12 | Amphibious constructions

Environmental impact	2/3
Risk protection	2/3
Durability	2/3
Affordability	2/3

Intro

Amphibious constructions are a valuable alternative to elevated buildings (see Measure [11]) which tend to be at risk of damage due to strong wind. Since temporary elevation to stay above water during flood events is the key concept of amphibious housing, theses constructions are less vulnerable to wind damage. In the case of flooding, the foundation of amphibious houses rests on the ground. The remaining parts of the house have a structural frame that floats depending on the intensity and depths of the flood event.

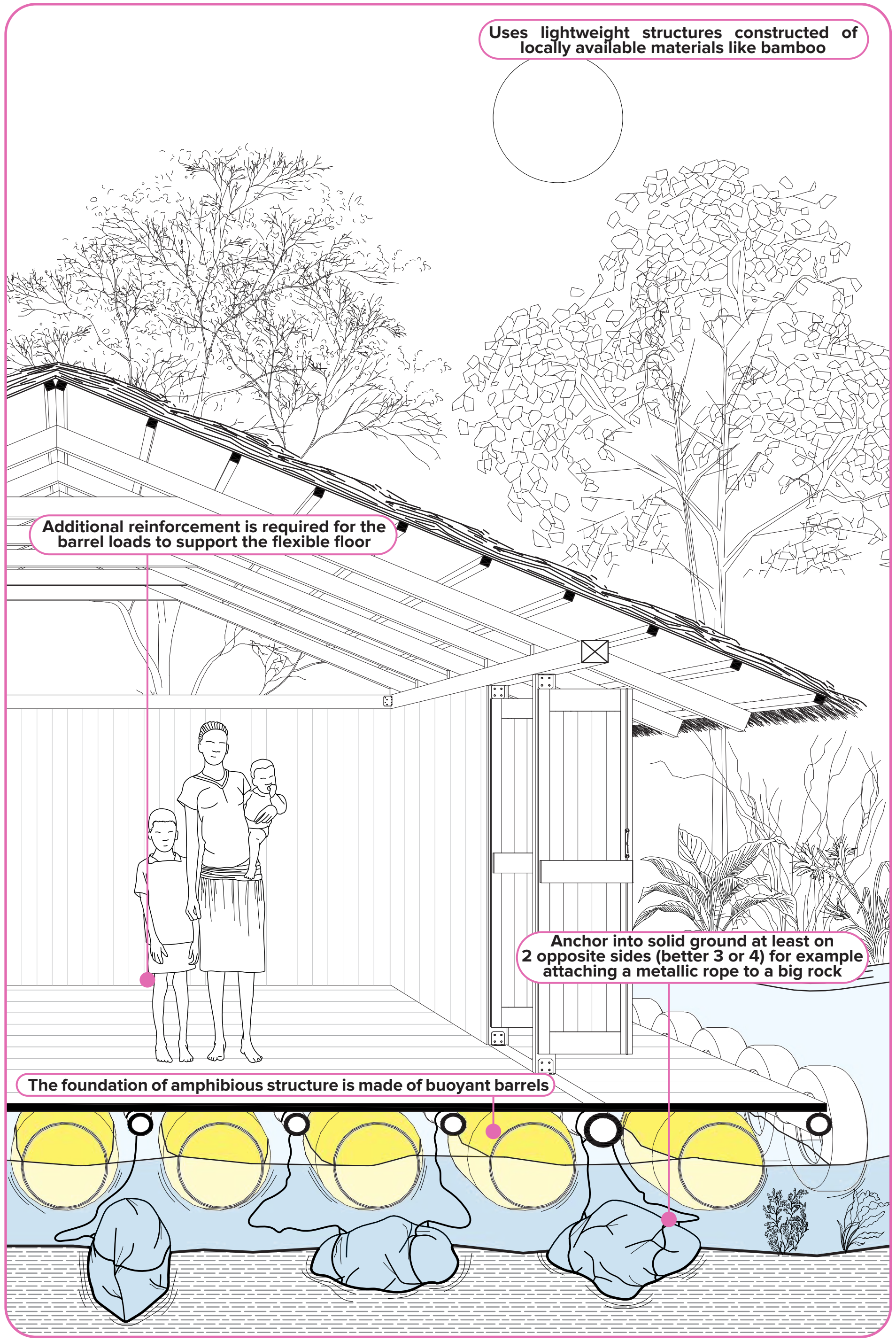
Benefits and Risk

In certain contexts, amphibious housing can be less expensive than permanently elevated housing *(see Measure [11])*. However, there is a need to investigate the impact of amphibious housing on water ecosystems since it may alter the water quality under and near the structure. The environmental impact depends on the scale and number of floating houses. Also, the design and interior of amphibious housing need a high level of accuracy to ensure the house does not face inclinations or the house's overall stability. Proper anchoring allowing the platform to rise with the water level while preventing it to derivate and crash against other buildings or objects is necessary.

Good practice

To tackle the flood risk in the most vulnerable settlements near Jamuna River in Sirajganj, Bangladesh, prototypes of floating houses were developed and implemented together with the community members. These prototypes retrofit existing housing structures by adapting the interior structure: The concept of buoyancy is used to design the floor as a hollow vessel, which ascends and sinks depending on the flood water level. The materials to construct the floor level comprise a lightweight surface that covers timber rafters. Both, the surface and rafters are made of timber. The void within the construction is then filled with reused plastic bottles.

The building process is undertaken in a participatory manner by involving the local communities, ensuring that the local people learn how to build the houses themselves. The involvement of the community contributes to local empowerment, creating identity and fostering the independent maintenance of the buildings. The project was carried out by the COmmunity REsilience through Rapid Prototyping of Flood Proofing (CORE) and the Bangladesh University of Engineering and Technology (BUET) *(Mseleku 2021)*.



Overview of Criteria

Type of Intervention:
Engineered.

Scale of Intervention:
Shelter-Plot-Block.

Materials:
Wood, Sand, Soil, Clay, Concrete, Timber, Steel, Barrels, Bamboo, Timber, Lightweight Surface, Timber Rafter (Wood), Plastic Bottles (see Good Practice)

Environmental Impact:
The carbon footprint of amphibious constructions depends on the refugee camp's location, the building's design, materials, maintenance, and transportation for the material delivery and construction. Generally, local (e.g., bamboo) and renewable materials can lower the carbon footprint. Minimizing material transportation and introducing solar and wind power benefits the overall environmental impact of amphibious constructions.

Targeted Natural Hazard:
Pluvial Flood, Coastal/Riverine Flood.

Targeted Vulnerable Assets:
Buildings.

Strategy Type:
Reduce Asset Vulnerability.

Implementation Time:
Medium (1 month - 1 year).

Effect Duration:
Medium-term (1 year to 10 years), Long-term (>10 years)
The lifespan depends on the construction materials, the refugee camps' exposure to natural hazards, maintenance, and repair.

Investment Costs:
Medium.
For example, a buoyancy system in Louisiana, US, costs around 5000 USD or less (English 2016).

Maintenance Costs (yearly):
Medium (10-50%)

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Flood Risk in Humanitarian Settlements: Compendium of Mitigation Measures

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