Graduation Plan for AE students

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Studio
Name of studio: Architectural Engineering
Teachers: Mo Smit, Andy van den Dobbelsteen
Argumentations of choice of the studio:
Explore the real problems and real possibilities to solve them. Have more knowledge about technical aspects in architecture – mainly in field of climatic design and sustainability.

Title
Into the climate – representation of four different climates by on building.

Graduation Project

Problem Statement
Problem statement 1: lack of bioclimatic designs

For centuries craftsman and architect had different tasks. Architects were focused on representative architecture, where the aesthetics, need to impress the observer and showing the power overcome the importance of environment and local climate. On the other hand, provincial craftsmen built dwellings to meet the needs of community, protecting them from local weather conditions and providing a comfort of living.

Nowadays, both professions come together and architects are the designers of all kinds of structures - from high-rises to dwellings. However, regrettably, the knowledge of craftsmanship, which was improved through centuries, become forgotten. Additionally, globalisation became not only an advantage for architecture but also a problem. No matter where the dwelling is located – Africa, Asia, Europe... - the design methods and used materials became similar. Looking at the building it is not only hard to define in which climate zone it is built but what is more important they are not suitable for the local climate, requiring compensation from high-tech solutions, which led to even bigger impact on the environment and health of their inhabitants.

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One of the regions which use imported foreign building methides and materials is Indonesia, which for many years was a Dutch cologne. This caused the loss of identity of bigger cities – some of them changed their character over the years, while other, like Bandung, were from the beginning planned on European standards. Also, the way of building slowly transformed to the overseas one, which not always met the needs of tropical monsoon climate.

The vernacular architecture of Indonesia was not only design with the culture and tradition but also for this specific climate – wide roof extension preventing from rain and structures lifted on the poles avoiding floods. Unfortunately, the contemporary villages became not only unsustainable but also not safe to live in – built fast, without governmental control, with minimum knowledge about the used materials or safety rules. Moreover, lack of new, local ways of buildings houses according to climatic principles cause not only problems within the dwellings but also have an impact to the environment - covering the footprint of the houses with not preamble materials led to often flooding.

Problem statement 2: lack of off-the-grid solutions/ lack of traditional craftsmanship

For centuries Indonesia is known for its textile and manufacturing culture. Nevertheless, the way of working on the textiles changed with time. Traditional manufacturing was a cottage industry based on local raw fibres and dyes, like kapok, or indigo. Moreover, Bandung was planned in the past as a garden city, which also allowed to keep the local ecology and growth of raw materials in home forest gardens-Pekerangan or man-made forests – Samida. Industrialisation, nevertheless, brought problem of pollution the rivers with waste water from textile industry and extract of huge quantities of ground water from deep acquirers caused drought of surrounded fields, water stress, landsubidence and floods. Factories, lacking local raw products started to order them from overseas. Farmers sold their dry lands to textile entrepreneurs and started either to work for textiles business themselves or extend and rent their houses for new workers. At the end new workers themselves started to build an industrial off-the-grid kampung on the dry lands taking away the last green spaces of the village.

Textile and garment industry is not only disconnected from the local ecology and agriculture but also disturbed the daily life of the community causing creations of unhealthy, polluted kampungs. Moreover, kampungs are overcrowded and there is a need for new densified typology of housing.
Objective/Aim/ Approach

On one hand, kampungs in Bandung copes with problems of unsafe dwellings not adjusted to local climate, insufficient number of them and overpopulation. On the other, the pollution and living off-the-grid cause slow devastation of the local ecology.

Problem of houses not suitable for the climate conditions is not only in Indonesia but in the whole world. Building methods of contemporary dwellings are similar in all over the world. People create a brick or concrete cube with air-tight windows and add modern innovations to improve the quality of indoor climate, which use cost them significantly every month. This does not lead to any healthy solution.

On the other hand, vernacular architecture was built in low-tech solutions without access to any contemporary innovations. Craftsmen built the houses with bioclimatic principles, taking into account the climate and location of the structure to achieve the best heating and cooling properties. People built for the needs not for innovations.

Bioclimatic principles in design are not so common anymore. For this reason, I would like to bring back this knowledge and as a research, not only collect all climatic rules learned from vernacular architecture in hot-humid climate but in other three more extreme examples – hot-dry, continental and cold. As a result, I would like to create a bioclimatic guide for architects, showing all similarities and differences between dwellings in various zones. Every climate is unique and requires diverse techniques of building, however, using local materials and bioclimatic principles it is possible to shape a low-tech dwelling.

Nevertheless, kampung Cigondewah is also struggling with problems of pollution and living off-the-grid, while within the social aspects there is a redefinition of the local inhabitants’ roles in the village, shortage of the housing and living on a small surface. Nevertheless, there in an interesting aspect of Indonesia that still 44% of garment industry in this country is home-based.

For an overall design I would like to create a textile village with closed flows, on the wetlands of Cigondewah. The living-working houses for workers would be designed with the bioclimatic principles form the researched guide and densified within plot. Moreover, I would like to extend the idea of sustainable design to the scale of the small semi-sufficient village on off-the-grid plot. Closing variety of the flows would decrease the impact on the environment. As the main ones I would like to focus on organic water purification and treatment, sewage treatment and organic waste. Later on the fertilizer could be used in local garden for food and building material growth.

The water in wetlands would be purified by the wet plants like bamboo or reed at the same giving a job for local farmers. Thanks to the plants the workers could either made textiles in their own workshops and create garments/sell textiles to the local fabric or learn how to build save houses from the local growing materials.

Thanks to this project people would not only have new, safe, healthy places to live but also to work. Moreover, the local, rural character of the village would be brought back – farmers would be able to do their job again, while others would have common green spaces.
Overall design question
How to create a densified, semi-sufficient, off-the grid village, producing sustainable garments and consist of bioclimatic dwellings in Cigondewah, Bandung, Indonesia?

Thematic Research Question
How to create bioclimatic dwellings learning from vernacular architecture in four different climate zones: hot-humid, hot-dry, continental, cold?

Sub1. What contains typical vernacular architecture in chosen climatic zones?

Sub2. What are the biggest weather obstacle in specific zones?

Sub3. What are the principles of bioclimatic design in specific climate zone?

Sub4. How to create bioclimatic dwelling in contemporary time? What elements are additionally needed?

Methodologies
Literature study
Reference analyzing
Research by design
Research at the field - Bandung

Relevance
Reinventing bioclimatic design and vernacular architecture.
There are a lot of real and literature examples of vernacular architecture in Indonesia, showcasing the adjustments of the building to local climate. Nevertheless, nowadays this kind of knowledge and way of building is forgotten in Indonesia. Concrete, bricks and other imported materials took over the local ones. Moreover, bioclimatic design especially important for such climate is less and less visible especially in the cities and using some new techniques or solutions. Project could be an example how to create suitable buildings for local climate, re-inventing old techniques of building with raw materials and create a fast, safe and affordable dwellings.
In my opinion, it is important to improve and combine the traditional local knowledge of building with traditional one. In this way not only bring back culture but also low-tech sustainable solutions.
Literature


Hot, dry climate:

Hot, wet climate:

Cold climate: