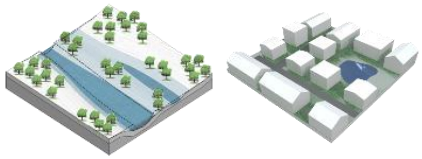
GEOTEXTILES



Suburban and urban	Rivers	High-cost	Riverbank erosion

DESCRIPTION

Measures

Geotextiles are permeable synthetic or biodegradable fabrics featuring high tensile strength and good resistance to UV, chemical substances and micro-organisms. They are provided in 4 to 6-m wide rolls of either woven or non-woven material and are usually placed and anchored on top of a soil slope or embankment. Geotextiles must be placed directly on the exposed soil surface and provide immediate protection against soil erosion by reducing the flow velocity by cushioning the impact of raindrops. They also prevent soil from migrating down the slope and can act as a filter to drain water from or through soils with low permeability. A geotextile blanket protects seeds during the initial stage when vegetation is being established and they improve the surface microclimate, by retaining moisture in the soil which promotes seed germination and thus vegetation growth. There are two main categories of geotextiles:

(i) Biodegradable geotextiles made of natural fibers (jute, coir etc.) are eco-friendly but they decompose after 3 to 5 years so they are more appropriate for slopes where vegetation can easily be established and over time will provide erosion control. Usually, when site conditions are suitable for quick vegetation establishment, a blanket of natural fibers is preferred to synthetic fibers because the material is environmentally friendly, easily available and less costly.

(ii) Synthetic non-biodegradable geotextiles, are made of fibers or yarns and may be woven or non-woven and bonded with resin fabrics. They are made of synthetic fibers (primarily polymers, fiberglass, rubber, steel), or a combination, and are stronger, have a longer life and can provide reinforcement for steep slopes (> 35°). They are used in cases where vegetation cannot easily establish and cannot provide sufficient erosion protection, or for slopes where vegetation will be degraded.

Location

Geotextiles are appropriate for slopes where the erosion hazard is high, and vegetation would otherwise be slow to establish but they are used for a variety of different functions including:

- Placement on steep banks to limit the slippage potential of the soil and improve stability
- Prevent the slope from being washed by rain, wind, tide and wave and prevent soil erosion
- As a filter layer between the soil slope and an outer layer of protective blocks to prevent sand and soil particles from passing through while allowing water to pass freely

Geotextiles provide immediate protection against rain splash and runoff and provide excellent erosion protection in steep or disturbed areas where vegetation is slow to establish. Synthetic mats can be used as reinforcement to add tensile strength to a soil matrix and on steep slopes (> 3:1 H:V) or sloping river channels subject to high flow velocities. They are not suitable for very rocky sites. It is important to select the correct geotextile for the intended application. Some

GEOTEXTILES

	synthetic materials can cause water pollution and, if used for stream bank stabilization, may be a threat to aquatic species and some are tightly woven, making it difficult for grass grown from seed to grow through the blanket.
Design options and performance	The specifications for the geotextile to be selected are determined by soil conditions and slope stability. If the slope conditions are suitable for vegetation growth and the measure is limited to control the runoff erosion, a temporary biodegradable solution such as geotextiles or erosion control blankets made of jute, straw or coir fibers can be selected. If the potential runoff is high, a woven geotextile is preferred because of its higher strength compared to nonwoven materials. When slope conditions are not suitable for easy vegetation growth or when slope reinforcement is required, synthetic products are preferred. However, geotextiles should not be used for slope stabilization for which geogrids would be a better choice.
Feasibility criteria	• **Technical design:** The geotextile blanket must be laid in close contact with the soil surface so, before placing the blanket, the slope surface must be prepared so that it is completely smooth with no projecting rocks, clods, vegetation or other obstructions. The slope surface should be seeded before installing the blanket. The geotextile blankets are first anchored in a trench on the top of the slope and then unrolled down the slope with an overlap of at least 15 cm with the adjacent roll. The blankets are anchored tight to the slope using staples that are fixed in a regular pattern. The length of the staples depends on the depth of the erosion zone and the spacing depends on slope steepness, slope height and general slope stability. • **Soil media:** n/a • **Soil slope:** (> 3:1 H:V) for synthetic geotextiles • **Surface cover:** n/a • **Materials:** geotextile blanket and fixing staples
Operation and maintenance	Once installed little maintenance is required.
Cost and benefits	High-cost measure. The benefits are that geotextiles allow steep slopes to be protected against erosion and vegetated (mainly by seeding with grass) whereas other methods would not be successful. It is very important for sustainability, that geotextiles should be composed of strong, durable, chemically inert polymeric materials that are resistant to the effects of ground conditions, weather, and aging.
Design solutions	Geotextiles provide immediate protection against rain splash and runoff and provide excellent erosion protection in steep or disturbed areas where vegetation is slow to establish. Synthetic mats can be used as reinforcement to add tensile strength to a soil matrix and on steep slopes (> 3:1 H:V) or sloping river channels subject to high flow velocities. They are not suitable for very rocky sites. It is important to select the correct geotextile for the intended application. Some synthetic materials can cause water pollution and, if used for stream bank stabilization, may be a threat to aquatic species and some are tightly woven, making it difficult for grass grown from seed to grow through the blanket.
Environmental performance	Soil erosion is a serious environmental concern and since geotextiles are effective in minimizing soil loss and runoff they have a mitigating effect. The impact on the environment is less however if the fabric used is made from bio-degradable materials such as jute.
Sources	• USDA Natural Resources Conservation Service. 2007. Stream Restoration Handbook, Chapter 14D: Geosynthetics in Stream Restoration.

GEOTEXTILES

- Terralys. Not dated. Geotextiles - Hy-Tex. Accessed via https://www.hy-tex.co.uk/product/terralys-geotextiles/.