Refuse as Resource: Exploring a community benefiting and place-based approach to municipal solid waste management in Juneau, Alaska

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Abstract

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Chair of the Supervisory Committee:
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Landscape Architecture

The linear economy operates in a “take-make-dispose” model, which necessitates the continuous extraction, production, and disposal of goods to maximize profits. The end of the linear economy, the disposal phase, results in excessive amounts of discarded material in municipal solid waste (MSW) landfills across the country. Private corporations dominate the MSW management industry in the U.S. and are responsible for operating the country's landfills. Communities adjacent to landfills often have no control over the amount, type, and origin of materials landfilled near them. This results in the concentration of materials at harmful levels, negatively impacting residents’ environments and health. This thesis uses Juneau, Alaska, as a case study to explore this phenomenon. The Capitol Disposal Landfill in Juneau, Alaska, has been privately owned and operated since the 1960s, and is slated to close in 15-25 years. Due to its geographic isolation, the closure of the landfill will leave the City in a fiscal crisis. For decades the City of Juneau has lacked autonomy in controlling its waste and extending the landfill's life because of the conflicting priorities with private ownership. Taking inspiration from Kamikatsu, Japan, Copenhagen, Denmark, and more, this thesis asks: how can public space be leveraged by communities to shift from current linear disposal methods to circular, harm-reducing, and community-benefiting systems? This thesis builds on previous work by landscape architects and other designers that work to bring visibility to 'waste' and intervene in the waste management system before materials make their way into landfills. By applying design as a research method, this thesis demonstrates how public spaces can be reimagined as "mini material parks," place-based and community benefiting spaces that disrupt linear disposal methods by diverting materials away from landfills to recirculate back to communities.

REFUSE as RESOURCE:

Exploring a community benefiting and place-based approach to municipal solid waste management in Juneau, Alaska

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All photos by author, except where otherwise noted.

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ACRONYMS:

EPA - Environmental Protection Agency

JCOS - Juneau Commission on Sustainability

LMOP - Landfill Methane Outreach Program

MSW - Municipal Solid Waste

RCA - Regulatory Commission of Alaska

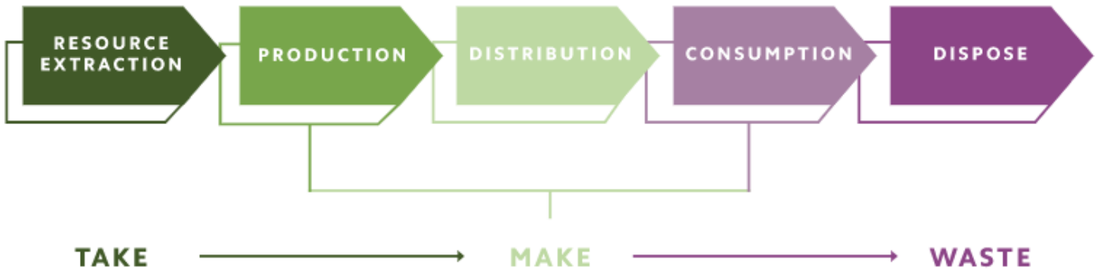
U.S. - United States of America

Figure 1.1: Bald eagles and crows scavenge at the Capitol Disposal Landfill in Juneau, Alaska. From Wikimedia Commons (2003).

1 INTRODUCTION

Modern capitalism promotes a linear, "take-make-dispose"[1] economy that extracts natural resources to make single-use products, leading to excessive amounts of discarded materials (figure 1.2). Corporations are incentivized to maximize profits by creating products with a limited lifespan, otherwise known as planned obsolescence, to ensure recurring customer purchases.[2] Linear economies do not acknowledge that natural resources are finite, and leave communities to bear the negative social and environmental costs associated with their activities.[3] The final stage of the linear economy relies on landfills: landscapes that collect and concentrate discarded materials at harmful levels. There are thousands of landfills across the United States (U.S.), with a vast majority owned by private corporations that control an industrial sector of the economy known as municipal solid waste (MSW). Like other corporations, those that control MSW management work within capitalism and the linear economy, aiming to maximize profit rather than social well-being. The U.S. is caught in a waste conundrum: consumers are sold products that are not meant to last, and privatized systems of waste management favor landfilling to maximize profits. In most cases, communities have no control over the types of materials that are landfilled, how much material is landfilled, and if the materials originate outside of their city. Waste management systems, however, can be transformed to not cause harm to the communities they operate in. By cutting out the private waste management corporations, whose incentives are misaligned with communities adjacent to their landfills, communities can claim more control over their waste. With additional control, communities can leverage their 'waste' as a resource to provide economic, environmental, and social benefits. The potential benefits of these lost resources for communities include cleaner air, cost savings, job creation, and more.

Figure 1.2: The structure of today's linear economy: "take-make-dispose". From Blue Bite (2020).



This thesis investigates new systems of material management that counter current systems of privatized and centralized waste management processes that benefit corporations while harming communities. To counteract this, I argue that MSW is not trash, but rather a mixture of material resources that hold value and potential for every community in the U.S. I believe landscape architects can intervene and counteract the harms caused by the linear economy. I use the current waste management system and the impending closure of the local landfill and resulting fiscal crisis in Juneau, Alaska as a case study to test an alternative approach for MSW management, one that centers communities rather than international waste corporations (figure 1.3).

A byproduct of the current capitalist waste management system is the creation of waste landscapes. Waste landscapes are sites that have or continue to "*accumulate materials and things*" or host manufacturing or technological processes.[4] These sites represent the physical and environmental costs of activities supported by the linear economy: "*byproducts of multi-scalar webs of material extraction, movement, and disposal.*"[5] Landfills, abandoned mines, hazardous waste landfills, industrial brownfields, junkyards, and oil spill sites are a few examples of waste landscapes. Additionally, these sites often lack *"concrete plans for their short- and/or long-term futures"*.[6] However, the environmental and social costs are felt asymmetrically throughout society.[7] The impacts and locations of waste landscapes disproportionately burden lower income communities and communities of color (in the U.S. and globally).[8] Environmental racism is apparent in the siting and planning of past and future waste landscapes that expose marginalized communities to higher levels of toxins in the air and soil and contaminated groundwater.[9] Exposure to these conditions results in negative health outcomes, such as shortened lifespan, cancer, and other mental and physical health challenges.[10]

In this thesis, I will discuss one type of waste landscape, MSW landfills. MSW landfills contain household, construction and demolition, and non-hazardous industrial waste.[11] The Capitol Disposal Landfill, an MSW landfill in Juneau, Alaska, is my case for exploration. I have selected this site because it is less than a mile from my family's home and is negatively impacting a community I care for deeply. Juneau has grappled with a lack of control over its waste stream for

Figure 1.3: The Capitol Disposal Landfill in Juneau, Alaska.

nearly 50 years, leading to its current, impending fiscal crisis. Juneau's MSW landfill is nearing the end of its operable life and is slated to close in the next 15-25 years. With no affordable alternatives to manage their waste identified, alternative strategies for MSW management are desperately needed. The City is currently in the early stages of creating a zero waste plan to extend the closure of the Landfill.

One alternative to the status quo is implementing a circular economy to "*reduce material use, redesign materials, products, and services to be less resource intensive, and recapture "waste" as a resource to manufacture new materials and products*" (figure 1.4).[12] Rather than purchasing new products, the circular economy model prevents the disposal of products in landfills by identifying value in discarded items and enabling customers to buy used goods. Linear economies are at odds with making this transition because they place value in profits, rather than environmental and community well-being .

One gap in transitioning to a circular economy is the lack of physical spaces that promote and support this behavioral shift. I argue that landscape architects can play critical roles in disrupting the linear economic system by designing physical spaces that prevent and minimize the negative impacts caused by existing privatized waste management systems. Designers can disrupt the linear waste system by intervening before materials are landfilled. This approach contrasts with designers' historical participation in waste management systems, where involvement often only occurs once waste is landfilled and the landfill is closed. The creation of spaces that promote a localized system of MSW management can help communities break free from linear waste cycles. I will test these ideas by applying alternative design approaches that explore a decentralized and community-benefiting system for Juneau.

Inspired by cities that are investing in community-based, circular, and localized material management strategies, I ask:

How can public space disrupt the current system of waste management, help achieve goals of zero waste, and shift attitudes around waste?

To answer this question this thesis first analyzes national-level MSW systems and their subsequent impacts on local scales and communities. Next, precedents demonstrate alternative systems of MSW, which informs a phased approach to implementing circular material systems through localized design interventions. The second chapter of this thesis discusses how environmental policies put into place by the Federal government in the 1970s spurred a national shift toward both privatization and centralization in the MSW management industry. This led to a consolidation and increased size of landfills as they accepted materials from further away. These landfills cause environmental and social harms that are most immediately experienced by neighboring communities. Chapter 3 introduces Juneau, Alaska, as a case study to understand how these broader systems of privatization and centralization impact a community at a local level. The chapter discusses the need for an alternative, circular approach to MSW management that works within regulatory and geographic constraints.

To begin to explore alternative, circular approaches, the fourth chapter evaluates six precedents that center material exchange, reuse, innovation, and collection. They were selected for their ability to provide community benefits and reduce the harm caused by linear MSW management systems. The precedents are analyzed using seven criteria that uncover the physical and social elements supporting circular, community-benefiting MSW management systems. These precedents serve as an important foundation that informs designs for Juneau. Chapter 5 outlines a neighborhood-scale design proposal that imagines a phased, decentralized, and circular material management system for Juneau. Finally, the sixth chapter provides recommendations for the City of Juneau and reflections from this thesis. In order to intervene in the current linear MSW management system, it is important to understand the structure and causes of the larger landscape of trash in the U.S.

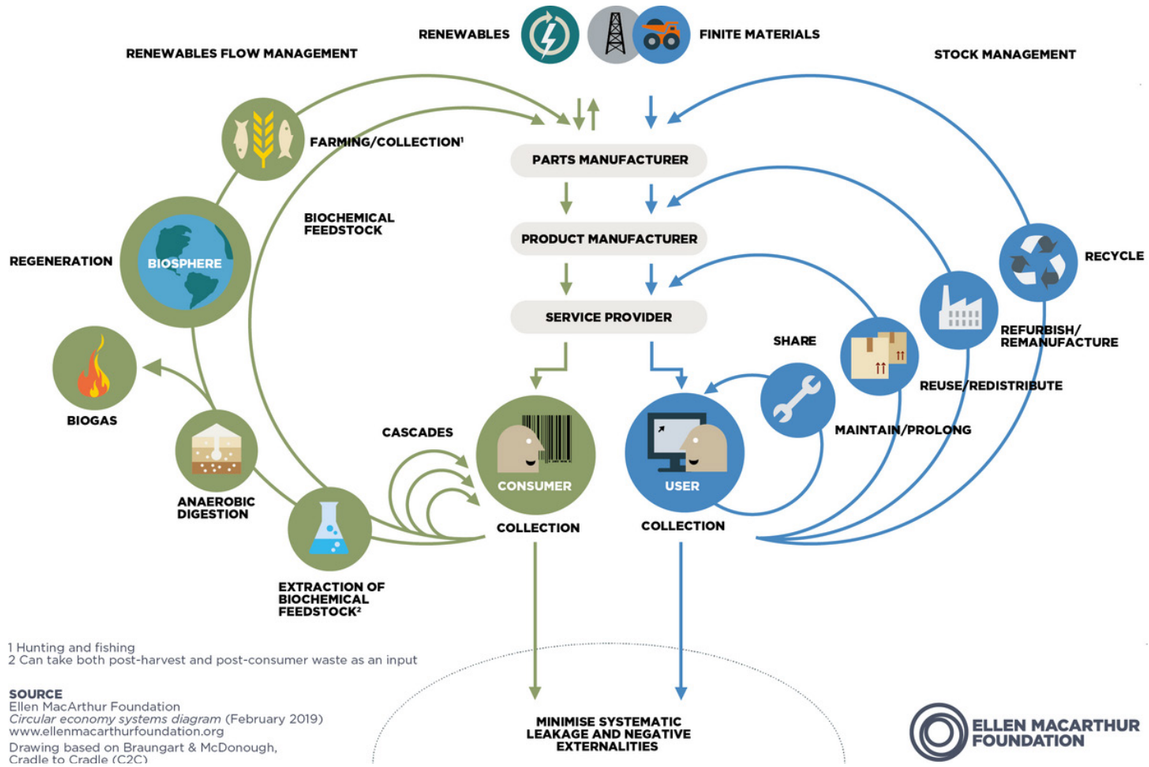


Figure 1.4: The structure of a circular economy system where materials are kept in continuous use. There are two main cycles of the circular economy: the biological (left) and technical (right). The technical system keeps materials in circulation through reuse, repair, recycling, and remanufacturing. The biological system returns the nutrients from organic materials back to the Earth, to support the regeneration of soil and biological materials. From The Ellen Macarthur Foundation (2019).

Endnotes

1. “The Linear Economy Follows a ‘Take-Make-Dispose’ System to Maximize Profits. The ‘Take-Make-Dispose Model’ Extracts Natural Resources to Manufacture Products That Are Then Disposed of. This Necessitates the Purchasing of New Products by Consumers, Which Starts the Cycle of Resource Extraction and Manufacturing over Again.”
2. Barros and Dimla, “From Planned Obsolescence to the Circular Economy in the Smartphone Industry: An Evolution of Strategies Embodied in Product Features.”
3. Bue, “How Long Can Our Linear Waste Economy Continue?”
4. De Almeida, “Landscape Lifecycles: Renewed Principles for Waste in Urban Landscape Design,” 182.
5. De Almeida, “Unearthing Citizenships in Waste Landscapes.” 22.
6. De Almeida, “Landscape Lifecycles: Renewed Principles for Waste in Urban Landscape Design,” 182.
7. De Almeida, “Unearthing Citizenships in Waste Landscapes.”
8. De Almeida, “Landscape Lifecycles: Renewed Principles for Waste in Urban Landscape Design.”
9. De Almeida.
10. Taylor, “Millions of Americans Live Near Toxic Waste Sites. How Does This Affect Their Health?”
11. American Society of Civil Engineers, “Report Card for America’s Infrastructure.”
12. U.S. Environmental Protection Agency, “What Is a Circular Economy?”

2 LARGER LANDSCAPE OF TRASH

This chapter will start by breaking down the composition of MSW into its individual material resources that end up in the 1,250 active MSW landfills in the U.S.[13] It will then discuss the history of how MSW landfills became consolidated, beginning in the 1960s, driven in large part by new Federal policies and environmental regulations which shifted localized systems to centralized ones.[14] Although environmental regulations made landfills less harmful, they caused landfills to become more expensive to operate. This spurred a shift toward privatization and consolidation of landfills. Consequently, most discarded materials are transported across county, state, and even international borders to reach a centralized facility.[15]

Finally, this chapter outlines the negative environmental and social repercussions of the current MSW system. Capitalism and linear economies rely on waste landscapes to "hold" the physical result of extraction, manufacturing, and disposal. The materials held in waste landscapes cause air pollution and water contamination, and also contribute significantly to climate change due to their methane emissions.[16] This chapter presents examples from Michigan, the Pacific Northwest, New York State, and Delaware to illustrate the impacts of this system.

Figure 2.1: Aerial images of MSW landfills in the U.S. From Google Earth (2023).

What is Municipal Solid Waste (MSW)?

Commonly referred to as trash, garbage, and waste, the Environmental Protection Agency (EPA) categorizes discarded materials and items from households, businesses, and institutions as municipal solid waste (MSW).[17] Food, packaging, paper, bottles, grass clippings, electronics, furniture, and appliances are all designated as MSW. Figure 2.2 illustrates the material composition of MSW in the U.S. in 2018. That year, the U.S. produced a total of 292.4 million tons of MSW.[18] Per person, this amounts to approximately 4.9 lbs of waste per day.[19] The U.S. produces a disproportionately large amount of MSW in relationship to its population; three times the global average (figure 2.3). Fifty percent is disposed in landfills, 24% is recycled, 12% is incinerated, 9% is composted, and the remaining 6% is managed through other alternative methods (figure 2.4).[20,21] The composition and volume of MSW have shaped the current system of MSW management in the U.S.

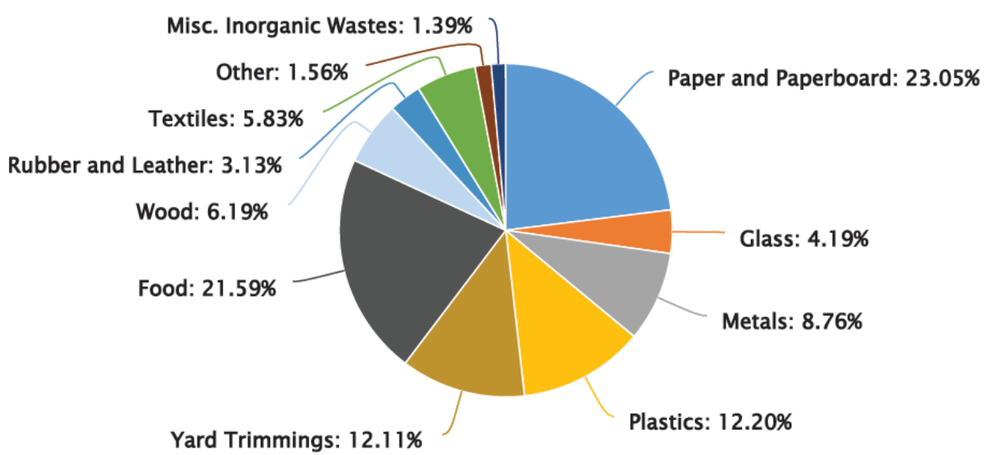


Figure 2.2: The composition of the U.S.'s 292.4 million tons of MSW in 2018. From U.S. EPA (2018).

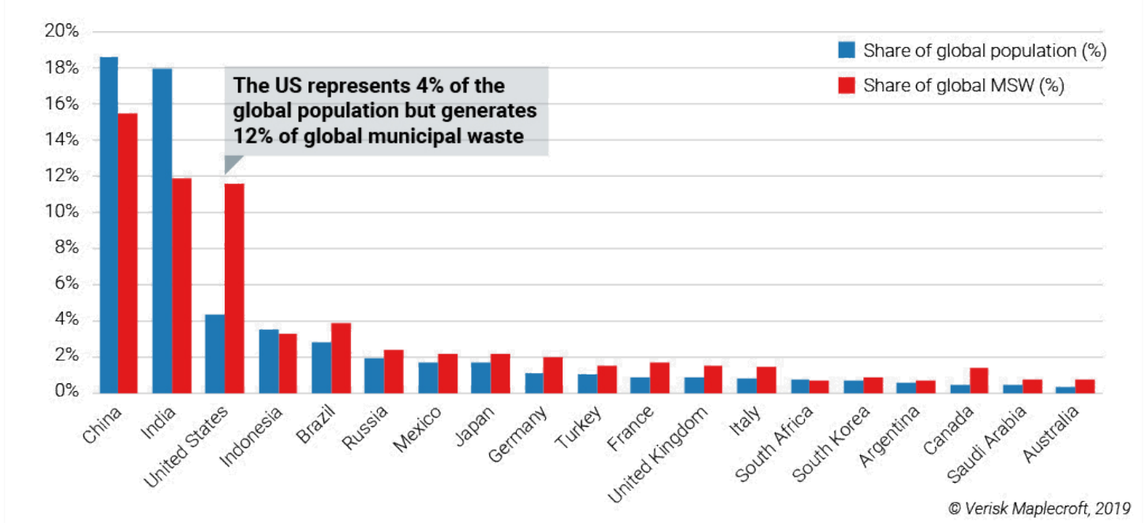


Figure 2.3: The U.S. produces a disproportionately large amount of MSW in relationship to its population; three times the global average. From Verisk Maplecroft (2019).

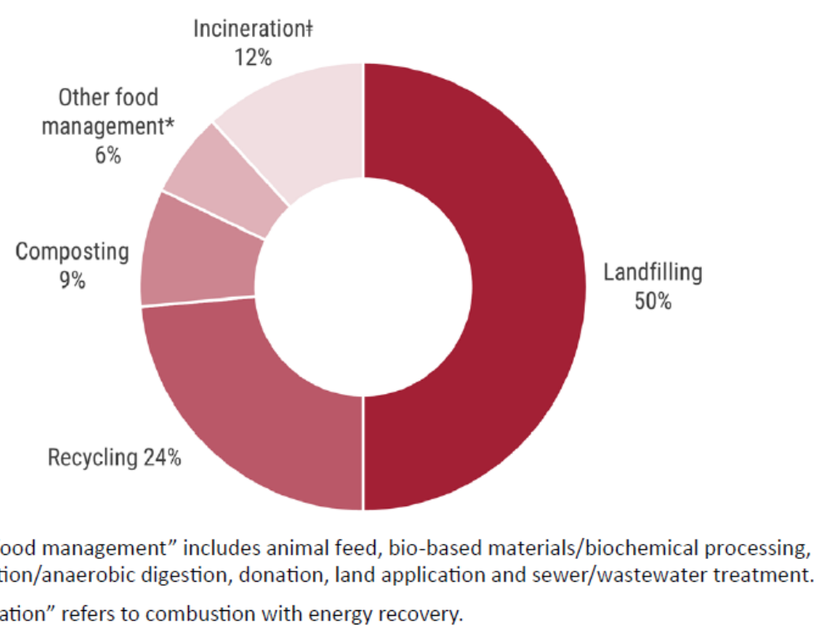


Figure 2.4: The pathways for MSW in the U.S. include landfilling, recycling, composting, incineration, and other food management. In 2018 the U.S. landfilled 50% of all MSW. From U.S. PIRG Education Fund (2021).

Unintended Consequences: The Rise of Private Entities in the MSW Management Industry

Over the past 100 years, the MSW management system in the U.S. has evolved from a highly localized system into an industry controlled by a "*small number of private corporations and their subsidiaries.*"[22] The current array, type, and quantity of MSW landfills in the U.S. is a result of federal legislation that arose from the environmental movement of the 1970s. Prior to this, MSW was "*viewed solely as a local function performed by individual citizens, private contractors, and county and municipal governments.*"[23] However, as the U.S. economy grew, and the advent of disposable single-use products became more popular, the rate of MSW generated boomed. Between 1920 and 1970, the generation of MSW grew at a rate nearly five times the rate of population growth.[24] The type of materials used also shifted dramatically during this time. Goods began to consist of durable synthetic materials, paper, plastics, and toxic chemicals from households. The drastic increase in the production of goods and a shift in consumer habits put pressure on the existing MSW management systems. This pressure increased the visibility of MSW and the environmental impact it was causing, garnering attention from the federal government.

By the 1960s, the environmental movement was gaining traction in the U.S. To address rising concerns about the environmental impacts of MSW management practices, the Solid Waste Disposal Act of 1965 was passed with the goal of "*improving disposal methods rather than on all the elements of the solid waste management system*"[25]. While this bill was the first piece of modern solid waste legislation in the U.S., it was amended by the Resource Recovery Act of 1970, which shifted the focus "*away from disposal to recycling and energy recovery from solid waste.*"[26] That same year, the EPA was established. The passage of the Resource Recovery Act radically reshaped the regulation of MSW at the state level. In the first five years after its passage, 44 states created solid waste management programs. Legislation helped develop more state involvement with MSW management, but operations continued to remain a local responsibility, with little to no systematic changes made.[27]

However, a series of federal legislation passed in the 1970s began to regulate MSW landfills more tightly. The combination of the Clean Air Act of 1970 and the Resource Conservation and Recovery Act of 1976 set required environmental standards for landfills. The Clean Air Act of 1970 regulated emissions from both landfills and incinerators. Meanwhile, the Resource Conservation and Recovery Act of 1976 gave the EPA the authority to set standards and requirements for the design, operation, and closure of landfills. These new standards required a hefty capital investment in new technology, additional labor, and added responsibility to meet the new criteria aimed at reducing the environmental harm of these sites. Many landfill owners and operators could not afford to make these upgrades, which resulted in the rapid closure of 70% of landfills in the U.S. from 1978-1988, of which a majority were municipally owned.[28,29] These regulations were incredibly important for protecting the environment, but unintentionally set off a cascade of consolidation and privatization within the MSW management industry. The owners and operators of landfills who could afford these upgrades were more often private companies, due to their larger access to capital.

Two publicly traded companies have led the shift toward privatization and consolidation. These two companies, Waste Management and Republic Services, control nearly 50% of the landfill volume in the U.S. (Figure 2.5).[30] Waste Management operates 247 landfills throughout North America, and serves more than 20 million customers through their various lines of business.[31] Republic Services operates nearly 200 landfills and has collection routes in 41 states.[32] These companies rely on centralized facilities where they are able to spread fixed costs across larger volumes of waste, allowing them to maximize their profits.

These profits result from the collection, processing, and disposal of materials into landfills and are valued at $76 billion, with over 80% of all revenues heading toward private corporations. The massive amounts of MSW produced in the U.S. (three times the global average at 239 million tons per year) directly benefit the landfill owners, which are overwhelmingly private corporations.[33] Only 27% of the U.S. landfill volume is owned and operated by municipalities (Figure 2.5).

Today, there are about 1,250 MSW landfills across the U.S.; a fifth of the number of MSW landfills that were operating in 1990 (Figure 2.5).[34,35,36] One consequence of consolidations is that the MSW collected in communities across the U.S. must travel extended distances to these landfills.

Figure 2.5: The U.S. is home to over 1,300 active MSW landfills, in addition to an estimated 10,000 closed landfill (not all closed landfills are recorded in this dataset). The number of active landfills has decreased over time, but resulted in larger regional landfills. Data from U.S. EPA LMOP Database (2023).

MUNICIPAL LANDFILL

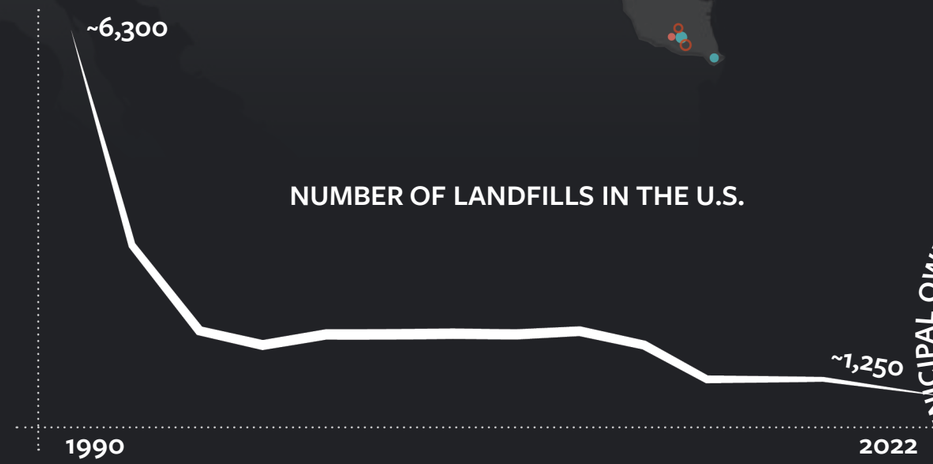
- OPEN
- OPEN-no size data
- CLOSED
- CLOSED-no size data

PUBLIC/PRIVATE LANDFILLS

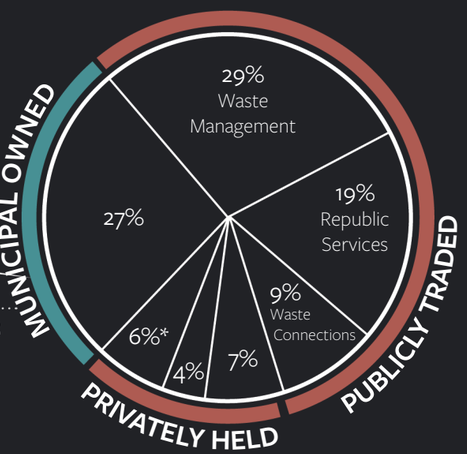
- OPEN
- OPEN-no size data
- CLOSED
- CLOSED-no size data

WASTE IN PLACE
IN U.S. TONS

- <20 MILLION TONS
- 60 MILLION TONS
- 100 MILLION TONS
- 140 MILLION TONS



NUMBER OF LANDFILLS IN THE U.S.



Privately Held
4% GFL Enviro
7% All Other

6%*-
2% Rumpke
1% WIN Waste
1% Casella Waste
1% Best Way Disp.
0.5 %Athens Services
0.4 % Recology
0.3% Interstate Waste

The **average tipping fee** in 2022 ($/ton) for Private/Public Landfills was $70.25 (up 6.1%), while Municipal Landfill's average was $50.76 (up 3.9%).

The Movement of Waste

Centralization of MSW services, including a shift toward fewer, larger landfills, has also led to MSW being collected and transported to landfills at further distances. It has become common practice for landfills to accept the MSW produced by not only local communities, but also the waste from cities further away, including MSW that has crossed over state and even international borders. In 1991, approximately 10 million tons of garbage from 43 states moved across state lines to reach their disposal destinations.[37] By 2000, this number tripled to 31.1 million tons from 47 states and the District of Columbia.[38] The movement of waste is continuous and ubiquitous: "*one out of every six large trucks in the United States is hauling garbage*." [39]

It is now common for states, especially in the Northeast, to "*rely on [exporting MSW] to meet their MSW management needs. This has resulted in significant interstate rivalries, ranging from incidents like the infamous Mobro 'garbage barge' in 1988 to attempts by state governors to block MSW imports to their respective states*" (figure 2.6).[40] The Mobro barge traveled over 6,000 miles in search of a landfill to accept its waste, however, no location was found, and ultimately it returned to New York City after 5 months, where the waste was incinerated in Brooklyn. The Mobro barge incident was only a preview to future MSW management practices in the U.S. Today, over 23,000 tons of garbage leave New York City each day, the same amount as 7 Mobro barges, and travels to South Carolina, Virginia, Pennsylvania, and Ohio.[41]

Figure 2.6: The infamous Mobro barge in the New York Harbor in 1987. From George Argeroplos / Newsday LLC/ Newsday via Getty Images (1987).

On the other side of the country, four regional landfills along the Columbia River Gorge in the Pacific Northwest accept the region's MSW. MSW travels by train, semi-truck, and barges to these facilities from Washington, Oregon, Canada, and Alaska.[42] The movement of material is near constant. Two trains haul 300 double-stacked containers daily to the Roosevelt Regional Landfill in Bickleton, Washington (owned by Republic Services) (figure 2.7).[43] Fifty to sixty semi-trucks travel to the Columbia Ridge Landfill in Arlington, Oregon five days per week (owned by Waste Management). The concentration of regional MSW landfills along the Columbia River Gorge is due to its dry climate, which lowers operating costs.[44]

Figure 2.7: A train carrying trash from the Pacific Northwest heads eastbound toward the Roosevelt Regional Landfill in Bickleton, Washington. The Roosevelt Regional Landfill is the fourth largest landfill in the U.S. and owned by Republic Services. From Railfan & Railroad Magazine (2021).

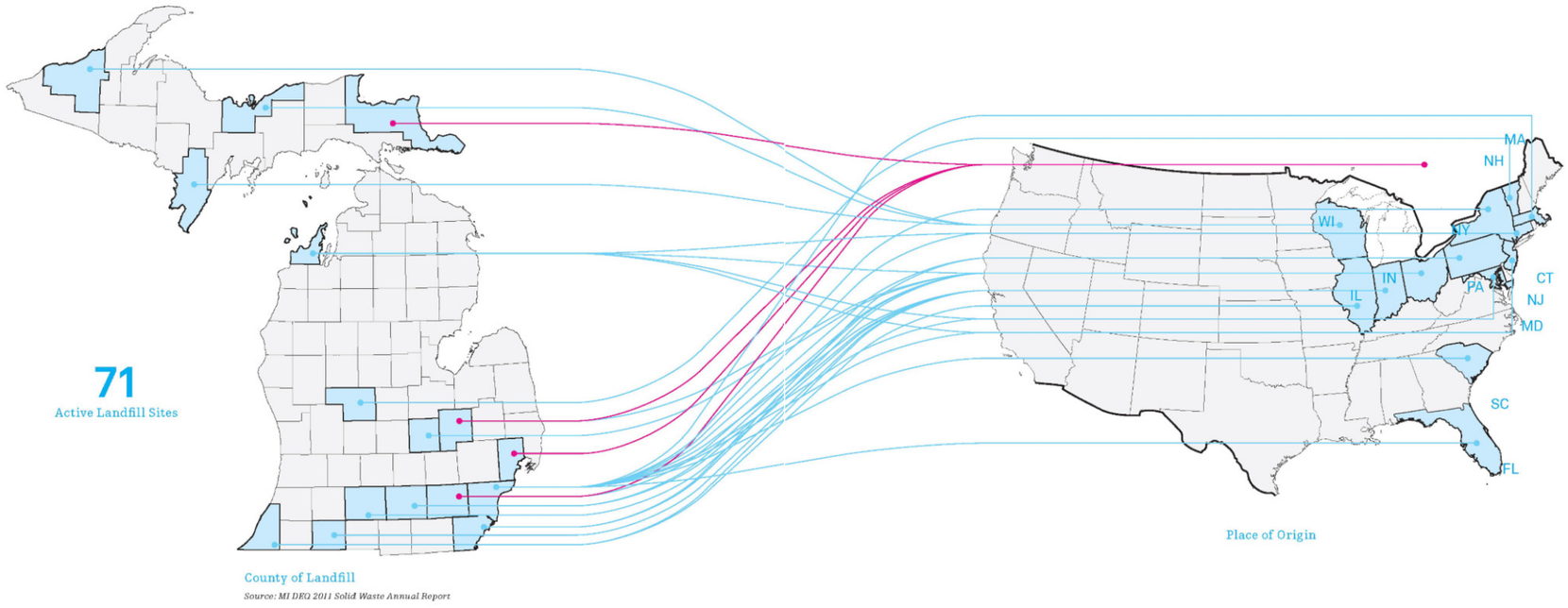


Figure 2.8: MSW flows to Michigan Landfills. Michigan is an example of the result of the confluence of a regionalized waste management system, low tipping fees, and the lowest surcharge on imported waste in the Great Lakes Region. From Ghosn and Jazairy (2014).

Figure 2.9: Community members of Lenox Township, Michigan protest the expansion of the Pine Tree Acres Landfill to accommodate imported Canadian MSW. From Heather Rousseau, Special To the Free Press(2006).

The State of Michigan demonstrates the confluence of a centralized waste management system. The state has bountiful landfill capacity, low tipping fees, and the lowest surcharge on imported waste in the Great Lakes Region.[45] This results in MSW traveling from Florida, South Carolin, Maryland, New Jersey, Connecticut, Pennsylvania, New York, New Hampshire, Massachusetts, Ohio, Indiana, Illinois, Wisconsin, and Canada to landfills in Michigan (Figure 2.8). Importing MSW is met with resistance from the communities adjacent to these landfills because of the negative environmental and social impacts that they cause, both on a global and local level (figure 2.9).

Impacts of MSW Landfills

Waste landscapes cause negative environmental and climate impacts. Landfills cause air pollution, groundwater contamination from leachate, and ocean pollution; they also contribute to habitat loss and emit significant amounts of greenhouse gases into the atmosphere.[46] When organic materials, such as food scraps and yard trimmings, decompose in landfills, they produce methane - a potent greenhouse gas. Methane is especially problematic because it has a warming potential 80 times that of carbon dioxide during the first 20 years in the atmosphere. It is estimated that *"at least 25% of today's global warming is driven by methane from human actions."*[47] MSW landfills *"are the third-largest source of methane emissions generated by human activity in the U.S., accounting for approximately 14.5 percent of national emissions in 2020"* (figure 2.10).[48] Landfills are different from other emission sources because they continue to emit air pollution long after they have been closed, in some cases up to 50 years.[49,50]

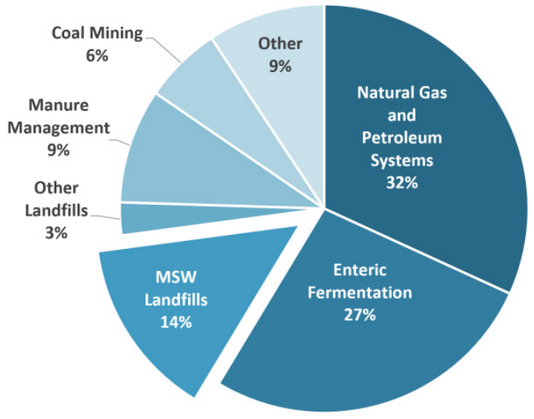


Figure 2.10: U.S.'s methane emissions by source in 2021. From U.S. EPA (2021).

Communities residing in close proximity to landfills experience increased direct and indirect adverse health impacts and reduced quality of life due to decomposing materials that release toxic and foul-smelling gases, leachate that contaminates groundwater, high levels of traffic to and from the landfill, and the expansive footprint of these sites. For example, in Minquadale, Delaware, a privately owned landfill accepts construction and demolition waste from New Jersey, Maryland, New York, and Pennsylvania, and its operation is negatively impacting the surrounding community. In 2019, county officials attempted to block Waste Management's request to raise the height of the Minquadale landfill from 130ft to 190ft over concerns about groundwater and air pollution. For over a year, the landfill had continuously violated air quality emission limits for its hourly sulfur oxide emissions caused by the chemical reaction between rainwater and drywall.[51] Nearby residents have reported experiencing respiratory issues because of air quality. As one resident has reported, *"we have smelled the egg smell...It has burned our eyes, throat. Now I'm at the point that my asthma, I've been in the hospital like four or five times. ... I didn't have asthma "til I started living here."* [52] In addition to air quality issues, the landfill sits atop the Potomac Aquifer, which supplies drinking water to the surrounding area. There is concern that the weight of newly added materials will compress the existing materials and release contaminants into the groundwater, especially in the unlined historic sites of the landfill (figure 2.11 +2.12). The County and Waste Management ultimately settled its dispute and the landfill will now operate until it reaches 140 ft, adding an estimated two years to its operable life.[53]

Figure 2.11 + 2.12: Residents of Minquadale, Delaware protest the proposed height increase to the Minquadale Landfill which accepts construction and demolition debris. There are concerns around the landfill contaminating the groundwater. From William Bretzger, Deleware News Journal (2019).

When communities are exposed to these conditions, both their physical health and quality of life are jeopardized. Studies show that "*living near MSW landfills is associated with elevated risks of poor birth outcomes including low birth weight; respiratory conditions including bronchitis and shortness of breath; site-specific cancers of the stomach, liver, and pancreas; and experience of malodors.*" [54] The communities who experience these negative impacts are disproportionately of low socioeconomic status or communities of color.[55,52]

In addition to direct negative health impacts, landfills also degrade the built environments that surround them. Studies have found that landfills act as "*repellents to health-promoting amenities,*" due to surrounding traffic, noise, odor, and even the visual aesthetics of a landfill.[56] Community facilities that promote health and well being, such as grocery stores, health clinics, and recreational facilities, are less likely to exist in areas surrounding a landfill.[57] In addition to impacting the built environment, landfills also have direct detrimental economic impacts on residents. Studies show that high-volume landfills decrease nearby property values by nearly 13%.[58]

Over the last century, the U.S. economy has rapidly grown and simultaneously shifted into a linear economy. Additionally, the environmental movement of the 1960s spurred the creation of legislation that regulated landfills and required them to reduce their environmental impact. This legislation unintentionally caused a shift towards privatization. To maximize profits, private companies shifted the MSW management industry towards a centralized system that relied on fewer, but larger landfills. As a result, waste now travels greater distances to its eventual destination in massive landfills, which tend to be located in minority and economically disadvantaged communities. The landfills perpetuate health, economic, and environmental challenges these communities face, while the corporations who own them are profiting. In the upcoming chapter, I will demonstrate this further by presenting the Capitol Disposal Landfill in Juneau as a case study. Juneau's MSW management system and its landfill serve as a local representation of the impacts of national and regional systems, further intensified by Juneau's unique geographical factors.

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3 THE CAPITOL DISPOSAL LANDFILL

The Capitol Disposal Landfill[59] in Juneau, Alaska demonstrates how the privatization of waste management systems negatively affects the surrounding community.[59] The Landfill has been privately owned and operated since the 1960s and is slated to close in the next 15-25 years. Its closure is a potential fiscal crisis with few options to avoid it. The City's current priority is to extend the life of the Landfill by diverting materials from it. However, this directly conflicts with the Landfill owner's goals of maximizing profits, since more material landfilled equals more money. In addition to the obstacles that come from private landfill ownership, waste management in Juneau, and the wider Southeast Alaska region, is unique and more challenging because of geographic constraints, small populations, and a disconnection from the larger road network. These factors limit the possibilities that the City has for gaining control of its waste flows and for future plans after the Landfill closes.

The combination of physical constraints and private ownership has resulted in a multi-decade-long conversation and struggle about how MSW should be handled in Juneau, resulting in few structural changes. Possible options the City has explored include incineration, the creation of a Southeast Alaska regional landfill, and shipping its waste to the Pacific Northwest within the contiguous U.S. However, all these possible options require a large financial investment by the City. Further, these "solutions" only perpetuate the current system of linear methods of waste disposal. They all fail to address, what I argue, is the root of the issue: our relationship to "waste" and the unrealized potential and wasted opportunity of the thousands of tons of material that are landfilled each year in Juneau.

Figure 3.1: Historical photos of the Capitol Disposal Landfill. In order from top to bottom 1940, 1942 1954, 1962, The site of the Capitol Disposal Landfill was previously used as gravel crushing plant to supply gravel for the construction of Glacier Highway. From Alaska State Archives.

Figure 3.2: The City of Juneau. The Landfill can be smelled up to a mile away. Weather patterns influence the potency of the Landfill's smell. The smell is often worse in winter when inversions (a layer of warm air over cool air) are more common and trap the Landfill's smell in the Lemon Creek Valley.

Out the Road

Auke Bay

Mendenhall Valley

SMELL ZONE

Lemon Creek

CAPITOL DISPOSAL LANDFILL

North Douglas

DOUGLAS ISLAND

Downtown

South Douglas

Major Roads

1 Mile

Figure 3.3: The Capitol Disposal Landfill and the Lemon Creek neighborhood. From Michael Penn/Juneau Empire (2013).

Figure 3.4: The Capitol Disposal Landfill is situated directly next to Juneau's main highway (Egan Highway) and the Mendenhall Wetlands State Game Refuge.

Waste Management in Juneau

Unlike many U.S. landfills located at the margins of cities, Juneau's landfill is located in the center of town next to the main highway (figure 3.4). This makes it extremely visible due to its large size and pungent odor that can be smelled up to a mile away (figure 3.2) . Since the 1960s, Juneau's waste has been disposed of at a 40-acre site in the Lemon Creek neighborhood. This neighborhood is home to about 3,500 people and is considered one of Juneau's hubs for commercial and industrial activities (figure 3.3).[60] It is also the most racially diverse and economically disadvantaged area in Juneau.[61] This illustrates a national pattern of asymmetrical harm caused by MSW landfills on a local level.

The Landfill is an unlined, Class 1 MSW landfill. A Class 1 landfill is defined as one that accepts, on average, more than 20 tons of MSW for incineration or disposal annually.[62] In 2021, Juneau produced over 22,000 tons of MSW and over 5,600 tons of construction and demolition waste.[63] This equates to the weight of over 1,700 school buses. Juneauites produce about 3.78 lbs of MSW per day, which is slightly less than the national average of 4.9 lbs per day.[64] For corporations that own landfills, this weight is seen as a lucrative venture.

In Juneau, the Landfill and curbside collection service is owned by two separate, publicly traded companies. The Landfill has always been owned and operated by private entities, from the Stroymeyers (1963-1972), to the Tonsgards (1972-1999), and finally to Waste Management (1999-present), the largest MSW management company in the U.S.[65,66,67] Meanwhile, the curbside collection service is owned by a subsidiary of Waste Connections (the third largest MSW management company in the U.S.).[68] In addition to private ownership, the stringent regulations around waste collection in Alaska add to the City's challenges. Waste collection in Alaska is considered a utility and requires a certificate of "convenience and necessity" for waste haulers to operate. The Regulatory Commission of Alaska (RCA) regulates rates and services, and issues certificates to utility companies to ensure that utility providers are qualified, have adequate facilities, are proficient in the services they provide, and are charging reasonable rates.[69] If the City were trying to establish its own hauling service in order to control the waste stream, it would have to purchase the collection certificate that Alaska Waste currently holds since,*"Alaska law expressly prohibits municipalities from collection companies".* [70] Waste Connections owns the only certificate available in Juneau, monopolizing the system.[71]

The City has lacked autonomy in controlling its waste, unable to participate in any decisions on how landfill and collection owners conduct business due to the complex web of private ownership and regulations (figure 3.5) . This makes it challenging for the City to achieve its MSW management goals of extending the landfill's life through waste reduction, resource recovery, and recycling. In addition to the regulatory and ownership constraints that stifle the City's MSW goals, its geographic isolation only exacerbates the situation.

Figure 3.5: MSW management in Juneau is complex due to the regulatory constraints and multiple stakeholders.

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

DEC Permits the Capitol Disposal Landfill

contact for public complaints

REGULATORY COMMISSION OF ALASKA

CITY AND BOROUGH OF JUNEAU

Leases land from the City

JUNEAU COMPOSTS!

RECYCLE WORKS PROGRAM

Processes recycling at

Regulates collection service

Hauls recycling to

WASTE MANAGEMENT

ALASKA WASTE

Hauls Waste to

Smell impacts daily life

Juneau's Geographic Isolation

Cities in the contiguous U.S. are able to easily and cheaply transport their MSW to regional landfills. Waste management in Juneau and the wider Southeast Alaska region, however, has unique challenges due to geographic constraints, disconnection from the road system, and small populations.

Juneau's topography makes siting new waste facilities challenging, primarily because of the limited amount of undeveloped, large, and industrially zoned areas. Much of the City's area is not developable due to the steep mountains that surround Juneau. The mountains rise out of the ocean at slopes of 35 to 46 degrees and reach heights of 3,500 to 4,000 feet less than 2 miles from the shore (figure 3.6).[72] The same reasons that Juneau's topography makes it difficult to build a new landfill also prohibit Juneau from building a road out of town. Due to the limited siting possibilities, it is most likely that the City will opt to ship its waste south, to other regional landfills via barge, once the Landfill reaches maximum capacity – a very expensive option. This option would likely send Juneau's MSW on a barge over 1,000 miles to Seattle, followed by a 300-mile train ride along the Columbia River in Oregon, to a final destination at either the Roosevelt or Columbia Ridge regional landfills.

Another constraint that Juneau faces is its small population of approximately 32,000 people. Alternative waste management systems, including incineration and building a new landfill, have been deemed economically infeasible due to their high fixed costs and, therefore, high cost per pound to landfill MSW.

Figure 3.6: Juneau is inaccessible by road due to the surrounding mountains and icefield. From Ron Gile (2015).

Material Flows

Due to these constraints, the City's goal is to extend the current use of the Landfill for as many years as possible. One strategy is to reduce the amount of MSW deposited in the Landfill. This can be accomplished by shifting how waste can be viewed as valuable materials. The City can identify and support alternative paths for reusing and reclaiming many materials typically considered waste.

There are only two diversion strategies currently in place: two recycling operations and a small-scale composting program.

The two active recycling operations are Alaska Waste's curbside collection program and the City's RecycleWorks program. Alaska Waste operates a fee-based curbside collection service and reports that only 37% of Juneau households pay for this service. The City's RecycleWorks program operates a free recycling drop-off program.[73] This program diverts about 5% of the annual waste generated in Juneau from the Landfill.[74] Both recycling operations are housed at a small facility next to the Landfill. The recycling is compacted and sent on a barge to the Waste Management JMK Fibers recycling facility in Tacoma, Washington or Waste Management Troutdale Commercial Transfer Station in Troutdale, Oregon (figure 3.7).

Compositing is the second diversion method. The only composting operation in Juneau is JuneauComposts!, a locally owned business started by Lisa Daughtry in her backyard (figure 3.7). The business has grown significantly since 2017, and now leases land from the City, in the Lemon Creek neighborhood. JuneauComposts! diverts about 2% of Juneau's food waste from the Landfill.[75] Diverting organic material from the landfill is extremely important because it comprises an estimated 23% of the current tonnage of material landfilled at the Landfill.[76] In addition to the sheer volume of material, the smell caused by decomposing organic material from the Landfill causes a stench that can be experienced up to a mile away and impacts the quality of life of people living in the area. Combined, the recycling and compost operations only divert a small portion of Juneau's MSW from the Landfill. Current and additional future material diversion methods must be expanded to significantly extend the life of the Landfill.

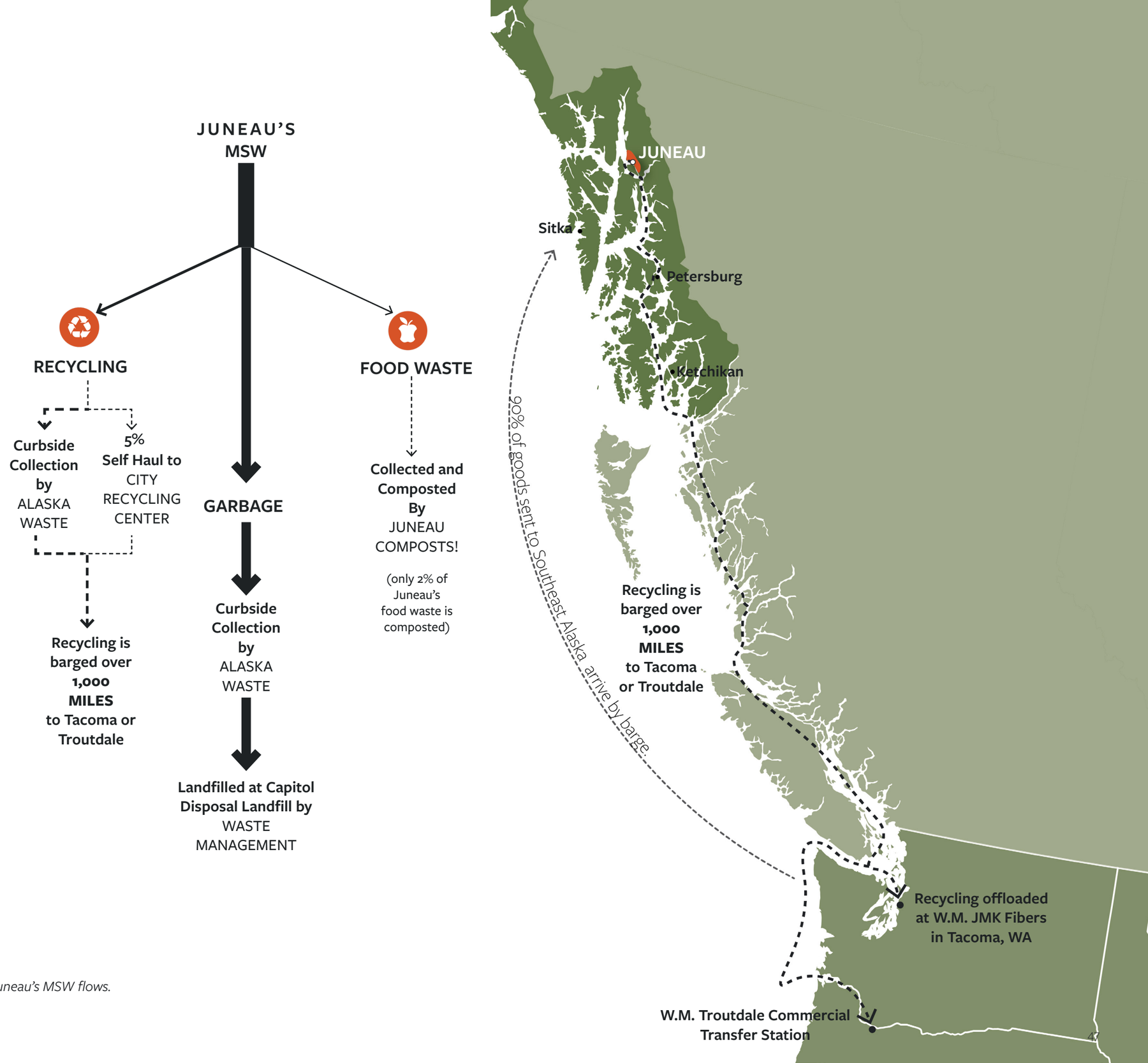


Figure 3.7: Juneau's MSW flows.

At the end of 2022, the City learned that it will be receiving 2.5 million dollars from the Federal government to establish a commercial composting facility. This funding will allow for the diversion of millions of pounds of food scraps from the Landfill.[77] The City is currently beginning the planning phase of the facility. The composting facility will most likely be sited on the current land that JuneauCompost! operates in Lemon Creek because the City owns the land. The City plans to contract out the operation of this facility.

Juneau's Pathway Forward: Zero Waste Plan

Given current ownership, regulatory, and geographic challenges, the only viable option the City can pursue to extend the life of the landfill is implementing a zero waste plan. Zero waste plans are "*policies and programs that incentivize shifting to a 'circular' or 'closed-loop' economy in which less is consumed and all materials are reused, recycled, and composted in a continuous cycle.*"[78] Implementing a zero waste plan will require Juneau's residents to redefine how they view waste.

Our relationship with definition of waste is *"culturally conditioned."*[79] Our geographic context, cultural surroundings, and established waste management systems shape our relationships with materials to which we assign varying levels of value. Our definition of waste and waste landscapes today are not fixed, *"but move in response to social pressure and technological advances."*[80] This means that we have the power to reshape, redefine, and cultivate a new relationship with the materials we consider waste. When we view material as waste it *"prevents us from deciding how to manage it well...and hinder*[s] *our ability to make waste a meaningful part of our lives."*[81]

As Juneau begins to plan for this new era of waste management, I argue that to achieve its zero waste goals and gain community buy-in to these new systems, the City must address people's understanding of what waste is, showcase the opportunities of material resources, and demonstrate how this new system of MSW management can benefit the community.

Zero waste plans often consist of general guidelines that lack place specificity and are policy focused. Policy changes are incredibly important in successfully implementing zero waste plans. Zero waste plans, however, must also create physical places for the community's perception of materials to shift and develop. The City must be creative in how it approaches changing the systems that have historically been controlled by outside, private corporations.

Achieving the City's zero waste goals will require sorting its waste into things that can be recycled, reused, repaired, repurposed, or landfilled. This will require an attitude shift about how people view waste - people in the community will inevitably ask: *"why would we sort our trash?"* Getting the community to view waste not as trash, but as a material that provides visible and tangible benefits is critical. To foster shifts in attitudes regarding waste, the City must create experiences that allow people to interact with and see the value of these materials. The product of the current waste management system in Juneau is highly visible, with the landfill sitting directly next to the main highway through town. This visibility (both visually and olfactory) can catalyze behavioral change in the community. I believe leveraging visibility around material possibilities and their benefits is key to achieving the City's zero waste goals. Investing in circular material recovery methods provides benefits such as job creation, keeping investment and material local, reducing dependence on imported materials, building and expanding new and existing communities, and achieving the City's greenhouse gas reduction goals. Figure 20 illustrates a reframing of waste as material to achieve zero waste goals (figure 3.8). The only difference between waste and material is how it is sorted. Providing material specific sorting allows for the processing and remanufacturing of materials to create a variety of valuable outputs. This material cycle keeps investment local, creates green jobs, reduces reliance on imported materials, and extends the life of the Landfill.

Landscape architects can play a critical role in creating the physical and social infrastructure to support zero waste goals by bringing a holistic, collaborative, community-based approach to redesigning these systems and spaces. This approach fills the gaps of place-specificity and community building that zero waste plans fail to address.

How can creating public space amenities help achieve the City's zero waste goals and extend the life of the Landfill?

How can sites of material collection showcase material opportunity and shift perceptions of waste?

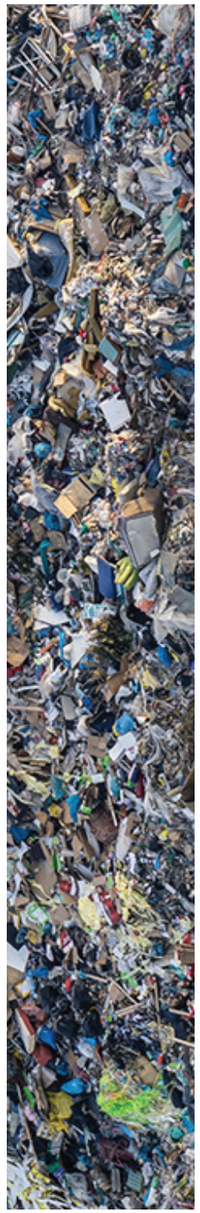
How can Juneau transition from an extractive waste management system to a circular and regenerative one?

In the 2021 report, *Trash in America*, the authors presented the current choice that the U.S. faces regarding MSW:

"*Today, with fewer opportunities to send our plastic waste "away," America faces a choice: Continue down a pathway of increased materials production and pollution – a future in which communities and our environment increasingly buckle under the cost and strain of dealing with an ever-increasing flow of garbage. Or boldly reimagine our entire relationship to the stuff we buy, use, and throw away*"[82]

Juneau is not alone in its situation of reckoning with the current systems of waste disposal, but its situation is amplified by complex factors of ownership and geography that make MSW management that much more challenging in Southeast Alaska. **I urge the City to take this opportunity to choose the latter- radically reimagine the future of MSW management in Juneau.** I hope this project can inspire such reframing. Achieving these goals is possible, as other communities around the world have been successful at redefining their relationships with waste. Understanding the context of Juneau's MSW management system provides the basis for exploring places that have implemented circular material management systems. The next chapter will evaluate six precedents of material exchange, reuse, and innovation that will help inform and inspire design interventions for Juneau.

Figure 3.8: Reimagining waste as material.

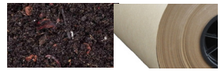


SORTING

- Requires community attitude and behavioral change to sort waste
- Requires physical infrastructure to support new waste flows
- Requires incentives and/or benefits community

PROCESSING

	Household Items	Resale / Swap / Repair
	Food Scraps	Compost / Anerobic Digestion
	Metal	Resale / Recycle
	Glass	Recycle
	Clothing +Fibers	Resale / Swap / Upcycle
	Construction Debris	Resale / Upcycle
	Plastics	Recycle / Remanufacture
	Wood	Resale / Compost / Upcycle
	Paper	Compost / Recycle
	Aluminum	Recycle
	Electronics	Repair / Recycle
	Yard Debris	Compost
	Cardboard	Compost / Recycle
	Waste	Landfill

	Affordable or free household items (furniture, appliances, etc)	
	Compost / biogas + fertilizer	
	Metal	
	Glass	
	Affordable or free clothing / upcycled goods	
	Building materials	
	Building materials or goods	
	Wood / carbon source / furniture	
	Carbon source / paper products	
	Aluminum	
	Electronics	
	Compost	
	Paper products	
	Waste	

BENEFITS

- creates jobs to support new system of management
- creates jobs in material re-use, material repair, raw material opportunity
- keeps investment and material local (invests in community wealth)
- less need for imported material
- Reduced landfill odor, improved quality of life
- Extends life of landfill --> able to invest tax dollars into community instead of a new landfill
- Social- builds communities around material exchange
- Reduced GHG emissions

LANDFILL → **MATERIAL** → **PRODUCT** → **BENEFITS**

Endnotes

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4 PRECEDENTS FOR MATERIAL EXCHANGE, REUSE, INNOVATION, AND

One approach to challenge extractive and harmful linear waste systems is the development of a variety of community spaces that are dedicated to material exchange, reuse, and innovation. I selected six precedents to investigate alternative MSW management systems that benefit their local communities. Precedents were chosen based on the following criteria:

1. Promote a circular approach to material management
2. Are owned by / operated for town or city residents
3. Aim to reduce harm caused by current linear material cycles
4. Provide communities with opportunities for rethinking the future of materials that are normally landfilled
5. Provide community amenities

Six precedents for material collection sites were identified and analyzed as examples that could inform options for Juneau to shift from a linear to a circular economy that would extend the life of the Landfill. The selected precedents range in their material focus, the size of the community they serve, and their rural or urban context. Three questions guided the broader analysis of these precedents:

How can physical spaces demonstrate "waste" as a resource?

How can physical spaces do more than collect material, such as build community?

How is public space used to promote recycling and material reuse, and how can it redefine our relationship with these materials?

Figure 4.1: A neighborhood recycling station in Copenhagen, Denmark

The selected precedents push back against the linear material economy by creating spaces that allow alternative, more circular material systems to flourish. These precedents all prioritize physical spaces that provide community amenities (whether that be community centers, spaces for workshops, or even simply enjoyable public places), integrate material reuse in the construction of these spaces, and offer communities economic incentives to participate in circular material systems. Finally, these spaces (to varying degrees) bring visibility, community ownership and empowerment, and community participation to MSW management. Rather than simply throwing something away in a trash can, more participation in MSW management systems can be garnered by spaces for material reuse, exchange, and innovation. In the U.S., it is less common for communities to be involved in waste management due to the overwhelming privatization of these systems. Subsequently, I drew from international precedents since they provide examples of city-wide initiatives that prioritize community values and reduce the harm caused by waste management systems. All international precedents function within larger government-owned MSW management systems. Achieving sweeping governmental ownership of MSW management systems in the U.S. is not realistic in the short term. Still, the approaches and techniques can provide valuable insights into how community-benefiting systems of MSW management can operate and inform Juneau on avenues to reclaim its MSW.

The six precedents are:

Copenhagen Recycling Station Network in Copenhagen, Denmark
A network of neighborhood scale material collection centers that provide a public space amenity and dedicated swap space.

Kamikatsu Zero Waste Center in Kamikatsu, Japan
A central zero waste community center that acts as a hub for material sorting and zero waste businesses.

Vancouver Zero Waste Demonstration Site in Vancouver, Canada
A dedicated space for material innovators to collaborate and test ideas around material repurposing and clean technology.

Portland Rebuilding Center in Portland, Oregon
A neighborhood non-profit that sells salvaged construction materials and appliances, and also provides classes on home repair.

Austin Material Marketplace in Austin, Texas
An online network that connects local businesses over unwanted materials.

Juneau Recycling drop boxes in Juneau, Alaska
Three recycling drop boxes placed in parking lots around the city to provide improved recycling access.

To answer the guiding questions above, I developed seven specific criteria to evaluate the selected precedents further. The criteria aimed to identify, quantify, and describe the physical and social elements that support a circular, community-benefiting MSW management system. The seven criteria were: characteristics of the system, material resources, public amenities, economic development, events and education, physical components, and community partnerships. The criteria are defined in more detail in figure 4.2.

Each precedent's ability to address these criteria varied as did the information available regarding each precedent. Figure 4.3 illustrates the six precedents, their goals, and their evaluation against the seven criteria. I elaborate more on each precedent and their analysis below.

CHARACTERISTICS OF SYSTEM
describes the role of this precedent in the larger MSW management system (ex: hub of a centralized system).

MATERIAL RESOURCES
refer to the materials processed and/or collected at the facility (ex: recycling).

PUBLIC AMENITIES
refer to the provided services available to the public (ex:public space).

ECONOMIC DEVELOPMENT
refers to how the precedent provides an economic benefit to the community (ex: job creation).

EVENTS + EDUCATION
describes the activities and education that occur (ex: repair classes).

PHYSICAL COMPONENTS + DESIGN
refer to how the physical design showcases waste as material (ex: facade made of salvaged tiles)

PARTNERSHIPS
describes the affiliated or connected agencies and community groups that support the precedent (ex: local business).

Figure 4.2: Seven criteria for precedent analysis.

Figure 4.3: Six precedent were evaluated against seven criteria to evaluate the components that contribute to a successful circular approach to MSW.

		GOALS	CHARACTERISTICS OF SYSTEM	MATERIAL RESOURCES	PUBLIC AMENITIES	ECONOMIC DEVELOPMENT	EVENTS + EDUCATION	PHYSICAL COMPONENTS + DESIGN	COMMUNITY PARTNERSHIPS
Copenhagen Recycling Stations Copenhagen, Denmark population: 602,481		• Increase rates of recycling • Extend life of objects and materials already in use	*part of decentralized system*	*recyclables*, *household objects*	*public space*, *swap shop*	*cost saving*, *job creation*	*repair services (free)*, *youth focused*, *swap*, *metrics*, *signage/ pamphlets*, *creative reuse + art*	*upcycled building materials*	*city government*, *organizations/ businesses*, *volunteers*
Kamikatsu Zero Waste Center Kamikatsu, Japan population: 1,344		• Eliminate 100% of waste and reliance on incinerators or landfills for MSW	*hub of centralized system*	*recyclables*, *household objects*, *construction + demolition*	*tourist destination*, *swap shop*, *community work space*, *laundromat*	*cost saving*, *job creation*, *sale of goods*, *tourism*	*metrics*, *signage/ pamphlet*	*upcycled building materials*	*city government*, *volunteers*
Zero Waste Demonstration Site Vancouver, Canada population: 631,500		• Develop innovations around zero waste or clean technologies to help support Vancouver's 2040 Zero Waste goal	*hub of centralized system*	*recyclables*, *household objects*, *organics*, *construction + demolition*, *industrial byproducts*		*job creation*		*upcycled building materials*	*city government*
Portland Rebuilding Center Portland, Oregon USA population: 1,344		• Make reuse and repair affordable and accessible for everyone • Divert construction materials from landfill	*hub of centralized system*	*construction + demolition*	*donation*	*cost saving*, *job creation*, *sale of goods*	*repair classes (paid)*, *youth focused*	*upcycled building materials*	*city government*, *organizations/ businesses*
Material Marketplace Austin Austin, Texas USA population: 964,177		• Develop a network of local businesses that exchange hard to recycle materials	*part of decentralized online system*	*recyclables*, *household objects*, *organics*, *construction + demolition*, *industrial byproducts*		*cost saving*, *job creation*	*innovation competition*		*city government*, *organizations/ businesses*
RecycleWorks Drop Boxes Juneau, Alaska USA population: 30,000		• Increase rates of recycling	*node of centralized system*	*recyclables*		*cost saving*			*city government*

COPENHAGEN RECYCLING STATIONS

COPENHAGEN, DENMARK

Goals:

- Increase rates of recycling
- Extend life of objects and materials already in use

The City of Copenhagen uses a hierarchical system to guide its priorities around MSW (figure 4.5). The hierarchy defines waste prevention and reuse as the best utilization of materials currently in circulation. To support a prolonged circulation of items and materials, the City of Copenhagen has invested in providing the public with neighborhood swap spaces.[83] They also aim to recycle 70% of Copenhagen's MSW by 2024. To achieve this, Copenhagen uses four main principles to guide MSW management in its city: *Recognizability*- waste is sorted in identical ways no matter the context; *Easy and Logical*- waste sorting must be easy to understand; *Accessible*- waste sorting should be able to occur as close as possible to resident's homes; and *Growth- "waste is a resource that can promote growth and innovation"*.[84] To achieve goals of material reuse and recycling, the city has established a decentralized network of various recycling centers (large facilities), local or neighborhood recycling stations, and dedicated swap centers. The neighborhood facilities will be the focus of this precedent analysis (figure 4.6).[85] The neighborhood recycling stations aim to collect residents' recycling and extend the life of unwanted items.

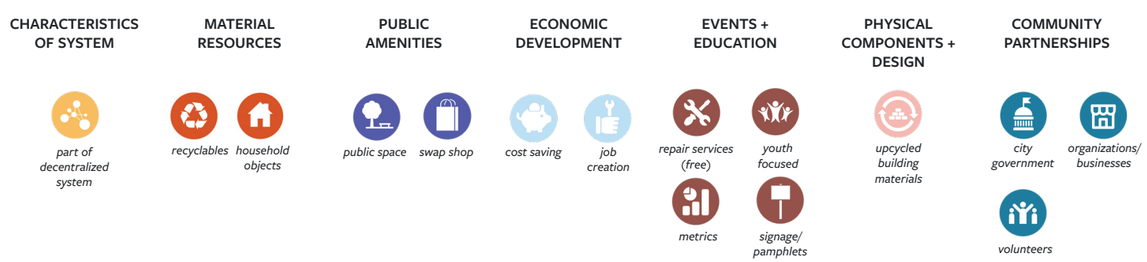
CHARACTERISTICS OF SYSTEM:

part of decentralized system

A robust network of recycling facilities and stations exists across the city. Larger recycling facilities allow residents to recycle oversized items like building materials. The larger facilities have more formalized reuse stores that sell these items. Smaller neighborhood recycling stations provide residents with spaces to bring everyday objects and recycle household waste.[86] Neighborhood recycling stations exist more frequently and are smaller in size. The decentralized network of recycling opportunities makes reuse and recycling easy, convenient, and highly visible to the city's residents. Decentralized networks of MSW management create opportunities for communities to intervene in the MSW process and keep materials in circulation and out of landfills.

The Copenhagen recycling network serves a population of approximately 600,000 residents, across approximately 8,000 blocks of residential apartments within the city limits.[87] The City of Copenhagen is characterized as a walkable and bikeable city; an estimated 60% of people commute by bike and only 29% of its residents own cars.[88,89] It is also important to note that over 60% of its residents live in multi-family housing, one of the reasons why the city utilizes public space, rather than private homes, to sort MSW. However, I believe that this is an advantage because it necessitates interactions between residents and materials, creating opportunities to participate in the MSW management system.

Figure 4.4: Characteristics of the Copenhagen Recycling Stations.



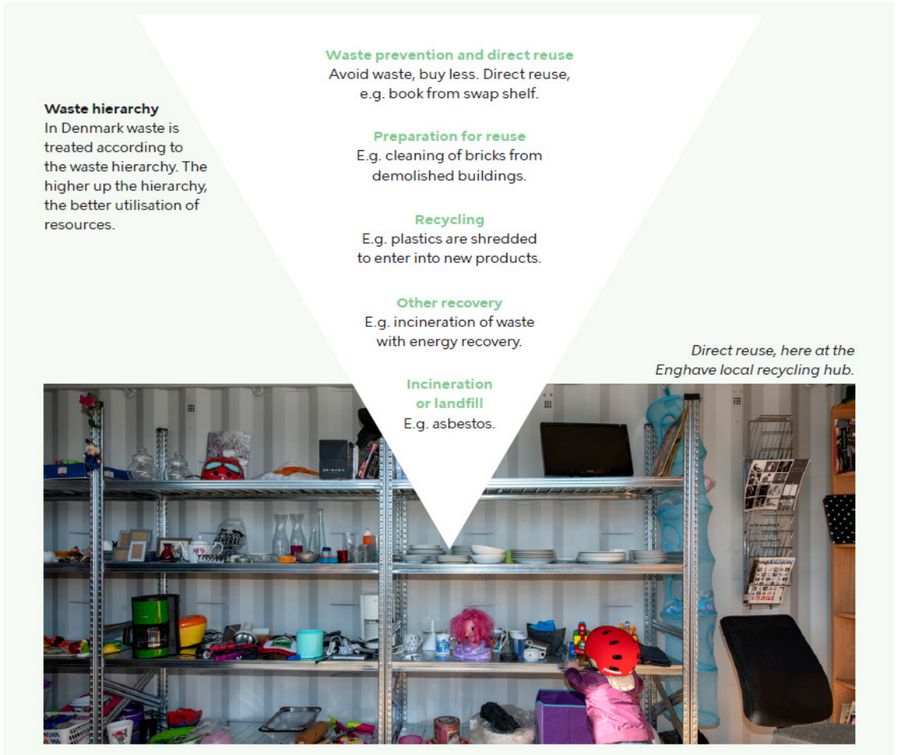
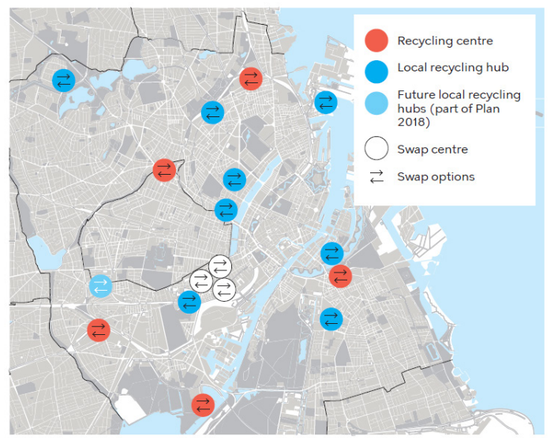


Figure 4.5: The City of Copenhagen's waste hierarchy. From the City of Copenhagen (2019).



Map of existing publicly accessible swap options as well as present and future recycling centres and local recycling hubs. Three new local recycling hubs have been planned, but not yet located.

Figure 4.6: A variety of recycling facilities exist around Copenhagen. From City of Copenhagen (2019).

Figure 4.7: A swap space at a neighborhood recycling station. From City of Copenhagen.

MATERIAL RESOURCES:
recyclables, household objects

The recycling stations are easily accessible spaces for residents to deposit both recycling and household goods. Construction waste is not accepted at these stations, and only items that can be transported without the use of a car are accepted. This rule effectively limits the amount of materials an individual can drop off in a single visit.

PUBLIC AMENITIES:
public space, swap shop

All recycling stations also have a "swap space" where residents can find *"everything from furniture, kitchen equipment, toys, books, clothes and much more"* (figure 4.7).[90] Many of the neighborhood recycling stations share courtyards with other organizations. For example, the Bytterum recycling center in the Norrebro neighborhood shares a courtyard with a preschool and artist workshop (figure 4.8). A combination of amenities at a single location contributes to the success of these sites in collecting recyclable materials. The layering of activities, organizations, and uses builds positive relationships between the community and materials that would otherwise be landfilled, or in Copenhagen's case, incinerated.

In addition to material collection, these sites act as small public parks. The sites function as flexible public spaces for gathering and events by providing seating and green spaces (figures 4.9, 4.10, 4.11). Some recycling stations have small community gardens (figure 4.10). Integrating additional public amenities into recycling stations invites people to participate and interact with these materials indirectly and informally, which helps promote participation in recycling and reuse.

ECONOMIC DEVELOPMENT
cost saving, job creation

The Copenhagen recycling stations provide direct access to free, used items in the dedicated swap space. Swap spaces allow residents to look for used items before buying new, which offers immediate cost savings. Keeping an object or material in use for as long as possible resists the linear economy by reducing demand for new production and resource extraction. Spaces like this can be especially important in isolated communities since they often pay significantly more for new items to be shipped in.

The Copenhagen recycling stations provide employment opportunities for both adults and youth.[91] The focus on engaging children and youth in these spaces leads to generational change and behaviors around waste as material. I believe that this strategy is an important element to address, as generational change is needed to extend the life of the landfill in Juneau.

Figure 4.8: The Møllegade Neighborhood Recycling Station. From ARC (2019).

Figure 4.9: The Hørgården Neighborhood Recycling Station. From Platant (2016).

Figure 4.10: The Hørgården Neighborhood Recycling Station's garden and seating area. From Platant (2016).

Figure 4.11: The Hørgården Neighborhood Recycling Station's seating is made from reclaimed stone from around Copenhagen. From Platant (2016).

Figure 4.12: Residents gather for a kid clothing and toy swap at the Møllegade Neighborhood Recycling Station. From Dit Noerrebro (2021).

EVENTS + EDUCATION
repair services, swap, metrics, signage/pamphlets, creative reuse + art, youth focus

The recycling stations provide local gathering spaces utilized by community groups and neighbors.[92] The accessible and welcoming nature of these stations allows them to be used for social purposes and host events. Recycling stations across the city host a variety of events from children's clothing, book, and toy exchanges (figure4.12), weekly bicycle repair workshops hosted by a city program called "Together About the Bicycle" (figures 4.13, 4.14) food trucks, community art classes, holiday events, and more.[93,94] Many of the events are directed toward children, and invite them to participate in reuse, repair, and creativity around "waste" materials.

Signage and pamphlets at the centers provide information about the activities and rules of the site, waste categories, and information about the larger system MSW management in Copenhagen (figure 4.15). The municipality also sends out seasonal pamphlets to residents about new recycling categories, instructions for seasonal items (ex: Christmas trees), special programs targeted at specific items (ex: old bikes), reminders about best practices when sorting waste, and metrics about waste diversion and recycling (figure 4.16).

By making events and education fun, practical, and free, the city attracts people to participate, learn about material management, and connect with their neighbors.

Figure 4.13: (TOP) A bike repair event at Hørgården Neighborhood Recycling Station. From Hørgården nærgenbrugsstation Facebook Page (2019).

Figure 4.14: (RIGHT) The City of Copenhagen runs a mobile bike repair shop that travels to different neighborhood recycling stations and more. From Hørgården nærgenbrugsstation Facebook Page (2021).

Figure 4.15. From left to right: "Welcome to the local recycling station" (rules and guidelines), "How to sort your food waste", "This is how you make a difference for the climate". Translated by Google Translate.

Figure 4.16. Pages from the seasonal trash pamphlet sent out to all apartments. The pamphlet provides a easy sorting guide, seasonal materials, sorting category changes, and even games! From the City of Copenhagen (2021).

Masks must be disposed of in residual waste

Although disposable masks are made of paper and plastic, they are not recycled.

Therefore, you must not put them in the containers for paper or plastic. They must go in the residual waste (for safety reasons in a closed bag) when you are at home, and if you have to dispose of it on the go, the mask must go into one of the street bins.

Masks contain microplastics, which are transferred to the environment if they lie floating on the street or in nature.

Pack dust and ashes

When the garbage man tips the waste container up into the garbage truck, he gets dust and ash on his head if it is not wrapped.

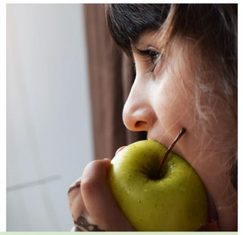
Dusty waste from e.g. floor sweeping, vacuum cleaner bags or the barbecue can pose a health risk to the garbage men if you don't wrap it up. So always make sure to pack dust and ash securely in a bag before throwing it away. Then you spare the garbage man.

Bio changes its name to food waste

A majority in the Danish Parliament has decided that the types of waste must have identical names, colors and pictograms throughout the country.

That is why Copenhagen's bio-waste is changing its name to food waste, which is the designation that has been made mandatory in all municipalities. But even though it is now called food waste, the content has not changed.

It's still old food scraps, vegetable peelers, used paper towels and cut flowers that you have to put in your green kitchen basket.



HAVE YOU RUN OUT OF BIOPSIES?

You must still use the green, biodegradable bags, also called bio bags, which the municipality provides free of charge for your food waste.

The bags can be ordered at kk.dk/bioposer or picked up at all recycling stations, where you can also get a new kitchen basket.

When you shop for new shoes, kitchenware or chocolates online, the goods are delivered together with a lot of packaging. See here how to sort it so that most of it can be recycled.

PAP PLAST PAPIR RESTAFFALD STORSKRALD

Help us sort the parcels you pick up in the parcel shop. Then we can recycle most of it in new products.

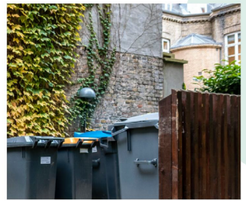
Shop and sort guide

- **Cardboard boxes –** delivered as cardboard after it has been folded, folded and stamped together. There must be clips and tape on. • **Tissue paper –** put in the container for paper. • Brown filler paper and paper bags - must be in the container

cardboard, as the brown fibers cannot be recycled as paper.

- **Flamingo balls/filling and flamingo boxes -** are wrapped and handed in as residual waste. If it is large, it is handed in as bulky waste.
- **Plastic cushions with air -** punctured and delivered as plastic. • **Plastic strips - plastic** shell. • **Moisture bags -** must be in residual waste.

750 new sorting points in the city



The new sorting points will supplement waste sorting at home, and the first sorting points will appear in the city at the beginning of 2022.

Maybe you are missing waste containers at home? Now help is on the way for more sorting.

Space is tight in many farms, rubbish bins and gardens, and in some places it is difficult to squeeze in the waste containers that make it possible to collect and recycle household waste in Copenhagen. That is why the Municipality of Copenhagen has started planning the location of 750 sorting points in the public space, where you can hand in your sorted waste. Sorting points must complement waste sorting at home.

You can help point out suitable locations for the sorting points. Click on kk.dk/sorteringspunkter, where you can read more and suggest a location.

Come and exchange for a new one

There is always a recycling station near you, where you can get rid of your waste, pick up a new kitchen basket or make a bargain in the exchange room.

The recycling stations have exchange rooms where you can drop off and pick up things that are too good to throw away.

In Copenhagen, there are as many as 13 recycling stations which receive waste for recycling and ensure that environmentally hazardous waste is handled properly. Then if you need to get rid of some hazardous waste, old rags, end-of-life furniture or other things that are not suitable for throwing away at home, please stop by the nearest recycling station.

At the recycling station, you can also pick up bio bags and a new kitchen basket for your food waste if the old one has worn out.
You will find the addresses and opening hours of the recycling stations at kk.dk/affald.

WASTE KBH APARTMENT JUNE 2021

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Waste collection and sorting
The Technical and Environmental Administration
Njalsgade 13, 2300 Copenhagen S

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Colourbox
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We'll be gone in a moment

The garbage trucks sometimes block traffic in the narrow streets of Copenhagen.
Bear with them, they are quickly gone again.

In some streets, the space is so narrow that the garbage trucks can get in the way of traffic when they have to empty the waste containers. It can of course be very annoying if you got out of bed too late and have to drive the children to school or yourself to work.

But the garbage men rarely take more than five minutes to empty an entire property of trash, so if you're unlucky enough to find yourself behind a garbage truck early in the morning, bear with them and take a second breath - they'll be gone in no time.

The garbage truck rarely stops for more than five minutes at a time, so be patient if you can't get past.

113 garbage trucks empty the 250,000 waste containers in Copenhagen.
This amounts to 9.5 million. emptyings in one year.

Now you can sort milk cartons – like plastic

Cartons from milk, juice and juice fill up well in many households, and now you can hand in the empty cartons in the container for plastic waste so that they can be turned into new products.

The cartons are sorted from the plastic waste at the receiving facilities, where the plastic waste is driven to, before it is sent on for recycling. In advance, plastics are sorted according to plastic type, and now the plant also sorts out food and drink cartons, so that the good long cardboard fibers can be recycled and turned into new packaging cardboard/cardboard.

No thanks to packaging from fast food and takeaway It is not yet possible to recycle cardboard cups or other plastic-coated cardboard and fiber packaging, which is typically used for fast food and takeaway. Therefore, you still have to hand that kind of thing in the container for residual waste.

All cartons must be handed in separately and must not be wrapped in each other.

Can you put the pizza tray in the cardboard container?

No, the empty pizza tray must be disposed of as residual waste.

Wet and dirty cardboard contaminates the clean cardboard, so it cannot be recycled. Although it is old news, there are still many people who believe that the pizza tray should be put in the cardboard container when the pizza is eaten. In a recent survey, 29% of Copenhageners answered that they sort the pizza tray like cardboard.

Dirty and chopped cardboard must be handed in for residual waste.

Give your old bike new life

We love our bikes and like to change them when the summer is upon us. But what do you do with your old bike when you get a new one?

It flows with abandoned bicycles in the streets and clean bicycle cellars in Copenhagen. It's a shame, because the bikes can be used by others, and they take up space in the bike racks.

There are many ways to give your old bicycle a new lease of life, and if you don't know anyone who could benefit from it, you can hand it in for recycling at one of the bicycle dealers and workshops found at kk.dk/giv- your-bike-forward.
You can also hand it in at the nearest recycling station.

Copenhagen Municipality collects every year 15,000 abandoned bicycles. You can use 'Giv et praj' on kk.dk or the app if you want to draw attention to abandoned bicycles on the street or in the bicycle racks in your district.

Click on kk.dk/giv-din-cykel-videre and see where you can hand in your old bike for recycling.

Fold your cardboard

If you find that the cardboard container at home in your yard is full to bursting point, it may be because the cardboard is not folded together properly.

Cardboard volumes have increased explosively in recent years. In 2016, the Municipality of Copenhagen collected 4,809 tonnes of cardboard for recycling, in 2020 it amounted to a whopping 8,037 tonnes. There is therefore extra reason to fold the cardboard well before you put it in the cardboard container.

Cardboard and cardboard is one of the waste types that is best recycled.
The fibers in cardboard and cardboard can be reused up to six times.

Remember that the public bins are for small waste for incineration such as coffee mugs and ice paper. If you put cardboard boxes in them, there is no room for small waste, which instead ends up lying and floating on the streets.

Sorting guide

From 1 July 2021, the waste types will have the same names, colors and pictograms in all the country's municipalities. In Copenhagen, you have to get used to the fact that BIO is now called FOOD WASTE and has become green, while PLAST has been given the color purple.

MADAFFALD

FOOD WASTE becomes biogas, fertilizer and electricity. Raw and prepared foods, nuts and shells, coffee grounds and filters, used paper towels, cut flowers, etc.
Always tie a knot on your bio bag.

GLAS

GLASS is recycled in its entirety or melted down into new ones. Wine and spirit bottles, glasses from food, drinking glasses and glass vases etc
Food glasses must be empty, but preferably with lids.

PAPIR

PAPER is recycled into new products. Newspapers, magazines, advertisements, envelopes/ window envelopes, books, writing and drawing paper, etc
Clips and tape are welcome.

PAP

PAPER is recycled in new products. Cardboard packaging from e.g. toys, toothpaste, sweets, smaller cardboard boxes from online stores, cardboard, corrugated cardboard etc. *Cardboard must be clean and folded. Used pizza trays must always be placed in the container for residual waste.*

SMÅ ELEKTRONIK

SMALL ELECTRONICS are recycled as far as possible - the rest is specially treated. Mobile phones and chargers, cords, electric toothbrushes, electronic toys, irons, small kitchen appliances such as hand mixers, blenders etc., postcards, shoes and ties with lights/music etc.
Electronic waste is anything with a battery or cord attached.

FARLIGT AFFALD

HAZARDOUS WASTE is treated under controlled conditions. Chemicals and poison, low-energy light bulbs, fluorescent tubes, paint, batteries, accumulators, spray cans etc.
Remember that empty packaging with 'Hazardous waste' symbols must be sorted as hazardous waste and in the Hazardous waste container.

PLAST

PLASTIC, FOOD AND DRINK CARTONS are recycled into new products. Plastic packaging from food, cans from drinks, mild detergents and shampoos, bubble wrap, plastic wrapping from flowers, candy bags, etc. Empty milk containers toner and cardboard packaging from e.g. juice and juice.
Empty plastic and cartons as best you can.

MAD- & DRIKKE KARTONER

METAL

METAL is recycled into new products. Cans, empty cans without a deposit, kitchenware and foil trays, tools, nails and screws, metal boxes, pots and pans etc. *Metal must be emptied of food.*

STORSKRALD

INDENDØRS TRÆ

BULK WASTE AND WOOD. Wood and metal are recycled, while the rest is turned into heat. Furniture, mattresses, carpets, window glass, construction waste from smaller 'Do-it-yourself' projects* etc.
Wood such as furniture must be kept separate.
**Soil, stone and gravel, sanitary equipment, roof tiles, bricks, roof tiles, concrete etc. must be taken to the recycling station.*

RESTAFFALD

RESIDUAL WASTE is turned into electricity and heat. Dirty cardboard and paper, nappies, sanitary napkins, cotton buds, flamingos, animal bedding, vacuum cleaner bags, scouring pads, used toothbrushes (not electric), cigarette butts, etc. *All residual waste must be securely packaged in bags.*

GENBRUG

RECYCLING AND EXCHANGE
Give what you have - take what you can use. Books, clothes, kitchenware, toys, trinkets, DVDs and electrical appliances that work.

You can read more at kk.dk/affaldssortering.

Garbage Crossword

Find the right category for things.

			TON	UP DRIVER	HOLD PEACE	TONE PATINA			RESPONSE YOU	HOLE	INHERIT PLANT	GANG WORD	FAIR
						3							6
OUT BREAK			ORIGIN NEEDLE ECHO					OWNED IRELAND					
MAP	8						DEC WHOSA					SPAIN TYPE	
TREE		1		BIRD FRUIT							ALL VITAMIN		
NORWAY		ANIMALS MELT				2							
					SHIP PAW			ROUGH POWER TIG			REMOVE VISION FURNITURE		
ROW			HURRY UP SAY ANIMALS	7			FILTER RED CREATES					PRONOUN FOR BOTTOM	
REX		GIRL NAME MAN				BROTHERS DECIDE MORE			THE BUSH POWER				
									5	TABLE CLOTH HANKE			9
RED THE CURRY					CREATURE AMAGER CANNES			SCORED GOALS FORK.				LITER PLACE RIGHT	
	LOSERS BODY SHAME		CONFIGURED MEDIA HOUSE						COLOR A COUPLE				
	4										NORDIC GOD		
FISH			SHIP SHARE				SONG GROUP PEN						

Find the nine letter solution in the colophon on page 6.

PHYSICAL COMPONENTS + DESIGN
upcycled building materials

The use of salvaged and repurposed building materials in the physical design of recycling stations is common. Repurposed materials are either used for art or make up a physical component of the building. Figure 4.17 shows the use of salvaged tiles as a facade of the center. Figure 4.19 shows an artful interior wall element that uses clear tubes to contain various materials. Figure 4.18 shows reclaimed stones from across the city repurposed into benches.[95] These design decisions put material reuse into action, and showcase its economic value and aesthetic opportunities.

Figure 4.18: Reclaimed stones at Hørgården Neighborhood Recycling Station. From Platant (2016).

Figure 4.17: Upcycled tile makes up the facade of the Gartnergade Recycling Station. Reclaimed stone is used for benches at the site. From Plantant (2020).

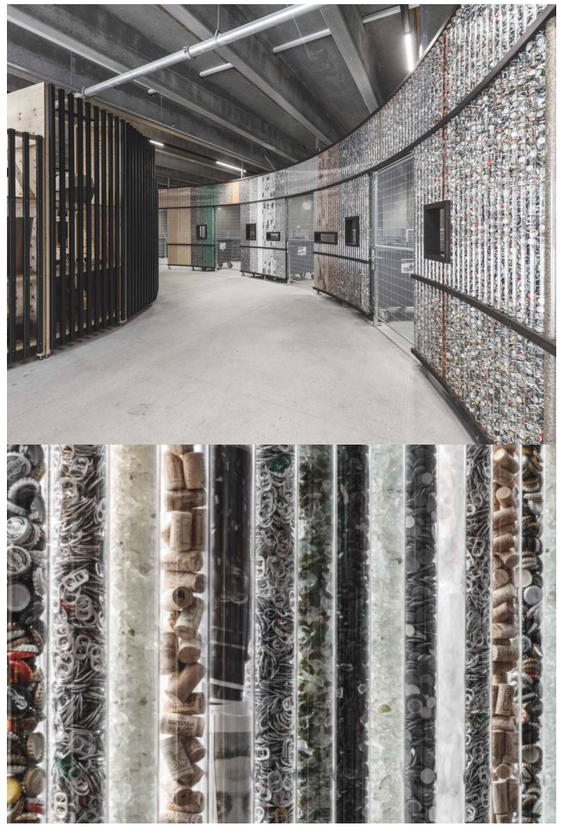


Figure 4.19: Clear tubes that hold sorted materials ranging from corks to fabric are used in the intior walls of the Nordhavn Recycyling Station. From Lendager (2020).

COMMUNITY PARTNERSHIPS
city government, organizations/businesses, volunteers

The City of Copenhagen runs the neighborhood recycling stations and offers volunteer opportunities for residents to help at the stations.[96] Additional community partnerships include a community organization called FRAK, which employs Copenhagen's youth to gain job experience. Figure 4.20 shows FRAK youth painting tires that will be used as planter pots at the Møllegade recycling station. Community partnerships from the neighborhood reinforce connections to the recycling station and help bring diverse activities to the recycling stations.

Figure 4.20: Youth employed by FRAK paint tires that will be used as planters at the Møllegade recycling station. From Copenhagen Municipality Facebook (2021).

KAMIKATSU ZERO WASTE CENTER

KAMIKATSU, JAPAN

Goals:

- Eliminate 100% of waste and reliance on incinerators or landfills for MSW

The Kamikatsu Zero Waste Center is located in Kamikatsu, Japan. It is a small mountain town on Shikoku island with only1,500 residents. During the past two decades, the people of Kamikatsu have radically changed the way they manage their MSW, as well as the way they buy and consume goods. Kamikatsu previously managed their MSW through open burning. When the municipality realized it could not afford a new incineration facility to meet environmental standards, it spurred into action (Zero Waste Declaration).In 2003, the town of Kamikatsu set a goal to completely eliminate the use of landfills and incinerators to manage its MSW by 2020[97]. Kamikatsu currently achieves an 81% recycling rate, and since 2000, has reduced the amount of waste it generates by 65%.[98] A shift this radical required both accessible infrastructure to handle material processing, but also the social infrastructure. Education helped shift perceptions from waste as a nuisance to a material that provides community benefits. *"In Kamikatsu, recycling isn't just an environmental imperative- it is the glue that unifies a community."*[99]

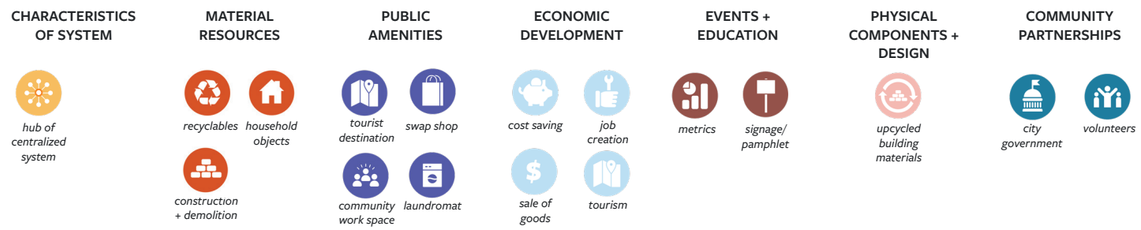
CHARACTERISTICS OF SYSTEM:
part of decentralized system

The Kamikatsu Zero Waste Center is a centralized hub for recycling, reuse, and other community activities. Surrounding residents bring their materials on an individual basis (figure 4.22). If residents cannot travel to the center (they may lack a car or have mobility issues), they may participate in the free collection service. The collection service picks up materials every other month. This may seem infrequent, but community surveys have found this frequency sufficient since residents produce low levels of MSW.[100]

Kamikatsu's MSW management system exists in a rural setting, with the primary industry being agricultural production. It is one of the least populated towns on the island of Shikoku, and more than half of its population is over the age of 65.[101]

Figure 4.22. Residents self sort their MSW at the Kamikatsu Zero Waste Center. From Nippon (2018).

Figure4.21: Characteristics of the Kamikatsu Zero Waste Center.



MATERIAL RESOURCES

recyclables, household objects, construction + demolition

Recycling, household objects, and construction/ demolition materials are sorted into 45 categories at the Zero Waste Center (figures 4.23, 4.24). Not all material is processed at the center, as organic waste is handled at the household level via home composting systems.

Figure 4.23: Residents must clean and dry their recycling before they can sort it into the appropriate category. From Zero Waste Town Kamikatsu.

Figure 4.24: There are 13 material categories, each with sub categories. In total there are 45 categories for waste sorting. From Zero Waste Town Kamikatsu.

PUBLIC AMENITIES
swap shop, community work space, laundromat, tourist destination

The Kamikatsu Zero Waste Center is more than a material collection center. It hosts a variety of material-themed activities that brings the community together, generates capital, and even acts as a tourist attraction (figure 4.25). The Zero Waste Center hosts a "Kuru Kuru" (translated as "round to round") thrift shop where residents can swap unwanted items for desired items for free (figure 4.26). The same shop also sells bags, clothing, and other goods from textiles that are upcycled by local artisans (figure 4.27). The center also has a laundromat and collaborative lab. The collaborative lab acts as a community co-working space and is free to use (figure 4.28).[102] Next door are a zero waste hotel and brewery, with beer made from fruits too misshapen to be sold at the market and leftover ingredients from nearby companies (figures 4.29, 4.30).[103]

It creates the social infrastructure and community participation needed to change attitudes and behaviors around waste. By layering multiple amenities in a single space, it invites more people to use the space. If the center only hosted a recycling sorting facility, I believe it would not have been able to gain the strong community backing and participation that it has today. Additionally, it adds a layer of convenience by providing a one-stop shop for social interaction, shopping, working, relaxing, and participating in the town's zero waste initiatives. I believe that Juneau can apply the strategy of layering multiple amenities into community spaces to attract participation.

Figure 4.26: The thrift shop has items that range from batteries, clothes, furniture, and dishes. From Michelle Ye Hee Lee (2022).

Figure 4.27: Sandals and other goods made from upcycled textiles. From Zero Waste Town Kamikatsu.

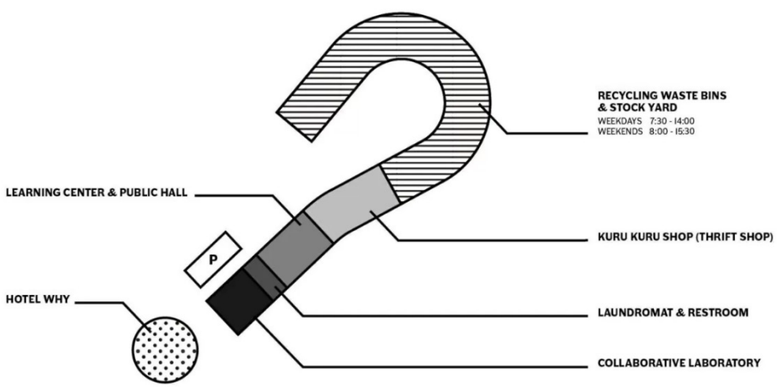


Figure 4.25. Plan view of the Zero Waste Center. From Zero Waste Town Kamikatsu.

Figure 4.28: (TOP) The Zero Waste Center has a free co working space avaialbe for residents and visitors to use. From Zenbird (2020).

Figure 4.29: (LEFT) The Rise & Win Brewing Company creates liquid fertilizer from spent grain which it then uses to grow barley. From Michelle Ye Hee Lee (2022).

Figure 4.30: (RIGHT) Beer made from imperfect fruits that would otherwise be thrown away. The brewery uses reusable cloth coasters to reduce waste. From Michelle Ye Hee Lee (2022).

EVENTS AND EDUCATION
metrics, signage/pamphlet

The Zero Waste Center utilizes signage to display the processes of material reuse and the town's progress toward its zero waste goals. In the swap shop, a sign displays the pounds of goods rehomed (figure 4.31). In the recycling area, signs show what types of items will be made from each recycling category, and the amount of money saved by the town by recycling instead of incinerating. These signs are an effective way to *"remind them [the residents] of their social responsibility"*.[104] I believe the visibility of these metrics is an important tool that incentivizes and fosters participation in recycling and material reuse.

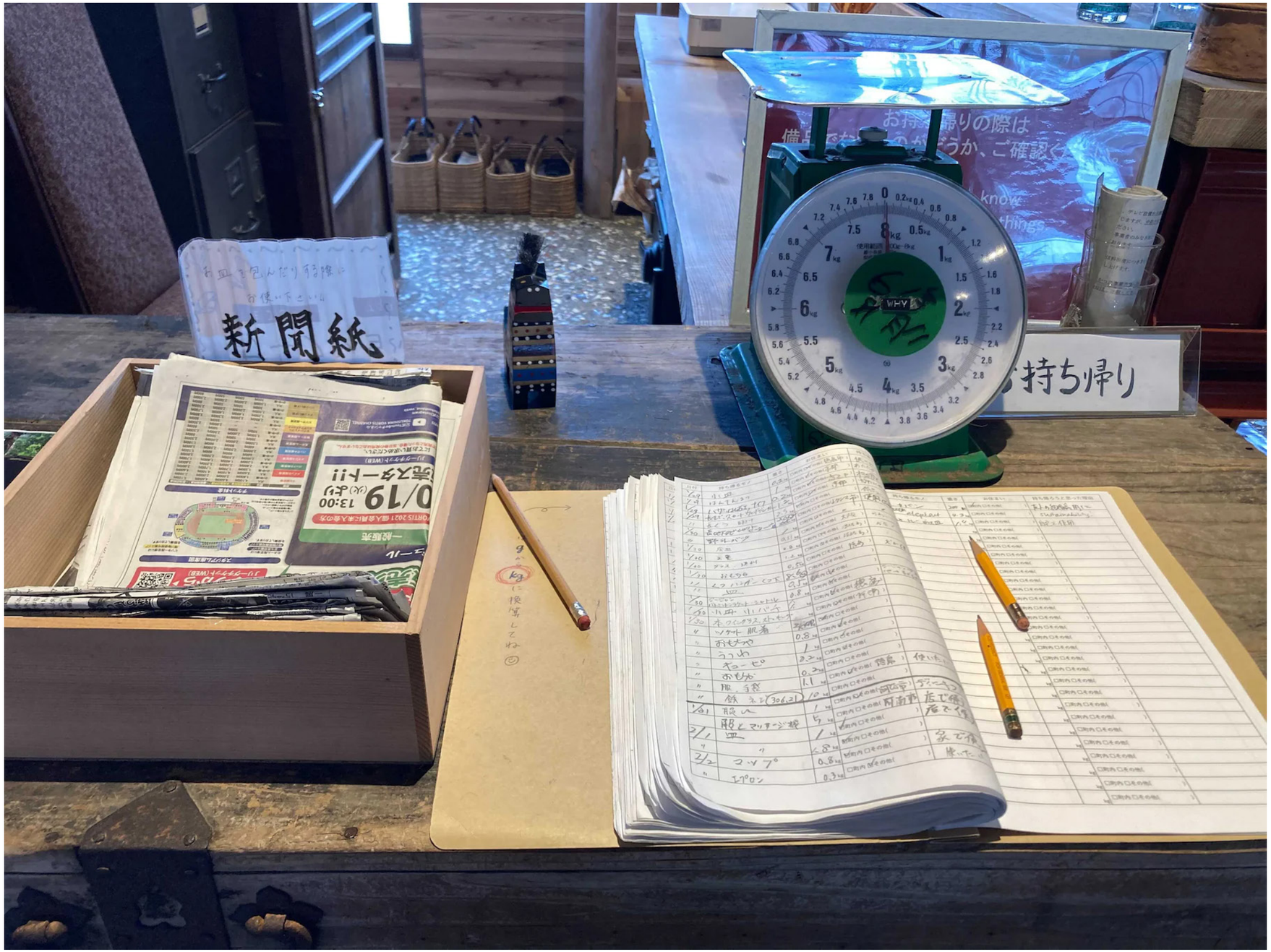


Figure 4.31. Each item at the swap shop is weighed and recorded. From Michelle Ye Hee Lee (2022).

PHYSICAL COMPONENTS + DESIGN
upcycled building material

The architecture and materials used to build Kamikatsu's Zero Waste Center are directly used to showcase the opportunity of second-hand material in a way that can be beautiful and functional. A few examples include over 700 repurposed windows used in the construction of the facility (figure 4.33), elegant glass bottle chandeliers (figure 4.32), and wall paneling made from plastic crates. Even the shape of the building, built in a question mark, is meant to ask "Why do we create so much waste?" (figure 4.34).

COMMUNITY PARTNERSHIPS
city government, volunteers

The Zero Waste Center is supported by Kamikatsu's local government.

Figure 4.32: A chandelier made from glass bottles. From Michelle Ye Hee Lee (2022).

Figure4.33: (TOP) Approximately 700 donated or salvaged windows were used to build the Zero Waste Center. From Koji Fujii (2022).

Figure 4.34: (BOTTOM) The Zero Waste Center from above. From Koji Fujii (2022).

VANCOUVER ZERO WASTE DEMONSTRATION SITE

VANCOUVER, CANADA

Goals:

- Develop innovations around zero waste or clean technologies to help support Vancouver's 2040 Zero Waste goal

The Vancouver Zero Waste Demonstration Site is a recent initiation by the City of Vancouver and the Vancouver Economic Commission to help reach the city's goal of becoming a zero waste community by 2040. It also aims to extend the life of the Vancouver Landfill.[105] The Vancouver Landfill is owned by the City of Vancouver and similarly to Juneau, is expected to close in 20 years.[106] To achieve these goals the city has invested in a future demonstration site and "industrial-sized incubator" for innovators exploring clean technology and material innovations that address various materials such as organics, recyclables, electronic waste, construction and demolition, composite waste, residuals from industrial activities, and more (figure 4.36).[107] The project is currently in the final stages of selecting its innovators, and is expected to open in July of 2023 and run for two years.[108] The City of Juneau has indicated that it wants to actively engage local innovators and entrepreneurs in its zero waste goals, and the Vancouver Demonstration Site provides one model of this.

Figure 4.36: A rendering of what the Vancouver Demonstration Site could look like. From City of Vancouver (2023).

Figure 4.35: Characteristics of the Vancouver Zero Waste Demonstration Site.

CHARACTERISTICS OF SYSTEM:
hub of centralized system

The Demonstration Site will be a single centralized location that will house a collection of innovators that aim to explore technologies that reduce and upcycle waste, and create valuable products. The City of Vancouver is exploring the Demonstration Site as one avenue to implement waste reduction and material innovation into their larger MSW management system.

The City of Vancouver is home to approximately 631,500 people, and the surrounding metropolitan area home to about 2.8 million people.[109]

MATERIAL RESOURCES
construction + demotion, recyclables, houshold objects, oranics, industrial byproducts

The Demonstration Site will handle a wide variety of materials ranging from recyclables, organics, household objects/composite, construction and demolition waste, and industrial byproducts.

PUBLIC AMENITIES

The Demonstration Site will be located at a converted parking lot in an industrial neighborhood of Vancouver. The Demonstration Site does not pair any public amenities with the innovation space. This is a missed opportunity to engage the general population of Vancouver, not just the innovators working at the site. I believe that making alternative waste systems visible is important because it invites the community to participate and engage with them. When a site is hidden or inaccessible (like many elements of linear disposal methods), it reinforces our disconnection to materials. The Demonstration Site will likely result in successful material innovations. Still, it may fall short of maximizing its potential to provide support toward the City of Vancouver's zero waste goals.

ECONOMIC DEVELOPMENT
job creation

This project highlights the untapped economic opportunities of materials that end up in landfill, as well as building a community of material innovators. The Demonstration Site will provide innovators access and exposure to investors, potential partners, and clients through the city's support. The City of Vancouver hopes the Demonstration Site could result in scalable products or technologies that would create green jobs in the region. [110]

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EVENTS AND EDUCATION

Currently there are no planned events or education around this site to the wider population of Vancouver.

PHYSICAL COMPONENTS + DESIGN
upcycled building materials

Innovation spaces will be housed in 20 or 40 ft shipping containers.

COMMUNITY PARTNERSHIPS
city government

The Demonstration Site is supported by the City of Vancouver and Project Greenlight. Project Greenlight is a program created by the Vancouver Economic Commission that acts as a technology demonstration platform that aims to connect innovators with enterprises to expedite the establishment of pilot projects.[111]

PORTLAND REBUILDING CENTER

PORTLAND, OREGON

Goals:

- Make reuse and repair affordable and accessible for everyone
- Divert construction materials from landfill

The Portland Rebuilding Center is a non-profit organization that diverts valuable construction materials from the landfill and resells them at affordable prices to the public (figure 4.38). Additionally, the space hosts classes on home repair for the community. Their mission is *"to make reuse and repair accessible to all as a means to reduce waste, end overconsumption, and empower homeowners and renters by making better use of our existing resources."* [112] Construction and demolition waste make up a significant portion of the landfilled materials in Juneau, and the City has expressed that one of its top priorities is to divert these materials. The Portland Rebuilding Center not only diverts materials, but also provides cost savings and knowledge-building to the community. I believe that this precedent is a strong example of circular systems that can directly benefit and engage with the local community.

CHARACTERISTICS OF SYSTEM:
hub of centralized system

The Portland Rebuilding Center is a single central hub that sells salvaged materials from construction and demolition activities. The Rebuilding Center provides a pathway for materials to re-enter the market. This is especially important because in Portland it is required by law to deconstruct homes or duplexes if they were built before 1940 or are designated as a historic home.[113]

The Rebuilding Center is located in Portland, Oregon home to approximately 641,100 residents. The Center takes up an entire city block, which is located along a mixed use street surrounded by a residential neighborhood that is accessible by bike, car, or foot.

Figure 4.37: Characteristics of the Portland Rebuilding Center.

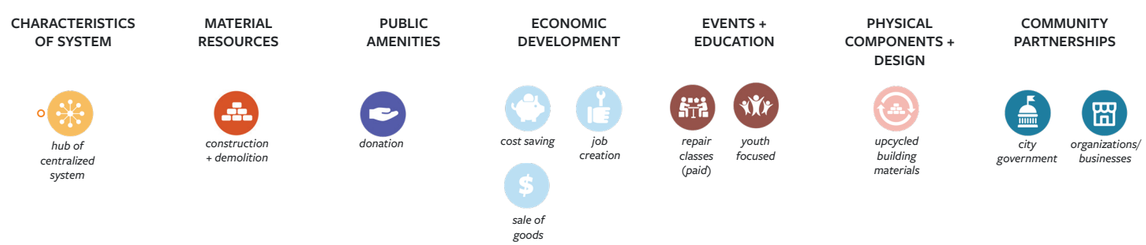


Figure 4.38: Volunteers pull staples and nails from salvaged plywood. From Portland Rebuilding Center.

MATERIAL RESOURCES
construction + demotion

The Rebuilding Center sells donated building materials from construction, remodeling, and disassembly projects at affordable prices that make participating in rebuilding and repairing more accessible (figure 4.39). Since its inception in 1997, the rebuilding center has diverted over 35,000 tons of reusable building materials from the landfill.

PUBLIC AMENITIES
donation

The Rebuilding Center provides a location for the public to donate their materials for free instead of paying to landfill them.

EVENTS + EDUCATION
repair classes (paid), youth focused

In addition to selling materials, the Portland Rebuilding Center offers community classes to build skills for home repairs and improvements. Courses offered include skill building around tools (essential home tools, saws, routers), carpentry (table, cutting board, and planter box building), plumbing (toilet repair/ replacement, plumbing basics), electrical (safety, outlets, light fixture), and creative reuse (mosaics, earrings). The Rebuilding Center also offers classes held specifically for youth.

In addition to classes at the center, mobile workshops are offered to reach people who cannot access the main Rebuilding Center. The pairing of a physical place that provides access to these materials and the skill-building opportunities of how to use these materials makes the Rebuilding Center a successful and robust community asset. Connecting people to materials through skill-building shows the potential of typically or commonly discarded materials, and builds community (figure 4.40).

PHYSICAL COMPONENTS + DESIGN
upcycled building materials

The Portland Rebuilding Center integrates salvaged materials into the structure of its building.

COMMUNITY PARTNERSHIPS
city government, organizations/businesses

The Rebuilding Center partners with the City of Portland to run a program called "*From Excess to Access*". The program is funded by an EPA grant and provides low-income property and business owners with free building materials to help them meet building codes.[114]

Figure 4.39: (TOP) The Rebuilding Center sells a wide variety of materials at discounted prices. From Portland Rebuilding Center.

Figure 4.40: (BOTTOM) A group of Rebuilding Center Volunteers. From Portland Rebuilding Center.

MATERIAL MARKETPLACE

AUSTIN, TEXAS

Goals:

- Develop a network of local businesses that exchange hard to recycle materials

The Material Marketplace in Austin is an online marketplace that connects business owners across the city to trade unwanted materials that range from spent grain to office supplies. The program *"aims to create a collaborative network of businesses, organizations and entrepreneurs where one organization's hard-to-recycle waste and by-products become another organization's raw material."*[15]

In addition to the online material marketplace, the City of Austin hosts a Re-verse pitch- an annual innovation competition where business owners donate their unwanted materials and ask community members to come up with an alternative use (figure 4.42). The winner of the competition will receive funds to make their pitch come to life. This competition is an excellent way to get community members involved and shows the economic opportunity of materials that would be landfilled.

This precedent focuses only on the exchange of materials between businesses, unlike all other precedents selected, which focus primarily on consumers. However, this precedent is valuable and applicable to Juneau because it fosters material exchange without being housed in physical space. Currently, Juneau lacks a physical space for these exchanges to happen. Creating an online platform to facilitate material exchange and diversion could be a low-cost solution and could be implemented relatively quickly compared to establishing a physical space.

CHARACTERISTICS OF SYSTEM:
part of decentralized online system

Material Marketplace Austin is an online platform that creates a decentralized network of local businesses. It acts similarly to popular apps like OfferUp, or Buy Nothing Facebook groups by posting items or materials to a shared feed to facilitate the efficient and direct exchange of materials from business to business. This network is an example that sites of material exchanges do not necessarily need to be physical and may even function better when they are not, especially when dealing with large or hard-to-transport items.

Figure 4.41: Characteristics of Material Marketplace Austin.

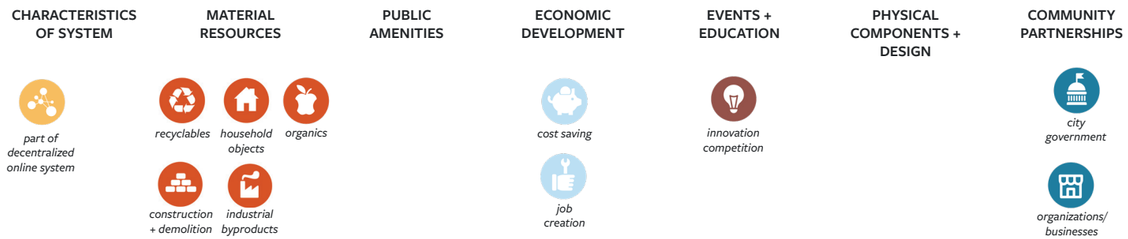


Figure 4.42: A Re-verse pitch participant shows judges a scrap food collector that aims to take expired canned goods and turn them into livestock feed. From Michael Knox (2016).

MATERIAL RESOURCES
recyclables, household objects, organics, construction + demolition, industrial byproducts

The marketplace handles a wide variety of materials ranging from recyclables, organics, household objects/composite, construction and demolition waste, and industrial byproducts (figure 4.43).

PUBLIC AMENITIES

The Material Marketplace provides an online service for businesses, but not the general public.

ECONOMIC BENEFITS
cost savings, job creation

The economic benefit of the Material Marketplace is that it provides cost savings to local businesses associated with the purchasing and disposal of materials. The Austin Material Marketplace has "*generated an estimated $372,000 in savings or value creation* for participants*" by diverting 45,000 cubic feet of materials.[116]

EVENTS AND EDUCATION
innovation competition

In addition to the online material marketplace, the City of Austin hosts an event called the Re-verse Pitch. It is an annual innovation competition where business owners donate their unwanted materials and community members develop creative reuses or alternative uses for these materials. The competition's winner receives funds to make their pitch a reality. This competition is an excellent way to engage community members and catalyze material innovation and potential job creation.

PHYSICAL COMPONENTS

No physical components define this system.

COMMUNITY PARTNERSHIPS
city government, organizations/businesses

The Material Marketplace is funded by the City of Austin and powered by the Rheaply App (figure 4.44) .

Figure 4.43: Metal dividers, spent grain, and extra canvas are all items that have been exchanged between businesses. From Austin Material Marketplace.

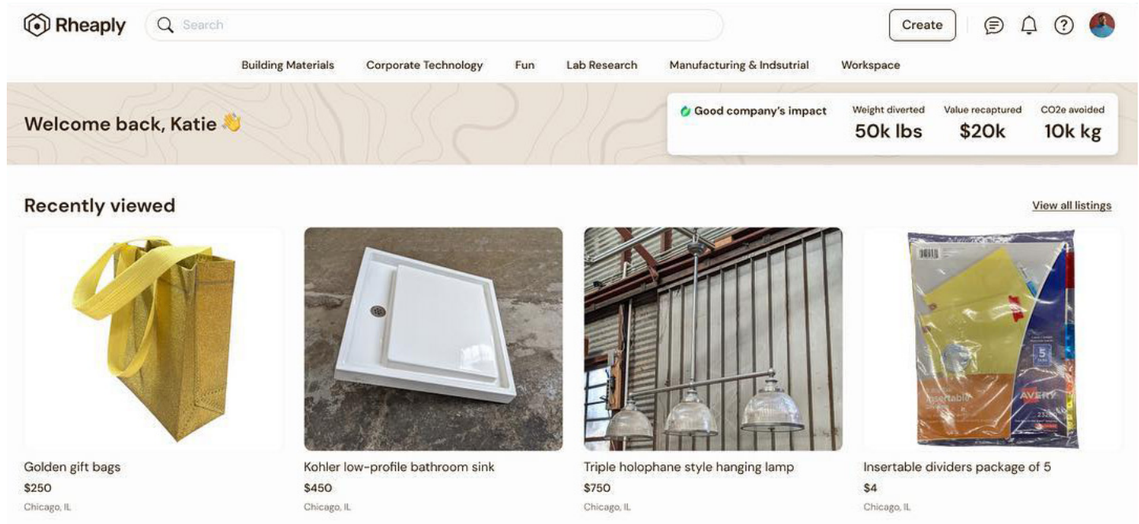


Figure 4.44: The Rheaply interface allows businesses to post and claim unwanted materials. From Rheaply.

RECYCLEWORKS DROP BOXES

JUNEAU, ALASKA

Goals:

- Increase rates of recycling

RecycleWorks Drop Boxes are from a recycling pilot program in Juneau that was implemented to increase the recycling rate. The City placed recycling bins in 3 parking lots across the city: Auke Bay Harbor, Thunder Mountain High School, and Juneau Douglas High School (figure 4.46). The pilot program ran from 2016-2020. The program ultimately ended because it did not increase the overall collection rate of recyclables. The drop boxes made recycling more convenient for people already in the habit of dropping off their recycling, but didn't attract new participants to utilize the boxes. The drop boxes reduced the amount of recycling the program collected because of a significant contamination issue. The containers were open 24/7, which led to people dumping trash in them (figure 4.47). Even though this precedent was unsuccessful, it provides essential insight into understanding focus areas for future design proposals. One lesson learned is that convenience and access to recycling sites are insufficient for changing people's behavior.

CHARACTERISTICS OF SYSTEM:
node of centralized system

The drop boxes were used to collect recycling. These boxes were then hauled to the local recycling facility in Lemon Creek.

MATERIAL RESOURCES:
recyclables

The drop boxes collected recyclable materials including paper/cardboard, plastics, and aluminum.

PUBLIC AMENITIES

The only amenity provided by these drop boxes was access to free recycling.

ECONOMIC DEVELOPMENT
cost savings

The drop boxes provided no economic development opportunities. The boxes did provide a cost savings benefit to the community as they were free to use, compared to the paid curbside recycling service offered.

Figure 4.45: Characteristics of RecycleWorks Drop Boxes.

Figure4.46: A RecycleWorks drop box in Statter Harbor. From KINY (2016).

EVENTS AND EDUCATION

The drop boxes did not host any events or provide any information about why the City had implemented the program to collect more recycling at the site. The City used social media and its ReycleWorks website to provide information about the drop boxes

PHYSICAL COMPONENTS

I believe these drop boxes were unsuccessful in changing people's behavior and attitudes because they did not connect to the places that they were placed in. This resulted in either being misused or not utilized. Improving access to recycling is an important part of extending the life of the landfill in Juneau, but these points of the material collection must do more than collect material. They also need to provide education around the City's zero waste goals, and shift attitudes around what is considered waste. These spaces will only be able to do that if they are places people want to visit and participate in.

COMMUNITY PARTNERSHIPS

city government

The City of Juneau's RecycleWorks Program supported the drop boxes.

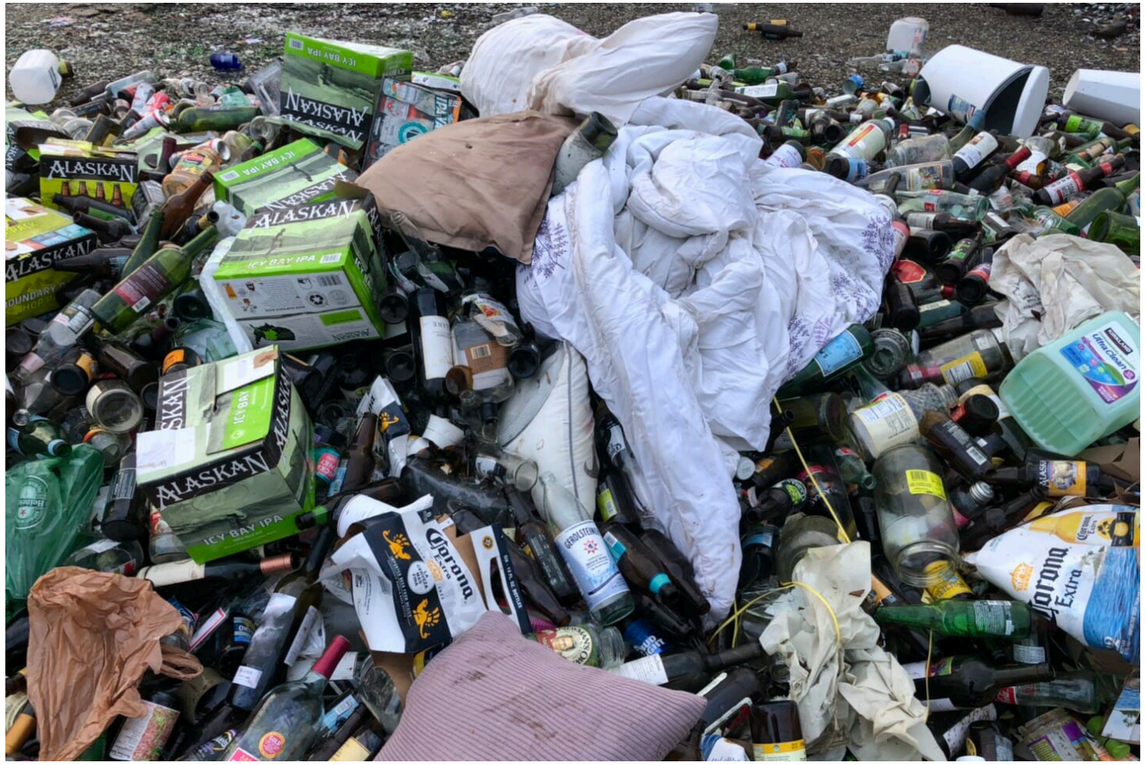


Figure 4.47: Contents of a RecyleWorks drop box contaminated with garbage. From the City and Borough of Juneau (2019).

Reflections on Precedents

Cultural and economic environments vary greatly from precedent to precedent. As discussed previously, our relationship with waste is formed by our geographic and cultural context. Relationships to waste are nuanced, which means that these precedents do not provide a direct one-to-one translation to Juneau, or other cities in the U.S. However, the qualities and experiences of these spaces can be emulated.

The precedents provided a variety of approaches, each with their own strengths. The Copenhagen Recycling Network was successful at making participating in MSW management accessible, with a variety of locations across the city. Depending on the size of the city the MSW management system serves, I believe frequency of and distance to material collection sites is important. Kamikatsu's Zero Waste Center and Portland Rebuilding center operated from a centralized hub, but I believe this was appropriate and successful because of the small size of town (Kamikatsu) and the characteristics of materials (Portland Rebuilding Center). Kamikatsu Zero Waste Center and Portland Rebuilding Center also made sure to provide access to its services for community members that could not access the center. A lesson from Kamikatsu and Portland is that centralized facilities must ensure that all residents can participate, so pairing a mobile service to fill these accessibility gaps was a strength.

Both the Kamikatsu Zero Waste Center and Copenhagen Recycling Stations excelled in engaging with a wide variety of residents through diverse programming and events at the sites. This made them a valuable community space, not just a material collection center. From bike repair to laundry, the sites invited everyone to participate, not just environmentally minded people. The Portland Rebuilding Center provided less variety but more specific programming which allowed for deeper learning and skill building to occur.

A common theme among the precedents is that they provided different forms of financial incentives to garner participation. Discounted items, funding, free services, and free goods all attracted people to use the site. However, I believe providing free swap spaces (Kamikatsu Zero Waste Center, Copenhagen Recycling Stations) was the most successful at attracting a wide variety of people because of the ubiquitous nature of household goods, whereas not everyone may be interested in building materials (Portland Rebuilding Center), creating a business (Vancouver Zero Waste Demonstration Site, Material Marketplace Austin), or own a business (Material Marketplace Austin).

The precedents each reduce harm caused by the linear economy in different ways. The Portland Rebuilding Center, Kamikatsu Zero Waste Center, Copenhagen Recycling Center, and Material Marketplace Austin address the financial harm caused by private and linear waste management systems. Access to free or low cost goods or services is important to placing wealth back into the community rather than corporations.

Kamikatsu Zero Waste Center most successfully reduced the environmental and social harm of linear disposal methods, as it was incinerating its MSW locally prior to its shift to circular material systems. In this sense, Kamikatsu is most similar to Juneau: isolated, directly experiencing the negative environmental and health impacts, and financially unable to continue to invest in linear MSW management systems.

One important quality should be used to guide the development of circular material systems is the layering of programs, events, and amenities in a single space to cultivate and connect communities to the value and potential of materials. The precedent analysis showed that it is essential to go beyond the minimum infrastructure needed to divert material from the landfill by providing social infrastructure. Circular material systems only work if people change their behaviors. People are much less likely to change their behaviors or attitudes about waste when they are not actively invited to by additional amenities, services, events, or community groups. The strength of precedents such as Kamikatsu Zero Waste Center and Copenhagen Recycling Stations are that they create spaces for people, not only materials. Making sure these spaces are accessible is important as well.

Juneau will need to develop both the physical and social infrastructure to extend the life of the landfill and reduce the harm caused by the current system. The analysis of precedents will be used to inform design ideas of physical places that will help transition Juneau from a linear to a circular material management system. The following chapter will outline a phased approach using public space and planned future infrastructure to divert materials from the landfill, provide community benefits, and reduce the harm of the current system.

Endnotes

83. City of Copenhagen, "Circular Copenhagen."
84. "Circular Copenhagen."
85. City of Copenhagen, "Circular Copenhagen."
86. Recycling at Sydhavn's Recycling Center in Copenhagen.
87. Recycling at Sydhavn's Recycling Center in Copenhagen.
88. Kirschbaum, "Copenhagen Has Taken Bicycle Commuting to a Whole New Level."
89. Cortright, "Copenhagen's Cycling Success."
90. Waste KBH "Find the Nearest Recycling Station."
91. "Platant Arkitekter | Hørgården Nærgenbrugsstation i Københavns Kommune."
92. City of Copenhagen, "Circular Copenhagen."
93. "Events at Local Recycling Stations during the Autumn Holidays."
94. "Hørgården Nærgenbrugsstation."
95. "Platant Arkitekter | Hørgården Nærgenbrugsstation i Københavns Kommune."
96. "Events at Local Recycling Stations during the Autumn Holidays."
97. Shenyoputro and Jones, "Reflections on a Two-Decade Journey toward Zero Waste."
98. Yeung, "Japan's 'Zero Waste' Village Is a Model for Small-Town Sustainability."
99. "Q&A: Questions from Visitors from Outside the Town."
100. Lee and Inuma, "Postcards from Kamikatsu, Japan's 'Zero-Waste' Town."
101. Ong, "Kamikatsu's Zero Waste Center 'WHY.'"
102. Lee and Inuma, "Postcards from Kamikatsu, Japan's 'Zero-Waste' Town."
103. Lee and Inuma, "Postcards from Kamikatsu, Japan's 'Zero-Waste' Town."
104. "City of Vancouver."
105. City of Vancouver, "Zero Waste Demonstration Site."
106. City of Vancouver.
107. City of Vancouver, "Population"; "Canada."
108. "City of Vancouver."
109. "Project Greenlight: Accelerating Smart and Sustainable Transformation."
110. "ReBuilding Center: Portland Nonprofit for Used Building Materials."
111. City of Portland, "Deconstruction Ordinance Expansion."
112. City of Portland, "City of Portland, ReBuilding Center Partner to Provide Donated Building Materials to Low-Income Property Owners."
113. Ellen Macarthur Foundation, "Developing the Materials Marketplace."
114. Ellen Macarthur Foundation.

5 FROM REFUSE TO RESOURCE: BUILDING A CIRCULAR MATERIAL SYSTEM IN JUNEAU

As described earlier, landfills are often controlled and managed by privatized corporations whose profits are directly linked to the amount of material that is discarded. This economic model disincentivizes corporations from employing alternative methods of material management which would reduce the amount of discarded materials. The current system's design is to streamline materials from homes to landfills; MSW is picked up outside our homes and landfills are inaccessible to the public. The current system provides few opportunities for people to disrupt it and participate in it. The precedents provided create space for circular material pathways and allow communities to intervene before material is landfilled. Circular material pathways reduce the negative environmental and health impacts of linear systems, as well as provide cost savings, create jobs, and build community,

Providing the physical infrastructure is only part of transitioning from a linear to circular system. The physical infrastructure must pair with public amenities that attract a wide variety of people to participate in circular material systems. Pairing social infrastructure with opportunities for communities to intervene and participate in diverting materials from landfills is a powerful combination. This integration has the ability to shift material management away from corporations and into the hands of a community. This alternative system, a circular approach to materials, reduces the harm caused by the linear economy and resulting waste landscapes.

As the City looks to extend the life of the Landfill, they must also build both physical and social infrastructures to support a new system of material management that is circular instead of linear. Circular systems will not only extend the life of the Landfill, but will also provide additional economic and social benefits to Juneau.

Figure 5.1: Left: Imagining circular material management systems in Juneau.

Circular + Regenerative Economies For Juneau

The circular economy provides an alternative system to the linear economy that aims to *"[decouple] economic activity from the consumption of finite resources"*.[117] The circular economy is based on three principles: eliminate waste and pollution, circulate materials and products, and avoid non-renewable resources.[118] The circular economy focuses largely on material productivity, flows, resources, and waste, but fails to address social justice in its plans for transitioning to a new system.[119,120] The Just Transition framework provides a set of principles that help support a just and equitable transition *"from an extractive economy to a regenerative economy."*[121] The following paragraphs will describe the benefits of the circular economy, critiques, and Just Transition strategies to integrate social equity into circular economy strategies.

A significant economic benefit of circular MSW management systems is a reduction of material costs.[122] Circular waste systems provide substantial material cost savings for local businesses and residents due to an increased reliance on recycled materials as material inputs rather than raw materials. This is especially important for Juneau because the vast majority of goods used in Juneau must be shipped thousands of miles to Juneau, which significantly increases their cost. Using (recycled) materials that are sourced locally also reduces expenses to dispose and recycle materials by eliminating disposal fees and the cost to ship recycled materials to the contiguous U.S. Additional economic benefits of the circular economy are the creation of green jobs and innovation of material processing.[123]

Green jobs are, *"jobs that reduce the environmental impact of enterprises and economic sectors, ultimately to levels that are sustainable. This definition covers work in agriculture, industry, services, and administration that contributes to preserving or restoring the quality of the environment while also meeting the criteria for decent work - adequate wages, safe conditions, workers' rights, social dialogue, and social protection. It also covers activities related to both mitigation and adaptation to climate change."* [124] In a circular economy, green jobs support an expanded system and innovations around recycling, repairing, and remanufacturing at a local level, providing economic benefits for individuals and communities.[125] The creation of green jobs in Juneau aligns with the vision put forward by the Juneau Economic Council to create a *"vibrant, diversified, and stable economy built around a business climate that encourages entrepreneurship, investment, innovation, and job creation; and supports the environmental, cultural, and social values that make Juneau a great place to live and enjoyable place to visit."*[126]

In addition to economic benefits, the circular economy provides important environmental benefits in the face of climate change. Circular economies reduce the need for extraction and processing of raw materials.[127] These activities contribute to 90% of the world's biodiversity loss and water stress issues, as well as 50% of global climate change emissions.[128] In addition to reducing the extraction and processing of natural resources, the circular economy provides environmental benefits because it reduces the amount of waste disposed of into the environment, which causes air, water, and soil pollution.[129]

However, a critique of the circular economy is its failure to address social injustices. The circular economy does not address how it will ensure that communities who have historically and disproportionately been impacted by the linear economy benefit equitably and help shape the new system. Although the circular economy can reduce harmful impacts of the linear economy, the benefits of the circular economy are not automatically distributed equitably. Cities must work to ensure that social justice is centered when planning for new systems of material management. The Just Transition Framework provides principles to support the transition from an extractive to a regenerative economy that centers social justice.[130] Just Transition Principles of equitable governance and place-based work are just a few of the principles that can work to support an equitable circular economy.[131]

Principles of equitable governance ensure the meaningful participation of those who have been negatively impacted by current linear systems. To ensure a just approach, decision-making and the development of new circular systems should strive to engage all stakeholders, and center diverse perspectives, especially those of marginalized groups who are disproportionately negatively impacted by current systems of extraction. Equitable governance principles *"affirm the right of all people to participate in decision-making but go further by simultaneously lifting up community experience and knowledge as legitimate, powerful, and effective forms of expertise."*[132] Community engagement is one avenue to achieve this. Additionally, community engagement has been shown to lead to greater buy-in for a program or policy established by a government entity. [133]

Place-based work ensures the focus of *"policy, programmatic interventions, and innovations in specific geographic areas that are suffering from environmental and social injustices."*[134] These programmatic interventions include improving access to green space, public transportation, affordable housing, cleaning up and preventing pollution, and encouraging regenerative agriculture. Focusing on the geographic areas most impacted by environmental and social injustices can improve health and economic outcomes for communities in specific neighborhoods.[135]

In the context of Juneau, Just Transition principles mean centering the voices of and working closely with the people most negatively impacted by the landfill. This includes, but is not limited to residents and workers in the Lemon Creek neighborhood, and Tlingit, Haida, and Tsimshian peoples whose land and waters have been degraded by linear systems of extraction and disposal. Due to time limitations and the distance from Juneau, consultation with these groups but was not feasible for the design proposal of this thesis.

Spaces For Circular Systems

To support Juneau's shift from a linear to a circular economy, I propose the development of a decentralized network of public spaces that subvert the status quo of discarding and landfilling materials. The networked sites actively work to divert material, capital, and opportunities back into the hands of the community by supporting the making, innovating, recycling, repurposing, repairing, and reimagining of materials. These sites and their associated activities bring visibility to the values of materials. Increased visibility and accessibility encourages participation in circular material systems which catalyzes attitude shifts around waste and promotes community buy-in.

Building on the analysis of the precedents and specifically learning from Juneau's failed RecycleWorks drop boxes, I use public spaces as multi-functional waste infrastructure by creating "mini-material parks" that do more than only collect materials. The mini-material parks provide five critical components to ensure success: events and education around the City's zero waste goals, public amenities, active display of waste as a resource, economic development opportunities, and partnerships with existing communities, organizations, and businesses. By layering these components with material collection, the mini-material parks engender greater community engagement and a sense of ownership in the MSW management system.

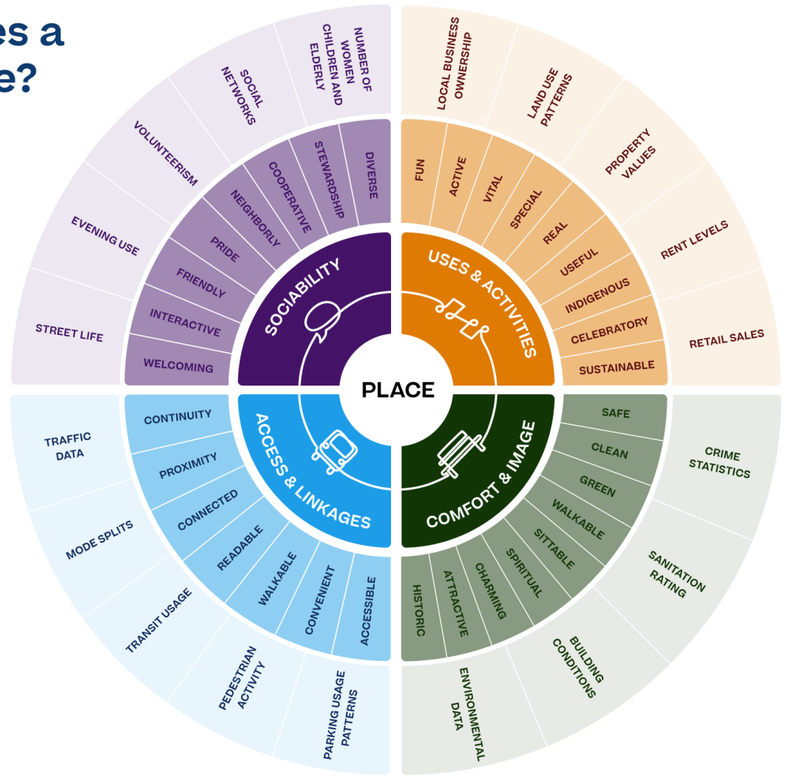


Figure 5.2: Successful public spaces are accessible, comfortable, have a variety of activities, and provide a space for social interaction. From Project for Public Spaces.

Public Space Principles for Sites of Circular Systems

Applying qualities of successful public spaces is important when re-imagining public space as infrastructure to host mini-material parks. Public spaces that are thriving, active, and successful are multidimensional; meaning they are *"used by many different people for many different purposes at many different times of the day and the year"*.[136] The Project for Public Spaces evaluated thousands of public spaces across the world and identified four qualities that contribute to a public space's success:

- Accessibility + Connection: A successful public space connects to its surroundings, is visible, and is easy to get to. It is convenient to access via multiple modes of transportation: public transportation, walking, and biking.

- Comfort and Image: A successful public space is inviting and comfortable to visit. It is safe, clean and provides places to sit.

- Uses and Activities: A successful public space attracts people to participate in the space through the activities and services it provides. Having various activities at various times of the day helps attract a wide variety of people to the space.

- Sociability: A successful public space acts as a meeting place for people in the community. This attribute is the most challenging to achieve, but also the most important because it fosters a strong sense of place attachment to the space, city, and the community.

Figure 5.2 describes the four key qualities of a successful public space (center ring), the intangible feelings of the place (middle ring), and the tangible/ measurable attributes of each quality (outer ring).

I argue that these same principles can be applied to sites of material collection. Creating successful public spaces is important, to achieve Juneau's MSW management goals, and providing additional community benefits. Successful public spaces foster social interactions, create a stronger sense of community pride, promote a sense of comfort, promote health, and promote economic development.[137]

Figure 5.3: How can public space be leveraged to promote circular material systems?

As I explore alternatives to the current MSW management system in Juneau, the following questions guide my design research and proposals:

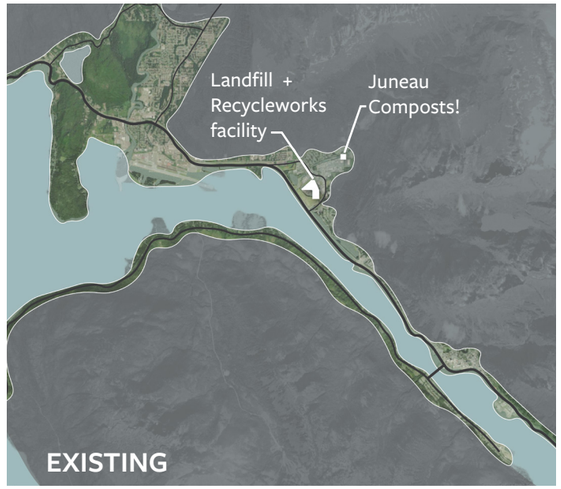
How can the City's zero waste goals be combined with public space amenities? (figure 5.3)

How can public spaces be leveraged to promote zero waste goals and education, and help redefine material possibilities?

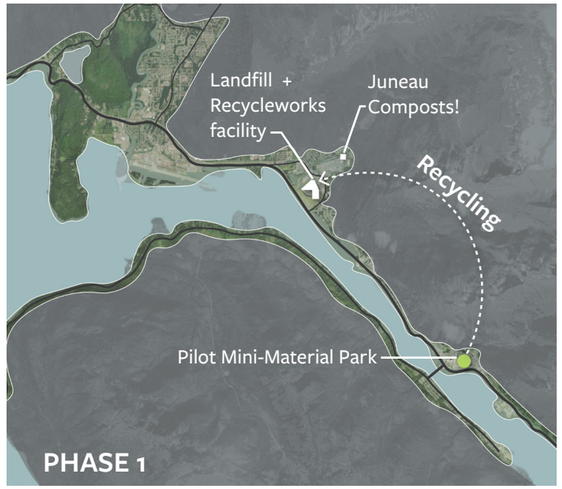
How can circular material systems address and reduce the harm caused by the current system of MSW in Juneau?

I propose a phased strategy utilizing public spaces and the future commercial composting facility to extend the life of the Landfill, provide public amenities, and spur economic development. This strategy will collect recycling, organics, and construction and demolition materials, while also exploring material innovations and changing the community's attitudes and behaviors regarding waste (figure 5.4). In the following pages I elaborate on the proposed phased strategy, which consists of a pilot program, a network of material collection sites, and a hub for expanded local material processing.

Figure 5.4: Maps of Juneau showing material flows in a phased approach that will transition Juneau from a linear to circular MSW management system.

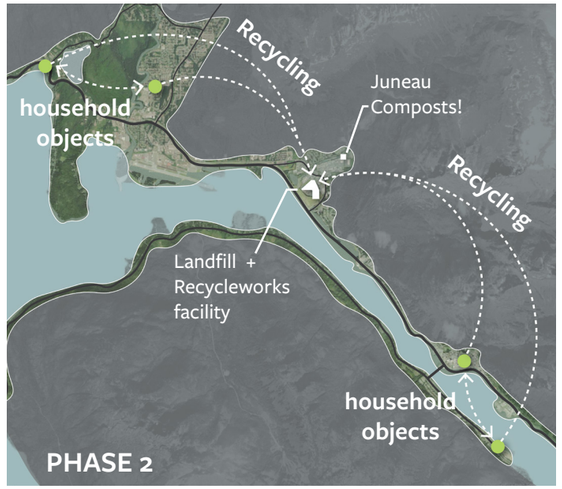


Existing Conditions



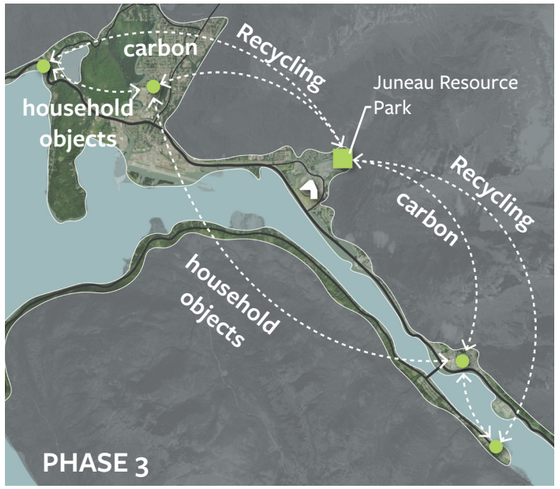
Phase 1: Pilot Mini-Material Park
0-2 years

The design strategy begins with the creation of a pilot mini-material park during phase 1 that expands into a network of mini-material parks throughout the city in phase 2. The mini-material parks will collect materials, create public space amenities, form partnerships with community groups, and lay the foundation for the community to view and participate in making waste a resource.



Phase 2: Mini-Material Park Network
2-5 years

The expanded network of mini-material parks in phase 2 increases the types of materials collected and each mini-material park, is tailored to its neighborhood's industries and community partners.



Phase 3: Juneau Resource Park
5+ years

The third phase will be a larger flagship version of the mini-material parks. The Juneau Resource Park will be a central hub for the material collection network. It includes space for a commercial composting facility, expanded recycling capabilities, material innovation practices, food production, and community workshop and training spaces. Although the City is receiving funding to build a commercial composting facility for Juneau, it must do more than composting. It needs to be a community space that provides additional pathways for material diversion, reuse, repair, and repurposing. The diversion of materials, especially organic materials, from the Landfill will mitigate air pollution that impacts residents' quality of life. It will also reduce methane emissions and its associated contribution to climate change. The Juneau Resource Park, combined with the mini-material parks, provide critical infrastructure to extend the life of the Landfill, and provide additional benefits that result from circular and regenerative economies. The combination of the Juneau Resource Park and the network of mini-material parks provide a just and equitable transition toward a new MSW management system that views 'waste' as material and prioritizes community well being.

PHASE 1: PILOT MINI-MATERIAL PARK

0-2 YEARS

Goals:

- Increase rates of recycling
- Extend life of objects and materials already in use
- Create public space amenity
- Introduce concepts of waste as material
- Test physical layout and programming of mini-material park

Phase 1- Pilot Mini-Material Park

Selecting a site to develop a pilot mini-material park required a careful approach. The location must be central, heavily trafficked, visible, accessible, and owned by the City . Based on these characteristics, 450 Whittier Street in downtown Juneau was identified for the pilot site (figure 5.6). The centrally located site is currently a parking lot for government employees and is adjacent to numerous government office buildings, businesses, schools, a museum, and a residential area (figure 5.7, 5.8). The Whittier Street site is easily accessible by car, foot, or bike, and is especially active in the summer by tourists when cruise ships dock a few blocks away. It is also located next to the Zach Gordon Youth Center, which has year-round programming for Juneau's youth; Centennial Hall, which regularly hosts city-wide events; Tlingit and Haida Tribal headquarters, and the newly renovated Alaska State Museum, which attracts locals and tourists alike.

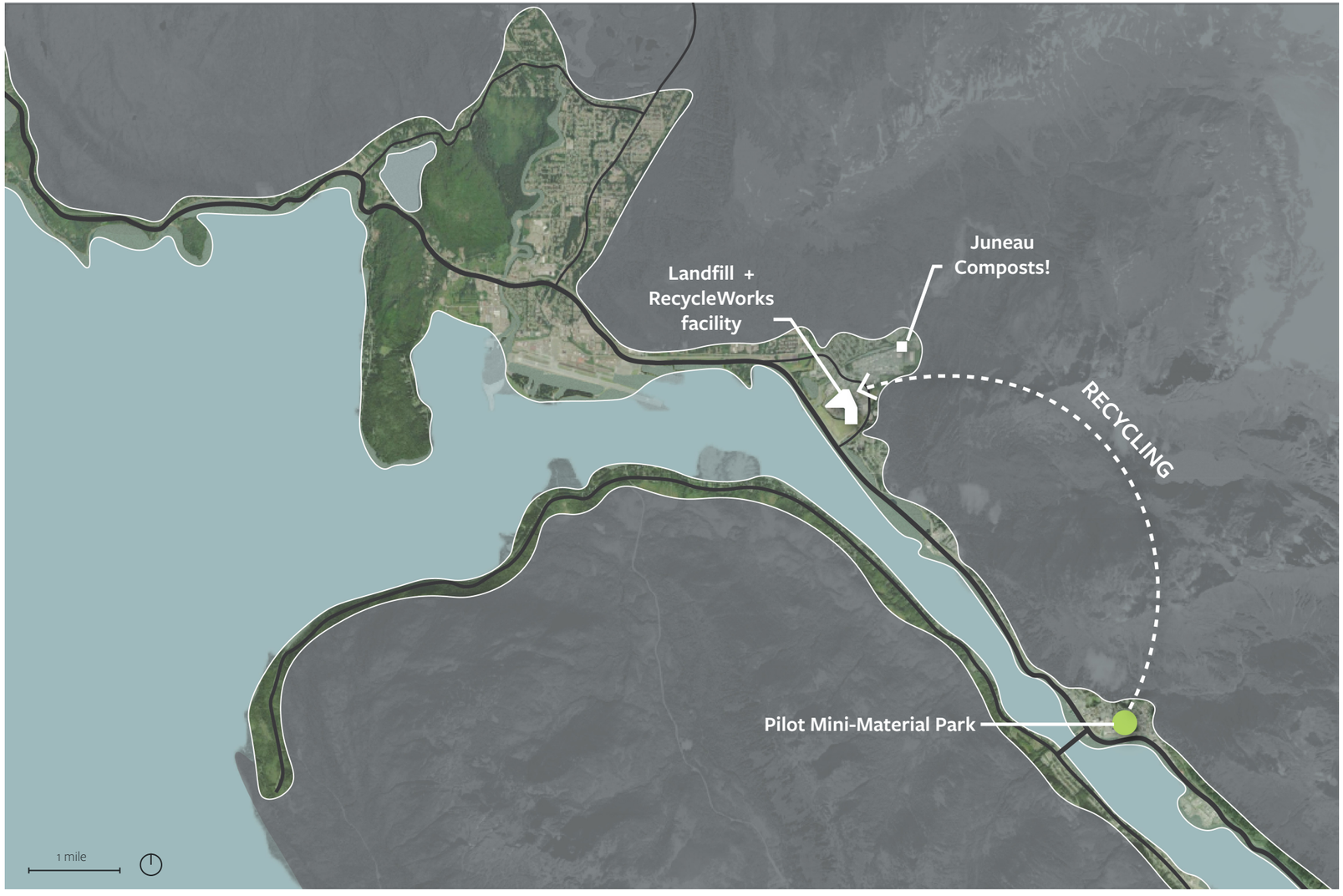
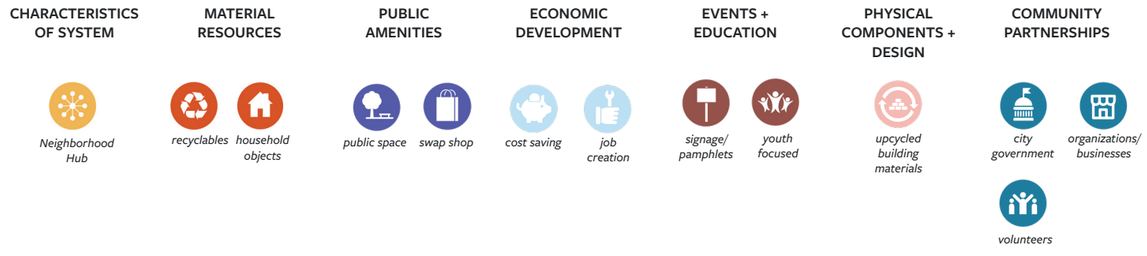


Figure 5.6: Phase 1 pilots a material collection site located downtown.

Figure 5.5: Characteristics of Pilot Mini-Material Park



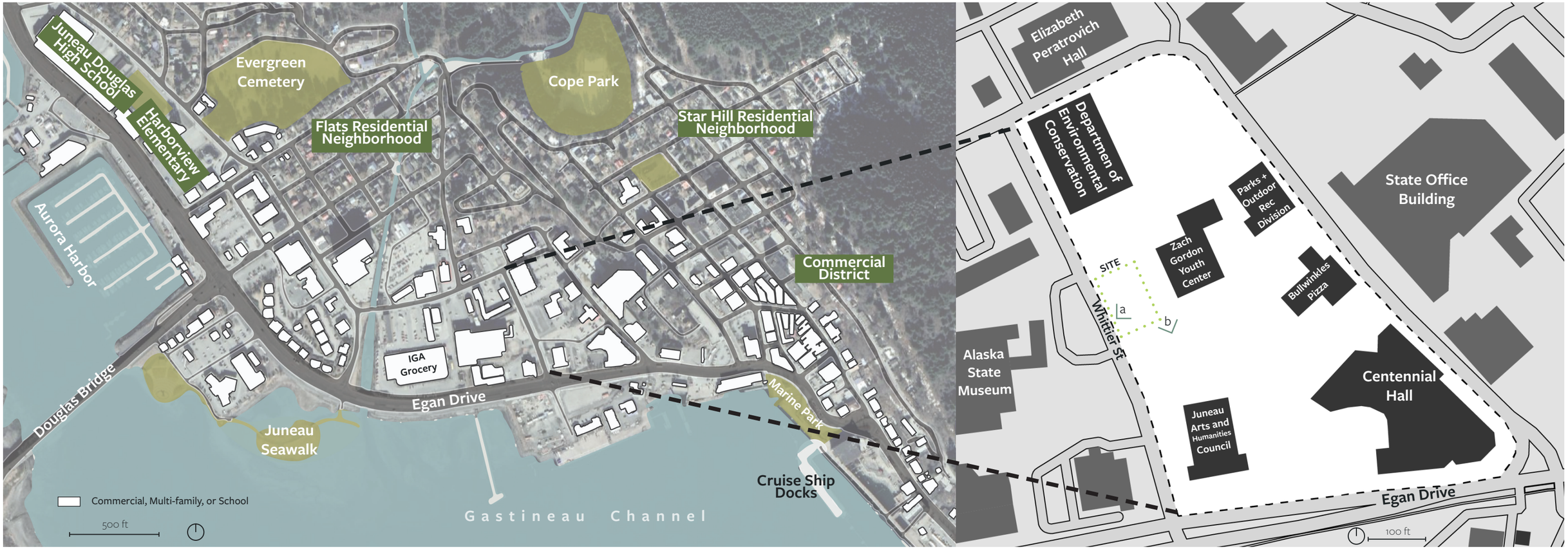
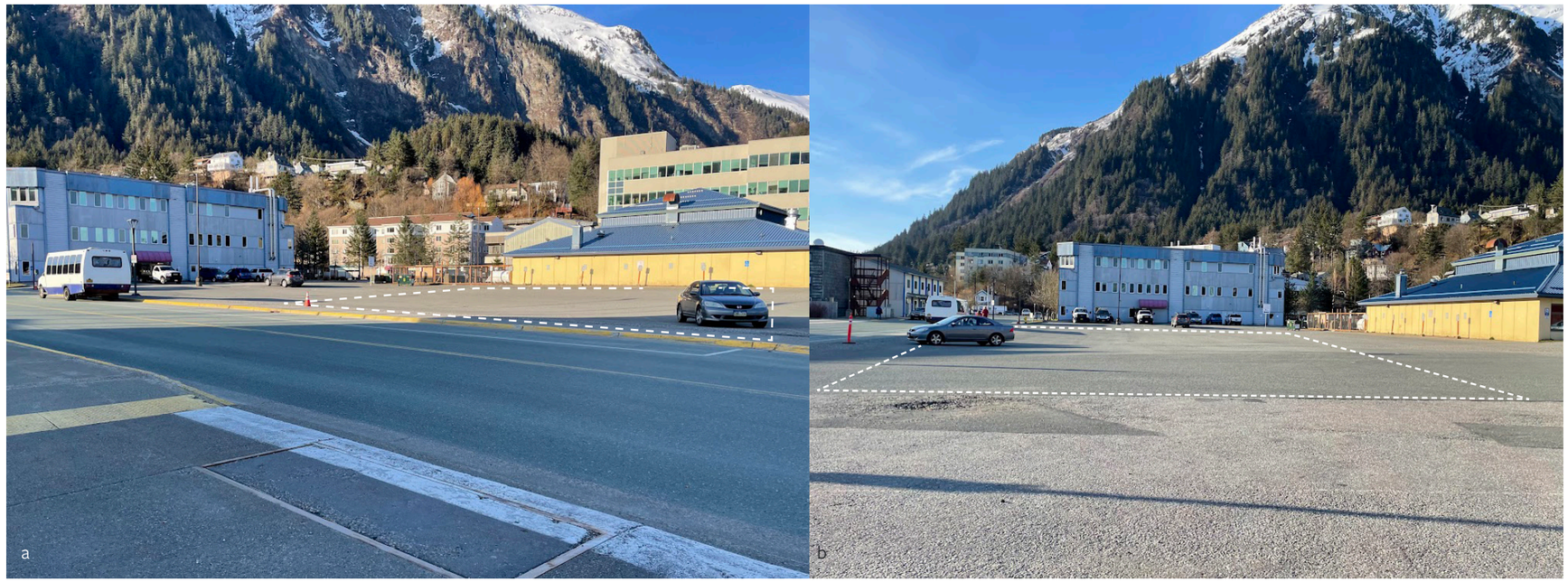


Figure 5.7 (TOP LEFT) Downtown Juneau is a densely populated neighborhood with a variety of activities (schools, offices, businesses, and tourist activity).

Figure 5.8: (TOP RIGHT) The 450 Whittier site is a highly trafficked area due to office buildings and event spaces.

Figure 5.9: (BOTTOM) Photos of the 450 Whittier site from 2023.



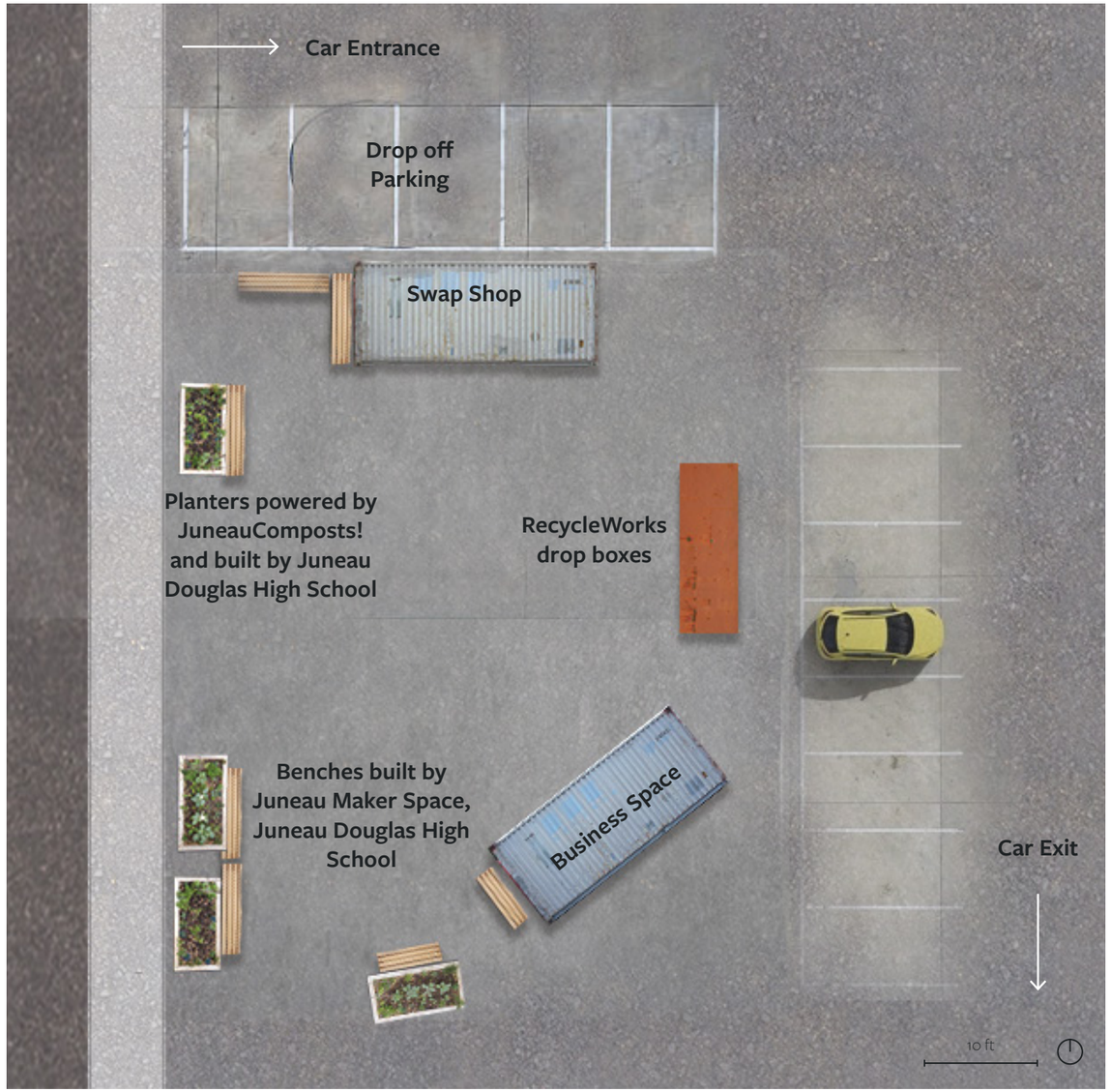


Figure 5.10: Site plan. All elements of the mini-material park will have the ability to move and change with the seasons and desired uses.

The goals of the pilot mini-material park are to collect recyclables, host a swap shop space for collecting household items, provide a business space, and create a welcoming and functional public space (figures 5.10, 5.11, 5.12). While the primary goal is to collect and divert materials from the Landfill, providing companion programming will strengthen the site's draw. Engaging the community as a whole, not only people interested in recycling, will help circular material management gain visibility and awareness within Juneau. This site lays the groundwork for the long-term goal of eliminating landfilling in Juneau.

The City would provide an upfront physical component: the existing RecycleWorks! collection containers, which have been retrofitted with open/close functionality to prevent illegal dumping of trash and contamination of recycled materials. In addition, the

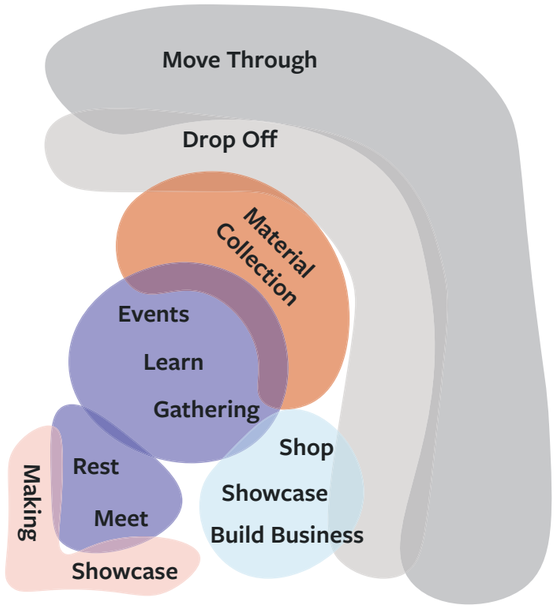


Figure 5.11: Layering of programs and activities.

City will provide shipping containers that will house the swap and business pop-up spaces. Other elements, such as seating, tables, and planter beds could be funded by the City, but built by a local community partner using salvaged construction and demolition materials.

The mini-park is an opportunity for engaging neighboring residents and building community through "placemaking". Placemaking is a collaborative process that *"inspires people to collectively reimagine and reinvent public spaces"* to achieve shared goals. The act of this collaboration strengthens "the connection between the people and the places they share".[138]

Having neighborhood residents and community groups help in the planning and design of the mini-material park and construction of site furnishings will connect people to and engender a sense of ownership for the park before it is operational. I believe instilling a sense of ownership into the park as well as the broader system of material management is critical to ensure the park's long-term success. A successful example of this community build method in Juneau is Project Playground. Community members collaborated to build the playground and create art for the park. I believe the community's participation in creating Project Playground is one reason why it is popular and valued by the community. To create the mini-material parks, nearby/local schools could partner with the City to build benches and learn about material reuse, design, and carpentry.

To ensure the meaningful participation of those most negatively impacted by the current linear system, the City should collaborate with Tlingit and Haida Tribes. The Tlingit and Haida Tribal headquarters is located one block north of the Whittier site. This partnership should begin from day one of the mini-material park planning processes to build a solid foundation for a new circular and just MSW management system in Juneau. Tlingit and Haida are currently in the early phases of exploring a composting system and zero waste measures at their offices, however, space is limited. Collaboration on a mini-material park can advance the goals for Tlingit + Haida and the City.

Spaces for swapping will provide immediate cost savings to the community through by eliminating disposal fees of discarded items and the costs of purchasing of new items. In Juneau this is especially relevant because of the high disposal costs set by Waste Management at the Landfill and the high cost of shipping new goods to Juneau. Circular material systems reduce the need to purchase new by providing the ability to purchase used items for less or even free.

Events and education will shift people's perception and relationship with waste by redefining its possibilities and values. Events and programming explaining themed material collections (styrofoam, electronics, etc.), DIY repair of products, and composting will invite people to participate and learn about the use and pathways of materials. Interpretive signage illustrating the mission of the mini-park will educate people about the City's zero waste goals and the importance of circular material systems. Additionally, a sign will track the amount of material diverted from the landfill. Providing the community with tangible metrics of their efforts can affirm that their actions are making a difference.

Figure 5.12: Mini-Material park in action.

HOUSEHOLD OBJECTS

SWAP SPACE

COST SAVINGS

RECYCLABLES COLLECTION

JOB CREATION

VOLUNTEERS

UPCYCLED BUILDING MATERIAL

PUBLIC SPACE

PHASE 2: MINI-MATERIAL PARKS AS NETWORK

2-5 YEARS

Goals:

- Increase rates of recycling
- Extend life of objects and materials already in use
- Create public space amenity
- Introduce concepts of waste as material
- Test physical layout and programming of mini-material park
- Expand categories of materials collected
- Develop relationships between mini-material parks

Phase 2- Mini-Material Parks as Network

Phase 2 expands from a single mini-material park to a network of mini-material parks across the city. This network will increase the accessibility of services and increase the amount of material that can be collected (figure 5.14). Multiple locations also provide redundancy in the system and allow Juneau residents to attend events, drop off recycling, or shop swap spaces throughout the city. Events and workshops will rotate locations to provide all neighborhoods with increased accessibility to participate. Each neighborhood will have the opportunity to be part of the process of making the elements of the mini-material park, similar to the pilot program.

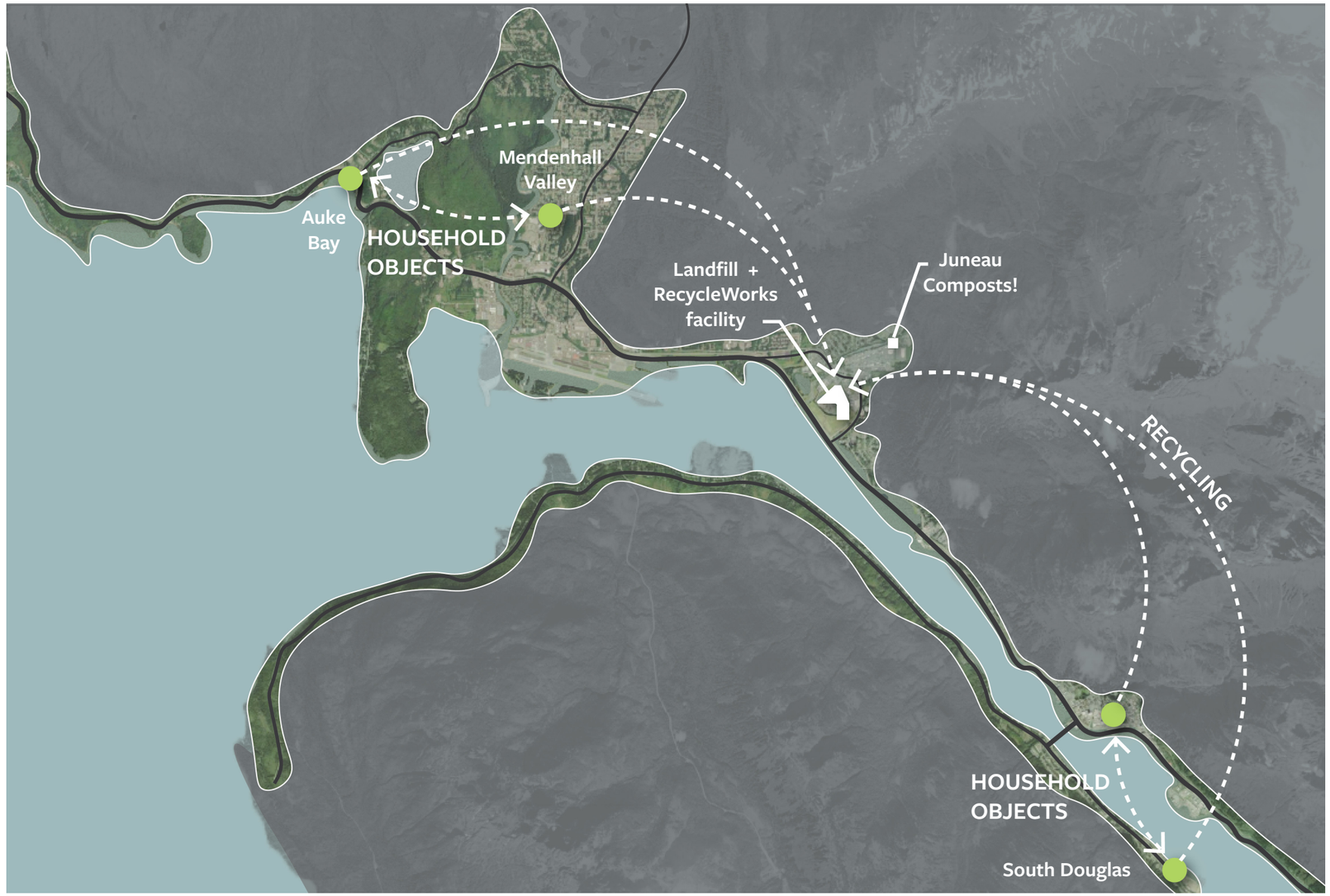
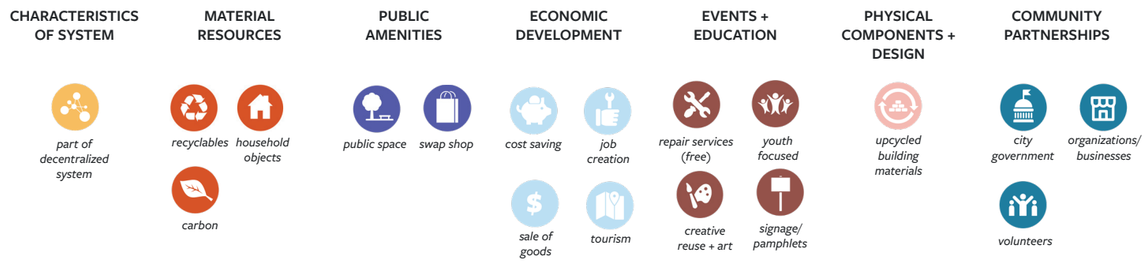


Figure 5.14: An network of mini-material parks across Juneau.

Figure 5.13: An network of mini-material parks across Juneau.



As the mini material parks become more established, each can take on its own identity. This will be especially important to expand the types of circular activities occurring (reuse, repair, making) before the Juneau Resource Park is available to host such activities. The mini-material parks can form a system for the exchange of items or services between locations. For example, one mini-material park may be a hub for repair, tool rental or composting products, while another may focus on textiles, clothing upcycling and swapping. The mini-material parks can also distribute items across the network based on demand making all materials accessible to all neighborhoods similar to branch libraries. The themes and specifics identified with each mini-material park are difficult to predict in advance, as each neighborhood will define its interests and needs.

The successes and failures of the pilot mini-material park will provide valuable information needed to create a network of mini-material parks across Juneau. Phase 2 begins with an evaluation of how the pilot-mini material park functioned. The following preliminary guiding questions and accompanying metrics can help evaluate the pilot program:

Participation and Engagement

- How many households or individuals used the mini-material park? How frequently?
- Did the mini-material park engage and attract a diverse group of users from the neighborhood(age/gender/race)? If not, what are the barriers to accessing the site?
- How are participants using the space? Are there any uses that are missing, or others that were highly successful?

Operation Logistics

- What times of days are most used for which activities? How can hours be adjusted to better serve the needs of the neighborhood?
- What activities need more spaces? What activities need less?
- Is there confusion around the rules of the swap shop or materials accepted to recycle?

Education and Events

- How effective were events at inviting people to the space?
- Is the frequency of events sufficient?
- Are events attracting a wide range of community members?
- Are community members returning to recurring events?

These questions provide a starting point to evaluate the pilot mini-material park. These questions can be answered through surveys sent to the neighborhood's residents and businesses, participation tracking, waste audits, interviews, and community engagement events. Community engagement efforts must be accessible (ie not just community meetings) and should compensate people for their participation. Ensuring that there is equitable participation in both the development and feedback from the mini-material parks will result in better community buy-in and functioning of the site. The knowledge gained from this evaluation will directly inform the functions of additional mini-material parks across Juneau.

The criteria for site selection of additional mini-material parks are similar to the pilot mini-material park. City-owned vacant lots and parking lots are potential sites for future mini-material parks. Sites were then prioritized on their adjacency to public amenities, schools, and other community spaces (libraries, recreational facilities, community centers, etc.).

I identified three additional sites to expand the pilot program: the Statter Harbor parking lot in Auke Bay, the Savikko Park parking lot in South Douglas, and the Dimond Park area in the Mendenhall Valley (figure 5.14).

Auke Bay is the main fishing and recreation harbor in Juneau (figure 5.15). It is heavily trafficked in the summer by both locals, who pass through to go fishing and boating, and tourists, who visit for whale watching and charter fishing excursions. Auke Bay hosts an elementary school, a variety of businesses/restaurants, and the University of Alaska Southeast. Auke Bay is a hub of amenities (restaurants, gas stations, and other businesses) for residents who live along the remaining 30 miles of Juneau's road system in the neighborhood aptly named "out the road".

The second site, Savikko Park, is located in South Douglas (figure 5.16). It is close to two schools, Sayéik: Gastineau Community School and Juneau Montessori School, an indoor ice rink, softball fields, and a small harbor. The South Douglas area is unique because it is a small, walkable neighborhood. However, siting a mini-material park here is important because South Douglas is farther away from the existing recycling center than most neighborhoods in Juneau. This location will expand and increase access to this new infrastructure

The third site for a mini-material park is Dimond Park in the Mendenhall Valley (figure 5.17). This is the most residential and populous area in Juneau. The site is located next to several potential partners including Thunder Mountain High School, Glacier Valley Elementary School, Juneau Public Library, and Dimond Park Aquatic Center. The collection of these community sites makes it a convenient and well-trafficked area.

Phases 1 and 2 of this plan lay the groundwork for the Juneau Resource Park by introducing circular economy concepts, garnering community support and buy-in for these spaces, and redefining people's relationship with material that was previously landfilled. These two phases will allow the City to begin implementing its goals rapidly, rather than waiting multiple years for the funding, planning, and construction of the future facility to occur. The City does not have the time to wait for the construction of the Juneau Resource Center. The Landfill's smell, presence, cost, and harm are at an all-time high, and its years of operation are dwindling. Investing now to subvert Juneau's current MSW management system will pay dividends in long-term benefits for the community's economy, environment, and health.

Figure 5.15: The mini-material park could cater to fisherpeople, tourist, and neighborhood residents by providing a swap space focused on marine materials, business space, and recycling drop off.

AUKE BAY MINI-MATERIAL PARK

LOCAL BUSINESS POP UP SPACE

RECYCLING DROP BOX

SWAP SHOP WITH EMPHASIS ON MARINE MATERIALS

MONOFILAMENT RECYCLING

MARINE PLASTICS COLLECTION

SALVAGED WOOD PLANTER

SALVAGED WOOD BENCH

Figure 5.16: The South Douglas Mini-Material park could be a hub for tool rental, composting classes, and community garden plots. Nearby schools could help in the co-creation of the park.

Figure 5.17: Construction of the Mendenhall Valley mini-material park in action. Thunder Mountain High School shop classes could partner with the park to learn about material reuse and carpentry in the construction of site elements. The Mendenhall Valley location could also expand its material collection to carbon (leaves, moss) to help power the JuneauComposts!

COVERED SPACE

CARBON DROP BOX

RECYCLING DROP BOX

SWAP SHOP

FLEXIBLE WORKSHOP SPACE

COMMUNITY BUILT SEATING FROM SALVAGED WOOD

MENDENHALL VALLEY MINI-MATERIAL PARK

PHASE 3: JUNEAU RESOURCE PARK

5+ YEARS

Goals:

- Increase rates of recycling
- Extend life of objects and materials already in use
- Create public space amenity
- Introduce concepts of waste as material
- Test physical layout and programming of mini-material park

Phase 3 establishes the Juneau Resource Park in the Lemon Creek neighborhood as the hub of the new waste management system. The Resource Park will focus on scaling up types of activities occurring at the mini-material parks, as well as adding additional ways to divert waste from the landfill, specifically a focus on composting and construction and demolition resale (figure 5.19) . Juneau has been allocated 2.5 million dollars of federal funding to build a commercial composting facility, and is in the early stages of planning now. The site for the planned composting facility is in the Lemon Creek neighborhood, near the current landfill and recycling center, and is the current site of JuneauComposts! (figure 5.20). This future facility needs to be the hub for the new circular material network in Juneau.

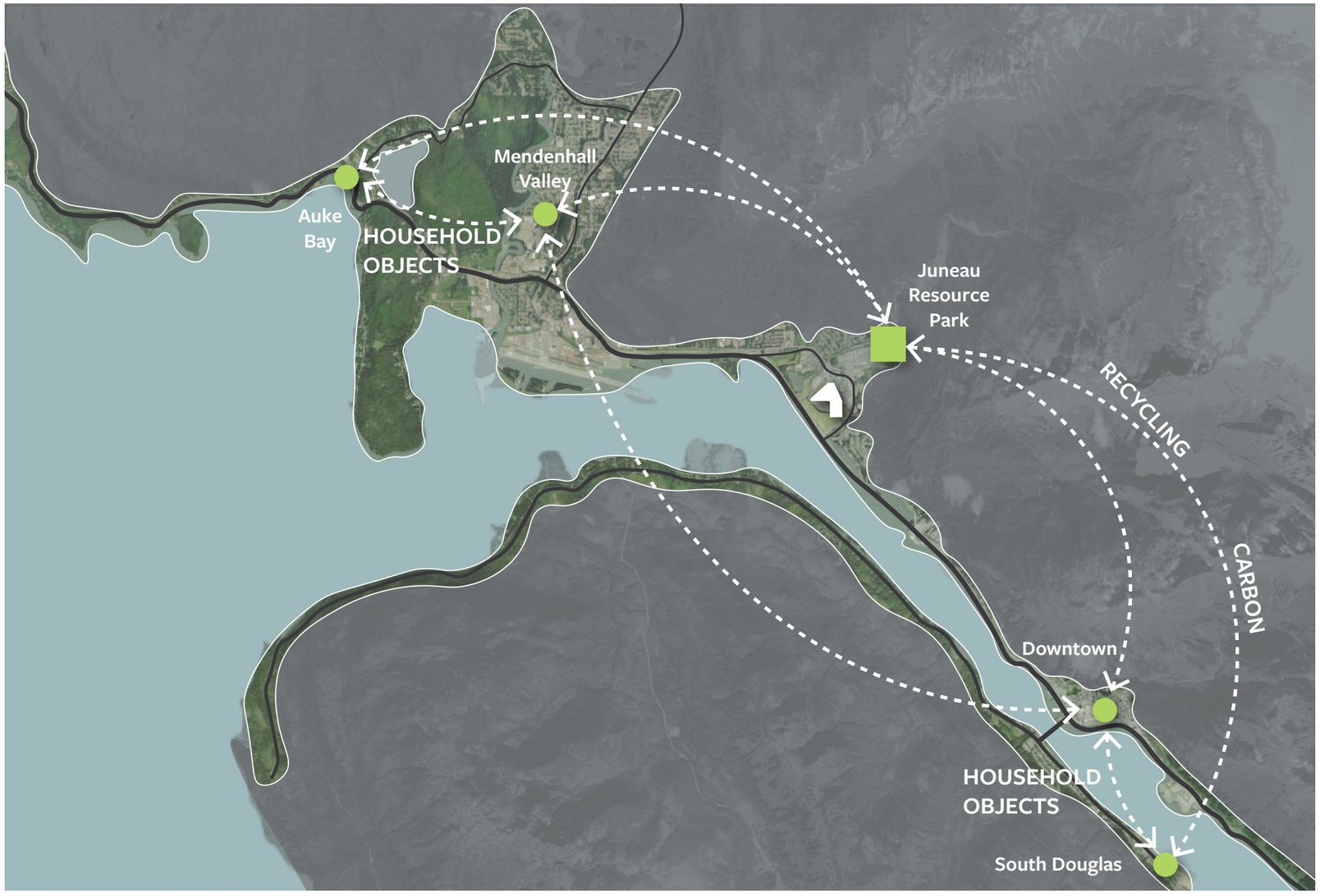


Figure 5.19: The Juneau Resource Park provides the critical infrastructure to expand recycling, house local material processing, store construction and demolition materials, grow local food production, and compost organic material.

Figure 5.18: Characteristics of the Juneau Resource Park.

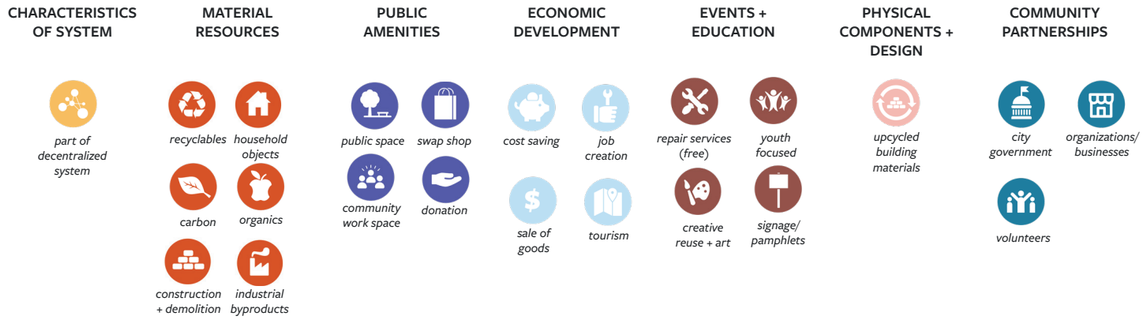


Figure 5.20: Future site of the Juneau Resource Park in the Lemon Creek neighborhood. The site is currently being leased by JuneauComposts!

In addition to composting, it could provide a scaled-up recycling system, an indoor community space, collection for a wider range of materials, and greenhouse areas for expanding local food production using the composted soil created in-house (figure 5.21). As a microcosm of the overall system, the Juneau Resource Park can provide additional paths to keep materials out of the Landfill while expanding material recovery and innovation.

The creation of the Juneau Resource Park should be informed by the meaningful participation of residents of the Lemon Creek neighborhood to ensure it does not perpetuate the harms of the current system. The City should ask how this hub can provide needed amenities to the residents of the neighborhood? And how this hub be accessible for the surrounding neighborhoods? Access to greenspace or recreation space, improved walking and biking infrastructure, and buffers between industrial activities and residents have been stated as neighborhood goals from previous community engagement sessions.[139]

A dedicated workshop for material innovation allows entrepreneurs, businesses, and students to explore alternative material processing methods, conduct experiments, and prototype potential products made from local materials (figure 5.24). The City should provide grants and scholarships to lower the barrier to entry into these industries. Creating a space that supports local material processing and recycling disrupts the flow of material to the contiguous U.S. and out of Juneau's economy. One example of a similar space is the Print Your City lab in Thessaloniki, Greece, which allows residents to bring their plastic recycling to be converted into 3D printed furniture(figure 5.23).[140]

A dedicated place to host repair events will extend the life of products already in use in Juneau. The Facility will provide the needed space to store materials, items, and tools that the mini-material parks can not (figures 5.25, 5.26). A large permanent space will allow for a wider variety of repairs to occur. This will both lessen the amount of material landfilled and reduce the costs and materials associated with replacing and having an item shipped to Juneau. This service would also be a valuable amenity to a smaller city like Juneau where repair services can be limited. Additionally, this space could also work with nearby schools to teach skills in repair and maintenance.

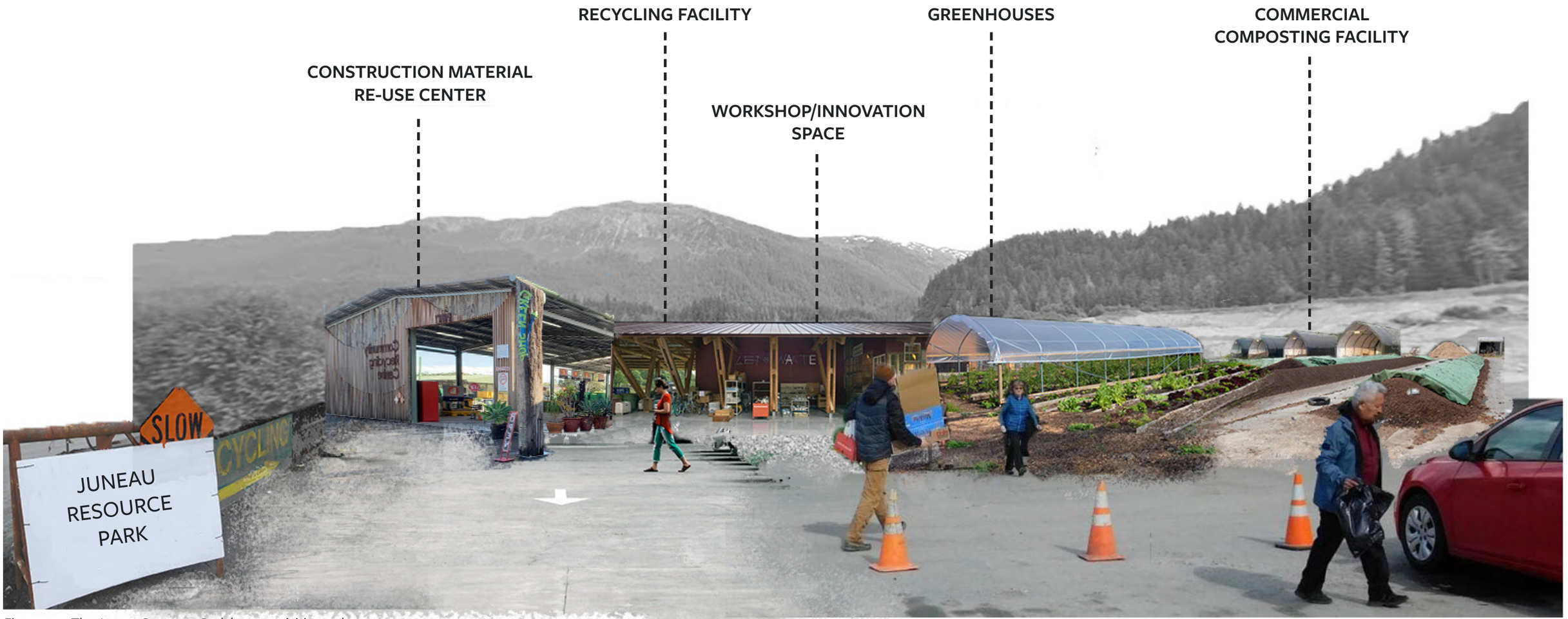


Figure 5.21: The Juneau Resource Park layers activities and uses on a single site.

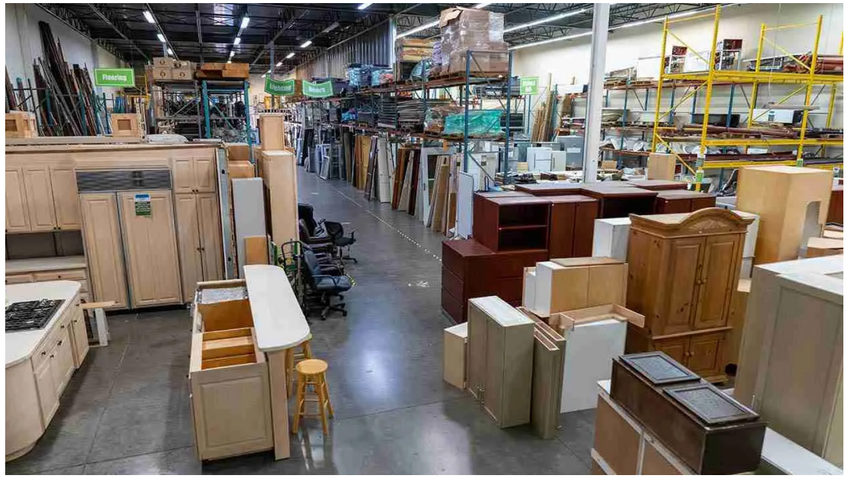


Figure 5.22: (UPPER LEFT) A high tunnel farm in Homer, Alaska. Local food production is a need and interest in Juneau and could pair seamlessly with the composting facility. From Jeff Faye.

Figure 5.23: (MIDDLE LEFT) Print Your City Lab in Thessaloniki Greece turns plastic waste into street furniture and parters. Local material processing will be important, especially since Juneau pays to ship its recycling to the Pacific Northwest. From The New Raw.

Figure 5.24: (BOTTOM LEFT) A Makerspace in West Newton Massachusetts. A dedicated makerspace will provide access to repair services and skill building. From Fessenden Summer.

Figure 5.25: (TOP RIGHT) Repair Cafes divert materials from the landfill and provide cost savings. From Bold & Open (2022).

Figure 5.26: (MIDDLE RIGHT) Storage of sale of construction materials provides cost savings, employment, and keeps material from the landfill. From ReUse Warehouse Store.

Construction and demolition waste makes up a significant portion of the material landfilled in Juneau. Creating a dedicated space to collect, store, and sell these materials could divert significant amounts of waste from the Landfill, as well as provide Juneauites with affordable construction materials (figure 5.26). Construction materials are especially expensive in Juneau due to the large distances they must be shipped, so keeping material local and in use can provide both MSW management and community benefits.

Expanding local food production is a significant priority of the Juneau community due to the high costs of fresh produce. In addition to its high costs, produce is often of lower quality because of its extended time spent in transit. Large scale food production is lacking in Juneau and would complement the commercial composting facility by creating a circular cycle of organic material. This space could host a greenhouse for both business and community garden use (figure 5.22). Access to community garden plots should prioritize the residents of Lemon Creek since there is a lack of greenspace in the neighborhood. Additionally, this space could provide learning opportunities for the nearby middle school around composting, gardening, and circular food systems.

The network of mini-material parks and the Juneau Resource Park would support one another (figure 5.27). Material will be collected at the mini-material parks to support activities at the Juneau Resource Park. The products of activities at the Juneau Resource Park can be showcased at the mini material parks around town, whether that be the selling of products or the display of innovations.

Figure 5.27: Decentralized network of material management in Juneau.

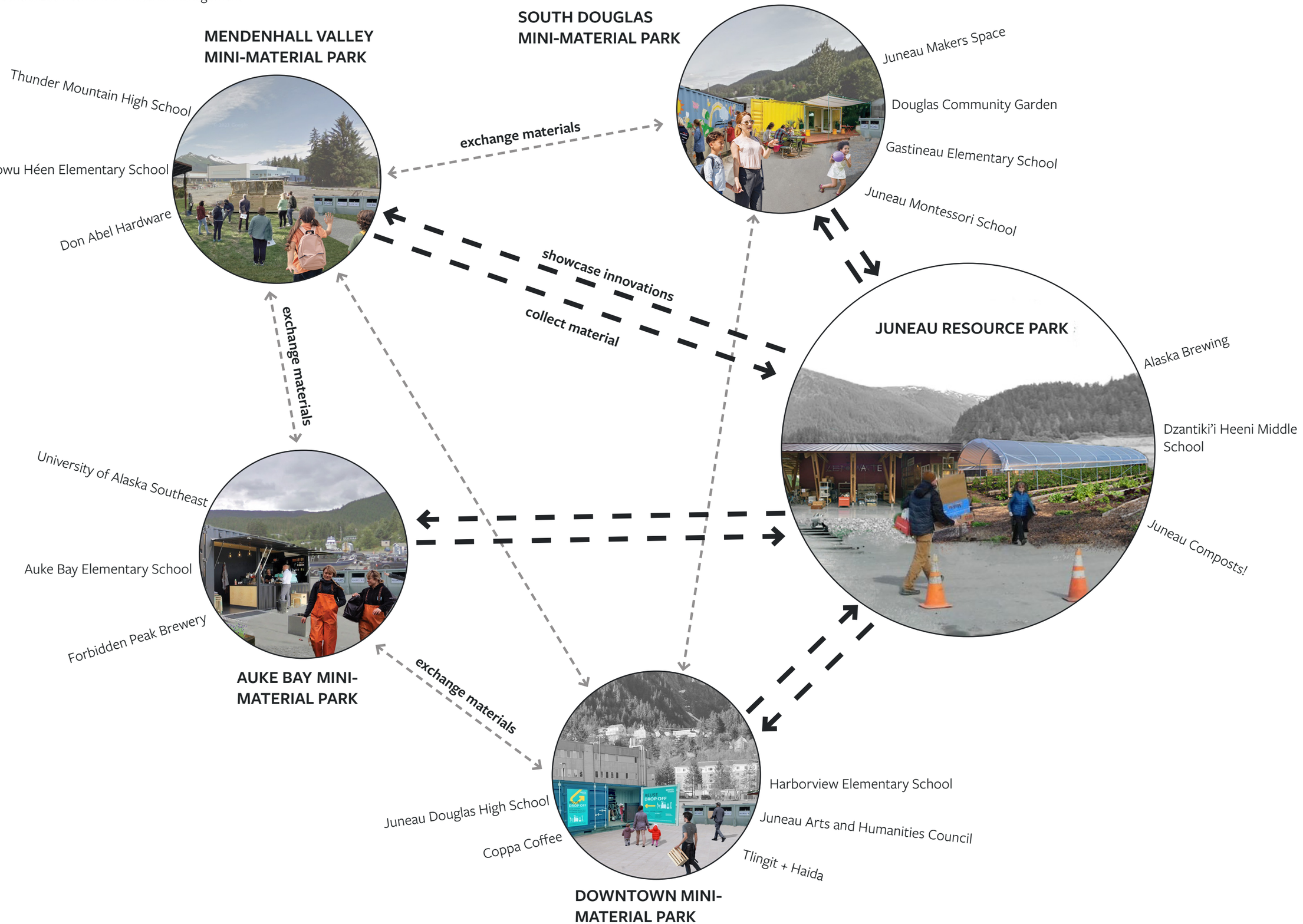


Figure 5.28: Two scenarios of material management paths for Juneau.

Shipping MSW to the Pacific Northwest

Extended Closure of Landfill 2075

$ COST

CIRCULAR SYSTEM SCENARIO

Initial investment followed by long term cost savings + benefits

STATUS QUO SCENARIO

Rapid Closure of Landfill 2045

2045

2065

2075

TIME

Impacts

At a neighborhood scale, these interventions will invite people to engage with materials and redefine their relationships and attitudes toward them. The mini-material parks will foster community, knowledge-building, and economic development in their neighborhoods. Working at a neighborhood scale allows residents of Juneau to feel heard and a part of this new MSW management system. As the network expands, it will increase the overall accessibility and breadth of activities and materials being collected. Additional mini-material parks will create the opportunity to engage more neighborhood residents in this process and build community-wide buy-in and participation, ensuring the success of the Juneau Resource Park. The Juneau Resource Park's impacts will be felt city-wide as it will create green jobs, increase local food production, reduce the reliance on shipping in materials, and reduce the smell of the Landfill due to the diversion of organic materials.

Creating a network of neighborhood-scale mini material parks with the Juneau Resource Park as a central hub can help transition Juneau towards a more circular MSW management system that shifts control into the hands of the community, a longtime goal of the City. This approach will extend the Landfill's life and provide economic, social, and harm reduction benefits to the community (figure 5.28).

Endnotes

115. Ellen Macarthur Foundation, "Circular Economy Introduction."
116. Ellen Macarthur Foundation, "The Circular Economy in Detail: Deep Dive."
117. França et al., "Filling the Social Gap in the Circular Economy: How Can Solidarity Economy Contribute to Urban Circularity?"
118. Vanhuyse et al., "The Lack of Social Impact Considerations in Transitioning towards Urban Circular Economies."
119. Climate Justice Alliance, "Just Transition: A Framework for Change."
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122. Strietska-Ilina et al., "Skills for Green Jobs: A Global View."
123. "The Circular Economy in Detail: Deep Dive."
124. McDowell Group, Inc. and Sheinberg Associates, "Juneau Economic Development Plan," 2.
125. "The Circular Economy in Detail: Deep Dive."
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6 Reflections

Centralized and privatized systems of MSW management concentrate the environmental and social harms of the linear economy in communities across the U.S. Communities, often communities of color and lower socioeconomic status, are held hostage by corporations prioritizing profits at the expense of their well-being. Juneau is only one instance of this phenomenon.

Circular systems provide an alternative that aims to counteract the harmful effects of the linear economy and create benefits for communities. International and national precedents provide tangible and effective methods of circular systems that local governments have implemented. Juneau must develop both the physical and social infrastructure that shifts attitudes around waste and invites residents to participate in circular material systems in Juneau. Developing a network of community-built mini-material parks and a central Juneau Resource Park for dedicated local material processing and creation will achieve the City's goal of extending the Landfill's life, while creating jobs, providing cost savings, public space amenities, skill development, and reduces negative impacts of the current landfill. I urge the City to take this opportunity to radically reimagine the future of MSW management in Juneau. I hope this project can inspire such reframing. Achieving these goals is possible, as other communities around the world have successfully redefined their relationships with waste and shifted from linear to circular material management systems.

I hope this thesis can add to the current conversation in Juneau about MSW management. Professionally, I hope this thesis focuses conversation around the role landscape architects can play in MSW management systems to be preventative and proactive related to climate change, reducing harm to communities, and promoting circular economies. This chapter will begin with recommendations for the City of Juneau as they move forward in their Zero-Waste planning, and how these ideas could apply more broadly to Southeast Alaska. Then, I include my own reflections on MSW management, as a landscape architect, researcher, and former (and future) Juneauite.

Figure 6.1: A familiar sight and smell. The Capitol Disposal Landfill seen from Egan Highway.

Recommendations:

... For The City of Juneau

This thesis explores a community-benefiting approach to MSW management in Juneau, Alaska. As the City plans for the future of MSW management, new management policies and improved infrastructure are an important part of the solution, and changing attitudes and behaviors is critical to the success of this endeavor. Changing behaviors requires building physical and social infrastructure that incentivizes and shows how defining waste as material provides more benefits than only extending the life of the Landfill. These benefits include, but are not limited to cost savings, improved public health, improved community resiliency, job creation, and ability to address the disproportionate harm felt by the Lemon Creek neighborhood. My recommendations to the City for next steps are as follows:

1. Perform a waste audit to inform the composition and volume of the material entering the Landfill. This will allow the City to focus on which areas of the waste stream need to be addressed and to identify possible alternatives for materials in Juneau.

2. Commit to JuneauComposts! operating the commercial composting facility and begin planning with their business now. Their knowledge of organic composting in Juneau is an invaluable foundation for the City in developing the new facility. Empowering and trusting them to lead Juneau into a new future of city-wide organic composting is vital.

3. Look to leverage businesses, restaurants, breweries, and City facilities as guides and points of education for indicating how new systems of composting will work in Juneau. These spaces are high-impact areas that can reach wide populations. Incentivize and compensate businesses for their participation.

4. Center social justice in the City's zero waste planning. Use Just Transition Principles to ensure the transition from linear to circular economies in Juneau is just and equitable. Empower, engage, and value the voices of the people who have been impacted most by the Landfill.

To establish the pilot mini-material park, the City needs to:

1. Identify and secure grant or City funding to implement and test this project

2. Identify and establish partners in the Downtown neighborhood to co-create the material park (potential options include: Juneau Douglas High School shop classes, Zach Gordon Youth Center, Harborview Elementary School, Ace Hardware, etc.)

3. Identify sources of materials to construct the elements of the pilot mini-material park

4. Advertise and invite business(es) to operate within the mini-material parks (examples include: coffee shops, local artists, etc.)

5. Acquire retired shipping containers and add open-close functionality to the City's collection containers

6. Establish paid and volunteer opportunities to pilot the mini-material park.

7. Although these recommendations are not comprehensive, they should be major priorities for the City if they were to establish a pilot mini-material park.

... To Other Southeast Alaskan Communities

This project is applicable to other towns in Southeast Alaska as they face similar challenges around MSW management (figure 6.3). Even for the five towns in Southeast Alaska that barge their garbage out, these costs could be redirected from investing in linear systems of MSW management to establish circular systems. There are currently five towns in Southeast Alaska that have a contract with Republic Services to barge their garbage. Ketchikan, Sitka, Wrangell, Klawock, and Gustavus all barge their garbage to Seattle, where it gets on a train and travels to the Roosevelt Regional Landfill in eastern Washington (figure 6.2).[138] If this method is implemented in Juneau, it can be used as a model for other Southeast Alaskan communities. This method of circular MSW management is not a solution that a municipality can contract out or buy, but rather one that leverages community wide behavior shifts through the use of public space.

Figure 6.2: Five Southeast Alaskan towns (Sitka, Petersburg, Wrangell, Klawock, and Ketchikan) currently contract with Repubic Services to ship their MSW to the Roosevelt Regional Landfill in Bickleton, Washington.

Figure 6.3: An open top shipping container full of Sitka's MSW caught fire on its way to Seattle in 2016. From City of Sitka (2016).

Reflections:

... on MSW Management

This project has revealed how complicated and ingrained our current systems of MSW management are, and that changing them will require policy or infrastructure change, and also community buy-in. This project has also revealed the asymmetrical impacts of modern waste management practices on communities. Because these systems are so firmly established as privatized and centralized, and the people who control these systems hold the power, reimagining new systems will be challenging. Change is possible when communities shift behaviors as a collective. The larger systems of extraction that support our linear material world must also be addressed to make producers pay the true environmental and public health costs of how goods are made.

... as a Landscape Architect

Landscape architects are increasingly called on to address, heal, and transform closed landfills into habitable recreation spaces. Landscape architects' role must not only be to remediate, but also prevent these landscapes from existing in the first place. Preventing these landscapes and subverting these systems through design is an environmental justice imperative, as harm is felt disproportionately by low-income and communities of color. We can help create spaces that allow communities to re-imagine our relationship with the things we buy, use, and dispose of. Landscape architects can help bring visibility to the current systems of MSW management and imagine alternative systems that benefit communities instead of harming them.

...as a Researcher

The project aims to add to the already existing work that communities across the world are doing to cut out methods of linear extraction and disposal through making, repairing, repurposing and innovating. This work provides ideas for the physical spaces needed to support a circular economy. These spaces aim to catalyze a new system of community benefiting, rather than harmful ways of material management.

If I were to continue this project, I would work more closely with the City and community members. I was able to present this project to a few members of the Juneau community working on solid waste, including members from the Alaska Department of Environmental Conservation, Tlingit and Haida, and the City's zero waste coordinator. Getting feedback on this thesis was incredibly valuable as they began to connect this project with other initiatives that their organizations are currently working toward regarding MSW management. Working alongside community members would strengthen the viability and likelihood of implementing this plan.

Figure 6.4: Scenes of home.

... as a *Former Juneauite*

I grew up in Juneau and regularly return to visit my family (who live less than a mile from the Landfill) (figure 6.4). I feel fortunate to have had the opportunity to develop a thesis about a place that I am deeply invested in and connected to. This thesis has allowed me to explore a familiar place through the lens of landscape architecture, which has been incredibly fulfilling after three years of studies. This project has challenged me to step out of what I felt was realistic or possible for Juneau and pushed me to work in a mindset that was more focused on re-imagining the system rather than trying to fit within it. I hope this project can both inspire and excite Juneau about a future of re-imagined material relationships and possibilities.

This thesis was written for the community of Juneau to help inform and inspire future work that aims to create new systems of MSW management.

"Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it's the only thing that ever has."
-Margaret Mead

138. Ronco, Banse, and Schoenfeld, “Talking Trash.”

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