

Visual Improvement & Ecosystem Establishment on Rock-filled Slopes at Yam O Service Reservoir Project

Toyo Greenland Co., Ltd. is a specialist landscape subcontractor in Hong Kong carrying out numerous local slope landscaping works. Recently, a joint research project is conducted with the Chinese University of Hong Kong and the South China Agriculture University in China. The main objective is to evaluate a special planting technique and identify native planting species that can be established onto the non-soil slopes. To this end, a high level of biodiversity will be achieved and will benefit the environment. Several trial projects were completed on sprayed concrete in Hong Kong since February 2003. We applied a new vegetation system, the Eco-Green System, on a 50-degree rockfilled slope in Yam O on Lantau Island for our client, Water Supply Department. This vegetation system is the first application on the rock gabion slope in Hong Kong.



Melastoma sanguineum (毛稔)

In 2000, an agreement was reached between the Government and The Walt Disney to build Hong Kong Disneyland at a site at Penny's Bay in Lantau Island. A service reservoir with access and pipeline was constructed within the South Lantau Island country park. Some of the slopes were designed to be covered by rock riprap that would have negative visual impact to visitors of the Hong Kong Disneyland. Therefore, Toyo



Gordonia axillaries (大頭茶)

Greenland Co., Ltd. was assigned to green the slopes in order to provide a more enjoyable journey for visitors and rehabilitate the ecosystem of the construction area.

Eco-Green System

The objective of the Eco-Green System is to establish an ecosystem on the man-made slopes so that new habitats can be established and sustained in terms of plant growth and nutrient cycling, on the slope.

By installation of 300mm thickness of Eco-Bag, a durable perforated pvc bag filled with fiber soil was fixed to provide supplementary anchoring support, nutrient and moisture for the establishment of shrub and tree species on the non-soil slopes. Turf



Rhododendron simsii (紅杜鵑)

reinforcement mat was fixed with fabricated fertilizer strip in order to strengthen the planting material to prevent leakage and washout between the rocks. Spacers were fixed under the turf reinforcement mat in order to indicate the thickness of fiber soil sprayed on the top. The fiber soil, which consists with peatmoss, compost, slow release fertilizer and bonding agent were mixed with grass seeds (15g of



Rock filled slope before application of Eco-Green System

Bermuda grass (*Cynodon dactylon* 百慕達) and 10g of Bahia grass (*Paspalum notatum* 百喜草). A special wet spraying machinery was used to spray the mortar to cover the whole slope.



Spraying of planting medium – Soil-Factor

The fiber soil is a good planting medium and its high gas permeability will encourage development of the rooting system. It can also retain moisture and nutrients for roots to improve bioengineering strength of vegetation so as to hold soil particles strongly to prevent erosion. A biodegradable erosion



Mallotus paniculatus (白楸)

control mat, Geomat, was laid to provide the temporary surface erosion control until the successful establishment of vegetation.

Selection of Vegetation Species

The pioneer species of grass vegetation Bermuda (百慕達), Bahia (百喜草) will provide the initial green effect and improve the micro-environment on the slope, Alysicarpus (小葉練夾豆) and the climber *Wedelia trilobata* (鱧旗菊) were planted by sprigging on fiber soil to provide a pleasant visual impact with yellow flowers all year round. Native trees like *Gordonia axillaries* (大頭茶) and *Mallotus paniculatus* (白楸) and shrubs including *Melastoma sanguineum* (毛稔), *Mussaenda pubescens* (玉葉金花), *Phyllanthus emblica* (油甘子), *Rhaphiolepis indica* (車輪梅), *Rhododendron simsii* (紅杜鵑) and *Rhodomyrtus tomentosa* (桃金娘) have been chosen to be planted on the Eco-Bag to attract the inhabitants by providing flowers and fruits. Beside,



Catharanthus roseus (長春花)



Mussaenda pubescens (玉葉金花)



Hibiscus rosa-sinensis (大紅花)

native plants are chosen due to their easy adaptation to the local environment and well grown under the climate of Hong Kong with low maintenance. Two exotic shrub species *Catharanthus roseus* (長春花) and *Hibiscus rosa-sinensis* (大紅花) have been used due to their fast development and growth on the slope. Alysicarpus (小葉練夾豆) was chosen due to its special nitrogen-fixing ability such that supplementary fertilizer will not be required in order to lower the maintenance cost. The vegetation has different flowering periods and flower colours which make the slope beautiful and attractive throughout the years. This project started in April 2004 and will be fully completed in early May 2004.

Unique Planting Materials

The spraying of the unique fiber soil called Soil-Factor Mix which consists of more than 60 % of organic matter such that 50 mm thickness of the layer is good enough to support the selected vegetation of climber and grass species. The gas permeability of the Soil-Factor that allows plant roots to penetrate into the planting medium is the important factor in promoting fast vegetation growth with the chosen seed mix. Besides, the Soil-Factor Mix is the self-sustained material being proved to be non-washed out under the heavy rainstorm on steep slope in Hong Kong. It is light in weight compared to traditional topsoil and has high cohesive ability to provide surface erosion control functions. On the other hand, distinctive Eco-Bag has been used for plantation of shrubs and small trees.

Ecosystem Establishment

Apart from providing erosion control function, the important objective of Eco-Green System is to establish an ecosystem on the slope. An ecosystem consists of a dynamic set of living organisms to interact among themselves, and



Rhodomyrtus tomentosa (桃金娘)



Rhaphiolepis indica (車輪梅)

interact with their surrounding physical environment (soil, climate, water and light). Under the Eco-Green System, the vegetation on the slope can provide self-sustained nutrient cycling and supplement to each other after the full establishment. The green slopes not only can improve the visual impact to the human being or provide the surface erosion control to the engineers; it can also provide and support the habitats to the rare wild life in our valuable country park.



One month after the application of Eco-Green System