HUMID TROPICS CENTRE KUALA LUMPUR

United Nations Educational, Scientific and Cultural Organization

The Regional Humid Tropics Hydrology and Water Resources Centre for Southeast Asia and The Pacific

Panel Session 2: Learning from Pilots and Models

Sustainable Science: Linking Sustainable Development with Environmental Science with Examples on Water Security and Ecohydrology

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Sustainable Development Goals(SDG's) and Post-2015 Global Development Framework

"We recognize that people are at the centre of sustainable development and, in this regard, we strive for a world that is just, equitable and inclusive, and we commit to work together to promote sustained and inclusive economic growth, social development and environmental protection and thereby to benefit all."

Rio+20 Outcome Document, The Future We Want

Six essential elements for delivering the SDGs (dignity, people, prosperity, planet, justice, and partnership)

Science is critical to help meet the challenges for sustainable development, as it lays the foundations for new approaches and technologies to identify, clarify and tackle global challenges for the future. Science can thus significantly contribute to sustainable development, but requires to that end a broad understanding of science as such.

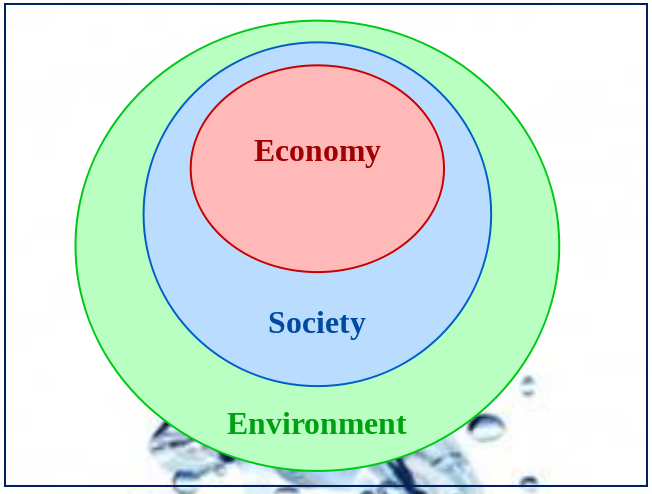
It requires a massive global cooperative effort and one major task of sustainability science is to assist integrated cross-disciplinary coordination.

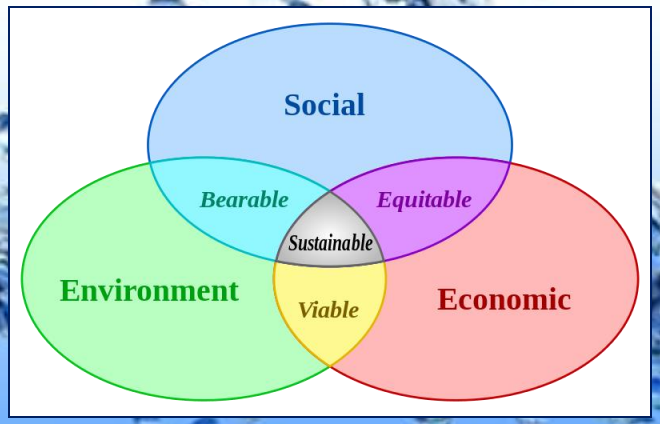
The Post-2015 Global Development Framework in centered on 17 no. SDG's

Pillars of Sustainability

"Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs"

Source: Brundtland Commission Report, United Nations, 1987.





- **Relationship between the "three pillars (domains) of sustainability", in which both economy and society are constrained by environmental limits**
- **Need to balancing local and global efforts to meet basic human needs without destroying or degrading the natural environment.**
- **sustainability is something that improves "the quality of human life while living within the carrying capacity of supporting eco-systems".**

The Three Pillars of Sustainability

Economic Sustainability 	**Consumption and production patterns, growth, development and productivity** while promoting the use of resources in ways that are efficient, responsible and likely to provide long term benefits
Social Sustainability 	The availability of resources for the **well being of individuals and communities** such as food, shelter, education, work, income, safe living and working conditions, creativity, cultural heritage, inclusion
Environmental Sustainability 	The **protection and maintenance** of **natural functions** and **ecosystem components** so that humans and other species are sustained

Pilots and Models: Examples on Water Security and Ecohydrology carried out by HTCKL

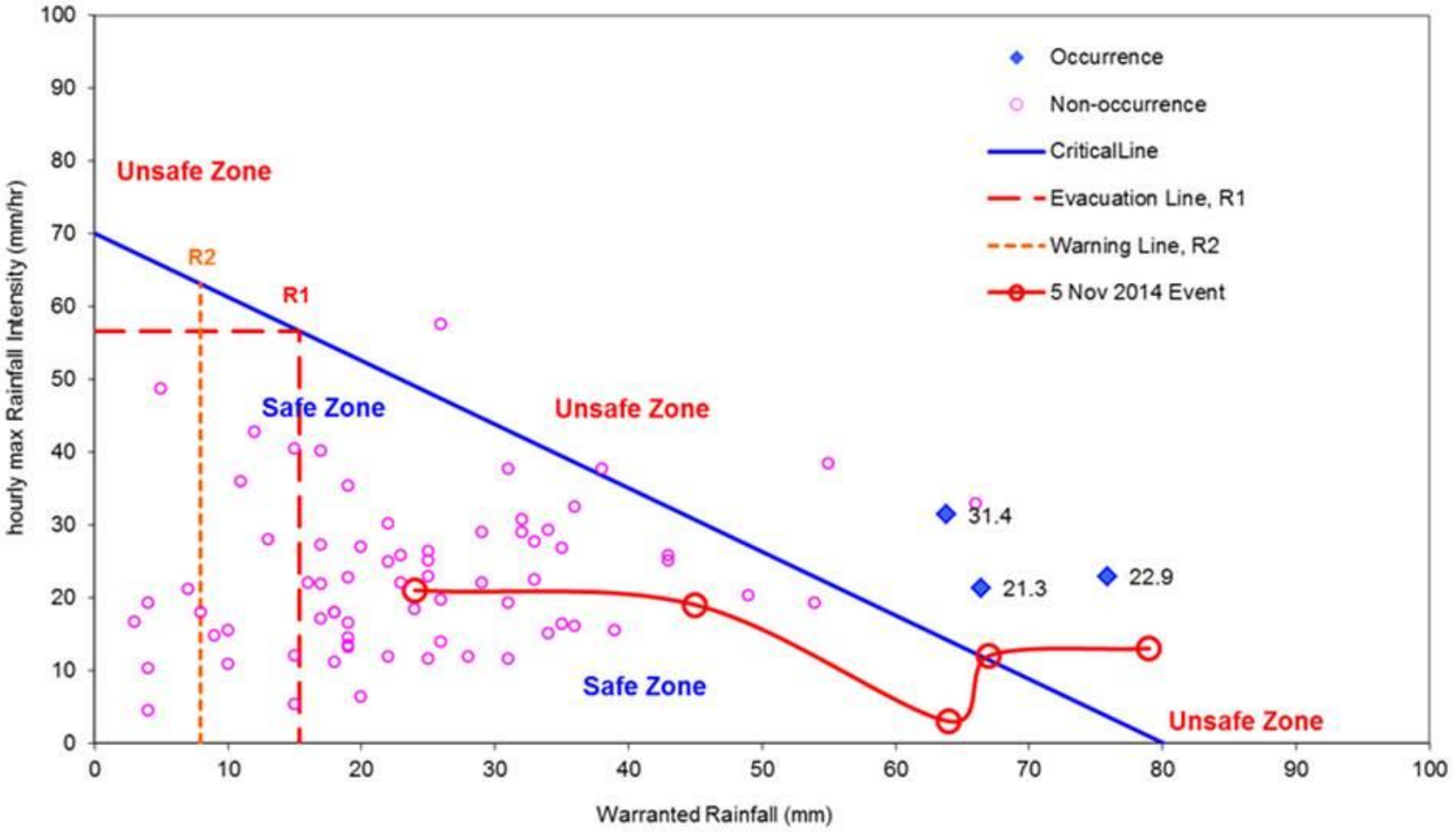
- **Debris and Mudflow Warning System (DMFWS).**
- **Rural River Rejuvenation (R3) Project.**
- **Study in Using A Solar Still Stepped System for Domestic and Drinking Water Desalination of Sea Water Proposes Upscaling.**
- **The Proposed Upscaling MSMA Integrated Stormwater Management Ecohydrology (ISME) Project.**
- **Monitoring the Performance of MSMA – Integrated Stormwater Management Ecohydrology.**

DEBRIS AND MUDFLOW FLOODING IN CAMERON HIGHLANDS CAUSING SEVERAL DEATH

Newspaper Cutting (Nov. 2014):
Not safe for occupation

WEDNESDAY, 23 OCTOBER 2013

Debris and Mudflow Warning System (DMFWS) at Planning Stage, to Develop On-line System and Operational System:



=> DEBRIS AND MUDFLOW WARNING SYSTEM
http://h2o.water.gov.my/Debris

Development of an architectural Decision Support System that can be expandable for DMFWS

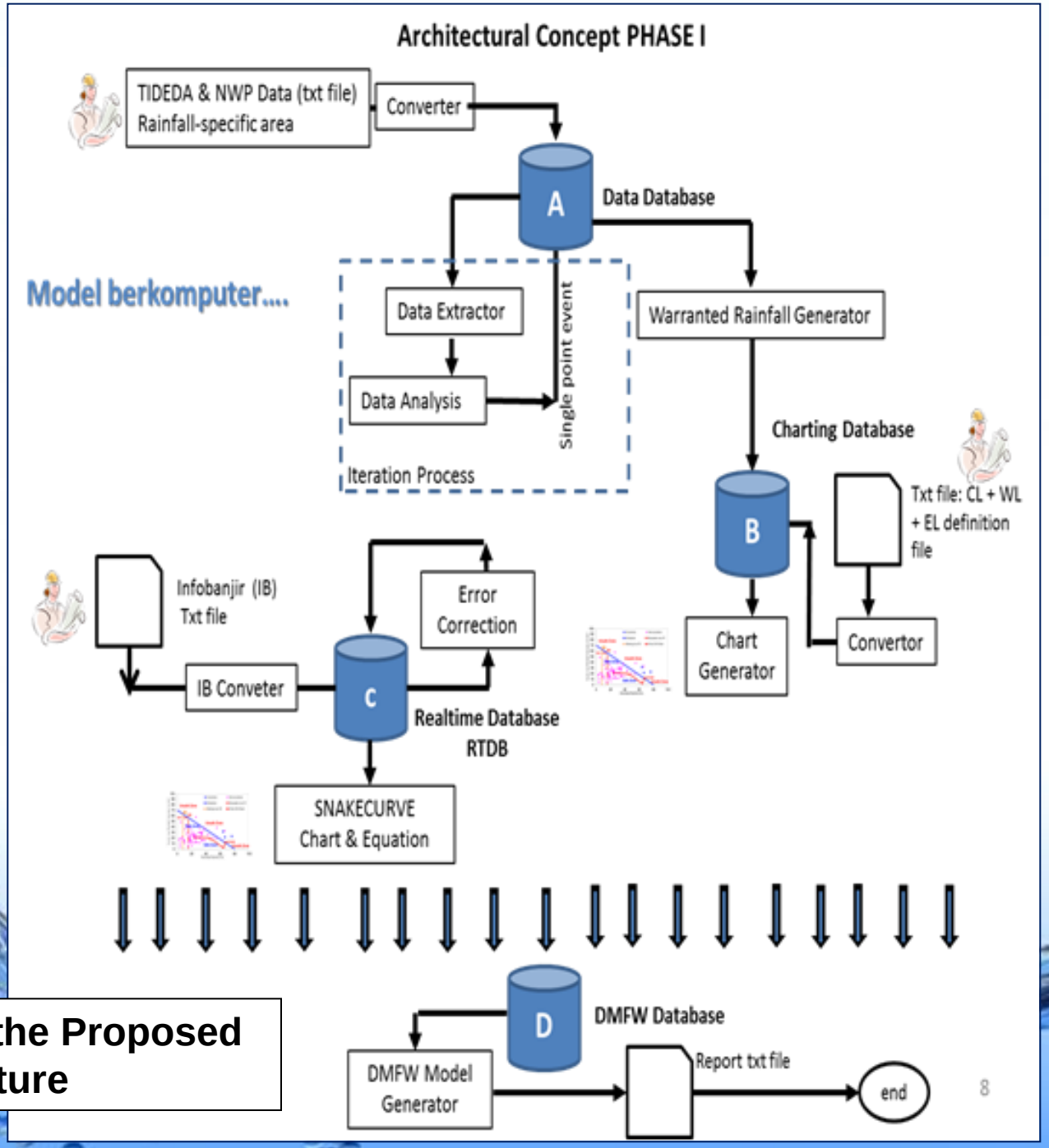


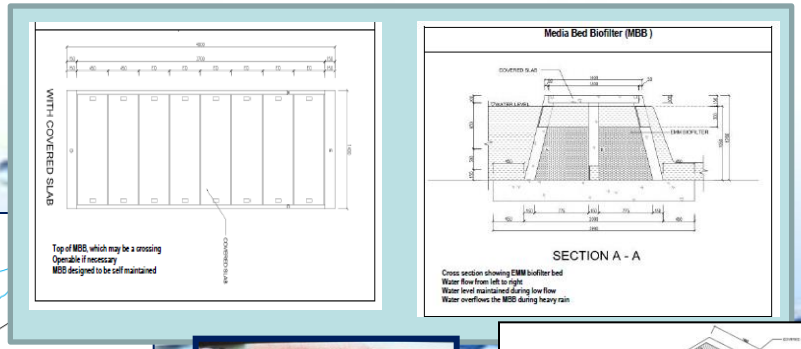
Figure showing the Proposed System Architecture

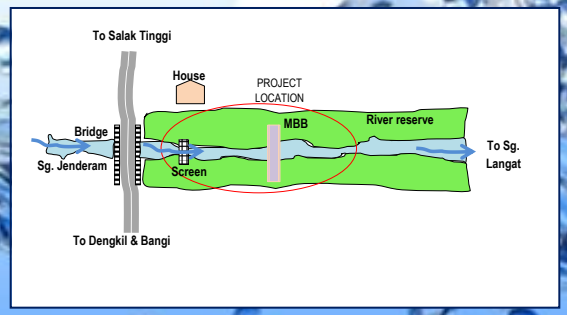
On-going *Rural River Rejuvenation* (R3) *Project* at Jenderam River (tributary of Langat-HELP Basin)

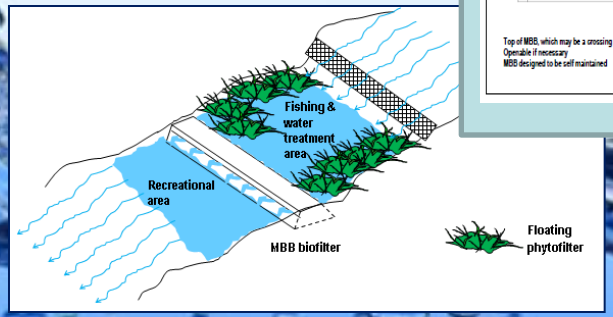
Project Location

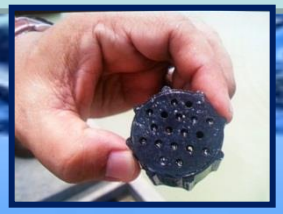
To create environmental friendly river in rural area for recreational purpose activities.

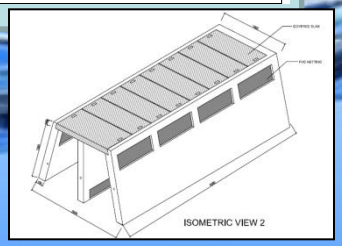
To improve river water quality using Multimedia Bed Bio-Filter and Phytoraft (vetiver grass) techniques.











On-going *Rural River Rejuvenation* (R3) *Project* by HTCKL at Jenderam River (tributary of Langat-HELP Basin)

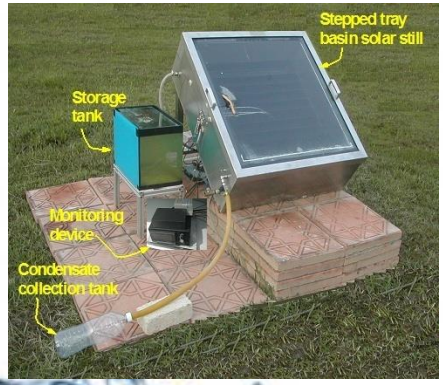
Construction of Multimedia Bed Bio-Filter (MBB) House to culture bacteria in improving river water quality

Phytoremediation: A Green Technology to Remove Environmental Pollutants Using Vetiver Grass

On going Study in Using A Solar Still Stepped System for Domestic and Drinking Water Desalination of Sea Water in Perhentian Island, Terengganu

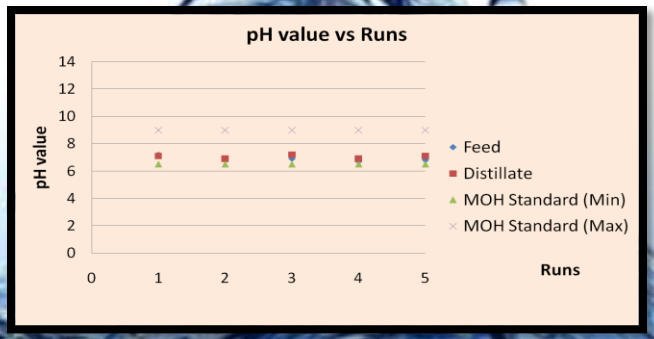
The pilot scale unit for distillation of sea water using solar

The laboratory scale of the solar still stepped system



Pipeline, sea water intake through the pump

Successful in the process of evaporation and condensation



Preliminary results of pH

Water evaporates and settled into freshwater

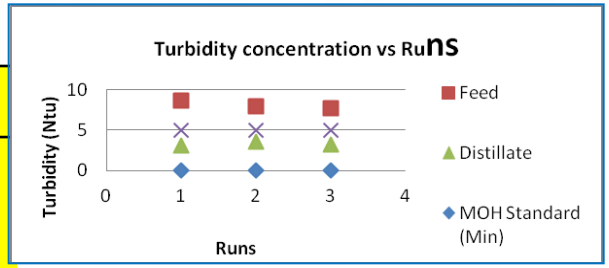
Standard Limit for Drinking Water Parameters

	Raw water		Treated water	
	Minimum	Maximum	Minimum	Maximum
pH	5.5	9	6.5	9
Total Dissolved Solid (TDS)	0	1500	0	1000
Turbidity	0	1000 NTU	0	5 NTU
Total Coliform	0	5000 MPN / 100 Ml	0 in 100 mL	0

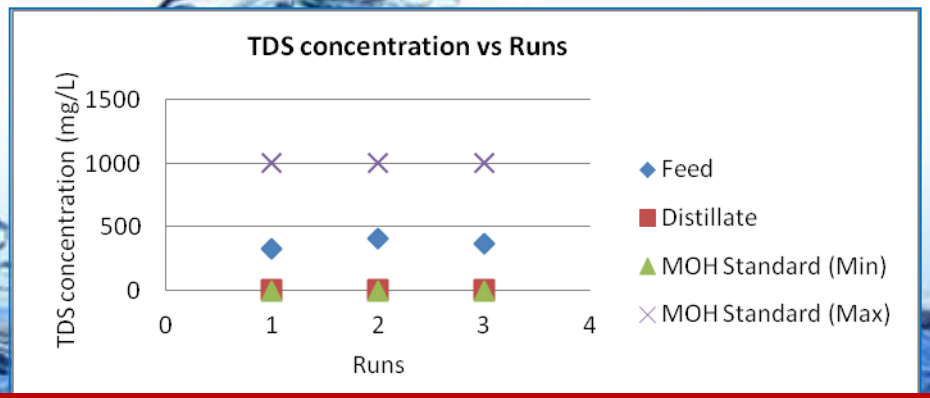
Lab scale system set-up

Water quality analysis method

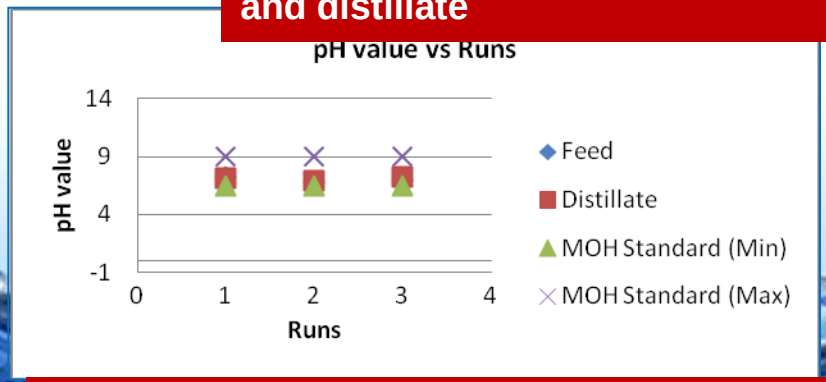
Parameters	Test analysis
Total Dissolved Solids (TDS), mg/L	APHA 2540 C
Total Suspended Solids (TSS), mg/L	APHA 2540 D
Atomic Elements eg: Na, Cl, Mg, Ca	Atomic Absorption Spectrometer (AAS)
Heterotrophic Plate Count (HPC), CFU/mL	APHA 9215
Turbidity, Ntu	APHA 2130
pH	APHA 4500 – H^+ B



Lab scale result: Variations in turbidity for each run for both feed and distillate



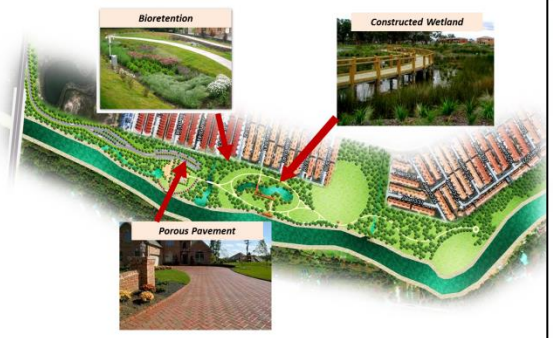
Lab scale result: Variation in TDS concentration that corresponds to each run



Lab scale result: Variation in pH for each run for feed and distillate

Proposed Upscaling MSMA Integrated Stormwater Management Ecohydrology (ISME) at Langat-HELP River Basin

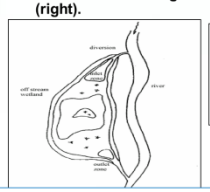
PROPOSED MSMA ISME COMPONENTS & LOCATIONS



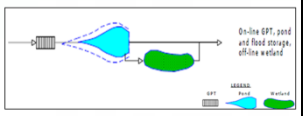
CONCEPTUAL DESIGN FOR CONSTRUCTED WETLANDS

CONCEPTUAL DESIGN FOR CONSTRUCTED WETLANDS

- Constructed wetland is proposed for the project area as one of the components of MSMA ISME in which its major purpose is to *enhance the water quality of stormwater and greywater* discharged from the contributing residential areas.
- An *off-line, horizontal surface flow mode* of constructed wetland will be proposed which will receive inflow from the major outlet of a detention pond at the residential compounds. The schematic diagram of the system is shown as following (right).



OFF-LINE CONSTRUCTED WETLAND

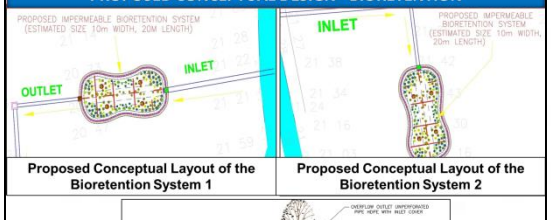


OFF-LINE CONSTRUCTED WETLAND WITH GPT & FLOOD STORAGE POND

PROPOSED CONCEPTUAL DESIGN - BIORETENTION

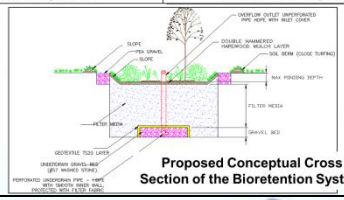
Proposed Site for Bioretention 1 and Bioretention 2

PROPOSED CONCEPTUAL DESIGN - BIORETENTION



Proposed Conceptual Layout of the Bioretention System 1

Proposed Conceptual Layout of the Bioretention System 2

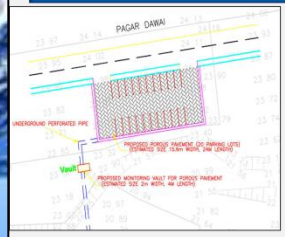


Proposed Conceptual Cross Section of the Bioretention System

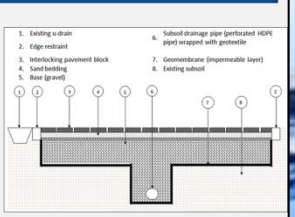
PROPOSED CONCEPTUAL DESIGN – POROUS PAVEMENT

Proposed Site for Porous Pavement

PROPOSED CONCEPTUAL DESIGN – POROUS PAVEMENT



Proposed Cross Section of Interlocking Block Paving with Subsoil Drainage Pipe



Proposed Layout of the Porous Pavement

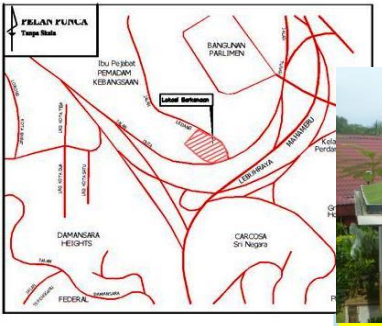
CONCEPTUAL DESIGN FOR SLOPE PROTECTION

❖ Three (3) types of slope protection are proposed for the study area. The slope protection measures are divided to the river stretch namely *Stretch 1* (DS01), *Stretch 2* (DS02), *Stretch 3* (DS03):

i) *Stretch 1* (769 m): Combination of Reno Mattress and gabion
ii) *Stretch 2* (800 m): Combination of gabion, Reno Mattress, and MacMat S
iii) *Stretch 3* (700m): Combination of Mechanically Stabilized Earth (MSE) wall, Green Mattress, and MacMat S

MSMA INTEGRATED STORMWATER MANAGEMENT ECOHYDROLOGY (MSMA-ISME) COMPONENTS IN HTC COMPOUND: Construction completed in October 2010

Monitoring the performance completed in December 2012



Green Roof

Porous Pavement

Rainwater Harvesting

Bioretention System

Constructed Wetland

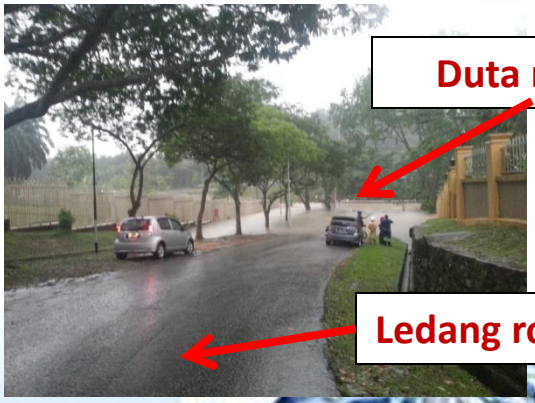
Greywater Reuse System

DATUM :-

All datum are based on value of BM No.W0062 (A.L = 44.442m)

At intersection of Jalan Duta and Jalan Bukit Ledang, before traffic light (junction) Damansara Height and Jalan Duta

Flood in front of HTCKL compound (junction between Ledang road and Duta road) on 10.4. 2013



- Can we reduce this flood hazard? Yes, we can. Such as with the techniques of control at source and making space for water.
- Did HTCKL compound contributed to it? No.

THE FRAMEWORK

OUTCOME

1. A tool for sustainability science
2. Established sustainable science culture
3. Sustainable science delivered

DEVELOPMENT OF SUSTAINABLE SCIENCE TOOL

FRAMEWORK

Components supporting the environment

Components supporting the socio-economic needs

1. Adopting from established tools
2. Adapting to the National situation
3. R&D needs
4. S&T needs

Components for the sustainability development

1. Planning
2. Project delivery
3. Procurement
4. Design
5. Construction
6. Maintenance

1. Selection of appropriate Performance Indicators (PI)
2. Setting targets (Key performance Indicators)
3. Establish gaps for R&D and S&T initiatives (fundamental and applied
   - Short term
   - Middle term
   - Long term

IMPLEMENTATION STRATEGY

1. The WILL
2. Governance
3. Capacity/capability
4. Training
5. Advocacy and engagement

OUTPUT/ ENHANCEMENT

1. Establishment of a data base/portal
2. Identification of outputs and results
3. Further gap analysis
4. Establishment of new problem statement for R&D
5. Establishment of more S & T initiatives
6. Provide feedback for further enhancements

THANK YOU

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