

Performing the City

A Hybrid Composting Center and Urban Food Park in Seattle, WA

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Abstract

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A Hybrid Composting Center and Urban Food Park in Seattle, WA

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This thesis investigates how the built environment can be a catalyst to enhance the design and performance of our cities. As cities continue to grow, so do their demands for space and resources. Global municipal solid waste (MSW) is one of the most important by-products of today's way of life. It is being produced at an alarming rate and with irreparable costs to our quality of life and our environment.

In light of the City of Seattle's new and visionary ban on organic and compostable waste in garbage, a zero waste model for a new 10-acre public park is proposed on a prominent site at the heart of the city. A composting facility and food hub are inserted to perform an open landscape. The resource life-cycling of organic waste to food is exposed on one site to bring awareness to the global waste problem and showcase a new socially responsible model that performs the site and its larger city.

Thank-you to my professors for their insight, and my family and friends for their continuous support.
I am especially grateful to my father for his guidance and inspiration throughout my academic journey.

PERFORMING THE CITY

a hybrid [composting] center and [urban food] park in Seattle, WA



Figure 1 Landfill (image from RecycleRiga)

TABLE OF CONTENTS

0.	INTRODUCTION
I.	THE GLOBAL WASTE PROBLEM
II.	THE AMERICAN LANDSCAPE OF FOOD WASTE
III.	SEATTLE'S PATH TO NET [ZERO WASTE]
IV.	RESOURCE LIFECYCLING WITH AD+COMPOSTING TECHNOLOGY
V.	CASE-STUDY Zero Waste, San Jose, US The Plant, Chicago, US Meerlanden, NL
VI.	THE LOCAL FOOD/YARD WASTE SYSTEM
VII.	ALL EYES ON [SITE]
VIII.	A [NEW MODEL] OF URBAN PERFORMANCE
IX.	CONCLUSION
X.	LIST OF FIGURES
XI.	BIBLIOGRAPHY

INTRODUCTION

The city is bound by its horizontal and vertical spatiality, its quality of density and access to the natural resources it depends on. An increasing urban population threatens environmental strain and natural resource depletion. Present day cities are faced with concerns of urbanization and its direct effect on climate change, economic dismay of rising energy prices from high supply demand, resource depletion, pollution, aging infrastructure and more. The densification of urban centers continues to be a threat to the public safety and health of over half of the world's inhabitants and the planet we live on.

However, **the city is both a solution and a problem.** World population growth is inevitable, but its rising costs of basic human needs is not. Smart densification and better performing cities can slow down the accelerating depletion of the world's resources and its costs, and welfare. Finding ways to turn the problems of urbanization into solutions can increase, and most importantly preserve, a basic quality of an urban lifestyle which is the fundamental reason cities exist and individuals choose to live in them. The architecture of cities starts to serve as the physical manifestation of rethinking performance in urban centers that will pro-actively engage entities within their larger fabric and retain an essential quality of urban life, which is the heartbeat of any city.

“ Designing a dream city is easy; rebuilding a living one takes imagination. ”

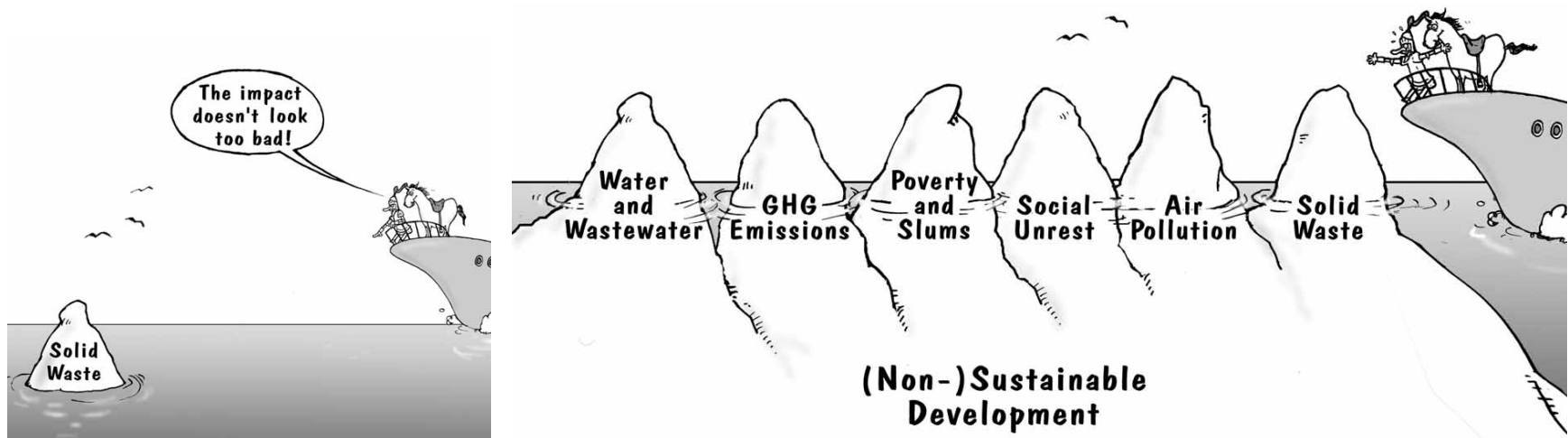
Jane Jacobs, *Downtown is for People*.

This thesis explores a new strategy for addressing the densifying City of Seattle's two major concerns of renewable energy and municipal solid waste, by preserving the city's preference for fresh and local food and unique scenery. The city becomes a source of inspiration and a model of operation. A [Zero Waste] public park is proposed to perform the site, neighborhood and city better by promoting food and waste education, green jobs, affordable and fresh food production, renewable energy, composting, open space, community and economic viability.

I.

THE GLOBAL WASTE PROBLEM

The amount of global municipal solid waste (MSW), commonly known as trash or garbage in the United States, is one of the most important by-products of today's way of life. It consists of daily items discarded by the urban public. MSW has surpassed the rate of urbanization and is being produced at an alarming cost and rate. These global costs are social, environmental and financial. Most of this global waste is being produced in urban centers, yet its detrimental impact resonates across the globe. The most common practice of solid waste handling is landfilling, a non-sustainable practice of burying waste. **The United States alone produces 1/4 of all global waste with only 5% of its population.** The country's vast land mass allowed for the practice of landfilling to dominate past MSW disposal practices. The growth of US urban centers and their need for space drove the eligibility of landfill sites to lower by 80% of which it is today. Exporting waste to other countries is now being practiced with landfilling. These unsustainable and costly options have some US cities looking for longer-term solutions with concepts of Reduce, Reuse and Recycle or Net Zero Waste initiatives.



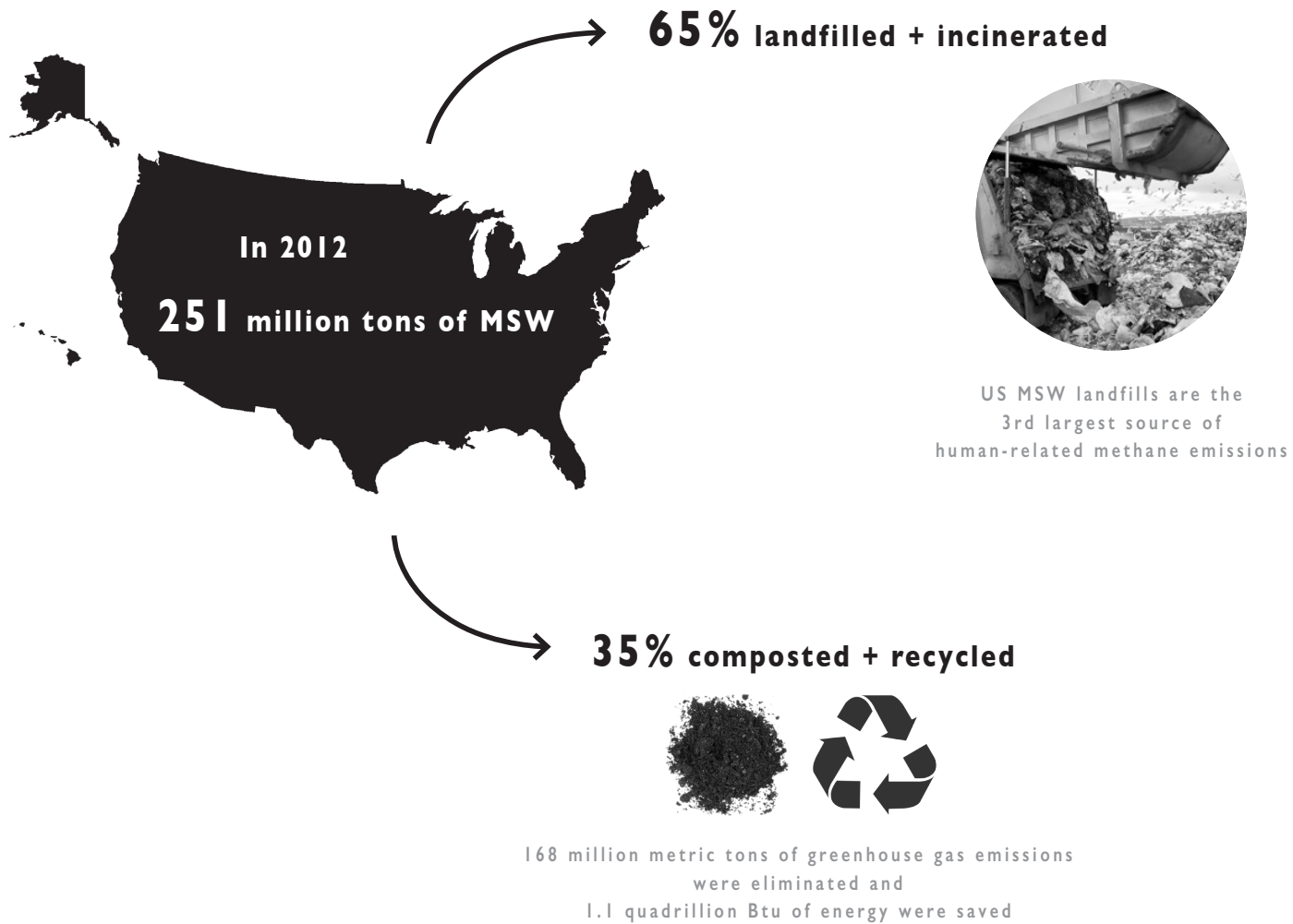


Figure 3 2012 United States processing of MSW (US EPA)

“ THROUGH A MOVE TOWARDS STABLE OR DECLINING POPULATIONS,
DENSE AND BETTER-MANAGED CITIES CONSUMING FEWER RESOURCES,
AND GREATER EQUITY AND USE OF TECHNOLOGY,
WE CAN BRING PEAK WASTE FORWARD AND DOWN.
THE ENVIRONMENTAL, ECONOMIC AND SOCIAL BENEFITS WOULD BE ENORMOUS. ”

Dan Hoornweg, Perinaz Bhada-Tata and Chris Kennedy, *Waste Production Must Peak This Century*.



Figure 4 2010 daily global waste (US EPA)

II.

THE AMERICAN LANDSCAPE OF FOOD WASTE

The United States is one of the major producers of all global waste. The largest component of MSW in US landfills is organic waste including food waste. \$165 billion dollars is spent per yearly average to landfill the majority of this food waste that could be recycled and composted into a sellable product. **Reducing the amount of food wasted in the US would have significant environmental, economic and social benefits.**

When food decomposes in landfills it produces a significant source of methane gas (CH₄). Though naturally processed through soil and chemical reactions in the atmosphere, this unnatural and large quantity of methane emission from landfills cannot be eliminated through the usual natural process. Landfills are the 3rd largest source of human-related methane emissions in the United States. This CH₄ gas has 21 times the global warming potential of carbon dioxide (CO₂), which explains why US landfills can directly be linked to GHG emissions and global warming. Composting food waste helps divert GHG emission, but the technology used to process food waste into compost determines the amount of GHG emissions diverted from the atmosphere. Reducing the amount of food wasted also has environmental benefits of improving facility sanitation, health and safety.

The economic benefits of decreased landfilled food waste is lower MSW disposal costs, lower over-purchasing and labor costs and possible food donation tax benefits. CH₄ is also the main ingredient of compressed natural gas (CNG) and landfilling and/or composting is more importantly a lost opportunity to capture and use, and/or sell, this renewable natural gas.



The United States wastes an estimated...

70 billion pounds of food per year
\$165 billion to landfill 95% of this food annually

...while 50 million Americans do not have access to enough food

Figure 5 United States food waste statistics (US EPA + NRDC, image from FoodManufacture.co.uk)

The US Environmental Protection Agency (EPA) and Department of Agriculture (USDA) is fighting against food waste through policy, research and public/private partnerships. The US EPA is working on “feeding people not landfills” by changing the culture of food waste on a national level. In thinking beyond recycling, composting and disposal, they are focusing on the transitioning of waste management into sustainable materials management (SMM). This systemic approach reduces material use and its correlated environmental impacts over the entire life-cycle of waste resources. By focusing on the resource life-cycle of food waste, for example, it is apparent that not only food is wasted but all the resources that went into producing, collecting and delivering this purchased and then wasted food.

Most of our urban food is being grown, picked and packaged far away from cities. The organic waste that this food produces is also trucked out of our cities to be processed elsewhere. People living in cities are completely removed from not only the process, but also the understanding of how food and organic waste occur. We commonly access fresh produce in our supermarkets and forget what kind of environment enables these products to exist at our fingertips. By being removed from the opportunity to understand the life-cycle of food and waste, it is not surprising that so much food is wasted along every step of the process. A localized model of the full life-cycle of food to organic waste on one urban site would begin to bring awareness and education through visual and physical experience to bring an end to the unfortunately American landscape of food waste.

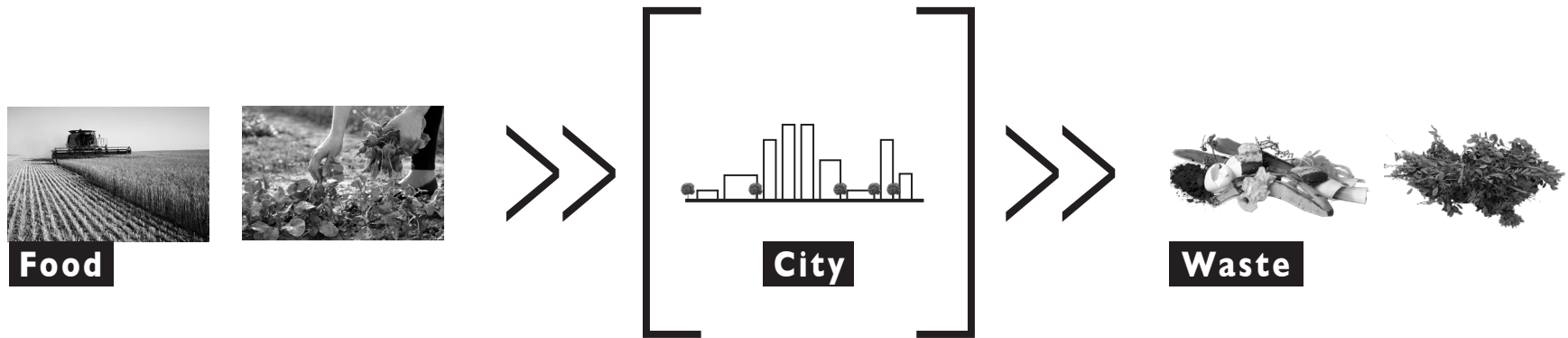


Figure 6 Typical decentralized and single-direction flow of food to organic waste resources through a [city]



Figure 7 Proposed localization model of the life-cycle of food to organic waste resources in a [city]

III.

SEATTLE'S PATH TO NET [ZERO WASTE]



“Zero waste” is a philosophy that refers to the **diversion of all solid waste from landfills** and incinerators. It does not imply that cities should be producing no waste, but rather reuse this waste as a resource for something else. The redesign of resource life-cycles eliminates the quantity and toxicity of urban solid waste that is globally polluting land, water and/or air at a non-sustainable rate and threatening the entire planet’s welfare in result. Preserving and recovering wasted resources by managing their life-cycles eliminates most existing environmental, social and economic costs.

Some major US cities have implemented “zero waste initiatives” to radically transform the costly problem of solid waste into an economical and efficient guide to living and practicing a more sustainable and quality lifestyle. Major West coast cities have taken the lead in setting high “net zero goals” to be met within the next 15 years.

The City of Seattle, Washington, has announced a 72% net zero goal by 2025. Seattle is the 23rd most populous city in the United States with 652,405 inhabitants, and is one of the top twenty fastest-growing major cities in the nation. The city and its residents have a history of being at the forefront of leading MSW by reworking its system to increase recycling and composting through public education and encouragement campaigns.



Figure 8 The City of Seattle, WA

III.

SEATTLE'S PATH TO NET [ZERO WASTE]


The city first highlighted guiding principles of zero waste in its solid waste comprehensive plan "On the Path to Sustainability" in 1998. These principles facilitated Seattle in banning all recyclables (not including organics) from garbage for residential, and recyclable paper/cardboard for commercial in 2003. Since this became effective in 2005, Seattle has been focused on addressing its organic waste and specifically composting its food waste, which is its largest MSW component.

In 2007, Seattle released its "Zero Waste Study" after a 5 months comprehensive study testing MSW collection strategies to divert significant and costly tonnage from being disposed in landfills. An "Every Other Week Pilot Design" project was implemented to test household organic recycling in populations that posed unique challenges (e.g. persons of minorities, language barrier, isolation, lower-income) and had low recycling response rates. The city learned that its highly diverse areas disposed of more garbage per household, but had greater reductions in garbage disposal after addressing their challenges through the pilot program. In the following years it became mandatory for single and multi family households to sign-up for weekly organics collection.

On January 1st, 2015 Seattle became to first city in the United States to pass a ban on food and compostable paper in garbage for all sectors. Compostables are the biggest target left in Seattle's waste stream. 30% of its landfilled MSW is compostable. Over 100 garbage samples were tested from city businesses with existing food waste collection, and 50% of components are compostable. There is 6 months of educational and informational tagging. This new ban will force sectors to properly dispose of all recyclables (including organics and compostables), and bring Seattle closer to its 60% MSW diversion rate by the end of 2015.



Figure 9 Seattle food/yard waste collection

A black and white photograph of the Seattle skyline. The Space Needle is prominent on the left. In the background, snow-capped mountains are visible under a cloudy sky. A dark semi-transparent box is overlaid on the right side of the image, containing white text.

On January 1st, 2015 Seattle **banned**
all **food** + compostable paper from **garbage**

Figure 10 Seattle's new 2015 ban (photo from MackUrban.com)

III.

SEATTLE’S PATH TO NET [ZERO WASTE]

The city's new 2015 ban is proving effective. Commercial subscriptions are up by 91.2% and an additional 3,000 tons of food/yard waste was collected according to Seattle Public Utilities' first quarter "2015 MSW Report". Increasing Seattle's solid waste diversion from landfills furthers its goal to control and reduce greenhouse gas emissions.

The success of this ban can be attributed to Seattle residents favorizing the ban 7:1, which builds upon the positive experience of the 2005 ban and is reflective of the city's decades of public education and encouragement campaigns on the benefits of recycling and composting MSW. The ban is also endorsed in the city's "Solid Waste Plan" and Seattle Public Utilities "Strategic Business Plan", which engage public agencies, stakeholders and private consultants to work together towards the same net zero vision of the City of Seattle.

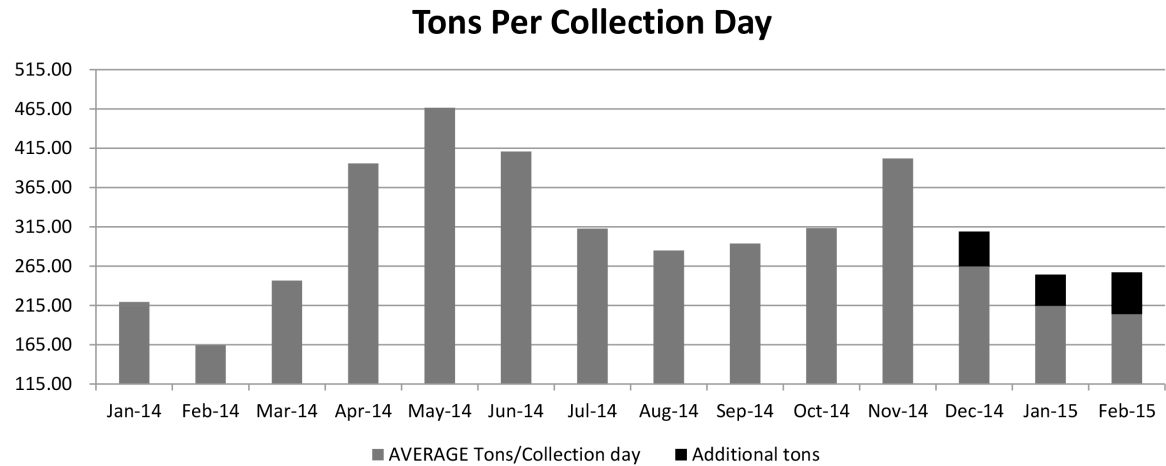


Figure II 2015 first quarter food/yard waste tonnage increased by 3,000 tons (Seattle Public Utilities)

SEATTLE'S PATH TO NET [ZERO WASTE]

The City of Seattle's strengthening tech industry is creating high-skill service with high-wage employment that is attracting more professionals to the city. This force is consequentially driving demand for housing, retail spending and lower-skill services in the food and drinking sectors. Seattle is currently projecting, and planning for, a 20% growth increase in population by 2035. We know that with more people living and working in the city in the next 20 years, the more waste will be produced.

How can Seattle begin to think beyond its successful approach to recycling, composting and disposal, and transition to a waste management system of resource life-cycling in light of its projected growth? How can the city integrate green technology to transform its growing waste resource into an economical, efficient, profitable and reusable product?

Seattle

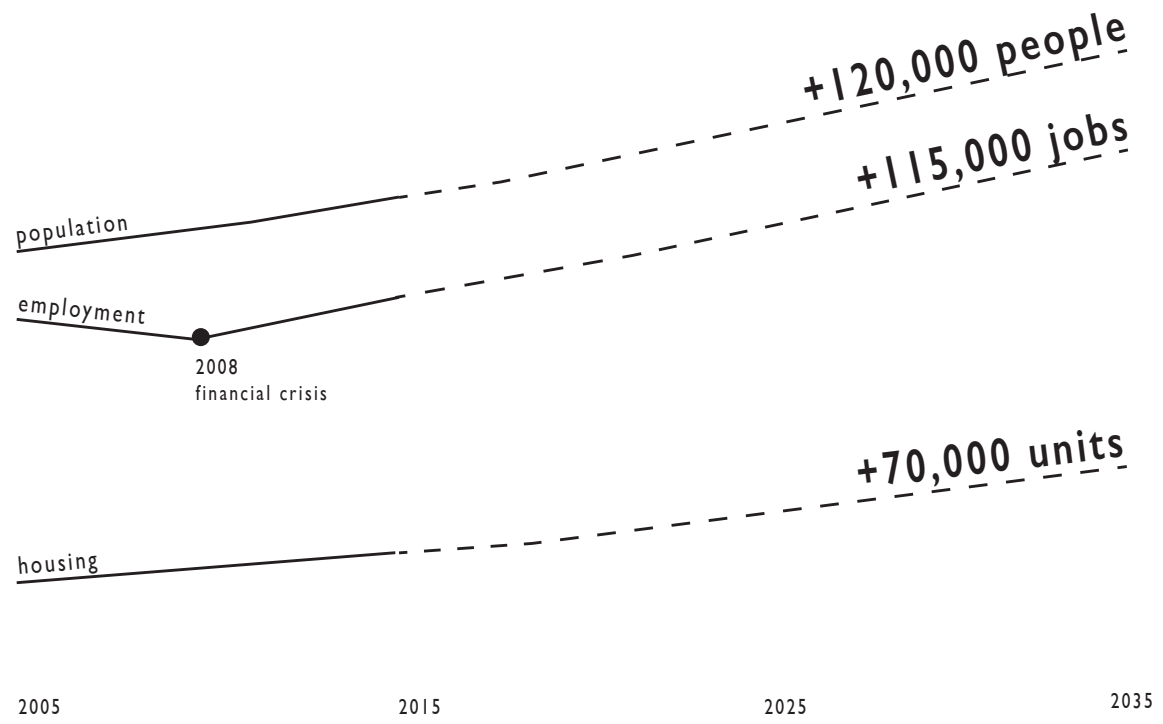


Figure 12 Seattle projected growth (Seattle DPD)

ANAEROBIC DIGESTION CAN BE AN INTEGRAL PART OF THE SOLUTION
TO TWO OF THE MOST PRESSING ENVIRONMENTAL CONCERNS
IN URBAN CENTERS: WASTE MANAGEMENT AND RENEWABLE ENERGY.
IN THE ANAEROBIC DIGESTION PROCESS, SPECIALIZED BACTERIA DECOMPOSE
ORGANIC MATTER...IN AN OXYGEN-DEPLETED ENVIRONMENT TO PRODUCE
BIOGAS AND A STABLE SOLID. EACH OF THESE PRODUCTS CAN BE USED FOR BENEFICIAL
PURPOSES TO CLOSE THE LOOP IN ORGANIC WASTE MANAGEMENT.
ANAEROBIC DIGESTION HAS BEEN SUCCESSFUL IN REDUCING
THE VOLUME OF WASTE GOING TO LANDFILL, DECREASING EMISSIONS OF
GREENHOUSE GASES AND CREATING ORGANIC FERTILIZER.

The Earth Institute of Columbia University, *Anaerobic Digestion*.

Solid waste is commonly disposed of and processed in open air (landfilling). As this solid waste decomposes it releases GHG emissions into the air and atmosphere, which contributes to global warming and threatens the welfare of the entire planet. What anaerobic digestion (AD) technology provides is a way to decompose waste on a smaller footprint and in a closed loop system, fully closed off from any oxygen, so that all the methane and carbon dioxide gases are captured and turned into renewable energy (heat/power) and biogas. In the case of food/yard waste, the solids left over become compost and liquid fertilizer. Anaerobic digesters make the processing of waste and sewage sustainable, profitable and highly effective.

Anaerobic digestion technology solves part of the two most pressing environmental concerns of urban centers: waste management and renewable energy. For decades Europe has been using anaerobic digestion technology to transform its MSW into a significant source of renewable energy from natural gas. In the United States, wastewater is typically treated with AD technology. However, the use of such technology for organic waste processing has been discovered recently. A combination of pilot AD and composting facilities are starting to emerge along the West coast of the US. The technology ranges from smaller and modular ADs (waste from: breweries, schools, residential units, etc.) to larger scale operations (waste from: universities, municipalities, etc.). Unfortunately, cost is a major factor holding back the spread of this method of disposing MSW in the United States. However, these initial investment costs are much lower than the typical alternative when looking at the long term social, financial and environmental costs.

Zero Waste Energy Development Company (ZWEDC) is the owner and developer of the Zero Waste Facility located on an old landfill in San Jose, California. ZWEDC was created in 2011 to **advance organics recovery infrastructure** for the City of San Jose. This combined AD and composting facility supports the city's 2007 "Green Vision" goal, while converting waste into renewable energy. The facility is housed inside a 100,000 sq. ft. building annually processing 90,000 tons of commercial organic waste. 16 high-solids dry fermentation digesters extract the energy value of the organic waste being processed. Two combined heat and power (CHP) units transform this energy from biogas into electricity. Less than 20% of all electricity produced is used to power the entire facility. The rest is used to power other waste resource recovery operations (e.g. the nearby wastewater treatment plant and materials processing facility) and any excess electricity left over is sold to the grid. All of San Jose's commercial organic waste is turned into compost. Unfortunately the quality of this compost is too high in non-biodegradables (e.g. pieces of glass) to become a sellable product. The final compost, which is only as good as the quality of its separated waste collection source, is sent to be landfilled. This is one of the multiple challenges still needing to be addressed by the city and ZWEDC to reach their goal of 100% zero waste by 2022.



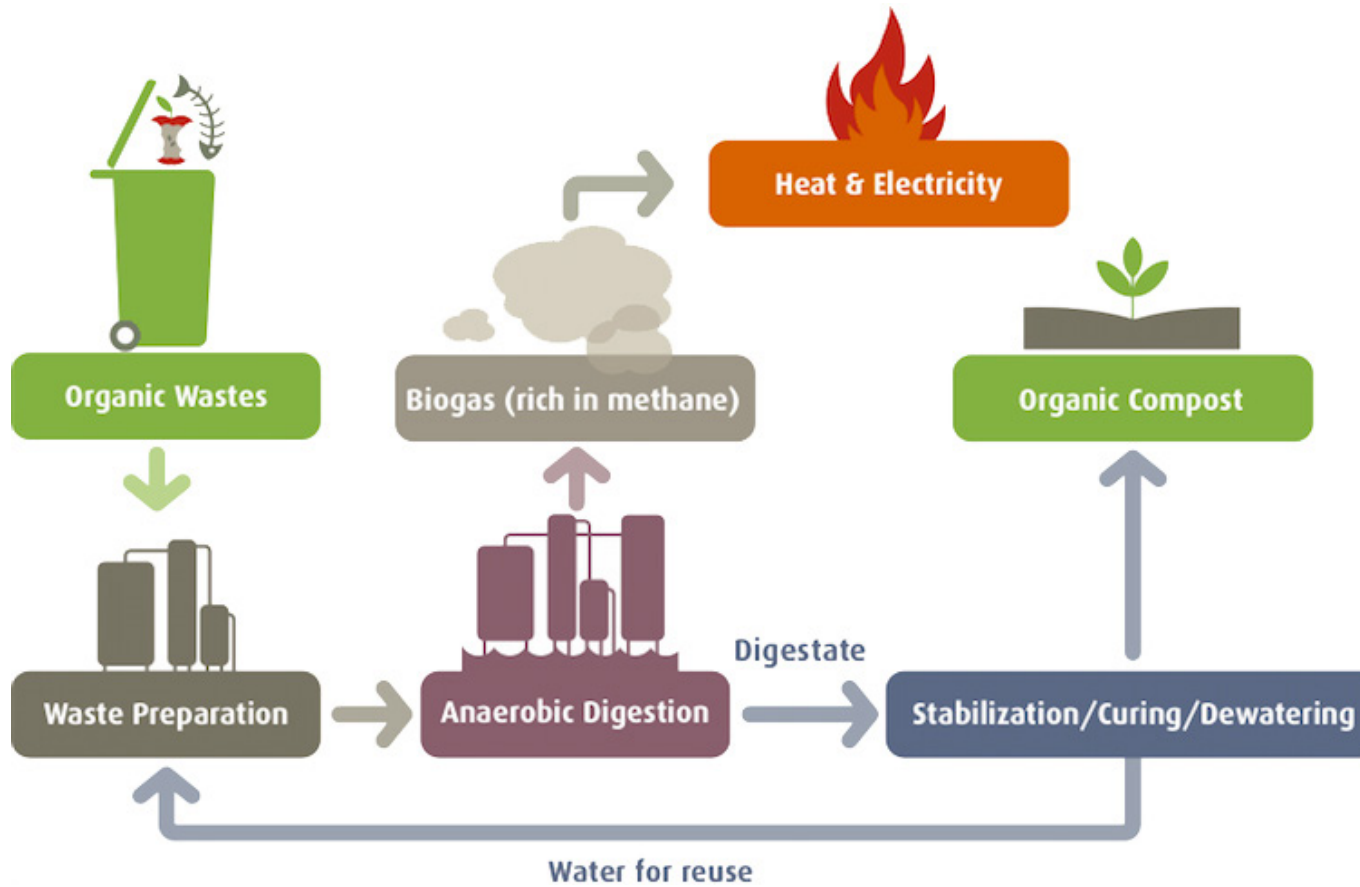


Figure 14 Integrated AD + composting facility flow diagram (diagram from Iona Capital Ltd)



Figure 15 Images of Zero Waste facility, San Jose, US

CASE-STUDY | THE PLANT, CHICAGO, US

The Plant is a sustainable and **"net zero energy vertical farm and business incubator"** housed in a former meat packing plant. Bubbly Dynamics, LLC founded the project on a model of "closing waste, resource, and energy loops" in the form of a 93,500 sq. ft. building and co-runs the space with the non-profit Plant Chicago, NFP. This project diverts over 10,000 tons of annual food waste from landfills by processing all of its organic waste on site with an anaerobic digester. This AD produces all of the building's heat and power needs, and the building's production activities are prioritized during off-peak electricity hours in the evenings so that the electricity produced from organic waste processing can be sold back to the grid for peak-hour profit. Sustainable food businesses are permanently housed at low energy costs and low rent. They are interrelated through a complex system of net zero energy, sustainable food production and social enterprise within the building and the adjacent community. Tenants feature a total of 30,000 sq. ft. of aquaponic growing systems and 27,000 sq. ft. of artisanal food production. The educational programming operated at The Plant is operated by the non-profit Plant Chicago. Topics include urban space reuse, and local and sustainable food production. Beyond closing resource loops, this visionary model creates a template to be replicated and adapted on a building and neighborhood scale to empower all people to create healthier and more efficient cities.



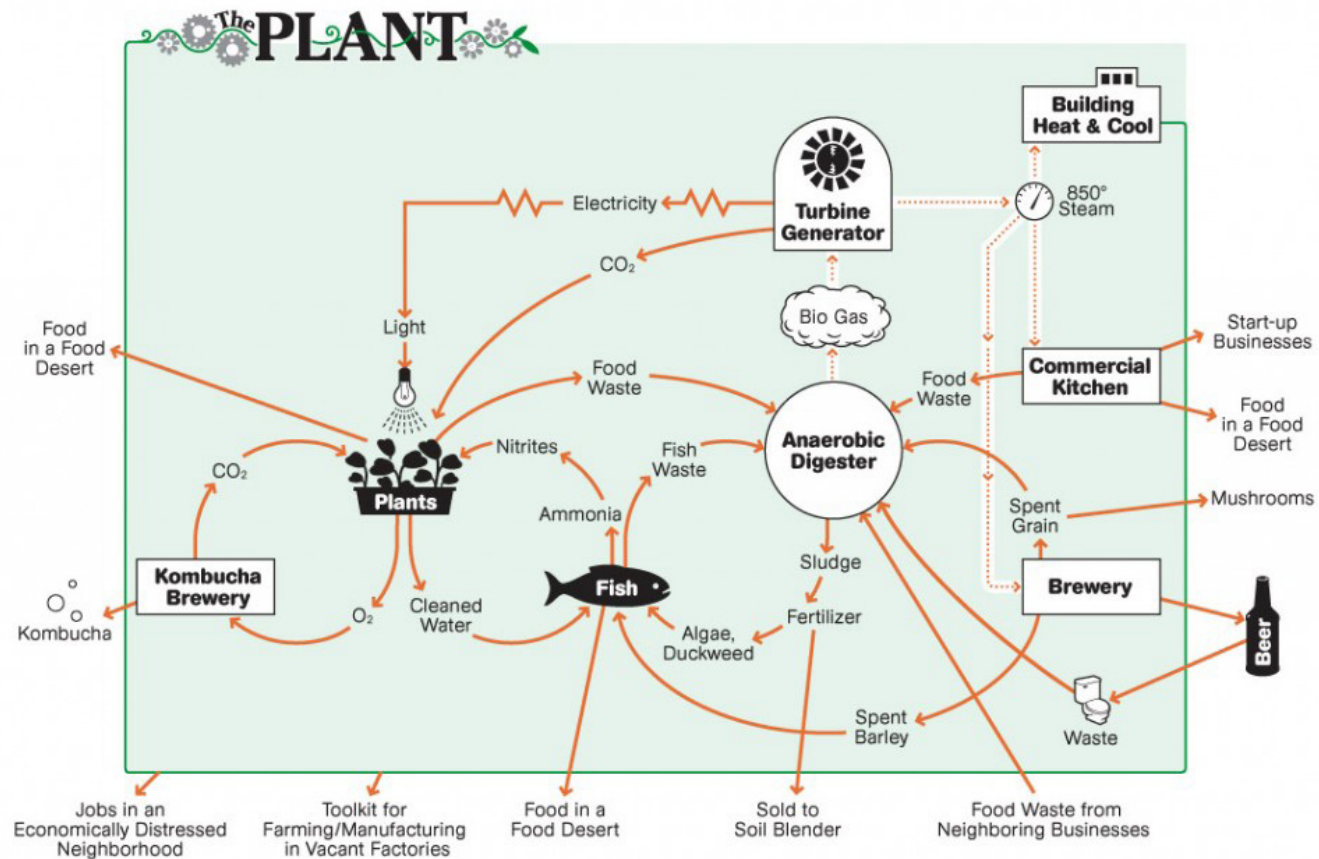
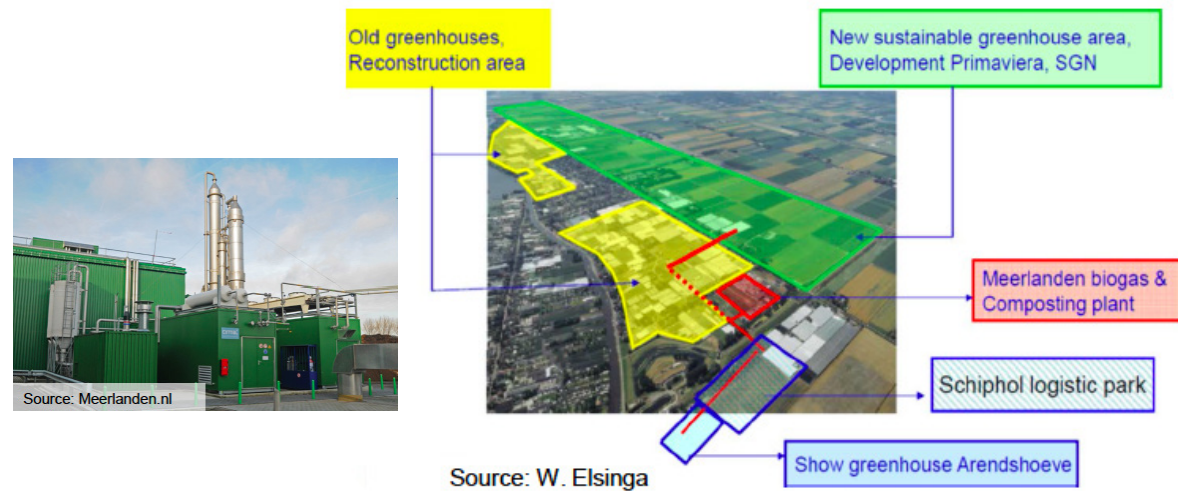


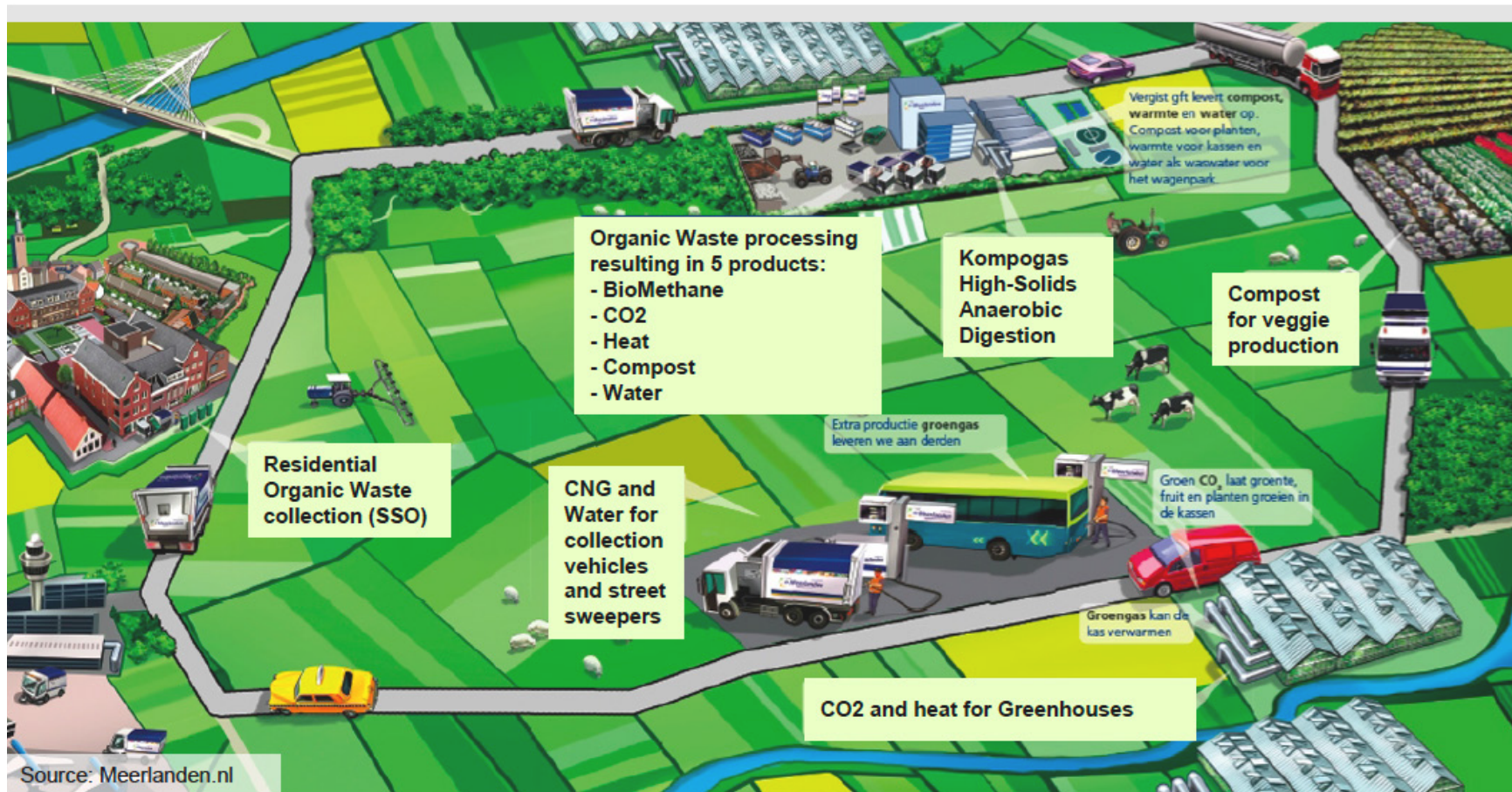
Figure 17 Building resource flow cycle (image from PlantChicago.com)



Figure 18 Images of The Plant (images from Flickr.com)

The town of Meerlanden, adjacent to the Schiphol Airport in Amsterdam, runs on an integrated anaerobic digestion and composting plant to produce the resources necessary to operate the entire town's **“decentralized green circular economy”**. In 2009, Meerlanden decided to upgrade its organic waste composting infrastructure to high-efficiency composting tunnels instead of their open-air windrows. This allowed the town to reclaim some land for a new AD plant and reduce their GHG emissions. Dutch regulations prohibit the use of liquid fertilizer from organic digestate on fields due to its high nitrate content (over fertilization), so a high-solids AD system was implemented to minimize liquid digestate production. 55,000 tons of annual residential and commercial organic waste is processed into: renewable energy (CHP) to power and heat all operations, CO₂ and heat for greenhouse food production, compost for crop-vegetable production, biomethane (CNG) to power vehicles and water to clean streets. By maximizing material recycling and energy efficiency, Meerlanden provides a new net zero model on a town scale.





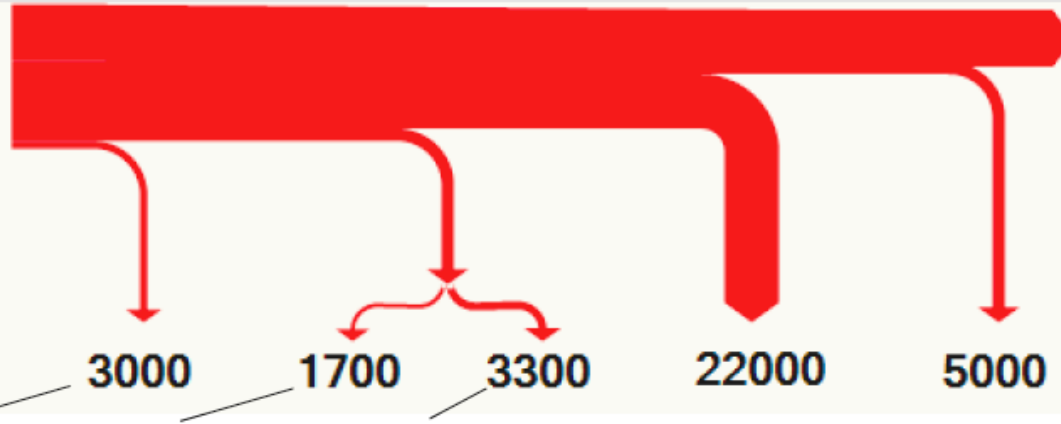
Let's build a Decentralized Green Circular Economy with
Maximum Material Recycling and Energy Efficiency

BioCycle West 2015, Portland/ OR, April 15th, Integrating AD and Composting, Netherlands Case Study 23

Figure 20 Kompogas high-solids AD helps closing the loop (by Hitachi Zosen | NOVA)

Organic Wastes
58'000 tpy

(at 40% DM,
-> water content
~35'000 tpy)








23000 tpy

Water evaporation
CO2 loss compost



however, heat
recovered up to
350'000
therm`s/year

Rejects	BioMethane	CO2	Compost	Water	Heat
To Amsterdam EfW plant → 150-200 kWel	580'000 DGE 1.7 M truck miles >10 M car miles	17a greenhouse 2000 tpy bell pep +50% due CO ₂ ,...	2500 acres of flowers or corn EC certified	Used for road cleaning and deicing	Used to heat greenhouses ... and heat
					
				Lakewood, CO	

Source: Meerlanden.nl

BioCycle West 2015, Portland/ OR, April 15th, Integrating AD and Composting, Netherlands Case Study 22

Figure 21 Mass balance of Meerlanden plant including Kompogas AD (by Hitachi Zosen | NOVA)

THE LOCAL FOOD/YARD WASTE SYSTEM

The City of Seattle works in public and private partnership to collect, haul and process its municipal solid waste. There are 2 companies that haul this source separated waste with the help of 146 compressed natural gas (CNG) trucks: Waste Management and CleanScapes. These haulers provide their own refueling stations. The city is broken up into 5 collection zones where garbage, recyclables, and food/yard waste is collected on a weekly calendar per zone. The composting of food/yard waste is bid out to processing companies on 2 year contracts. Recyclables and garbage waste is triaged at Seattle's North and South transfer stations, then relocated and processed outside of the city, the state and even the country.

Washington state supports the composting of organic waste, but it is the 22+ composting companies that drive this into reality as well as carbon reduction standards. In 2014, Seattle composted 22,365 tons of organic waste. Waste Management hauled 28,776 tons of food/yard waste to Cedar Grove's processing facilities in Maple Valley and Everett, WA. CleanScapes hauled over 24,391 tons of food/yard waste to Lenz Enterprises in Stanwood, WA. None of Seattle's food/yard waste is processed into compost inside the city, which raises costs and adds to vehicular traffic. Cedar Grove, which used to process all of Seattle's yard waste starting in 1989 as part of Seattle's "clean green" composting program, had previously looked into an AD and composting system upgrade from open windrows and aeriated static piles. Due to high cost, stringent permitting and high-regulations on such systems, it is now using a membrane laminate technology with a "fully automated aeration/leachate collection trenching system". Lenz Enterprises uses concrete bunkers with low-friction aeration floors and a mass bed. Composting diverts GHG emissions that landfilling does not, however it is the technology used to process this organic waste that determines the extent of methane and carbon dioxide gas diversion.



Figure 22 Seattle MSW Collection Zones Map (map from CleanScapes.com)





[CEDAR GROVE, MAPLE VALLEY, WA]

+8,945 tons of food/yard waste
from West and South collection zones



[CEDAR GROVE, EVERETT, WA]

+19,831 tons of food/yard waste
from NW collection zone



[LENZ ENTERPRISES, STANDWOOD, WA]

+24,391 tons of food/yard waste
from NE and Central collection zones

Figure 23 2014 food/yard waste processing facilities contracted by Seattle (images from Google Maps)

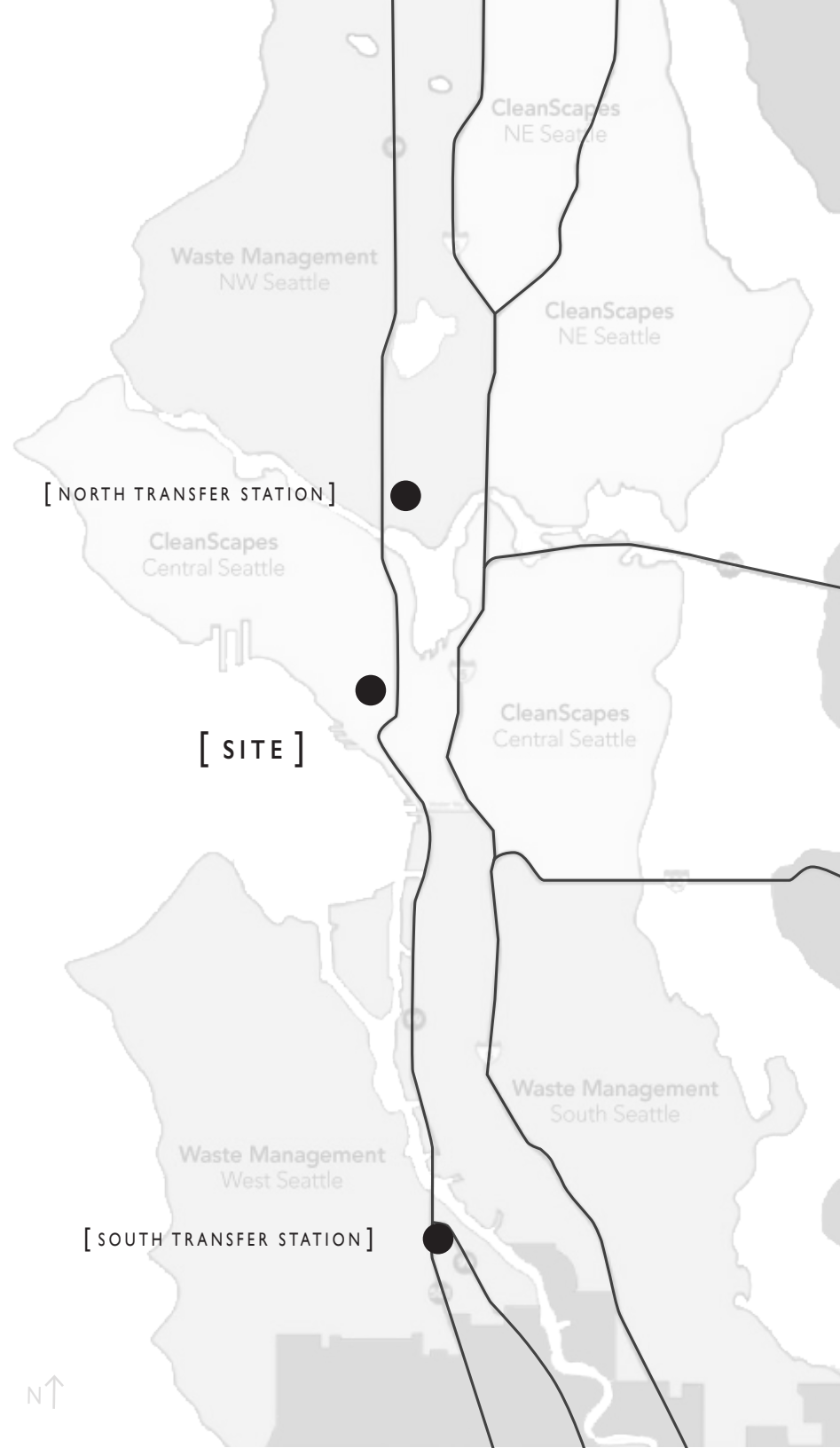


Figure 24 Site location (basemap from CleanScapes.com)

The City of Seattle has successfully implemented source separation organics (SSO) on its path to zero waste, and is one of the US cities best managing its organic waste. Seattle needs to start utilizing modern waste technologies to solve its pressing concerns of MSW and energy demands from a growing population. More people will be moving to, and working and living in Seattle in the next 20 years. Seattle receives most of its energy from hydropower, which it no longer considers a renewable energy. Hydropower has also increasingly become volatile with climate change in the recent years. This inevitable growth will put more pressure on generating increasing energy and waste demands.

This thesis offers a new zero waste model of a composting center in the heart of Seattle. The site is located in between the city's MSW North and South transfer stations and is accessible to and from them through Highway 99. It is conveniently located in the greater downtown, which is one of the 3 main urban centers to absorb most of Seattle's future growth according to Seattle's 2015 Comprehensive Plan. This proposed integrated anaerobic digestion and composting center will absorb the new food/yard waste for all of the Central Seattle zone (which produced 5,247 tons of food/yard waste in 2014), while showcasing a new and socially responsible model for performing the site and city better.



Figure 25 Seattle Center Campus, Uptown Neighborhood (base from Google Earth)

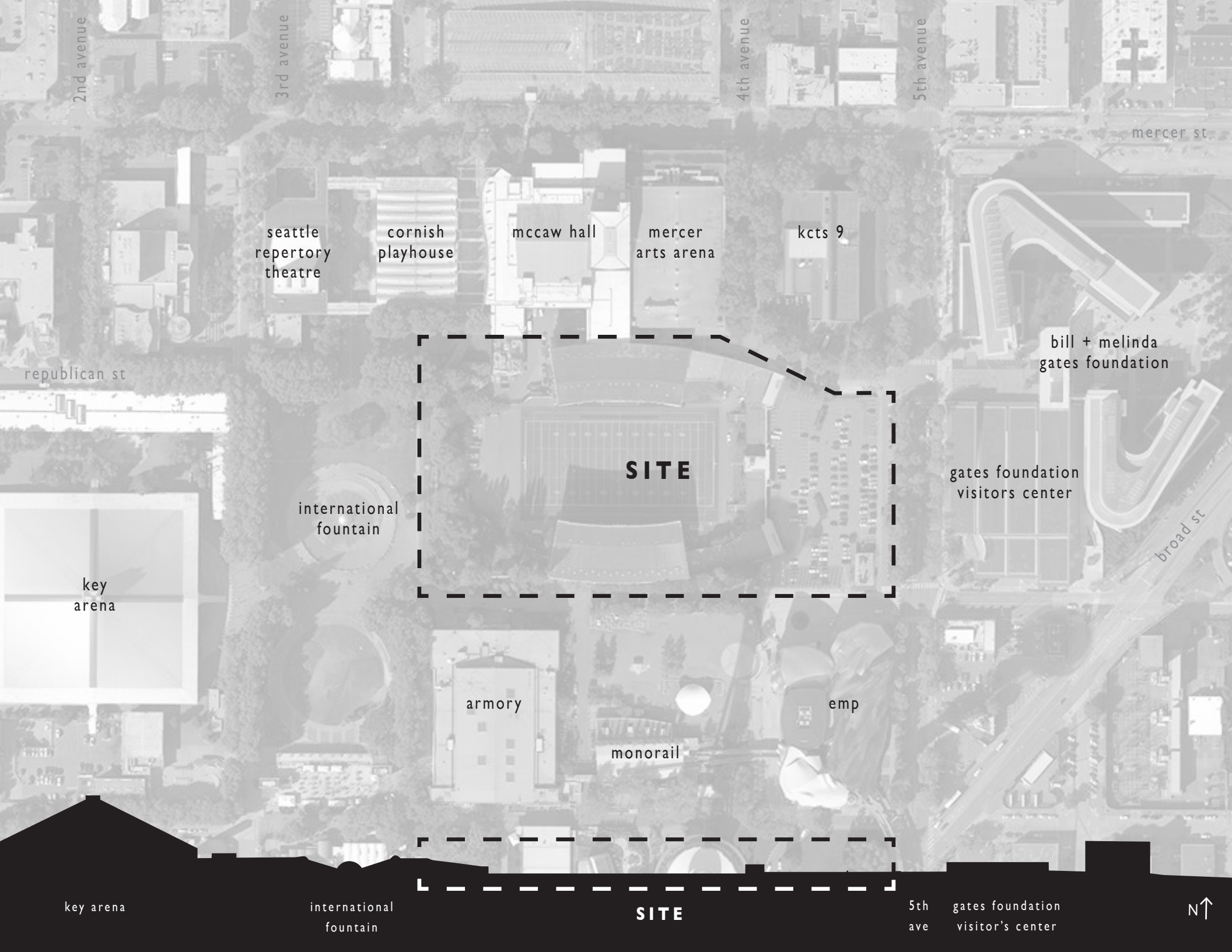


ALL EYES ON [SITE]

The City of Seattle's comprehensive plan has highlighted the area of Uptown, in Lower Queen Anne, as one of the existing "Urban Villages" that will be used to leverage projected growth and benefit the larger city. A recently developed urban design framework (UDF) for this urban center will apply a community-driven approach of a walkable, livable and connected Uptown to meet the city's comprehensive goals. The Bill and Melinda Gates Foundation lays adjacent to the Seattle Center along 5th avenue North. This private foundation is said to be the largest and works all over the world. It provides approximately 1,227 jobs in Seattle (as of September 2014). With its proximity to Downtown, the waterfront and South Lake Union (the city's fastest developing neighborhood and biotech industry home), Uptown is a prime and untapped site for smart growth.

Uptown's identity is at its heart. The Seattle Center's 74-acre urban park is an enormous presence providing a combination of tourist attractions, hosts 30 top regional entertainment powerhouses, a solid core of arts-related and educational institutions and more than a dozen smaller groups. It attracts an average of 12 million visitors and creates 15,534 jobs annually. Seattle Center is also home to the City of Seattle's most identifiable landmark: the Space Needle. Originally built in 1962 for the Seattle World's Fair, named "Century 21", the iconic Needle and the rest of the exposition provided visitors with a glimpse of the future. It gave Seattle international recognition, shaping its culture and legacy.

Seattle Center supports a campus growth framework that will showcase green technology, generate revenue through mixed programming and reaffirm itself as an urban park. Their vision is to open-up the once enclosed grounds of the World's Fair to the neighborhood to continue to shape the local and global culture of the world.



2nd avenue

3rd avenue

4th avenue

5th avenue

mercier st

seattle
repertory
theatre

cornish
playhouse

mccaw hall

mercier
arts arena

kcts 9

republican st

bill + melinda
gates foundation

SITE

gates foundation
visitors center

international
fountain

broad st

key
arena

armory

emp

monorail

key arena

international
fountain

SITE

5th
ave

gates foundation
visitor's center



ALL EYES ON [SITE]

This thesis proposal is sited on Memorial Stadium Zone at Seattle Center. It is prominently located at the Northeast corner of the 74-acre urban campus, across from the Gates Foundation along 5th Avenue North. Originally a large and open field from 1928 used for sporting and public events by the name of Civic Field, the current 10-acre site hosts a parking lot off of 5th Avenue North and a 12,000 seat outdoor and athletic stadium (only the North bandstand is in use today). Memorial Stadium, design by architect George Stoddard, opened in 1947. Its existence precedes the larger Seattle Center campus developed for the 1962 Seattle World's Fair that introduced Seattle to the rest of the world. The stadium hosted the majority of the opening ceremonies. The Seattle School District purchased the stadium and parking lot in 1944 from the city for \$1. It is used for high school football games, and rented to adult recreational leagues and for periodic concerts/festivals.



CIVIC FIELD



1928

Image from PaulDorpat.com

amateur + HS sports, events
+ 9,000 seats

MEMORIAL STADIUM



1944

Image from from SeattlePi.com

HS district purchased land from city for \$1



1947

Image from from SeattleMag.com

amateur + HS sports, events
+ 17,000 seats



1951

Image from from Wikimedia.org

WWII HS student memorial wall

PUBLIC PARK



1962

Image from SeattleTimes.com

world's fair opening ceremonies
amateur + HS sports
+ 17,000 seats



2009

Image from from Panoramio.com

professional + amateur + HS sports
some performances
6,000 seats used



2015

Image from from SeattleMag.com

2035...

local + sustainable food/waste
production + education
performances + events
net zero public park

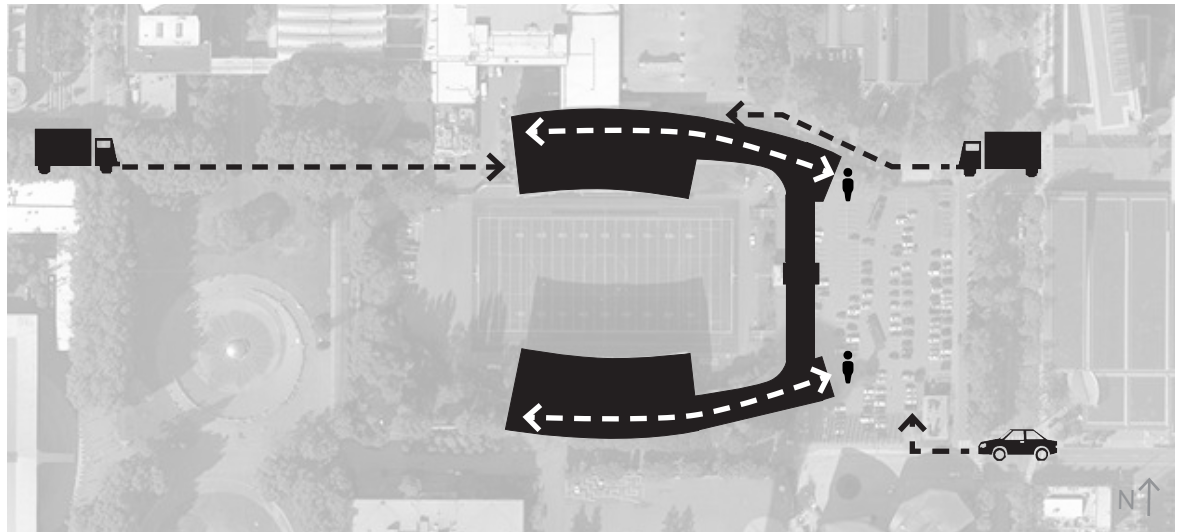
Figure 27 Site history and evolution

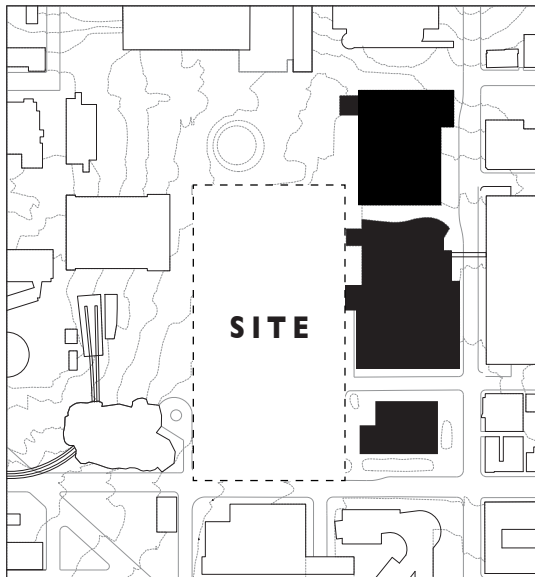
ALL EYES ON [SITE]

Memorial Stadium has undergone some repairs since it was first conceived (e.g. roof) in 1947. Only the North bandstand is currently made accessible for public attendance of professional sports games, and its 6,000 seats are rarely all sold. According to King County Assessor records, it is the parking lot that is generating annual revenue of around \$700,000 for the Seattle Public Schools district. The entire Memorial Stadium Zone is valued at \$46.8 million. The City of Seattle and the Seattle Center plan to reappoint Memorial Stadium Zone with flexible and open-lawn for performances, and parking below grade (2008 Seattle Center Masterplan). This considerable move would visually and physically open up the larger campus to the street, the neighborhood and the rest of the city. The walled off site would once again be servicing and accessible to the greater public. The battle continues to convince the Seattle Public School district to relocate. If this were to happen, the property would legally default back to the city for it to allow the Center to make use of this prime site.

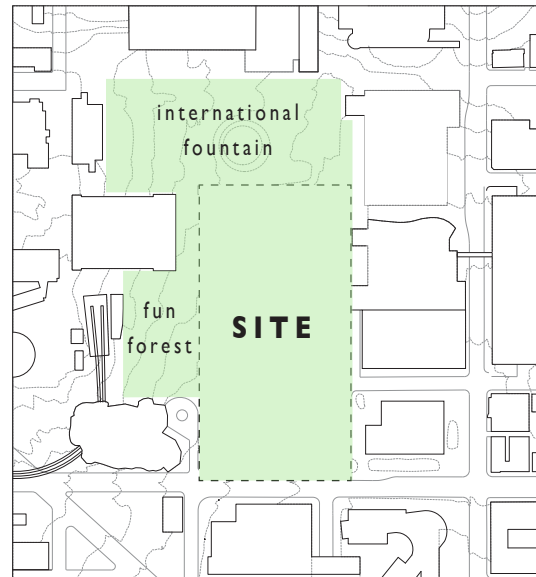


The existing stadium provides access to large trucks along its Northern edge which abuts the hard edge created by the back of house of Mccaw Hall (opera house) and Mercer Arts Arena. The 5th avenue North parking lot has 241 parking spaces. It leads the public to the stadium's two entrance gates that filter onto a level platform feeding into the bandstands. Only the South gate and North bandstand are being currently operated for public access to games. Despite the stadium being walled off from its context and sunken below grade, it sits in the center of an architecturally and programatically rich context. Open views to sky and downtown are enhanced with some of Seattle's most prominent landmarks such as the Space Needle, the Key Arena and the EMP. The entire glass wall of the Gates Foundation Visitor's Center prominently views onto the 5th avenue North parking lot.

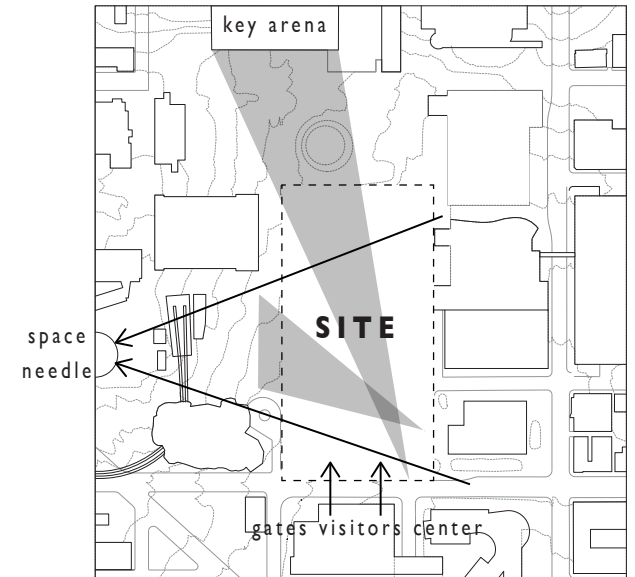




HARD EDGES



SOFT EDGES



VIEWS + VISTAS

Figure 30 Site analysis

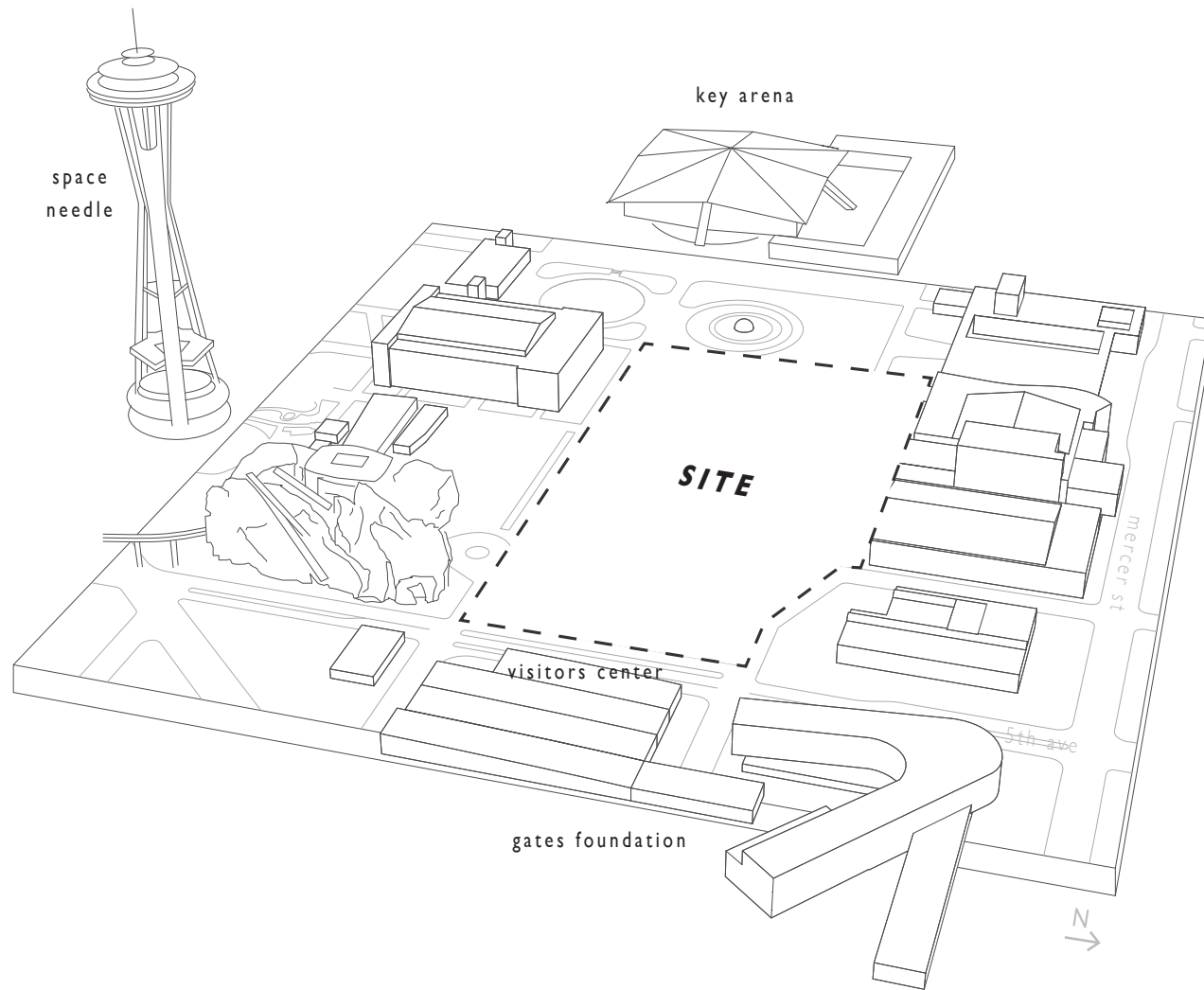


Figure 31 Site context

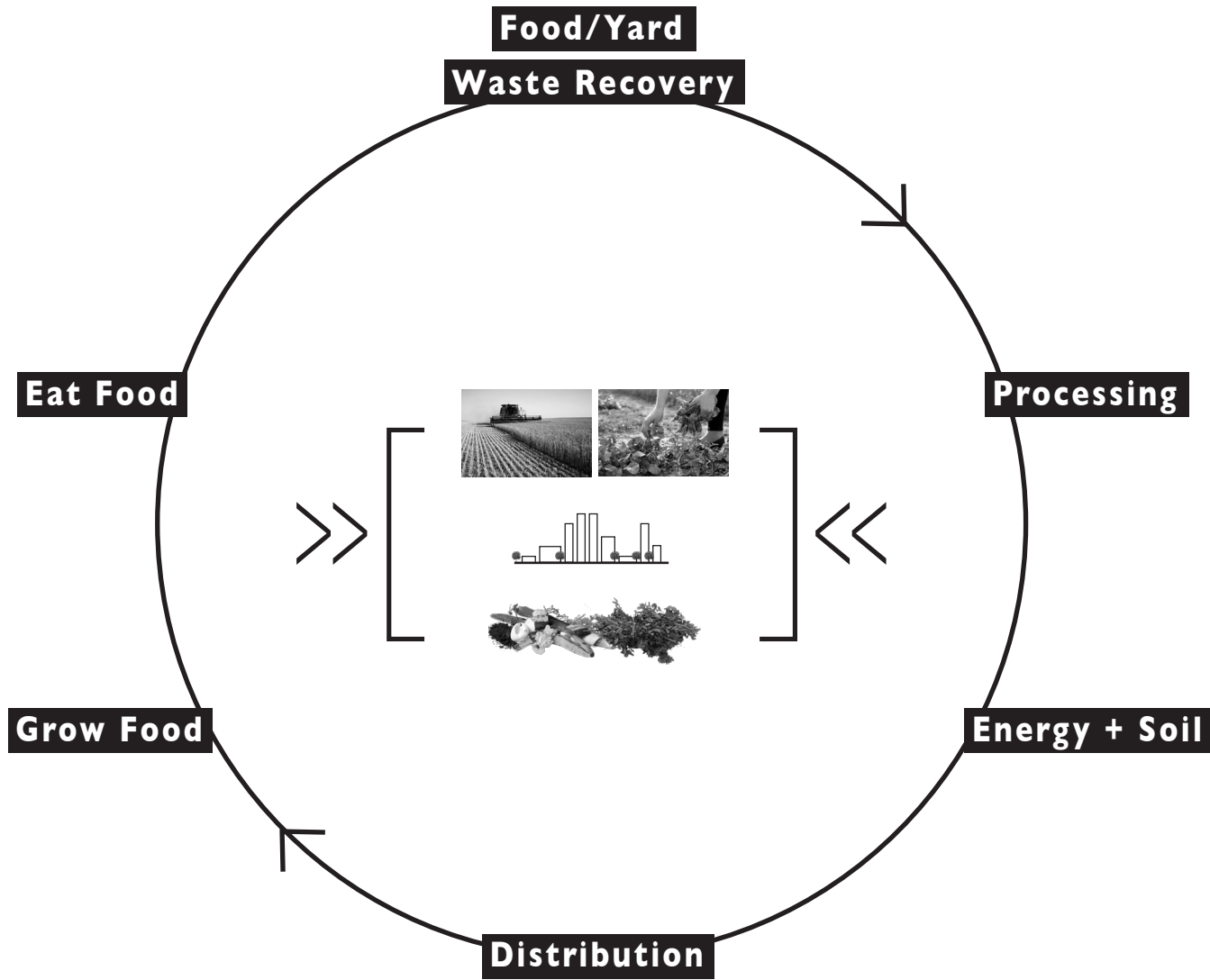


Figure 32 Resource life-cycling diagram (top left image from WiseGeek.com, top right image from TheSelfRelianceSummit.com)

X.

A [NEW MODEL] OF URBAN PERFORMANCE

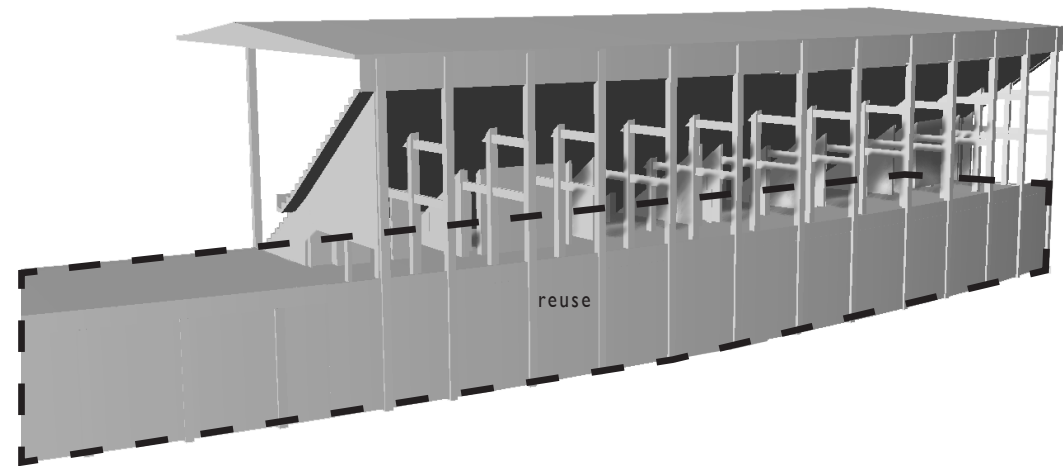
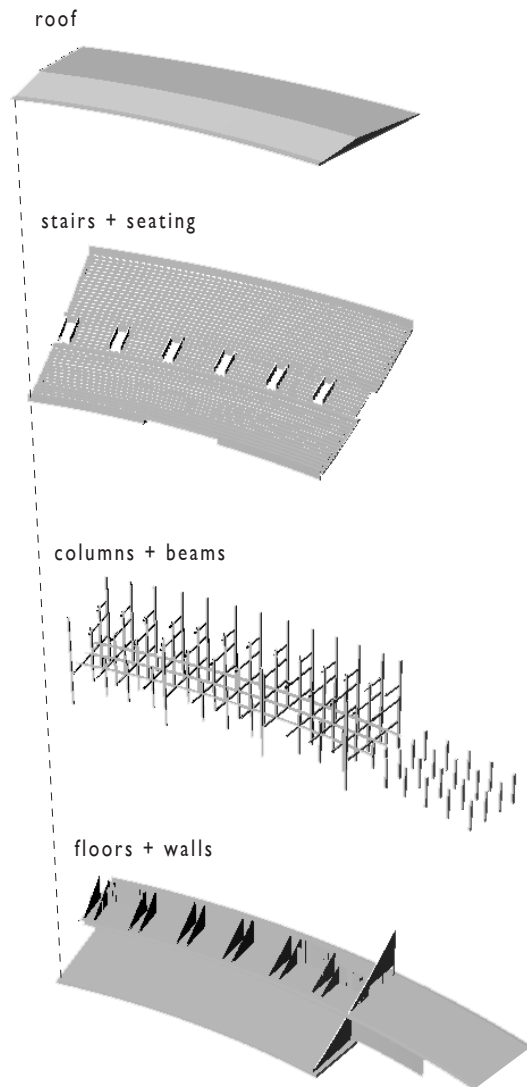
There are two major site strategies are proposed for the new Memorial Stadium Zone masterplan. The first connects the 10-acre site with its immediate context and the greater city by removing the existing perimeter wall and meet the topographical grade changes with open landscape. A public park will not only integrate the site by allowing more porosity into the campus, but it will highlight the historical edges and create a grand entrance into the heart of the campus with public visibility and access along 5th avenue North. As increasing density begins to erode the urban fabric of the greater downtown, this public and open park will help preserve the heart of the city, Seattle Center Campus, that contributes to the urban quality of the Seattle lifestyle.

A composting facility is inserted into the North and West parts of the site, while a food production facility will be inserted to the South. The public park will cover the entire facility programs with landscape by inserting them underground on the existing stadium site, which currently sits between 17 to 33 feet below its perimeter grade. The only existing on grade access to the stadium ground level is off of 4th avenue North. The composting facility's main entrance will be sited there for on street access and visibility. This location also abuts Mccaw Hall's existing loading access ramp along the Southeast edge of the site. This existing ramp will be expanded for garbage truck access to the facility receiving hall. All other food and food/yard waste resources will be moved underground through a common parking garage. An underground parking access ramp is proposed off of the Experience Music Project museum's existing drop-off route. The second site move is the proposal of underground program.

X.

A [NEW MODEL] OF URBAN PERFORMANCE

Parts of the existing Memorial Stadium foundations will be adaptively reused and integrated into the new structure of the proposed program. The North bandstand foundations will house the main receiving hall and digesters of the composting facility, while the South bandstand foundations will house the conditioned food rooms of the food production facility.



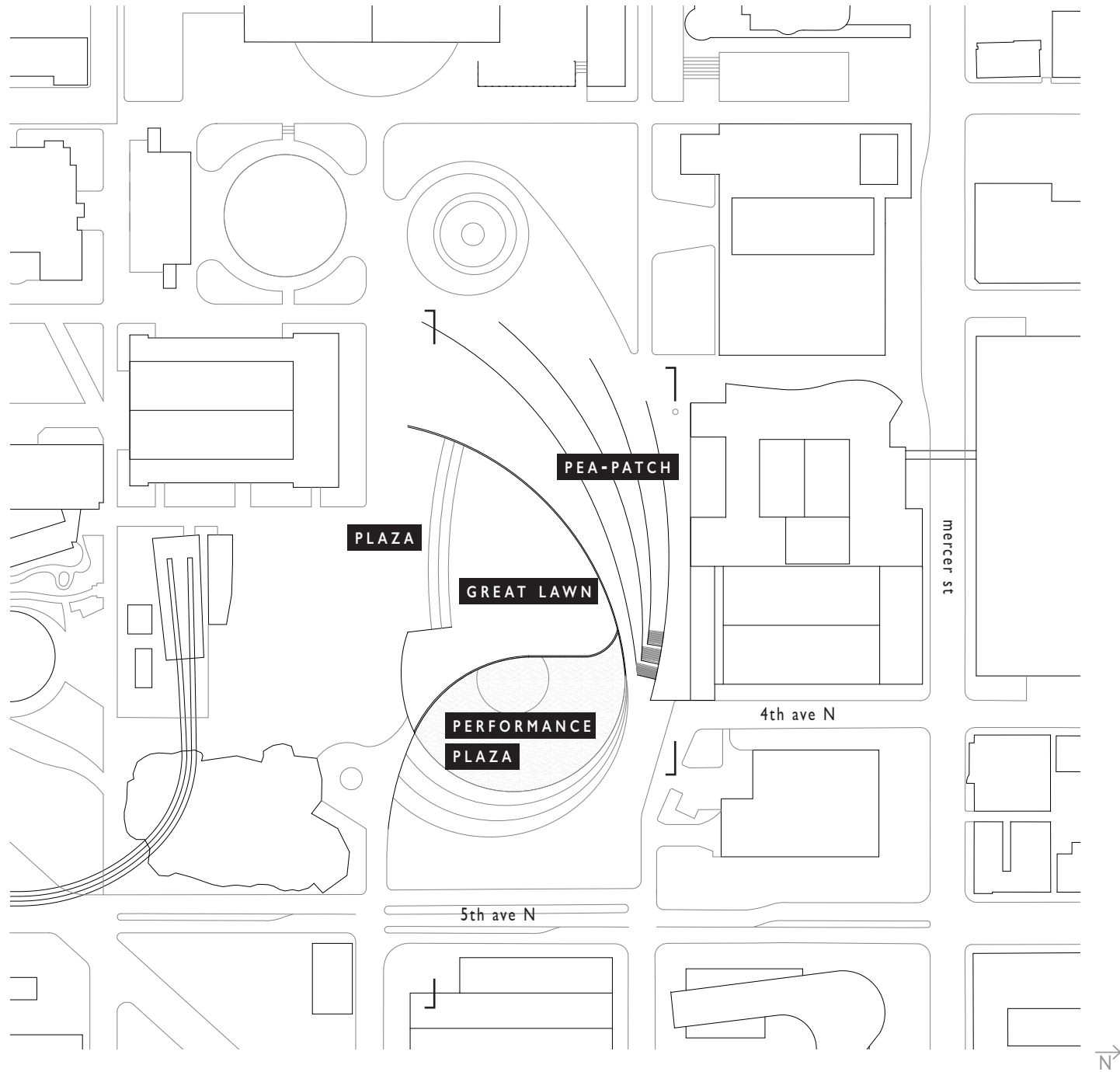


Figure 34 Masterplan

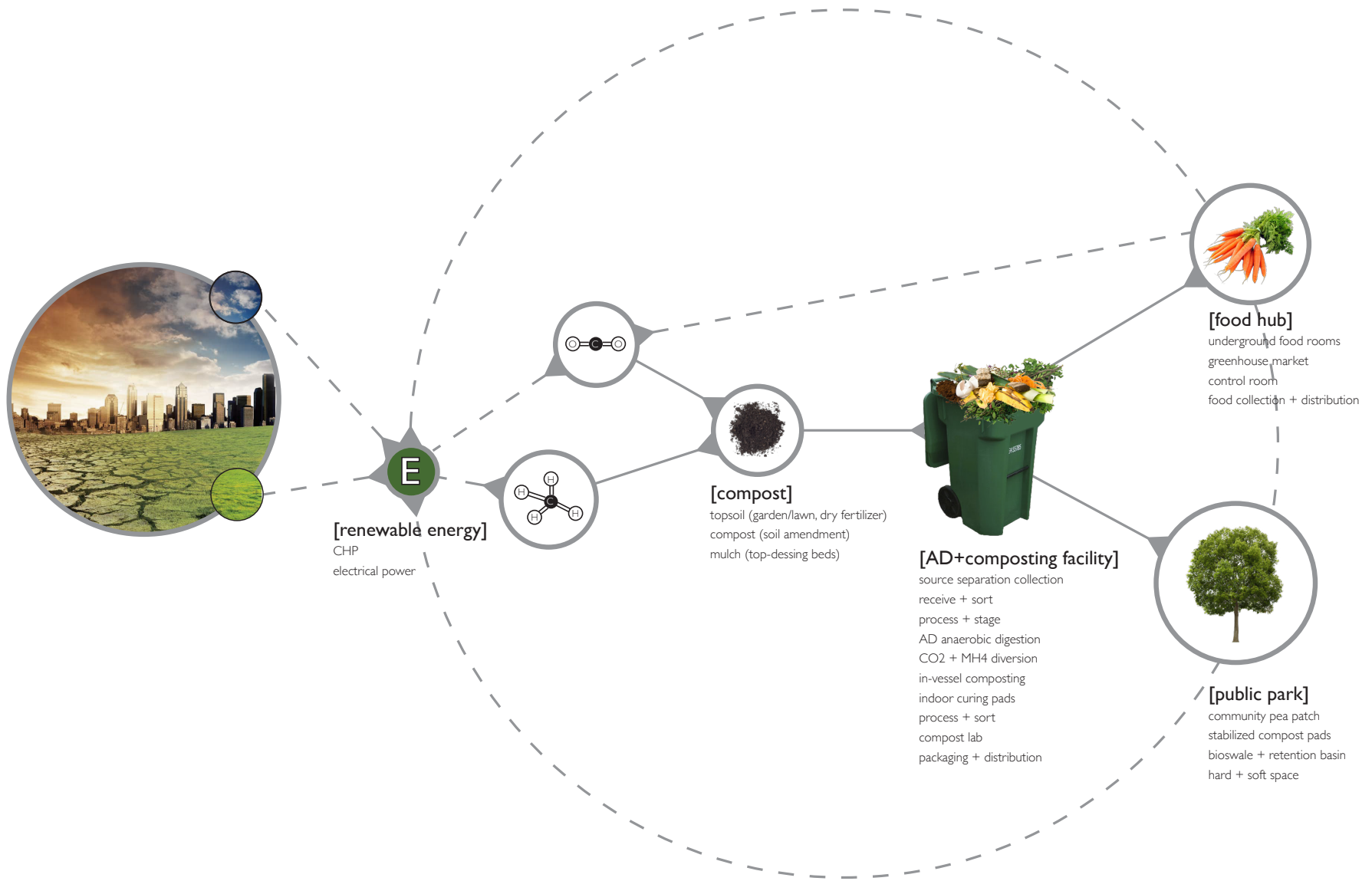
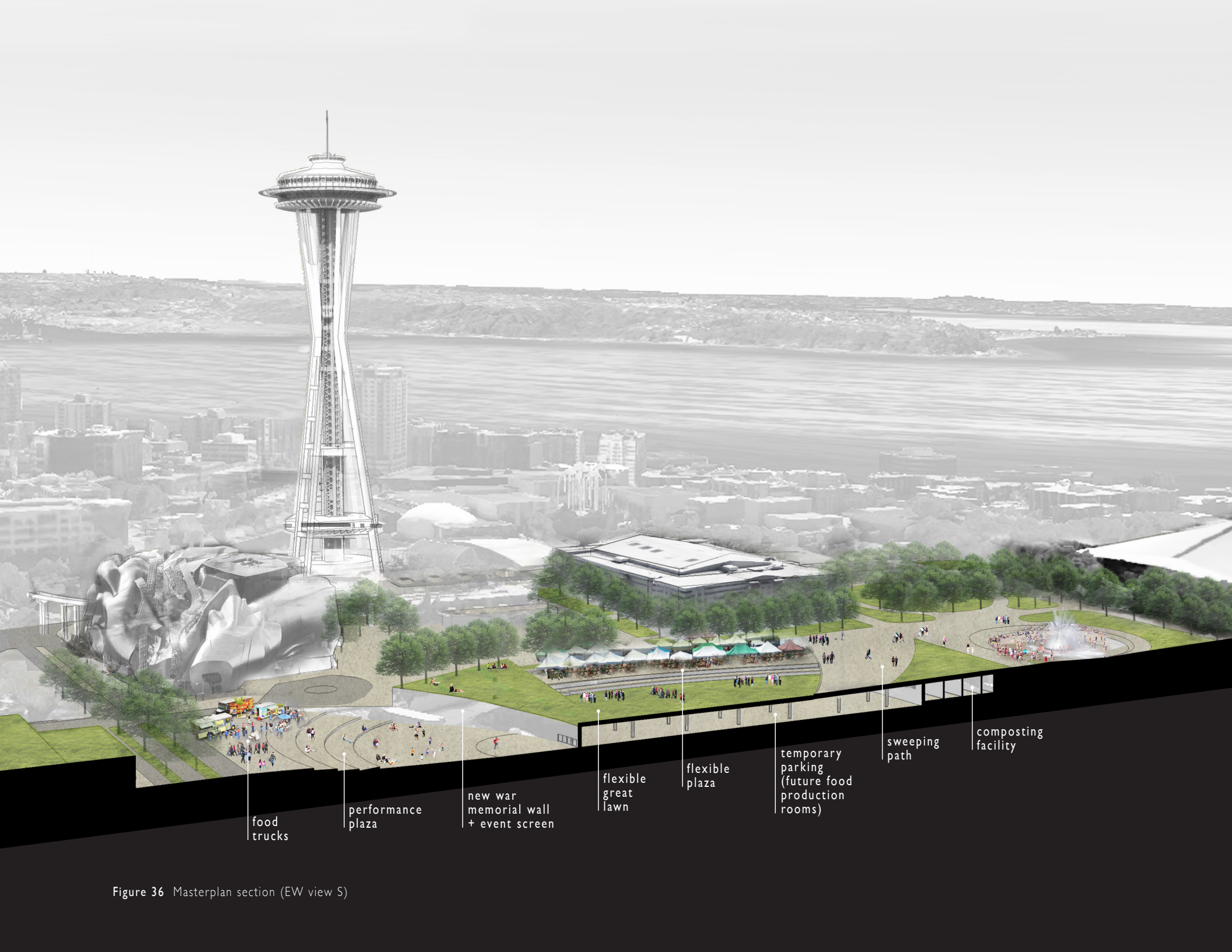


Figure 35 Masterplan resource life-cycling diagram (left image from GuyanaChronicle.com)

A [NEW MODEL] OF URBAN PERFORMANCE

Urban farming and small-scale sustainable food production is thriving in Seattle. The city has supported a culture of community pea-patches, local farmers markets, urban farming and now food trucks. Local and fresh produce is abundant in Seattle though it is not always accessible. The masterplan proposes using the site as an urban food park powered by a composting facility. The underground food production facility would produce affordable, local and fresh produce to the public by using the latest vertical farming technologies (e.g. Plant Lab NL). As the proposed composting facility processes more food/yard waste with growth in the greater downtown, more resources are produced to expand the food production facility into the proposed and temporary parking garage. The more food/yard waste is produced in Seattle, the more food can be produced in underground food rooms on site. Modern vertical farming techniques offer a solution to aging or un-used buildings in urban centers, while producing fresh produce with the least amount of resources.

The food interface above ground focuses on public awareness and outreach throughout the 10-acre public park. Seeing food being grown, using food crops as landscape vegetation and having access to eating fresh food creates a new standard of urban farming that is conducive to a healthier Seattle and quality lifestyle.



food trucks

performance plaza

new war memorial wall + event screen

flexible great lawn

flexible plaza

temporary parking (future food production rooms)

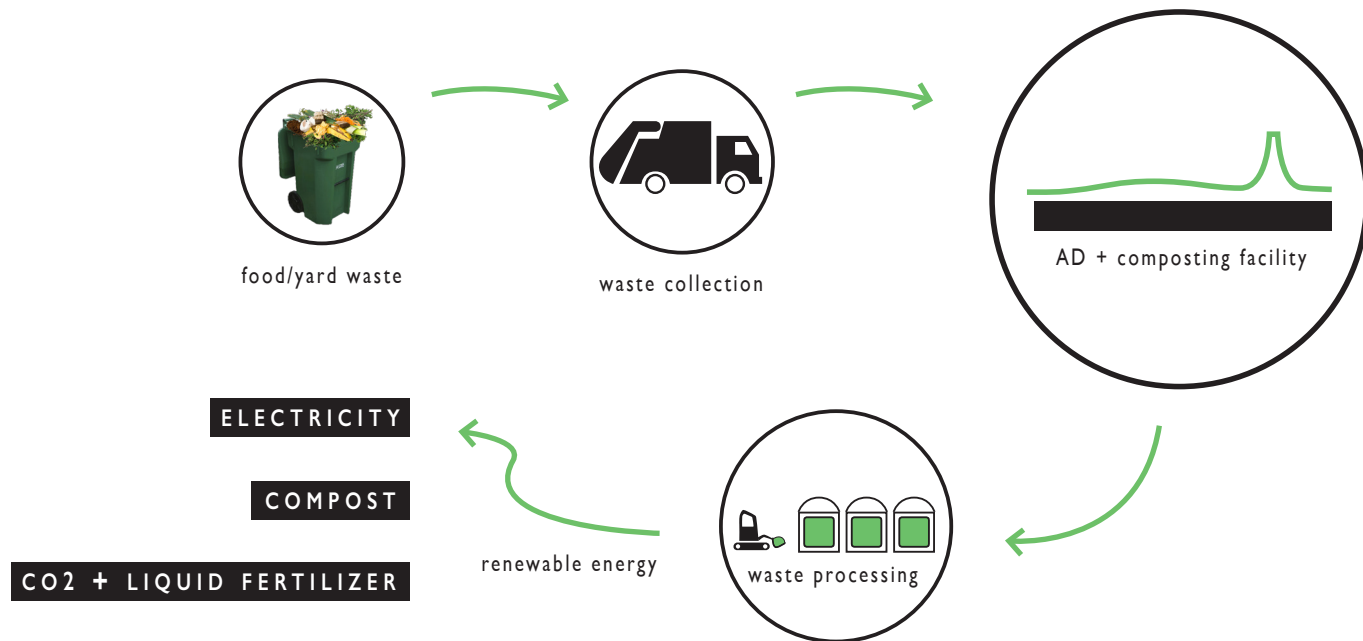
sweeping path

composting facility

Figure 36 Masterplan section (EW view S)

A [NEW MODEL] OF URBAN PERFORMANCE

The proposed masterplan functions with the success of its composting facility, which produces the key resources to operate and maintain the entire 10-acre site. All of the current and future food/yard waste produced in the Central Seattle municipal solid waste collection zone will be hauled to this new facility for processing into valuable resources. This facility integrates modular anaerobic digestion (AD) technology with the composting of organic waste in fully enclosed building envelop. This allows the facility to take on more waste with the growing tonnage of Seattle's greater downtown. With modern technology the composting facility produces combined heat and power, liquid fertilizer and a compost product. Organic waste is diverted from landfills and methane emissions are captured as a valuable source of renewable energy.



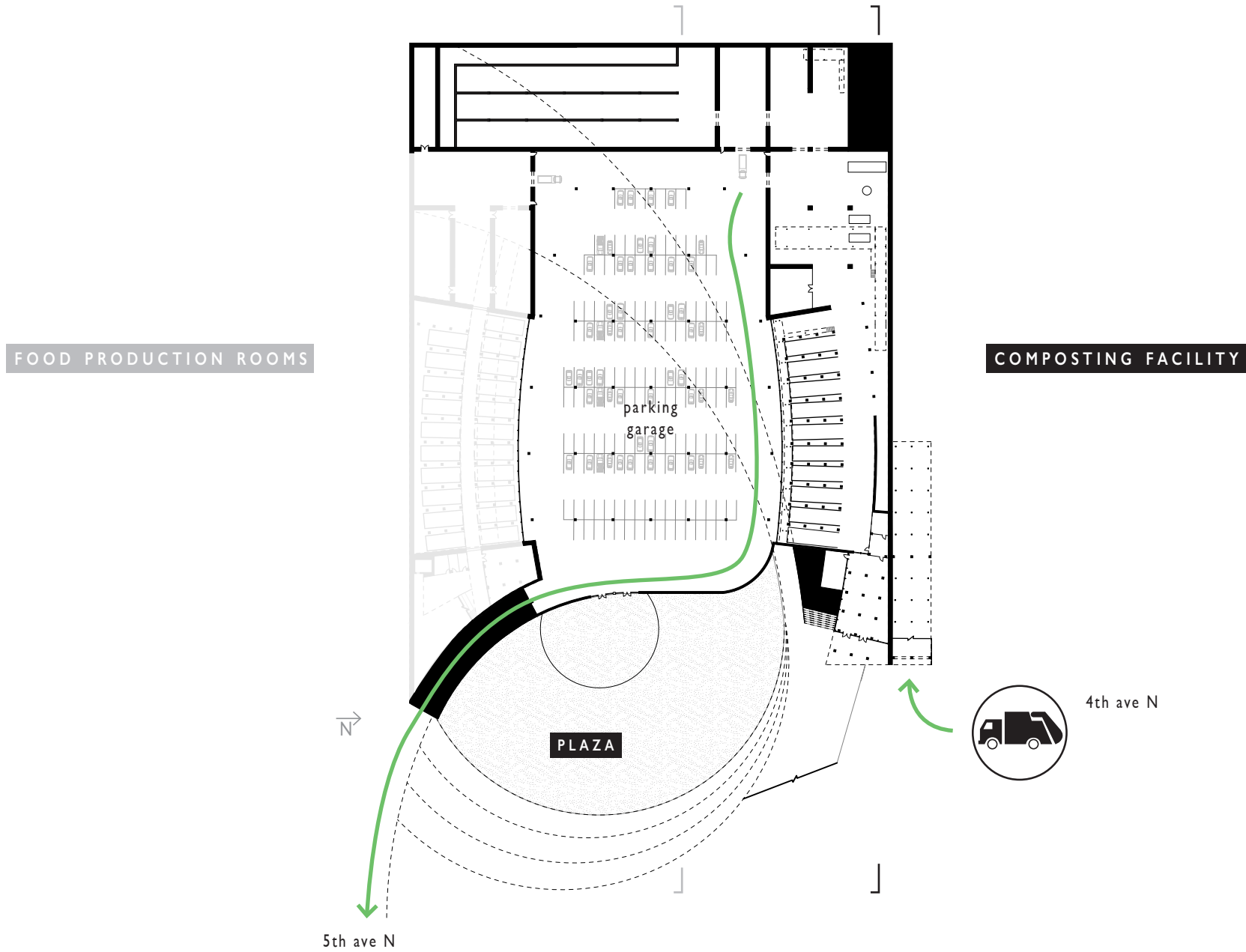


Figure 38 Ground level plan

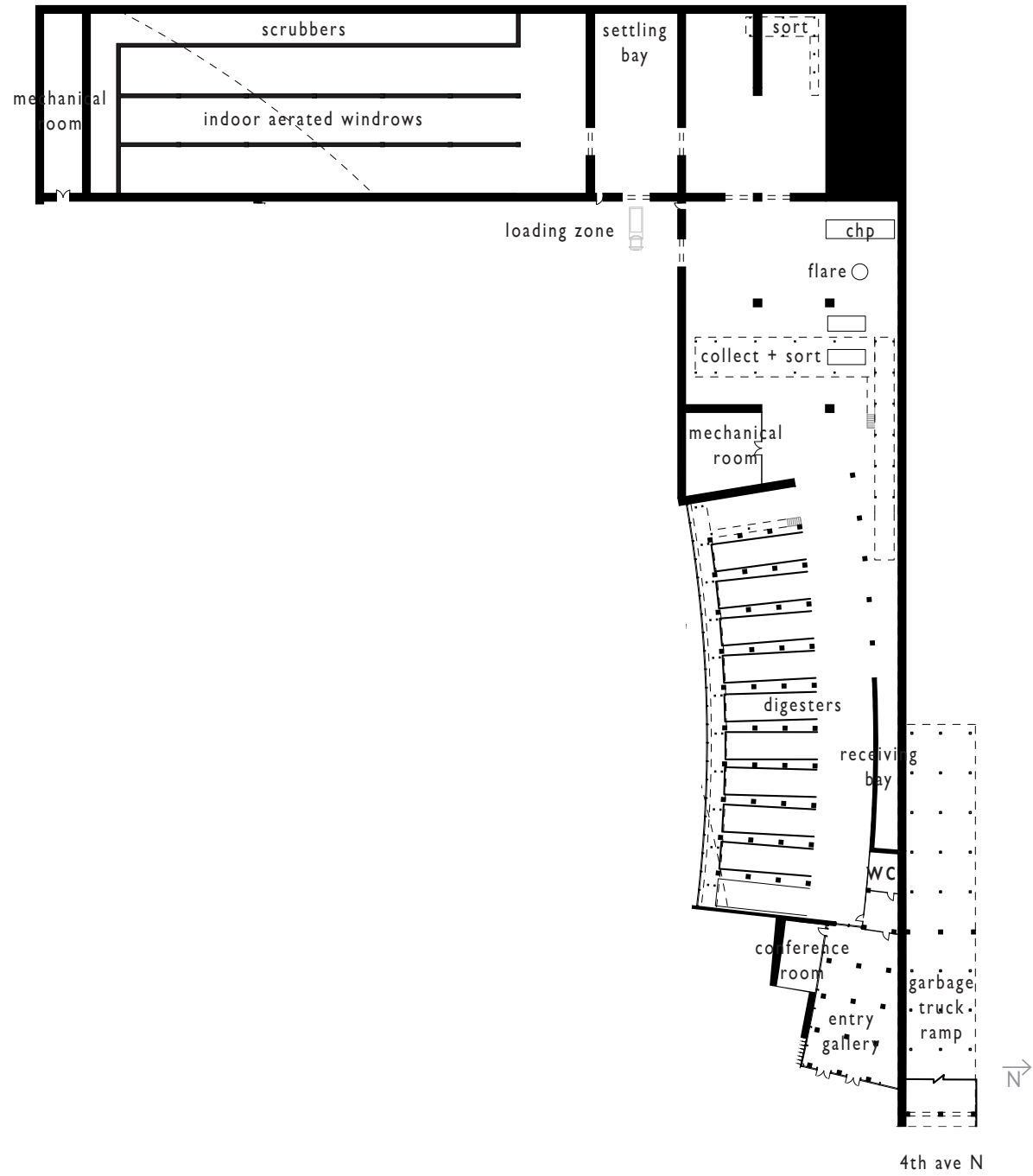


Figure 39 Composting facility plan (ground level)

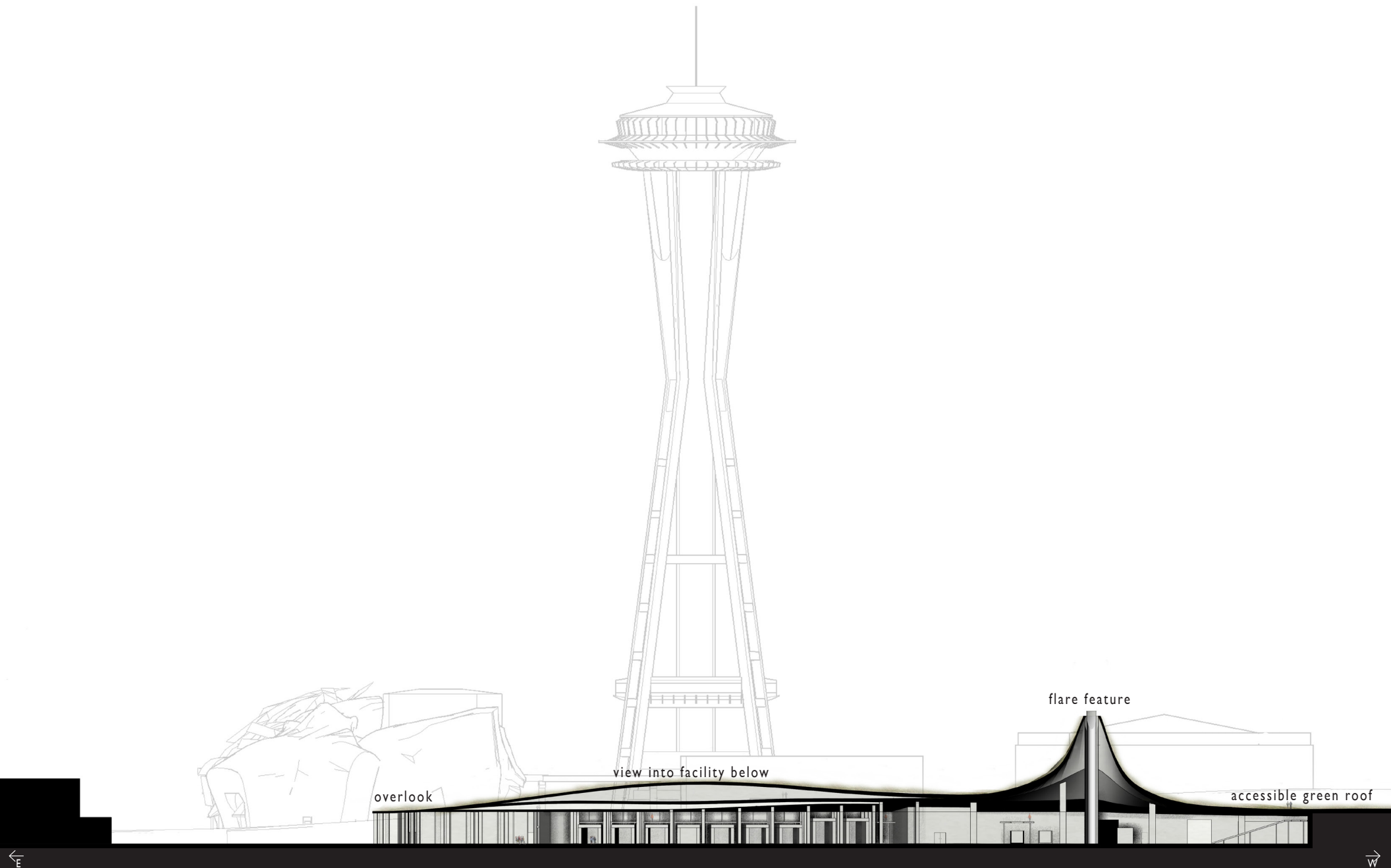


Figure 40 Composting facility section (EW view S)

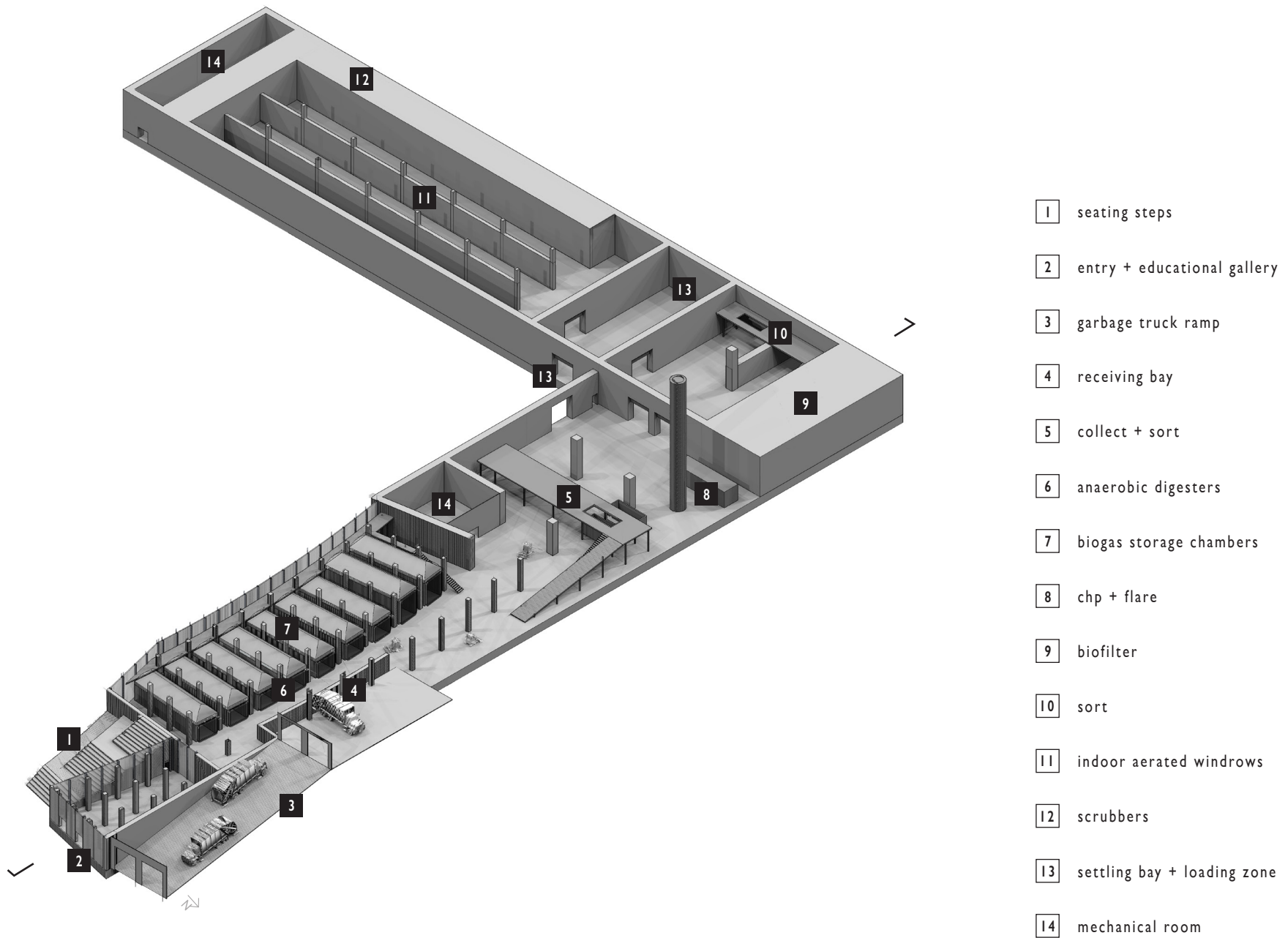
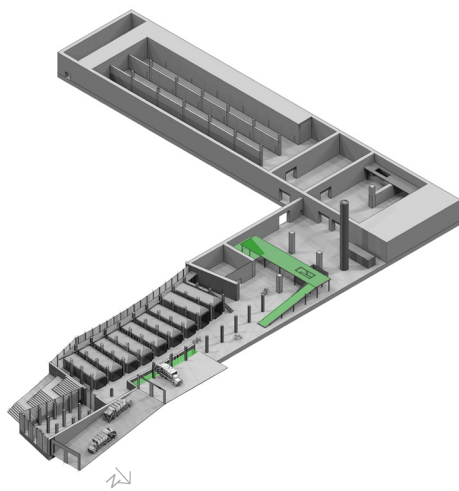


Figure 41 Composting facility diagram

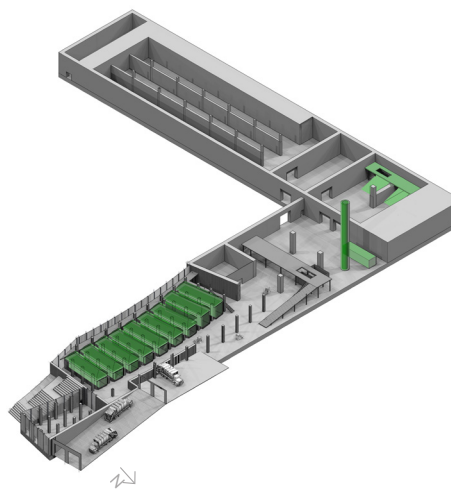
X.

A [NEW MODEL] OF URBAN PERFORMANCE

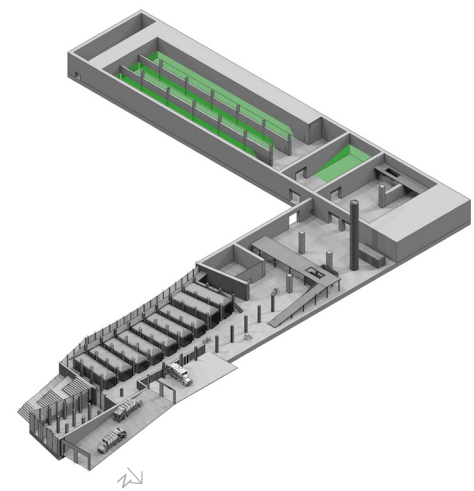
The proposed composting facility prioritizes the flow of food/yard waste throughout the different stages of its composting process. Garbage trucks dump the waste weekly during in a receiving bay. It is then collected with a small backhoe along a conveyor belt to be manually and machine sorted. Once most non-organics are removed, the waste is inserted into an anaerobic digester for a period of 21 days (peak methane yield). A mixture of water, bacteria, heat and oxygen is pumped through to accelerate organic decomposition and the waste mass is typically reduced down to 2/3 of its original size. Commercial composting facilities typically use and waste a lot of water to process organic waste. The integration of ADs in the process allows for minimal water usage on a closed-loop system, which stores and reuses the water and bacteria mixture. At the same time Biogas is captured above each AD and transferred to a combined heat and power unit (CHP) to be transformed into renewable energy.



receive, collect + sort



digest + sort



cure, settle + load



Figure 43 Facility view of interior

X.

A [NEW MODEL] OF URBAN PERFORMANCE

The partially digested waste is then transferred into a larger digester for another 4 to 5 days. This step removes 90% of the ammonia remaining, which reduces odor compounds. The compost is sorted again for non-organics. All of the digesters' air is transferred to a biofilter room. The air is pumped through a mixture of wood chips and compost for cleansing, and re-circulated into the building. An average of 3 air exchanges per hour occur in the entire building, except for the curing stage. An indoor aerated windrows system is proposed to remove any strong odors from leaking into the public park. The air in this space is pushed through nearby scrubbers with a similar mixture of wood chips and compost, and the space requires 5 air exchanges per hour. The compost is placed in 9 foot tall piles within the windrows and oxygen is pumped through. A machine travels along the piles to rotate the compost every 7 days (minimum). After 4 to 5 weeks the compost is ready to be loaded and delivered across the city.

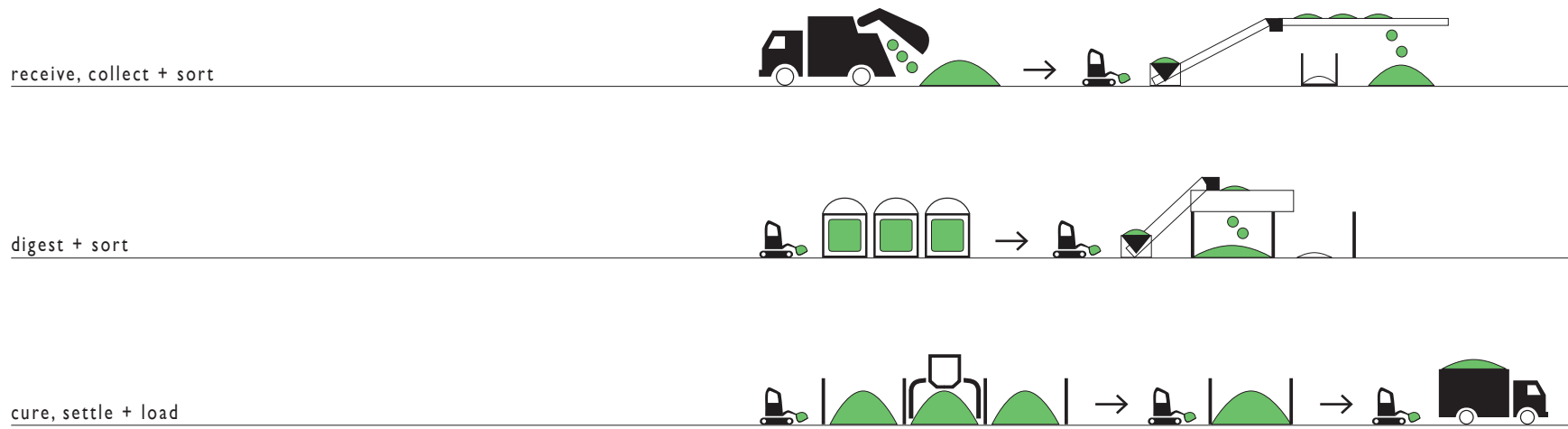


Figure 44 Composting facility flow

X.

A [NEW MODEL] OF URBAN PERFORMANCE



bicycle recycling



education programs



community events



neighborhood rewards

The composting facility's main entrance leads onto a public gallery supporting waste education. Despite the need for the facility to operate in a closed-envelop, curtain walls are used along the building's South facade for exterior visibility and daylighting. Educational tours are offered to promote local composting and the benefits of organic waste. The facility will work in public and private partnership with existing educational waste programs throughout the city to promote Seattle's path to zero waste.

The Central Seattle solid waste collection zone that the proposed facility caters to is hauled by Recology CleanScapes. The company offers community and school workshops and training catering to the proper recycling of municipal solid waste, and the importance of reusing and reducing waste. They also offer waste audits to help university campuses, schools and businesses to minimize environmental impact while reducing the cost of their solid waste.



Figure 45 Recology student training on waste recycling (images from CleanScapes.com)



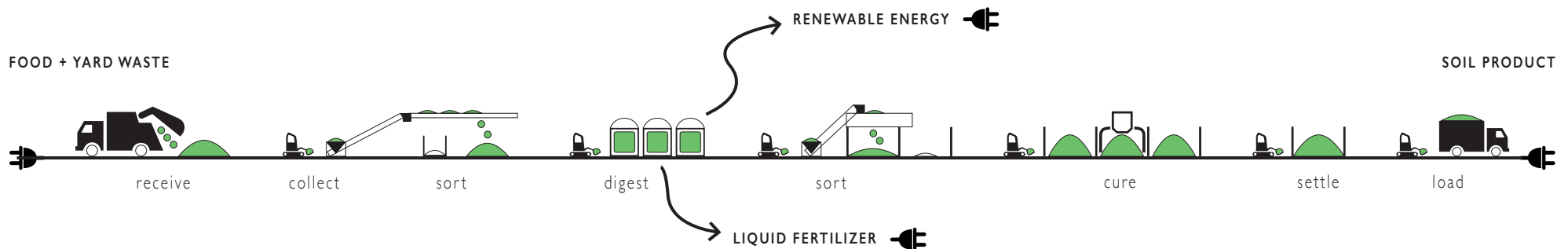
Figure 46 Composting facility view of entrance (at 4th ave N park entry)

X.

A [NEW MODEL] OF URBAN PERFORMANCE

This composting facility enables the abundant and municipal resource of food/yard waste that continues to grow with density to cycle back into new life for the benefit of the site and the city. The integration of anaerobic digestion technology with composting is emerging on the West Coast of the US out of need to reduce the energy and water costs of processing solid waste. Additionally, the use of ADs allow for the expedited decomposition of organics by at least half and on a much smaller site footprint. This technology offers the possibility of small to large scale composting within urban environments.

Seattle is one of the cities leading a successful composting program city wide, which increases its share of the municipal solid waste stream recycled annually. However, the city is still spending money to haul and process organic waste outside of the city. A new high-tech facility integrating anaerobic digestion technology with composting, which could be plugged into the city's existing MSW system, would enable the city to financially profit from its own organic waste rather than spend money for someone else to gain from it.



CONCLUSION

World population and its global waste problem continue to increase with an estimated increase of 9 billion people over the next 25 years. It is imperative that cities start to embrace the potential of organic waste to dramatically reduce the detrimental social, environmental and financial costs of global waste. By focusing on making cities and urban centers responsible for composting their organic waste, the quality of life of the entire planet begins to improve and the rate of climate change is reduced.

The City of Seattle is already leading the way towards a zero waste future. Compostables are the biggest target left in its solid waste stream. In response, the city passed the first American ban on food and compostable paper in garbage for all residential and commercial sectors. A proposed [zero waste] public park in the heart of Seattle would foster the city's goal to restructure its waste management and processing system even further, while absorbing the additional waste produced from its densifying greater downtown. This new park would be a showcase for the latest green technology in processing organic waste into a compost product and renewable energy.

As urban populations inevitably continue to rise, density growth and its strain on resources will continue to threaten the public safety and health of future cities. It is clear that the benefits and potential of food/yard waste composting is a catalyst towards a global shift in turning our waste into a long-term the solution.

LIST OF FIGURES

- Figure 1** Landfill (image from RecycleRiga)
- Figure 2** The global waste problem (illustration by Brian Fray)
- Figure 3** 2012 United States processing of MSW (US EPA, *2012 MSW Characterization Report*, p.1,2,4,7,10)
- Figure 4** 2010 daily global waste (US EPA, *2010 MSW Revised Fact Sheet*, p.1-2)
- Figure 5** United States food waste statistics
(US EPA, *The Food Recovery Hierarchy: Social Benefits*. <<http://www.epa.gov/foodrecovery/>>)
(NRDC Issue Paper by Dana Gunders, *Wasted: How America Is Losing Up to 40 Percent of Its Food from Farm to Fork to Landfill*, August 2012. P.1.)
(image from FoodManufacture.co.uk)
- Figure 6** Typical decentralized and single-direction flow of food to organic waste resources through a [city]
(far left image from WiseGeek.com, left image from TheSeltRelianceSummit.com)
- Figure 7** Proposed localization model of the life-cycle of food to organic waste resources in a [city]
(top left image from WiseGeek.com, top right image from TheSeltRelianceSummit.com)
- Figure 8** The City of Seattle, WA
- Figure 9** Seattle food/yard waste collection
- Figure 10** Seattle's new 2015 ban (image from MackUrban.com)
- Figure 11** 2015 first quarter food/yard waste tonnage increase
(Seattle Public Utilities, *Measuring Effectiveness of Seattle's Organics Ban: Tonnage Increase* by Luis Hillon. April 14, 2015. Page 20.)
- Figure 12** Seattle projected growth
(Seattle DPD, *Seattle 2035 Plan Your City, Your Future: Development Capacity Report*. Updated September, 2014. Page 1, 5, 8-12.)
- Figure 13** Zero Waste AD Facility, San Jose, US (images from Biocycle.net + Bing.com)
- Figure 14** Integrated AD + composting facility flow diagram (diagram from Iona Capital Ltd)
- Figure 15** Images of the Zero Waste Facility, San Jose, US
- Figure 16** The Plant, Chicago, US (image from Bing.com)

LIST OF FIGURES

- Figure 17** Building resource flow cycle (image from PlantChicago.com)
- Figure 18** Images of The Plant (images from Flickr.com)
- Figure 19** Meerlanden Masterplan and AD+Composting Facility, NL (by Hitatchi Zosen | NOVA)
- Figure 20** Kompogas high-solids AD helps closing the loop (by Hitatchi Zosen | NOVA)
- Figure 21** Mass balance of Meerlanden plant including Kompogas AD (by Hitatchi Zosen | NOVA)
- Figure 22** Seattle MSW Collection Zones Map (map from CleanScapes.com)
- Figure 23** 2014 food/yard waste processing facilities contracted by Seattle (images from Google Maps)
- Figure 24** Site location (basemap from CleanScapes.com)
- Figure 25** Seattle Center Campus, Uptown Neighborhood (base from Google Earth)
- Figure 26** View South to city from North bandstand at Memorial Stadium
- Figure 27** Site history and evolution
 (1928 image from PaulDorpat.com)
 (1944 image from SeattlePi.com)
 (1947 +2015 image from SeattleMag.com)
 (1951 image from WikiMedia.org)
 (1962 image from SeattleTimes.com)
 (2009 image from Panoramio.com)
- Figure 28** Memorial Stadium Zone consists of the 5th ave N parking lot (left) and Memorial Stadium (right image from SeattleMag.com)
- Figure 29** Memorial Stadium access (base from Google Earth)
- Figure 30** Site analysis
- Figure 31** Site context
- Figure 32** Resource life-cycling diagram (top left image from WiseGook.com, top right image from TheSelfRelianceSummit.com)
- Figure 33** Existing bandstand structure
- Figure 34** Masterplan
- Figure 35** Masterplan resource life-cycling diagram (left image from GuyanaChronicle.com)

LIST OF FIGURES

- Figure 36** Masterplan section (EW view S)
- Figure 37** Composting facility waste processing
- Figure 38** Ground level plan
- Figure 39** Composting facility plan (ground level)
- Figure 40** Composting facility section (EW view S)
- Figure 41** Composting facility diagram
- Figure 42** Composting facility program
- Figure 43** Facility view of interior
- Figure 44** Composting facility flow
- Figure 45** Recology offers school training on waste recycling (via CleanScapes.com)
- Figure 46** Composting facility view of entrance (at 4th ave N park entry)
- Figure 47** Composting facility plugs into city food/yard waste system

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