10 | Permeable ground and pavement

Environmental impact	3/3
Risk protection	1/3
Durability	2/3
Affordability	2/3

Intro

Using permeable material for the surface of roads, pathways or other open spaces diminishes the overflow by increasing the overall pervious surface, allowing water to infiltrate the ground to limit runoff. Multiple materials can be used such as compacted gravel and sand for roads, or pavement systems with holes or large, permeable joints between the pieces. Pavements can be produced with different materials and promote the use of locally available materials whenever possible.

Combined with geotextiles, the PPS increase their porous capacity and cut the charges for operating sewer systems. Geotextiles remove pollutants from the water before it enters the ground, making it an eco-friendly solution for the downstream surroundings. This leads to the co-benefit of groundwater recharge. Overall, PPS is most effective in the context of short but heavy rainfall.

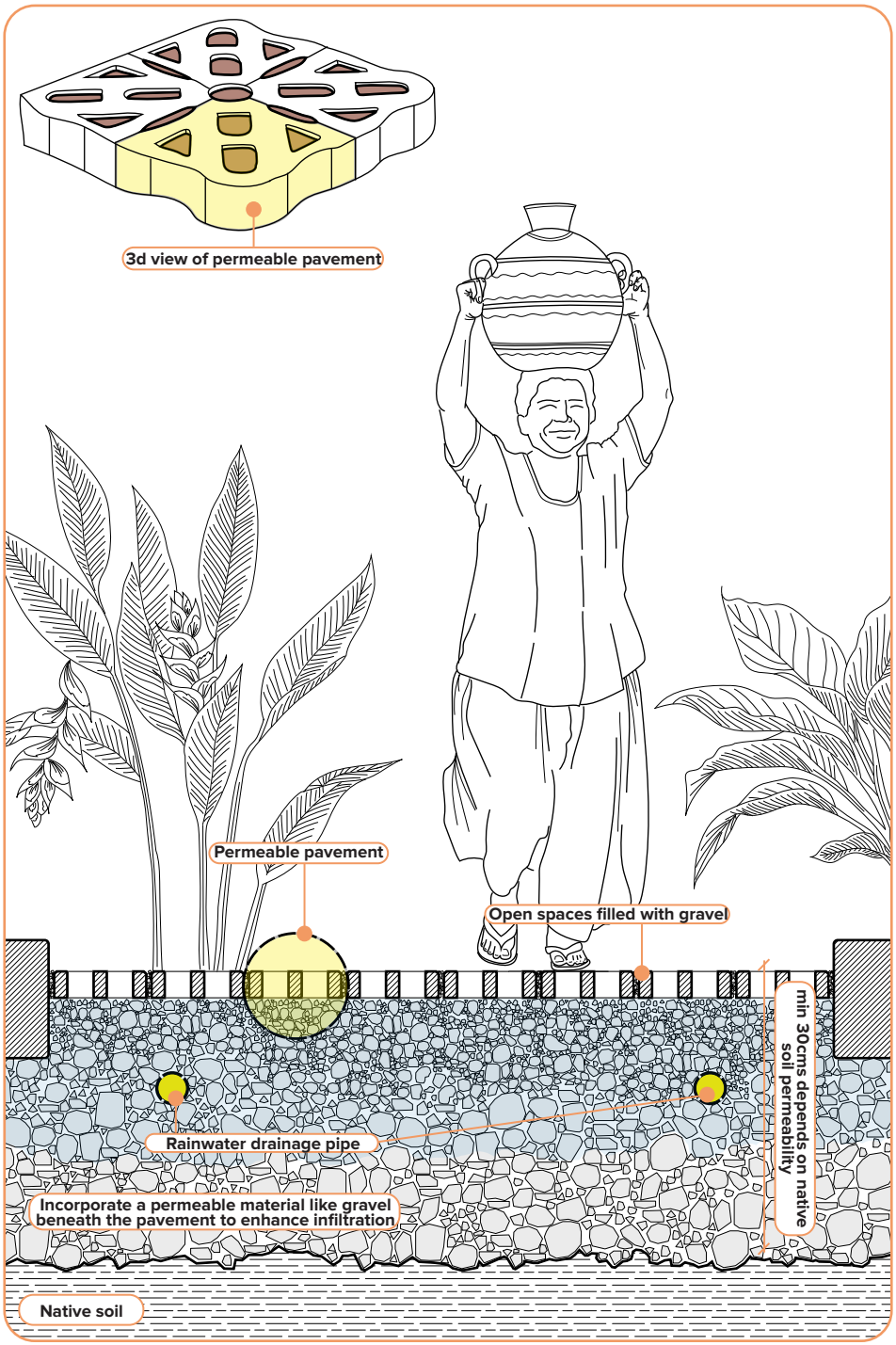
Benefits and Risk

The benefits include stormwater mitigation, which decelerates the deterioration of the overall infrastructure in refugee camps. However, permeable pavement tends to easily clog with debris or sediment and needs regular maintenance. The installation of PPS should, therefore, be avoided in areas with regular and high pollutant loads *(e.g., trash, sediment, chemical storage).*

In some cases, there can be a risk of increased runoff. That is when rainwater remains in the permeable pavement and mixes with the incoming stormwater. Finally, permeable pavement should be used mainly for pedestrians or low traffic due to its limited load-bearing capacity in the context of high and fast traffic.

Good practice:

Permeable terracrete blocks in the Langrug informal settlement, SA.
As a special type of Permeable pavement systems (PPS), 'terracrete' permeable pavements can be partly filled with soil and grass. Permeable terracrete blocks have been installed in the informal settlement of Langrug in Cape Town, South Africa. The goal of the pavement is to tackle the local concerns regarding stormwater flow, fouling of wastewater, littering, and solid waste. In Langrug, the installation paves 1000 square meters of road surface and is part of a wider water management system. It links to greywater disposal points and a pipe system that then leads into small wetlands and tree plantations instead of directly feeding into the municipal sewer system. The installation also includes the planting of indigenous trees along the pavements. The project (The Berg River Improvement Plan) was carried out by the Western Cape Government and Biomimicry SA *(Mseleku 2021).*



Overview of Criteria

Type of Intervention:
Hybrid.

Scale of Intervention:
Shelter-Plot-Block, Settlement.

Materials:
Concrete, Construction waste, Clay, Geotextiles (e.g. reeds, jute, coco), Soil, Grass.

Environmental Impact:

By filtering pollutants from the stormwater, permeable pavement (especially combined with geotextiles) can help improve the water quality of surrounding waterbodies and the groundwater. It supports the maintenance of the groundwater level, which benefits the local ecosystems, vegetation, and water resources. Nevertheless, some designs cannot filter every possible contamination. As a result, contaminants can easier reach the groundwater levels. Finally, terracrete permeable pavement helps reduce heat islands in settlements since the pavement can be combined with vegetation and allows the evaporation of water, which cools the pathways.

Targeted Natural Hazard:
Pluvial Flood.

Targeted Vulnerable Assets:
Buildings.

Strategy Type:
Reduce Asset Vulnerability.

Implementation Time:
Short (1 day – 1 month).

Effect Duration:
Long-term (> 10 year).

Investment Costs:
Medium
$120 – $170 per square meter (Context: Melbourne, Australia) (Concept Concrete 2022); 27 USD (530 ZAR) per square meter of terracrete grass block pavers (Context: South Africa) (Pavement Materials Group n.d.)

Maintenance Costs (yearly):
Low (<10% investment costs)
Due to the increased risk of clogging, regular maintenance is required (see 'Benefits' and'Risks'). Cleaning with a vacuum sweeper twice a year.

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Flood Risk in Humanitarian Settlements: Compendium of Mitigation Measures

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