOOD WASTE FROM LANDFILL

Many people are already aware of the need for recycling even if their agency is stifled by a fragmented network that is difficult to access as illustrated (see Textbox 4.5 in Chapter 4). On the other hand, the value of food waste generally passes most people by and the dearth of efforts in this regard is evident in the lack of composting in Cape Town. So, having established the feasibility of food waste separation and carried out the necessary institutional waste assessment, the next step is to revitalise the compost facilities already present in the city and initiate new collection programmes and compost initiatives.

Figure 5.2 shows the various areas of the city where collection drives are to be piloted with a particular at schools. These areas are chosen because they are relatively school dense and provide a socioeconomic diversity.

City of Cape Town Actors

- **SWM Directorate**
  Act as solid waste liaison to describe the role SWM can play

Other Government Stakeholders

- **Department of Education**

Non- Government Stakeholders

- Finance houses
- Schools
- Private material reclamation firms

PRIORITY 5 – MEDIUM-TO-LONG TERM

INFRASTRUCTURAL DEVELOPMENT–DEVELOPING RAILWAYS RESOURCE CENTRES.

After allowing resident to acclimate to the waste minimisation initiative mentioned above, the introduction of waste drop-offs at railway stations. Figure 5.2 highlights the stations close to existing drop-off where this can be piloted.

City of Cape Town Actors

- **SWM Directorate**
  Who facilitate running of drop-offs
- **Transport for Cape Town**
  The city's transit authority

Other Government Stakeholders

- **Passenger Rail Agency of South Africa and Transnet**
  Owners and/or manager of railway stations in Cape town
- **Metrorail**
  Manage rail operations

Non- Government Stakeholders

- Private material reclamation firms to manage drop-off.

The actions noted above are seen as the priority actions which will bring about the changes in the attitudes to waste desired by the interventions. While the interventions mention other imperatives, it is not that those actions are seen as lesser priorities. Rather, they can follow logically from one of these abovementioned priorities.

Conclusion

"The future belongs to those who understand that doing more with less is compassionate, prosperous, and enduring, and thus more intelligent, even competitive."
– Paul Hawken, *Natural Capitalism*

This thesis begun with the premise that solid waste management has generally been relegated from the ranks of priority concerns in urban planning. It sought to understand how, in light of this, the result has been to create resource intensive cities with linear urban metabolisms. Moreover, it pursued ways and means in which adaptation to the urban form—that is its morphology, social and infrastructural network components—can mediate shifts in the understanding of the importance of relationships in constricting the production of waste. From this foundation, the study endeavoured to investigate the interaction of spatial planning and solid waste management in Cape Town and open the conversation to a less rigid and more nuanced perception of the interplay between these fields.

Accordingly, a review of the literature began by painting the scene understanding the terminology of sustainability which is the purported basis for metabolic loop closure and resource frugality and efficiency. It revealed that a severely differentiated approach is needed to achieve an urban relationship with waste that reflects the restorative potential of waste. In other words, the one-size-fits-all approach is no longer relevant; moreover, in a future of radical uncertainty across many spheres—social, economic, political, environmental and others—ecological exhaustion means nature should no longer be taken for granted and so a decidedly 'both-and' strategy ought to be employed. Moreover, a greater integration of urban systems is needed such that the complexities of metabolic processes result in the renewal of urban mentalities towards waste and encourage recommitment to participation and personal responsibility. In effect, waste must be 'unhidden'. In so doing a shadow economy emerges which yields environmental and social equity benefits alongside any financial potential. Moreover, 'unhiding' waste militates against the capacity for deference—individuals must take responsibility for their actions.

In the context of Cape Town, this invitation to participate has broadly been adopted by the SWM profession but has not fully understood the actor-network implications of its particular macro-level response. As such, the contextual relationship between waste and waste generators (both people and processes) has been lost in the translation of policy into programs. Within this, the planning profession has remained largely silent, uncertain what its specific role in the waste management is. So, despite noble attempts (by SWM) to reduce and reuse waste streams, progress is slow. What is needed is the reorganisation of material flows—largely through dense and decentralised networks—so that citizens can engage with the regenerative potential of their waste. Instead, waste largely remains bothersome and not beneficial.

Rather paradoxically, one of the approaches has been to increase the 'bothersomeness' of waste by

engaging participation in the thought processes around the 'where' and 'what' of waste. In so doing, it is hoped, the benefits of waste would emerged into the social consciousness and result in the improvement of relationships between proximate (viz. resource cascading) and distance citizens (viz. repealed exportation of waste). In effect this means that improvements in waste management lie not in points of intervention but rather in creating lattices of integration and spaces of interruption which challenge conceptions of waste and perceptions of place (viz. multiple uses of facilities). Waste concerns must be integrated into the superstructure of the city—that is notions of regeneration must be reflected in the transport elements, the recreational realms, and production spaces must move beyond the exclusively economic. This weaving of waste into urban production may ultimately produce a sort of 'new normal' in which banning the disposal of certain resources like food scraps ceases to be necessary. Furthermore it should challenge the pervasive out-of-mind-out-of-sight mentality.

Indeed the interventions proposed sought to achieve this shift by building a policy framework that draws public culture toward a new dimension of understanding regarding waste their role in its management. With the values of integration, equity and sustainability as driving forces, the dissertation sought to show that planning could co-pilot SWM's effort toward zero waste. Also, it sought to demonstrate that with the assistance of planning, not only is doing more with less "compassionate, prosperous… enduring… intelligent [and] competitive" (Hawken, 2010: 475); it is possible.

By appealing to the 'toolkit' of urban planning, the dissertation attempted to show that planners can 'throw' waste concerns into the mundane and ordinary practices of everyday citizens. In so doing, the collective consciousness of regular citizens produces a public culture cognisant of waste and its utility in the urban system. However this inclination towards planning interventions only reflects one voice in the larger conversation about urban waste streams. The singularity of purpose—zero waste—requires multiplicity of approaches from different fields as evident throughout the literature and interventions.

One of the biggest obstacles therefore was contemplating change beyond the realm of the upper-middle class and envisioning how urban waste realities for the marginalised areas people could be addressed. To this end, more research is required into an understanding of what perceptions of space and waste are. What specifically are the 'service delivery' expectations of the urban poor and where do these arise? Is it from a sense of entitlement conveyed by Government, or is from a sense of aspiration reflective of the profligate lifestyles of the city's wealthy?

In addition, this dissertation calls for the forging of a stronger relationship between waste and food. It intimated that food concerns are poorly addressed by the city. Subsequently a much deeper understanding of the Cape Town's urban food systems is required. Also, particularly in light of the suggestion to integrate infrastructures, a more rigorous investigation of the institutional arrangements and policy relationships between various entities is required. For example, who specifically would manage resource facilities at railway stations—station management or solid waste? Also, what changes in public transport policy and plans would be needed to accommodate such an arrangement.

The dissertation alluded to the need to prepare for the impacts of climate change. In this regard, more research is needed into how the redirecting and overall reduction of waste flows can impact can be leveraged as part of adaptation to and mitigation of the effects of climate change. Legal and regulatory aspects of waste management were considered at some length; however, a much deeper investigation of the law reforms necessary to induce a wholesale reform in waste perceptions ought to be taken.

These are but a few recommendations for further study; they demonstrate complexities of urban waste

flows. More specifically, they highlight that waste impacts deep into people's lives. Yet we can be so imperceptive of its penetrance. However, delving into the issues around waste and seeking to find ways to restrict its production has had profoundly conscientising influence on my own patterns of consumption and propensity for wastefulness. It has fostered a sensibility to my own attitudes and assumptions about environmental responsibility, nature and the way in which people interact with their natural and built environment.

The dissertation has shown that physical and imagined space between people and their waste has manifest as the creation of spaces of value and spaces of isolation. This has been reinforced by the distanciatation of waste processes. So the role of planning is to minimise these distances by a maximising of urban spaces so as to bridge the disconnect between people and waste. To this end, planners must recognise that not only does waste matter in planning but that we have the necessary tools to address waste concerns effectively.

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Appendix

EBE Faculty: Assessment of Ethics in Research Projects (Rev2)

Any person planning to undertake research in the Faculty of Engineering and the Built Environment at the University of Cape Town is required to complete this form before collecting or analysing data. When completed it should be submitted to the supervisor (where applicable) and from there to the Head of Department. If any of the questions below have been answered YES, and the applicant is NOT a fourth year student, the Head should forward this form for approval by the Faculty EIR committee: submit to Ms Zulpha Geyer (Zulpha.Geyer@uct.ac.za; Chem Eng Building, Ph 021 650 4791).
NB: A copy of this signed form must be included with the thesis/dissertation/report when it is submitted for examination

This form must only be completed once the most recent revision EBE EiR Handbook has been read.

Name of Principal Researcher/Student: Simba Chitapi
Department: School of Architecture, **Planning** and Geomatics

Preferred email address of the applicant: CHTSIM005@myuct.ac.za

If a Student:
Degree: Master of City and Regional Planning
Supervisor: Tania Katzschner

If a Research Contract indicate source of funding/sponsorship:

Research Project Title: A Waste of Space: An Analysis of the Spatial Implications of the City of Cape Town's Integrated Waste Management Policy

Overview of ethics issues in your research project:

Question 1: Is there a possibility that your research could cause harm to a third party (i.e. a person not involved in your project)?	~~YES~~	NO
Question 2: Is your research making use of human subjects as sources of data? If your answer is YES, please complete Addendum 2.	YES	~~NO~~
Question 3: Does your research involve the participation of or provision of services to communities? If your answer is YES, please complete Addendum 3.	~~YES~~	NO
Question 4: If your research is sponsored, is there any potential for conflicts of interest? If your answer is YES, please complete Addendum 4.	~~YES~~	NO

If you have answered YES to any of the above questions, please append a copy of your research proposal, as well as any interview schedules or questionnaires (Addendum 1) and please complete further addenda as appropriate. Ensure that you refer to the EiR Handbook to assist you in completing the documentation requirements for this form.

I hereby undertake to carry out my research in such a way that

- there is no apparent legal objection to the nature or the method of research; and
- the research will not compromise staff or students or the other responsibilities of the University;
- the stated objective will be achieved, and the findings will have a high degree of validity;
- limitations and alternative interpretations will be considered;
- the findings could be subject to peer review and publicly available; and
- I will comply with the conventions of copyright and avoid any practice that would constitute plagiarism.

Signed by:

	Full name ar		Date
Principal Researcher/Student:	Simbarashe Hope Cl		07/06/2013

This application is approved by:

Supervisor (if applicable):		07/06/2013
HOD (or delegated nominee): *Final authority for all assessments with NO to all questions and for all undergraduate*		26/06/2013

ADDENDUM 2: To be completed if you answered YES to Question 2:

It is assumed that you have read the UCT Code for Research involving Human Subjects (available at http://web.uct.ac.za/depts/educate/download/uctcodeforresearchinvolvinghumansubjects.pdf) in order to be able to answer the questions in this addendum.

2.1 Does the research discriminate against participation by individuals, or differentiate between participants, on the grounds of gender, race or ethnic group, age range, religion, income, handicap, illness or any similar classification?	~~YES~~	NO
2.2 Does the research require the participation of socially or physically vulnerable people (children, aged, disabled, etc) or legally restricted groups?	YES	~~NO~~
2.3 Will you not be able to secure the informed consent of all participants in the research? (In the case of children, will you not be able to obtain the consent of their guardians or parents?)	YES	~~NO~~
2.4 Will any confidential data be collected or will identifiable records of individuals be kept?	YES	~~NO~~
2.5 In reporting on this research is there any possibility that you will not be able to keep the identities of the individuals involved anonymous?	YES	~~NO~~
2.6 Are there any foreseeable risks of physical, psychological or social harm to participants that might occur in the course of the research?	~~YES~~	NO
2.7 Does the research include making payments or giving gifts to any participants?	~~YES~~	NO

If you have answered YES to any of these questions, please describe below how you plan to address these issues:

In order to achieve the outcomes of my research, I will make use of human subjects (people) as sources of information. The very definition of confidentiality demands respect and honour and thus I will safeguard all information to the best of my ability. I will earnestly strive not to misrepresent information and where possible will ask the very subjects if my portrayal of them and/or their opinion or information is accurate. Finally, I will be careful to protect both my notes and my sources (where this is their request). Below is a point response addressing the each of the above seven questions even those to which my response was 'no' so that I can demonstrate the importance of ethics in my research. In addressing each question individually, I hope my thoroughness illustrates prudence of process.

2.1
In sampling for my interviews, I may target specific individuals, professionals and/or employees with particular knowledge in the relevant fields. My intention is not to discriminate but rather to ascertain precisely what I need to know in the most efficient manner and from the most knowledgeable sources available.

2.2
While presently, I have no intention to particularly target vulnerable groups, it is likely that during the course of my research the need for this may arise or present itself spontaneously. In this regard, I refer specifically to socially vulnerable, low-income individuals and/or communities or recreationally deprived people. I will not interview children.

2.3
As stated above, I will not work with children. I will secure the consent of all people that I work with as sources of information. It is imperative to note that while I have prepared and attached an Interviewee Consent Form, I will only use this where appropriate. However, I will be sure to secure verbal consent with questions similar to those on the aforementioned form

wherever written consent is either not possible or impractical. (For the sake of illustration, a Skype™ conversation is an example where written consent is impractical.)

2.4
At this point, it seems unlikely that any confidential data will be recorded. The research involves the working lives of people so the material will pertain to working professional adult lives not to personal and private lives. Given the subject matter, I do not expect to collect any sensitive information from respondents. However, I am open to the possibility that some unexpected confidential data may be encountered. Where this occurs, I will treat it – as with all my data – with respect and great care. Given that consent forms will be used where appropriate, identifiable records of individuals (i.e. the consent forms they sign) will certainly be obtained and kept.

2.5
As per my attached Interviewee Consent Form I have every intention of disclosing professional identities where permission is granted to do so. However, where this is not given, I believe I can veil the identities in generic designations and I do not anticipate that readers would be able to deduce identities. I must reiterate however, that this research concerns professional lives and thus deduction of identities should pose no threat to respondents' lives or wellbeing. The research is not overtly politically sensitive, contentious and cannot be expected to threaten anyone's social or economic security.

2.6
I cannot foresee anything in my research process that may cause any physical, psychological or social harm to any participants or their property.

2.7
Participation in my research is completely voluntary. Respondents will be thanked for their participation but I will offer no remuneration to any participants whatsoever.

SCHOOL OF ARCHITECTURE, PLANNING AND GEOMATICS
University of Cape Town
Private Bag X3
Rondebosch
7701
Centlivres Building
Email: Janine.Meyer@uct.ac.za Tel: +27 (0)21 650-2359

UNIVERSITY OF CAPE TOWN

STATEMENT TO BE READ OUT TO AN INTERVIEWEE BY A STUDENT ABOUT TO UNDERTAKE AN INTERVIEW FOR THE PURPOSES OF RESEARCH, AS A REQUEST FOR PERMISSION FOR THE NAME AND/OR IDENTITY OF THE INTERVIEWEE TO BE REVEALED IN MY DISSERTATION

My name is Simba Chitapi. I am studying city and regional planning at the University of Cape Town. I am doing research on integrated solid waste management in urban planning. As part of my Masters dissertation, I would like to ask you some questions to help me with my research.

The questions I ask are only for research and they cannot directly benefit you or your community.

I would like to use your name, designation and possibly direct quotes in my dissertation as a source of information. Please indicate yes or no below to give or withhold your permission for me to do this.

A copy of the form can be given to you should you request it.

YES, I GIVE PERMISSION FOR YOU TO USE MY NAME / DESIGNATION / WORDS IN YOUR DISSERTATION [X]

NO, I DO NOT GIVE PERMISSION FOR YOU TO USE MY NAME / DESIGNATION /WORDS IN YOUR DISSERTATION [ ]

NB. If you want to end the interview at any point you are free to do so.

My supervisor is Tania Katzschner, and her contact details are: (021) 650-2381 or tania.katzschner@uct.ac.za.

Susanne Karcher (former Dittke)
Name of interviewee

Signature of interviewee _____ Signature of student _____

Date:

SCHOOL OF ARCHITECTURE, PLANNING AND GEOMATICS
University of Cape Town
Private Bag X3
Rondebosch
7701
Centlivres Building
Email: Janine.Meyer@uct.ac.za Tel: +27 (0)21 650-2359

UNIVERSITY OF CAPE TOWN

STATEMENT TO BE READ OUT TO AN INTERVIEWEE BY A STUDENT ABOUT TO UNDERTAKE AN INTERVIEW FOR THE PURPOSES OF RESEARCH, AS A REQUEST FOR PERMISSION FOR THE NAME AND/OR IDENTITY OF THE INTERVIEWEE TO BE REVEALED IN MY DISSERTATION

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A copy of the form can be given to you should you request it.

YES, I GIVE PERMISSION FOR YOU TO USE MY NAME / DESIGNATION / WORDS IN YOUR DISSERTATION ☑

NO, I DO NOT GIVE PERMISSION FOR YOU TO USE MY NAME / DESIGNATION /WORDS IN YOUR DISSERTATION ☐

NB. If you want to end the interview at any point you are free to do so.

My supervisor is Tania Katzschner, and her contact details are: (021) 650-2381 or tania.katzschner@uct.ac.za.

M. S. HAIDER
Name of interviewee

Signature of interviewee

Signature of student

Date: 16.09.2013