Crafting The Disused

Local waste material transformation and integrated waste management on a decentralised scale

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ae intecture | 30th June 2017
Content

Introduction

research/ context
objective/ concept

Design Development

guidelines
layout
structure
climate and energy scheme
Introduction
INTRODUCTION

overview

64 MILLION TONS
of waste produced in Indonesia
every year

ONLY 7.5%
of waste is recycled
(prevailingly in mayor cities)

15 MILLION TONS
of waste is illegally
dumped or burned every year
INTRODUCTION

research focus

Byfusion bricks
[ByFusion Limited]
INTRODUCTION

research focus

**SQUARRY**

[Better Future Factory]
INTRODUCTION

research focus

BIMA MICRO LIBRARY

[Shau Architects]
INTRODUCTION

research focus

Trinket Series

[Bethany Walker]
INTRODUCTION

research focus
INTRODUCTION

context

Bandung was build as a

GARDEN CITY

1980
arrival of large scale
fashion industry leads to
rapid urban growth
INTRODUCTION

Bandung
INTRODUCTION

Bandung

Cigondewah
INTRODUCTION

Cigondewah
INTRODUCTION

Cigondewah

Rukun Warga 02 & 12
(neighbourhood)
INTRODUCTION
RW02 & RW12

RESIDENTS: 3100

60%

40%

INCOME:

66% < 6.750k Rp (480€)

29% 6.750k - 13.500k Rp (480€-960€)

5% > 13.500k Rp (960€)

cigondewah Football Field
cigondewah Football Field
Recycling Business
Commercial Cardboard Recycling
Recycled Mat
Mr Dudun & Family
**Research**

**Waste Occurrence**

Currently:

- **0.0007 ton** per day

- **15 ton** per week

In 10-15 years:

- **25 ton** per week

*Waste accumulation - data source: Rahayu, N. & Yudoko, G. (2012)*

*Waste composition on weekly basis - data source: Damanhuri, E. et al. (2009)*
Facilitating sufficient waste management and the production of waste material into vernacular building material in support of a cleaner kampung and a sustainable and extendable housing model.
I

Central Collection point
Sampah Bank
Research

Conclusion

Central Collection point
Sampah Bank

waste collection point
bank administration
sorting and storing space
cleaning
drying
Central Collection point
Sampah Bank

- waste collection point
- bank administration
- sorting and storing space
- cleaning
- drying

Processing Factory
I

Central Collection point
Sampah Bank

- waste collection point
- bank administration
- sorting and storing space
- cleaning
- drying

2

Processing Factory

- secondary sorting
- shredding
- heating
- compressing
- cooling
- finishing
- storing
- trading
Research

Conclusion

I

Central Collection point
Sampah Bank

- waste collection point
- bank administration
- sorting and storing space
- cleaning
- drying

= 100m²

II

Processing Factory

- secondary sorting
- shredding
- heating
- compressing
- cooling
- finishing
- storing
- trading

= 100m²
**Research**

Conclusion
RESEARCH
Waste Distribution and Routing
Research
Site Location Options
Architectural & Technical Design
Design guidelines
Design guidelines
Design guidelines
Design guidelines
Design guidelines
Design guidelines
Design guidelines

Block definition
Design guidelines
Design guidelines

Roof Overhang
Plan

Reception
Pick Up & Delivery, Public Toilet
Plan

Storage & Trading
Plan

Machinery Processing
Plan

Workshop
Wall Concept
Wall Concept

Type 1: open structure

Type 2: open structure defining space and acting as storage unit

Type 3: clad but with open, usable storage from the inside

Type 4: clad & fully insulated
STRUCTURE
Cladding System

standing hook system

easy assemble - 3D printable

100% waste cladding
Climate Strategy

ROOF HOOD & DIRECTION

GARDEN

PLATFORM & STACK EFFECT

> 60° at June solstice

general building height in area
Climate Strategy

Anti-flood blockage foundation
energy requirements for processing machines:

full capacity: 1740kWh/week

cigondewah: 900kWh/week

biogas digester capacity:

produces 2.4x the energy of the facilities consumption based on kampung waste
Thank you
## SPATIAL REQUIREMENTS

Comparison of spatial requirements on a weekly basis of receiving, storing and producing waste/products

**RW02&12 accumulating waste amounts in ton per week** | **Spatial requirements/ dimensions of waste m³** | **Spatial requirements in m² on the basis of 2 metre height - rounded**
--- | --- | ---
Reception & Bank Administration | 6 |  
Initial Collecting & Sorting |  |
Organics | 7.90 | 8.88 | 5 |
Plastic | 1.60 | 1.78 | 1 |
Glass | 0.30 | 0.83 | 0.5 |
Cardboard & Paper | 1.30 | 13.00 | 7 |
Textile | 1.20 | 0.86 | 1 |
Rubber | 0.10 | 0.01 | 0.5 |
Metals | 0.20 | 0.01 | 0.5 |
Rest Household Waste | 2.60 | 21.67 | 11 |

**Total Collection/ Sorting, incl. Admin and 8m² workspace** | 40 |

**Processing**

- Cleaning: 20
- Drying: 40
- Shredding: 8
- Heating: 10
- Compressing: 10
- Cooling: 15
- Casting: 8
- Finishing: 9

**Total Minimum Processing incl. 15m² workspace** | 135 |

**Trading**

- Storing: 20
- Selling: 5

**Total Trading incl. 5m² workspace** | 30 |

**TOTAL** | 205 |
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<tr>
<th></th>
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<td>day/cap.</td>
<td>0,0007</td>
<td>0,0019</td>
<td>0,0007</td>
<td>0,0019</td>
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<td>day</td>
<td>1.800</td>
<td>4.952</td>
<td>2</td>
<td>6</td>
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<td>week</td>
<td>12.601</td>
<td>34.664</td>
<td>15</td>
<td>41</td>
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<td>month</td>
<td>54.760</td>
<td>150.639</td>
<td>66</td>
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<td>year</td>
<td>657.051</td>
<td>1.807.473</td>
<td>792</td>
<td>2.151</td>
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<table>
<thead>
<tr>
<th>Waste Composition</th>
<th>Bandung ton</th>
<th>Bandung %</th>
<th>Cigondewah RW02&amp;12 ton</th>
<th>Cigondewah RW02&amp;12 %</th>
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</thead>
<tbody>
<tr>
<td>Organic</td>
<td>6539,9</td>
<td>51,9</td>
<td>7,9</td>
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<td>Inorganic</td>
<td>3893,7</td>
<td>30,9</td>
<td>4,7</td>
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<td>Plastic</td>
<td>1524,7</td>
<td>12,1</td>
<td>1,6</td>
<td>10,7</td>
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<td>Glass</td>
<td>453,6</td>
<td>3,6</td>
<td>0,3</td>
<td>2,3</td>
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<td>Paper</td>
<td>1234,9</td>
<td>9,8</td>
<td>1,3</td>
<td>8,4</td>
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<td>Textiles</td>
<td>441,0</td>
<td>3,5</td>
<td>1,2</td>
<td>8,0</td>
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<td>Rubber</td>
<td>75,6</td>
<td>0,6</td>
<td>0,1</td>
<td>0,5</td>
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<td>Metals</td>
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<td>1,3</td>
<td>0,2</td>
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<td>Other</td>
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<td>17,2</td>
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<td>Total per week (in ton)</td>
<td>12.601,0</td>
<td>100,0</td>
<td>15,2</td>
<td>100,0</td>
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* These measurements taken from transfer points.*

* Average days per month over full year are 30.42 in a regular year.*

Data source: Rahayu, N. & Yudoko, G. (2012). Backcasting Integrated Municipal Solid Waste Management in Bandung City: A ... Bandung: ITB. As part of the 3rd International Conference on Technology and Operations Management, July 4-6, Bandung.
cigondewah has 7900kg organic waste weekly - 15.8m3 (without human feces)
1m3 gas is approx kwh calorific energy=2kWh usable electricity

15m3 = 1200m3 gas= 2400 kwh usable electricity

1200m3 gas produced weekly - 170m3 per day = 5.5m3 powers 2.4 times the energy consumption of my facility

e xtruder:
produces 120-180kg/h and uses 31kwh for that
selfbuilt extruder: 200-400€ (2.8-5.7mil rp)
  weekly energy consumption: full capacity: 960kwH; cigondewah waste: 279kwh

s hredder:
produces 100kg/h at 7.5-15kWh
bought: 920€ - 13mil rp
  weekly energy consumption: full capacity: 330kwH; cigondewah waste: 170kwh

compression oven:
produces ? at approx 2.5kWh per oven (need 6; 2 big (double) 2 small)= 20kWh
selfbuilt at 120€ - 1.7mil rp
  weekly energy consumption: full capacity: 450kwH; cigondewah waste: 450kwh

Tota l:

with machines and cigondewah capacity together i can produce approx 1000 tiles per week - 1 roof