LIVING WITH THE WASTE

Creating a better life image by constructing decentralized waste management in Kampung Kranggan, Semarang

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introduction

problem field

analysis

strategy

design
introduction

problem field

analysis

strategy

design
By 2050, global waste generation could increase **70%**
[ Introduction ]

No such thing as waste!

Waste is, unwanted or unusable materials.
Semarang is situated on Java Island, and it is the capital and the largest city of the Central Java Province. The city has 1,288,085 inhabitants, 424,628 households, with a total area of 373.7 km². The only landfill is located at the southwest of Semarang. However, the daily waste production is 1,200 tons, which exceeds the capacity of the landfill.
Social Structure

[ Introduction ]

RT

RW

Kampung

KOTA SEMARANG
Semarang city

KECAMATAN
district

KAMPUNG
village

RW (Ruma Warga)
7-15 RTs

RT (Rumah Tetanga)
18-20 households

Household
Gotong Royong

Mutual assistance
Collective work

Source: Gotong Royong: Cooperation; steemit.com
[Introduction]

Landscape Structure
Introduction

Urbanization

- 1719: Dutch settlements dominate the urban fabric, and also attracts several ethnic groups to settle nearby.

- 1824: To deal with flooding, the West and East waterways are built. The city grows rapidly because the establishment of the Daendels Road.

- 1917: Semarang grows towards the hinterland. The Dutch government initiates drainage development due to the serious disease like cholera caused by flooding.

- 1946: Few documentation of the city planning can be found because of the war. Semarang city keeps expanding towards the mountain area.

- 2019: Semarang city expands horizontally, unorganized expansion causes many problems.
[Introduction]

Current Green&Blue structure
[Introduction]

Waste Infrastructure

solid waste

liquid waste
[ Introduction ]

Interviews

Paper Shop Owner
- Pecinan resident
- Age: 73

“Every two or three houses share a trash bin, we put the daily waste into it, then supposedly a waste collector should come and collect every two days. But the waste collector usually doesn’t show up on time, then the trash will pile up on the streets.”

Restaurant Owner
- Pecinan resident
- Age: 76

“The residents and visitors sometimes just throw garbage on the streets. Street vendors are even worse, they leave waste everywhere if the manager from RT doesn’t pay attention.”

Drinking Water Refill Store Owner
- Bandarharjo resident

“Every two days a guy comes to take up the trashes in front of our houses. But, that’s it.”

Casual Worker
- Bandarharjo resident

“I only know a guy will come and pick up the garbage on the streets.”
[ Introduction ]
[Problem Field]

**INSUFFICIENT WASTE MANAGEMENT**

- **poor infrastructure**
- **limited local participation**
INSUFFICIENT WASTE MANAGEMENT

unhygienic environment
[Problem Field]

**LACK OF GREEN SPACE**

**environment aspect**

- no space for nature

**social aspect**

- poor biodiversity
- lack of public space
- unattractive landscape

- unattractive landscape
Insufficient waste management and lack of green space leads to an unhygienic and unattractive environment, disconnect people and their living environment, further undermines the living quality.
How can landscape architectural interventions create a healthy environment by reconstructing waste management?

- What is the existing waste management and environment it creates?

- What are the possibilities for future waste management?

- What are the principles and strategies to reconstruct a decentralized waste management to create a clean, inviting environment?

- How to translate these principles and strategies into a spatial design?
Methodology

Fascination
Observation
Field Study
Interview
Problem Statement

Research Question
How can landscape architectural interventions create a healthy environment by reconstructing waste management?

Theoretical Framework
Healthy Environment
Circular Economy
Ecoparks
An Integrated Approach
Landscape as Infrastructure

Analysis
Mapping
Literature Review
Case Study

Research by Design

Conclusion & Reflection
[Site Introduction]
Location
[ Site Introduction ]

Location

Kampung Kranggan

Current waste situation       Impact of waste

residential + commercial

residential
[ Site Introduction ]

Location

TPS (waste collection point)

Kampung Kranggan

25.25 Ha

1589 Households

RW boundary
Accessibility
[Site Analysis]

Street Profile

- **Main Road**: 1.5m (left) - 9m (center) - 1.5m (right)
- **Secondary Road**: 1.5m (left) - 6m (center) - 1.5m (right)
- **Tertiary Road**: 0.5m (left) - 3m (center) - 0.5m (right)
[Site Analysis]

Building Typology
[ Site Analysis ]

Building Condition & Heritage Value
[ Site Analysis ]

Temples

1. Siu Hok Bio
2. Tek Hay Bio
3. Ling Hok Bio
4. Tong Pek Bio
5. Hoo Hok Bio
6. Kong Tik Soe
[Site Analysis]

Waterfront Typology
[ Site Analysis ]

Waterfront Typology
Waterfront Typology

[Site Analysis]

[Image of a waterfront scene with trees and water]
[Site Analysis]

Solid Waste

- **Waste Sources**
  - household
  - industrial area
  - market/shop
  - commercial area
  - public facilities
  - streets
  - others

- **Waste Composition**
  - organic
  - plastic
  - paper
  - glass
  - metal
  - rubber and leather
  - fabric
  - others

- **Land Use**

- **Waste Generation**
  - more waste generation
  - less waste generation
[Site Analysis]

Solid Waste

Diagram showing the flow from household to TPA/Landfill with intermediate steps involving waste collection at TPS/temporary coders point.
Liquid Waste

[Site Analysis]

wastewater generation (L/p/day)

21L blackwater
60L greywater

- showering
- washing
- others
- cooking
- toilet
- drinking

Household

black water
grey water

septic tank

underground pipe
open ditch

Kali Sewarung

Dump
Liquid Waste - Combined Sewer

[ Site Analysis ]

Typology 1

Typology 2

Typology 3

Typology 4
[Site Analysis]

Liquid Waste - Combined Sewer

Typology 1

Typology 2

Typology 3

Typology 4
[Site Analysis]

Liquid Waste - Topography

Section 1

Section 2
[ Site Analysis ]

Liquid Waste - Water level

Semarang annual rainfall

Water levels near Semarang at its source are also less than half of normal and water shortages have become severe with even rivers drying up. News from Sept. 2019 (dry season)

Water Level Estimation

+2.8m

+1.4m (rainy season water level max.)

0.0 mean water level

-0.4m (dry season water level min.)

3.6m

12m

combined sewer
[ Site Analysis ]
Liquid Waste - PDAM Pipe Network
[Site Analysis]
Existing Green Space & Trees
[ Site Analysis ]

Empty Space & Abandoned/Broken Buildings
[Summary]

dense urban tissue

weak West to East connection

insufficient waste management

lack of high quality green space
MAKOKO Urban Design Toolbox

decentralized waste management with socio-economical benefits

Weishanhu Wetland Park

constructed wetland water purification

UP+S Rain Garden

low-cost rainwater harvesting
[ Vision ]

Green&Blue structure
[ Design Strategy ]

**PROVIDE**
Provide space for waste management

**CONNECT**
Connect people with waste infrastructure

**INTEGRATE**
Establish new waste flow and healthy environment
Placemaking

[ 1. Provide ]
1. Provide

Relocate

7.5%

118 demolished buildings
Relocate

within the kampung
abandoned buildings
vacant buildings

outside the kampung
social housing in coastal or mountain area

118 demolished buildings

7.5%
[ 2. Connect ]

[Map of urban area with existing and added roads marked.]
3. Integrate
[Overall System]

Solid Waste
Overall System

Solid Waste Infrastructure Access
[Overall System]

Liquid Waste - Household Wastewater
[Overall System]

Liquid Waste - Rainwater
[Overall System]

Street Typology - Main Road

Before
[Overall System]
Street Typology - Main Road
Overall System

Street Typology - Secondary Road

Before
[Overall System]

Street Typology - Tertiary Road

Before
Overall System

Green Space

- Waste Square
- Composting Garden
- Soft Riverbank

Legend:
- Composting garden
- Plastic waste center
- Wetland park
- Water terrace
- Kampung square
Detailed Design

- Plastic Waste Center
- Composting Garden
- Temple
- Water Terrace

[ 0 - 5 - 25m ]
[ Detailed Design ]

- Plastic Waste Center
- Composting Garden
- Tek Hay Bio Temple
- Water Terrace
- Nearby Kampung

- Distribution Center
- Organic Waste
- Plastic & Other Sorted Waste
- Household

Waste
- Street Hero
- Household
[Composting Garden]

- Rest Lawn
- Composting Area
- Tree Matrix
- Rain Garden
- Food Garden

sunshine analysis
Rain Garden

- weathering steel
- existing tree
- existing wall
- FRP grating existing tree
Rain Garden

[ Composting Garden ]

Runoff from roof
Primary purification

Cyperus alternifolius

Secondary purification
Thalia dealbata

Tertiary purification
Acorus calamus

Pond
Underground water tank

Discharge to drainage during heavy rainfall

Runoff from road
Composting Garden

- parthenocissus tricuspidata
- vertical greening
- existing tree
- composting area
- tree matrix
- pterocarpus indicus
- lagerstroemia indica
- gabion with plastic bottle infill
- food garden
[Composting Garden]

- Imprinted brick made by locals
- Plastic wall
[ Composting Garden ]
[ Tek Hay Bio Temple - biodigester ]

- Organic waste
- Biogas output
- Wastewater from household
- Biogas
- Digester
- Fertilizer
- To constructed wetland

Biodigester capacity: 108m³
[ Water Terrace ]

constructed wetland
permeable pavement
soft riverbank
[Project Phasing]

Stage 1 (1-3 years)
placemaking & knowledge broadcasting

Stage 2 (3-5 years)
fulfill solid waste network

Stage 3 (3-5 years)
fulfill liquid waste network

workshops, activities
negotiation, relocate

earth work for the new waste system

solid waste center construction
establish solid waste network

biogas digester installation
riverbank public space construction

plantation
establish liquid waste network
Terima Kasih
Thanks For Listening