



BIO – ECOLOGY DRAINAGE SYSTEM (BIOECODS)

**MAKMAL PENYELIDIKAN STRUKTUR & KONKRIT DAN
ALAM SEKITAR CREaTE DAN BAHAGIAN
KEJURUTERAAN AWAM CKAS**

WHAT IS BIOECODS?

- It Is An Ecological Urban Storm Water Management
- An Innovative Sustainable Drainage System To Restore Natural Environment, maintain River Flow And Control Ground Subsidence
- Adopting The Concept Of Integrating Stormwater Best Management Practice
- Control-at-source Approach Into Urban Planning And Design To Achieve Multiple Objectives In Newly Developing Areas



**BIO-ECOLOGICAL
DRAINAGE SYSTEMS
(BIOECODS)**



WHY BIOECODS

- BIOECODS In New Development Attempts To Solve Three Major Problems Commonly Encountered In Malaysia Namely ;
 - Flash Flood
 - River Pollution
 - Water Scarcity
- New Development In Malaysia Implementing BIOECODS To Achieve The Government Aim And Help Preserving The Natural characteristics Of Existing Rivers In Line With The National Campaign 'Love Our Rivers' and 'Rivers Of Life'

FLASH FLOOD

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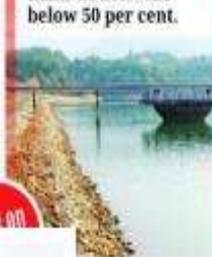
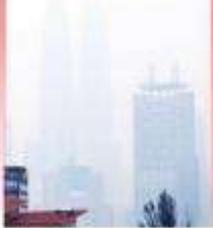
Harsh weather rising

Natural Resources and Environment Minister warns of little rain, plenty of haze in coming months.

Govt spent RM1.6m on cloud seeding activities over last 16 days, will continue to do so daily until mid-May.

DPM to chair high level committee for disaster management meeting today as reserves in seven dams nationwide below 50 per cent.

UN says 60 million affected by El Nino worldwide, RM14 billion required to meet critical needs for food and agricultural support.



BARISAN SEEKS WINNING LIKEABLE CANDIDATES FOR BY-ELECTIONS, SAYS ZAHID
4 MISSING AT SEA ARRIVE IN KOTA KINABALU
RUN-UP TO FA CUP FINAL
MADE FROM 100% RECYCLED PAPER

ESTABLISHED 1845

NEW STRAITS TIMES

KAJANG AWARD

Celebrating 172 years with the Nation. Inspired by Greatness.

BRACE FOR MORE FLASH FLOODS

THE Meteorological Department warns that the unusually heavy rains over the last few days in Kuala Lumpur are expected to last until the end of the third week of May. The flash floods, that brought KL to a standstill on Thursday, were exacerbated by low capacity culverts, clogged drainage and a shallow retention pond in Kajang due to siltation.

REPORTS ON PAGE 10 & 11

A 'healthy set of numbers'

Economy on track to expand by 4 to 4.5 per cent this year.

REPORTS ON PAGE 2; BUSINESS ON PAGE 10

NATIONAL TEACHERS' DAY
02 More Days

LITSIAN MALAYSIAN • RINGGIL 23 JUNI 2016

PRESERVE CHARACTERISTIC OF THE RIVERS IN MALAYSIA

MILKY RIVER



CLEAN RIVER



FUNCTIONS OF BIOECODS

- To Promote Storm Water Infiltration From Impermeable Areas (e.g Roof Tops And Car Parks) By Means Of Bio-Ecological Swales
- To Release Gradually The Storm Water Through The Use Of Bio- ecological Swales, On-line Underground Bio-ecological Detention Storages And Bio-ecological Dry Pond
- To Enhance Treatment Of Storm Water Quality Using Treatment Train Concept By Utilizing Bio-ecological Swales And Bio- ecological Ponds (E.G, Wet Pond, Wetlands)
- To Reduce The Occurrence Of Flash Flood In Urban Areas

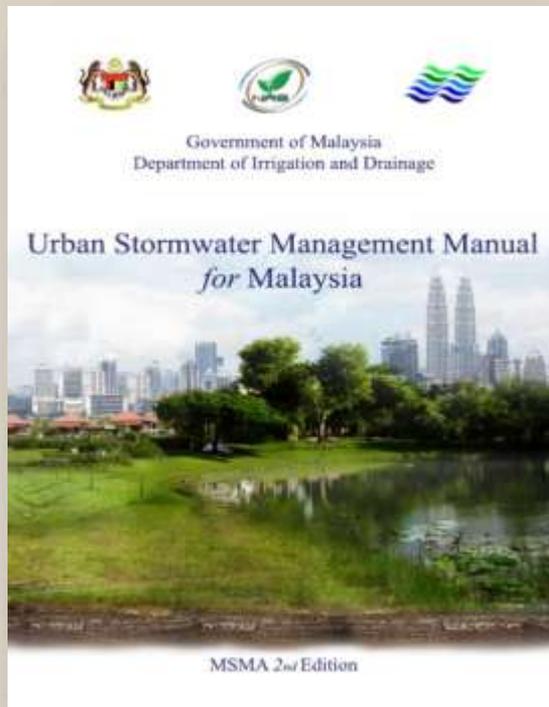
ADVANTAGES OF BIOECODS



- ✦ An innovative sustainable drainage system
- ✦ Water Quantity Control
- ✦ Water Quality Control
- ✦ Aesthetical Very Pleasing, Provide Amenities, Preserve
- ✦ Ecology.
- ✦ Integrating Rainwater Harvesting
- ✦ **SUSTAINABLE AND GREEN TECHNOLOGY !!**
- ✦ Low maintenance, Preserving Environment to benefit human beings, flora and fauna.

BIOECODS DESIGN CONCEPT

Sustainable Drainage System Complied the following guidelines;



Urban Stormwater Management Manual (MSMA).



Malaysia Standard for Urban Stormwater Management

BIOECODS DESIGN CONCEPT

Runoff Quantity and Quality Management Strategies

**From Rapid disposal of Stormwater
(Conveyance Oriented Approach)**



**To Control-At-Source
(Conveyance Oriented Approach +
Storage Oriented Approach)**

The Components

**Detention
Pond**

**Ecological
Swale**

**Engineered
Channel**

**Bio-
Filter Drain**
(Subsurface
Drainage)

**BIOECODS
Components**

Wetlands

**Bio-
Retention**

**On-Site
Detention**

**Water
Quality
Pond**

Dry Pond

CONSTRUCTION OF BIOECODS

CONSTRUCTION OF ECOLOGICAL SWALE

Setting-out and Survey works



Excavation



Sand bedding (100mm)



Module installation



Sand / chipping stone backfilling (200mm)



Turfing

Construction of Ecological Swale

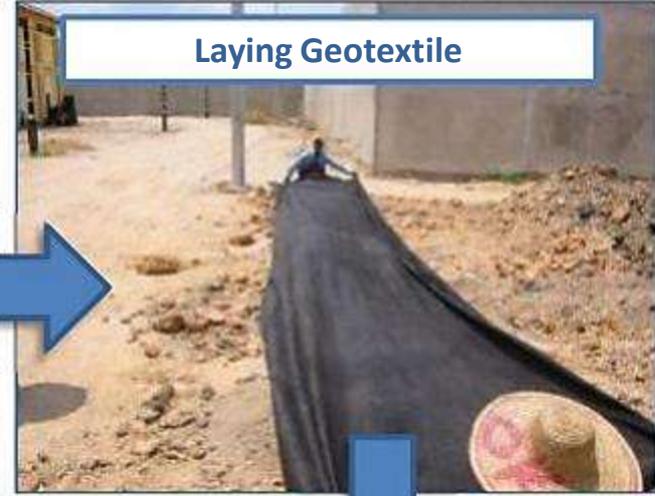
Excavation



Levelling & Profiling



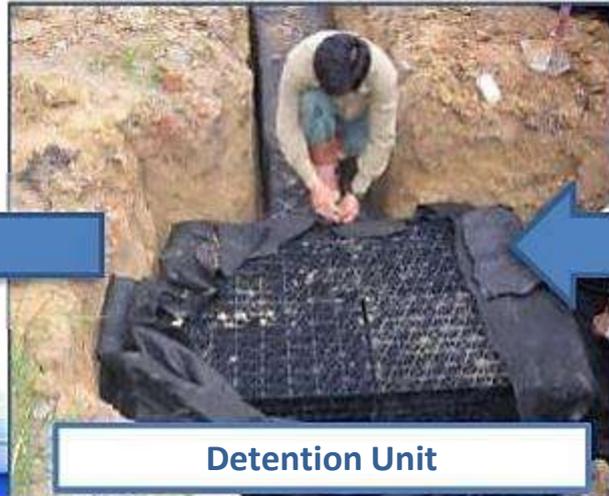
Laying Geotextile



Backfill & Turfing



Detention Unit



Laying Module



Construction of Ponds

Laying Bamboo Support Structure



Laying Bamboo Support Structure



Laying Geo-membrane



Backfill & Profiling



Construction of Wetland

Final Product



Site Clearing



Dewatering & Excavation



Backfill & Profiling



Inlet Installation



Further Planting



Prelim. Planting



Construction of Final Discharge Outlet



Initial Outlet



Fitting in Check Valve



Immediate Completion



Final Product

APPLICATION OF BIOECODS IN JKR



Hospital Bahagia Tanjung Rambutan Perak



BIOECODS @Health Clinic Taiping (KK2), Perak



BIOECODS @UMK Bachok Campus, Kelantan

Project Title :	Universiti Malaysia Kelantan (UMK), Kampus Bachok
Funder/Client :	Ministry of Higher Education Malaysia Public Works Department Malaysia Jurutera Perunding Sinar Sdn Bhd
Status :	Completed
Site Area :	41.0 ha



The Components: Swale & Underground Detention in UMK Bachok Campus



Constructing Subsurface Layer

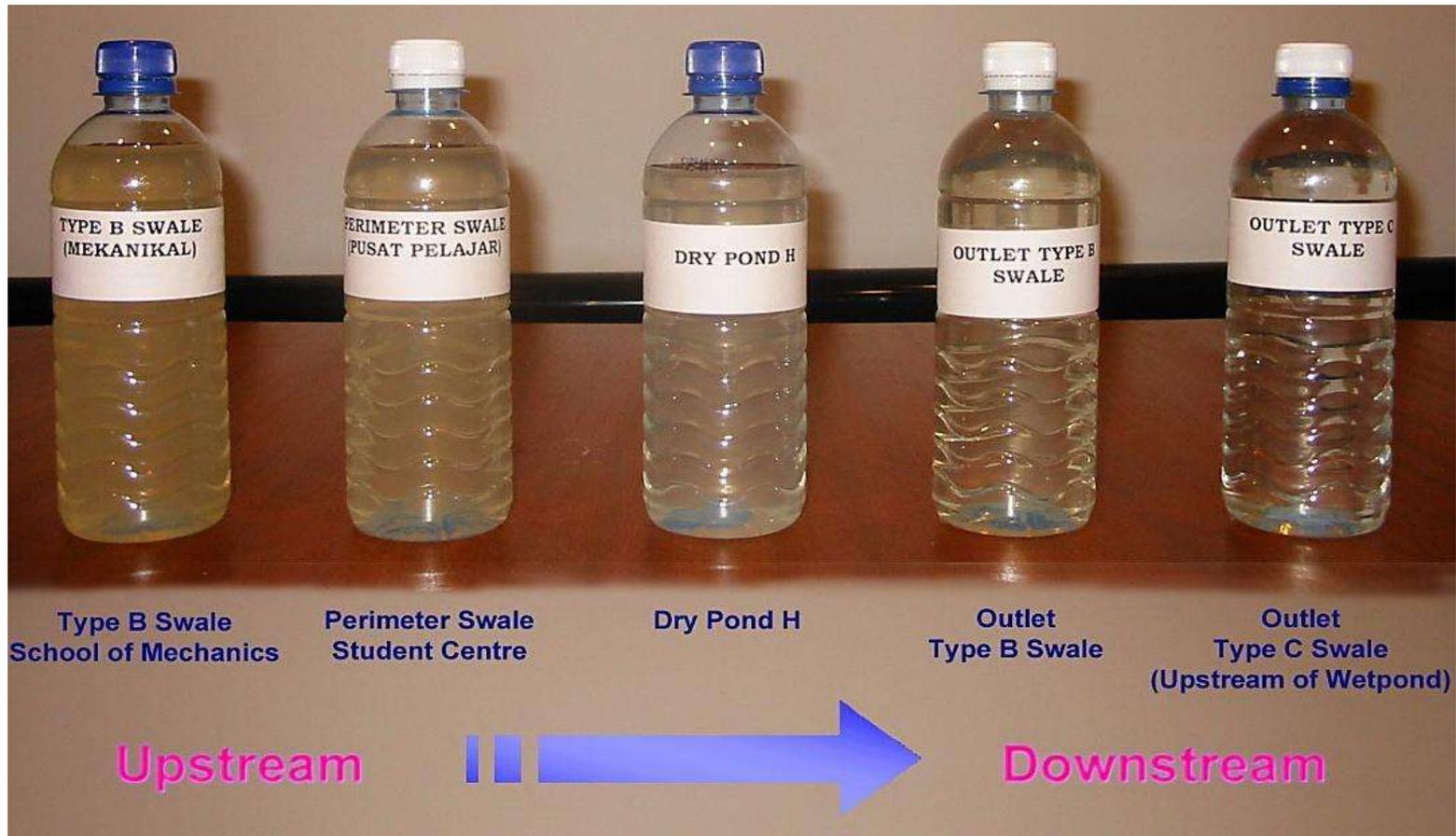


Constructing Surface Layer

The Components: Wetlands & Discharge Outlet in UMK Bachok Campus



BIOECODS STORMWATER TREATMENT TRAIN



SUMMARY



BIOECODS is an applicable concept that will fulfill new urban stormwater management objectives to restore each component of the hydrological cycle to its natural level. This new stormwater management approach has taken into broad consideration with the purposes:

- to provide safety for the public,
- to minimize and control nuisance flooding,
- to stabilize the landform and erosion control,
- to enhance the urban landscape, and
- to minimize the environmental impact of urban runoff on water quality.



Thank You

