One of the biggest challenges facing climate change and poverty, is indifference.
CIRCULAR COMMUNITIES FOR HOUSING

Rushabh Chheda
aE Graduation Studio 19
Mo Smit | Engbert Van Der Zaag | David Peck
P5 Presentation
10.07.2018
BANDUNG

2.4 Million

4.35 Million

14,283 /km²

25,888 /km²

2010 | 2050

Expanding Urban Population

Rural Migration

INDONESIA | WEST JAVA | BANDUNG
SITE LOCATION
CIGONDEWAH | PT KAHATEX
CIGONDEWAH | KAMPUNGS

RW02
8.1 ha
1200 people
40% migrants

RW12
3.9 ha
1600 people
50% migrants

SITE LOCATION
PROBLEM STATEMENT

HOUSING | WASTE MANAGEMENT
CITY HOUSING STOCK

89% KAMPUNGS

MONTHLY HOUSEHOLD INCOME

61.5% 100-499 USD

FORMAL | INFORMAL BUILDING INDUSTRY

70% INFORMAL
Rapidly Growing Population
Housing Shortage +11.5 million
Poor Quality Constructions
Maximum G+1 Structures

Governement Insufficiency
Self-Build Housing
Horizontal Sprawl Poor Living Conditions
Low Technical Skills
Low-income

HOUSING
FUTURE PROJECTION
TOTAL M.S.W.

2010
1500 TONNES/DAY

2030
2700 TONNES/DAY

2-4% GROWTH RATE

WASTE MANAGEMENT
Disposal of Municipal Solid Waste

Daily MSW Bandung: 1,500 t/d

Total: 1,500 t/d
Collection - Transportation: 1,250.2 t/d

Final Disposal: 810 t/d
Landfill: 789 t/d
Scavengers: 50 t/d

Improper Disposal & Bio-Degradation: 411.2 t/d

Improper Disposal: 92.2 t/d
Primary recycling and composting: 80 t/d
Self-Disposal: 12.8 t/d
Rivers: 9.8 t/d
Open Burning: 69.6 t/d
Others: 77.6 t/d

Waste Management
Composition of Municipal Solid Waste
AFFORDABLE HOUSING

WASTE PLASTIC
OBJECTIVE

HOUSING | RECYCLING
Why?

Prefab Construction
Material from Waste

How?

Easy Construction Technique

What?

Vertical Densification
Structural Stability

Collaboration of the Informal Systems

Affordable Housing Shortage

Affordable Housing

Ecological Sustainability
DESIGN QUESTION

How do we solve the affordable housing crisis in the Kampungs of Indonesia using a 'Decentral' Circular Economy system?
STRATEGY

KAMPUNG HOUSING

LOCAL/SELF BUILDERS

LOCAL SHOP

COMMUNITY COLLABORATION 'GOTONG ROYONG'

INFORMAL RECYCLERS

BANK SAMPAH WASTE BANK (1000 PPL MIN)

DECENTRAL MATERIAL FACTORY

ARCHITECT FACILITATOR & MEDIATOR

GOVERNMENT POLICY & FUNDING
RESEARCH

METHODOLOGY | TYPOLOGY | RESULTS
LEGO BASED DESIGN

PLASTIC WASTE

HOUSING PROVISION

BOGOTA, COLOMBIA

CONCEPTOS PLASTICOS
LEGO based design

SAND + polymer resin

HOUSING provision

WEIBRIDGE, U.K.

POLYDURE - M.A.S.
PROTECTION DURABILITY
AFFORDABLE
LOW-MAINTAINENCE EASY TO USE
AESTHETIC APPEAL

PROTOTYPE HOUSING

DESIGN PROGRAM

REQUIREMENTS
Base Plate

Foundation Wall 300mm

Plinth Level

Sill Level

Window & Lintel

End Wall & Floor Joists

Truss & Roofing

Foundation Pad with Anchor Bolt

CONSTRUCTION
CONSTRUCTION

- Foundation Pad with Anchor Bolt
- Base Plate
- Foundation Wall 300mm
- Plinth Level
- Sill Level
- Window & Lintel
- End Wall & Floor Joists
- Truss & Roofing
SOCIAL SPACES

FRONT PORCH

BALCONY

COURTYARD
7 x FAMILY UNITS
ROOFING TYPOLOGY

DOUBLE ROOF SYSTEM

RAIN WATER HARVESTING

21° - 30°C
Average Temperature

7 MONTHS
Wet Season

10.5 M
ROOFING TYPOLOGY

7.2 M
ROOFING TYPOLOGY

3.9 M
HOUSING DESIGN
SITE LOCATION
DESIGN STRATEGIES

- Cross Ventilation
- Breaking the Edge
- Vehicular Traffic
- Landscape Barrier
- Public Zones
- Flood Protection
- Percolation Pit
DESIGN STRATEGIES

Cross Ventilation
Breaking the Edge
Vehicular Traffic
Landscape Barrier
Public Zones
Flood Protection
Percolation Pit

GROUND FLOOR PLAN
DESIGN STRATEGIES

- Cross Ventilation
- Breaking the Edge
- Vehicular Traffic
- Landscape Barrier
- Public Zones
- Flood Protection
- Percolation Pit

GROUND FLOOR PLAN
DESIGN STRATEGIES

- Cross Ventilation
- Breaking the Edge
- Vehicular Traffic
- Landscape Barrier
- Public Zones
- Flood Protection
- Percolation Pit

GROUND FLOOR PLAN
Poly-Block Permeable Paver

Crushed Brick 6-9mm x 50mm thk
Gravel 20-25mm x 100mm thk
Rammed Earth
150mm thk PolyBlock Wall
Coarse Sand 150mm thk
Crushed Brick 6-9mm x 150mm thk
Gravel 20-25mm x 250mm thk
Drain Pipe

Permeable Pavement
Planter Bed
Deep Percolation Pit
WATER PERCOLATION
FOUNDATION DETAIL

1. R.C.C. Foundation Pad
2. 300mm thk PolyBlock Foundation Wall
3. S.S. Extension Nut
4. M20 Threaded Rod x 950mm
5. S.S. Plate 200mm x 20mm
6. M20 S.S. Nut
7. 15mm Flattened Bamboo Flooring
8. 20mm Recycled Felt Sound Proofing
9. Waterproof Membrane
10. 25thk Bamboo Side Board
11. P.C.C. Floor
12. Coarse Gravel
13. Rammed Earth
1. Wooden Jamb 80mm x 50mm
2. Ventilation Window Frame 40mm x 40mm
3. Horizontal Bamboo Slats
4. Window Mid Jamb 80mm x 80mm
5. Top Rail 40mm x 60mm
6. 8mm Single Glazing
7. Mid Rail 40mm x 40mm
8. S.S. Window Handle
9. 750 mm Wide Sill & Lintel Block
10. 700mm x 100 mm Wooden Support
11. 100 mm x 20 mm S.S. Plate
12. 30mm x 30mm Battens @ 325mm c/c
13. Poly-Block Roof Tiles
14. 50mm x 200mm Floor Joists @300 c/c
15. Stile 40mm x 60mm
16. Muntin 60mm x 40mm
17. M20 Threaded Rod x 950mm
1 Poly-Block Roof Tiles
2 30mm x 30mm Battens @ 325mm c/c
3 30mm x 30mm Runner @ 300mm c/c
4 Steel Purlin 40mm x 75mm @ 1000mm c/c
5 Steel L-Angle Truss 60mm x 60mm @ 3600mm c/c
6 Steel L-Angle Web Bracing 40mm x 40mm
7 M20 S.S. Nut
8 20mm Recycled Felt Sound Proofing
9 Water Proofing Membrane
10 25mm thk Plywood Subfloor
11 50mm x 200mm Floor Joists @ 300 c/c
12 240 mm x 340mm Gutter
13 Aluminum Flashing
14 80 mm PVC Drain Pipe

Gutter Detail

Roof Edge Detail
Wooden Handrail 70mm x 50mm
2. Wooden Ballusters 50mm x 50mm
3. Wooden Mid Rail 50mm x 30mm
4. Woven Bamboo Mat
5. Wooden Cleat
6. 25mm thk Facia Board
7. 15mm Flattened Bamboo Flooring
8. 25mm thk Plywood Subfloor
9. 50mm x 200mm Joist @300 c/c
As of 2015, more than 6.9 billion tons of plastic waste has been generated. Around 9% of that was recycled, 12% was incinerated, and 79% accumulated in landfills or leaked into the environment."

- Planet or Plastic?, National Geographic
STRATEGY

KAMPUNG HOUSING

Local/ Self Builders

Bank Sampah Waste Bank (1000 ppl min)

Community Collaboration 'Gotong Royung'

Informal Recyclers

Local Shop

ARCHITECT FACILITATOR & MEDIATOR

DECENTRAL MATERIAL FACTORY

GOVERNMENT POLICY & FUNDING
CASE STUDY: URBAN RENEWAL

SMART SLUMS: KRILL ARCHITECTS

Joint Venture Condominium

Community Driven Development
Co-Design System
Higher Density
Open Space
Rental Income
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>*Tonnes/ Week</td>
</tr>
<tr>
<td>Organic</td>
<td>51.90</td>
<td>6.30</td>
</tr>
<tr>
<td>Inorganic</td>
<td>30.90</td>
<td>3.78</td>
</tr>
<tr>
<td>Plastic</td>
<td>10.7</td>
<td>1.35</td>
</tr>
<tr>
<td>Glass</td>
<td>2.3</td>
<td>0.28</td>
</tr>
<tr>
<td>Paper</td>
<td>8.4</td>
<td>1.05</td>
</tr>
<tr>
<td>Textile</td>
<td>8.0</td>
<td>0.98</td>
</tr>
<tr>
<td>Rubber</td>
<td>0.5</td>
<td>0.01</td>
</tr>
<tr>
<td>Metals</td>
<td>1.0</td>
<td>0.13</td>
</tr>
<tr>
<td>Others</td>
<td>17.20</td>
<td>2.1</td>
</tr>
<tr>
<td>Weekly Total (Tonnes)</td>
<td>100.0</td>
<td>12.25</td>
</tr>
</tbody>
</table>


= (1500/2.4mil) x 2800 = 0.000625 x 2800 = 1.75 tonnes/Day