

Rehabilitation of Ecosystem in Sai Kok Mei Village Stream Bank

Toyo Greenland Co., Ltd. is a specialized landscape subcontractor in slope landscaping works in Hong Kong. Recently, a joint research project was conducted with the Chinese University of Hong Kong and the South China Agriculture University in China. The main objective is to identify the special planting technique and native plant species that could be established onto the non-soil slopes. Therefore, a high level of biodiversity will be achieved and will benefit the environment. Several trial projects were completed on sprayed concrete in Hong Kong in 2000, and one of them involved a new vegetation system, Eco-Bag System, on the shotcrete slope on the stream bank at Sha Kok Mei Village of Sai Kung. This vegetation system was the first application on a stream bank in Hong Kong in order to reconstruct a functional ecosystem on man-made stream bank slope.

Conditions of Sai Kok Mei Village Stream Bank

The village is located at Sai Kung where high biodiversity of local wildlife had been observed. Engineering works were carried out to stabilize the natural slopes on the stream. According to the engineers' requirement, the natural rock boulders were removed and stocked behind the site. Sprayed shotcrete were applied onto the existing soil surface to prevent erosion of soil due to the high flow of water. However, this engineering cover could not provide a proper habitat for plants. Facing the sensitive environment for rehabilitation and the strict requirements, it is a great challenge to the engineers to provide a self-sustained planting medium on the steep concrete

slopes without washout, especially in the totally submerged condition during heavy rainstorm. Therefore, Toyo Greenland Co., Ltd. was assigned to green the slopes as well as to rehabilitate the ecosystem of this construction working area. This project started in March 2004 and completed in April 2004.

Eco-Bag System Installation

Eco-Bag System is a vegetation treatment for non-soil slope surface along stream bank. Its objective is to establish an



Sprayed concrete for slope protection



Fixing of the Eco-Bag System on the concrete slope

ecosystem in the deteriorated environment so that new habitats can be established, be sustained and allow functional nutrient cycling on the slope. Eco-Bag is an UV-resistance durable perforated PVC bag filled with 300 mm thick of fiber soil. Multiple rows of Eco-Bags are used to provide supplementary

anchoring support, nutrient and moisture for the establishment of grass species on the non-soil slope. The fiber soil, which consists of peatmoss, compost, slow release fertilizer and bonding agent, provides a suitable environment for the vegetation to grow. The fiber soil is a good planting medium and its high gas permeability will encourage the development of a healthy root system. It can also retain moisture and nutrients for roots to improve the bioengineering strength of the vegetation so as to hold soil particles strongly to prevent erosion. It is placed in rows on the non-soil slope surface using galvanized mild steel anchor. The PVC-coated galvanized wire mesh will be fixed as the final cover to prevent soil washout by surface water flow. The slope is then hydroseeded with mixed pioneer grass seeds: Bermuda grass (*Cynodon dactylon* 百慕達) and Bahia grass (*Paspalum notatum* 百喜草). Besides, different sizes of holes will be punched onto the sprayed concrete layer at the bottom of the stream, such that it will hold the river boarder again and provide a habitat to aquatic organisms.

Selection of Vegetation Species



Flowering of *Lonicera japonica* (忍冬) on the Eco-Bag System



Flowering of *Gardenia jasminoides* (白蟬)

The grass species Bermuda (百慕達) and Bahia (百喜草) will provide a pioneer green vegetation cover and improve the micro-environment on the slope. A climber, *Lonicera japonica* (忍冬), was planted on top of the slope which will climb all over the Eco-Bags to provide a pleasant visual impact with yellow and white flowers in April. *Gardenia jasminoides* (白蟬) was planted at the top of the river bank to produce big white flowers from March to August. All these flowers will attract various species of butterflies, dragonflies and birds. Furthermore, these native plants are chosen because of their easy adaptation to the local environment and better growth under the local climate with low maintenance requirement. The vegetation has different flowering periods and flower colours, which makes the slope beautiful and attractive throughout the years.

Unique Planting Materials

Eco-Bag uses a fiber soil called Soil-Factor Mix, which consists of more than 60% of organic matter



Eco-Bag System applied in Sha Kok Mei

such that a 50 mm layer is good enough to support the selected vegetation of climber and grass species. The gas permeability of the Soil-Factor that allows roots of vegetation to penetrate into the planting medium is the important factor in promoting fast vegetation growth using the chosen seed mix. Besides, the Soil-Factor Mix is a self-sustained material proven to be non-washed out under heavy rainstorm on steep slope in Hong Kong. It is light in weight compared with traditional topsoil and has high cohesive ability to provide surface erosion control functions. Further, the distinctive Eco-Bag is UV-resistance and can maintain the soil for the plantation of shrubs and small trees.

Inhabitants Discovered

It was observed that the Eco-Bag System could be self-sustained under the high water flow during the recent black rainstorm signal on 8th May 2004 after completion of the installation work. The main purpose of the Eco-Bag System is to re-establish an ecosystem on the slope near the stream bank. An ecosystem consists of a dynamic set of living organisms, which will interact among themselves and with their surrounding environment (soil, climate, water and light). Under the Eco-Bag System, the vegetation on the slope can provide a self-sustained nutrient cycle and complement with each other after full establishment. The greened slope can both improve the visual impact to people nearby and provide surface erosion control for the slopes; it can also give and support habitats to wildlife in our valuable surroundings.

In the first month after the completion, we discovered a high biodiversity in the stream and on our Eco-Bag. We

found singing of birds, dancing of butterflies and dragonflies, swimming of fishes and jogging of invertebrates like water skaters and ants. All these were observed in and near the stream applied Eco-Bag.

It has been proved that the Eco-Bag System is feasible and therefore new ecosystem can be established as well as the adjacent stream bank ecosystem condition. It was really amazing when wildlife was discovered and the stream ecology has been re-established. We will make this project in our best effort, and look forward to the results of greening in Sha Kok Mei Village.



Papilio polytes 玉帶鳳蝶



Graphium sarpedon 青鳳蝶



Fishes under Eco-Bag



Rhinocypha perforata 三斑鼻蟌