REFLECTION PAPER

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DESIGN OBJECTIVE

I want to try to prove that a highrise building can be designed significantly more sustainable than traditional highrise buildings. I also want to try to prove that a sustainable highrise concept also contributes to a liveable and inclusive building and city environment. Therefore, my design question is: Is it possible to design a sustainable highrise concept for an urbanized modern city to account for population growth and climate change while also making sure that it contributes to a liveable and inclusive city and building environment?

1. What is the relation between your graduation project topic, your master track (Ar, Ur, BT, LA, MBE), and your master programme (MSc AUBS)?

Highrise buildings have always been a personal fascination, but after doing some research and education on this topic, I found out that highrise buildings in general are not sustainable at all, and with the agenda on aiming for a sustainable future, there has to be a way to change the narrative into a sustainable concept. Since this topic is very broad, complex and requires a lot of cross-disciplinary knowledge positioning, I figured that a project like this would be the ultimate graduation project for me. In order to change the concept of highrise buildings from something not sustainable and counter-interactive with the city scape to something with a more environment-friendly and liveable character, there should be a focus on reconceptualizing this building typology from an architectural perspective since you can design a building from a cross-disciplinary point of view where all disciplines interact and possibly counteract with each other in order to provide one (of possibly more) solutions in the form of a building that supports your vision. This is where the Architecture Master track relates to the graduation topic.

From what I have learned from the Master studio Architectural Engineering is that it is about creating architectural concepts from a personal technical fascination. Quantifying sustainability efforts in order to change a building concept with the aid of architectural and computational methods such as Parametric design, BIM, and data analysis to support your design fits within the description of a technical design process. These methods are also my preferred methods since I have a fascination for using computational design methods and software. Also, with more focus being laid on building engineering, structural engineering, and climate design to justify my architectural and sustainability efforts adds to the focus on a technical approach. That is how my graduation topic relates to the Master studio Architectural Engineering.

2. How did your research influence your design/recommendations and how did the design/recommendations influence your research?

During the concept phase of my design, I needed to assess knowledge on the most sustainable approach to highrise construction since the structure has a significant impact on the carbon footprint of a highrise building. Therefore, for my research I wanted to test if a simplified highrise structure layout can be significantly more sustainable compared to a traditional highrise structure layout. I also wanted to see which materials result to an optimized carbon footprint layout by means of parametric design optimization. Therefore, my research question is: To what extent is it possible to reduce carbon footprint

of a highrise structure with parametric design methods? What I found out after collecting the data for the structural and carbon footprint properties of construction materials and setting op the conditions for the experiment, is that a parametric optimization has proved that a structural layout containing timber CLT floors and timber Glulam columns scattered over a grid with divided spans has potential to be approximately 46% more sustainable than a similar traditional concrete layout. This result from my research determined the structural typology and materialization of the structure of my design. Due to my research, I knew that in order to contribute to a sustainable highrise, I needed to use a Timber frame containing CLT floors and Glulam columns with a concrete core for stability for my design. These elements have a beneficial effect to the total carbon footprint of the building and during its lifetime store a considerable amount of CO2. In short, my research determined the structure of my design while also making a huge impact on sustainability efforts.

3. **How do you assess the value of your way of working (your approach, your used methods, used methodology)?**

In my methodology, I mainly used computational design methods in an integral way in order to provide solutions with design interventions, and to justify design decisions. I consider that a beneficial method to my design process since it is cross-disciplinary focused, data-driven, and possibly prevents design clashes. My approach was mainly focused on building engineering, structural engineering, and climate design due to topics such as stability, load bearing capacity, fire safety, acoustic performance and climate design strategies being of great importance for highrise buildings especially. These topics create the necessary scope of design restrictions and possibly opportunities for the project. This approach made sure that the design decisions I made are justified within every cross-disciplinary field touching the design of my highrise building.

4. **How do you assess the academic and societal value, scope and implication of your graduation project, including ethical aspects?**

Making attempt to design a highrise building more sustainable than traditional ways of building requires extensive knowledge on cross-disciplinary fields as stated earlier. Designing a highrise building also has the potential to be comprehensive across the scope of city to detail scale. Furthermore, designing a sustainable highrise building needs an approach of research-based design aided by data from quantifications of the level of sustainability. Furthermore, there are not many examples of highrise buildings designed with sustainable materials such as timber, let alone a highrise building designed with a main approach of sustainability. Therefore, the amount of effort in order to achieve my ultimate goal (or possibly fail but set it as an example) is well in accordance with the expectations of an academic level design approach in my opinion. Also, with a sustainable approach needed within the construction industry in order to contribute to saving the planet and highrise being a well-known example of an unsustainable approach, trying to design a sustainable highrise concept can possibly have significant impact on a societal scope. At last, the question that arises if we as a society should even build highrise buildings due to its unsustainable and lone-wolf character in relation to the city scape and what can be done to change its narrative or reasons why its narrative cannot be changed promotes also ethical dialogues and discussions.

5. **How do you assess the value of the transferability of your project results?**

The results of the project will be explained in an attempt to show if design intervention visible from the presentation slides contribute to a sustainable highrise, a liveable highrise and/ or an inclusive highrise, or not. In that way I can prove or disprove if my highrise design contributes to the question if a highrise building can be designed sustainably to a great extent. The parameters from building policies, strategies, and approaches that aided or restricted certain design choices in my design will also be used to explain if the design achieved its goals. At last, trying to quantify and justify the level of sustainability and liveability will also be the main approach to guide the story. Altogether, during periods of struggle in development of my project, the feedback from the tutors and students helped the design process aim into the right direction, and I hope that my results will reflect if my efforts are worthy for graduation.