# Capturing Compostables:
# A Case Study of Small Scale Composting in Vancouver

**by**

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# Abstract

This research study explores the role of small-scale composting for the processing of food scraps in the City of Vancouver within the nexus of organics diversion and the municipality's Greenest City policy goals. Conceptually the study is informed by the integration of public policy, the policy cycle, and concepts relating to diversified, scalable technology. Empirically the study adopts a soft systems methodology that employs an inquiry-based approach, predicated on in-depth semi-structured interviews with 27 individuals active in organic waste management within the City of Vancouver and the Metro Vancouver Region. Interviews were stratified into three groups to: reveal regional policy impediments; identify drivers for small-scale composting; and describe the operations and challenges experienced by City small-scale composting operators. This study found that City and Regional policies continue to be formulated and implemented to prioritize the development of large-scale organic waste collection and processing facilities. However, small-scale composting continues to gain momentum, as it presents an opportunity to diversify the scale and geographical placement of organic waste processing. Small-scale composting also connects directly to Greenest City policy outcomes for low-carbon waste management, local food production, increased awareness and behaviour change, and the potential to create low-barrier, green jobs. Findings suggest that, as innovative models for small-scale composting emerge, current regulatory requirements are prohibitive for the establishment of systems that aim to process food scraps from multiple City sites, and need to be adapted to meet the evolving options for diversified organics management. To further ensure the viability of small-scale composting, new policy development is needed to create a regulatory framework that is conducive for encouraging innovative methods of capturing and processing compostable organics.



**Keywords**: small-scale composting; Greenest City; food scraps; urban compost; organic waste diversion; waste policy

For Sue Blakeway,

Jim Blakeway, and

Darren Anderson.

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# Table of Contents

# List of Tables



# List of Figures

# List of Acronyms

| | |
|---|---|
| AD | Anaerobic Digestion/Digester |
| AOM | Advanced Organic Management |
| AT | Appropriate Technology |
| CCC | Community Compost Centres |
| CCF | Composting at a Central Facility |
| CNT | Centre for Neighbourhood Technology |
| DLC | Demolition, Land-Clearing, and Construction |
| DS | Drop Spot |
| EMA | Environmental Management Act |
| FRSF | Fraser Richmond Soil and Fibre (Harvest Power) |
| GCAP | Greenest City Action Plan |
| GHG | Greenhouse Gas |
| GVS&DD | Greater Vancouver Sewerage and Draining District |
| ICI | (Light) Industrial, Commercial, Institutional |
| ISWRMP | Integrated Solid Waste and Resource Management Plan |
| ITDG | Intermediate Technology Development Group |
| MF | Multi-family |
| MSW | Municipal Solid Waste |
| OMRR | Organic Matter and Recycling Regulation |
| RFP | Request for Proposal |
| RFSS | Regional Food System Strategy |
| ROS | Regional Organics Strategy |
| SF | Single-family |
| SBIA | Strathcona Business Improvement Association |
| SSM | Soft System Methodology |
| UOW | Urban Organic Waste |
| WTE | Waste to Energy |

# 1. Introduction

## 1.1. Waste and the City

In the City of Vancouver the current Mayor and civic administration is committed to becoming the *Greenest City* in the world by 2020. As a part of this goal the administration, and attendant metropolitan regional government, have committed to keeping organic waste out of regional landfills and incinerators by 2015. This research study will explore the broader organic waste policies and systems to understand what impediments exist to achieve organic waste diversion commitments and goals, and how these impediments might be overcome to allow for both organic waste diversion and Greenest City policy outcomes. The primary focus of the study is to understand the role that small-scale composting[1] can play in achieving waste commitments and targets, and to describe impediments that exist with regard to the operation and establishment of these small-scale systems within the City of Vancouver (the City).

Cities have long contended with issues pertaining to waste and its management. Descriptions of the nineteenth century slums of London, Berlin and New York reveal living conditions with no running water, no plumbing and no garbage collection. In this depiction of the city, sewage and garbage flowed beneath the feet of those who dwelled there (Hall, 2002). Waste and issues of sanitation contributed greatly to the chaos of the nineteenth century city, and prompted the need for urban planning (Melosi, 2000). In modern and developing cities of the twenty-first century waste continues to be a challenge for jurisdictions that face mounting environmental pressures such as

[1] For the purposes of this study small-scale composting includes systems that do not exceed the processing capacity of 50 tonnes per annum and encompasses three scenarios as described in section 1.2.2.

advancing climate change, looming resource scarcity and depletion, peak oil, and increasing land-use constraints and demands. In a recent World Bank report (2012), municipal solid waste (MSW[2]) management is described as the most important service a city can provide. The UN Human Settlement Programme, in the report *Solid Waste Management in the World's Cities* (2010), cites waste as one of the biggest challenges of the urban world and refers to waste as a city's "calling card".

Globally, cities have experienced an increase in the generation of waste due to a steady in-flux in the number of people living and working in urban centres as well as an increase in the amount of waste generated per person and by the business sector. It is estimated that the generation of MSW is growing faster than the rate of urbanization. Currently 50 percent of the world's population lives in cities, representing 3 billion people, generating 1.3 billion tonnes of waste per year. By 2025 the urban population is projected to increase to 4.3 billion residents, effectively doubling the amount of MSW generated to between 2.2 and 2.6 billion tonnes annually (World Bank, 2012; Worldwatch Institute, 2012; Gardner, 2012). Alongside this trend there is a growing interest in MSW recovery, including recycling of organic material through composting or conversion to energy. The UN Environment Program estimates that amongst other strategies, to truly "green" the waste sector would require a 3.5-fold increase in MSW recycling world-wide, including near complete recovery of organics through composting or conversion to energy (Worldwatch Institute, 2012). The waste management costs that cities bear have also increased significantly, driving a search for less expensive management options that are also environmentally responsible. Globally, cities are looking to composting initiatives as a mechanism to divert organic waste away from landfill in a manner that is cost effective, sustainable, and responsible (UN Habitat, 2010).

[2] Municipal solid waste is waste collected and treated by and for municipalities. It consists of organic material, paper, plastic, metals and other refuse mainly from homes, offices, institutions, light industry, and commercial establishments. It composes a subset of a broader waste universe, and does not generally include waste from sewerage, large industry, and construction and demolition (Worldwatch, 2012; World Bank, 2012, p. 4).

In Canadian cities, diverting urban organic material to commercial composting facilities is a big business with many benefits. Organic waste is increasingly considered a valuable resource that can be recycled into compost/soil amendment to be used as a natural fertilizer, or used for the production of biofuels and to generate district energy. Diversion of organics will increase the lifespan of landfills, and in many cases reduce the carbon footprint of urban centres. Composting in and of itself is not a new idea. It is a process that occurs naturally – often described as "the Earth's way of recycling" (McGill, 2008) - that dates back millennia (University of Illinois Extension, 2012). In its simplest form composting can be described as a natural, biological process carried out under controlled conditions - in the presence of oxygen, specific moisture levels and a certain ratio of carbon to nitrogen (generally dry to wet material) – whereby microorganisms convert organic material into a stable, humus-like (e.g. rich soil) substance. Through an aerobic process different phases of microorganisms generate high temperatures that speed up the rate of decomposition. The benefits of composting, and its resultant product are well known and well understood from a scientific point of view. Organic waste disposed of in landfill in the absence of oxygen biodegrades to produce and emit methane, a potent greenhouse gas (GHG) considered to have a global warming potential 21 times greater than $CO_2$ due to its ability to capture and hold heat in the atmosphere (UNEP, 2010 p. 9). Keeping food waste out of landfill thus helps to achieve multiple sustainability targets for local governments around the world.

As city populations grow alongside waste generation the cost for waste management increases due to land constraints, limitations on what residents will tolerate with regard to siting of waste facilities, fuel cost increases and resource depletion. For these reasons the diversion of organic waste away from landfills, incinerators or waste-to-energy facilities becomes more crucial. The benefits of a compost product also become more evident. Benefits include the use of compost to: build depleted soil, reduce soil compaction, increase soil fertility and moisture retention, increase disease resistance in soil, reduce the need for irrigation, provide slow release nutrients, reduce the need for pesticide use, and enhance carbon sequestration (Antler, 2012). As cities like Vancouver and its metropolitan neighbours formulate food scraps collection strategies to ensure organic waste is separated at source and transported to large-scale composting facilities, what is less immediately apparent is the potential that small-scale

and on-site composting hold for innovative and greener organic waste management. Small-scale composting in the Metro Vancouver Region (the Region), *is* a new idea, one that is capturing the imagination of many. From bureaucrats to urban farmers, the value of urban, small-scale composting is growing beyond waste management cost savings to include a mechanism for generating local green jobs, cultivating innovative technology development, closing the food system loop and providing a greenest solution to organic waste management challenges like those occurring on a large scale.

## 1.2. Research Objective

### *1.2.1. Questions and Purpose*

Organic waste is a complex waste category that allows for a variety of recovery and diversion options. Currently, forty percent of material disposed of as garbage in the Metro Vancouver Region is organic compostable material, most of which is food scraps (67 percent is fruit and vegetable scraps/peelings, meat, bones, grains, pasta, dairy, etc.), but also includes soiled paper (15 percent is composed of napkins, pizza boxes, cardboard take-away containers, etc.) and yard waste (18 percent is made up of leaves, grass clippings, branches, etc.) (Metro Vancouver, 2011b; EBA, 2012). Models for organic waste management are emerging as a spectrum of solutions. At one end of the spectrum, large-scale (industrial), regionally centred composting and anaerobic digestion facilities process tens of thousands of tonnes annually. In this scenario organics may be travelling long distances in order to be processed. This industrial model of collection, transportation and processing has enabled cities like San Francisco to achieve a diversion rate of 77 percent (Siemens, 2011). However, composting at this scale calls into question the appropriateness of scale in the nexus of diversion and Greenest City outcomes. On the other end of the organics diversion spectrum, small-scale and on-site composting initiatives are beginning to emerge. In this scenario organic waste is simply

composted on or near the site in which it is generated. Organics may also be transported short distances, via bicycle[3] or truck (generally within 5km), to one or several communal small-scale composting systems within city boundaries (and processed in amounts ranging from 250kg to 50 tonnes annually).

This research study explores the policy commitments and goals at the regional and municipal levels for the diversion of organic waste as well as impediments that exist to achieving these goals. Given this information, the initial question that guided this study asks: **How can impediments (to achieving organic waste commitments and goals) be overcome to allow for both organic waste diversion *and* Greenest City outcomes?** Impediments to large-scale organics waste diversion in Metro Vancouver also point to drivers for small-scale composting, which will be discussed in detail below. A qualitative description of small-scale composting systems for processing food scraps in Vancouver was also conducted. This was done to understand the diversion potential and Greenest City connections as well as to answer the question: **What impediments exist with regard to the operation and establishment of small-scale composting systems within the City of Vancouver?**

The purpose of this research project is two-fold: 1) to understand the broader waste management policy context at play within the Region and City especially as this relates to policy implementation to achieve regional targets; and 2) to identify the role of small-scale on-site composting operations in Vancouver, as a requirement to achieve diversion that is also green. This involves understanding what is being achieved and what can be built upon both practically and in relation to policy. In addition, the study uses descriptions of small-scale composting, including impediments to their operation and establishment, to encourage dialogue on how organic waste diversion and Greenest City actions can be implemented. In short, this research examines the role, and perhaps the necessity of small-scale composting within the nexus of organics diversion *and*

[3] For example, Petal to Pedal is an organization in Victoria, BC that uses bicycles and bike trailers to transport compost to approximately 17, mainly backyard composting sites (personal communications, September 13, 2012).

Greenest City outcomes. Small scale is discussed in the context of a clear policy direction stated within Vancouver's Greenest City Action Plan (GCAP) to address food scraps diversion through either collection or small-scale and on-site composting systems. Small scale is also discussed in consideration of and reference to an existing population of early experimenters that are currently operating such systems.

### *1.2.2. Small-Scale Composting Definition and Scale*

The City of Vancouver defines neighbourhood scale composting as communal composting conducted within a central location involving one or more properties, including single family (SF) residential but with the emphasis on multi-family (MF) residential and light industrial commercial and institutional (ICI) properties (City of Vancouver, 2010b, p. 3). In the Metro Vancouver *On-site Composting Technology Review*, on-site composting programs are described as those where organic waste material generation, composting activities and the end use of the generated compost material will occur on the same site (Garden Heart Productions, 2012, p. 8). Interviews with Metro Vancouver staff found there to be several different scenarios in which food scraps can be processed within a small-scale on-site context. These scenarios are categorized as on-site/on-site, on-site/partnership, and on-site/communal; this reflects the activities conducted by small-scale compost operators identified in this study. As above, on-site/on-site represents a scenario where waste is generated, processed/composted and used on the same site; this is being trialed at several multi-family complexes in the Metro Vancouver Region. Within the ICI sector, businesses, especially those located in urban centres, do not often have space on which to use a compost product. Also, some in-vessel[4] composting technologies do not produce a completed (ready to use) compost product. Therefore, in the on-site/partnership scenario food waste that is generated and processed on-site has to be collected for use

[4] In-vessel composting is that done in an enclosed apparatus, drum or silo, whereby the environmental conditions – including temperature, moisture and aeration/oxygen – are closely controlled. The apparatus usually has a mechanism to turn or aggregate the material for proper aeration, or this can be done manually (EPA, July 2012).

(with possible further composting or curing) on another site. This often requires a partner to provide the collection service. Lastly, the on-site/communal scenario presents the most complicated of the three given that when waste is transported from one site to another be processed, multiple levels of government regulation are triggered. Metro defines this scenario as one where waste is coming from multiple sites and generally used on the site in which it is processed. This study observed the operational and establishment impediments for the three on-site scenarios described by Metro Vancouver.

For the purposes of this study small-scale composting is used synonymously with all of the on-site scenarios described here and includes a range of technology (low- and high-tech composting systems). For the small-scale systems observed in this study the diversion capacity (i.e. the amount of food scraps that can be processed through one system) does not exceed 50 tonnes per annum. For comparison purposes, backyard composting is estimated to capture 250kg to 450 kg of compostables per year (per compost unit) (North Shore Recycling Program, 2011), whereas large-scale regional facilities capture 50,000 tonnes and more annually.

This study has focused on the collection of data from small-scale composting systems operating within the ICI sector in the City of Vancouver. This focus is due in part to the fact that few on-site composting systems operating in MF residences were identified in Vancouver (or were not available for an interview).

# 2. Organic Waste Context and Policy

There are a number of reasons why this research study is timely and relevant – these reasons are elucidated here within regional and municipal contexts and in the description of the two key policy documents, commitments and goals (for 2015 and 2020) below. This chapter reveals the most salient points that demonstrate why this topic requires further investigation, outlines the policy goals as they relate to organic waste diversion and describes how these goals will be achieved. This includes information outlining what stands to be gained though achieving municipal and regional organic waste diversion commitments and highlights the limited timeline in which these goals are to be achieved. Furthermore, this section demonstrates the interest of the City and Regional governments (and citizens) to incorporate small-scale composting into organic waste management systems and highlights where information with regard to pilot studies is lacking. The following section points to the sectors that have yet to receive organic waste diversion options (mainly MF and ICI) and helps to further define the nature of small-scale and local-scale composting and its attendant benefits.

## 2.1. Municipal and Regional Context

Metro Vancouver, Canada's third largest metropolitan region comprising 24 local authorities, is responsible for core utility services including drinking water, sewerage and drainage, and solid waste management (Metro Vancouver, 2011a). The Greater Vancouver Sewerage and Drainage District (GVS&DD), a legal entity that co-exists alongside Metro Vancouver, oversees a public sector solid waste disposal system that operates in conjunction with (regionally licensed) private recycling and composting facilities. The GVS&DD has delegated authority (under the provincial Environmental Management Act) to manage and control the flow of MSW in the Region. The waste management system consists of a mass-burn waste to energy facility, six transfer stations, and a long-haul landfill in Cache Creek (340km from the Metro Region). The

system also includes a transfer station and local landfill owned and operated (since 1962) by the City of Vancouver. The City's landfill is situated in the municipality of Delta and currently accepts up to 40 percent of the Region's municipal solid waste. It is the only landfill located inside the Region and provides a valuable asset to Vancouver taxpayers and the Region as a whole (City of Vancouver, 2009b). The public sector waste system provides transfer and disposal services to residents and businesses within and is governed by the Regional Integrated Solid Waste and Resource Management Plan (ISWRMP) (discussed in detail below). In short, Metro Vancouver is responsible for the planning and management of recycling and solid waste services. The roles and responsibilities of the regional government as they relate to the ISWRMP are overseen by the Zero Waste Committee, which provides advice and recommendations to the Metro Vancouver Board on solid waste management programs.

In Metro Vancouver residents and businesses generate over 3 million tonnes of solid waste each year (TRI, 2012). Approximately 55 percent of this waste, close to 1.6 million tonnes is recycled annually (through privately owned and operated recycling and composting facilities). The management of MSW in the Region is a complex processes that involves a web of stakeholders, policies and regulation, infrastructure, and education and awareness. The transportation and disposal of MSW is divided between the private and public sector, generally based on the source of waste generation. For example, waste sectors are differentiated based on their diversion potential, composition of waste, and tactics required to divert waste materials. MSW generators are commonly broken into three sectors: Residential - SF homes and MF complexes; ICI, including businesses, manufacturers, schools and hospitals; and demolition, land-clearing and construction (DLC). Solid waste planning objectives for Metro Vancouver represent four sectors, with very different target reduction needs and priorities, as: MF, SF homes, ICI, and construction and demolition. DLC waste is primarily transferred by private haulers and managed at privately operated facilities. Residential and ICI waste is received at Metro Vancouver and City of Vancouver waste facilities. Most municipalities, some through management of their own truck fleets, oversee the collection of garbage and recyclables from SF homes and some MF dwellings (generally duplexes and triplexes), and rely on private sector contracts for the collection/hauling of garbage and recyclables for MF and ICI properties (TRI, 2012). While residential (and some commercial)

recycling programs (such as blue box recycling of paper, cardboard, plastic, aluminum and yard trimming collections) are generally well established within the Region this has not included food scraps until recently. Starting in 2009, residential yard trimmings collection programs region-wide began to expand to include food scraps comingled in the same curbside container and generally only available to single-family homes, duplexes and some small multi-family complexes. The following table outlines the quantities of organic waste recycled and disposed of within the Region in 2010, by sector.

***Table 1. Regional Organics – Disposed and Recycled Quantities and Diversion Rates***

| | Residential | ICI | DLC | Total |
|---|---|---|---|---|
| **Disposed (tonnes)** | 226,668 | 147,188 | 15,915 | 389,771 |
| **Recycled (tonnes)** | 171,594 | 66,752 | N/A | 238,346 |
| **Diversion Rate** | 43% | 31% | - | 38% |

Sourced from EBA's Metro Vancouver Recycling Market Study (2012) (data sourced from Metro Vancouver 2010a)

There are currently two large-scale (centralized) composting facilities in the Region licensed to take municipal food scraps (and food soiled paper) and others that accept only yard and garden waste. The first, Fraser Richmond Soil and Fibre (FRSF - A division of Harvest Power), is the largest facility in the Region; it began collecting food scraps in 2009 and has recently expanded its operations to include a dry anaerobic digestion (AD) facility (which generates electricity through a specialized, in-vessel decomposition process and composts the product that remains). The second large scale facility is Enviro-Smart Organics, a turf farm located in Delta that currently accepts MSW compostable organics in addition to some agricultural waste. Regional composting capacity (based on FRSF, Enviro-Smart, and the Vancouver landfill yard waste compost facility) is estimated at 300,000 to 360,000 tonnes annually. It is understood that Metro Vancouver is currently considering license application for four additional composting facilities. According to a *Recycling Market Study* conducted by EBA (2012) "proposed facilities include in-vessel composting systems which can operate on a smaller footprint in a more controlled environment, and AD facilities, which can

produce biofuels or energy then process the remaining material through composting or other processes" (p. 43).

Metro Vancouver has a long standing history of promoting a sustainable future for the Region. Sustainability is central to the identity of Vancouver and current sustainability policy, which strives to make Vancouver the *Greenest City* in the world by 2020 perhaps best asserts this claim to 'greenness'. Within this policy context, as presented in the Greenest City Action Plan (described in detail below), Vancouver will endeavour to achieve zero waste by making the capture of compostables from all sectors a priority (City of Vancouver, 2011, p. 79). More specifically the City aims to reduce total solid waste going to landfill or incinerator by 50 percent from 2008 levels, by 2020. The City's target is described as synonymous with that set by Metro Vancouver, who through the ISWRMP specifies a minimum 70 percent waste diversion goal to be achieved by 2015, over all sectors and strives for an aspirational goal of 80 percent diversion by 2020.

At this time, the Region diverts 55 percent of waste from landfill and incinerator. However, all sectors are not equal with regard to diversion of recyclable material. Within the residential sector, MF residences achieve a mere 15 percent diversion rate, compared to SF homes that consistently achieve 48 percent diversion (Metro Vancouver, 2010a). This is specifically significant for Vancouver considering that 50 percent of the City's residents live in MF dwellings (within approximately 5,000 buildings, or 160,000 suites) a percentage that increases daily as the city continues to build and grow (Metro Vancouver, 2011d; City of Vancouver, 2012). Region-wide, as outlined in the Regional Growth Strategy, the population in Metro Vancouver is expected to increase by 585,000 people in the next ten years, with an additional 1.2 million people expected to move into the Region by 2040. As growth pressures continue (including pressures that could prevent large scale composting facilities from being sited within urban locations), a vast majority of housing demand will be met through an increasing share of multi-family complexes (Metro Vancouver, 2009). As far as business and institutions are concerned, they currently capture 42 percent of waste for diversion. However the business sector also generate the greatest volume of recyclable material and are the largest producers of organic waste (generally food scraps). Materials from the ICI and MF sectors account for 60 percent of waste delivered to regional waste

facilities (Metro Vancouver, 2012a). According to Metro Vancouver, organics generated from the business sector will represent the "largest part of organics diverted from disposal in the future" (Metro Vancouver, 2011b, p.8). These growth considerations (population and development) and resultant increased waste generation predicate the need for effective and diverse organic waste diversion options for the MF sector, and the businesses and institutions servicing the growing population. Given that status quo collection models for recyclable material from MF and ICI sectors do not result in acceptable diversion rates, the ability and will of these sectors to suddenly begin separating organics for recycling (through the same systems) is questionable. Small-scale composting thus presents an opportunity for recycling of organics at a different scale that also aims to engage citizenry in a different way from conventional systems.

For comparison purposes it is worth noting that in the *US and Canada Green City Index*, within which 27 cities are measured and given a sustainability rating based on their environmental performance, Vancouver is ranked second (behind San Francisco) for its overall sustainability accomplishments. With regard to waste however, Vancouver scores seven out of 27. While the City recycles 55 percent of its waste generated, well above the 26 percent US/Canada city average, it ranks well below San Francisco, where they achieve a waste diversion rate of 77 percent[5] and Los Angeles that recycles 61 percent of waste (Siemens, 2011).

Organic waste represents a diversion potential that could allow the City to achieve nearly half of its 2020 (50 percent reduction) target, and with single-family home organics collection (food scraps and yard trimmings) largely established, attention has quickly turned to the multi-family and commercial sectors. The estimated amount of food

[5] Legislation that mandates source separation, recycling and composting, along with strong enforcement, is at the heart of San Francisco's impressive waste performance (Siemens, 2011, p. 118). San Francisco relies on a system whereby urban organic waste is collected and trucked (by a single franchised company) approximately 90 km out of the city to Jepson Prairie Organics (one of the largest food scraps composting operations in the US), which processes over 100,000 tonnes of organics per year (Recology, 2011 - http://thecomposttstore.com/facilities.htm). San Francisco was the first US city to mandate the separation and collection of compostables (Siemens, 2011).

scraps available for diversion from these sectors combined (in Vancouver alone) is 82,000 tonnes annually (City of Vancouver, 2012 October). This amount represents approximately 75 percent of the total food scraps disposed of in City garbage. City waste collection forces currently supply garbage and green bin (yard waste and food scraps) collection services to all single family homes as well as 1,000 of the total 5,000 MF buildings (generally duplexes, triplexes, townhomes and some small apartments) that are located within SF residential collection routes. The City also provides garbage and yard trimming collection for some businesses. The remainder of MF complexes and commercial properties contract private waste haulers for the collection of garbage. It should be noted that the City offers blue box/bin recycling services to all residential and commercial properties in Vancouver (through both City fleets *and* contracted haulers), and the full swath of services to SF residents. However, many MF and commercial buildings contract private haulers to manage recyclables along with their garbage hauling and some buildings opt out of recycling collection altogether (often due to space constraints). The City currently has little jurisdiction around ICI sector waste management (with regard to the requirement for recycling and composting for ICI) but is looking to make recycling mandatory.

In essence, solid waste services are provided collaboratively within the Region. Through the Environmental Management Act (EMA), the Provincial government enables regional districts (e.g. Metro Vancouver), to regulate private waste facilities through bylaws[6] and maintain management control over all regional transfer and disposal facilities. Regulation at this level is required to ensure reduction and diversion goals can be applied uniformly to all residents and businesses in the Region such that targets are achieved (Metro Vancouver, 2012b). Municipalities are responsible for implementing recycling programs and management of solid waste collection services; and will

[6] For example, under the Solid Waste and Recyclable Material Regulatory Bylaw 181, a privately owned composting facility operating within the region must be licensed by Metro to do so (Metro Vancouver, 1996). This includes facilities that range in size and technology type (currently the bylaw does not specify between a composting facility that processes 50,000 tonnes per year versus one that processes 50 tones per year – to be elaborated on below).

implement bylaws in conjunction with Metro Vancouver to ensure diversion of organic waste, and will be required to report on tonnage of diverted material (Metro Vancouver, 2010b). The private sector manages recycling services (brokerage, physical recycling, and recycling infrastructure) and provides services for collection, and operation of transfer stations, composting, and disposal facilities (TRI, 2012). The policy documents, plans and strategies that support the diversion of organic waste are described in detail in Section 2.3 below.

## 2.2. Local Scale Composting Context and Regulation

The City of Vancouver has long recognized the value of promoting composting at a local/small scale and has subsidized and promoted the practice of backyard composting since 1990 (City of Vancouver, 2010a). A 2007 survey commissioned by Vancouver City staff estimated that there were nearly 50,000 backyard composters in use in the City (at the end of 2009). The role of these systems, as stated in a March 2010 Council report, is described as a low cost and low energy alternative to large-scale collection programs. The City estimates that residential backyard composting results in the diversion of 6,000 tonnes of yard and fruit and vegetable scraps annually (City of Vancouver, 2010a). However, a study undertaken by The North Shore Recycling Program (NSRP, 2011) suggests that backyard composting is underestimated and undervalued (whereby each backyard bin can divert 360kg to 450kg of organics per year). The study, conducted by Christine Pinkham and Elizabeth Leboe**,** found that each year in three North Shore municipalities between 8,400 and 10,500 tonnes of single-family organic waste is never placed curbside as a result of backyard composting. They state that diversion (tonnage) through backyard practices, rivals that of yard trimming collection service tonnage (10,638 tonnes) “minus all the associated municipal costs (~$2,100,000) and environmental implications of an industrialized collection and composting system” (p. iii). As a result they state that “without backyard composting, North Shore municipalities would require an additional 1,500 truck trips to the transfer station, for which they would be charged $874,227 in tipping fees each year” (p. iii). The NSRP (2011) findings represent a significant diversion tonnage that demonstrates the

value of small-scale composting as a practice with the lowest environmental impact and lowest cost for diversion.

There are a number of small-scale on-site systems operating in a variety of scenarios, including the MF and commercial sectors across Metro Vancouver. The regional government is conducting ongoing research and development in this area; for example on-site pilot studies are underway in several Metro Vancouver MF dwellings (personal communications, August 14, 2012). However, there are a number of on-site in-vessel systems being used in demonstrations sites, and through established on-site composting programs in multiple jurisdictions around Canada. These examples, including The Forks, as mentioned in the literature review below, represent technology that offers significant diversion potential not yet present in the Metro Vancouver Region (Garden Heart Productions, 2012).

As research and development continues, the regulatory requirements for on-site composting in Metro and the City of Vancouver are also likely to evolve. Currently, small-scale systems fall under the regulatory requirements of all three levels of government in BC. The Provincial Organic Matter and Recycling Regulation (OMRR) applies to the extent that it ensures there are no negative health or environmental implications associated with the operation of a composting facility as well as the production, distribution, storage, sale and use/application of compost. From a small-scale perspective this is applicable only when waste is collected from multiple sites to be processed at one location. OMRR outlines very explicit guidelines pertaining to record keeping (e.g. temperature records), leachate and odour management, vector control, and capacity requirements. Rigorous operating requirements must be followed by facilities processing 20,000 tonnes (or more) per annum. And all composting facilities (regardless of operating capacity) are required to have an operating plan in place (personal communications, MoE, March 30, 2012). In all cases, operating requirements indicate that operators must demonstrate that temperatures within composting systems reach above 55 degree consistently over three days to ensure pathogens within the

system are destroyed (Ministry of Environment, 2004; personal communications, October 4, 2012). The OMRR does not apply to backyard composting, defined as the composting of food waste and yard waste generated by the residents (of a residential dwelling), which does not exceed the generation of 20 cubic metres or 4 tonnes[7] (of final compost product) per year. It excludes demonstration gardens for the composting of yard waste (non-food vegetative matter) in quantities not exceeding 100 cubic metres (or 20 tonnes of final compost product) per year; and has been updated to now exclude from regulation the 'backyard composting' of up to 20 cubic metres per year at non-residential sites (i.e. schools, universities, hospitals, etc.) (Ministry of Environment, 2011; personal communications, Ministry of Environment representative, March 30, 2012).

At the regional level, under bylaw 181 all private solid waste and resource recovery facilities (regardless of size and including composting facilities) must be licensed by Metro Vancouver to operate within the Region. To ensure proper and safe operations licensing often requires information with regard to the following: types and maximum amount of material allowed on the site, how that material should be handled and controlled (e.g. odour and nuisance controls) and reporting requirements for materials entering and/or leaving the facility and disposal locations. Recent revisions to this bylaw through amending bylaw 272 will expand the number of private facilities requiring an operating license to include aerobic and anaerobic digestion, biogas and rendering plants. Within the amendment Metro Vancouver is proposing to require facilities that may use these newly added technologies to apply for a license at the discretion of the Solid Waste Manager. As this pertains to small-scale composting, changes have been made for the licensing of pilot scale projects such that they can be expedited for approval where appropriate (Metro Vancouver, 2012b). The amendment also states that "The Solid Waste Manager, as a result of an application, may exempt a

[7] According to the Ministry of Environment (through personal communications, March 30, 2012) the conversion factor from cubic metres to tonnes is 1 to 5, where 1 tonne of finished compost is equivalent to 5 cubic metres of finished compost. Where backyard composters are estimated to process between 250 and 450 kg per year, this equates to approximately 1.5 cubic metres of input per year (and likely one half to one quarter of that in output as organic waste decomposes into a final compost product).

Pilot Facility from this Bylaw or any provision of this Bylaw and issue a License on such terms and conditions and specifying such requirements under this Bylaw as the Solid Waste Manager considers necessary" (Metro Vancouver, 2012b, p. 171). Because bylaw changes have only just been approved by the Zero Waste Committee (at the November 2012 meeting) and are to be sent to the Minister of Environment for approval, it is unclear the implications that this will have on small-scale composting projects in the Region (Metro Vancouver, 2012c).

At the municipal level, at least for the City of Vancouver, regulatory requirements with regard to recycling are also changing. The bylaws that relate to small-scale composting projects appear to be specific to the location, the technology being used, and the structural requirements of each project/system. That is to say, multiple building codes (including structural, electrical and plumbing) and attendant requirements are applicable based on a system's form and structure (personal communications, October 4, 2012). City requirements will be discussed in more detail in Section 5.4.3.

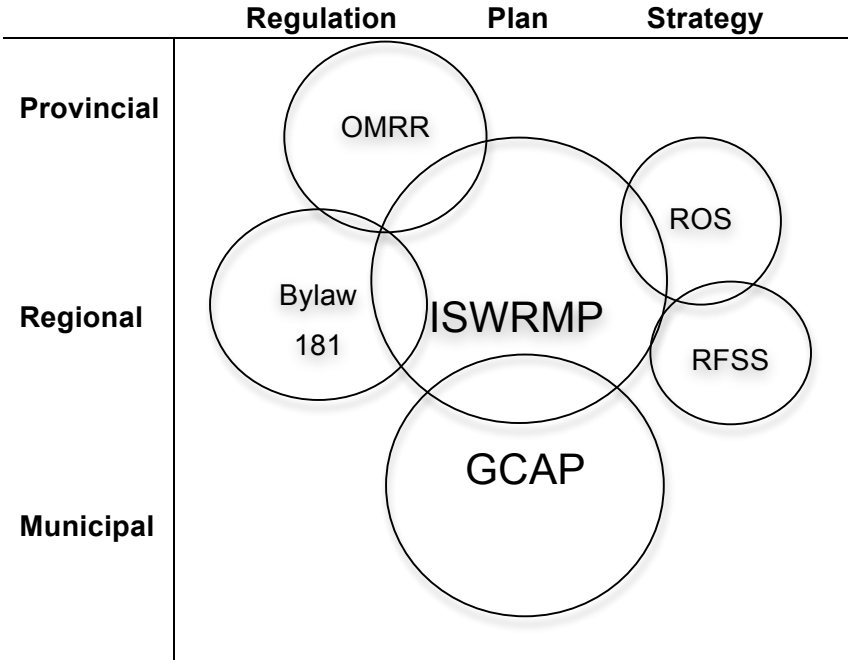
## 2.3. Policy Documents, Commitments and Goals

There are a number of policy documents, plans, strategies, and bylaws that intersect in the management of waste in the Region and in the City of Vancouver, which are visually represented in Figure 1 below. These range from regulatory and financial mechanism that are being proposed and passed as bylaws and bylaw amendments (e.g. waste flow management), to higher level planning documents (e.g. the Regional Food System Strategy – RFSS) with little to no regulatory implications but direct links to the management of compostable organics in the Region. While most of these documents have been reviewed, for the purposes of this research, only two significantly inform this study and will therefore be elaborated on in detail. The following will outline the policy commitments, goals and strategies as within Metro Vancouver's Integrated Solid Waste and Resource Management Plan (ISWRMP) and the City of Vancouver's Greenest City Action Plan (GCAP) as they relate to organic waste diversion. Together these policy documents describe how organic waste diversion goals will be achieved as well as the specified timelines, and at the municipal level, how compostables will be 'captured' in a manner that asserts Greenest City outcomes. Many of the strategies and actions are in

the implementation phase, some are still being formulated (or reformulated as it were) and neither of the policy documents is yet at the stage for evaluation. Identifying how the goals and commitments are likely to be achieved is the first step in determining what impediments exist with regard to 'getting there' in the allotted timeframe.

The two key policy documents described below lay the foundation for this research, which is to understand the place and role of small-scale composting in the broader policy context and discuss small-scale systems within the nexus of organic waste diversion *and* Greenest City outcomes. In essence, this study questions the "one-size fits all" centralized approach that large-scale collection and processing of organic waste represents.

***Figure 1. Intersecting Policy Documents that Guide and Influence Organic Waste Management in Metro Vancouver***




Intersecting documents reviewed for the purposes of this study included: the Organic Matter Recycling Regulation (OMRR), Municipal Solid Waste and Recyclable Material Regulatory Bylaw (Bylaw 181), Metro Vancouver's Integrated Solid Waste and Resource Management Plan (ISWRMP), the Regional Organics Strategy (ROS), the Regional Food System Strategy (RFSS), and the City of Vancouver Greenest City 2020 Action Plan (GCAP).

Before small-scale composting can be discussed, an understanding of how the broader goals will be achieved is presented below; beginning with a timeline of key organic waste management decisions, as follows:

- February 2010 – Vancouver City Council adopts the long term goals recommended by the Greenest City Action Team and directs staff to proceed with the GCAP
- March 2010 - Vancouver City Council approves the first phase of food scraps recycling (raw fruit and vegetable scraps collection) for single family homes
- June 2010 – Metro Vancouver releases the Integrated Solid Waste and Resource Management Plan
- January 2011 - Vancouver City Council adopts various Greenest City 2020 targets, including reducing total waste to landfill or incinerator by 50 percent from 2008 levels
- March 2011 - Vancouver City Council endorses the general approach outlined in the ISWRMP, including mandatory diversion of organic waste from disposal by 2015
- July 2011 – The BC Minister of Environment approves the Metro Vancouver ISWRMP (as a mandated policy direction)
- July 2011 - Vancouver City Council adopts, in principle, the Greenest City 2020 Action Plan (GCAP) and directs staff to implement the highest priority short term actions, including that which directs the collection of all compostable waste from single family homes on a weekly basis (and introduces every other week garbage collection)
- September 2011 – The Regional Zero Waste Committee approves the Regional Organics Strategy
- September 2012 – The City of Vancouver rolls out food scraps collection to all single family homes in the city (including the collection of the full spectrum of food scraps through yard trimmings bins)
- November 2012 – the Zero Waste Committee approves amendments to the Solid Waste and Recyclable Material Regulatory Bylaw 181 (amending bylaw 272), to enable the licensing of new types of resource recovery facilities in the Region including aerobic/anaerobic digesters, rendering plants and gasification plants; and allows special consideration for pilot projects and facilities (e.g. small-scale composting)
- Ongoing – Metro Vancouver (under the adoption of the Integrated Air Quality and GHG Management Plan) is undertaking development and implementation of an odour management program to regulate potential impact of odourous emissions, including those from any/all resource recovery facilities (e.g. composting operations);
- Ongoing - The City of Vancouver is developing a strategy for the collection of compostable waste from the MF and ICI sectors; The City is undertaking public consultation for the introduction of mandatory recycling

### *2.3.1. Metro Vancouver – Solid Waste Management Plan*

Since 1995 the BC Provincial government has required all BC regional districts to create and submit Solid Waste Management Plans for approval. The original purpose of the planning process was to restructure solid waste management systems such that they were regulated to be more sustainable with a specific goal to reduce waste going to landfill by fifty percent. Plans were to include strategies demonstrating how regions aimed to "reduce, reuse, and recycle" to ensure pollution prevention and reduction associated with waste. The BC Environmental Management Act (EMA) represents broader legislation and regulation that underpins the management of landfills[8], liquid waste, organic matter and recyclable material in the Province (including Extended Producer Responsibility or 'take back' programs). All regional solid waste management plans are authorized through the Environmental Management Act (Ministry of Environment, 2010).

Metro Vancouver has initiated a number of aggressive waste reduction and diversion actions and targets, mandated through the provincially-approved (in July 2011) Regional Integrated Solid Waste and Resource Management Plan. The ISWRMP is the key policy document that guides the flow, regulation, and management of solid waste in Metro Vancouver. Targets specified within the ISWRMP will see the regional government strive to minimize waste generation and maximize reuse, recycling and material recovery to the extent that 70 percent of all waste is diverted away from disposal (landfill and incinerator) by 2015. Metro Vancouver will aspire to achieve 80 percent diversion by 2020, and calls for a minimum 10 percent reduction in per capita waste generation by 2020 (Metro Vancouver, 2010b; Metro Vancouver, 2011b, p. 5). Under the EMA, Metro has the authority to enact the ISWRMP, which similar to the 1995 initiative, substantiates the values of the waste management hierarchy based on the principle that waste disposal has the greatest impact on the environment.

[8] The management of landfills is authorized by the Greenhouse Gas Reduction (Emissions Standards) Statutes Amendment Act (Ministry of Environment, 2010).

The ISWRMP hierarchy is as follows:

1. Minimize waste generation, followed by
2. Maximize reuse, recycling and materials recovery,
3. Recover energy from the waste stream after material recycling
4. Dispose of all remaining waste in landfill, only after material recycling and energy recovery.

The ISWRMP's overall 70 percent diversion target implies different approximate diversion rates to be achieved for each sector, including the following: 30 percent for MF; 65 percent for SF; 70 percent for ICI; 80 percent for DLC (Metro Vancouver, 2010b, p. 5).

The following table provides an outline of the ISWMRP goal, strategies and actions most pertinent to how organic waste diversion will be achieved in the Region. Metro Vancouver will divert organics from the waste stream by: banning all compostable organics from disposal; developing additional organics processing facilities (through policy mechanisms that will encourage private sector development of capacity); developing bylaws and an enforcement model to require recycling in all MF and commercial buildings and complexes; creating supportive communication and marketing programs; and establishing pricing and flow management mechanisms to ensure that garbage is the most expensive option for diversion such that waste remains within the Region for processing (Metro Vancouver, 2010b; Metro Vancouver, 2012a).

In September 2011 the Regional Waste Management Committee, now referred to as the Zero Waste Committee, approved the Regional Organics Strategy, a "hybrid model" for managing organic waste and a strategic direction to achieve regional waste diversion targets. In section 2.6.2 of the ISWRMP, the Organics Strategy calls for the Region and member municipalities to work together to create processing capacity at a large scale such that an additional 265,000 tonnes per annum of organic waste is directed away from disposal (280,000 tonnes are currently being diverted) (EBA, 2012; Metro Vancouver, 2012b).

***Table 2. Metro ISWRMP – Pathways to achieve regional organic waste diversion (strategies, actions and projected date to be achieved)***

<table>
<tr><td colspan="2">Metro Vancouver Integrated Solid Waste and Resource Management Plan (July 2010)<br>Targets:<br>- Reduce the quantity of waste generated per capita to 90% or less of 2010 volumes by 2020<br>- Increase the regional diversion rate from 55% to a minimum of 70% by 2015 and an aspirational target of 80% by 2020</td></tr>
<tr><td>Goal 2<br><br>Maximize Reuse, Recycling and Materials Recovery<br>- Strategies to achieve this goal focus on proactive approaches to reuse, increased recycling effort and implementation of a region-wide food waste composting program.</td><td>Strategy 2.6 – Target organics for recycling and energy recovery<br>- Action 2.6.2 – Divert organics from the waste stream. (2015)<br>(a) Establish additional organics processing facilities. (2011 and ongoing)<br>(c) In collaboration with municipalities, develop and implement a workplan for the diversion of organic waste, including food waste from: i) single-family residences (2012); ii) multi-family residences (2015); iii) the ICI sector (2015)<br>(d) Develop and implement supporting communication programs for 2.6.2c. (Ongoing)<br>(e) Ban all compostable organics allowed in residential green bins from disposal to landfill and all forms of waste-to-energy except anaerobic digestion. (2015)<br><br>- Action 2.6.3 – Municipalities will*, in collaboration with Metro Vancouver develop and implement a work plan, including appropriate communication programs for the diversion of organic waste from: i) single-family residences (2012); ii) multi-family residences (2015); iii) the ICI sector (2015)<br>(a) Municipalities will divert organics from the waste stream to a Metro Vancouver or alternative licensed organics processing facility. (2015)<br>(b) Municipalities will report the tonnage of diverted organic waste to Metro Vancouver in the event that organics are delivered to licensed non-regional processing facilities. (Annually)</td></tr>
<tr><td></td><td>Strategy 2.9 –Target multi-family and industrial, commercial and institutional (ICI) sectors to improve diversion rates<br>- Action 2.9.1 – Develop bylaws to require recycling in all multi-family and commercial buildings (complete –Metro Vancouver, 2012, Sept)<br>(a) Develop a model bylaw and enforcement model to require recycling in multi-family and commercial buildings. (2011)<br>(b) Create an advisory service for recycling programs for multi-family and commercial buildings (2011).<br>- Action 2.9.2 – Municipalities will work with Metro Vancouver to implement recycling for multi-family and commercial buildings. (2011)<br>- Action 2.9.3 – The Provincial Government to modify the BC Building Code to require that space be provided for recycling collection, sorting and pick-up in multi-family residential and commercial buildings (2014)</td></tr>
</table>

*The goals, strategies and actions listed above are the responsibility of Metro Vancouver unless stated "municipalities will…" (Metro Vancouver, 2010b, p.18-23)

Historically Metro has had little involvement in creating regulations or economic incentives with regard to organic waste diversion. This status quo management has led to a great deal of uncertainty that sufficient composting capacity can be achieved. Thus,

the hybrid model, endorsed by the Zero Waste Committee (September 2011) outlines a plan that will see Metro implement economic incentives and regulation that signals the private sector to create organics capacity and innovate in this area of waste management (Metro Vancouver, 2011d). While this model does not necessarily preclude the creation of small-scale composting capacity it certainly does not address it.

The hybrid model and other strategies that compliment the ISWRMP will consider a number of mechanisms and tools, and the degree of influence that Metro and its member municipalities could and should leverage to direct the flow of organics to ensure targets are achieved[9]. The following regulatory and financial mechanisms, and monitoring and infrastructure upgrades demonstrate in detail how the Region intends to achieve organic diversion targets:

- The phasing in of an organics ban – for SF residents by the end of 2012 and MF and ICI by 2015; will secure feedstock to organics processing facilities and act as a market signal to the private sector for the development of additional regional capacity.
- Monitoring and adjustment of the tipping fee differential between garbage disposal and organics processing to ensure an economic incentive (the differential is set to increase annually but will be monitored to ensure fees are high enough to incentivize organics diversion but not too high that haulers truck waste out of region to avoid fees).
- The introduction of a surcharge on the garbage tipping fee (for disposal) for waste from businesses and MF residences containing excessive amounts of organics; to be increased by 10% each year, for a 50% surcharge on the garbage tipping fee by 2015. The fee could be monitored and changed depending on the rates of diversion and regional capacity available (a staged process will allow for waste preparation and compliance with a full ban in place by 2015).

- The introduction of enforcement efforts once the organics ban is in place, using methods such as increasing the frequency of disposal ban inspections, increasing fines (as indicated above) and barring repeat offenders from

[9] For example, it is unclear if Metro Vancouver has the regulatory authority to implement a franchising model (which has in part led to the successful diversion of organics in San Francisco), however this is a tool that has been considered with regard to waste flow management options at the Zero Waste Committee level (Metro Vancouver, 2012a, p. 14).

accessing regional waste facilities (Metro Vancouver, 2011b) – enforcement is likely to include initial targeting of large organic waste generators such as grocery stores and restaurants but may include targeting at different scales/levels of projected non-compliance (personal communications, March 28, 2012 and September 28, 2012).

- The development and implementation of a bylaw (e.g. mandatory recycling), in conjunction with member municipalities that requires all sectors to separate and recycle organics (at the municipal level) and other materials through authorized facilities.
- Enacting a waste flow management approach that includes the introduction of bylaws requiring haulers of ICI and MF waste to be licensed and use regional facilities only (in order to create a level playing field within the Region and ensure waste haulers do not bypass regional facilities for disposal/recycling); this first requires an engagement and consultation process with stakeholders (to be conducted in early 2013).
- The development of a municipal approach (including technical specifications) for minimum recycling storage space and access in new multi-family residential and commercial developments as well as existing ones undergoing alterations; to be incorporated into the municipal building permit process and the BC Building Code (by 2014).
- Monitoring of supply and demand for organics processing capacity and the end market product, such that more extensive regulatory control can be applied if necessary (e.g. implementing a region-wide organics tipping fee).
- Providing residential organics transfer sites at existing transfer stations, at the request of member municipalities and where possible (with costs recovered from facility users).

(Metro Vancouver, 2012a; 2012b)

These mechanisms and proposed tactics represent a complex set of considerations that stand to affect composting at all scales throughout the Region despite being designed to effectively and fairly manage large, industrial processing systems. Through implementation of such mechanisms Metro Vancouver hopes to ensure fair pricing and fair competition for haulers and processors, oversee regulatory compliance with the ban and various bylaws, guarantee end-product markets and system stability, ensure geographical and financial equity and community acceptance (with regard to where in the Region composting facilities are located), and integrate with liquid waste operations where possible (Metro Vancouver, 2011e, p. 33).

In line with the potential issue of processing capacity Metro Vancouver has also encouraged member municipalities to establish their own processing facilities. While the inclusion of small-scale composting is not demonstrated within the ISWRMP, Metro

Vancouver has suggested that MF and commercial buildings look to manage organics through on-site composting/digestion, or to arrange with nearby buildings to share a neighbourhood collection/processing facility (Metro Vancouver, 2011b). This follows a report generated by the Recycling Council of BC (RCBC) Organics Working Group that recommends local governments should "encourage the use of small, neighbourhood-scale compost facilities to minimize the GHG emissions associated with trucking organic waste to large scale facilities". The report also suggests that local governments should conduct a "feasibility assessment of neighbourhood and community garden based composting facilities" (RCBC, 2009, p. 8).

In late 2011 Metro Vancouver conducted a technical study of seven on-site, small-scale composting systems operating both within and outside of the Region. The purpose of the study was to determine the suitability of these systems for MF dwellings. The *On-site Composting Technology Review* (October 2012) is described as "part of Metro Vancouver's initiative to encourage waste reduction and organics diversion while providing quality compost to local gardeners" (p. 4). Findings outline a set of key criteria required to determine which technology is best for a specific MF complex and concluded that "given that the regional organics management infrastructure is not yet fully developed, on-site composting can serve as part of an integrated solution for diverting organics from the waste stream" (p. 6). The annual capacity of the on-site composting technologies reviewed range from approximately 1300 kg to 130,000 kg per annum[10] (or 1.3 to 130 tonnes yearly) (Garden Heart Productions, 2012).

Consistent with the conclusions of the technology review, the Regional Food Strategy (a Metro plan that coincides with regional sustainability planning objectives)

[10] Based on the capacity of the high-tech 'Rocket' composting system, which processes up to 130 tonnes per year (Garden Heart Productions, 2012, p. 50); If 100 of these systems were operating in MF dwellings in Vancouver (whereby the MF sector produces 27,000 tonnes* of food scrap/year), nearly half of this waste stream could be captured and processed within the city (e.g. (130 x 100)/27,000 x 100 = 48 percent). Likewise for the ICI sector, which sends 55,000 tonnes* of food scraps to landfill/year, the use of 100 Rocket systems could allow for nearly one quarter of this waste stream (e.g. (130 x 100)/55,000 x 100 = 24 percent) to be composted on-site in the city (*City of Vancouver, 2012 October).

considers composting as a key aspect within a sustainable regional food system, whereby neighbourhood-composting programs in particular can provide valuable soil supplements for urban agriculture (Metro Vancouver, 2011c, p. 39). Currently Metro Vancouver is in the early phases of conducting on-site composting pilot projects at five of its MF buildings (located in Richmond, Surrey and North Vancouver) (personal communications, August 14, 2012).

A review of the ISWRMP and other Metro policy planning and direction documents indicates a focus on the development and management of large-scale composting facilities, and the flow of waste to those facilities as key to ensuring organic waste diversion. The focus is on large-scale composting as this is largely where the mandated authority and responsibility lies at the regional level. The policy context here also indicates a funneling down of responsibility for small-scale composting to the municipal level, but does not indicate small or neighbourhood scale composting as a regional priority focus. While the regional plan anticipates large-scale hauling to major regional composting facilities, for the City of Vancouver this approach runs up against its additional Greenest City policy commitment. Here small scale becomes more central to achieving both key goals (diversion and greenness). Composting at this scale is addressed more directly within the Greenest City Action Plan in reference to organic waste diversion, climate leadership, local food and the ability to foster an engaged and aware citizenry.

### *2.3.2. City of Vancouver – Greenest City Action Plan*

The City of Vancouver is described as the historic core of one of the fastest growing regions in North America. It is known for its building density, urban quality, and progressive planning. Punter (2003) describes Vancouver's location at "the edge of the wilderness" as an essential part of its attraction, ethos, and lifestyle that, along with a history of environmental activism and leadership, has fostered an urban population (and evidently current City Council) with a higher level of environmental awareness. Vancouver touts an international reputation as one of the world's most liveable cities, and is home to residents considered to have the smallest carbon footprint in North America (City of Vancouver, 2009a).

The Greenest City Action Plan perhaps represents the pinnacle of this awareness that aims to capitalize on the environmental limits to growth by incorporating this ethos in City policy. The GCAP (2011), modelled on Sweden's world-leading approach to environmental objectives and referred to as a "significant policy initiative" (p. 5) is described as a map of potential paths for becoming the Greenest City by 2020. According to the Greenest City Action Team (a group brought together by the Mayor to draft the GCAP) "becoming the Greenest City in the world is more than an environmental objective; it's also a savvy economic strategy, for it will offer a competitive advantage in attracting highly mobile investment dollars, businesses, entrepreneurs and talented workers" (p. 11). Thus, green enterprise, at the heart (goal one) of the GCAP is said to provide a new focus on economic growth based on providing goods and services that meet human needs while also reducing our overall ecological footprint. The Greenest City goals and targets are focused on creating a green economy and green jobs, greener communities and enhancing human health.

The GCAP represents a policy framework formulated over a 2 year period, identifying ten long-term goals, fifteen 2020 targets, and a multiplicity of strategies. It was adopted in principle by Vancouver City Council on July 12, 2011. The City has stated that due to limited financing capacity of the plan, implementation efforts will focus on three themes under which all of the Greenest City goals[11] are nested, including: carbon, waste, and ecosystems. Waste is closely aligned with the green economy, local food, lighter footprint and clean water. While many actions identified in the GCAP are underway, many others will require further "policy shifts" (p. 1). In other words, further detailed policy formulation, decision-making, and implementation will occur on a departmental basis, and in some cases "outside of City budget" financing. Individual and specific plans and policy are presented to Council as they are developed, following the time-span as identified within the plan (i.e. short-term, 1 to 3 years; medium-term, 3 to 9 years). Accountable city departments (designated within each goal) are responsible for

[11] The ten Greenest City goals are categorized as follows: 1) Green Economy, 2) Climate Leadership, 3) Green Buildings, 4) Green Transportation, 5) Zero Waste, 6) Access to nature, 7) Lighter Footprint, 8), Clean Water, 9) Clean Air, 10) Local Food.

implementing their parts of the plan. For example, the Director of Waste Reduction and Recovery Management will be responsible for bringing significant new policy, regulatory, planning or programmatic recommendations to Council as they are developed for the strategies under "creating zero waste" (goal 5) (City of Vancouver, 2011). Regarding the plan as a whole, most of the strategies and actions described "can only be delivered through City-led policy, programs and regulations in relationship with other levels of government, non-profit and private sector partners, as well as the community at large" (City of Vancouver, 2011, p. 4). In short, partnerships are key.

In striving to achieve zero waste the City's 2020 target aims to reduce total solid waste going to landfill or incinerator by 50 percent from 2008 levels[12]. This target is said to be in line with that of Metro Vancouver (70 and 80 percent diversion). There are seven strategies that create the road map with regard to how this particular target will be achieved. Strategy three – capture the compostables[13] - presents the most immediate opportunity for Vancouver to both realize regional waste diversion commitments (in line with Metro's organic waste ban) and achieve up to 20 of the 50 percent waste reduction target. In essence, the city will increase diversion and prevent landfill gas generation by keeping compostables out of the waste stream (City of Vancouver, 2011, p. 79). However, the ability to achieve diversion while also demonstrating Greenest City attributes (beyond just organics diversion) relies on the connection to other goals within the plan, including climate leadership and local food.

Given the timeline of organic waste diversion commitments, and in consideration of impediments that exist with regard to rolling out food scraps collection to MF and ICI sectors, as outlined in the October Council report described in Findings below; it would appear that small-scale composting has an important role to play in *how* the City will

[12] According to City of Vancouver waste composition reports 473,927 tonnes of solid waste was disposed in landfill or incinerator in 2008 (City of Vancouver, July 2011).

[13] In Vancouver "compostable waste", which makes up 33 percent of Vancouver's waste stream, is composed of food scraps (22%), compostable paper (or food-soiled paper - 6%), yard and garden trimmings (3%), landclearing debris (1%), and pet waste (1%). Food scraps is the central organic waste fraction discussed within this research.

achieve organic waste goals and targets in a manner that also demonstrates greenness. The following table outlines the Greenest City goals, strategies and actions most pertinent to how organic waste will be managed and diverted over the coming years. The table also demonstrates Greenest City attributes, which include those related to GHG emissions reduction, public education and awareness to foster a zero waste culture, and the creation of local food assets and infrastructure (e.g. community composting).

***Table 3. Greenest City Action Plan – Pathways to achieve municipal organic waste diversion (strategies, actions and projected date to be achieved)***

| **Long Term Goal #2: Climate Leadership**<br>**2020 target: Reduce community-based greenhouse gas emissions by 33% from 2007 levels.** | |
|---|---|
| **Strategy 4**<br><br>Zero Waste – the direct, measurable relationship between waste and climate change results from the decomposition of organic matter in landfill, which produces methane gas. | (Short-term, 1 to 3 years)<br>Work with Metro Vancouver in their efforts to prevent compostables from entering landfill.<br>(Long-term, 3 to 9 years)<br>- Assess the feasibility and opportunities to establish infrastructure to recycle food scraps, compostable paper and other organics materials into biogas as a clean source of energy and/or transportation fuel.<br>- Work with Metro Vancouver to ban organic waste from the landfill by multi-family dwellings and business and institutions by 2015, and increase regional capacity to use the organics for productive purposes.<br>- Undertake research and explore opportunities to account for and reduce the GHG emissions associated with the production, transportation, and disposal of goods and materials, including food, through life-cycle waste management approaches. |

| **Long Term Goal #5: Create Zero Waste**<br>**2020 target: Reduce total solid waste going to landfill or incinerator by 50%, from 2008 levels** | |
|---|---|
| **Strategy 1**<br>Nurture a Zero Waste Culture | (Short-term, 1 to 3 years)<br>Public education and engagement:<br>- Promote composting and food waste reduction to all sectors<br>- Promote recycling to all sectors, especially multi-family<br>- Engage multi-family residents and building managers to identify and address barriers to MF recycling. Invite them to demonstrate zero waste buildings and suites<br>Incentives and enforcement:<br>Expand bylaw requirements and develop a program to enforce disposal bans at the household and business level, as required in Metro Vancouver's waste management plan (target materials include compostables) |
| **Strategy 3**<br>Capture the Compostables | (Short-term, 1 to 3 years)<br>City Hall<br>- Collect and recycle food scraps and food-soiled paper from all City facilities and events<br>Apartments and condominiums<br>- Conduct a pilot project to collect compostable organics from a limited number of multi-family and commercial properties<br>- Based on the pilot develop a strategy for food scraps collection from multi-family buildings<br>Infrastructure<br>- Investigate on-site in-vessel composting technologies as an option for MF complexes, schools and businesses<br>- Assess the feasibility of developing organic material conversion facilities to transform food scraps and food-soiled paper into compost or biogas at the Vancouver Landfill and in district energy systems<br><br>(Medium-term, 3 to 9 years)<br>All Sectors<br>- Ensure food scraps and other compostable materials are recycled from all apartments, condominiums, businesses and institutions by the end of 2015, either through on-site composting, or transport to composting or bioenergy facilities<br>- Explore the possibility of social enterprises collecting food scraps by bicycle from businesses in the downtown core and delivering the material to a transfer station or processing facility in support of the Green Economy action plan |
| **Strategy 5**<br>Keep Recyclables out of Landfill and Incinerator | (Short-term, 1 to 3 years)<br>Apartments and condominiums:<br>- Explore user-friendly recycling services for apartment and condominium buildings, like container sizes and collection frequencies that are scaled to the number of units in the building and configuration of space |
| **Strategy 7**<br>Foster a Closed-Loop Economy | (Short-term, 1 to 3 years)<br>Develop a Triple Bottom Line decision-making framework to determine the *highest best uses (at highest possible level for specific types of waste)<br>*Based on environmental, social and economic considerations ("Highest Best Use" means managing a specific type of waste at the highest possible level on the waste management hierarchy = source reduction, reuse, recycling, and energy recovery) |

| **Long Term Goal #10: Vancouver will become a global leader in urban food systems**<br>**2020 target: Increase city and neighbourhood food assets by a minimum of 50% from 2010 levels** | |
|---|---|
| **Strategy 2**<br>Support the creation of food infrastructure and food-related green jobs related to production, processing, storage, distribution, access and waste management | (Short-term, 1 to 3 years)<br>Ensure that each neighbourhood has, as needed:<br>- Adequate community garden plots<br>- Learning opportunities connect with food<br>- Community food composting facilities (five facilities by 2020) |
| **Strategy 3**<br>Ensure that Vancouver's food system is resilient at the neighbourhood level | (Medium-term, 3 to 9 years)<br>Support the reduction in food waste by:<br>- Promoting neighbourhood-related composting projects to ensure that household food waste does not end up in the landfill |

(City of Vancouver, 2011)

Actions to increase food scraps diversion in Vancouver have been officially underway since 2010, with the approval of the first phase of city wide food scraps recycling, including the addition of raw fruit and vegetable scraps in SF home yard trimmings collection. In March 2011 City Council officially endorsed the regional ISWRMP, including actions for mandatory diversion of organics. In September of 2012, the City rolled out collection of the full spectrum of food scraps (including meat, bone, bread, pasta and dairy) to all SF and duplex residents, working toward every other week garbage collection and weekly organics collection. In addition, from April to July 2012 the City conducted a pilot project for the collection of food scraps from small MF buildings (with 6 to 22 units) that were already receiving City collection services. This study was conducted to understand the barriers specific to the MF sector although it did not include large MF towers. The results of the study were considered "generally successful and well received by both residents and building managers", with few contamination issues, high participation, and moderate diversion rates (City of Vancouver, 2012b, Appendix A). The purpose of the study was to inform the development of a food scraps collection strategy for the MF and ICI sectors, currently underway. In addition, longer-term actions within the GCAP indicate that composting capacity could be created (Goal 2, Strategy 4 above) through the conversion of organics

into biogas as a clean source of energy and/or transportation fuel - the scale of such systems is suggested to be of a larger size.

Under the zero waste goal, action items for strategies one (nurture a zero waste culture) five (keep recyclables out of landfill) and seven (foster a closed-loop economy) describe aspects that stand to affect the ability and effectiveness of capturing compostables at all scales (e.g. bylaws, systems setup, education, future decision-making). For example, strategy one (nurture a zero waste culture) echoes the sentiment and action proposed by Metro Vancouver in calling for the implementation and enforcement of bylaws to support waste bans. Short-term actions under strategy three (capture compostables) indicate an investigation of on-site in-vessel composting technologies as an option for apartment and condominium complexes, schools and businesses. Medium-term actions (now only two years away) will "ensure food scraps and other compostable materials are recycled from all apartments, condominiums, businesses and institutions by the end of 2015, either through on-site composting, or transport to composting or bioenergy facilities" (City of Vancouver, 2011, p. 79-80).

In a summary of the public engagement that took place during the development of the GCAP, capturing compostables is described as an exciting prospect in reference to how the city will divert organics, where the "composting hub" concept is viewed as an opportunity that would allow for shorter distance trips (from bin to composter) at a smaller scale, which is a central Greenest City attribute and key aspect of this research. Further, waste management gaps that were identified during the second phase of community engagement included the need to emphasize "neighbourhood-scale collection and processing" (p. 86). The main challenge for capturing compostables by 2015 is ensuring that secure composting facility capacity is in place. In an effort to transform Vancouver into a global leader in urban food systems (goal ten) the City will aim to increase local food assets, such as "community food composting facilities", by 500% by 2020 – that corresponds to the addition of five new community composting facilities (p. 143). Thus, goal ten closely aligns with that to create zero waste, and achieving this aspect of the GCAP is essential to accomplish Greenest City goals rather than just diversion. According to the City, composting at a small scale and within the city holds a particular purpose:

> To complement expansion of curbside organics collection, increased promotion of local scale composting is proposed. Local scale composting provides a sustainable means of diverting a portion of the organics waste stream. It requires individual participation which can raise awareness of the benefits of waste diversion, reinforces the direct benefits of composting and lifestyle changes required to participate, results in the production of a soil amendment that can be utilized locally, and provides a low cost and low energy alternative to large scale collection programs. (City of Vancouver, 2010a, p. 6)

Composting at a small scale, as described by the City of Vancouver: demonstrates Greenest City attributes that allows for diversion while also reducing the cost, energy and GHG emissions associated with transporting organic waste; creates awareness raising opportunities through direct participation in small-scale waste management; and ties into local food production/systems through the local production of a soil amendment.

In October 2010, the City of Vancouver released a request for proposal (RFP) for a third party to research, develop, conduct and evaluate one or more pilots of neighbourhood scale composting. They describe composting at this scale as follows:

> Neighbourhood scale composting is communal composting at a central location involving one or more properties, and one or more types of properties including single family residential but with the emphasis on multi-family residential, industrial commercial and institutional. One approach of interest to the City is to test multiple properties bringing material to a central location in concert with local community gardens. (City of Vancouver, 2010b, p. 3)

The purpose of the pilot was to determine the effectiveness, operational requirements, barriers, opportunities, cost of designing, promoting, sustaining, and implementing neighbourhood scale composting projects (City of Vancouver, 2010b). For unknown reasons the pilot study was never initiated (personal communications, on November 2011 and September 2012) and is being "re-scoped" (personal communications, June 19, 2012).

As is indicated in the City of Vancouver October Council report (2012, *Food Scraps Diversion Update*), and through personal communications (June 19, 2012), City staff are currently working with Metro Vancouver, waste haulers and organics processors to develop and implement options for diverting organics from the MF and ICI

sectors. Prior to finalizing this collection strategy the City will look to introduce mandatory recycling as a signal that all sectors need to prepare to divert organic waste (a priority for 2013/2014). In addition, the City will continue to monitor regional progress with regard to food scraps processing capacity. They have also recently put forth plans to expand waste infrastructure (to manage additional food scraps at the Vancouver transfer stations), to develop a comprehensive communication's campaign and to increase education and enforcement personnel. Costs for program and infrastructure upgrades will be $10.4 million and mainly cover programs designed to support SF home food scraps collection and diversion (City of Vancouver, 2012 October).

As the City of Vancouver and Metro Vancouver inch closer to waste diversion target deadlines, the policy direction is clear – keep compostables out of landfill. A review of the GCAP, in the context of the ISWRMP, demonstrates a priority at both levels of government to divert organics through large-scale collection and processing systems. The pathway to how this will be achieved is clearly demonstrated above. For the City of Vancouver the challenge is to ensure both diversion and Greenest City outcomes are achieved, which will likely require an integration of small-scale systems. The management of food scraps through local/neighbourhood/small-scale composting is subtly incorporated into planning objectives. The GCAP, and other City documents, describe the role that small-scale composting can play with regard to reduced GHG emissions associated with trucking organics, the benefits of direct management and responsibility for waste at the citizen level, and the direct connection to local food in a manner that is different from what we know large scale diversion and processing *can* achieve (as is evident through current recycling rates in MF and ICI sectors). An account of the impediments that stand to affect the Region's ability to achieve organics diversion targets through large-scale mechanisms and within the allotted timeframe is an important aspect to this study. These impediments, which will be described in detail in the findings below, can also be viewed as drivers for small-scale composting. That said, the purpose of the study is not to suggest that small-scale is a replacement for large-scale organics diversion but rather should be considered an important, complimentary part of the system as a whole.

Before going further with discussion of the findings, two sections follow this introduction to regional and municipal organic waste policy. The literature review

outlines scholarship relating to policy cycles, appropriate technology and small-scale composting examples, which further demonstrate the role of small-scale composting. The methodology section outlines the study design and framework within which interviews and data were collected and assessed. This is followed by a discussion of interview findings, examining more closely the impediments that exist with regard to diversion of organic waste and the ability to achieve Greenest City outcomes; moving from there to impediments with regard to the operation and establishment of small-scale composting in the City of Vancouver.

# 3. Literature Review

A range of scholarship has been identified to create a three point conceptual framework used to situate this research study within its broader and more specific concepts, as well as to assist in the collection of appropriate data. Literature consulted includes that relating to public policy and policy cycles, the concepts and principles of appropriate technology and examples of small-scale composting systems. A review of policy literature and examples of small-scale systems were used to create a framework with which to approach the research interviews. A fourth body of literature pertaining to soft systems theory and methodology (SSM) was also consulted. SSM is used to discuss and substantiate the qualitative approach to this study that creates a "rich picture" of organic waste diversion policy and practice from a diverse group of actors. SSM will be discussed in the methodology section to follow.

## 3.1. Public Policy

Literature pertaining to public policy and theory regarding policy cycles was consulted in order to create a lens through which to better understand attributes of the two policy documents described above (the ISWRMP and the GCAP), and through which to gain insight into the nature of policy development and factors that stand to affect policy processes. This informed the research design (e.g. appropriate interview participants and types of questions to pose) and final recommendations.

According to Howlett, Ramesh, and Perl (2009), public policy is characterized as applied problem solving, whereby public policy initiatives are those series of decisions sanctioned by the government to fix or alleviate a problem. According to Pal (2010):

> Policy is a framework, a map, or a guideline. It connects a problem definition (or clusters of problems) with goals and objectives, and a selection of instruments (means or tools) whereby the problem will be

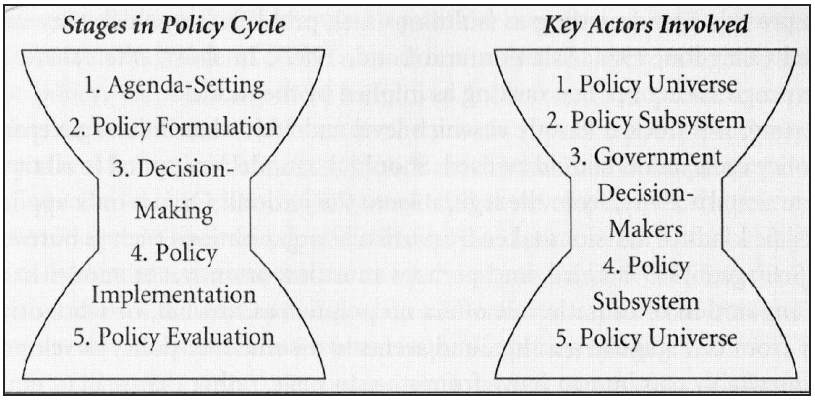
> overcome and the objectives met. To be actualized or made real, policies have to be expressed or implemented through programs, and any given policy (if it is broad enough) will likely have several programs, which in combination will tackle different aspects of the broader problem (Pal, 2010, p. 145).

Public policy can be broken down into a sequence of inter-related stages referred to as the policy cycle, forming a framework that facilitates an understanding of multi-dimensional policy processes, whereby each stage can be investigated alone or in terms of its relationship to any or all other stages within the cycle. The stages include: 1) agenda-setting, 2) policy formulation, 3) decision-making, 4) policy implementation, and 5) policy evaluation. Howlett et al (2009) describe this model, or framework for policy analysis, as that which "permits examination of the intertwined role of all actors, ideas, and institutions involved in policy creation, not just those government agencies formally charged with the task" (p. 13). In this regard, and in reference to the GCAP, it is important to note that the policy cycle may not be a single iterative loop but include a series of smaller loops, whereby one stage informs the next, such that the implementation of one policy action can impact future policy formulation (Howlett, Ramesh, Perl, 2009). In a review of green building policy in Vancouver, Slater cites Connelly (2010) who points to the iterative nature of sustainability policy and initiatives as that which in practice demonstrate "evolving processes that change and shift in focus as the values, relationships, and contexts in which the initiatives are situated shift over time and place" (Slater, 2011 p. 9). For example, the development of small-scale composting by the private sector, and advancement of research on this front by the public sector create changing conditions and practices that are likely to lead to further policy formulation, decision-making and implementation with regard to evolving options for organic waste management in Vancouver.

For the purposes of this research, the focus is primarily on the mid-section of the policy cycle, including policy formulation (or policy design), decision making and implementation. Literature pertaining to the mid-section of the cycle is pertinent given that the GCAP, while taking the form of a policy road map, is described as requiring further policy "shifts", decision-making at the Council level, and implementation with each progression through the plan, inching closer to 2020 targets. Ongoing policy development is evident in the roll-out of food scraps collection for SF homes. Programs

were implemented through a series of phases such that two years from the initial collection of fruit and vegetable scraps in 2010 there is now curbside collection (for all SF homes in Vancouver) of the full spectrum of food scraps (since September 2012) and imminent implementation of every other week garbage collection. A review of policy theory was undertaken to understand the factors that affect different stages within the policy cycle so as to inform the idea that a full array of policy actors should be consulted for the purposes of data collection. This literature was also used to form the basis of research questions, especially regarding question categories, as well as to assist in creating final recommendations that are consistent with the realities of policy development (e.g. making suggestions for what further policy formulation and implementation may be required to encourage the use of small-scale composting in the City). Figure 2 below outlines the stages within the policy cycle and the corresponding actors and institutions that influence each phase of public policy. The hourglass illustrates all policy actors as the policy universe; the policy subsystem represents only actors with sufficient knowledge of the problem area or resources at stake; and where a decision is being made, the actors are reduced further to include only those that have the authority (e.g. elected officials) to make the decision.

***Figure 2. The Policy Cycle-Actor Hourglass***




Howlett, Ramesh, & Perl, 2009, p. 13; used with permission.

## *3.1.1. Policy Formulation and Implementation*

Policy formulation is the process of generating options, solutions or a course of action, for how to address a public problem. This stage of policymaking involves a

narrowing-down of possible decisions that policy-makers could accept before going on to formal decision making[14]. Thus, defining and weighing risks and options forms a substantive process within policy formulation, and involves the identification of technical and political constraints, and recognition of impediments or limitations - "the essence of the search for solutions to a policy problem entails discovering not only which actions are considered to be technically capable of addressing or correcting a problem but also which among these is considered to be politically feasible" (Howlett, Ramesh and Perl, 2009, p. 113). In this regard, it is suggested that policy makers often fail to acknowledge the limitations that constrain or prevent a proposed course of action, including both potential substantive and procedural[15] impediments. To this point, the basis of this research study is to uncover the impediments or limitations with regard to both the higher level regional and municipal diversion commitments and impediments that exist for small-scale composting operations (and their establishment), in order to inform further, appropriate policy development. Policy theory suggests that in order to understand why some policy options gain attention over others, the ideas, motivation and experience that policy actors bring to policy formulation must be recognized along with the context within which they operate (Howlett, Ramesh, Perl, 2009). For the purposes of this study, this concept has resulted in data collection relating to actors,

[14] The decision-making stage within the cycle will not be discussed in detail but represents the process where one or none of the policy options, developed during agenda setting and formulation, is approved as an official course of action. Decision making (or policy ratification) is usually accompanied by a statement of intent by the authorized public actors to take (or not take) action such as a law or regulation (Howlett, Ramesh and Perl, 2009 p. 139)

[15] Substantive constraints include those that are innate to the nature of the problem, such that there is no known solution to the problem (e.g. poverty). Procedural constraints include those that related to the procedures involved in adopting the solution option or carrying it out, such as constitutional or authority related constraints as well as established ideas and beliefs that prevent a solution from being considered while promoting others (Howlett, Ramesh, Perl, 2009 p. 113)

ideas (or purpose) and motivations (or drivers) behind the systems and processes of discussion with all participants[16].

Proposals that emanate from the formulation phase of policy-making include how best to address the policy issue and implement a solution, which requires the use of policy or governing tools and instruments. There is a taxonomy of instruments used to achieve policy goals including information-based instruments, such as public campaigns and authority-based instruments, such as financial and regulatory mechanisms. It is not within the scope of this paper to describe the nature of each instrument type; however it is noted here, as the instruments identified with the ISWRMP and the GCAP form the basis for *how* policy goals will be achieved, described above.

Pal (2010) discusses policy as that which is best thought of as "creative solutions to challenging puzzles" rather than an ordinary legislative or program response (p. 143). He elaborates to say that the creative aspect is that which goes beyond conventional definitions of a problem to offer solutions that others before had not thought of or put forth. And these creative solutions (perhaps including small-scale organics diversion options), offer a surprising or unanticipated approach to a public policy problem. He describes policy design (synonymous with formulation) as a mix of inspiration and technique that involves choosing appropriate instruments to achieve a specified policy goal. Pal (2010) further suggests that there is an overlap between policy design or formulation and policy implementation, where design refers to the technical means of achieving a goal (e.g. mandatory bans and the creation of bylaws), and implementation to the organizational structure and process to execute the chosen design (e.g. enforcement conducted at the municipal level; door to door outreach conducted by City staff to ensure communications to inform and encourage compliance of a ban). The link between formulation and implementation is ratification, or political decision-making.

[16] Participants interviewed include: Public representatives from Metro Vancouver and the City of Vancouver (e.g. engineering and planning professionals) who have and continue to work on policy strategy, as well as 'actors' including a waste hauler, soil scientist, compost program expert, and consultant who are prominent in the industry and were present during the several phases of public consultation that culminated in the current form of the GCAP.

Policy implementation constitutes the effort, knowledge and resources devoted to translating policy decisions into action where funding allocation, personnel assigned, and procedures developed must be taken into account (Howlett, Ramesh, Perl, 2009). While planning for implementation is indeed not implementation in itself (and may in fact be formulation) it is important to understand the factors that stand to affect implementation, which by virtue, should inform the formulation process. That said, if policy implementation makes a distinct contribution to the success or failure of a policy (Pal, 2010), then as Howlett et al. would suggest, implementation requires more than simply enacting decisions that were previously made. They argue the following:

> Policy implementation can only be meaningfully understood and evaluated in terms of the existing range of policy actors present in the policy subsystem, the kind of resources that policy actors have at their disposal, and the nature of the problem they are trying to address and the ideas they have about how to go about addressing it, all in the context of the policy regime in which they are working (Howlett, Ramesh, & Perl, 2009, p. 173).

These broader aspects of implementation (including actors, ideas, and resources or structures), informed questions and categories considered when gathering data from all interview participants, particularly small-scale composting practitioners/operators (as a first layer of categorizing questions). This approach assisted in determining how composting at this scale was implemented, what worked well, what did not work and why. This information can be used to inform further planning for formulation and implementation of policy as it relates to the processing of organic waste in the City.

Unfortunately, there is no definitive checklist of what works and what doesn't when it comes to implementation. Success may vary depending on the approach and instrument chosen to enact a decision, and is dependent on the identified target group. For example, the larger the target group, the more difficult it becomes to affect behaviour change. Waste management is a clear example of a policy problem (with broad environmental and health implications) with a very large and diverse target group (including *all* MSW generators).

Regardless of the approach toward implementation Howlett et al. state that "the process of giving substance to a government decision always involves choosing among

several tools available that could each make a contribution to advancing policy" (p. 168). This brings forth two points that determine the success of policy implementation: 1) that an understanding of the larger policy picture is required and 2) what constitutes success for one initiative may not be the same for another (Howlett, Ramesh, & Perl, 2009). In this regard, and in reference to the GCAP, policy that will see the implementation of large-scale, centralized collection/hauling and processing of organic waste may very well lead to achieving diversion targets; however, GCAP implementation success cannot necessarily be assumed if Greenest City outcomes are not also achieved.

The implementation of policy can be characterized as a "continuous improvement that aims to adapt to specific contexts and changing circumstances" (Slater, 2011 p. 9). Within the iterative process of policy development it is possible that the limitations of policy implementation can also be viewed as drivers for a different phase of formulation. This idea is represented in the research findings where it has been observed that the limitations for achieving diversion through centralized, large-scale collection and composting facilities within Metro Vancouver can also be viewed as drivers for small-scale composting. Before moving on to these findings, a review of the nature of small-scale composting and its drivers as demonstrated in multiple studies will be discussed below. First, the key points and principles relating to the importance of diversity in scale and technology are outlined through concepts of appropriate technology.

## 3.2. Appropriate Technology

The development of intermediate or appropriate technology has occurred over a period of time marked by a burgeoning environmental movement, the questioning of the effectiveness of foreign aid, and the ensuing energy crisis. In light of these factors, British economist E.F. Schumacher began to examine the philosophies holding up Western economics, a life long exercise through which he developed the concepts, principles and criteria for what would come to be known as intermediate technology and later referred to as appropriate technology. His early development work in India and Burma culminated in the publishing of the 1973 *Small is Beautiful, Economics as if People Mattered*, touted as one of the most influential books of its time and a significant contribution to the environmental movement. Over a 20 to 30-year period the

appropriate technology movement waxed and waned within a broader economic/social/environmental dialogue and branched off into several influential movements that have shaped the way sustainable/economic development and environmentalism is viewed today. In a "sequel" to Schumacher's *Small is Beautiful*, McRobie in *Small is Possible* (1981), offers a practical review of the effort that began as a result of Schumacher's works and through the Intermediate Technology Development Group (ITDG) that formed as a result. The following provides a short account of relevant criteria, concepts and principles that stem from the work of Schumacher and others as they relate to scale, applicability and usability of technology within a local context. These notions are useful in describing the role of small-scale composting in the City of Vancouver today.

As described by McRobie (1981), Schumacher first discussed the critical role of technology in economic development in a 1962 report prepared for the Indian Planning Commission within which he stated his concern of the direct transfer of large scale western technology into countries that were "long in labour and short in capital" (p. 19). He premised that the mere transfer of western economics into places like Burma would simply lead to western economic demands – demands that were not suitable for such countries (Weber, 1999). He wondered why no one seemed to think that a Buddhist way of life, in countries like Burma, would call for "Buddhist economics" (a chapter within *Small is Beautiful*), in the same way that a materialistic way of life had brought forth modern economics (Schumacher, 1973, p.73). In this regard Schumacher began to ask questions of size in relation to economies and technologies, stating that "when it comes to the question of size: there is no single answer. For his different purposes man needs many different structures, both small ones and large ones, some exclusive and some comprehensive" (Schumacher, 1973, p. 70). He called for a new economic approach; one that would not simply impose Western economic philosophy in the developing world but that considered and encompassed the following attributes:

- Workplaces created where people are living now
- Workplaces that are "cheap" enough so that they can be created in large numbers and without an unattainable level of savings and imports
- Production methods designed to be relatively simple so as to minimize the demand for a high skill level in all aspects of production, manufacturing, etc.

- Production that is done largely from the use of local materials and for local use

(McRobie, 1981, p.27)

These notions and years of studies, conducted at first by the ITDG, sparked the development and application of intermediate technology that embodied four criteria, including that of smallness, simplicity, capital cheapness, and non-violence. As described by Weber (1999), the concept of intermediate technology, though initially criticized by the economic community, was eventually taken up by UN agencies, governments and non-governmental organizations around the world. As work progressed Schumacher was increasingly convinced that the need for rich countries to restructure their technologies to also include an intermediate approach was perhaps even more urgent than that of developing nations (McRobie, 1981).

Appropriate technology (referred to from this point on as AT - and synonymous with intermediate technology) took many forms depending upon where in the world it was applied. With the four criteria in mind the ITDG undertook a series of design studies and devised AT projects and theory through practical application. In the developing world AT was applied to address issues in a wide range of fields from agriculture, building materials and techniques, to small-scale energy production and water availability. One project, demonstrating the development of small-scale technology through localized production of building materials, investigated the opportunity for cement production that was vastly scaled-down from conventional, large-scale (1,600 tonnes per day) manufacturing. Mini-cement plants, with a production output of 25 to 110 tonnes per day would allow for the use of small, local lime deposits (that were too small for use by large-scale plants). Scaled-down technology would also make an essential building material available near to the point of use, resulting in a decrease in transportation requirements (and costs), and the creation of local jobs. In all accounts, this was but one example of a successful AT project where the criteria and attributes of AT (as outlined above) were present and *appropriately* applied. In the developed world the application of AT took a different form.

In the UK, America and Canada AT exists primarily as an “alternative movement” in the form of workers’ cooperatives, land trusts, community investment funds, credit unions, and urban agriculture. Movements described by McRobie (1981), such as

voluntary simplicity (living more simply, within community), biological husbandry (the promotion of organic methods of farming), neighbourhood development (ways of identifying and meeting neighbourhood-level needs), alternative energy (renewable, small scale), and local self-reliance (decentralized ownership and control of production resources) are not dissimilar to GCAP strategies for creating community assets and neighbourhood infrastructure, networks and engagement (e.g. urban agriculture, neighbourhood composting and neighbourhood energy utilities). In McRobie's examples, formed during the late 60's to early 80's, he describes individuals, groups and organizations that are standing in opposition to the notion that conventional, large-scale industrialization is the only means to economic growth and prosperity. He portrays the value of local systems that provide economic benefit to local communities.

Through his narrative, McRobie suggests that policies favouring more appropriate technologies were beginning to emerge in both the US and Canada starting in the mid 70's (p. 163). For example, in the City of Chicago the Centre for Neighbourhood Technology (CNT) formed with the notion that neighbourhoods are the right place for new (small) technologies. Their projects at the time (1978) focused on ways to improve urban living in the face of urban flight, whereby big industry was leaving Chicago and taking the jobs with them; more houses and people were moving to the suburbs, and local shops began to disappear. As a means to improve local food security and nutrition and lower the cost of food for Chicago's urban poor, the CNT turned to urban food production through the use of greenhouses and urban agriculture on vacant lots (McRobie, 1981). Since 1978 the Centre for Neighbourhood Technology has been a leader in urban sustainability and community development, improving the health of natural systems and the wealth of people through initiatives at the neighbourhood scale (CNT, 2012). The organization is alive and thriving today; their food security projects initiated in the 1970's are an example of technological innovation resulting in adaptation and diversity in face of an industrial system rendered ineffective.

In a review of the "rise and fall of the appropriate technology movement in the US (1965 to 1985)" Carroll Pursell (1993) illustrates a rich history within which AT was born, thrived, and died. She briefly describes a time marked by the growing environmental movement, an energy crisis, flip-flopping political reform and the end of the Vietnam War. Pursell cites multiple reasons for the failure of the AT movement but claims its

eclipse in the 80's was due to political failure - the inability to counter advocates of large-scale agribusiness, private utilities, multinational construction companies and the military-industrial complex. She goes on to suggest that while the technologies themselves survived - including solar electricity, low-head hydroelectric generation, the development of methane gas for fuel, a reemphasis on bicycles and mass transit, composting and sustainable agriculture - the movement lacked "ideological context" to give the technology political meaning (p. 629 – 633). Zelenika and Pearce (2011) have found that in the 20 years since the "eclipse" of the AT movement the ability to collaborate online through crowd sourcing, collaborative consumptions mechanisms, and improved access to appropriate and improving software and design information has changed significantly. These movements and mechanisms are enabling more effective and rapid development of AT for both industrialized and non-industrialized regions.

The studies, examples and writings of Schumacher and McRobie strongly support the notion of questioning the scale, method of application, and purpose of technologies and techniques for economic development (globally). In McRobie's recounts and Schumacher's words we hear loud and clear that bigger does not necessarily mean better. AT is defined as "that which is appropriate for a particular community at that time and place in terms of size, scale and usability"; the aim of which, in principle "is not to replace an existing industrial system but to promote technological innovation in the areas where it is weak or ineffective" (Zelenika and Pearce, 2011, p. 15). Furthermore, "an appropriate technology is one, which evolves or is developed in response to a particular set of needs and in accordance with prevailing circumstances" (Practical Action, 2012). These concepts support the intent of this study, which is not to suggest that small-scale composting replace large, centralized facilities; but rather offer opportunity (and diversity) in the areas where the industrial system demonstrates limitations. Where innovation allows for diversity within the waste system, adaptability and resilience is likely to follow. Perhaps it could also be said that where innovation allows for diversity (in scale) then together, diversion ***and*** Greenest City outcomes can be achieved.

The key concepts and lessons taken from this brief review of appropriate technology include those which:

- Encourage diversity within a system – diversity of scale, skill level, and type of technology
- Define *appropriateness* in terms of what is most suitable for a specific time, place and people (because in some instances bigger may be better and situations change over time)
- Encourage the questioning of systems and technologies that are being implemented within the context of what others have done and are doing (to question large-scale industrial methods because it makes sense for the community to do so).

These concepts are applicable in many ways to this study of organic waste diversion policy and management, and the role of small-scale composting. The following examples of small-scale composting (generally within the commercial and institutional sector) provide insight with respect to what others have done and are doing.

## 3.3. Small-Scale Composting

Increasingly small-scale, on-site and community composting is being examined as an alternative to organic waste disposal in many cities across North America and the globe. Processing of food waste at this scale is unique within the context of status quo waste management, generally landfilling of waste (Taylor, 2009); when examining its application in sectors that do not include SF homes (e.g. applications for restaurants); and within the context of and connection to urban food production.

Multiple studies have been conducted to evaluate the technical and life-cycle performance of small-scale systems in comparison to other organics disposal and processing methods. These studies spend a great deal of time analysing the different environmental, economic and sometimes social costs and benefits of small-scale, on-site and in-vessel systems. Many of these studies cite the rising cost of waste disposal and higher level policy directives (e.g. organic waste bans and increased landfill tipping fees) as well as increasing urban populations and therefore waste generation rates, as impetus for on-site composting. A number of indicators, with regard to a successful small-scale operation/system are identified within the studies discussed below; these informed research questions in this study but are not being used as indicators. Multiple case studies have also been conducted in places like King County, Washington,

Cornwall, United Kingdom, and recently Metro Vancouver that describe the technical and operational barriers and benefits of small-scale systems. To a lesser degree these examples also describe the cultural, managerial, and political aspects and constraints associated with on-site and small-scale composting for schools and businesses and MF properties. In addition, many feasibility studies measure costs and benefits of higher-tech systems, such as anaerobic digestion and biogas generation at a small scale (Richter, Amlani & McCarry, 2008; Radlein, Bywater, Gell & Murcott 2011).

While this is not a review of the technology being used for commercial and institutional on-site processing of organics technology is an important factor for the success of such systems and must be appropriate for the type and quantity of food waste generated from a site or coming from multiple sites. Technical studies and case studies often provide cultural insight with regard to the management of on-site, small-scale systems that were useful to consider (and question) in the description of examples of small-scale composting in Vancouver.

### *3.3.1. On-Site Composting Examples*

Common comparisons within studies of small-scale composting measure the costs and benefits of such systems against landfilling, commercial/centralized composing facilities (large scale), community composting centres (small scale), household composting, and in-sink disposal systems (maceration of food scraps, flushed through the sewerage system) (Mitchell 2001; Lundie & Peters, 2005; Adhikari at al., 2010). In a review of on-site composting of restaurant organic waste in the San Francisco Bay area, Mitchell (2001) describes increasing sophistication of available composting technology and an anticipated rise in landfill disposal fees as impetus for research on the relative economic, ecological, and social costs and revenues of on-site composting of restaurant organic waste. This study was conducted based on three methods of waste disposal (landfilling, centralized composting, and on-site composting) in two restaurants (whose waste generation data was collected and costs for collection/disposal compiled).

In the study, Mitchell hypothesizes that on-site composting is more ecologically and socially valuable and less economically valuable than landfilling organic waste.

Given that organic material is expected to compose an average of 74 percent of a restaurant's waste stream in the United States, it is reasonable to assume that where food scraps are used to generate a quality compost product, the use of that compost can render the production and application of synthetic/in-organic fertilizers and mined soil amendments (such as peat) unnecessary[17]. Thus ecological costs and revenues in Mitchell's study were determined through the valuation of "environmental externalities with regard to energy consumption, materials cycling and pollution generated and avoided" as they pertain to in-organic fertilizers. The GHG emissions from transportation of organic waste and methane emissions through landfilling were not discussed (p. 3). Mitchell ran a series of scenarios, discussing the economic, ecological, and social considerations of each disposal option.

Her findings indicate that the adoption of on-site composting by a restaurant achieved triple-bottom line goals; where on-site was in fact economically more valuable than landfilling in the long-term (as tipping fee costs rise). The social benefits are described as developing a culture of re-use rather than maintaining a throw-away approach to waste management. However, management was viewed as a significant constraint where more time and potentially money would be required for staff to maintain the on-site system so that it functioned effectively. That said, the on-site composting technology evaluated is that which allows for continuous loading of organic waste, such that organics no longer sit in waste bins for several days before collection. This was viewed as an opportunity to reduce odours rather than potentially creating an odour issue, which is often the assumption with on-site systems. A King County case study of on-site systems operating on commercial properties also discusses the fact that "in-vessel systems often have fewer odour issues than leaky dumpsters…" (King County, 2012 p. 2). While Mitchell's study failed to discuss space constraints and other potential limitations of composting on-site in a restaurant, based on a qualitative life-cycle

[17] With the caveat that a waste material must cycle back into its initial use and quality in order to close a material cycle (p. 12).

assessment approach, on-site was deemed the favourable option for organic waste management given the original hypothesis (Mitchell, 2001).

In a review of the challenges and benefits of in-vessel composting of food and catering waste, Pettitt et al. (2010) present a case study for a system operating at a large tourist attraction in the UK (Eden Project in Cornwall). Pettitt describes a system chosen as a part of a waste neutral program that fosters social responsibility of waste within the culture of their organization. Through significant staff involvement (from collection of food scraps, transportation to the system, weighing and inspection of each organics load, removal of contamination before loading, shredding of material, and washing of empty bins) the Eden Project processes 20 tonnes of food waste into 10 tonnes of quality compost product each year through the Neter 30 in-vessel composter. The final product is used back on their gardens as a growing medium and combined with their green (garden) waste to create a high nutrient mulch.

Initially, challenges were encountered with regard to finding an appropriate carbon source that would balance the high nitrogen food waste content (by adding dry material that also created a balanced pH) to create a quality compost product. This represents a challenge also experienced by composters operating on-site systems at schools in Vancouver (personal communications, September 18, 2012). Eden Project partnered with a local college to research and experiment with different feedstock combinations in order to arrive at a tried and tested feedstock, composting processes, and quality final product. This required a high level of knowledge, understanding of how the in-vessel technology works, and shared scientific expertise for the creation of a compost product that was best suited for use on the site (Pettitt, Bullock, Knight, Newton, Fuller, Orthodoxou, Smith, Massey & Griffiths, 2010). The Forks, a large tourist attraction in Winnipeg is a similar, Canadian example of on-site, in-vessel composting in a commercial setting. The Forks uses an on-site Biovator composting system to process food waste from its five full service restaurants, fifteen fast food merchants, seven fresh food producers and a hotel. Food waste composes 80 percent of the waste stream generated from The Forks (it is unclear what amount of this is processed through on-site composting) (The Forks, 2012).

Both The Forks and the Eden Project demonstrate the use of on-site composting of food scraps from multiple commercial food producers (vendors and restaurants) in locations that benefit from the use of the manufactured compost product on the site in which it is generated. The importance of technology choice, as it relates to successful on-site organics management (beyond the effectiveness of the technology itself) is best described by Practical Action (an organization that has evolved from the Intermediate Technology Development Group of the 1960's, discussed above). They state that:

> Technology choice begins with information. An informed decision demands an understanding of the needs a technology is intended to serve, knowledge of the options available, and of the techniques, skills and resources which are entailed in their adoption. Choice of technology also implies access to the tools, the techniques, the resources, knowledge and organisational capacity required for a technology to be adopted successfully (Practical Action, 2012 p. 3).

This concept of technology choice (stemming from Schumacher's original words and intent) is reflected in the findings within a recent Metro Vancouver study of on-site composting technology for multi-family dwellings. It points to where perhaps some of the Vancouver commercial examples, as discussed in findings below, have experienced challenges – where technology does not perform to the extent that the organization, site, and feedstock requires. Findings from the Metro Vancouver study identified that the key criteria for determining technology choice and the successful application for on-site composting in multi-family complexes included the following: the presence of a champion and/or volunteers to initiate and supervise on-site composting operations, and the establishment of partnerships if the final compost product cannot be used back on the property in which it is generated. With regard to the technology itself an understanding of the demands of the system is also a key requirement, including where the compost system is to be located (indoor or outdoors), the compost inputs (whether residents want to compost cooked food and/or raw food scraps), and the funding available to purchase a higher-tech (or low tech) system (Garden Heart Productions, 2012). These criteria also represent some of the findings from this study, which are discussed in the context of drivers for small-scale composting below.

In a trial conducted by Nemiroff and Patterson (2007), a number of small-scale compost bins (with a capacity of 4 cubic metres) were installed and then monitored in an

urban dog park in Montreal to try and capture the dog waste for on-site composting and learn from the implementation process. The purpose of the study was to determine the feasibility and efficiency of an on-site dog waste composting program, with the hope that a ten week trial would result in the implementation of permanent composting infrastructure. Indicators of success in this case were two-fold. First, that actual composting was occurring (i.e. there was enough waste and the composting process produced a usable end product), and second, that the public was participating, whereby the composters were being used and dog waste kept off the ground and out of the trash (year round). A factor that contributed to the success of the trial and continuous program was the presence of an active and engaged dog park committee (i.e. champions) who had a vested interested in their green space. As a result (and because researchers ensured appropriate proportions of saw dust was added with the dog waste to guarantee full and complete composting) odour, a real concern amongst participants, never became a problem. As a result of the project an estimated one tonne of dog waste, 140kg of sawdust and 7000 plastic bags is annually diverted away from landfill from just one dog run. The project is responsible for fostering an engaged community that operates nine composters in the dog park (Nemiroff and Patterson, 2007). This case study demonstrates a very specific example of innovative organic waste management that can be accomplished in an urban setting.

The above studies reveal some of the ecological, social and cultural costs and benefits and indicators for successful on-site composting in a variety of scenarios with the use of a variety of technologies. In a feasibility analysis (of a much more technical/scientific nature) Adhikari et al. (2010) investigated the economic and environmental impacts of promoting community composting (e.g. on-site/communal) and household composting (i.e. on-site/on-site) for the processing of urban organic waste (UOW). Processing at this scale is compared as an alternative to landfilling and against the projected costs of composting at a central facility in Europe and Canada. The study projects the growth of MSW and UOW to 2025 and analyzes this against current and projected waste management costs (along side the ecological costs of transporting and disposing of waste in landfill). Their findings, based on complex financial projections and assumptions, suggest that on-site treatment of UOW can lower waste management costs (in Canada) by 34 percent and reduce GHG emissions by 40 percent by 2025

(despite gas capture practices on landfill sites). Key assumptions include the following: the cost of landfilling waste (including collection and transportation costs) is approximately US$165 per tonne of MSW; composting at a central facility (CCF) costs 33 percent more in collection and transportation compared with landfilling because of increased collection requirements[18] (dependent on the location of the CCF compared to landfill); community composting centres (CCC) are estimated to process UOW at a lower cost, approximately US$118 per tonne because of time volunteered to operate the centre (p. 1047); the cost of purchasing home composters, promoting home composting within the community and training the community is estimated at US$42 per tonne; garbage trucks collecting and transporting MSW generate 25kg of $CO_2$ per tonne of wet UOW (p. 1047).

Adhikari et al. make projections for on-site composting (costs and benefits) of UOW for the cities of Paris (population density of 3400/$km^2$) and Toronto (population density of 2500/$km^2$), both of which are estimated to produce approximately 0.63kg of UOW per person per day. They indicate that in Paris the use of two CCC systems per square kilometre (including three 15$m^3$ in-vessel composters) and 438 individual home compost bins (400L) per square kilometre, in comparison to landfilling, would result in annual waste management cost savings of US$55,000. For Toronto the use of one CCC system per square kilometre (including two 15$m^3$ in-vessel composters) and 255 individual home compost bins (400L) per square kilometre, in comparison to landfilling, would result in annual waste management cost savings of US$58,000. Such on-site practices would also result in substantial GHG emission reductions from reduced collection and transportation requirements. While an interesting concept, Adhikari et al. recognize that the composting of even a fraction of UOW through such on-site practices poses momentous challenges, including but not limited to: ensuring participation (which is likely to require legislative and/or tax incentives), finding space for on-site composting

[18] A life-cycle assessment by Lundie and Peters (2005) indicates that centralized composting in Sydney Australia has a relatively poor environmental performance (compared against landfilling, home composting and house-hold in-sink food waste garburators) due to the frequency of food scraps collection required and the small quantities of green waste collected per household.

in highly urbanized and dense cities, and ensuring use of the final compost product within the city (to minimize transportation) (Adhikari, Tremier, Martinez and Barrington, 2010). While there is a great deal more to consider with regard to constraints and realistic management of the proposed on-site systems, they present an assessment of what is possible.

### *3.3.2. Small-Scale Composting and Local Food*

In a White paper entitled *Advanced Organics Management (AOM) and Local Food Systems*, Radlein et al., of Vancouver (2011) put forth a business case for what is described as decentralized AOM that departs from the linear waste management system and connects directly to local food production and neighbourhood scale energy production[19]. In essence, the proposed AOM system uses a variety of integrated technologies (anaerobic digestion, renewable natural gas generation, solar thermal design, low-tech composting bins within a greenhouse) to process source separated urban organic waste for energy production and a growing medium and nutrient input for local food production. The paper puts forth a case for a $12m^3$ capacity system, suitable for 52 households, with organics processing capacity of approximately 44 tonnes annually. The project is discussed as beneficial within the context of rising fuel, energy and food prices, and creating a platform for community engagement where "an interest in how food is grown can connect urban residents to the efforts of local food producers and the importance of the organic matter cycle to their personal lives and the local economy" (p. 4). From the perspective of solid waste and resource management, the benefits of the system are described as follows:

- Reduced waste hauling costs and distances with on-site processing
- Reduced fertilizer costs with the direct generation of high quality compost
- Input of energy into the market using district heat and energy channels

[19] The business case presents the economics of a semi-automated $6m^3$ digester and a basic $6m^3$ three-bin wood and mesh composter (for a total capacity of $12m^3$) enclosed in a greenhouse with user operated vents (Radlein, Bywater, Gell, Murcott, 2011 p. 10)

- Creation of local jobs and local businesses via the operation and maintenance of the system
- Building strong community relationships and awareness with regard to closed loop systems
- Sale of local food and value added food products via greenhouse productions

While this integrated technique for waste processing and energy and food production is new to North America, Radlein cites communities in China, India and the UK as having benefited from the decentralized systems for years. Radlein et al. suggest that moving toward the use of AOM systems will require a step-wise approach, beginning with a demonstration project to "build community support and optimize the technical processes for maximum efficiency" (Radlein, Bywater, Gell & Murcott, 2011). Given regional and City of Vancouver waste diversion and local food goals this concept presents potential to achieve both waste diversion and Greenest City targets. It offers an appropriate segue into the research findings discussed below, which describe urban food production as a key driver for small-scale composting.

# 4. Methodology

As discussed above, the purpose of the research project is two-fold: 1) to understand the broader waste management policy context at play within the Region and City and how policy has progressed in terms of implementation, and 2) identify small-scale and on-site composting operations in Vancouver to understand what is being achieved and what can be further built upon, and to use descriptions of small-scale composting, including impediments to their operations and establishment, to further a discussion about how organic waste diversion and Greenest City actions will be formulated and implemented. In short, this research examines the place and role of small-scale composting within the nexus of organic waste diversion *and* Greenest City outcomes. The City of Vancouver was chosen as the key study area due to the clear policy direction, goals, strategies and actions relating to organic waste management and its Greenest City objectives, and because a population of small-scale composting systems operating within the ICI sector in Vancouver was identified.

## 4.1. Soft Systems Methodology

A mixed, qualitative and iterative methodology was chosen for this inquiry into organic waste policy and small-scale composting systems. The study was guided by a Soft Systems theory and methodological approach. Soft Systems Methodology (SSM), founded by Peter Checkland in the early 1970's has, over the course of 25-30 years developed into a methodology that is described as an inquiry process – with the aim to bring about improvements in areas of social concern through iterative learning whereby many perspectives, beliefs and values are taken into account. This methodology was created in the breakdown or failure of "hard systems" engineering that resulted in the bifurcation of systems thinking - the two outlooks are now referred to as "hard" and "soft" systems thinking (Checkland, 1999, p. A6). The hard systems ethos is described as that which is best applied in circumstances where "the logic of the situation" is dominant,

rather than for situations “dominated by culture and meaning” (Mingers, 2000, p.742). Early work to test hard systems engineering as a declared framework found that it did not stand up when applied to systems or situations where no clear problem definition or objective existed. In short, SSM arose as a response to applying hard systems in social organizations (Mingers, 2000). SSM assumes the existence of a more fluid social world that persists and changes over time; research conducted under this methodology seeks interpretation and learning rather than optimization (Checkland & Holwell, 1998). Thus, where hard systems thinking is goal-directed in the sense that a particular study or task begins with a defined objective to be achieved (e.g. *how* can we transport garbage from urban households to landfill at a minimum cost?) (Checkland, 1981, p. 154); a soft systems approach uses an inquiry based process to first *identify* the problem and/or goal from which desirable and feasible actions can then be crafted. SSM can be characterized as the principle of method; it presents a cycle of learning that could be interpreted as steps, but is rather a process that may involve one or two aspects of the methodology, or go through the entire range in a way that suits the specific nature of a situation. Checkland and Poulter, (2006) suggest that the best way to learn about and understand the applications of SSM is to use it “however crudely… at first” (p.168). They summarize a broad account of SSM as:

> [SSM is] an action oriented process of inquiry into problematic situations in the everyday world; users learn their way from finding out about the situation to defining/taking action to improve it. The learning emerges via an organized process in which the real situation is explored… which serves to provide structure to discussion… (p. 22).

SSM uses the language of stakeholder perspectives and objectives that might not otherwise be captured through a technological or hard systems analysis. In the desire to apply principles of SSM to this study, the research goal in broader terms is really to create a rich picture of activities and actors connected to organic waste management in Vancouver and Metro Vancouver. Interview participants represent the informed opinion of multiple stakeholders as they pertain to food scraps as a problematic situation. Given this inquiry based approach, the following series of questions were explored through content analysis (mainly questions 1, 2 and 3) and a series of interviews with multiple participants with different perspectives (mainly questions 3 to 5).

1. What are regional and municipal organic waste diversion goals?
2. How will diversion goals be achieved (what are the pathways/strategies/timelines)?
3. What are the impediments to achieving organic waste goals as they relate to diversion and Greenest City outcomes?
4. How can impediments be overcome to allow for diversion and Greenest City outcomes?
5. What impediments exist with regard to the operation and establishment of small-scale composting systems within the City of Vancouver?

## 4.2. Study Population and Area

The participants who contributed to the findings of this study include public sector policy planners and professionals, waste management professionals, consultants, experts and thought leaders (identified as Group One) in the field of organic waste management. Individuals and organizations managing small-scale composting systems within the ICI sector were also interviewed (compost practitioners/managers - identified as Group Two). While there are a number of organizations and individuals operating small-scale and on-site composting systems in the Metro Vancouver area, Group Two includes all of those who could be practicably identified as operating systems within the business and institutional sector in the City of Vancouver, including one system operating at the University of British Columbia.

All participants are members of the waste management community and many are also connected to local food policy and practice in the City of Vancouver. Participants were identified through preliminary research, which helped to determine prominent voices and figures in organic waste management in the City and Region. Many were identified as speakers at Metro Vancouver Sustainability Dialogue and Sustainability Breakfast sessions, and City of Vancouver GCAP community engagement events (relating to waste). Further participants were identified during informational interviews. While high level, public sector waste managers were initially identified as potential participants, informational interviews revealed that public sector staff rather than managers with both the City and Metro Vancouver were better able to address research

questions relating to small-scale composting and higher level policy implications of organic waste management, and were more readily available for interviews.

All participants were initially contacted via e-mail, and all contact information was obtained through publicly available websites (no contact information was received during/from informational interviews). The study involved semi-structured interviews conducted with all participants in person (only one was conducted via telephone). A more structured series of questions was posed to the compost practitioners relating to their systems and operations that would not have been applicable to Group One. As per SFU Office of Research Ethics protocol, all participants were provided the study details and a consent form to participate, including the purpose and the voluntary nature of the interviews and the option to remain anonymous. Most interviews were audio taped with the permission of the participant. Only one interview participant asked that their name and organizational affiliation remain anonymous, while others preferred just their names to remain anonymous but were fine with the mention of their organization. Twenty-seven interviews were conducted in total, however not all resulted in information that was relevant to answering the research questions. Data from 21 interviews is directly referred to in this study (as outlined in Appendix A).

It should be noted that while a majority of interview participants consented to have their name/organization attributable to their comments within the study, most are referred to based on date of interview only. Some participants asked that specific comments or quotes remain anonymous, which is cited as such within the findings below. This was done based on personal preference and does not affect the quality or nature of the findings.

## 4.3. Data Collection and Analysis

### *4.3.1. Content Analysis – Phase One*

Data collection was conducted in an iterative, inquiry based manner beginning with content analysis. A myriad of documents were reviewed to gain an understanding of the actors, ideas and structures in place and at play with regard to organic waste

management and policy at the regional and municipal levels. Documents reviewed are as follows:

- Provincial regulation, including Organic Matter Recycling Regulation and to a lesser extent Recycling Regulation
- Regional policy documents, strategic plans, bylaw documents and Waste Committee meeting minutes including: the ISWRMP, the Regional Food System Strategy, the Regional Organics Strategy, Bylaw 181 (MSW and Recyclable Material Regulatory Bylaw) and Amending Bylaw 272 (for new disposal facilities including "pilot scale trials and facilities"), the Zero Waste Challenge document, Zero Waste Committee meeting minutes, Future of the Region Sustainability Dialogue documents and Issue Papers (e.g. Solid Waste Regulatory Program Review)
- Municipal policy documents and reports, Council reports and minutes, RFP documents, and the City website. Specific documents included: the Bright Green Futures Report (prelude to the GCAP), the GCAP and Talk Green to Us website, and Council reports dating back to 2009
- Newspaper articles and blogs as they related to organic waste management in the Region

Content analysis, in conjunction with the literature review allowed for the identification of potential interview participants and creation of interview questions.

### *4.3.2. Informational Interviews – Phase Two*

With the review of multiple policy documents as the first phase of this research study, as outlined above, it became clear that policy is moving in the direction of including small-scale composting as a mechanism to increase food scraps diversion. It was unclear however, how this would be implemented and where the community (or policy subsystem) was at, spatially and temporally, with regard to implementation of small-scale systems.

As discussed above, where a soft systems approach uses an inquiry based process to identify the problem and/or goal, the purpose of the informational interviews was to understand, from multiple perspectives the issues surrounding food scraps management and diversions. This included what small-scale models were emerging in the community, what role they played and how these systems may or may not be integrated into the proposed and developing organics systems. In essence,

informational interviews were used as an opportunity to build an appropriate inquiry – to ensure the most suitable questions were being posed to the appropriate people and ensure that the participants saw value in the research endeavour. Five informational interviews were conducted with two City of Vancouver staff (planning and engineering), a soil scientist/mid-scale composter, a Vancouver-based waste, recycling, and organics hauler, and a local compost expert/teacher/consultant. Interviews for this group were open-ended and aimed to understand their unique perspective (and background) with regard to organic waste management including their thoughts on and the potential for small-scale composting in the City.

These interviews composed the second phase of the research process and were conducted over a four week period. Once complete, interview transcripts were reviewed and mined for questions that would be posed in the next phase of interviews (e.g. where interviews had revealed missing information based on the content analysis and where participants directly posed a question about policy and/or practice). The questions were categorized based on whether they were policy or practice related (for Group One and Group Two). With a broader understanding of the policy actors (who) and ideas (how to go about organics diversion), and a greater sense of the policy and practice gaps, more interview participants were recruited.

### *4.3.3. Semi-structured interviews – Phase Three*

#### 4.3.3.1. Policy Professionals

The purpose of the policy interviews (with professionals described as Group One above) was twofold. Foremost, policy professionals assisted to fill in the gaps in the organic waste policy framework (e.g. regulatory authority, applicable bylaws, and phase of policy formulation and/or implementation) and to identify further documentation required for review in this regard. This information helped to answer *how* diversion goals would be achieved. Second, interviews were conducted to begin to identify *what* impediments to achieving diversion goals were, or were likely to be, which in turn pointed to drivers for small-scale composting (to be further explored with small-scale operators). Interviews with this group were important to further refine the research

problem/goal, identified as the nexus of diversion and Greenest City outcomes, as interview results began to reveal options for achieving both.

Policy interviews were conducted with approximately eight individuals, five from Metro Vancouver and the City of Vancouver, one consultant and one academic (who had also managed an on-site system) in the field, plus two individuals closely connected to the Vancouver urban farming/local food movement. These interviews were conducted during the same time period as those with compost practitioners and done in an iterative manner, such that additional interviews were sought where new information and/or gaps were uncovered. Interview questions were semi-structured and related to the policy information that required clarification but were also designed to gain an understanding of the impediments that exist with regard to achieving organic waste diversion goals and, as above, sought also to understand the participants perspective with regard to the potential for small-scale, on-site composting.

#### 4.3.3.2. Compost Practitioners

Interviews with compost practitioners were conducted to create a qualitative description of the examples of small-scale composting systems (processing food scraps) in Vancouver. This was done to determine the types of technology being used, how systems are being managed and by whom, the diversion potential and how they connect to Greenest City outcomes (mainly local food, education and emissions reduction). In short the interviews aimed to understand the actors, ideas or drivers, and structures/resources in place that help describe the role of small-scale operations. Interviews of this nature were also conducted to uncover the impediments that exist with regard to operation and establishment so as to inform further policy development. This seemed especially pertinent given that models for communal organics management are starting to emerge whereby food scraps are collected from multiple sites to be processed in an on-site manner within the City.

Approximately fifteen small-scale operators/practitioners were identified to be interviewed for the purpose of this research, including a mix of systems operating in the MF and ICI sectors. In the end eight small-scale examples were included within the findings. Only those composting food scraps and not just yard/garden waste were included in the study. One MF dwelling did not respond to an interview request and

others were found to be inappropriate for the purposes of this study. For example, two downtown grocery stores were identified to be using food scraps processing technology that discharge food waste into the sewerage system after converting it to a slurry. In addition, three others were interviewed but did not produce significant findings. For example, residents in one MF dwelling in downtown Vancouver are composting food scraps on their rooftop with two small backyard composting systems. However only a few residents were participating and the composter itself was not performing well. An interview was conducted with the Executive Director of Mole Hill (community housing society, in the West End Vancouver), however they were in the process of replacing their composting system; the new one was not yet operational. A tour of the UBC Wright in-vessel system was conducted (along with an interview with the manager of that system) but it was clear that it presents a very different model for on-site composting. The system is substantially larger than the others observed (with a current processing capacity of 350 tonnes per year and diversion potential of approximately 1300 tonnes). It has substantially higher capital and operating costs and employs 3.5 full time staff to operate the system, including collection of food waste via pick-up truck (five days a week) from over one hundred buildings on campus (including MF residential buildings and university buildings/offices).

Compost practitioner interviews were the most structured out of the three groups - all participants were asked the same 20 questions (as outlined in Appendix B). While it was the intent of this study to capture some quantitative data, due to the nature of the small-scale operations (managed in partnerships and/or by volunteers) very few participants capture data with regard to input and output weights, diversion percentage, and cost savings. Most of the data is of an empirical nature and in most cases is estimated. Transcribed interview results were compiled into tables for each question/response, such that answers could be mined for common themes and compared across systems. A high level summary is provided in the findings below. One interview stood out over the others based on the system type and the regulatory process for establishment. This interview is presented as a more detailed case study as it provides valuable insight into the regulatory reality of composting food scraps (coming from multiple sites) in the City.

Two supplementary interviews were conducted to fill in information gaps about the role of small-scale composting in urban agriculture/farming. For example, one interview offered the perspective of an individual who has gone through the regulatory processes of establishing small-scale composting as the proprietor of a small-scale technology (designed to close food system loops through food scraps processing). This information feeds into regulatory impediments in terms of the establishment of on-site/communal composting systems but may also be referenced with regard to drivers for small-scale composting. These interview participants were considered policy professionals as they contributed to an understanding of the bigger picture issues at play.

# 5. Findings

The following provides an outline of findings from all interview groups and where appropriate includes information found through content analysis. Information from approximately twenty one (of twenty seven) interviews is directly referred to below, and is presented in a manner that aims to outline the perspectives and opinions of many different actors with respect to policy, regulation, practice and impediments for both large and small-scale composting operations.

## 5.1. Setting the Scene (Informational Interviews)

The review of multiple regional and municipal policy documents, as outlined in Section 2, comprised the first phase of this research project. Informational interviews were conducted as a second phase, to further set the scene with regard to how waste goals would be met, to uncover some of the nuanced aspects of the organics industry, and create a platform for further inquiry. Interviews conducted with City of Vancouver staff (from an engineering and planning perspective) and other waste professionals revealed different perspectives, comments, questions and concerns around issues relating to the current large-scale organics diversion system, drivers for small-scale composting, questions relating to how small-scale operations would or should be regulated, and different ideas for integrating small-scale operations within a broader organics management system. The following offers a summary of key informational interview findings, which led to a closer examination of the existing impediments to organics diversion and drivers for small-scale composting.

Initial interviews with two City staff (an engineer and a zero waste planner in the engineering department) were conducted to understand information gaps, as the City perceived it, with respect to small-scale and on-site composting. Interviews made clear the shorter-term priority of the department to develop a food scraps collection model for

the MF sector (which at the time of communication had not been discussed in Council reports and was suggested in interviews to be completed by the end of 2012). In developing this strategy it was stated that the engineering department is cognisant of the fact that a large-scale collection/processing model (as with garbage collection) is "a one size fits all solution" that may not be appropriate for all MF dwellings and ICI properties in Vancouver. In addition, from a planning perspective, it was communicated that the City was grappling with issues around their jurisdiction relating to the management of commercial waste and the ability to mandate food scraps recycling for a sector that does not receive City waste services (personal communications, March 5, 2012). In striving to develop a collection strategy (which now also includes the commercial sector), to be brought to Council for approval in a timely fashion the City was unclear as to how small-scale composting systems could be integrated to allow for the food waste diversion they need to achieve. It was communicated that clearer understanding of options and models for small-scale and on-site composting was needed (e.g. technology available, program implementation models, waste composition studies and communication plans). Missing information also included an inventory of how local scale could be integrated with centralized operations and what other cities were doing in this regard (personal communications, March 13, 2012).

It should be noted that since the March interviews several research and pilot projects evaluating and implementing on-site systems have been initiated in the Region (some by the regional government), which all member municipalities are hoping to learn from (personal communications, February 13, 2012). By both accounts, the City is clearly operating in new territory regarding both large and small-scale organics collection and diversion (e.g. strategy implementation and formulation); with few readily available examples of how other cities are mandating/regulating/integrating composting at a smaller scale in conjunction with large-scale operations (at least to the level of detail required by the City at this time). That said, interviews with a local organics waste hauler and compost expert/consultant revealed multiple examples of small-scale systems operating throughout the Region in small MF dwellings and businesses and institutions (Vancouver specific operations are captured within this study).

When asked how interest in organics waste collection and recycling has changed over the past two years, Vancouver based waste/recycling hauler, Louise from Recycling

Alternative stated that growth (i.e. increased collection) has ramped up around food specific businesses (e.g. restaurants and convention centres that produce large amounts of food scraps requiring daily collection). However, office workplace collection is difficult considering such small quantities of food waste are produced; regular collection to ensure odour minimization becomes costly. From a collection/hauling perspective, voluntary diversion of food scraps in MF dwellings has been slow and represents a difficult sector to tackle due to the potential for contamination and non-compliance. Haulers in general are hesitant (within the MF sector) as contaminated organics loads can be refused by regional composters and sent to landfill. Having just begun collection at a MF building in Yaletown, Louise stated this has required an engaged strata council and a champion within the building, pushing for organic waste diversion (and willing to educate residents). She cites poor recycling rates in MF dwellings as cause for concern, especially given recycling programs (e.g. blue box recycling) have been in place for 20 years. These circumstances demonstrate the need for a more informed resident base before requiring the separation of food scraps for recycling in MF residences (personal communications, March 3, 2012).

As an interim food scraps collection/diversion option, Recycling Alternative spearheaded the Food Scraps Drop Spot – an innovative model designed to capture compostables generated from what Louise refers to as “multi-unit residential buildings”. This model represents a mechanism to engage and inform residents on proper food scraps recycling practice (e.g. tactics to reduce odour) and has created a visible alternative for organics waste management within several neighbourhoods in Vancouver.

Through the acquisition of a Greenest City Neighbourhood Grant (City of Vancouver), Recycling Alternative (with the Vancouver Farmers Markets) manages the collection system with a group of volunteers. Through this model, “droppers” bring their food waste (generally once per week for each site), which is monitored for contamination, and are asked to donate $2 per drop for the service. The initial drop spot was co-located with the West End Farmers Market for three months (summer 2011) and collected 5 tonnes (11,000 pounds) of food scraps from MF residents over that period. Recycling Alternative provided weekly collection and transport of food scraps to a regional composting facility. As a result of the success of the initial drop spot, the

program was extended for another 10 months (Sept. 2011 to May 2012) resulting in an additional 5,000 drops and the diversion of 23 tonnes (50,000 pounds) of food scraps.

Since May 2012, a number of new drops spots have been created, funded through Greenest City Neighbourhood Small Grants (generally less than $1000), whereby collection and transportation was done weekly from multiple sites by Recycling Alternative. A total of five drop spots were operating from June 2012 (to early Fall, and some ongoing) at the Olympic Village, the West End Community Centre, the Main Street Farmers Market, the Trout Lake Farmers Market, and the West End Farmers Market[20]. According to reports from Recycling Alternative, not only was this model for organics waste diversion embraced by apartment dwellers it also fostered a community of informed citizens and offered a platform for education and awareness raising that naturally (over time) led to an increase in voluntary participation. Louise states that "when people make the effort [to separate food scraps for composting] they start to understand what is required to comply, including what waste can go in, what stays out and how easy it is, which could also result in a much more engaged constituency. A more informed constituency may result in an easier transition to MF organics collection" (e.g. preventing contamination and getting buy-in) (personal communications, March 3, 2012).

The Drop Spot model represents a form of local-scale composting that is relatively straightforward due to the fact that organics (collected locally) are transported to a regional facility for processing. If the food scraps, coming from hundreds of households and apartment units, were to be composted within the City (either on-site or in a neighbourhood system), then the system would become much more complicated. All of the informational interview participants cited "unknown" issues relating to the health and regulatory implications of small-scale on-site composting systems as a concern. In an interview with soil scientist and large-scale composter John, he suggests that as we start to see the expansion of small-scale composting operations into MF and

[20] As of October 31, 2012, over 82,000 pounds (more than 37 tonnes) of food scraps have been diverted from landfill through this model (Food Scraps Drop Spot, 2012).

ICI scenarios the need for regulation with regard to compost quality becomes more important. Issues of quality are especially acute given a scenario where unmonitored food scraps are coming from multiple different dwellings not simply from one household into a backyard composter.

The use of composting systems that can ensure potential pathogens are destroyed is an important aspect of creating a healthy, quality compost product. Further to this point, one Metro Vancouver staff person suggested that health risks may dictate the suitability of a small-scale composting system and the type of technology chosen for processing based on expected feedstock/inputs. For example, in MF buildings it is difficult to maintain control over contamination; in particular the entry of unwanted materials, such as dog waste, could create health risks unless technology that guarantees the elimination of pathogens is employed. On the other hand, when you have businesses participating in on-site composting, they generally have a consistent feedstock and can train staff to manage that feedstock; on-site or neighbourhood scale composting might then make more sense (personal communications, August 14, 2012).

John went on to explain that the current drive for small-scale composting (including backyard and community scale) is largely due to the need to divert increasing amounts of waste from landfill. The push to increase the regional organic waste diversion rate has resulted in little regard for how and where the end compost product will be used. What he suggests is missing from the debate is concern for the creation of healthy soils. Healthy soils are a key aspect of a healthy food system and relates directly to the health of communities (personal communications, February 16, 2012). This sentiment (the creation of good soil/amendment) was later echoed by a City staff member when asked how local scale composting can contribute to Vancouver local food goals and targets (personal communications, September 24, 2012). Health implications, with regard to an appropriate level of regulation for small-scale systems were also discussed by a compost expert/consultant, who suggested that the operation of indoor, in-vessel composting systems can have adverse air quality and thus health risks. Also, where compost technology is not understood and properly managed this can lead to the creation of a questionable compost product (personal communications, February 13, 2012). In discussing these specific health concerns (citing need for regulation) five informational interview participants were unsure as to the level of regulation that should

apply and under what authority. That said, three of the interview participants suggested that, based on the level of knowledge and time required to manage even small-scale systems, composting operations, whether in a business, institution, MF or community garden scenario should be properly managed by a trained professional and funded through a paid position. The same three suggested that if residents (who are also employees and business owners in the community) can see composting systems in action (whether tied to community gardens, urban farms or district energy) and understand that by separating food scraps for composting they are contributing to a closed-loop sustainable system, then there is likely to be greater buy-in at the local level. And this buy-in may also translate to greater forgiveness when operational hiccups, such as odour issues occur (personal communications, February 13, 2012; February 16, 2012; March 3, 2012).

In short, informational interviews made apparent the key concerns and unknowns around both large and small-scale composting operations, largely related to health and regulation. This phase of research also revealed a key benefit and/or driver for small-scale systems being that of direct, citizen engaged education and awareness raising opportunities and the potential benefit of demonstration sites where citizens can see their organic material used as a resource. The benefits and barriers of different models for on-site and neighbourhood scale composting were also discussed during informational interviews (e.g. the food scraps drop spot, and composting at community gardens, school and community centres). These are presented as examples of what can be expanded upon to allow for different types of small-scale composting, as mentioned in the recommendations section below.

## 5.2. Impediments to Small-Scale Composting

Interviews with policy professionals were conducted in order to fill in gaps where policy and regulation was unclear (at the regional and municipal level). These pointed to impediments to achieving organic waste commitments and goals as they relate to waste diversion and Greenest City outcomes. The following section outlines and describes the different impediments as identified through approximately eight policy interviews (three of which focus on impediments to small-scale composting discussed further below).

This section also combines findings from content analysis to further explain the impediments. These findings discuss both regional and municipal issues generally related to large-scale diversion, as interviews demonstrate that this is the priority focus for both levels of government at this time. Impediments that relate to on-site composting specifically, or interview findings that point to shortcomings within specific City policies, will be discussed separately after findings from small-scale compost practitioners.

### *5.2.1. Processing Capacity*

A key challenge within the Region has been to ensure infrastructure is in place to manage compostables within the allotted time frame to achieve targets. A review of The Recycling Market Study conducted for Metro Vancouver (EBA, 2012), in conjunction with findings from several policy interviews, indicates that regional capacity for large-scale processing of municipal food scraps is growing (e.g. the cities of Port Coquitlam and Surrey are in the process of developing large-scale facilities). However, growing capacity does not necessarily result in adequate or secure capacity as we approach 2015. While the Zero Waste Committee (October, 2012) suggests that projected capacity is expected to accommodate additional diversion of organics (265,000 tonnes annually), there remains uncertainty regarding whether the proposed facilities will become operational (p. 137). The Recycling Market Study lists several barriers to the establishment of new large-scale processing facilities, including: the high cost of commercial and industrial lands which makes it difficult to site facilities close to residential areas; start-up costs that require considerable capital investment; competition for new operators in a market with established facilities that have additional capacity and established customers and connections to private and public players; and the ability to sell the end compost product (EBA, 2012, p.44)

The process through which facilities are sited, permitted/licensed and ultimately approved for development is lengthy and complicated and there are multiple regional factors that could change capacity needs and demands over time. For example, an interview with an enforcement officer at Metro Vancouver suggests that capacity issues can be more hindered by NIMBYism (not in my backyard mentality) than by the actual licensing process. Municipalities within the Region can veto the final location of a

prospective food scraps processing facility; the willingness to accept such a facility can be hindered or helped by a municipality's knowledge of composting and the type of system/technology proposed (personal communications, July 16, 2012). It could also be said that the ability to site future facilities will be impacted by the performance of existing facilities, especially in relation to how large operations manage odour (personal communications, February 16, 2012). For example, Fraser Richmond Soil and Fibre, one of two key food scraps processors operating within the Region has received an increased number of odour complaints this year from residents in Richmond as well as in Burnaby, New Westminster and Vancouver. Metro Vancouver is investigating the exact source of the odours to find ways to assist the facility to fix the problem and to ensure diversion continues through this large-scale operation. While Harvest Power (the operating company) is sure that the commissioning of their new anaerobic digestion facility will help reduce odours (Carman, 2012), it is possible that extended odour issues could impact the ability of this facility to receive and process food scraps to their full capacity. This challenge reinforces the need for a diversified organics processing infrastructure in the Region.

In an interview with a Metro Vancouver staff person, she states that while regional composting capacity is coming along, there is still a place for small-scale units, including backyard and on-site composting. She cites studies conducted by Metro municipalities (including the NSRP referred to above) on backyard composting which found that the capacities of those processing methods are underestimated. Backyard composting could have an impact on whether there is enough regional capacity because if everyone decides that curbside collection (through green bins) is easier than backyard composting, then the required capacity (for collection and processing) could increase. In this regard she suggests that some see backyard and on-site composting as an opportunity to divert real numbers, and it is important to continue advocating and promoting composting at this scale (personal communications, March 28, 2012). On the other hand, several other interviews suggest that regionally no one is viewing small/local scale systems as displacing a large amount of organics (personal communications, September 28, 2012). For example, one participant suggested that those overseeing infrastructure development view small-scale as "a nice thing that people do on the edges" but when tasked with diverting 265,000 tonnes of organics within the Region,

small-scale is not a high priority. The priority is to get organics out of the waste stream that is destined for landfill. Furthermore, this interviewee believes that we don't have the government signals yet to encourage green enterprises to create innovative waste management practices within the Region (personal communications, August 14, 2012).

Further potential impediments to capacity building relate to geographical locating of large-scale processing facilities within the Region and thus the transportation costs for hauling organics (personal communications, September 28, 2012). For example, if there is no large-scale processing infrastructure in the eastern part of the Region, or easy access to a facility for North Shore municipalities then this could drive organic waste producers, specifically grocery stores and food based businesses that generate large volumes of food scraps, to look for local alternatives. The spatial development of systems may affect capacity in terms of the required and expected feedstocks entering large-scale operations (personal communications, September 28, 2012). Organics processing capacity as developed by the private sector is expected to adequately service the increased collection of MF and ICI organics, however this continues to be monitored at the regional and municipal levels and will continued to be influenced by other factors, including those discussed as follows.

### *5.2.2. Collection and Hauling*

The collection and hauling of organics to large-scale facilities is subject to scrutiny by Metro Vancouver and its member municipalities for a number of reasons. Transportation of organics presents a number of potential impediments for large-scale operations that relate to the logistics/efficiency of hauling and to issues of authority and the regulation of haulers. Collection and hauling is also directly connected to the cost of organics recycling and ties into issues of capacity (e.g. enables feedstock to reach processors). Currently, according to a Metro Vancouver staff person, the capacity in the Region for hauling organics is building, but it's expensive and fairly inefficient in that regional haulers have "free-reign" to collect from anywhere and dispose of waste at a facility/transfer station of their choosing (personal communications, March 28, 2012). A Vancouver-based consultant and organics expert echoed this sentiment in stating that as we work within regulatory requirements (e.g. the 2015 organics disposal ban) a large

market for organic waste collection/hauling is emerging, which means a number of haulers are wanting to capture that market. She also stated that a free market collection system is not efficient if an increasing number of organics haulers are collecting waste from wherever they choose (personal communications, September 28, 2012). Efficiency issues relating to lack of route density management (and perhaps lack of franchising or regulating collection/haulers) raises issues with regard to the distances travelled and the subsequent cost of hauling. As will be discussed below, the tipping fee differential creates the cost differential between garbage disposal and organics processing and hauling adds to this cost. Collection costs directly affect the ability of businesses or MF buildings to pay for the removal of a third waste stream (assuming garbage and recyclables are already being hauled separately), which in turn affects the ability to divert organics within the Region (personal communications, March 28, 2012; September 28, 2012).

Several interview participants view the ability to franchise waste haulers as a tool to lower the costs associated with hauling waste (including all waste streams) by reducing the number of haulers and increasing route efficiency. However, the authority to manage a hauling system through this mechanism is unclear. One Metro staff person suggested that municipalities have the greatest power for franchising haulers, whereas Metro Vancouver has control with respect to where haulers go (e.g. transfer stations – to direct the flow of waste in the Region). For example, in the same way that some municipalities contract haulers for the collection of waste from SF residents (or recycling for MF residents), the same could be done for the collection of organics from MF dwellings and/or businesses. This could be done on a territory/collection zone basis, allocated to several haulers, increasing efficiency, reducing costs, and tracking where loads come from, which could be a benefit to overall regional recycling and composting. However, this would likely require more staff and management/time at the municipal level where many are already struggling to manage current collection systems (personal communications, March 28, 2012). Also, there remain issues regarding authority and how a municipality goes about limiting the number of haulers allowed to operate within their city. A suggested downside of franchising is the potential implications (e.g. discouraged use) for small-scale composting systems operating in hauler collection zones (personal communications, June 19, 2012).

An enforcement officer at Metro Vancouver indicated that the franchising of waste haulers has been looked at from both a municipal and regional perspective. He stated that Metro Vancouver has the authority to control the number of haulers and this is something that is being considered in the new bylaw (amendments to bylaw 181) as hauling affects the flow of waste in the Region (personal communications, July 16, 2012). It should also be noted that it is believed that some ICI and MF residential waste haulers are now by-passing regional facilities and delivering waste for disposal to private landfills outside of the Region. One report suggests that up to 50,000 tonnes of waste per year has shifted to private, out of region facilities (Nagel, 2012). Currently it is unclear what form the regulation of haulers will take, though this is likely to include a bylaw that requires haulers to use regional disposal facilities (Metro Vancouver, 2012a). However, whether this will address issues of inefficiency (e.g. reduce the number of haulers in the Region) and reduce collection costs in a manner that is consistent with the organics ban is uncertain.

In only one policy professional interview was the issue of emissions related to inefficient, large-scale collection and transport discussed. While carbon emissions generated from the disposal of food waste in landfill is considered a key driver to keep organics out of landfill, a Metro staff person indicated that no one appears to be undertaking the carbon accounting for hauling food waste around the Region (personal communications, March 28, 2012). This is despite the fact that reducing GHG emissions through reduced trucking of organic waste is considered a key driver for small-scale composting (as has been demonstrated above and is further discussed below). Clearly franchising and other forms of regulating haulers is an area of policy development being contemplated by the regional government, however there remains only two years before initial diversion targets are to be met. The affordable collection and processing of an additional 265,000 tonnes of organics each year is key to meeting targets (EBA, 2012). From a systemic perspective, policy interviews suggest that an efficient and cost effective organics collection system is an important piece for enabling increased organics diversion and if not managed appropriately could impede the ability to achieve diversion targets.

### *5.2.3. Policy Influences (organics ban and enforcement)*

As discussed in the outline of the two policy documents above, there are several policy mechanisms (e.g. tipping fee cost differential, bans and bylaws) in place and in development that are set to help drive regional organics diversion. The tipping fee differential between organics processing and garbage disposal was described by one Metro staff person as the number one policy tool being used at the regional level (personal communications, July 16, 2012). The disposal fee for garbage, currently at $107 per tonne (and $63 per tonne for organics) is projected to reach $182 per tonne by 2015. Tipping fees are expected to drive increased organics diversion and provide organics feedstock to composters (EBA, 2012). However, several interviews revealed that the current cost differential does not create enough of a difference to make hauling of three separate waste streams (garbage, recycling, and organics) cost effective, at least for businesses (personal communications, March 28, 2012; September 28, 2012). This has resulted in composting facilities that have capacity but are struggling to receive feedstock (personal communications, September 28, 2012). What's more is that the Zero Waste Committee has actually changed the tipping fee bylaw to reduce the cost of garbage disposal by two dollars, down to $105 per tonne for 2013 (Metro Vancouver, 2012a). This has been done in response to haulers sending waste to private landfills outside of the Region in order to avoid increasing tipping fees and regional disposal bans; thus avoiding paying their fair share of the costs to manage the regional waste management system, including implementation of waste reduction and recycling initiatives (Metro Vancouver, 2012a, p. 9).

The phasing in of an organics waste ban is also viewed as a significant policy driver. When asked what enforcement of this ban will look like, one Metro staff person indicated the word "ban" (as it might be perceived) was perhaps misused. The ban will essentially result in the ramping up of surcharges (on top of tipping fees) for waste that contains banned materials when delivered to disposal sites/transfer stations (personal communications, July 16, 2012). Because Metro's mandate is centred around disposal facilities and transfer stations, enforcement is bound to checking trucks that enter these sites. In this scenario, penalties related to non-compliance of the organics ban will not necessarily affect the offender but rather target the waste hauler (personal communications, August 14, 2012). One interview participant (consultant/organics

expert) says that there is thought going into how to target the ban at different scales of organic waste generation. For example, it is with the large-scale organics generators, such as grocery stores and large restaurants that enforcement can be targeted at the beginning, which should coincide with education. She states that it is true that once you get to the trucks with sealed black garbage bags of waste (potentially containing organics) then it becomes difficult to enforce (though not impossible). Enforcement is also about how "you chase offenders up the milk run" – you have to rely on the hauler knowing where they went before dumping because the hauler will be the one to receive the fine and will want to send the message up stream (but not in a way that might cause their clients to look elsewhere) (personal communications, September 28, 2012). The extent to which fines will be traced back to offenders is uncertain, which suggests that the extent to which behaviour will be affected is also uncertain.

A Metro Staff person indicated that at the municipal level there is no implementation and enforcement model yet (e.g. how they will enforce and what the cost structure for this will be) as it pertains to ensuring organics stay out of landfill. From a municipal perspective, when asked about the regional organics ban, one City staff member stated that ultimately Metro is responsible for enforcement. Thus, as the City of Vancouver develops collection strategies (for the MF and ICI sectors), one option for enforcement is to do nothing and hope that the ban works such that haulers take responsibility for ensuring their garbage loads are free of organics. This option will require heavy enforcement by Metro Vancouver, including spot-checking haulers and applying fees and fines for those who are not ensuring their customers are following the ban. In the options for food scraps collection (for the MF and ICI sectors) that the City of Vancouver is researching, how to educate and engage residents, as well as how much enforcement is required, is being taken into consideration, including the implications of each. With regard to enforcement however, the City is currently unsure of the level of authority they hold under the Vancouver Charter[21] (at the time of the interview this was

[21] For example, it was suggested that the City may not be able to require residents and businesses to source separate their organic waste unless the City provide (or contract out) an organic waste collection service (personal communications, June 19, 2012).

under research). If the Charter allows enforcement authority then the question becomes, how do you enforce source separation of compostable waste in 5000 MF buildings, and countless businesses city-wide (personal communications, June 19, 2012)?

There seems to be a lack of clarity as to how the ban will be enforced and the exact role that the Region and municipalities will play. Regardless of the shape enforcement takes one interview participant stated that there has to be a certain uniformity in terms of how the ban is implemented, which means having enough staff to monitor waste but also ensuring there is buy-in (e.g. a culture of source separation) by waste generators (e.g. MF and ICI) (personal communications, September 28, 2012). All in all, there are several factors that may impede the ability to successfully enforce the ban, and ensure an adequate tipping fee differential to drive the diversion of compostables through policy mechanisms. Poor recycling rates within the MF sector (and to some extent the ICI sector), as described above, stand as a huge impediment to achieving compliance (also indicated in content analysis and informational interviews). This is discussed below with regard to drivers for small-scale composting.

### *5.2.4. Compost Quality and End Market Use*

Compostable organics are processed into a variety of products in the Region, including soil amendments and mulch, with over 350,000 cubic yards (268,000 cubic metres) of "compost blended products" sold in Metro Vancouver each year. The retail price of compost products varies widely, from approximately $7.65 per cubic yard (approximately $10 cubic metres) for City of Vancouver compost (generated from yard trimmings) to $29 per cubic yard for a general compost product and up to $55 per cubic yard for a high value blend (costs are reduced when products are purchased in bulk). It is suggested that bagged specialty products (high quality and high nutrient content), such as worm castings and Sea Soil sell at an average retail price four to five times higher than that of a high value blend. As organics diversion increases in the Region so will competition for composters. The Recycling Market Study indicates that:

> The demand for higher quality compost is likely to grow and there are niche market opportunities for compost with higher nutrient and microbial

> value, as by demand of a growing number of organic farmers. Consumers are increasingly interested in local, sustainably grown food and growth in organic food production has the potential to further increase demand, especially for higher value compost (EBA, 2012, p. 47).

The need for a quality soil amendment for use in urban food production is identified as one of the key drivers for small-scale composting (personal communications, September 28, 2012).

An overabundance of nutrients (i.e. organic material for composting) in the Lower Mainland is described as adding a layer of complexity to the developing compost industry/market. A growing population, limited landscape for the application of compost, and an increase in intensive farming has resulted in an overabundance of nutrients in the form of agricultural manures, biosolids (from the regional sewerage system), and an increasing amount of pre and post-consumer food scraps (EBA, 2012; personal communications, September 28, 2012). EBA's Recycling Market Study suggests that while the value of compost is recognized within the Region there are barriers/impediments for the use of regionally produced compost products. A Metro Vancouver enforcement officer stated there is not yet a huge demand for compost products being generated in the Lower Mainland (in comparison to places like California), despite increasing supply, due to an abundance of nutrients and high level of rain (e.g. perception that compost is not needed for moisture retention) (personal communications, July 16, 2012). Further interviews suggested that there is concern from landscapers and urban farmers with regard to the quality of compost that they would be receiving from regional facilities[22], which was confirmed by one urban farm

[22] Landscapers are a major buyer of compost products in Metro Vancouver and for those who use products in bulk (delivered directly from regional composters), they state that while they find products consistent there are concerns about quality (especially for use of compost on edible gardens). Quality issues include: excessive plastic, large particle size, less than optimal nutrient amounts and microbial activity (EBA, 2012, p. 46). When used, there is also indication that landscapers are blending these product to ensure quality for specific uses or traveling out of the City (Vancouver) to get a product that is needed (Anonymous).

staff member (in Vancouver) (personal communications, March 28, 2012; September 28, 2012; October 2, 2012).

Furthermore, demand for compost use is said to have declined since 2010, given the reduction in development due to an economic recession, which occurred after the 2010 Vancouver Olympic Winter Games (personal communications, September 28, 2012). In the end, a balanced supply and demand relationship will need to be developed as the volume of compost produced increases. The quality of compost produced in the Region will have direct implications on the cost for diverting this waste stream and thus the ability to divert the quantities required to achieve targets. For example, where large compost processors make their revenue by charging both a tipping fee and selling the final product, the ability to sell the product (and at a reasonable rate, given it of adequate quality) will impact the ability to lower the tipping fee so that the cost differential remains high (and increases over time) (personal communications, September 28, 2012).

One interview participant suggests that there are policy mechanisms that could be put in place to stimulate the compost market and increase opportunities for use (e.g. procurement policies). Additionally, more education is needed to create awareness about compost use and the value of a quality product.

### *5.2.5. Municipal Impediments*

As discussed above, City of Vancouver staff members are currently working with Metro Vancouver, waste haulers and organics processors to develop and implement options for diverting organics from the MF and ICI sectors. However, prior to implementing mandatory organics recycling, there are a number of issues that must be addressed at the City level. These issues were outlined in an October 2012 City of Vancouver Council Report (*Food Scraps Diversion Update*). Municipal impediments to achieve organics waste diversion, which connect to those discussed above, include: space constraints within MF, commercial and institutional buildings; capacity limits within private sector collection, transfer and processing; increased commercial hauling truck traffic and emissions; appropriate timing relative to the regional waste ban; and an understanding of the strategic roles for the City that maximizes waste diversion (City of Vancouver, 2012).

Many of these issues presented in the Council Report (e.g. reducing truck emissions, capacity limitations, and the ability to achieve diversion in time for the ban) relate closely to the drivers for small-scale composting uncovered during policy interviews. The drivers are outlined in detail below and are an important aspect to the inquiry process that asks how impediments can be overcome to achieve both diversion and Greenest City outcomes.

## 5.3. Drivers for Small-Scale Composting

During policy interviews several participants spoke about the value of small-scale composting with regard to "the big three": low carbon waste management options, connection to local food production, and educational value and opportunities (coined "the big three" during personal communications, September 28, 2012). These were described as valuable drivers when looking at a full-cost accounting perspective for organics management, not just dollar savings. From a systems perspective the drivers are likely to be influenced by how the tipping fee differential grows, how compost processing infrastructure develops (e.g. monopoly versus diversification), and how the regulatory framework for small-scale evolves (personal communications, September 28, 2012). In an interview with a small business owner closely connected with the Vancouver urban farming movement, he discussed the importance of incorporating environmental, social and cultural value in the development of civic infrastructure, including that for (small-scale) organic waste management. He stated that small-scale composting presents the opportunity to create jobs, reduce the carbon footprint of waste through reduced transportation, and close the food system loop (personal communications, October 9, 2012).

The "big three" correspond with the role of local scale composting described by the City (2010) as, a low cost and low energy option for diverting a portion of the organics waste stream; this requires individual participation and creates awareness of the benefits of waste diversion and results in the production of a soil amendment that can be used locally (City of Vancouver, 2010a, p. 6). The drivers as identified by interview participants also coincide with Vancouver Greenest City strategies, as outlined in Table 3 above, which include: climate leaderships and GHG emissions reduction; the

promotion of composting as a strategy to nurture a zero waste culture; support for the creation of food infrastructure and food-related green jobs through use of community food composting facilities (as one type of infrastructure); and the ability to capture compostables through on-site technology (to achieve diversion). Studies on small-scale composting as outlined in the literature review above further demonstrate these values with perhaps greater emphasis on the benefit of such systems to foster social responsibility and generate a culture of re-use (rather than maintaining a throw-away approach) while also discussing the beneficial use of an end product that is generated on-site, and the potential to reduce GHG emissions. The drivers for small-scale are also reminiscent of the criteria and attributes of appropriate technology, including size, scale, usability and diversity.

### *5.3.1. Carbon Footprint*

The ability to reduce the carbon footprint of capturing compostables was generally discussed in reference to the current inefficient organics collection system operating in the Region (as outlined under impediments above). The present costs associated with trucking organics (as a third waste stream requiring collection from one property) is also related to the drive for small-scale and thus inadvertently the opportunity to reduce emissions from trucking. One Interviewee (March 28, 2012) stated that given the current pricing environment some businesses are saying that the cost of processing food scraps on site (with in-vessel technology) pays for itself. Findings from one compost practitioner (operating a system at Trafalgars Bistro) indicated this to be true - in part because of the reduced requirement for waste collection. While it would appear that the ability to reduce emissions from trucking organics will be influenced by other factors, the drive to do so through on-site systems within urban centres is viewed as a valuable endeavour.

### *5.3.2. Quality Compost and Urban Food Production*

The ability to process local food scraps into a quality soil amendment that is connected to urban food production is viewed by many interviewees as the greatest potential and perhaps most important role for small-scale composting (especially given

the momentum behind the urban farming movement in Vancouver). One interview participant conveyed this best by stating that there is a lot of value to be captured by food scraps that are kept in the City as it is a resource that is a direct input into a closed-loop food system. Furthermore, he stated that many urban farmers feel that composting is a missing piece to closing the local food system loop (personal communications, October 9, 2012). Several suggested that where backyard composting is fuelled largely by gardeners, urban farmers and agriculture folks are going to play an important role in getting a handle on creating a business case for local scale composting (personal communications March 28, 2012; September 28, 2012; September 18, 2012). With regard to quality as a driver (intrinsically connected to food production), one person stated that local scale composting is connected to and driven by end users who want a quality product from an operation where they really know what is in that product (personal communications, March 28, 2012).

A City of Vancouver food policy planner stated, in reference to urban food production, that it's all about the soil because we need good soil to grow good food (referring to a quote by Will Allen, legendary urban farmer from the US). When asked how local composting can contribute to local food goals and targets he stated that it represents an important part of a systemic approach to food and resource management. For example, local composting presents an opportunity to connect Vancouver businesses (e.g. restaurants) to local food whereby their food waste is composted (at a neighbourhood scale in the city) and then used on the gardens and agriculture plots to grow produce that goes back to the businesses (personal communications, September 24, 2012). The ability to create a quality soil amendment that feeds into local food production and helps to create closed-loop systems is a very tangible driver for small-scale composting that also clearly demonstrates the ability to achieve Greenest City goals, including the creation of local green jobs.

### *5.3.3. Education*

As indicated in the description of the Food Scraps Drop Spot above, small-scale models for waste management can create a platform to engage and inform residents in a manner that allows direct management (and thus responsibility) for the organics waste

stream (personal communications, March 3, 2012). Two Metro staff members described small-scale and on-site composting as a great vehicle for awareness and education around proper and appropriate organic waste management. They suggest on-site composting presents an opportunity to facilitate programming around waste that allows residents to see how waste can be used as a resource. They suggest that MF dwellings are a great opportunity to look at both suitable site-specific infrastructure and community based social marketing techniques to increase participation and awareness especially given that this sector is "falling through the cracks" in terms of recycling rates. For example, where appropriate, residents within a MF dwelling could have the opportunity to see their food scraps processed on-site into compost for their gardens (whether on rooftops or property grounds) (personal communications, March 28, 2012). As previously mentioned, some have also suggested that residents may be more inclined to separate food scraps for recycling if they can see the waste treatment process in action.

One interviewee suggested that culture is an important aspect of waste management; there are different mechanisms to successfully create a culture of source separation. This may occur if a group of restaurants installs a small-scale composting system as part of a public relations campaign to demonstrate the link to urban agriculture. This broader sustainability agenda and message offers significant monetary value (such as The Forks in Winnipeg) (personal communications, September 28, 2012). It is clear within the GCAP that creating a zero waste culture will be key to achieving waste commitments and targets and those interviewed thought that small-scale composting, especially as it connects to other sustainability endeavours (e.g. local food production) has the potential to drive a shift in thinking about waste.

### *5.3.4. Diversion Potential*

There are mixed thoughts and opinions about the diversion potential that small-scale composting offers. The value of processing food scraps at this scale is connected to a broader framework, including those aspects represented in the impediments discussed above. Given this framework (e.g. policies and regulation, management tools, infrastructure and its operations, education and outreach) it is suggested that the

organics waste management system is likely to evolve and diversify with regard to both technology and scale. A more diversified system is one that can handle products better (personal communications, September 28, 2012). For example, a diverse system may allow for a combination of processing opportunities where "the easy stuff" (e.g. pre-consumer fruit and vegetable scraps and peelings) is kept on-site and the more difficult food scraps (e.g. post-consumer, meat, bread, dairy, compostable cutlery and packaging) are collected and taken to a regional facility (personal communications, September 18, 2012; September 28, 2012). Also, in a scenario where a regional facility has to temporarily reduce its capacity (e.g. to deal with odour issues) a diversity of operations may allow for adaptation to changing requirements. The diversion potential for small-scale will evolve as different technologies come into the Region, as reliability of small-scale technology increases over time, and as familiarity with small-scale systems improves amongst its diverse group of users (e.g. creation and public availability of localized operating manuals and case studies) (personal communications, September 28, 2012).

Additional drivers for small-scale composting, as discussed by one urban farming representative, include the ability to generate business opportunities and provide service to individuals and businesses that want more environmentally responsible, sustainable solutions and cost savings for organics management. On-site composting located within the City also has the potential to offer socially responsible waste management that is cost effective and creates local jobs, especially for those who face barriers to employment. Such services may also directly feed into jobs that relate to urban agriculture (personal communications, October 9, 2012).

### *5.3.5. Overcoming Impediments*

In moving through a process of inquiry, content analysis and interview findings (to this point) have uncovered: how waste commitments and goals are poised to be achieved; the impediments that exist with regard to diversion and Greenest City outcomes; and the drivers for small-scale composting. In asking how impediments can be overcome to allow for diversion *and* Greenest City outcomes, small-scale composting presents as an important solution that can introduce diversity of scale and technology

into the regional (and municipal) organics management system. According to policy interviews, small scale offers the potential to better engage waste generators, and to monitor and create a quality compost product that is directly connected to local (urban) food production. In turn this can reduce trucking requirements for waste and end compost products, thus providing valuable diversion potential. However, small-scale composting is not without its own challenges and so the inquiry process extends further to understand the impediments that exist with regard to the operation and establishment of small-scale composting systems. Interviews with Vancouver-based compost practitioners demonstrate what is being achieved at a small-scale and demonstrates local, innovative models for organics management.

## 5.4. Compost Practitioner Findings

There are many examples of composting at a small scale currently operating within the City. These systems are located at schools, in restaurants, on community centre grounds and on vacant city lots. While fifteen small-scale systems were identified (from both the MF residential and ICI sector), information from eight operations was obtained and used for this study. All of the systems discussed below fall within the ICI sector, representing all small-scale system types as defined above (i.e. on-site/on-site; on-site/partnerships; on-site/communal). The technical parameters and performance of the small-scale composting systems identified through this study have also been reviewed in Metro Vancouver's on-site composting technology assessment (Garden Heart Productions, October 2012). While this study does not review the different technology used for on-site composting, findings refer to the technology with regard to the management of systems, diversion potential, and overall experienced benefits and barriers. Findings also demonstrate that the operational components of the different systems affect its function, the inputs that can be processed and thus the outputs.

Overall, the findings demonstrate the role of small-scale composting within the ICI sector and provide a baseline of data to inform future policy development for small-scale operations. The information presented below includes a higher level summary of the findings compared and contrasted across the eight systems, quantitative data outlining the diversion potential of the systems and a more detailed case study of the

Strathcona Business Improvement Association (SBIA) on-site/communal composting operation. The following table provides a brief summary of the organizations, technology being used, system types and status at the time of the interviews.

***Table 4. Summary of Small-Scale Composting Systems Operating in the City of Vancouver***

| *Organization* | Sector Type | Technology | System Type | Status* |
|---|---|---|---|---|
| University of British Columbia – Student Union Building | Institution | Worm Wigwam | on-site/ on-site | Operational – processing 20 kg per week |
| Windermere Secondary School | Institution | Earth Tub + a 2m x 2m vermicomposter to cure Earth Tub outputs | On-site/ on-site | Operational – processing 90 to 110kg per week (depending on time of year) |
| David Thompson Secondary | Institution | Earth Tub + a three bay, vermi-compost system to cure Earth Tub outputs | On-site/ on-site | Operational – processing 45 to 75kg per week (depending on time of year) |
| Grandview Elementary | Institution | Earth Tub | On-site/ on-site | Operational – processing 35 to 45 kg per week |
| Grandview-Woodland Food Connection (GWFC) | Neighbourhood Food Network (Non-profit organization + institution) | 3 bin composting system (low tech) | On-site/ on-site | Operational – weekly processed amount unknown |
| Trafalgars Bistro (restaurant) | Business | GreenGood Composter (GG50 – 50 tonner/yr capacity) | On-site/ partner-ship | Operational – processes 500 kg per week |
| Organic Lives (restaurant) | Business | GreenGood Composter (GG30 - 30 tonnes/yr capacity) | On-site/ partner-ship | No longer operational (due to a fire that caused restaurant to close) |
| Strathcona Business Improvement Association (SBIA) | Commercial organization | 4 Jora (JK400) in-vessel composters;<br>2 large (1.5m x 2.4m) vermicomposters | On-site/ communal (collecting from multiple businesses) | Not yet operational - awaiting arrival of second vermicomposter and 'occupancy license' but licensed to process 50 tonnes per year |

*The processing amounts per week are highly variable, especially for elementary and secondary schools as this is dependent on the time of year; and should be considered estimated amounts

### *5.4.1. System and Operation Comparisons*

Approximately 20 questions were posed to compost practitioners to get a sense of how the small-scale systems are managed and operating, where food waste is coming from, what is contained within the feedstock and how/where the end product is used. Tours of all but one composting operations were also conducted. The system established by the SBIA presents a slightly different model. While the SBIA was not composting on-site at the time of the interview, the collection of approximately 400kg of food scraps per week, from 40 different businesses (approximately 20 properties) was being done by a partner organization. Food scraps were being stored on-site at the "resource park" (in 240L totes) and collected weekly by Recycling Alternative (for composting at a regional facility) as they await an occupancy permit from the City, and the arrival of vermicomposting bins. The SBIA is the only small-scale system that collects organics via truck. That said, the high schools are using bicycles to collect compostables from nearby elementary schools and some local businesses. All other systems are within walking distance (a few metres to a few minutes) form where waste is generated to where it is composted. For example, in the schools and at the Grandview Woodland Food Connection site, pre-consumer food scraps generated in cafeterias is taken by cafeteria staff and/or students to be emptied into composters. Some schools have food scrap bins in classrooms and staff room areas that are collected by both students and staff. In most instances bins are washed out each time the contents are emptied. The GreenGood[23] (GG) systems operating in the restaurants were literally within several metres of the kitchen. At Trafalgars Bistro staff empty pre and post-consumer food scraps (from kitchen bins) into the GG system as needed from Tuesday through to Sunday. Processing of waste occurs over a 24 hour period from 3pm Sunday

[23] The GreenGood system essentially de-waters and thus reduces the volume and odour of food waste in a 12-24 hour period (through the addition of heat and ventilation, mainly of $C0_2$). The product that is removed after the food waste is 'cooked down' requires an additional 3 to 4 weeks to further decompose and cure before use (requiring space to do so). Locally the pre-compost has been applied to soil in minimal amounts (generally 1:10 proportions) or added as a feedstock to other composting or vermicomposting systems (personal communications, March 12, 2012).

to 3pm Monday, the contents of which are then emptied by staff into storage bins and collected once per week to be taken to UBC Farm for further composting. Other than transporting the processed material, management of the system takes approximately 20 minutes or $4 per week of staff time. Organic Lives, whose system was set to continuously process food waste, was having their pre-compost product collected (at a cost) two to three times per week by an organics hauler and occasionally by an urban farm group and/or members of the community (for use on gardens). The school systems remove some contents of the Earth Tub every three to six weeks and both high schools are further composting and curing Earth Tub outputs through vermicomposters for three to six weeks before the final soil amendment is used on gardens/greenhouses.

A majority of the small-scale systems are processing the full range of food scraps (including meat, bread, dairy) and all except for the GreenGood systems are using shredded paper, wood shavings/sawdust and/or cardboard as a carbon source/bulking agent (to balance the wet with dry material). Pre-consumer food scraps (raw and some cooked fruit and vegetable scraps) are being processed through the low tech systems - the Worm Wigwam and three bin composting system. Whereas the in-vessel composting systems (i.e. GreenGood, Earth Tub and in coming months the Jora) are processing the full range of food scraps (including meat, bread, dairy). All but the two restaurant systems are using the final compost product on the site in which it is generated.

Table 4 above illustrates the current (estimated) amounts processed through each system. Cumulatively, the eight systems represent an annual diversion potential of over 130 tonnes. All composters are currently operating under capacity, though the weekly amounts composted are generally estimates. While nearly all systems had at some point collected data on inputs and diversion, data is not collected on an ongoing basis. At the time of the interviews all composting systems had been operational for at least 6 months and up to 1.5 years, with some downtime for technology repairs and/or working toward optimal operation requirements (e.g. combination of inputs based on available feedstock, turning requirements, moisture management etc.). The Worm Wigwam and three bin composter had only been operating for six and nine months respectively and neither had yet harvested a composted product. All interview respondents cited some challenges with regard to the operation of on-site composting

systems, generally relating to technology, culture and capacity. Establishment/installation challenges for schools related to safety requirements, logistics and time as well as cost for installation. Specific impediments for ongoing operations and establishment of systems are discussed in more detail below.

### *5.4.2. Motivation, Partnerships and Benefits*

The motivation behind the on-site systems is simple – reduce waste to landfill and generate a quality compost product that can be used as a soil amendment for on-site gardens. For some the motivation is tied to a broader sustainability policy (e.g. to be a zero waste restaurant), while for others it was simply about doing the right thing. For five of the eight systems, composting food scraps is one aspect of a local or healthy food initiative that uses compost as a soil amendment for growing food on-site and closing food system loops. The potential for cost savings was minimally discussed, though the system at Trafalgars Bistro is described as paying for itself (resulting in significantly reduced garbage bills). The Worm Wigwam is described as the most cost effective option when compared to landfill and in-vessel composting. Potential cost saving opportunities are generated where some have received grant money for infrastructure and site development. For example, the Grandview Woodland Food Connection received a $15,000 Greenest City Grant for the establishment of their system and the SBIA received substantial City of Vancouver “start-up” grants and a Metro Vancouver Zero Waste Challenge grant totalling over $50,000.

Interestingly, all small-scale composting operations appear to rely on partnerships (mostly volunteer) to varying degrees, to ensure the success of the systems. For example, Trafalgars Bistro relies on a connection to the UBC Farm, where the pre-compost product is incorporated into the Farm composting system (for further composting and curing) before use. The SBIA relies on multiple, contracted partnerships including one with Mission Possible who provide waste collection services to 40 participating businesses. Grandview Woodland Food Connection presents an interesting case whereby they partner with different organizations to manage the community garden and three bin composting system. For example, Britannia Secondary school (located within the same complex/site) offers assistance with compost

management through students (e.g. garden club members) and cafeteria staff; Environmental Youth Alliance (a non-profit organization which works closely with school garden programs) has offered workshops to assist with set up and ongoing management of the community garden; and SOYL (Sustainable Opportunities for Youth Leadership, through UBC) has conducted summer garden internships on-site. SOYL youth built the Food Connection's three bin composting system.

It was found that the key to the success of the school Earth Tub operations is the paid coordinating positions (i.e. champions) that support them. At Windermere Secondary activities around compost collection are embedded within courses (across all grades, rather than through volunteers or student clubs). For example, students collect food scraps from nearby elementary schools (i.e. feeder schools - whose students will attend that high school) via bicycle as a part of a PE class. These activities are supported through the actions and leadership of an innovative program and a strong teacher champion.

At David Thompson Secondary the culinary arts teacher has been a strong champion. They also have a BioCycle program/club through which student volunteers manage the composting system. The BioCycle Team is supported by coordinating staff at the South Vancouver Neighbourhood House. At Grandview Elementary their composting endeavours are ultimately supported through a paid (part time) garden coordinator (funded through a partnership with a health authority). All three schools share information about their composting and garden systems through joint workshops, and through outreach to elementary schools. Windermere Secondary is providing feeder schools with support to set up their own composting systems (or provide collection of organics to be composted through their Earth Tub system). At David Thompson Secondary the BioCycle team members have conducted sustainability courses with students from Douglas Elementary (one feeder school) through which they spent a week focussing on composting activities. This group of students have also conducted outreach work in their cafeteria whereby they impose a $0.25 compost tax on all food bought so as to encourage students to separate food waste for composting (to receive their $0.25 back).

The benefits of the Earth Tub systems were described by students (from the two high schools) as producing a good quality soil amendment that is going back into school gardens, reducing the schools waste and the communities waste to landfill, creating opportunities for leadership and contributing to Vancouver becoming the Greenest City. Grandview Woodland Food Connection described the benefits of their system as an opportunity to form partnerships with other organizations to engage students and create excitement and ownership around the gardens and building of the compost system. Students at David Thompson said that the composting system and management that is required seems to attract the attention of many student volunteers as well as mentors who were able to provide support when teachers were not available. The composting system and garden have offered them the opportunity to gain volunteer hours and hands-on learning experience. Brent Mansfield, the former Grandview Elementary garden coordinator (of four years) says that schools present a huge opportunity for on-site composting as they are natural gathering spots and education hubs for the community as a whole.

At UBC the motivation behind the Worm Wigwam (and larger composting system not discussed here) comes from internal sustainability policy. They have conducted waste audits to know that approximately 40 to 44 percent of campus garbage is food waste and keeping that out of landfill helps to reduce costs and work toward creating closed-loop systems. The Worm Wigwam composting initiative was born from a partnership with and funding from the Alma Mater Society and a program through which staff and faculty identify sustainability problems and connect students to the issues through research projects. As a result of the success of this system, through the work/management by student Emme Lee, the university intends to install a scaled-up vermicomposting system (32 feet by 5 feet) to process food scraps generated from the new Student Union Building (to be completed in 2014). Emme described the use of the Worm Wigwam as a good starting point to get staff on board and generate student interest (e.g. creating a culture of source separation in kitchens and food outlets), and modeling a successful system that is more cost effective than landfill and in-vessel composting. She says this is a system that can and should be duplicated in other buildings across the UBC campus and beyond.

All of the systems operating in institutions are supported by the administration via funding and ongoing operations, including the allocation of space for systems, and some repair and maintenance work. For the SBIA money is allocated for sustainability operations through the businesses that the organization represents. All of the systems have had a positive local response and many, including Windermere Elementary (and the two other schools to some degree), the SBIA, and Trafalgars Bistro have offered tours and provide information to the general public who are interested in understanding how on-site composting can work. Both the SBIA and Trafalgars Bistro have cited the generation of positive press as a key benefit of the systems. When interview respondents were asked if they are aware of regional organics waste diversion goals and commitments most replied yes. However knowledge of the organics ban for example, is not necessarily tied to motivation for the on-site system (some of which pre-date news of the ban). The SBIA stated that it is within their mandate to serve businesses in the area, including preparing them to divert food scraps as per the requirement of the coming ban. As a result they are lobbying other Business Improvement Associations to assist in the management of food scraps, especially for the food/restaurant/grocery sector. All in all, businesses, schools, the Food Connection and the SBIA are sharing information with regard to system operations as they believe in the benefits that the systems provide.

### *5.4.3. System Establishment*

All interview respondents were asked about the procedures they went through to get on-site composting systems up and running (from decision to use). For the institutions this was generally a complex and lengthy process (perhaps less so for UBC) and for the restaurants the process was more a matter of procurement and installation. None of these systems were required to receive an operating license or conform/report to any level of government (although the Vancouver School Board is involved in the successful operation of the Earth Tubs). It is for this reason that the SBIA resource park, inclusive of on-site composting is a unique case. Not only is the SBIA collecting organics from multiple sites and business types but they also intend to sell the completed compost product; these two aspects of operation have triggered three levels of government regulation, bylaws and operating requirements. This small-scale , on-

site/communal model of operation is the first to be established in Vancouver. It demonstrates, as per the definition of appropriate technology above, a neighbourhood asset that seems appropriate for the Strathcona business community in terms of its size, scale and usability. It is providing a solution for organic waste management where one does not yet exist and does not aim to replace the existing organics collection/haulage system but rather leverage and promote the advantages that this innovative model offers. The SBIA small-scale system demonstrates Greenest City outcomes that: showcase urban composting as an opportunity to reduce trucking emissions; engage multiple partners and stakeholders in both the business and resident community; contribute to low-barrier job creation; connect to local food production; and provide considerable diversion potential. What's more, this system represents an opportunity to learn from the establishment process and identify regulatory impediments that may be considered prohibitive for others, described as follows.

#### 5.4.3.1. SBIA Establishment Case Study

The SBIA is the first in Canada to have a portion of its budget allocated to sustainability activities. Some of these funds been leveraged to develop a resource park. The site, situated on a former vacant parking lot in the Downtown Eastside area of Vancouver, is now home to a resource exchange, on-site composting, recycling depot, container gardens, and a mini park. The small-scale commercial composting system is the first of its kind in Metro Vancouver, born out of the need for more space for a materials exchange service. The SBIA has a mandate to serve the businesses in their area, many of whom do not necessarily understand why it is important to divert food waste, that doing so can save money, or that they will be required to separate food waste in the next two years. A primary goal of the SBIA is to educate members about food waste diversion and to offer them the opportunity to do so with minimal effort. They will also encourage business members who use their services to renegotiate contracts with garbage hauler as a result of reducing garbage generation.

The SBIA has gone through a lengthy process to develop their composting system which they have tried to keep as low tech as possible. With a total licensed processing capacity of 50 tonnes per annum the system consists of four Jora in-vessel

composters (total of 1600L capacity) and two large vermicomposters. The Jora is a small insulated system designed to reach temperatures that are high enough to kill pathogens. All compost will also be put through vermicomposters to add nutrients and create a high quality final product. All manner of food waste currently coming from 40 businesses (located on 21 different properties, out of approximately 450 different businesses) will be put through the system. The composters were chosen and the system designed based on an understanding of the amount and type of feedstock generated from current participating businesses. For example, most food scraps will go through the Jora systems for just two to three weeks, dependent on temperatures they are able to reach, and then go through a vermicomposter for up to four weeks to create a high quality finished product. The second vermicomposters will be used to process fruit and vegetable scraps. Before loading, all food scraps will be sorted (if required), shredded and combined with a carbon source, such as wood waste and/or cardboard. The SBIA is hoping that business members will be willing to further separate their food waste to ensure all of the "easy stuff" (fruit and vegetable matter) is captured for on-site processing (with minimal issues) and some portion of the more difficult organics, such as meat and bread can be taken to the regional facility as needed.

On the 6100 square foot site, three of six sheds are dedicated to composting (80 square feet each for a total of 240 square feet). As mentioned above, the SBIA has offered a food scraps collection service to its members for more than a year (stored on-site for weekly collection). Currently a majority of waste comes from three commercial kitchens who receive a lot of donations, including food that has already gone bad. Food waste is also collected from manufacturing facilities, offices, social services and approximately eight restaurants.

Cost for the system was not specified, however the SBIA received several funding grants to pay for development of the site, which do not fund ongoing management costs. Development of the project began in the summer of 2011 with the receipt of grant funding, including the following:

- $10,000 Zero Waste Challenge grant from Metro Vancouver – used to determine logistics of collecting food waste from businesses and piloting what that looked like (including collecting data with regard to weight and types of waste generated by businesses). A stipulation of the grant included development of a composting system operations manual

- City of Vancouver Downtown Eastside Capital Grant for $30,000 that went into developing the site
- City of Vancouver Great Beginnings Grant for $11,000

The remainder of site development costs, as well as that for partnership involvement were paid for by the SBIA. This has included bringing in contractors to conduct various aspects of the project that the SBIA had neither the time nor expertise to manage. A noteworthy partnership is with Mission Possible, an organization that works with individuals with employment barriers. They will continue to provide collection of recyclables and help to maintain the resource park site. The SBIA is finalizing a partnership with a local restaurant that will provide an urban farmer to manage the on-site gardens so as to also grow produce for use in the restaurant. While exact ongoing operating costs are unknown, this will include funding (for paid positions/contractors) required for the sorting and shredding of organic waste, management of food scraps collection, and running of the urban farm/gardens. In addition the SBIA is looking to create partnerships with SBIA members and community members to have some volunteer time to take care of different aspects of the site.

For the purposes of this study, information pertaining to the regulatory procedures required for the establishment of the SBIA composting system is most pertinent, especially as it relates to impediments for small-scale operations in the City. Unlike other small-scale examples presented above, the SBIA was required to go through three levels of government approval, certification and licensing to go ahead with their operations. At the time of the interview (October 4, 2012) they were still waiting to receive occupancy approval from the City before on-site composting could begin. A breakdown of the requirements for each level of government is outline below.

Conversations between the City of Vancouver and SBIA began in November 2011 to determine what the permit and approval process would entail for the entire site. In February 2012 the SBIA submitted their first operating permit application, followed by further discussion about requirements for the site that would need to be met (as the first application triggered building code requirements that took time to navigated based on what they were trying to achieve on the site). The application was resubmitted in early May and approved mid May, 2012. To obtain an operating permit the SBIA had to

develop a site plan (including plans for the sheds, designed by a structural engineer) and get a building and development permit. They were required to obtain multiple permits and approvals for plumbing and electrical work, environmental approvals, an occupancy permit and had to purchase insurance and place signage on the site (outlining development intentions). Furthermore they had to register a name to obtain a business license, obtain permission from the SBIA Board to carry through with project requirements, create a municipal information package, pay a fee, and obtain WCB clearance letters from everyone who will work on the site.

At the regional level the SBIA was required to obtain a composting license from Metro Vancouver because they intend to collect and process waste from multiple sites. Because there is no license for small-scale composting operations (as this is the first of its kind), the SBIA was required to go through the same licensing process as large scale operators, including fee payment. The cost of the license was $2500 ($1000 licensing fee, plus cost for advertising the intent for the site to be used for composting). Metro required data and specifications with regard to the composting technology the SBIA would be using, which eliminated the opportunity to use a composting system developed by a local, small business (who could not provide the rigorous technical specifications the Region required).

As a result the SBIA switched their system design to an “off the shelf” model that could provide operating data. The operating license also required them to consult with an agrologist (on a contracted basis) for the development of a detailed operations manual (to include all of the technical aspects of the system). While Metro worked closely with the SBIA to assist in navigating through the licensing process, the interview respondents found current regulations to be inappropriate for this new model/scale and are lobbying the Region to change the bylaw to accommodate small-scale composting projects. As with the City of Vancouver, Metro also wanted to see site and operating plans and expected signage to be posted at the site, advertising their intent to compost. The SBIA received a composting license from Metro allowing the system to operate for one year (until May, 2013).

The Ministry of Environment, in accordance of the Organic Matter Recycling Regulation, has stipulated that if the SBIA is going to sell their compost products, then

they would be subject to meeting temperature and soil test requirements. This data is to be collected (from the time they begin operating) and submitted to the Ministry as specified (before they can sell the product). According to the SBIA the Ministry had never heard of a "composting facility" that was so small, applying for their approval.

All levels of government have given the SBIA until May 2013 to prove that the system is working efficiently, meeting the standards set out by the Ministry and not creating odour (defined as that which can be smelled from the entrance of the site) or noise. As a result, the SBIA feels they need to maximize the potential of the site in the next six months and ensure there are no odour, vector or noise issues or complaints from neighbours. Once they begin to collect data in terms of how well/quickly the composting systems are working then that information will be written into an operations manual. From that point the SBIA will have a better understanding of the labour and time requirements and can begin a jobs training program to employ people to manage the site. They estimate that it will take a couple of months of managing the system themselves and collecting data before they can hand those duties over. According to the SBIA website, on-site composting of food scraps commenced November 28, 2012 – over a year after initial talks with the City of Vancouver began. At the time of the interview the SBIA was collecting 30 percent (roughly 15 tonnes) of the licensed 50 tonnes they are allowed. They anticipate food scraps collection and processing will grow and partnerships will evolve with the successful operation of this innovative model for resource management.

The SBIA presents an innovative model for small-scale resource management, including on-site composting that engages waste generators in a manner that is different from the norm. Not only is the SBIA working to educate and prepare their commercial members for the waste ban and source separation requirements, they also intend to help members reduce waste management costs through local organics recycling and will encourage members to renegotiate waste collection contracts with haulers. They are also advocating that other Business Improvement Associations assist in the management of food scrap waste, especially for food producers (e.g. restaurants, grocers, community kitchens). The SBIA has found that the resource park has generated increased, positive press for themselves and their members, which is significant in an area of the City that is often associated with negative press.

The system, as it is poised to operate will rely on paid partnerships that are generating low-barrier green jobs for local residents and creating opportunities for local food production and closed-loop food systems. On-site composting has been designed, and will be monitored to create a quality product that will generate revenue for ongoing operations. Trucking of organics to regional composting facilities will be minimized and used mainly to manage the more difficult organics waste stream. This operation represents low carbon and diversified waste management that plays to the strengths of both large and small-scale composting systems.

The SBIA model demonstrates how small-scale composting can allow for diversion while also achieving Greenest City attributes. However, it is not without its own challenges, especially in relation to system establishment. Final interviews with individuals categorized as policy professionals (largely connected to food policy) were conducted to further understand the institutional and regulatory impediments associated with the establishment of small-scale systems as well as factors that challenge the ongoing operation of these systems; as discussed below.

## 5.5. Small-scale Impediments

This section will answer the final question in the inquiry process to determine what impediments exist to the operation and establishment of small-scale composting systems within the City. Operational impediments discussed by small-scale Vancouver operators do not necessarily present new challenges. They have experienced issues pertaining to culture, capacity and technology that at some point have impeded their ability to divert waste through the on-site system and produce a quality compost product that can be used as a soil amendment. Many of the operational issues can or have been overcome while others are of a systemic nature that will require a cultural shift in the way compostable materials are viewed and managed. Impediments relating to the establishment of small-scale composting systems represent new issues and challenges that are more directly connected to policy and regulation. Interviews with individuals who have a working knowledge of the SBIA case study, and who have tried to establish a similar model for food scraps processing (including urban farms), helped to uncover

institutional and regulatory barriers that will need to be overcome if the role of small-scale composting is to evolve.

The impediments as outlined below have been captured through interviews with all respondents, though operational impediments are largely based on information from compost practitioners. This section is designed to present a myriad of perspectives regarding existing issues, which help to form recommendations for pathways to improve and increase small-scale composting operations in Vancouver.

## *5.5.1. Operational Impediments*

### 5.5.1.1. Technology

Technology was the main challenge for composting systems operating on school grounds. Challenges centred on the time and expertise required to build to, and understand optimal operating requirements. For example, one interview respondent stated that while the Earth Tub technology was presented as a relatively simple system, in reality this was not the case. It took those managing the systems several months to determine optimal conditions pertaining to feedstock, turning/aeration and moisture content. System operations were based on the specific context at each school rather than operating the system according to the manual (as was suggested would be the case). Damage to system components resulted in fly and odour issues for all Earth Tub systems at some point. In addition, finding an adequate, appropriate and local carbon source has been a key challenge for schools. It has been difficult to secure enough dried leaves and/or a suitable, local sawdust product for the school year and often shredded paper and cardboard does not supply adequate carbon. An appropriate carbon source is required to balance out the moisture content and ensure enough oxygen throughout the system (to prevent odour). If compost material is too wet, as experienced at David Thompson, then it becomes heavy and difficult to deal with.

In all cases it was clear that the technology should be chosen based on the site specific characteristics. The processing ability of the technology can hinder the type and amount of food scraps that are diverted. For example, a unique challenge at Grandview Elementary relates to the fact that they provide a lunch program, meaning food scraps

generally consist of rice, bread and meat that are not ideal in large quantities for on-site processing with the technology they are using. For others, the limitation of composting technology is viewed as an impediment as it relates to size and function (e.g. the Worm Wigwam "maxes out"). For example, the GreenGood (GG) composters are really designed to dehydrate food waste rather than produce a compost product, requiring space (or transportation) to further compost the product into a readily useable soil amendment. Organic Lives cited "growing pains" (e.g. breaking parts) with their GG system when it was first installed, which required multiple repairs, though they experienced no issues after that.

Some have suggested that the technology (at least in this Region) "has not yet arrived" and it is clear that in-vessel systems are not all made equal. The trialling of different in-vessel technology in Vancouver demonstrates that systems must be appropriate for the projected feedstock (including carbon source), management time available, site specific context (e.g. a period when no composting will be done), capital and ongoing funding availability, and final use of the compost product.

#### 5.5.1.2. Culture

Culture is the key aspect of waste management that makes it a complex issue, requiring a multi-tiered approach. For small-scale composting, culture involves cultivating social norms that are backed by appropriate policy. It includes building trust and demonstrating that on-site composting is valuable in more than one respect. Nearly all systems cited cultural issues relating to lack of participation, lack of institutional support due to rodent, fly and odour concerns, and contamination of food scrap bins mainly from plastic cutlery. At UBC, the separation of food scraps by kitchen staff required constant education and trust building. Initially staff felt that the new practice would increase food prep time and cause fruit fly issues. The restaurant systems appear to be immune to cultural issues, perhaps due to the more simplified process; where organics are placed directly into the composter by staff with limited potential for contamination, and no time required to manage compost beyond loading and unloading the machine.

In schools and other institutions cultural issues apply to more than just contamination. Impediments of this nature extend to institutional policies and norms that

relate to how unions operate (e.g. in some cases union workers are unwilling to deal with compost) and willingness to change how lunch is served (e.g. reduce portion size so that students can come back for seconds rather than throwing food away). Issues also include the ability to increase the number of food scraps waste streams, so that the easy stuff can be separated from the meat and bread material and remain on-site for composting (and ensuring someone monitors and enforces this). Cultural issues should also take into account broader zero waste concepts that look at the waste hierarchy to first prevent food waste generation and then process it based on its highest best use (e.g. separating food waste streams). Policies such as this are not currently in place (personal communications, September 18, 2012).

#### 5.5.1.3. Capacity

Capacity issues generally concern the people power available to manage all aspects of an on-site system. Ideally, composting activities will be a part of someone's job description. In fact, a majority of interview respondents have cited this as essential to the success of small-scale composting. In all of the Vancouver examples presented above there is some funded time for the management of the systems, however there is no position dedicated to the coordination of composting systems alone. Institutionally, large organizations like the City of Vancouver and the Vancouver School Board are more willing to fund infrastructure than coordinating positions especially if funding for positions can be obtained through a partner organization at no additional cost. According to one interview respondent, the economic argument for organizations to divert waste away from landfill via organics separation exists for large organizations. However, getting funded coordination time to manage small-scale systems is not as attainable (personal communications, September 18, 2012). And so while organizations like the Food Connection have received funding for infrastructure and workshops, the ability to separate and collect food scraps from the school cafeteria is an ongoing challenge because it is no one's job; there is no champion overseeing effectiveness, consistent source separation of organics, and an opportunity to generate cultural change in this area is lost.

### *5.5.2. Establishment Impediments and Impacts*

To add further depth to the SBIA case study presented above three additional interviews were conducted to better understand impediments to the establishment of small-scale composting. Interview respondents included a local business owner developing an innovative small-scale composting technology (i.e. Urban Stream), and an urban farm staff person at Sole Food (urban street farms) who has investigated the use of in-vessel composting for their multiple urban farm sites around the City. Given that neighbourhood composting is an aspect of the GCAP local food goal, an interview with a City of Vancouver Food Policy Planner was also conducted. The food policy interview was done to understand the extent to which small-scale composting will be incorporated into the Food Strategy (going to City Council for approval in early 2013) and how the City currently defines community composting[24]. While these interviews, especially that with Urban Stream, could be discussed as a case study in itself, only issues pertaining to the establishment of small-scale composting in Vancouver are included below.

The examples of small-scale composting as presented above demonstrate a direct connection to local food for the majority of operations. However, within the development of the Local Food Strategy, community composting (considered a local food asset) has received little attention. According to a City Food Policy Planner, the Food Strategy contains approximately 68 actions, six of which relate to food waste. Some of these actions include those already underway, such as broadening food scraps collection to MF dwellings, yet none of the six refer to community composting. Food scraps collection for the MF sector is described as a key priority action in order to achieve diversion targets. Once that strategy is in place, then perhaps more attention will be directed at local scale composting, including backyard composting described during the food policy interview as an important piece of the puzzle.

[24] While the City does not have an official definition for community composting there have been discussions between departments that suggest it should be a community effort that closes neighbourhood food system loops and distributes a compost product within the neighbourhood where that food waste was generated (personal communications, September 24, 2012).

Given the grassroots innovation and momentum that the City is seeing in the area of urban agriculture/farming and the ongoing work to create urban farming rules and regulations to make these activities easier, it is not a stretch to suggest that momentum will form around the concept of community composting, especially if there is funding available for infrastructure. Organizations like the SBIA are redefining what is possible in this realm (personal communications, September 24, 2012). That said, several interview respondents suggest that small-scale composting operations within the City involving waste transport from multiple sites to a single processing location currently sit within a no-man's land with respect to regulatory requirements and planning priority.

Further impediments affecting the ability to establish small-scale composting operations are:

- Small-scale composting is not currently being addressed within local food policy planning (specifically within the Local Food Strategy) despite the fact that one of the GCAP Local Food strategies is to increase local food assets, including community composting facilities (by 500% by 2020). Moreover, criteria to define what constitutes a community composting facility are unclear.
- At all levels of government regulators and bureaucrats appear to be struggling with how to categorize, manage and regulate small-scale composting systems. Regulation is important to protect public health and the environment but at this time it is lagging behind the development and appropriate use of small-scale systems. Regulation does not appear to weigh the risks that small-scale systems may pose against the potential benefits, including diversion and the ability to achieve GCAP outcomes.
- Small-scale composting is not being directly addressed by the engineering/waste management department with regard to how these systems can be incorporated into City waste management strategies; the focus is on large-scale collection and processing to capture compostables from MF and businesses. This could affect the ability for small-scale to be incorporated later (if/when large-scale collection and processing is established) perhaps resulting in the inability to achieve Greenest City zero waste outcomes (i.e. beyond diversion).
- At the provincial and regional level small-scale composting is being treated the same as large-scale facilities in terms of requiring an operating license (with a $1000 application fee), leachate and odour management strategies. Small-scale operators must also demonstrate technical specifications that new technologies may not be able to produce. The time and cost requirements of this process have been cited as inappropriate and prohibitive for this model of composting.

According to a Sole Food staff person, the Green Economy represents new activities and urban land uses/requirements, including urban agriculture, urban composting and deconstruction activities. Because these activities are new there is no clear understanding of how they should be regulated or how/if existing bylaws are or should be relevant (personal communications, October 2, 2012). Urban Stream, a small Vancouver based business, has been working with the City to understand the bylaws and regulations that their innovative, small-scale composting/food production system[25] would trigger. They have found that the composting unit was required to comply with several bylaws and land-use applications and processes thought to be inappropriate or irrelevant given its use. Compliance would be costly, time consuming (due to new/uncertain land use classification for this technology), and difficult to navigate. The building code was the main bylaw that proved an impediment to developing the system as originally designed. For example, because their composting system was meant to be enclosed within a repurposed shipping container, which exceeds 100 square feet, the building code required that the unit be fitted with wheelchair ramps, a security system and fire sprinkler system. In order to avoid the costs that complying with the building code would incur the unit was redesigned such that it did not exceed the 100 square foot trigger. Once the final design was signed-off by the City the composting technology was passed on to the province for further approval (e.g. technical specifications) under the OMRR. This would have been a further 90 day wait for approval and given that the system was being treated as a temporary pilot project with limited operating time granted, a further wait time of three months was not feasible (personal communications, October 9, 2012).

[25] The Urban Stream technology is designed with the use of a repurposed shipping container (generally larger than 100 square feet). In its simplest explanation the unit is fitted with a dual tiered composting system that shreds and breaks food waste down before funneling it through a vermicomposter. The unit is fitted with hydroponic trays or an aquaponic barrel system for growing produce or fish (compost tea feeds the plants or worms feed the fish). In essence it is a mini closed-loop food system with an 18 to 22 tonne per annum diversion capacity.

Similarly, one urban farmer expressed that they are also coming up against impediments (mainly cost and regulatory uncertainty) due in part to the requirements of bylaws that weren't designed for the application of urban, on-site composting. Currently Sole Food farms is paying significant costs to have garden waste trucked to a local facility and soil amendments and growing mediums brought into the City for use. It is regulatory uncertainty that is a key impediment to composting on urban farm sites (personal communications, October 2).

Presently, the ability for a small business such as Urban Stream to introduce a new technology for on-site composting (that does not fit within existing City bylaw structures or designations) may be impeded by "a maze of regulations, bureaucracy, land-use and zoning requirements and permits that stand in the way of being able to compost in the city" (personal communications, October 9, 2012). Based on this experience, and input from Sole Food farms, impediments relating to municipal bylaws and institutional regulatory frameworks are as follows:

- Provincially, the OMRR has a minimum 90 day approval turn around, which may be too lengthy for many small-scale operations, especially those that are operating within a minimal pilot project license (which limits the time that operations have to demonstrate they meet regulatory requirements to be able to continue operations).
- Current municipal bylaws that are applicable to small-scale composting do not appear to support innovation in this area in a manner that allows for flexibility. Rather than determining what information or education is missing with regard to allowing a small-scale composting operation/business on City land, current bylaws require that new systems conform to existing regulatory structures. This could create cost impediments for those trying to innovate in this area.
- Small-scale systems do not currently fit within existing City of Vancouver designated land uses. Uncertainty regarding land-use classifications and zoning applications that apply to small-scale composting systems can result in lengthy approval processes.
- Vancouver is one of the most densely populated cities in North America with extremely high land value, meaning the City has a fiduciary responsibility, as a corporate body, to ensure that City land is allocated for highest best use development. Current policy that considers highest best use as that which returns the greatest net financial gain could exclude the opportunity for small-scale composting as an innovative use of land. As a result of high land value, current urban agriculture and small-scale composting are classified as 'pilot projects' (to prove their use), which denotes temporary use and places risk on the small business and/or operators of those systems. This classification

could impede further development of such systems.
(personal communications, October 9, 2012)

Establishment impediments very clearly connect to regional and provincial regulatory issues but the key finding at the municipal level illustrates that current City bylaws do not support innovation in a manner that coincides with what the GCAP is calling for. The establishment impediments presented above call into question the ability to achieve Greenest City outcomes related to organic waste management and diversion. Similar to the operating challenges described above, the ability to establish small-scale composting appears to also be hindered by issues relating to technology, culture and capacity. For example, several interview respondents stated that the City's "bandwidth" (i.e. capacity) to integrate small-scale composting into both waste management and local food strategies is limited. Small-scale composting operations and innovations are not a priority action for many reasons. Technologies for small-scale composting applications that trigger multiple levels of government regulation (i.e. the transport of food scraps from one site for processing on another) represent new territory with many unknown risks. One interview participant has suggested that the City displays a rigid institutional culture that is currently working within existing land uses and paradigms, such that innovative models and ideas must conform to what is already known and understood.

As discussed above small-scale composting could be a critical component to meeting both diversion and GCAP outcomes. However there are multiple impediments to fostering a robust and viable organics management system that includes small-scale composting. The potential impact of these impediments includes: stifling the momentum that seems to be building around small-scale operations to the extent that those developing these systems will stop asking for permission to do so, and lost opportunities for the City to leverage the work of these small operations to achieve Greenest City outcomes. In addition urban farmers may find other, unsanctioned means to compost garden waste if they can't viably do so on their sites. Perhaps the role of small-scale composting in this regard is to act as a catalyst to drive new policy formulation and development of a suitable regulatory framework that encourages innovation to capture compostables.

# 6. Recommendations

Findings from compost practitioners reveal the people and factors involved in making small-scale systems successful as well as the impediments or barriers that affect the operation and establishment of these systems. In reference to large-scale operations, broader and systemic issues relating to infrastructure, policy mechanisms and tools, waste flow management and end market applications of compost will affect the ability to achieve collection and processing of urban organic waste. The findings suggest that small-scale composting systems are an opportunity to achieve organic waste diversion through a diversified system, as well as Greenest City outcomes relating to low carbon waste management, local food production, and opportunities for behaviour change. Thus, the following recommendations provide a pathway to increasing small-scale composting operations, which could be applicable to both the MF and commercial sectors, but are generated based on the institutional, commercial and business examples presented in this study.

The primary recommendation suggests that the City should integrate small-scale composting alongside strategies for large-scale collection and processing. The failure to integrate small-scale systems early on could preclude the ability to do so later when city-wide collection mechanisms for all sectors are in place. In order to integrate small-scale composting the City will need to address the operational and establishment impediments discussed in detail in the previous section. With the support of the City of Vancouver (e.g. through the Food Policy Council, food waste working group) an urban composting forum should be held that is designed to: compile first-hand experience of policy and regulatory barriers for small-scale composting; create an inventory of existing systems and technologies; and develop a roadmap for action to further integrate small-scale systems and recognize and quantify their value. At the time interviews were being conducted Metro Vancouver's waste and recycling bylaw (181) was undergoing review so as to "close the gaps" and encompass regulation that addresses the specific needs of small-scale, on-site, in-vessel systems, as well as pilot projects. While a new bylaw

amendment (272) includes consideration for “pilot projects” that are at the discretion of the Waste Manager, it does not specify what regulation is likely to entail. Considering that the process of changing the bylaw has not attempted to include the input of small-scale composting stakeholders, the urban composting forum should include the generation of information to further inform regional bylaw amendments or considerations. This could involve the development of an urban composting license that provides for a more permanent operation rather than the present system of approving pilot projects.

One of the GCAP local food goals identifies the need to “create land use policies that make use of rezoning, public benefit and other regulatory levers to build new food infrastructure, retrofit existing infrastructure or enhance the potential for urban agriculture and food activities”. The policy document further suggests that actions to be conducted in this regard include “establishing dedicated zoning to protect food-growing spaces (including, but not limited to community gardens)” (City of Vancouver, 2011, p. 145). The same should be done in reference to small-scale composting. For example, industrial lands, particularly the False Creek Flats could hold great potential for land use zoned for urban composting. Underutilized, industrial land could make a huge impact (if redeveloped to include on-site urban composting) “in the transition to the next paradigm, more sustainable, local economy“ (personal communications, October 9, 2012). This is one of the last large portions of land that could be used to forward the green economy agenda and could be the place where we see a great deal of innovation. Another model for neighbourhood scale composting that involves land use is to utilize school grounds or community centres as central sites for composting. This would require a paid manager to oversee collection/drop-off’s. In this scenario residents could drop-off food scraps for a token fee and nearby businesses could pay a fee to have their organic waste processed through the neighbourhood system. This could involve the optimization of the diversity of composting systems in the Region based on their intrinsic strengths. For example, not all food wastes, such as meat and bread are ideal inputs for composting on a small scale. Inputs and scale affect odour production, decomposition timing and capacity, and the quality of the compost product. Where appropriate, local scale systems could be used to process the “easy stuff” (like we see in backyard composting systems). Large-scale systems (that are closely monitored and regulated in terms of

odour management and quality of the final product) would be used to compost the more difficult food scraps material. There is opportunity to integrate the systems (at different scales) so that some of the challenges of operating a small-scale system can be mitigated.

Given the innovative examples of small-scale composting that are beginning to emerge, the City should look to leveraging existing systems and developing models that could demonstrate success in other contexts. For example, the Food Scraps Drop Spot model could be used as one pathway for collection, but rather than trucking organic material out of the City for processing, it could be taken to a neighborhood processing centre, perhaps located on school or community centre grounds. Further, the SBIA presents as a model of what is possible for neighbourhood scale composting and can serve as a template for on-site/communal processing that could be rolled out to other Business Improvement Associations and neighbourhoods once a business case is developed and best practices established.

Finally, based on the collective experience of schools/institutions, restaurants, and other businesses a toolkit should be developed to help evaluate, select, install, and operate a composting system based on local context and requirements.

# 7. Conclusion

Through content analysis and a series of interviews the purpose of this research study was to understand organic waste management policy and identify the role of small-scale composting operations in Vancouver as a method to achieve diversion targets and Greenest City outcomes. Multiple policy documents, plans and strategies, at three levels of government converge to reveal the framework within which organic waste is managed in the Region. The most relevant aspects of these documents have been discussed in detail above and present the organic waste goals and commitments as well as the pathway for how goals are anticipated to be achieved.

Progression through the inquiry process of this study revealed higher-level impediments relating to regional and municipal issues, including ensuring adequate regional processing capacity, developing efficient collection and hauling for organics, monitoring policy influences that drive diversion, and ensuring end market use of compost. Many of these issues relate closely to the drivers for small-scale composting and the role that these operations can play in achieving Greenest City outcomes. These are described above as allowing for reduced GHG emissions associated with trucking organics, benefits related to the direct management and responsibility for waste at the citizen level, and direct connections to local food and closing food system loops. Additional findings indicate that small-scale may also play a role in creating a diversified organics diversion system, local jobs and catalyzing further policy formulation and a regulatory framework that encourages innovation to capture compostables. Recommendations stemming from the findings make suggestions for how to increase small-scale composting operations, which could be applicable to both the MF and commercial sectors.

The ability to divert organic waste from all sectors for the Region and City of Vancouver represents the opportunity to meet stated policy targets. Furthermore, the capacity to capture compostables through a diversity of technologies, scale and

collection mechanisms represents the opportunity to achieve both Greenest City outcomes and diversion. A review of two key policy documents, including the regional ISWRMP and the Vancouver GCAP both revealed a priority for the development of large-scale collection and processing. At the municipal level the City is grappling with issues pertaining to authority to mandate and enforce separation of organics. The priority is to first develop regulation, bylaws, and communication campaigns for large-scale diversion (including collection and hauling) to capture compostables and in doing so contribute to achieving regional organic waste targets by 2015. The regional context suggests that there are more systemic issues that will affect diversion, including traditionally poor recycling rates for the MF and to a lesser extent ICI sectors, and the fact that policy mechanisms to drive diversion are still under development. Thus, it is questionable whether large-scale alone will be able to achieve the 2015 policy targets. In addition, given the minimal attention to small-scale composting at the City level to date, it can perhaps be concluded that the ability to achieve Greenest City outcomes as they relate to waste management (that goes beyond simply diverting organics) is being compromised. It is difficult to say how the inability to incorporate a variety of organics diversion options up-front will affect the role that small-scale composting will play going forward. For these reasons, this research examined the role, and perhaps necessity of small-scale composting within the nexus of organic waste diversion *and* Greenest City outcomes.

Literature pertaining to policy theory, appropriate technology and small-scale composting examples were useful in assessing and reviewing policy content and further defining the value of small-scale composting. Policy theory was useful in understanding the different processes and mechanisms at play within the regional and municipal context and informed the research methodology that sought to uncover actors, ideas and structures as they related to small-scale operations. Concepts taken from appropriate technology literature support the intent of this study, which is to question the one size fits all solution that large-scale collection and processing of organics presents. While the literature dates back to the 1960's and 1980's its concepts are very current within sustainability policy and development and what the City aims to achieve. In line with attributes of appropriate technology, findings from this study do not suggest that small-scale composting replace large, centralized facilities but rather be integrated in a manner

that compliments all systems and promotes diversity in scale, technology and collection mechanisms. The examples of small-scale composting present models that can be further built upon and learned from as policy formulation and implementation in this realm evolves.

Interview findings suggest that small-scale composting is under research and development throughout the Metro Vancouver Region. The reasons we are not seeing more of these systems are likely due to the following: there is a clear priority to develop large-scale systems and a time constraint to do so (to meet the ban deadline); uncertainty (from multiple actors) with regard to the level of regulation that is applicable to such systems (and bylaw changes required for their operation); and a general attitude that local-scale composting systems are not likely to displace a large amount of organics (which may help to explain why we are not seeing more of a variety of small-scale technologies in the Region). Small-scale compost operators suggest that there are many benefits, as well as ongoing challenges with regard to on-site and neighbourhood-scale (on-site/communal) composting, and a long way to go to see that this is encouraged and fostered through regulation. However, for many, small-scale presents an opportunity to: save costs associated with collection/haulage of compostable waste; connect with local partners to generate a compost product that can be used in local food production; generate local jobs; generate positive press and public relations opportunities; and connect with and inform local business operators and residents about responsible (and innovative) waste management.

Recommendations suggest moving forward with the development of opportunities for small-scale composting to contribute to Regional and City goals. The way forward should include the engagement of stakeholders, such as early experimenters/innovators who have much to contribute to the successful implementation of small-scale composting in the City. Findings from this study suggest that small-scale composting be part of an integrated system that includes diversity in scale, technology and collection mechanisms. Key components of this system include integration with local food networks and urban agriculture, and showcasing closed-loop systems that demonstrate to residents why food scraps should be considered a resource.

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# Appendices

# Appendix A. Interview Respondents

| | Organization | Individuals Interviewed | Date of Interview |
|---|---|---|---|
| **Informational Interviews (open-ended interviews)** | | | |
| 1 | Recycling Alternative | Louise Schwartz | March 3, 2012 |
| 2 | Transport Compost Systems | John Paul | February 16, 2012 |
| 3 | Garden Heart Productions and Village Vancouver | Spring Gillard | February 13, 2012 |
| 4 | City of Vancouver, Engineering Department | Monica Kosmak | March 5, 2012 |
| 5 | City of Vancouver, Engineering Department | Bob McLennan | March 13, 2012 |
| **Compost Practitioners (semi-structured interviews)** | | | |
| 6 | UBC, Alma Mater Society | Emme Lee | March 12, 2012 |
| 7 | Grandview Elementary School | Brent Mansfield | September 18, 2012 |
| 8 | Windermere Secondary School | Leadership Team (two grade 12 students) | March 27, 2012 |
| 9 | David Thompson Secondary | Maryam Imtiaz (South Vancouver Neighbourhoo House Youth Coordinator) & BioCycle Team | July 25, 2012 |
| 10 | Grandview Woodland Food Connection (Britannia Community Centre) | Ian Marcuse | March 14, 2012 |
| 11 | Trafalgars Bistro/Inner City Farms | Will Valley (manages system at Tranfalgars) | March 12, 2012 |
| 12 | Organic Lives Restaurant and Kitchen | Preet Marwaha | September 20, 2012 |
| 13 | Strathcona Business Improvement Association | Sophie Agbonkhese and Joji Kumagai | October 4, 2012 |
| **Policy Professionals & Opinion Leaders (semi-structured interviews)** | | | |
| 14 | City of Vancouver, Social Planning (Food Policy) | James O'Niell | September 24, 2012 |
| 15 | EBA | Tamara Shulman | September 28, 2012 |
| 16 | City of Vancouver, Sustainability Group | Amy Fournier | June 19, 2012 |
| 17 | Metro Vancouver, Sustainable Business Services and Corporate Relations | Carrie Hightower and Christine Cummings | March 28, 2012 |
| 18 | Metro Vancouver, Regulation and Enforcement Branch | Rick Laird, Senior Enforcement Officer | July 25, 2012 |
| 19 | Metro Vancouver, Corporate Relations | Ian Williamson | August 14, 2012 |
| 20 | Sole Food Farm | Staff Person | October 2, 2012 |
| 21 | Urban Stream/Hastings Crossing BIA | Wes Regan | October 9, 2012 |

# Appendix B. Interview Questions

**Examples of Informational Interview Questions (least structured interviews)**

- Can you tell me about your involvement in the organic waste/diversion industry?
- Can you provide me with a bit of regional context with regard to the recycling of organic waste, (more specifically food scraps) and regional considerations that will affect the City of Vancouver's ability to promote on-site/NS composting?
- In your opinion, how is policy shaping the waste management industry and the recycling of food scraps? What are some of the changes that we can expect to see?
- What are some of the factors affecting organic waste diversion in the Region?
- How has the interest around organic waste recycling change over the last number of years?
- How has policy shaped waste diversion in the Region over the last two years (with the ISWRMP and GCAP)?
- Do we need regulation at the neighbourhood scale and is this something that municipalities are currently overlooking?
- What do you think is the potential of on-site composting as a mechanism for diverting organic waste away from disposal? What is the potential for on-site composting as a way to recycle organics coming from multi-family and commercial buildings (e.g. restaurants)?
- What information is missing and/or needed for the City to consider integration of local scale composting into current and developing composting collection and processing strategies?

**Examples of Policy Interview Questions (semi-structured interviews)**

Metro Vancouver specific questions:

- How does the policy framework (including the ISWRMP, GCAP, OMRR) shape organic waste diversion in the Region?
- What are some of the factors (context) affecting organic waste diversion in the Region?
- Can you explain how do different levels of government interact for the management of organic waste? How is authority delegated in this regard?
- How are composting facilities licensed or authorized?
- What are the regional policy drivers (or policy tools) that stand to affect composting at both a large scale and a local scale? For example, tipping fee differential, quality control at large scale facilities?
- What are the regional drivers (including policy tools) that stand to affect composting at a local scale? For example, tipping fee differential, quality control at large scale facilities?
- What are some of the tools or tactics that Metro is using to control the flow of waste in the Region, in particular, the flow of organic waste away from landfill?

- If Metro is the main governing body responsible for enforcement – what is enforcement likely to look like with regard to the organics waste ban?
- The crafting of regulation and incentives to promote the diversion of organic waste is currently in preliminary development. Are these likely to be in place by 2015?
- Has the Region looked at the number of haulers operating within the region as a way to control the flow of MSW toward diversion?
- Where are policy formulators at in their thinking and planning for composting at a local scale?
- There appears to be a current policy gap at the Provincial and perhaps regional level with regard to the potential regulation of 'pilot projects' and small-scale (local/neighbourhood) composting systems – what regulations are being considerations for these systems?

City of Vancouver specific questions:

- Can you explain how do different levels of government interact for the management of organic waste? How is authority delegated in this regard?
- Can you clarify to whom and how the City provides waste management services (e.g. garbage and recycling, and now organics waste collection)?
- How can local scale composting contribute to City of Vancouver waste reduction goals and targets?
- Can you tell me a bit about the strategy that the City is currently working on for organic waste management generated from MF and businesses?
- Is this a collection strategy (truck away to centralized, regional facilities)?
- Are there examples of other cities that you are looking to?
- Is this likely to include the introduction and enforcement of bylaws? What type of bylaws?
- Does this include a strategy for small-scale composting in any form?
- What is a city and neighbourhood food asset – how is this defined (e.g. scale)?
- Local food crosses over with a number of GCAP goals – at this point, is there much cross departmental planning with regard to neighbourhood scale composting/facilities?
- Have there been any planning/discussion with regard to where such systems might be sited?
- What size (capacity) will these systems be?
- How they will be funded, staffed and/or managed? E.g. Will they be City owned/operated or rely on partnerships?
- What are the challenges of local scale composting/composting in the city?

**Compost Practitioner Interview Questions (structured interviews)**

1. What was the motivation and/or goal/purpose of/for your small-scale composting system (why important to compost)?
2. In doing a tour of the composting system your organization has in place can you tell me more about the following:
    a. What specific technology/system do you use and why did you choose this particular technology?
    b. How long have you been operating this system?
    c. What type of waste goes into the system/machine? (fruit, veg, meat, dairy, cardboard, garden waste, etc. – cooked food or raw food)?
    d. Where does the waste come from?
    e. How much waste goes in (weight per week/month/year) and how much compost comes out (weight per week, month, and/or year)?
    f. How would you describe the final compost product? Have you ever had soil testing done to determine nutrient content? Where is your final compost product used?
    g. Do you know what percentage of your total waste is diverted through this composting process?
    h. Can you explain the logistics of how waste is collected, processed, harvested, used, from your composting system?
    i. Who manages the system and what are the management requirements (time, effort, money)?
    j. What was the initial start-up cost? What are the ongoing costs? Are you saving money? Did you receive any funding/subsidies for the system?
    k. What are the challenges (limitations, constraints) of this system? Why?
    l. What are the benefits of this system – what is working well? Why?
3. What procedures did you have to go through to get this system up and running (from decision to use)? (Who made decisions for this system?)
4. What has been the local response (of neighbours, stakeholders)? Has there been opposition or apprehension or support?
5. Do you do any education/outreach as a part of operating the system? If so what?
6. To what extent, if any does this operation/system rely on the participation or partnership of others?
7. Does your organization share its urban agriculture/composting/soil science knowledge with others? Sectors? Regions? Schools?
8. Are you involved in other working groups, advocacy groups, committees, etc. that influences City waste management and urban agriculture policy?
9. Do you think that the system you are operating could be used in other locations and scenarios in the City?
10. Are you/your organization familiar with City/Regional waste management goals and commitments as they relate to organic waste/food scraps?
11. If you had one message to send to the City and Regional planners and policymakers with regard to on-site and neighbourhood scale composting (how it should evolve/change; what you need) what would that be?