Reflection on My Graduation Project

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The Reuse of Spaces Beneath Bridge Decks

1. Connecting My Graduation Project to My Master's Track and Programme

My graduation project explores the reuse of vacant spaces beneath bridge decks in urban environments, with a specific focus on the Papendrechtsebrug. The proposal to transform this underutilized space into a semi-indoor swimming facility aligns closely with the broader themes of my master's track in Architecture (A) and the MSc AUBS programme.

At its core, my project addresses the intersection of urban infrastructure, spatial reuse, and architectural innovation. It challenges conventional perceptions of bridges as mere infrastructural elements, instead positioning them as spatial opportunities that can benefit urban connectivity. By viewing the bridge deck as a "free" pre-existing roof, my research and design engage with circular thinking, demonstrating how the repurposing of bridges can minimize material use while capitalizing on their structural qualities, particularly their large spans and durable construction. This approach resonates with the sustainable and adaptive reuse principles emphasized within my academic programme and my main personal drivers for me to be in the Revitalising Heritage studio.

2. The Interplay Between Research and Design

My research and design are each informing and refining the other. Through my research, I explored various strategies for reusing bridges and identified the primary drivers and challenges associated with their repurposing. The interviews I conducted with residents near the Papendrechtsebrug revealed three additional key concerns that I had not initially considered:

1. **Noise Pollution** – The bridge is a significant source of noise, which directly affects the quality of life for nearby residents.
2. **Functional Connectivity** – Rather than valuing the bridge for its aesthetics or heritage, residents primarily appreciate it for its practical role in connecting them to essential locations.
3. **Local Knowledge** – The residents possess an intimate understanding of the bridge and its surrounding environment, knowledge that is often overlooked in professional planning processes.

These insights significantly shaped my design approach. For instance, the noise pollution issue prompted me to integrate not just a building façade but also a more extensive noise barrier within the design.

Conversely, my design process also led me to further research. Understanding how bridges move and vibrate was crucial in ensuring that any structure built beneath or adjacent to the Papendrechtsebrug would remain structurally independent of these dynamic forces. This technical investigation was essential in refining the feasibility of my proposal.

3. Evaluating My Methodology and Approach

I believe the strength of my project lies in its dual perspective: an architectural vision that challenges traditional spatial uses while remaining adaptable to real-world needs. The space beneath bridges is unconventional and demands a design approach that is both explorative and responsive. My working method, consistently shifting between physical models, technical drawings, and digital impressions, helped me grasp the unique spatial qualities and scale of this atypical architectural intervention. I believe this iterative process is key in ensuring that my design remains both conceptually ambitious and practically grounded.

4. Assessing the Academic and Social Value of My Graduation Project

Academically, my project contributes to the growing discourse on adaptive reuse and circular architecture, offering a novel perspective on the potential of bridge infrastructure. It challenges the traditional division between infrastructure and urban space, proposing a multifunctional role for bridges that goes beyond transport.

A key aspect of my design approach was to enhance the circularity of the intervention by embedding principles of modularity, reversibility, and standardization throughout the proposal. The design was developed to be readable and reproducible, with repetitive structural elements that can be assembled and disassembled down to the foundations. I made a conscious effort to take the production and construction processes of individual components into account, considering how materials are sourced, fabricated, and joined in ways that support future reuse. Central to this strategy was the development of a clear sectional grammar, which defines the architectural logic of the building while allowing for future adaptation and transformation.

From a social perspective, the project engages directly with community needs, addressing concerns such as noise pollution, accessibility, and the pragmatic relationship residents have with the bridge. By integrating these lived experiences into the design, the project underscores the importance of community-driven urban interventions.

Ethically, my work highlights the significance of inclusive design. Often, major infrastructural projects overlook the voices of those who live in their immediate vicinity. By incorporating local perspectives into the decision-making process, my project advocates for a more participatory approach to urban redevelopment.

5. Transferability and Future Implications

The principles and methodologies explored in my project provide transferable insights. While my case study is specific to the Papendrechtsebrug, the broader concept of repurposing spaces beneath bridges can be applied in various urban contexts worldwide. Many cities face the challenge of underutilized infrastructural spaces, whether beneath bridges, highways, or viaducts. By demonstrating a feasible and community-conscious approach to reactivation, my project serves as a reference for similar interventions in different urban settings.

As a concluding outcome of this project, I have translated my design and research into a set of nine guiding principles for reactivating spaces beneath bridge and roof-like structures (figure 1). These principles prioritize the use of the existing structure as a ready-made roof, enabling material efficiency and supporting circular construction. They emphasize the

importance of (re)connecting fragmented urban areas, ensuring safety, structural independence, and maintaining access for infrastructure maintenance. Additionally, they address the integration of escape routes, the removal of on-bridge noise barriers to enhance road safety, and the potential to deliver added value—from ecological functions to renewable energy systems. Together, these guidelines offer a replicable framework for transforming infrastructural voids into productive, adaptable, and socially meaningful urban spaces.

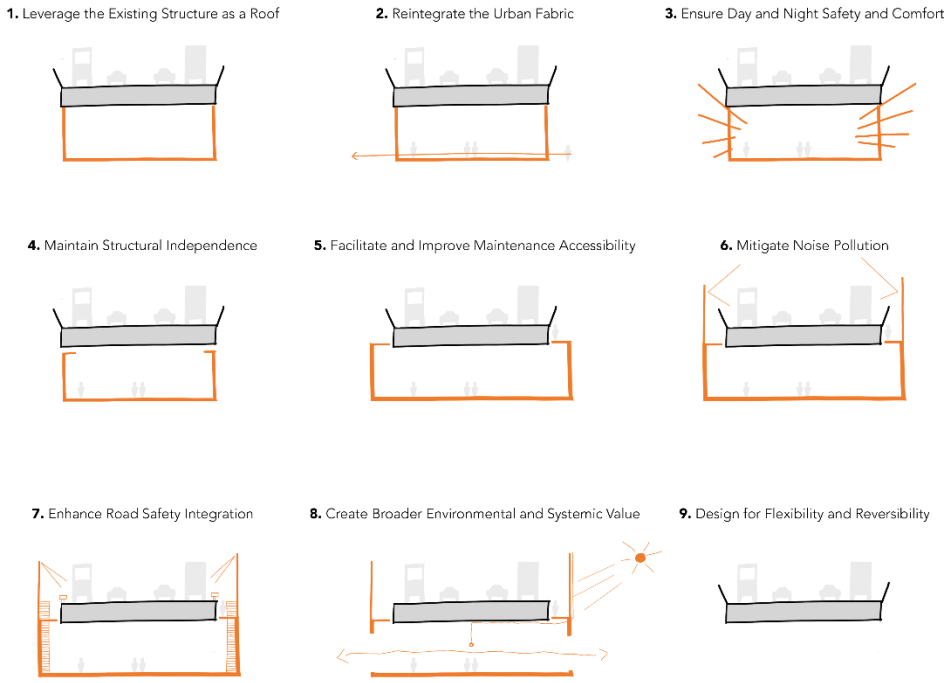

Figure 1: 9 Design guidelines for reactivating spaces beneath bridge and roof-like structures.

While my project provides a foundation for understanding bridge reuse from a design and community perspective, future research should expand on these findings in several ways:

- Quantitative Studies on Community Impact – A larger-scale study involving diverse community groups could provide a more comprehensive understanding of public perceptions of bridge reuse.
- Exploration of Structural Integration Techniques – Further technical research is needed on how structures can be safely integrated beneath existing bridges while mitigating issues such as vibration, load transfer, and weather exposure.
- Economic Feasibility Analysis – A deeper exploration of cost-effectiveness and financial models for implementing such reuse strategies would be valuable for policymakers and developers.

6. In what ways does my project relate to heritage, and how does it contribute to the discourse on cultural preservation?

My project is inherently connected to heritage through its focus on the reuse and reinterpretation of existing infrastructure, specifically the Papendrechtsebrug. While the bridge itself may not be widely recognized as a historical landmark, it holds significance within the local context as a long-standing infrastructural element that shapes both the physical and social landscape of the area. By repurposing the space beneath the bridge, the project engages with the idea of living heritage, adapting built structures to contemporary needs while maintaining their presence and relevance in the urban environment.

Moreover, the project challenges conventional perceptions of heritage by shifting the focus from purely aesthetic or historical appreciation to functional and communal value. The interviews with local residents revealed that their connection to the bridge is primarily practical rather than sentimental, emphasizing its role as a critical connection rather than an architectural landmark. However, this does not diminish the bridge's cultural relevance; instead, it suggests that heritage can be understood not only in terms of historical significance but also through its continued role in shaping daily life.

By integrating adaptive reuse strategies, the project contributes to the discourse on cultural preservation by demonstrating that heritage is not static but can evolve through thoughtful interventions. It advocates for a broader understanding of preservation, one that acknowledges both tangible and intangible aspects of infrastructure and considers community needs as central to sustaining the relevance of built heritage.

7. What I Take Away from This Project for My Future Profession

This project has reinforced my belief that contemporary design and construction techniques, such as parametric modelling, material passports, 3D scanning, prefabrication, and modular systems, equip us with powerful tools to adapt and reuse the existing built environment. These innovations allow us not only to work more efficiently and sustainably, but also to bridge the gap between the old and the new, blending innovation with the character and memory embedded in existing structures. Rather than seeing the built environment as fixed or obsolete, I now see it as a resourceful and dynamic foundation for transformation.

Another important takeaway is the value of engaging diverse perspectives throughout the design process. This project has shown me that as architects, our role is not to dictate outcomes, but rather to act as humble facilitators of spatial change. We help shape the initial vision, but must remain responsive to the knowledge, needs, and experiences of others, especially those who are affected by the built environment.

Lastly, this project has deepened my understanding of architecture as a discipline that defines a grammar, a framework of spatial, material, and structural logic, while allowing room for variation and adaptation within that structure. Good architecture, I believe, provides clarity without rigidity; it gives form to an idea, but accepts that over time, uses will shift, people will intervene, and meanings will evolve. Carrying this mindset forward, I hope to approach future projects with both vision and openness, crafting designs that are rooted in context and built to adapt.

Design Guidelines for the Adaptive Use of Spaces Beneath Bridge and Roof-Like Structures

1. **Leverage the Existing Structure as a Roof**
   Utilize the inherent overhead cover provided by the bridge to minimize the need for additional structural elements and materials, supporting material efficiency and circular construction principles.

2. **Reintegrate the Urban Fabric**
   Use the space to (re)connect fragmented urban areas, creating a socially engaging program that encourages movement, occupation, and continuity.

3. **Ensure Day and Night Safety and Comfort**
   Integrate lighting, sightlines, and spatial openness to promote a sense of safety and visibility during both day- and nighttime use, enhancing the space's public value.

4. **Maintain Structural Independence**
   Ensure a structural and dynamic separation between the bridge and any added architectural volume to accommodate vibrations, movement, and long-term performance. Any closings in terms of thermal skin or vapor barriers should be able to withstand the vibrations and movement of the bridge.

5. **Facilitate and Improve Maintenance Accessibility**
   Design the space to retain or enhance access for bridge inspection and maintenance, integrating such considerations into circulation and service strategies.

6. **Mitigate Noise and Environmental Pollution**
   Employ architectural and landscape elements to reduce the acoustic impact of traffic and other sources of noise, improving the environmental quality of the space. For example, the facade of the added volume can have the dual function as free-standing noise barrier.

7. **Enhance Road Safety and Infrastructure Integration**
   Improve adjacent infrastructure by optimizing road width, barriers, and visual clarity, for example made possible by removing the need for noise barriers on the bridge. Use the space below to integrate escape routes from the upper deck, contributing to safer and more efficient traffic management.

8. **Create Broader Environmental and Systemic Value**
   Use the space to generate additional benefits beyond its immediate function, such as integrating ecological interventions, renewable energy systems, climate adaptation measures, or urban utilities, thereby contributing to long-term environmental resilience and multifunctional urban infrastructure.

9. **Design for Flexibility and Reversibility**
   Embed modularity, reversibility, and adaptability in the architectural language to ensure that the space can evolve over time with changing needs/programs, or that it can be completely removed in case of bigger changes.