

15 | Green roofs and walls

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

Intro

Green roofs are vegetated installations on top of a building or another built structure. Depending on the building type, size, and strength of the building structure, the installations can range from simple, low-cost green roofs to high-cost and complex roof gardens. Similarly, green walls are vertical, vegetated installations along any kind of wall. They are particularly favored in areas where there is limited space for planting on the ground. Green roofs and walls can support flood mitigation by slowing down the waterflow on the roof and, for example, by avoiding the gutters to spill over. They are best combined with other measures such as rainwater harvesting (see *Measure [09]*).

Benefits and Risk

Green roofs are multi-functional. They mitigate and absorb precipitation and stormwater, especially in the event of less intense but frequently returning rain. Green roofs can reduce air pollution and heat islands. Additionally, they support microclimates and save energy due to their cooling effect. That is also because the cooling effect decreases the need for air conditioning. Green roofs are also able to foster amenity values through, for example, space provision for water harvesting, recreation, food production or education. Similar to green roofs, green walls reduce heat islands and mitigate the rainwater runoff from buildings. However, the mitigation effect concerning heavy rainfall is less effective than the one of green roofs.

Design example

Green roofed containers

Green roofed containers can be a design option for shelter in refugee camps. Transitional shelters, including the ones made from containers, can be equipped with green roofs that again provide biodiverse new habitats and space for potential food production. Depending on the local context, the green roof includes a layer of filtration materials, soil, and native vegetation. The common size of (reused shipping) containers is approximately 6 x 2.4 meters (Full Circle Design n.d.).

Good practice

The UNHCR Domiz Camp in Northern Iraq hosts over 40,000 Syrian refugees. Together with a landscape designer, the UNHCR created a greening strategy which included the installation of Syrian plants such as roses, pomegranate or lemon trees, also in the form of a green wall. The wall included vertically installed tin cans and plastic bottles for gardening that can absorb water from small rain events (Padoan 2018).

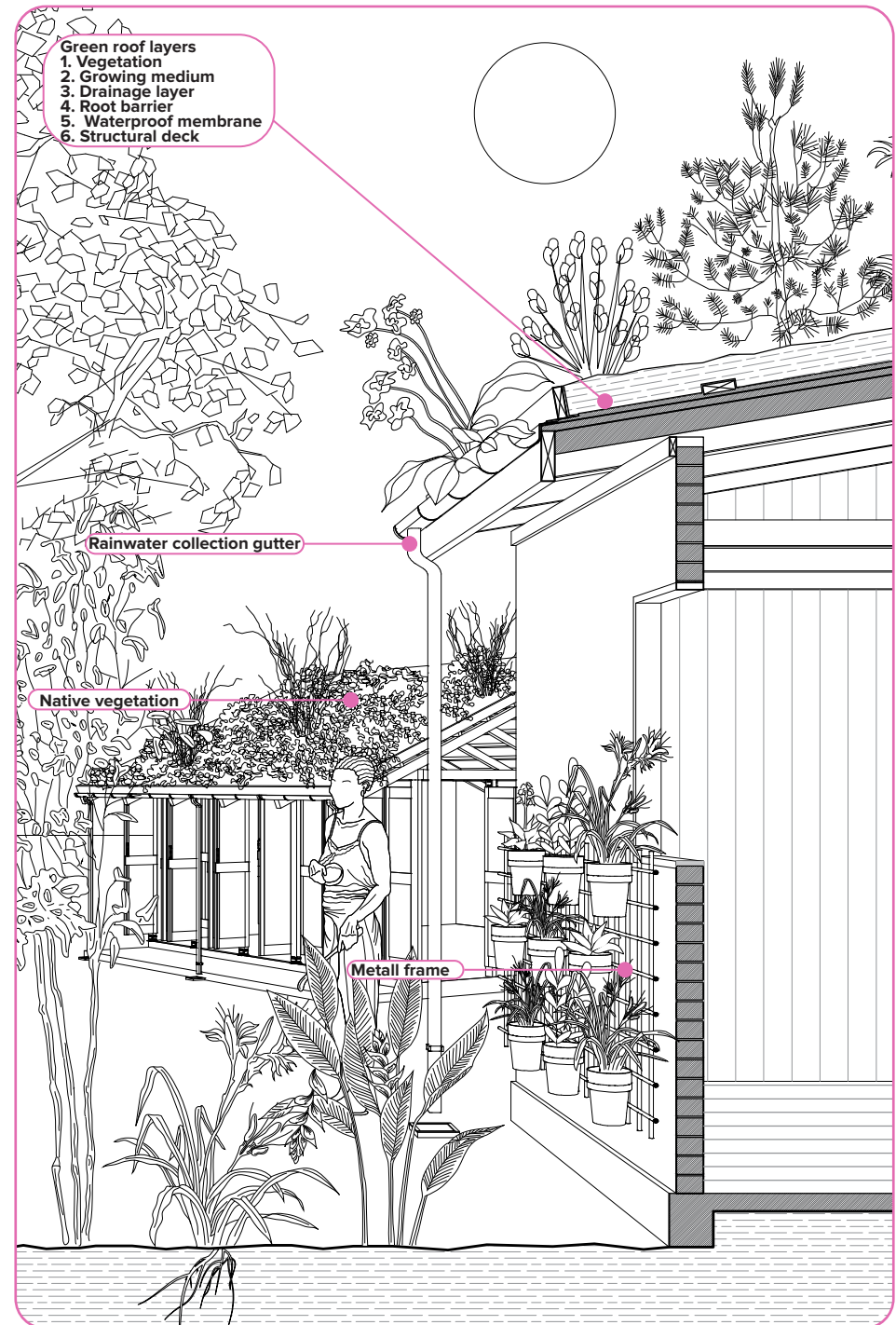




Fig. 15: Design of a Green Roofed Shipping Container. Beaumé and Pabón 2023 based on Full Circle Design and Illustration n.d.

Overview of Criteria

Type of Intervention:

Hybrid.

Scale of Intervention:

Shelter-Plot-Block

Materials:

Wood, soil, waterproof membrane, drainage and filtering, growing media (soil), irrigation & plant materials, (reused shipping containers), painting

Environmental Impact:

Green roofs (and walls) can function as new habitats for insects, birds, or other animals which increases the local biodiversity. The vegetation might improve the air quality by carbon dioxide absorption and foster energy savings (see Benefits and Risks). Although the environmental impact of green roofs is generally positive, there can be reverse effects by, for example, introducing non-native or invasive plant species.

Targeted Natural Hazard:

Pluvial Flood.

Targeted Vulnerable Assets:

Buildings.

Strategy Type:

Reduce Hazard Magnitude, Reduce Asset Vulnerability.

Implementation Time:

Medium (1 month - 1 year).

The implementation time of green roofs usually ranges from several weeks to a few months. However, the timeframe highly depends on factors such as site-specificity, weather conditions, logistics, the roof size, the structure's complexity, the local availability of materials, and the expertise in installing green roofs.

Effect Duration:

Long-Term (>10 years).

Although the waterproof membrane of a green roof has a life expectancy of around 40 years, regular maintenance of the installation, the plants and soil are necessary.

Investment Costs:

Low.

In the United States, it costs approximately \$10-\$25 to install a square foot of a green roof. The implementation of a green roof on top of an existing structure that needs reinforcement could include more costs. Nevertheless, there is evidence that the investment in a green roof will pay back after a short period of time, not least due to the energy savings enabled by the green infrastructure.

Maintenance Costs (yearly):

Low (<10% investment costs).

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Flood Risk in Humanitarian Settlements: Compendium of Mitigation Measures

Spatial Development and Urban Policy, SPUR

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