Circular Communities
For Housing

Transforming waste plastic and glass into building blocks making housing construction simpler, cheaper, faster and more sustainable

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Choice of Studio:

The focus of the studio is to explore and enhance the connection between architecture and technology and understand how irreversibly these both topics are connected. The 'Research by design' approach of the studio equips the students with the possibilities of exploring their individual technological fascinations and their application in architecture to optimize our built environment. I believe that architects need to deal with relevant social, economic and ecological problems all at the same time in a coherent way with their design. Technology has a big role to play in it, so it is important to adapt to new possibilities of design and architecture, to create a holistic sustainable environment in which we dwell.

Problem Statement:

Indonesia faces a major problem of housing backlog (approximately 11.5 million in 2015) to house the low-income dwellers and migrant workers. 40% of the total population still belongs to the low-income group and 10.9% population living below the poverty line, thus most of the population can’t afford formal housing, increasing their reliance on the Government for housing provision, a basic human need. The government policies in place currently, like the KIP (kampung improvement program), the PERUMNAS programme, the 1:3:6 policy, though introduced with the right intention, fails in solving the issue on a larger scale, thus access to formal housing schemes for a lot people still is unavailable. The residents of the Kampungs and the new residents, who in search for a better life and job prospects come to the city are thus left with no option but to construct their houses on their own, also known as self-built or self-managed housing, where the owner of the house constructs their houses, either on their own or with the help of the informal construction sector, as it is the most affordable option for them.

Currently, 80% of the low-income houses are self-build and 70% of such construction is done by the informal
sector (Utomo – Bappenas 2015). These informal constructions, due to the lack of technical construction knowledge has led to low quality and unsafe houses, hampering the vertical densification of the kampungs, leading to an ever-expanding urban sprawl and poor living conditions.

The population boom along with the industrial developments has aggravated the problem of improper waste management in Indonesia. Bandung City (2.6 million population) generates over 1500 tonnes of domestic waste daily. Only 50-60% of the total MSW (Municipal Solid Waste) generated reaches its final disposal site, which is usually a landfill site, a highly unsustainable method of waste disposal creating loss of potential resources. The rest of the waste ends up either in the local rivers, streams, dumped or burnt in open spaces, causing health hazards. The informal recycling sector plays an important role in acquiring recyclables from such wastes and bringing them back into use. Various players involved in this informal activity include, handcart crews, junkmen, scavengers, waste traders and recyclers in that hierarchy. The main reason for recycling by the informal sector is purely to generate income rather than the need for being sustainable. Indonesia is one of the 5 countries that collectively contribute to 60% of the global ocean plastic pollution. 70% of all plastics produced is single use, also the long shelf life of plastic means that the more plastic we produce, the more waste plastic will leak into our environment.

The main material resources currently used for construction like in other parts of the world are brick, concrete, steel, etc. They are acquired from the local material shops. These materials require a lot of energy for production and transportation and are limited in nature. Considering the magnitude of the construction needed and the current problems of climate change and extensive carbon emissions (39% of total emissions worldwide) by the building industry, housing is not just a spatial and quantitative problem, but also a problem for sustainability in terms of building materials used for construction.
Objective:

In Cigondewah, Indonesia, like in many of the Peri-Urban Kampungs, the existing informal industry can be organized to form a decentral network for the collection, processing, reusing and upcycling of domestic inorganic waste. The design approach aims at using circular concepts of upcycling of domestic waste by creating prefabricated building elements, that are easy to use, low-tech, aesthetically pleasing and low on maintenance, thus reducing the environmental impact from the built environment.

The architect acts as a facilitator for providing the technical knowledge for safe construction, material innovations and optimum use of resources, while maintaining the self-build housing system as the driving force for the transformation. The research results will provide grounds for the feasibility of such a system to be applied in the Kampungs. The design idea is to create prototypes of different housing typologies in the Kampungs using these elements, to convince the people to use the new materials.

The main aim is to improve the quality of life of the people, by designing affordable, comfortable and safely constructed live-work spaces and an inclusive social and public infrastructure to support it, such that the overall community thrives in a highly sustainable environment.

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

Sub-Design Questions:
How to design a hybrid structure for construction to optimize the structural safety and the use of upcycled materials?

How to safely densify the Kampungs, to improve living conditions and provide for public spaces?

What is the role of the architect as a facilitator in developing self-build Kampung housing?

Research Question:
How to develop low tech, sustainable and affordable prefabricated building elements using waste, which can be produced and used safely by the unskilled labor?

Sub-Research Questions:
How to create a decentralized circular material economy, by including the informal recyclers and the informal self-building industry as the main actors in the process?
Method and Process:

Literature Study:
The research began by doing a literature analysis of the context by studying the relevant research papers, books, journals and documentaries regarding the housing typologies, the structure and working of the informal sector, statistics about the population demographics, housing, government schemes and the Municipal solid waste management system. Case studies were investigated based on the conceptual fascination after the initial research.

Field Study:
During the field trip, interviews were conducted of the residents, to get a grip on the life in the Kampungs and investigate the issues directly. The observations during the visit helped understand the structure of the informal sectors and their role in the community. The different typologies of Kampung houses in both urban and rural contexts were documented by means of sketches, videos and photographs. The observations of the constructions helped to analyze the skills and techniques of the informal building industry.

Interviews:
Interviews were conducted of the people working in the informal construction and recycling industry, factory workers and some Kampung residents to get an overall picture of the context. This helped to get valuable information about the societal and technical challenges that might arise in using waste as a building material.

Research by Design:
The research paper aims at investigating the possibilities and potentials of a decentral collaboration between the informal sectors, to provide for affordable housing, conscious use of limited resources and reducing plastic pollution. The design is supported by the inferences made after research and field study. The research will be continued ahead by design development, material and technical explorations and by studying relevant case studies.

Design by Model Making:
Further research with regards to material experimentation, product prototyping and testing, will be done during the next design phase, to check the feasibility for application in the prototypes.
Literature:

20. Tenure security for Indonesia’s urban poor. (n.d.).
31. Formalizing the Informal: Understanding the Position of Informal Settlements and Slums in Sustainable
Urbanization Policies and Strategies in Bandung, Indonesia


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**Time Planning:**

### Table: Time Planning

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**Notes:**

- Writing:
  - Graduation Plan
  - Research Paper
  - Literature
  - Case Studies
  - Field Trip
  - Program

- Design:
  - Concept
  - Sketch
  - Preliminary Design

- Presentation:
  - Preparation
  - Reflection

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**Notes:**

- Research:
  - Literature
  - Case Studies
  - Program

- Design:
  - Concept
  - Drawing
  - Virtual 3D Model
  - Physical Model

- Presentation:
  - Preparation
  - Reflection