Life in a Shell
A Farming Integrated Dwelling in a Greenhouse Envelope

Ruoning Ni 4617541
Mentors: Jan Jongert, Parravicini Mauro, Tomesen Paddy

The relationship between research and design

In the research paper, I explored the complementary material flows between the dwelling and the greenhouse farming system. The research concluded in several proposals which include a prototype for architectural design (figure 1) and an assessment workflow (figure 2) to evaluate the environmental and economic impacts. Since the research is aiming at improving the physical performance of existing buildings. A preliminary study on the target building for renovation is also included in the research (figure 3). The quantified possible material exchanges in the building as well the production of the rooftop farm indicated the potential of the design project.

After the P2, the greenhouse envelope and rooftop farming system proposed in the research is further developed in the design project as a renovation solution for a military dormitory in the Marineterrien, Amsterdam. In term of climate, the buffer zone and inner chimneys are designed to guide the residual heat from the apartments to the rooftop farm. In the architectural design, the buffering zone created by the greenhouse envelope, which was initially proposed for the climate reason, becomes also the key part where the spatial quality of the existing building is enhanced. The buffer zone replaced closed corridors as the main transportation space towards each living unit. Besides, the rooftop farm works not only a place for food production but also a featured experience of the building. Design decisions are also made to attract visitors' interest towards the rooftop farm.

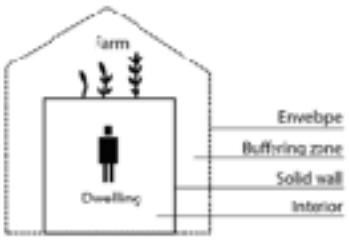

Figure 1

Figure 2

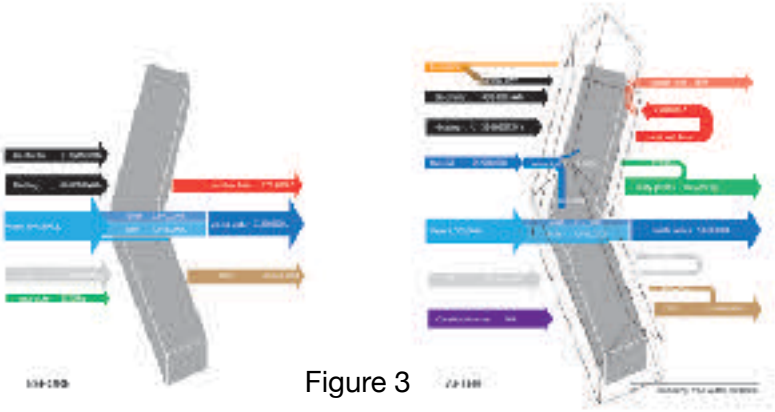

Figure 3

The relationship between graduation topic, the studio topic, master track , and master programme

The overall topic of the AE graduation studio, 'INTECTURE', which is about exploring innovative technologies in architecture that benefit the broader environment as well as the spacial experience. In terms of my project, the study starts with the theoretical material flows in a greenhouse envelope which gradually developed into spacial strategies as well.

Other than the overall 'INTECTURE' concept, the research topic of my graduation project is part of the 'flow' track which is about the material flow in the building and the urban environment. My research starts with the pain points in Amsterdam as an urban environment. Then it developed into a specific focus on the material flow inside a greenhouse envelope which tackles the issues found in the urban scale.

Elaboration on research method and approach chosen

The methodology of this project starts with a technical fascination based on existing issues in a specific but representing urban context, in my case, Amsterdam. Then the technical fascination is further explored through scientific research, in both qualitative and quantitative perspectives. In the conclusion of the research paper, a prototype architectural intervention is proposed for the application in a practical situation. The design task is then a continuity of the prototype from the research and is developed based on not just spacial and social concerns, but also climate strategy, structure, and materiality.

Overall the final design project is a result of the initial research findings at various levels, from the social and environmental impact to the architectonic details.

The relationship between the graduation project and the wider social, professional and scientific framework, the transferability of the project results.

The research on the complementary material flows between two typical building environments, the dwelling and the greenhouse, is aiming to be a theoretical guide for future transformation of existing buildings. In the conclusion, a workflow that evaluates the potential and investment of a possible project is proposed. This workflow tackles social, climatical, environmental, economic impacts of a project which is fundamental for renovation cases in many situations.

The design project is a renovation of an existing building with an independent and disassembly structure. It is used as in a way that could enhance the thermal performance, as well as the optimization of material flows inside the envelope. So it has the potential to be applied in other existing buildings. Also, the structure and the cladding are designed to be easily disassembled so it could be used for other projects in future.

The ethical issues and dilemmas

One issue I met in the design process is about the balance of the investment and the added values it brings. How much does the extended part need to do? What's the positioning of the extension in the building environment? The in-between space created by the greenhouse envelope was initially intending to create a comfortable space for the residents to use during all weather conditions. However, a comfortable indoor environment in such a big scale requests a considerable amount of materials and management. In the end, the decision was made to position it as a semi-outdoor space which only needs basic cladding, using simple and economic materials such as single glazing. As a result, the extension performances as a buffer zone between indoor and outdoor space.

Conclusion

In conclusion, the design project is a further development of the prototype proposed in the research. In the design decisions, the complementary material flow plays a central role while the spacial and social value of the intervention is elaborated as well.

However, to consider this project in real practice, more studies are needed such as the investment of the added construction as well as the quantification of resource cost compared to conventional situations.