



TERRAVUA

Titan Tubes for coastal and Marine applications



Built on change, Powered by connection

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TERRAVUA GEOTEXTILE SOLUTIONS FOR COASTAL APPLICATIONS

Terravua supplies geotextile systems for coastal and marine works where separation, filtration, and soil retention are critical to long-term performance. These materials are used to support shoreline and hydraulic structures by controlling soil loss while allowing water to pass through the system in a controlled manner. Used in place of conventional graded filter layers, geotextiles can simplify construction, reduce material requirements, and improve installation efficiency across a wide range of coastal conditions. Terravua provides solutions for works above water level, within tidal zones, and below the waterline, supported by global product expertise where required.

REVTMENTS

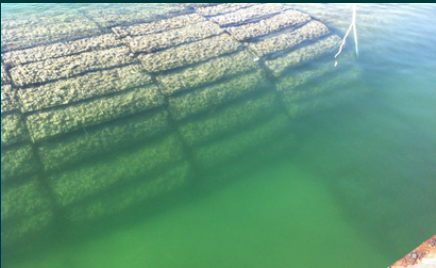
In revetment applications, Terravua geotextiles are installed beneath rock or other armour systems to separate the protection layer from the underlying soil and prevent fines from being washed out. This helps maintain slope integrity, supports drainage, and improves the service life of the overall structure.

BREAKWATERS AND BED PROTECTION:

For breakwaters and bed protection works, Terravua geotextiles are used to protect the underlying formation from scour and instability caused by waves, currents, and hydraulic loading. Installed as a filter layer beneath armour stone or structural protection, they help preserve the bearing surface and support long-term structural performance.

DYKES AND GROYNES:

In dykes and groynes, Terravua geotextiles provide filtration and separation beneath stone, rock, or other protection layers. Their role is to retain foundation and backfill soils while supporting the stability of the structure under changing coastal and hydraulic conditions.



Stone-Armoured Titan Tube Revetment



Beachfront Revetment Installation



Riverbank Protection with Vegetated Titan Tubes



Perimeter Dyke for Marsh Protection



Geotextile Groyne Construction



Dune Core Protection System



Terravua offers geocontainment systems for coastal and marine projects where engineered sand-filled elements can be used to form structural protection works. These systems use locally available fill to create robust containment and shoreline features suited to a variety of applications. By reducing reliance on imported rock and enabling the use of site-won material, geocontainment systems can offer both construction and logistical advantages. They are well suited to projects where access, cost, environmental sensitivity, or material availability make conventional hard-armour solutions less practical.

REVTMENTS:

For revetment works, Terravua geocontainment systems can be used to form erosion protection layers on exposed slopes and shorelines. Filled and installed to suit the design profile, these systems provide effective protection against wave and current action, with additional cover or armour incorporated where required for permanent applications.

BREAKWATERS:

Terravua geocontainment systems can be used in breakwater construction as core elements within larger coastal protection schemes. In suitable conditions, they provide a practical alternative to conventional rock cores and can be integrated with underlayers, armour stone, or other protective measures depending on design requirements.

DYKES AND GROYNES:

For dykes and groynes, Terravua geocontainment systems provide a practical method of constructing containment and shoreline-control structures using sand-filled units. These systems are particularly useful where locally available fill can be utilised efficiently and where project conditions favour a more adaptable construction approach.



REVETMENTS

Revetments are used in coastal and marine environments to protect the toes of cliffs, bluffs, dunes, and other exposed land areas against erosion. They may also be designed to reduce wave energy, limit overtopping, and manage wave reflection. Terravua provides a range of geotextile and geocontainment solutions to suit different revetment types and site conditions, with support from global partners such as Flint where required.

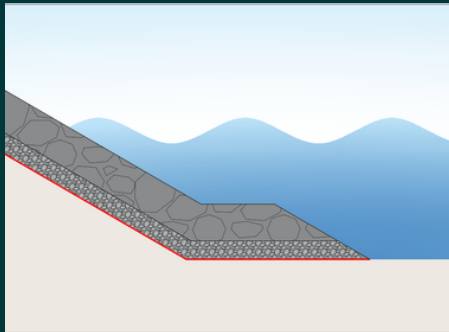
ROCK REVETMENTS

A revetment is a protective layer placed on a soil slope to prevent erosion caused by waves, tides, and currents. In conventional rock revetments, the outer armour layer is designed to resist hydraulic forces, while the underlying geotextile filter layer helps prevent erosion of the base soil. Granular bridging layers may also be incorporated between the armour and the foundation, depending on the design requirements.

The primary armour layer is commonly constructed from rock, but can also include pattern-placed concrete units or other engineered protection systems. Revetments are typically designed with sufficient freeboard to extend protection above the expected wave run-up.

Where this is not practical due to site constraints, a capping element may be incorporated to help deflect overtopping forces.

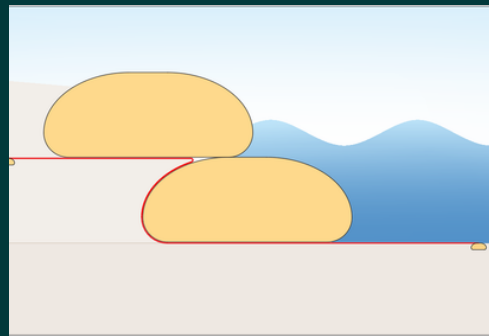
Revetments may be permanently exposed to hydraulic action or may be installed as submerged systems. Submerged revetments are often used in beach and dune protection applications, where the structure remains buried beneath the sand under normal conditions. During storm events, the sand cover may erode temporarily, exposing the revetment so that it can protect against further shoreline loss. Once conditions stabilise, the sand cover can be naturally or artificially restored.



GEOCONTAINMENT REVETMENTS

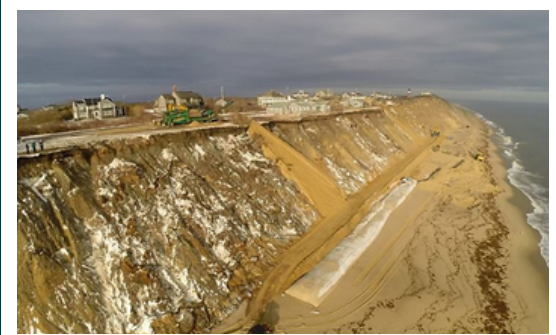
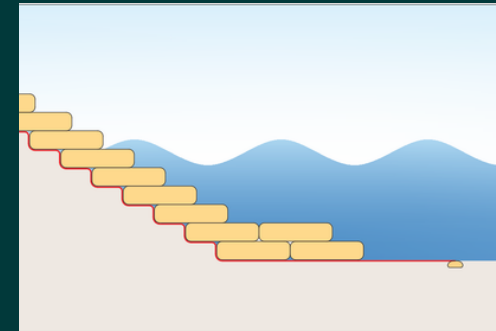
Terravua geocontainment revetment solutions can be formed using hydraulically filled sand-filled tube systems installed in situ. In these applications, locally available sand is used to create stable, mass-gravity structures with good erosion resistance. Depending on the required revetment height and design profile, multiple units can be stacked to achieve the specified slope and protection level. To improve performance at the base of the structure, scour protection measures such as an apron may be incorporated before installation and filling. This helps protect the toe of the revetment against undermining in dynamic coastal conditions.

These revetment systems are particularly well suited to beach protection works, where conventional rock or concrete solutions may be less desirable. They can be installed beneath a sand cover so that the shoreline retains a more natural appearance under normal conditions. During storm events, when sand levels are reduced, the revetment becomes active in protecting the backshore against further erosion. Once conditions stabilise, the beach profile can be restored naturally or through artificial replenishment.



GEOBAG REVETMENTS

Terravua geocontainment revetment solutions can also incorporate sand-filled bag systems. These units are filled on site to a high density and then placed in a controlled pattern to create a stable erosion protection layer. Depending on the application, geobag revetments may be installed as exposed or submerged systems. Where they remain continuously exposed to wave and environmental action, additional protection measures or design considerations may be required to suit the intended service life.



CASE STUDY:

Sand Bluff Stabilisation, USA

A coastal bluff protection project in the USA utilised sand-filled geotextile tubes installed at the toe of an eroding shoreline to reduce wave attack and help stabilise the bluff base. The system formed part of a broader shoreline management strategy that also incorporated sand cover and vegetation measures to support long-term coastal performance.

Solution Highlights

- Toe-of-bluff erosion protection
- Sand-filled geotextile tube system
- Reduced direct wave attack on the bluff base
- Support for slope stability and shoreline resilience
- Integrated sand management and revegetation approach



BREAKWATERS AND BED PROTECTION



CASE STUDY:

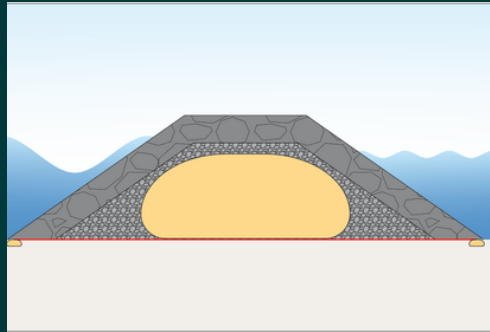
New Fort Pierce City Marina

A coastal protection project in the USA utilised sand-filled geotextile elements to form the core of an artificial island and groyne system designed to improve storm resilience, reduce erosion, and protect key waterfront infrastructure. The solution made effective use of local fill material to create stable mass-gravity structures while reducing dependence on conventional rock-only construction. In addition to shoreline protection, the project also delivered environmental enhancement, highlighting the value of geocontainment systems in modern coastal engineering.

Solution Highlights

- Artificial island and groyne protection concept
- Sand-filled geotextile core elements
- Reduced reliance on imported rock fill
- Scour control and erosion resistance
- Improved storm protection and wave energy dissipation
- Integration of environmental and habitat benefits

Terravua's woven geotextile solutions are used as filtration layers beneath rock-fill breakwaters and bed protection systems to help prevent erosion of the underlying foundation soils. Terravua geocontainment solutions, including sand-filled tube and container systems, can also be used in the core of breakwaters to form stable, mass-gravity structures with strong erosion resistance. Where required, these solutions can be supported by global partners for proven coastal and marine application expertise.



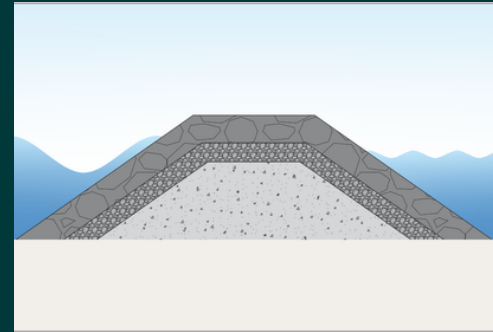
BREAKWATERS

Breakwaters are marine structures designed primarily to dissipate wave energy. They reduce wave forces through a combination of partial reflection and wave breaking along the structure, creating calmer conditions on the protected side. Breakwaters may be attached to the shoreline or constructed offshore as detached systems. In some applications, detached breakwaters may be permanently submerged and used to help retain a perched beach or support shoreline protection behind the structure.

As wave energy is dissipated, turbulence can develop at the toe and across the base of the breakwater. Where the structure is founded on sand, this can lead to erosion of the foundation material and potential instability. To address this, Terravua woven geotextile solutions can be installed beneath the structure as a filtration layer, helping to prevent the loss of foundation soils while allowing water movement through the system.

In more demanding ground conditions, woven geotextile systems may also be used to reinforce the base of breakwaters constructed over soft foundations. In these applications, the reinforcement helps improve stability during construction and early service life, until the underlying soils have consolidated sufficiently to support the structure.

Depending on site conditions and installation requirements, geotextile systems may be prefabricated into large panels or mattress units to simplify offshore placement and improve construction efficiency.



Terravua woven geotextile systems can also be fabricated into large panels or mattress units that are floated into position and then sunk onto the seabed to form a stable foundation layer. Once in place, these mattress systems can be ballasted with rock to secure them against the seabed and provide support for the overlying coastal structure.

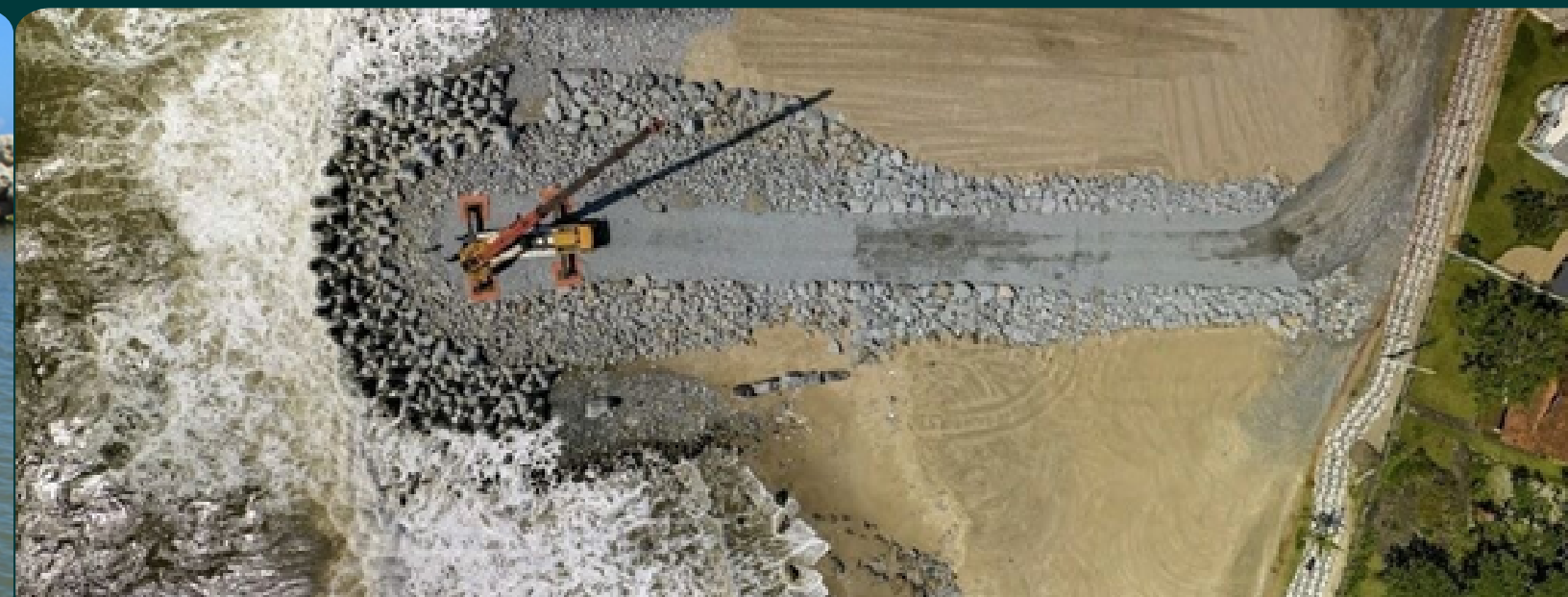
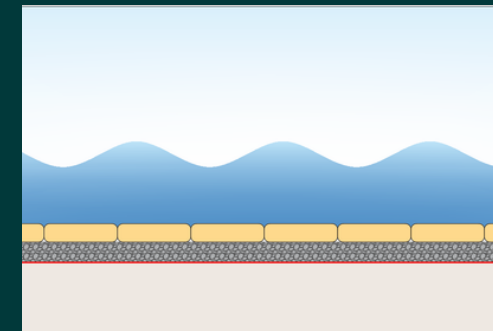
Alternatively, sand-filled tube and container systems can be used to replace the rock-fill core of breakwaters. This approach is particularly attractive where rock is costly, difficult to source, or logistically challenging to install, and where site conditions allow for the use of geocontainment-based mass-gravity structures.

BED PROTECTION

Bed protection systems are similar in principle to revetments, but are installed in a predominantly horizontal configuration. They are used to protect the beds of rivers, harbours, channels, and marine outlets against scour, particularly in areas influenced by hydraulic structures, vessel activity, or concentrated flow conditions.

The upper protection layer may consist of rock armour, but where surface regularity or protection against damage is important, prefabricated concrete elements or linked protection systems may also be used.

Beneath the primary protection layer, a woven geotextile filter can be installed on the bed to help prevent the loss of underlying soils while allowing water movement through the system. Granular bedding layers may also be incorporated as required by the design.



DYKES AND GROYNES

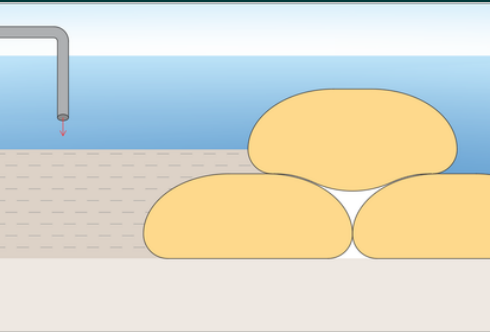
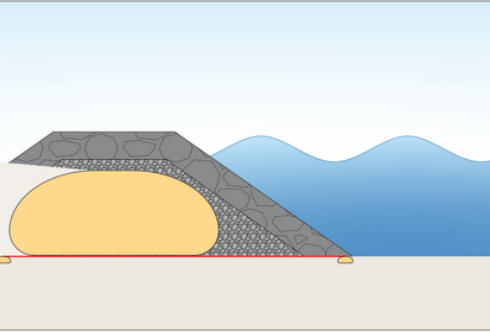
Terravua geotextile solutions are used as filtration layers within rock-fill dykes and groynes to help prevent erosion of adjacent and retained soils. Terravua geocontainment solutions, including sand-filled tube and container systems, can also be used to form the core of dykes and groynes, creating stable, mass-gravity structures with strong erosion resistance and practical installation advantages in suitable coastal conditions. cores of dykes and groynes providing mass-gravity, stable structures.

PROTECTION DYKES

Protection dykes, or levees, are used to control water movement in confined areas and to protect land against flooding and related water damage. Where dykes are required to retain elevated water levels over extended periods, they are designed in a similar manner to embankment dams, with low-permeability zones incorporated to limit seepage through the structure. In these applications, the water-facing slope is typically protected with a revetment to prevent erosion caused by waves, currents, or fluctuating water levels. Protection dykes may also be used in low-lying coastal or estuarine areas where flooding occurs only during storm events, high tides, or other short-duration conditions. In these cases, Terravua geocontainment solutions can be used to form the core of the dyke, with the system then covered by sand or soil to create a more natural profile that blends into the surrounding landscape. During severe storm or high-water events, the outer sand cover may erode and expose the geocontainment core, but the overall dyke structure remains protected against breaching. After the event, the cover material can be restored naturally or through planned rehabilitation, allowing the protection system to continue functioning as intended.

CONTAINMENT DYKES

Containment dykes are used to retain waterborne sediments, hydraulic fills, and other fill materials within a defined area. In coastal and marine works, they are commonly constructed around the perimeter of a reclamation or disposal area to prevent the loss of fill into the surrounding water and to establish the boundary of the works before filling begins. These structures play a critical role in land reclamation, spoil containment, and hydraulic fill operations, providing a stable perimeter that supports controlled placement and retention of material throughout the construction process.



GROYNES

Groynes are coastal structures installed perpendicular to the shoreline to intercept littoral sediment transport within the surf zone. In addition to reducing shoreline erosion, they can also encourage sand accretion by slowing local water velocities and influencing sediment movement along the coast. Conventional groynes are often constructed using rock mounds, timber, or sheet piles. In rock-based systems, a geotextile filter layer is typically installed beneath the structure to help prevent erosion of the foundation soils and reduce the risk of undermining. As an alternative, Terravua geocontainment solutions can be used to form groynes using locally available sand as fill material. These systems are installed in situ and can provide a practical solution where conventional materials are less desirable from a cost, constructability, visual, or public interface perspective. To improve performance, scour protection measures such as an apron may be incorporated around the sides and toe of the structure prior to installation. Smooth-surfaced geocontainment groynes can also offer advantages in public-access coastal areas where safety and aesthetics are important considerations.

Containment dykes are commonly constructed using dumped rock-fill, with a geotextile filter layer installed behind and beneath the bund to help prevent the retained fill or underlying foundation soils from washing out through the structure. This filtration layer supports the stability and long-term performance of the dyke while allowing controlled water movement. As an alternative, Terravua geocontainment solutions can be used to construct containment dykes using locally available sand as the primary fill material. In suitable applications, this offers a practical and efficient option where conventional rock-fill may be costly or difficult to source. In some cases, underwater containment dykes are constructed to retain spoil or other fill materials in a controlled and environmentally responsible manner. In these applications, sand-filled container systems can be used to form the dyke walls and establish the required containment footprint.



CASE STUDY:

Brazil, Jetties and Groynes

In this coastal protection application, jetty and groyne structures formed part of an integrated shoreline management strategy aimed at reducing erosion and improving beach stability along a vulnerable urban coastline. Combined with nourishment measures, the works reflect how coastal control structures can be used to influence sediment movement, support shoreline retention, and strengthen resilience in high-risk marine environments.

Solution Highlights

- Urban coastal erosion mitigation
- Jetty and groyne shoreline control structures
- Support for sand retention and shoreline stabilisation
- Integration with beach nourishment measures
- Application in a dynamic sediment transport environment





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