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This document shortly reflects on my actions during the 2024-2025 academic year in the *Architectural Wood Studio*.

1. The relationship **between my graduation project, master track Architecture, and the MSc AUBS program:**

My graduation project focuses on optimizing CO_2 uptake with minimal embodied energy through both research and design. The research identifies key parameters influencing the CO_2 balance, such as CO_2 storage, Operational Carbon, Embodied Energy, and Operational Energy. Integrating these parameters into design requires a clear visual translation, which I applied in the project by extending an existing building.

The design incorporates strategies like building on an existing grid to save materials, reinforcing the structure for longevity, adding balconies and drip edges for climate resilience, and introducing a large roof with solar panels, wind turbines, natural ventilation, and shading. These choices aim to significantly reduce the building's energy demand while enhancing CO_2 storage.

Calculating the building's performance in CO_2eq/m^2 compared to other timber constructions demonstrates the impact of these design choices. This step-by-step approach aligns with my ambition to innovate sustainable architecture, fitting seamlessly with the MSc AUBS program's focus on sustainable urban development and architectural innovation.

2. How my research and design influenced each other:

My research identified key parameters, especially building lifespan, as critical to maximizing CO_2 storage. This led me to design for a 500-year service life (inspired by Japanese pagodas) with easily replaceable components, high adaptability, and accessible building services. Strategies include moisture/fire/UV protection, high insulation with vapor-open assemblies, natural ventilation (Venturi effect), on-site water storage, sustainable systems, adaptable shading, and minimal floor area per occupant.

Conversely, designing revealed that structural mass dominates CO_2 storage. In later stages, I reduced and slimmed structural members (using rule-of-thumb calculations) to lighten the frame and improve the CO_2-to-embodied-energy ratio. These insights refined my “Guide to Maximize Carbon Uptake and Minimize Embodied Energy,” ensuring the model and design evolved together.

3. Evaluation of my approach, methods, and methodology:

Time constraints and unreliable LCA data meant many decisions relied on expert judgment rather than detailed scenario calculations. Grounding my work in prior thesis knowledge and expert discussions provided a valid research foundation. I found that small refinements barely impact the design, core strategies (e.g. durable structure, high insulation, natural ventilation) drive the biggest CO_2 and embodied-energy gains. A comparative analysis with Brock Commons confirmed the approach’s effectiveness. In future work, earlier focus on these core strategies and more rigorous quantitative data would further strengthen the argument.

4. Academic and societal value, scope, implications (including ethics):

This project turns scattered timber-construction LCA studies into a clear, practical design guide, filling a gap in actionable advice for architects and engineers. By demonstrating how timber extensions can cut CO_2 emissions (up to 9 % of needed global reductions by 2030) and streamline early-stage decision-making, it directly supports the Netherlands’ housing goals (401 000 unit deficit) and Paris targets.

Ethically, it promotes material reduction and long-life design, ensures social cohesion by integrating new and existing users (shared workspaces), and enhances occupant well-being through biophilic elements (roof gardens, balconies). Its strategies are scalable across similar climates and material markets in Europe, offering a replicable model for responsible, low-carbon construction.

5. Assessing the value of the transferability of my project results:

My project hinges on the transparency of the model I developed. After defining the parameters and applying the model, it gave me clarity and guidance throughout the design process. Several experts reviewed it to confirm that every parameter is complete and accurate. That said, transparency for others depends on hands-on use: without at least a brief introduction, new users may find it hard to follow. I intentionally kept the model as simple as possible, but real understanding comes from entering your own data and seeing how each choice affects CO_2 uptake and embodied energy.

The final design is a direct output of this model, a clear example of how to build responsibly. It isn't perfectly optimized, and improvements are possible, but it demonstrates the core vision: use materials and carbon sparingly and design for lifespans well beyond 75 years.

6. How has my understanding of sustainable design evolved through this project?

My previous thesis gave me material knowledge and basic strategies for housing, but I lacked insight into large-scale commercial projects and the tangled world of MKI, LCA, and MPG metrics. Through hands-on research I learned exactly how these calculation rules work and formed my own informed critique. Diving further into this research exposed me to the gaps and inconsistencies in CO_2 data, sharpening my critical perspective. Developing and applying a parameter-driven model taught me to design every project with a 500-year lifespan in mind, prioritizing CO_2 storage, material emissions, CO_2eq/m^2, and operational energy. I now have a clear toolbox for spotting impact hotspots and integrating effective strategies into any design. This knowledge boost will guide my future practice and help me persuade other architects to build more responsibly.

7. How would I refine my project in a follow-up study?

Conducting a year of research and developing a project has proven quite challenging given the complexity of this design issue. The model, after a single test, is unlikely to be fully optimised. However, it is undoubtedly a step in the right direction. In future projects, I would like to expand and refine the model, keeping it detailed yet transparent to ensure ease of use while acknowledging that personal expertise and creativity will always play a role.
If more time were available, I would also focus on improving the connections. Although minimal steel was used, only a few corner profiles, I'm sure that moment-resistant connections without steel exist and could further enhance the project.

Time constraints and the lack of measurement data meant that some design choices were based on assumptions and reference examples. Ideally, every decision could be quantified in terms of CO_2 and embodied energy, making each choice entirely justifiable. In practice, however, this is challenging, as data on CO_2 storage from existing timber buildings is rarely disclosed. Despite these limitations, this project marks the first step towards a manageable and adaptable model.