02 Vernacular / Non-engineered dams

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

Intro

Next to engineered floodwalls (see Measure [01]), there are simpler dams, dikes, and levees made from local materials and without an impervious core. These can include piles of soil, earth, sand, wood, vegetation, stones, or rocks. Vernacular dams are a specific type of such nature-based dams. They describe structures that are created from locally available materials and make use of context-specific traditional knowledge and construction techniques.

Dikes and levees can also occur fully based on geological processes. For example, naturally occurring dikes describe a body of rock blocking water flow, often originating from volcanic action. Natural levees form due to accumulated sediments *(sand, gravels, silts, clay)* after repeated flooding. Combining vernacular and natural dams with engineered structures (including an impervious core) can be particularly efficient in terms of the environmental impact, risk protection, durability, and affordability of a dam, dike, or levee.

Benefits and Risk

Compared to engineered structures, vernacular dams, dikes, and levees benefit from their cost-effectiveness due to the local material use and simpler construction. In addition, they have a lower environmental impact than engineered dams because vernacular/natural dams usually seek to blend into the surrounding ecosystems and environmental context. Finally, vernacular structures are often based on local knowledge and community engagement.

However, vernacular dams, dikes, and levees are generally not as resistant to extreme weather events as engineered solutions and are more prone to erosion, overtopping, slope failure, and damage. That is also because they are commonly of smaller scale and do not involve the same safety features *(e.g., flood gates)* compared to engineered structures.

When constructing dikes, it should be considered that the constructions can lead to a more intense and faster river flow. Moreover, if dikes do not have a proper watertight core *(as the engineered ones have)* and are porous, the water may pass under the dike. Constructing vernacular dikes in regions with clay soils, wetlands, or marshes should also be avoided for the concern of environmental stressors and the risk of drying the areas up if they are not regularly flooded. Consequently, the vernacular dams themselves are often most effective in combination with engineered measures.

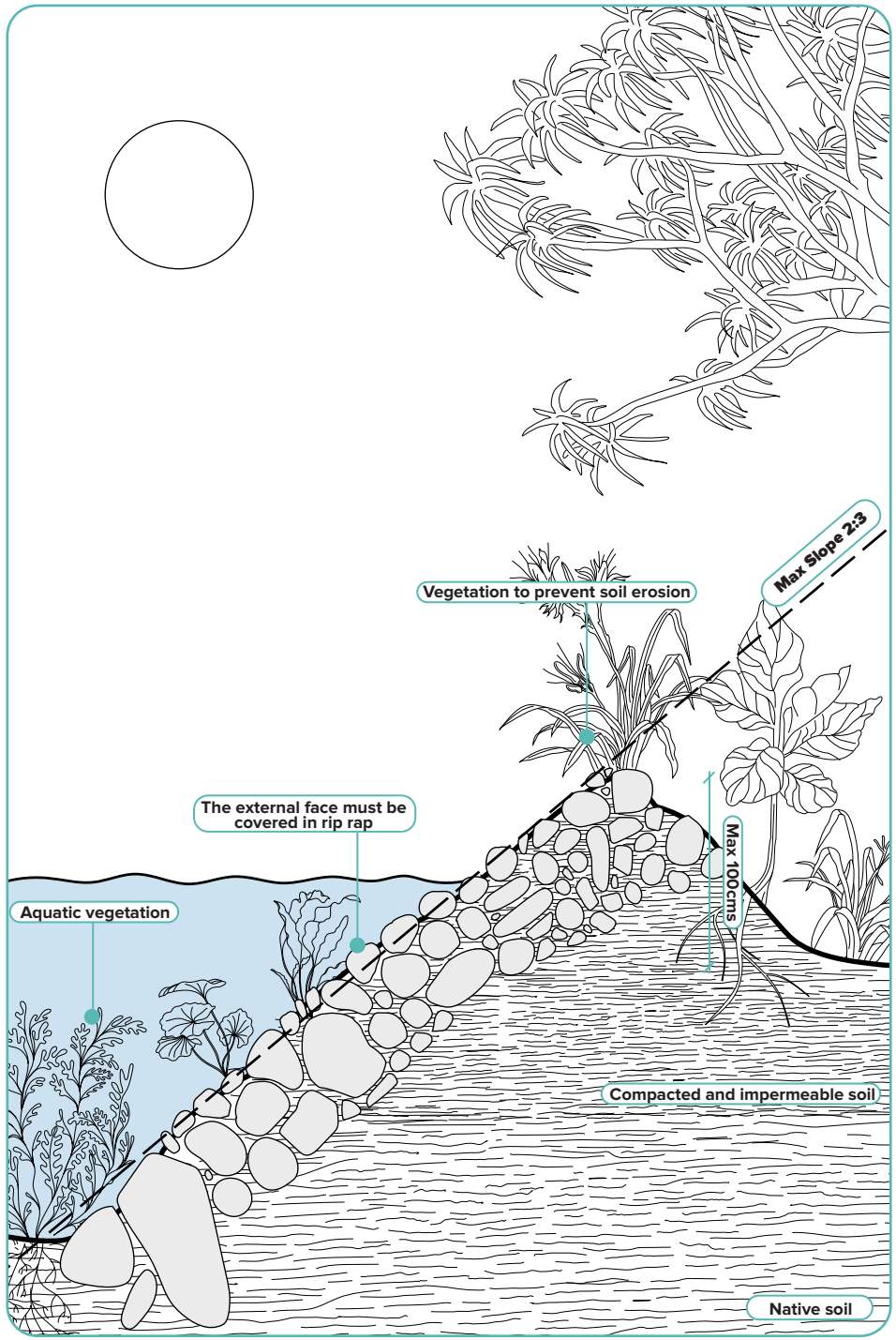

Fig. 04: *Example of an earthen dike in the Al-Redis Refugee Settlement. Philippe Reymond, UNHCR 2023.*

Good practice

Earthen dike in the Al-redis Refugee Camp, Sudan
To protect the residential areas in the Al-Redis refugee settlement in Sudan, an earthen dyke alongside the settlement was constructed during an emergency in 2022. Although the dike has a protective impact on the shelters, it cannot ensure appropriate access during long time periods of the year. That is due to the inundation of the access road to the settlement which could not be averted by the dike.

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Overview of Criteria

Type of Intervention:
Hybrid.

Scale of Intervention:
Settlement, Supra-settlement.

Materials:
Soil, Sand, Wood, Vegetation, Stones, Rocks; Coir (Husk of coconut shell)

Environmental Impact:
Due to their natural occurrence or the use of locally available materials, the environmental impact is comparatively low, and vernacular solutions tend to blend into the surrounding ecosystems. However, dikes and levees can lead to a more intense and faster river flow, erosion, or slope failure. In regions with clay soils, wetlands, or marshes, their construction could trigger environmental stressors and the drying up of the surrounding areas.

Targeted Natural Hazard:
Coastal / Riverine Flood.

Targeted Vulnerable Assets:
Buildings, Land Cover.

Strategy Type:
Reduce Hazard Magnitude.

Implementation Time:
Short (1 day – 1 month), Medium (1 month – 1 year).

Effect Duration:
Medium-term (1 year to 10 years), Long-term (>10 years).

Investment Costs:
Low (Vernacular Dams).

Maintenance Costs (yearly):
Low (<10% investment costs).

Flood Risk in Humanitarian Settlements: Compendium of Mitigation Measures

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