

# Mitigating Landslides in Bogotá's Periphery

## REFLECTION

**Architectural Engineering Studio**

Yannick Warmerdam

Mo Smit

Paddy Tomesen

**Daniela Diaz Avila** (5901553)

## REFLECTION

I began by identifying landslides as a global issue with severe consequences and explored how architectural engineering could mitigate their impact. Focusing on South America, particularly Colombia, where landslides are a prevalent hazard, I analyzed the Plan of Territorial Use to identify the most vulnerable areas in semi-urban zones on the periphery of cities like Bogotá, characterized by steep topography, challenging weather conditions, and a consistent demographic profile.

The project aimed to design a housing typology that prioritizes safety while improving the quality of life for displaced communities, often forced to settle in informal developments. These settlements lack proper urban planning, contribute to deforestation, and fail to meet basic living standards. Self-built homes are frequently structurally unsound and made with substandard materials, increasing risks in landslide-prone areas. These factors underscored the need for sustainable architectural solutions. To address the socio-economic challenges of these communities, I focused on bio-based and recycled building materials. As the project developed, it became clear that a replicable housing typology was only part of the solution. The scope expanded to designing a self-sustaining housing block system that incorporated landslide mitigation techniques. This included a complete cluster layout with carefully designed interstitial spaces. During the site visit and discussions with the community, the importance of social spaces emerged as a priority. To meet this need, the design incorporated a community garden, a children's park, a material storage and workshop space, and an outdoor lounge. These features aim to foster social interaction, support communal activities, and enhance the overall quality of life within the housing block.

My approach effectively addressed both the identified problem and the community's needs. Visiting the site allowed for a deeper analysis and provided valuable firsthand insights that guided the integration of critical design elements. The iterative research and design process further refined the solutions, such as adopting a mixed foundation strategy of embedded and stilted structures to adapt to the terrain. However, discussions with my tutors raised important questions about the project's boundaries and flexibility. They encouraged me to test the limits of my building system, exploring how it could adapt to accommodate diverse preferences rather than a homogeneous layout, ensuring greater adaptability and user agency.

The project aligns closely with the architectural engineering studio, which emphasizes the integration of architectural and engineering techniques. It also resonates with technological themes such as Biodiversity & Nature Inclusivity and the "make" ethos, empowering communities to construct their own sustainable housing solutions.

My research was elemental in shaping the design and recommendations. By analyzing the socioeconomic conditions, environmental factors, and community needs, I identified critical elements such as landslide mitigation, sustainable materials, and the importance of social spaces. These insights directly informed the development of a self-sustaining housing block system. Conversely, the design process highlighted gaps in the research, such as the need for deeper exploration into community-driven construction techniques and how to optimize bio-based materials for structural safety. This iterative process ensured that the research and design informed and refined each other. Furthermore, I had to add more to my research especially on the

foundation style whether embedded into the terrain or on stilts. The conclusion was a mix of both. My approach, rooted in site-specific research, stakeholder engagement, and iterative design, was valuable in addressing a complex, multi-faceted problem. Methods such as community consultation, site analysis, and relevant insights from vernacular architecture. Additionally, combining architectural and engineering perspectives allowed for a holistic approach to sustainability and safety. The methodology was effective in bridging theory and design, ensuring that the solutions were both feasible and impactful.

Academically, this project contributes to discussions on integrating architecture with engineering to address natural hazards, advancing the use of bio-based materials in disaster-prone areas, and emphasizing community participation. Societally, it tackles issues of displacement, unsafe housing, and environmental degradation, while fostering empowerment through self-build initiatives. Ethically, the project respects community agency by involving them in the process and prioritizing sustainable, low-impact solutions. The use of bio-based and recycled materials, coupled with community-driven construction, can inspire adaptable solutions in other disaster-prone areas. While the design is tailored to Bogotá's periphery, its core engineering strategies—such as biotechnical slope stabilization, tire retention walls, drainage, adaptation to the mountain's contours, and terracing. While also taking into account self-sufficiency, safety, and inclusivity.

Further reflection questions:

- How can the inclusion of local traditions and construction techniques further enhance the community's engagement and ownership of the project?
- How could future technological advancements in bio-based materials further improve the feasibility and performance of this project?

The final phase of the graduation period will focus on testing the design's flexibility by giving each house within the cluster a unique character, reflecting the individuality of its residents. This approach explores customization techniques that transform a house into a home. Additionally, demonstrating how the same modular and construction methods can be used to create various elements would empower the community to continue building and adapting their homes independently, equipped with the foundational skills and techniques they have learned.