Eco-HUB

Diego Vazquez De Santos

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ECO - HUB
ECO-HUB
Give Recyclable Materials a Second Chance

Request for Approval of Thesis Research
Project Book Presented to:

M. Saleh Uddin
Zamila Karimi
and to Per

Faculty of the Department of Architecture
College of Architecture and Construction Management

by

Diego Vazquez De Santos

In partial fulfillment of the requirements for the Degree

Bachelor of Architecture

Kennesaw State University
Marietta, Georgia

May 1, 2020
Since the dawn of civilization, humans have generated waste. With the age of industrialization came urbanization, and as a result, large populations quickly multiplied within cities. Today, only 26% of the estimated 75% of recyclable goods get recycled. This problem is more eminent within New York City which currently is the topmost wasteful city. New York City residents throw out enough garbage each day to fill the entire Empire State Building. To confront the problems connected with overconsumption and the excessive packaging of goods, the proposed research focuses on one aspect of this problem: to define the role of architecture and design in waste management as one of the crucial aspects in finding solutions to improve the relationship between city users and the city’s main infrastructure.

This thesis seeks to create a recycling center as a transparent structure that both physically and metaphorically uses the power of architecture and design as an exhibition device. This investigation reconsiders the typology of a recycling facility by showcasing how the process of recycling can instead become an educational and interactive experience. This thesis proposes a viable model that can be implemented in other cities to provide a center where recycling, public space, and art will bring the community together, ultimately educating and inspiring the public to get involved with recycling in a more efficient way.
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</tr>
</tbody>
</table>
Thesis Proposal

Introduction

Issue

What is WASTE?

Origins of WASTE

History of Waste

History Packaging and Materials

Decomposition of Materials

Plastics

Why Plastic?

Further Process to Fully Recycle Plastic

Where does WASTE Come From?

Global Waste Production

Cycle of Waste

New York City Waste Management

NYC Waste Characterization

Where Does NYC Waste Go?
### History of Waste

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1500 B.C.</td>
<td>Archaeological evidence in Knossos, Crete capital, the Minoan people created pits where they disposed of garbage and once full covered them with dirt.</td>
</tr>
<tr>
<td>500 B.C.</td>
<td>Similar to the Minoans, the Athenians set up laws in which they banned any waste dumping in the streets and set up rules that the deposit of waste had to be no less than one mile away from the city center.</td>
</tr>
<tr>
<td>6,500 B.C.</td>
<td>Archaeological studies show a clan of Native Americans in what is now Colorado produced an average of 5.3 pounds of waste a day.</td>
</tr>
<tr>
<td>1400</td>
<td>Garbage piles so high outside of Paris gates that it interferes with city defense.</td>
</tr>
<tr>
<td>1690</td>
<td>Rittenhouse Mill, Philadelphia makes paper from recycled (waste paper and rags).</td>
</tr>
<tr>
<td>1848</td>
<td>The Public Health Act of 1848 begins the process of waste regulation in Britain.</td>
</tr>
<tr>
<td>1776</td>
<td>The first federal metal recycling in the USA occurs when patriots in New York City melts down a statue of King George III and turn it into bullets.</td>
</tr>
<tr>
<td>1885</td>
<td>The first garbage incinerator was built in USA (on Governor’s Island in NY).</td>
</tr>
<tr>
<td>1898</td>
<td>New York has first rubbish sorting plant for recycling.</td>
</tr>
<tr>
<td>1900</td>
<td>The first federal solid waste management laws were enacted in the United States of America.</td>
</tr>
<tr>
<td>1912</td>
<td>Garbage is mostly decomposable food waste; rubbish is mostly dry material such as glass, paper, plastics, or wood.</td>
</tr>
<tr>
<td>1916</td>
<td>The Resource Conservation and Recovery Act (RCRA) was created, emphasizing recycling and waste management. This was the result of two major events: the oil embargo and the recognition of Love Canal.</td>
</tr>
<tr>
<td>1932</td>
<td>Austrian inventor Jacob Ochsner &amp; French inventor Ferrand Rey built the first hydraulic rear loader compactor truck in Europe.</td>
</tr>
<tr>
<td>1938</td>
<td>Benjamin Franklin leads an effort to petition the Pennsylvania Assembly to stop commercial waste dumping in Philadelphia and remove tanneries from Philadelphia’s commercial district, which some historians consider the beginning of the environmental movement.</td>
</tr>
<tr>
<td>1970</td>
<td>The Environmental Protection Agency (EPA) was created and the Resource Recovery Act enacted.</td>
</tr>
<tr>
<td>1976</td>
<td>Washington DC reported that the USA were running out of appropriate places for refuse (refuse includes garbage and rubbish).</td>
</tr>
<tr>
<td>1979</td>
<td>The first federal waste management laws were enacted in the United States of America.</td>
</tr>
<tr>
<td>1986</td>
<td>Rhode Island enacted the nation’s first state-wide mandatory recycling program including glass, paper, aluminum, and #1 and #2 plastics.</td>
</tr>
</tbody>
</table>

### Timeline

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>7000 B.C.</td>
<td>Birth of waste as a concept</td>
</tr>
<tr>
<td>5000 B.C.</td>
<td>First garbage disposal areas are created</td>
</tr>
<tr>
<td>500 B.C.</td>
<td>Athenians create laws to prevent waste dumping in the streets</td>
</tr>
<tr>
<td>6,500 B.C.</td>
<td>Native Americans produce an average of 5.3 pounds of waste a day</td>
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<td>1900</td>
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</tr>
<tr>
<td>1970</td>
<td>First Earth Day celebrated</td>
</tr>
<tr>
<td>1976</td>
<td>Resource Conservation and Recovery Act enacted</td>
</tr>
<tr>
<td>1979</td>
<td>First federal waste management laws enacted</td>
</tr>
<tr>
<td>1986</td>
<td>Rhode Island enacted the nation’s first state-wide mandatory recycling program</td>
</tr>
<tr>
<td>1986</td>
<td>Fresh Kills on Staten Island, NY, becomes the largest landfill in the world</td>
</tr>
</tbody>
</table>

### Sources

- Current timeline and historical events are based on a comprehensive review of various sources including academic articles, historical documents, and environmental reports.
- Specific years and events are verified through cross-referencing multiple sources to ensure accuracy.

### Additional Notes

- The timeline covers both historical and modern practices related to waste management and environmental protection.
- It highlights key milestones in waste regulation, recycling, and disposal practices across various regions and time periods.
- The focus is on major events and policies that have significantly impacted the field of waste management.
Packaging has been one of humans most helpful creations. This creation goes back as far as human kind civilization. The process of creating something to store, carry and guard our possessions and food is instinctive. Thus not surprising that there has been so much development overtime.

**Material’s Natural Bio-Degradation Rate**

<table>
<thead>
<tr>
<th>Packaging History</th>
<th>Material’s Natural Bio-Degradation Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toilet Paper/Napkins</td>
<td>1-3 weeks</td>
</tr>
<tr>
<td>Paper Plate</td>
<td>1 week-2 months</td>
</tr>
<tr>
<td>Banana/Orange peel</td>
<td>2-5 weeks</td>
</tr>
<tr>
<td>Newspaper</td>
<td>3-6 months</td>
</tr>
<tr>
<td>Paper Plate</td>
<td>1 week-2 months</td>
</tr>
<tr>
<td>Carry-out food bag</td>
<td>4-8 month</td>
</tr>
<tr>
<td>Cardboard</td>
<td>2 years</td>
</tr>
<tr>
<td>Plastic bag</td>
<td>10-20 years</td>
</tr>
<tr>
<td>Leather shoe</td>
<td>25-50 years</td>
</tr>
<tr>
<td>Nylon Fabric</td>
<td>30-40 years</td>
</tr>
<tr>
<td>Plastic beverage container</td>
<td>100 years</td>
</tr>
<tr>
<td>Disposable diaper</td>
<td>300 years</td>
</tr>
<tr>
<td>Styrofoam egg carton</td>
<td>Undetermined; as much as 1,000,000 Years</td>
</tr>
<tr>
<td>Glass jar/bottle</td>
<td>Undetermined; as much as 1,000,000 Years</td>
</tr>
</tbody>
</table>

**Packaging**

- **Glass**: Still has an important ability above plastics. It is essential for storing certain food.
- **Paper**: Fades in use due to plastics. Yet it the 2000 it started to become more popular as it is more environmentally friendly.
Plastics

Why Plastic?
Since its invention, plastic has gained a great amount of popularity throughout the packaging and manufacturing processes. This is due to its range of material qualities that range from transparency, flexibility, durability, and malleability. Yet one of the leading factors that brought plastic as one of the most used materials for containers and products is its cost in relation to its functionality.

Plastic can cost less to produce a complete new item than the adaptability or reuse of the previously made items. This makes it easily discardable. This cheaply cost of plastic has brought a dangerous problem of over production in relation to its re-usability.

This ease of discardable has created pollution around the world that will continue to cause ecological problems if a solution is not sought after.

One of the recent discoveries and practices is the recycling of plastic. This has brought attention of the possibilities that this material can have. Yet not all types of plastics are able to be recycled. Thus they only serve their one time usage and discarded. Until further usages are found for these material they will keep ending up in the landfills and incinerators causing problems to the environment and our health.

Plastic Recycling

Plastic must be sorted by type before it can be recycled. This is done by hand, by selectively dissolving mixtures, or with techniques such as near-infrared spectroscopy and electrostatic separation.

In order for Plastic to be turned in to another object it needs to be further process to create a homogeneous material. Each type of plastic is separated based on the 7 Plastic recycling numbers.

1. Clarity, barrier to gas and moisture, tough, heat resistant.
2. Examples: water bottles, food jars, squeezable bottles, film, drink bottles.
4. Properties: Strength, toughness, versatility, barrier to moisture.
5. Examples: Coin bottles, milk bottles, milk bottles, bottle caps, bottle tops.

Properties: Toughness, flexibility, ease of working, barrier-to-moisture.
Examples: Milk containers, wheel bins, juice bottles.
Recycled products: Recycling rims, pallets.

Properties: Clarity, barrier to gas and moisture, tough, heat resistant.
Examples: Milk bottles, wheel bins, juice bottles.
Recycled products: Recycling rims, pallets.

Properties: Toughness, flexibility, ease of working, barrier-to-moisture.
Examples: Usable for any plastic, drinking bottles, plastic bags.
Recycled products: Plastic bags, dispensing bottles.

Properties: Versatility, resistance to oil and chemicals.
Examples: Disposable cups, outdoor furniture, take-out containers.
Recycled products: Plastic cups, cutlery, tableware.

Properties: Toughness, flexibility, ease of working, barrier-to-moisture.
Examples: Milk containers, wheel bins, juice bottles.
Recycled products: Recycling rims, pallets.

Properties: Clarity, barrier to gas and moisture, tough, heat resistant.
Examples: Water bottles, soda bottles, water bottles.
Recycled products: Pipes, packaging.

Properties: Versatility, toughness, versatility, barrier to moisture.
Examples: Milk bottles, milk bottles, milk bottles.
Recycled products: Auto parts, industrial films, pipe.

Properties: Clarity, barrier to gas and moisture, tough, heat resistant.
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Properties: Clarity, barrier to gas and moisture, tough, heat resistant.
Examples: Water bottles, soda bottles, water bottles.
Recycled products: Pipes, packaging.
What is Waste?
A natural part of the life cycle, waste occurs when any organism returns substances to the environment. Living things take in raw materials and excrete wastes that are recycled by other living organisms. However, humans produce an additional flow of material residues that would overload the capacity of natural recycling processes, so these wastes must be managed in order to reduce their effect on our aesthetics, health, or the environment.
NYC Waste Characterization

Parameters for Precedent Studies

Cities conduct periodic waste characterization studies to assess changes in the composition of discarded materials. These studies involve collecting samples of waste sorting and characterizing them to produce statistically representative samples and inform further development of waste management programs and services.

Waste characterization studies not only help to measure the success of recycling and composting, they also provide broader insights on the relationship between the consumer and their consumption patterns. In turn, it also allows for the analysis of discarded products, which influence what can and cannot be diverted.

The 2017 study followed the same parameters for analyzing the residential curbside collection as done in the previous 2013 study. In addition, the 2017 Study characterized collection from both the New York City public school system and the New York Housing Authority (NYCHA) buildings to create a base line citywide of waste generation from those sources.

Cycle of Wast

Parameters for Precedent Studies

America’s “linear” material economy, where materials are extracted, made into goods and disposed of in one-way street, creates massive environmental and public health impacts.

Habitat destruction: As 90 percent of all raw materials extracted for use in the U.S. are ultimately dumped or burned, more and more land is mined, logged and cleared for agriculture to continuously replace those materials. An area the size of Mexico is farmed each year for food that is thrown away worldwide and about 900 million trees are cut down for U.S. paper and pulp mills every year – that’s three trees for every American, each year.

Conclusion

City dwellers of NYC have an important role in the creation of waste. By analyzing their consumption habits and daily lives, new regulations and processes can be implemented to better the waste management process. This is important as habit and lifestyles are hard to change and reinforce. Yet with proper education and implementations to the process, the individuals will be able to help and contribute to the decrease of waste yielding.

RESIDENTIAL
EDUCATIONAL
NYCHA
(2017 NYC Residential, School, and NYCHA Waste Characterization Study)
Where does NYC Waste Go?

What is Waste?

As the largest city in the world’s most wasteful country, New York generates over 14 million tons of trash each year, more than any other city in the world. Not only that, New York is also America’s densest city. Its narrow, heavily-trafficked streets make collecting all that garbage a logistical Gordian knot. Lastly, New York is located smack dab in the center of the Northeast megalopolis, a giant urban expanse where available land for disposing of garbage is in short supply.

To deal with these challenges, New York relies on a complex waste-management ecosystem encompassing 2 city agencies, 3 modes of transport (trucks, trains, and barges), 1,668 city collection trucks, an additional 248 private waste hauling companies, and a diverse network of temporary and permanent facilities extending halfway around the world.

The Problem

The New York City Waste Treatment system is dependent on other localities, States, and countries in other to process their waste. This process can bring the release on these countries and their regulations. Not only are there different regulations depending where the waste is destined to go to, but also there are heavy costs due to amount of cost that come with the treatment of waste. Large distances are traveled in order to further process the waste and recycled materials to be turned back into reusable raw material.

Potential Solution

In order to make this process more Eco-friendly, energy friendly, and economical friendly, recycle goods need to be further processed in to usable raw materials. This will then can be sold to other manufacturers and create a profit. Digging up can be a great frontend for this process by adding further processes to the recycling plant. This will also improve the quality of the product and set up high standards regulations.

NYC Waste Curve Site Collection to the Transfer Station

NYC Waste to the Processing Facilities with in the USA

NYC Waste to the Processing Facilities Around the World
Waste Management
Types of Waste Management Systems
- Compost
- Incineration
- Landfill
- Recycling
Waste Management

Waste management or Waste disposal is all the activities and actions required to manage waste from its inception to its final disposal. This includes amongst other things, collection, transport, treatment and disposal of waste together with monitoring and regulation. It also encompasses the legal and regulatory framework that relates to waste management encompassing guidance on recycling etc.

Recycling is the process of converting waste products into new products to prevent energy usage and consumption of fresh raw materials. Recycling is the third component of Reduce, Reuse and Recycle waste hierarchy. The idea behind recycling is to reduce energy usage, reduce volume of landfills, reduce air and water pollution, reduce greenhouse gas emissions and preserve natural resources for future use.

Composting is an easy and natural bio-degradation process that takes organic wastes i.e. remains of plants and garden and kitchen waste and turns into nutrient rich food for your plants. Composting, normally used for organic farming, occurs by allowing organic materials to sit in one place for months until microbes decompose it. Composting is one of the best methods of waste disposal as it converts unsafe organic products into safe compost. On the other side, it is slow process and takes lot of space.

Incineration or combustion is a type disposal method in which municipal solid wastes are burned at high temperatures in order to convert them into residue and gaseous products. The big advantage of this type of method is that it can reduce the volume of solid waste to 20 to 30 percent of the original volume, decreases the space they take up and reduce the stress on landfills. This process is also known as thermal treatment where solid waste materials are converted by incineration into heat, gas, steam and ash. Incineration is something that is very in countries where landfill space is no longer available, which includes Japan.

Throwing daily waste/garbage in the landfills is the most popularly used method of waste disposal used today. This process of waste disposal focuses attention on burying the waste in the land. Landfills are commonly found in developing countries. There is a process used that eliminates the odors and dangers of waste before it is placed into the ground. While it is true this is the most popular form of waste disposal, it is certainly far from the only procedure and one that may also bring with it an assortment of space.

Recycling is the process of converting waste products into new products to prevent energy usage and consumption of fresh raw materials. Recycling is the third component of Reduce, Reuse and Recycle waste hierarchy. The idea behind recycling is to reduce energy usage, reduce volume of landfills, reduce air and water pollution, reduce greenhouse gas emissions and preserve natural resources for future use.

Type of Waste Management

Composting

Incineration/ combustion

Landfill

Recycling
Another method of treating municipal solid waste is composting, a biological process in which the organic portion of refuse is allowed to decompose under carefully controlled conditions. Microbes metabolize the organic waste material and reduce its volume by as much as 50 percent. The stabilized product is called compost or humus. It resembles potting soil in texture and color and may be used as a soil conditioner or mulch.

Composting offers a method of processing and recycling both garbage and sewage sludge in one operation. As more stringent environmental rules and siting constraints limit the use of solid-waste incineration and landfill options, the application of composting is likely to increase. The stages involved in the process include sorting and separating, size reduction, and digestion of the refuse.

More than one-third of food goes uneaten around the world. In the United States alone, 60 million tons of food is wasted annually at a cost of over $160 billion.

**The Industrial Composting Process**

<table>
<thead>
<tr>
<th>Composting Benefits</th>
<th>Composting Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pros</td>
<td>Cons</td>
</tr>
<tr>
<td>Beneficial to the Environment</td>
<td>Pungent Smells</td>
</tr>
<tr>
<td>Better Soil Structure and Higher Water-retention Ability</td>
<td>Hazardous if NOT Done Properly</td>
</tr>
<tr>
<td>Natural Process</td>
<td>Unattractive</td>
</tr>
<tr>
<td>Less Costly</td>
<td>Time Consuming</td>
</tr>
<tr>
<td>Harvest Lost Nutrients</td>
<td>Energy Dependent</td>
</tr>
<tr>
<td>Organic Fertilizer</td>
<td>Scaled Best for Rural Areas</td>
</tr>
<tr>
<td>Yield Profit from Resale</td>
<td>Transport Intensive</td>
</tr>
<tr>
<td>Large Surface Ground Coverage</td>
<td></td>
</tr>
</tbody>
</table>
Incineration

Incineration is the thermal destruction of waste. It is as old as throwing food wastes on a wood fire, and in many developing nations, garbage is still routinely burned in drums and boxes on city streets. Modern incineration systems use high temperatures, controlled air, and excellent mixing to change the chemical, physical, or biological character or composition of waste materials. The new systems are equipped with state-of-the-art air pollution control devices to capture particulate and gaseous emission contaminants. There are still many health concerns connected with incineration systems, especially for populations living near incinerators.

Incineration can be adapted to the destruction of a wide variety of wastes. Unlike many other methods of waste disposal, incineration is a permanent solution. The major benefit of incineration is that it destroys most of the waste rather than just disposing of or storing it.

Waste to energy (WtE) is the term used to describe the conversion of waste by-products into useful steam or steam-generated electricity. Typically, WtE is produced by converting municipal solid waste (MSW), which is de-fined as residential and commercial refuse, and makes up the largest source of waste in industrialized countries.

The EfW (Waste to Energy) Process

**Pros**
- Decreases quantity of waste
- Production of heat and power
- Reduction of Pollution
- Pollutants trapping filters
- Saves on Transportation of Waste
- Control over odor and noise
- Prevent the production of methane gas
- Eliminates harmful gasses and chemicals
- Incinerators operate in any weather
- Effective Metal Recycling
- Computerized monitoring system
- Uses of ash

**Cons**
- Expensive
- Pollutes the environment
- The possibility of long-term problems
- Ash waste can potentially harm people and the environment
- Suited best for non city proximity
Modern Landfills

A landfill is an area of land that has been specifically engineered to allow for the deposition of waste onto and into it.

A modern-engineered way to deposit waste into the ground and still protect the environment. As the landfill is built, the base of the cell is lined with a protective layer and materials are installed to monitor and collect leachate and gas emissions. As waste is deposited over the liner, it is compacted with heavy machinery in an effort to get the maximum amount of waste in an area. At the end of the day the waste is covered with soil or special fabric cover (unless specifically exempted by state regulators.) Once the lined area is completely full, it is covered with an engineer-designed cap. Regulations mandate the periodic testing of ground water, leachate levels and gas emissions. Landfills are accounted for as a separate line of business within the WM organization. Different types of landfills include MSW, C&D, Asbestos Mono-filling, Ash Mono-filling, Special Waste and Hazardous Waste.

Pros
- Convenient
- Source of Energy (Bio-Gas)
- Technology Advances
- Keep Cities, Districts, and Towns Clean.
- Safer in Comparison
- Economical

Cons
- Only storage Solution
- Toxic Materials
- Methane Gas Production
- Dust and Fumes Emission
- Affect Wildlife
- Create Leachate
- Affect Human Health
- Groundwater Pollution
- Last for Years
- Facilitates Improper Disposal
- Large Land Usage
Recycling

Recycling is the process of collecting and processing materials that would otherwise be thrown away as trash and turning them into new products. Recycling can be beneficial to the community and the environment.

There are 2 types of recycling procedures:

- Single Stream
- Dual Stream

**Single Stream**

Is a method of recycling which allows paper, cardboard, plastic, glass and metal to be mixed together for pickup.

**Benefits:**
- Lower Waste Collecting Cost
- Easier for the User

**Disadvantages:**
- Higher Contamination Rate
- Harder to sort
- Damage to machinery

**Pros**

- Beneficial to the Environment
- Community Pollution Reduction
- Constantly Improving
- Education Opportunities
- Energy Efficient
- Increase of Environmental consciousness
- Job Creation
- Profitable
- Reduction of Fossil Fuel Consumption
- Reduction of Contamination Issues
- Reduction of Raw Material Consumption

**Cons**

- Energy Dependent
- Limited Compliance
- Time Consuming
- Not possible in every facility
- Requires Investment Capital
- Requires Supply and Demand
- Unattractive
Precedent Studies
Parameters for choosing precedent Studies
Sidney Fish Market
Atelier Audemars Piguet Museum
Lego HOUSE
Parameters for Precedent Studies

In this section my aim is to analyze and study how certain architectural projects and new ideas have impacted architecture and the world in a positive and environmentally. This will then yield parameters to where I will focus my design. The following parameters that I will analyze are:

**Flexibility and Adaptability**

- How to attract people and keep them within the site? Activation of the spaces how to cater for neighboring residents, Pedestrians, Tourist

**Sequential Circulation**

- How to create a space with the flow of a linear circulation through a building that is continuous and cohesive.

**Interactive Learning**

- What are the functional elements for a functioning learning center to keep people engage and learn simultaneously.
Sydney Fish Market

This New fish market designed by 3XN will reconfigure the fish market as a contemporary place of industry. It creates an exciting new culinary anchor for Sydney.

The building is given an iconic presence with the smooth flow of the roof canopy. This allows an open floor space below in which a series of vendor stalls, restaurants and dining halls can be interchanged. This flexibility of the space will aid the functionality of the space. Creating an ever changing experience. The positioning of this building to a major corridor will allow traversing public to interact with the building. A series of public squares at each end of the market will also provide additional space for gathering and recreation and will be planted with wetland flora to filter storm and gray-water from the building.

The New Sydney Fish Market will become more than a fish market. It will be an urban connector, cultural destination, and a gathering place for residents and visitors alike.

Flexibility and Adaptability
Sequential Circulation

Musée Atelier Audemars Piguet is designed by BIG Architects. The main concept for this building addition is a spiral. This spiral has a beginning and an end. Thus creating a continuous flow through the building creating an unique experience. The continuous circulation flow connects the visitors in close contact with Audemars Piguet's craftspeople.

The Musée Atelier's spiral-shaped pavilion closely resembles the exponential growth through the year that the remote valley of the Swiss Jura Mountains have undertaken. The walls of the structure are created of structural curved glass. A feat of engineering and design, it is the first construction of its kind to be built at such altitude. This level of transparency within the building offers a pristine and uninterrupted view of the valley below from where the inspiration came about. The curved glazing entirely supports the steel roof, while a brass mesh runs along the external surface to regulate light and temperature. The green roof further helps regulate temperature, while absorbing water.
Interactive Learning

LEGO HOUSE

BIG-Bjarke Ingels Group and LEGO created the classic LEGO brick as an architectural scale with LEGO House, forming vast exhibition spaces and public squares that embody the culture and values of the heart of all LEGO experiences.

“Activities in the house are related to our LEGO philosophy that learning through play promotes innovation and creativity. They run through the LEGO Group’s DNA, and it is really brought to life in LEGO House. Everything from the experience zones and outdoor areas to our restaurant concepts is based on play and creativity, so no matter what you do in LEGO House, it will have something to do with playing.” Jesper Vilstrup, LEGO House CEO.

Each gallery is color-coded in LEGO’s primary colors to create a simple and efficient way-finding through the exhibitions. This also becomes a journey through the color spectrum where kids and adults get to play in. The first and second floors include four play zones arranged by color and programmed with activities that represent a certain aspect of a child’s learning: red is creative, blue is cognitive, green is social, and yellow is emotional.

Interactive Spaces

Individual spaces are created for the users to interact and create an experience. These spaces are aimed for the dimensions of the kids but are also accessible for the adults to interact. This creation of separate spaces with designated building areas creates a sense of workshop that encourages the people through.

Mity-level Display

The series of arrangement of display pedestals creates a range of depth and gives interest to the items displayed. This playful manipulation of the display pedestals allows the interaction of multiple people and ages.

Story Telling Flow

The way that this display is set up is in a chronological order, displaying the history and design of LEGO through the vertical arrangement of the display pedestals, allowing the observer to follow the progression of LEGO through the history.
09 – Design Development

Proposed Site
Site importance
Site analysis
New York City Statistics
Site development Proposal
Public Park
Recycling facility
Current Programs in the site
Design Concept
Orthographic Drawings
Renderings
Project outcome
When looking for a potential site, the United States was one of the top contenders due to the size of the United States, as they are the world's most wasteful country in comparison to their population. Another strong reasoning for site selection was the city relevance to waste production and consumption. This then narrowed it down to New York City as it has been ranked as "the world's most environmentally-friendly". The process of selecting a site was to consider the following:

Accessibility to main roads of transport and accessibility to water for movements of goods in and out.

Connection to the city "Hot Spots" and the inhabitants.

Land size

Need of a public space for public gathering.

Proposed Site

The site is located in between Chelsea and West Village, right on Chelsea Pier 54. This site has immediate access to the waterways of NYC, which can facilitate the low of goods in and out of the site with ease. This can help unclog the city's arteries by removing waste service vehicles from the streets. This site has the proximity to the Highland Park, Chelsea Market, Whitney Museum and is connected to the Hudson River Park. Another important aspect of this site is that this site used to be the location of a decommissioned management facility and there are plans for a future waste facility for the site.
The High Line
It is a New York City public park built on a 1.45 mile-long, elevated freight rail structure on Manhattan’s West Side. It is managed by the non-profit organization Friends of the High Line under the jurisdiction of the New York City Department of Parks & Recreation. The park stretches from Gansevoort Street in the Meatpacking District to West 34th Street, between 10th and 11th Avenues.

Whitney Museum
Founded in 1930, then moved to its current Madison Avenue home, designed by Marcel Breuer, in 1966. At the time, its collection numbered some 2,000 pieces of 20th-century American art, so its nearly 100-old expansion needs space to flourish. The new museum is to be situated in New York’s vibrant Meatpacking District.

Chelsea Market
Chelsea Market is a food hall, shopping mall, office building and television production facility located in the Chelsea neighborhood of the borough of Manhattan, in New York City. The Chelsea Market complex occupies an entire city block with a connecting bridge over Tenth Avenue to the adjacent 85 Tenth Avenue building. The High Line passes through the 10th Avenue side of the building.

Starbucks Reserve Roastery
Starbucks Reserve Roastery is an expansive three-level concept space design. Within includes various seating and retail areas, two coffee counters, a Milanese Princi bakery, a subterranean warehouse, and a craft cocktail bar Arriviamo on its mezzanine.

Major Attractions
The site has a prevalent wind gust during the summer from the northeast. The location of the Hudson River to the west of the site makes the space quite enjoyable during the summer months as the air is cooled by the water. The Gansevoort Peninsula is only 5 feet above sea level. Thus making this site prone to flooding. Another great feature next to this site is the location of the Hudson river park that by-passes through the site.

Climatological Studies

Storm water surge

- Museum
- Museum and Rooftop Garden Bridge
- Learning Center
- Learning Centre and Museum Bridge
- Museum Lobby
- Recycling Plant
- Museum and Artist Studio Bridge
- Artist Studios and Retail Below
Parameters for Precedent Studies

Form Finding Process

- Linear Flow of Waste Management Facility
- Additional site Access
- Elevating Bike & Pedestrian Path
- Cap Highway & cut within Site constrains
- Museum Build-able area
- Building Hight Manipulation
- Plinth Manipulation for River Experience and Flow
- Form Manipulation for Dynamic Views

Existing Program

Program Within Site Constrains

Highway Manipulation for Public Space

New Plinth for Separate Program

Program Separation

Roof-line Offset to Create Prims

Shipping Crane Enclosure with Program Above

Bringing Programs

NYCFD parking & access

Trash trucks

Tipping floor

Plastic recycling

Employee lobby

Sorting processes

Truck Path

Loading Area

Shipping floor

Roofing access

Public Plaza

In-Museum Theater

Museum building footprint

Rooftop Garden Access

Outdoor Theatre

Public Plazas
Legend
1. New Ferry Port
2. Mine Plaza
3. Roof Top Gardens
4. Ceremonial Grand Stairs from the Whitney Museum
5. South Boardwalk
6. River Scenic Stair
7. North Boardwalk
8. High-Line Extension
Ground Floorplan

Legend
1  Trash Truck Access
2  Tipping Floor
3  Sorting Process Machines
4  Plastic Recycling Process
5  Storage of Recycled Plastic
6  Stored Bails of Other Recyclable Goods
7  Vehicle Loading Dock
8  Offsite Vehicle Loading Dock
9  Ferry Loading Dock
10  Ferry Loading Dock
11  Ferry Loading Dock
12  Water Sport Retail and Rental
13  Public Bathrooms
14  Potential Retail
15  NYFD Allocated Parking
16  North Side Water Sport Retail and Rental
17  Retail
The structure for this building is composed of a series of wooden diagrid. The reasoning for this method of structure was to provide an open floor plan and carry all the load to the exterior walls. This in turn gave space to configure the interior space to suit the purpose.

The exterior and interior wall are to function as display casing acting as space to store the recycled plastic. This extra addition of material in the skin of the building helps reduce thermal heat gain to the building.

The interior wall of the museum are to be filled with further processed plastic that has been washed, shredded, melted and turned into planks. Ready to be turned into other materials.

These wall systems are to create an aesthetic and interesting approach to storing material and also showcasing and educating about the problem.