The GEOSS Joint Asia – Africa Water Cycle Symposium

25 - 27 November, 2013, UNIVERSITY OF TOKYO

Project Design Matrix (PDM) for Malaysia
Theme : SUSTAINABLE WATER AND LAND MANAGEMENT PLAN

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MOTIVATION

- On 23 Oct 2013, continuous rainfall and subsequent dam release caused Bertam river to overflow and mud flood to **inundate a downstream village**, **killing 3 people**;
- Prior to this disaster, fatal landslides had occurred in this area in years 1996, 2000, and 2008. With the onset of climate change, the situation in **Bertam valley in Cameron Highlands** is looking dire.

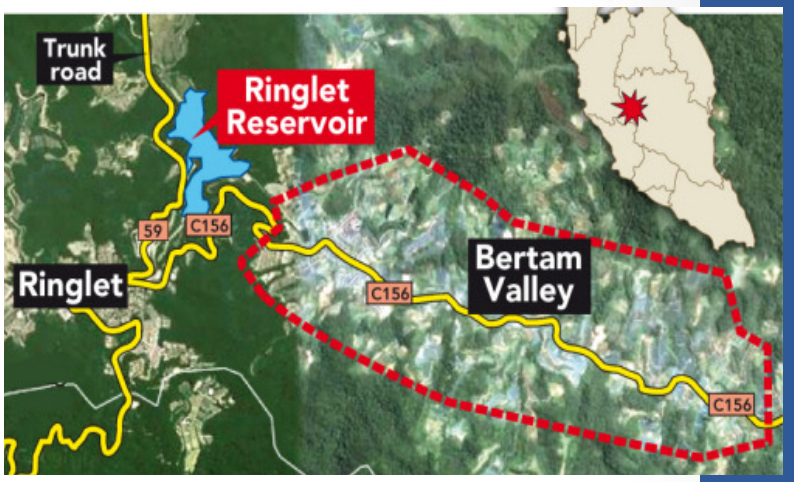
BACKGROUND

- **Cameron Highlands**
  - Established in 1885 after his name of Sir William Cameron, a British surveyor;
  - one the largest hill resorts in Malaysia,
  - referred to as ‘green bowls’, growing a wide variety of vegetables, flowers and other ornamental plants.
  - also provides many tourist attractions (tea plantations, tea factories, rose gardens, strawberry farms and aging colonial-style homes).

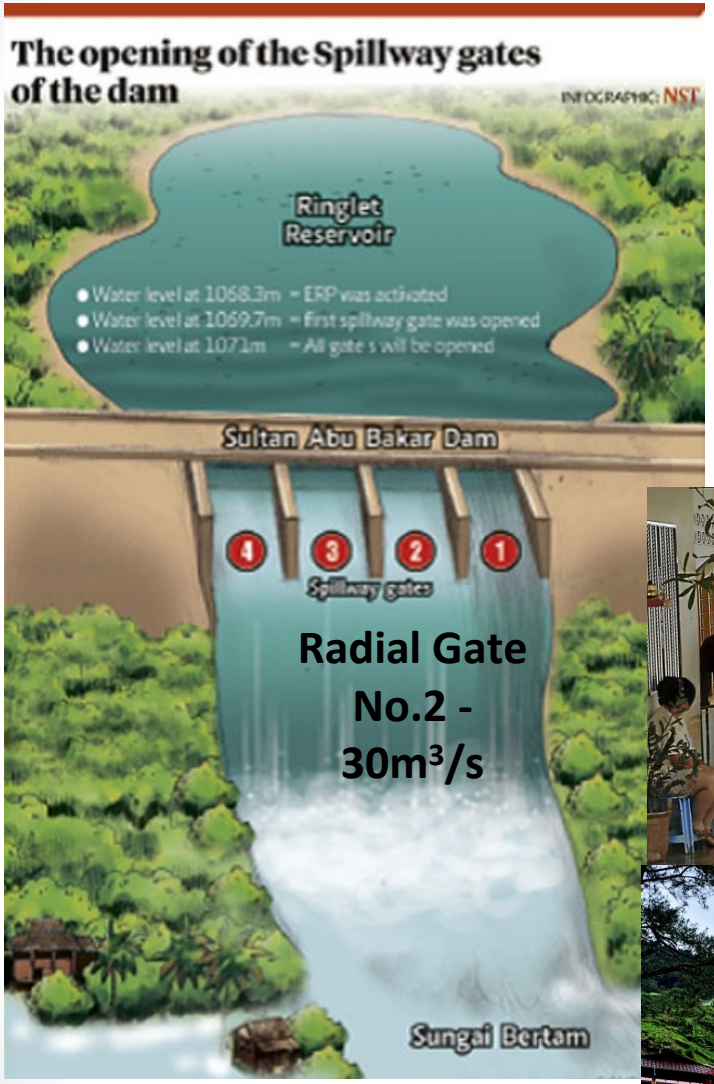
The green quietude of the Cameron Highlands

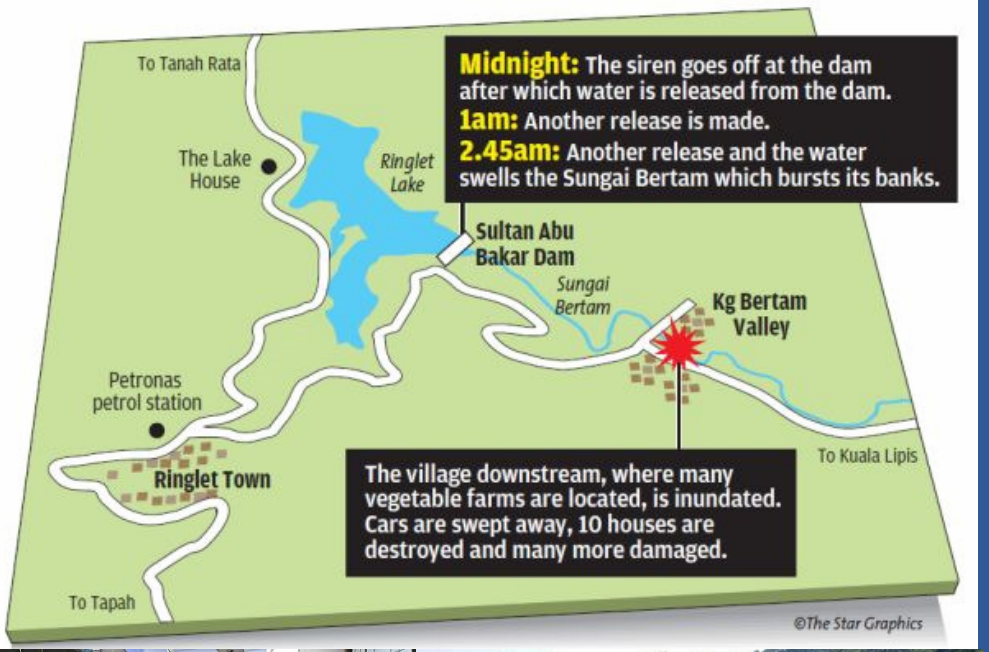
BACKGROUND (cont'd)

- **Tech. Facts of Ringlet Reservoir**
  - man-made lake covering 60 hectares
  - upstream of Sultan Abu Bakar Dam on Bertam River
  - maximum live storage of 4.7MCM
  - the storage is connected to the 100MW underground power station which consists of four small run-of-river and storage hydro projects and has five power stations.
  - due to land erosion, uncontrolled development, legal and illegal land clearing, deforestation, and reckless farming practices, rubbish, silt and sediment have clogged up the dam storage ;
  - caused the reservoir capacity to decrease to a mere 1.5MCM.



23 Oct 2013


The opening of the Spillway gates of the dam
INFOGRAPHIC: NST
Ringlet Reservoir
Water level at 1068.3m = ERP was activated
Water level at 1069.7m = first spillway gate was opened
Water level at 1071m = All gate s will be opened
Sultan Abu Bakar Dam
4
3
2
1
Spillway gates
Radial Gate No.2 - 30m³/s
Sungai Bertam


To Tanah Rata
The Lake House
Ringlet Lake
Midnight: The siren goes off at the dam after which water is released from the dam.
1am: Another release is made.
2.45am: Another release and the water swells the Sungai Bertam which bursts its banks.
Sultan Abu Bakar Dam
Sungai Bertam
Kg Bertam Valley
Petronas petrol station
Ringlet Town
To Kuala Lipis
The village downstream, where many vegetable farms are located, is inundated. Cars are swept away, 10 houses are destroyed and many more damaged.
To Tapah
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OVERALL GOAL

Reducing water related disaster (man-made and natural); and improving water resources management in the context of water nexus and climate change

PURPOSE

To quantify and minimize the impact of climatic and non-climatic factor on sedimentation in Ringlet Reservoir and water nexus issues within the vicinity of Cameron Highlands

KEY LEADERS & LEAD ORGANIZATION

- National Hydraulic Research Institute of Malaysia (NAHRIM), Ministry of Natural Resources and Environment – Team Leader
- Tenaga Nasional Berhad (TNB) – Government Link Company (GLC)
- Local authorities - Cameron Highlands District Council, State of Pahang
- National Security Council (NSC)

EXPECTED OUTPUT

- A hydro-meteorological observation and real-time monitoring network covering the whole Cameron Highlands
- Integrated land-use and GIS database to monitor atmosphere-land interaction in upper Cameron Highlands
- soil erosion model/sediment transport model for accurate simulation of sedimentation in Ringlet Reservoir.
- Projection of climate change impacts on potential risk or disaster on water resources and water-nexus in Cameron Highlands
- Numerical model for inflow forecasting, early warning system and Decision Support System (DSS) for local authorities and decision-makers

PROPOSED ACTIVITIES, CONTRIBUTORS & COLLABORATORS

NO. 1

Establish a hydro-meteorological observation and real-time monitoring network covering the whole Cameron Highlands

- Produce high accuracy precipitation data by integrating radar, satellite and ground gauges

DID, MMD, DOA, TNB, JAXA, NOAA, USGS, NASA, UT

- Collect precipitation and other climatic and non-climatic parameter (groundwater, temperature, radiation) dataset from global data archive

UNESCO/G-WADI, UNESCO-WMO/IGRAC, Reanalysis (ECMWF, NCEP, JMA), CEOS Water Portal, GEOWOW, NOAA, JAXA, DIAS

PROPOSED ACTIVITIES, CONTRIBUTORS & COLLABORATORS

NO. 2

Development of integrated land-use and GIS database to monitor atmosphere-land interaction in Cameron Highlands

- Past, present and future (projected) land-use maps

DOA, Department of Town and Country Planning Peninsular Malaysia (JPBD), local authorities

- Land-use change monitoring using satellite images

ARSM, JAXA, NOAA, USGS, NASA

- GIS database comprising of topography, fine resolution DEM (sub-meter resolution), river network and profile

USGS, Department of Survey and Mapping Malaysia, JAXA

PROPOSED ACTIVITIES, CONTRIBUTORS & COLLABORATORS

NO. 3

Establish and improve soil erosion model/sediment transport model for accurate simulation of sedimentation in Ringlet Reservoir

- Develop soil erosion or sediment transport model to determine soil loss rate, sediment load and reservoir bed level changes for current and future period
- Produce high accuracy precipitation data by integrating radar, satellite and ground gauges.
- Estimate the Revised Universal Soil Loss Equation (RUSLE) and using Infoworks RS for river modeling.
- Understanding relationship between precipitation, landuse change and sediment load
- Revise the storage-elevation relationship of Sultan Abu Bakar Dam

DID, DOA, TNB, JPBD, local authorities, UT

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PROPOSED ACTIVITIES, CONTRIBUTORS & COLLABORATORS

NO. 4

Projection of climate change impacts on potential risk or disaster on water resources and water-nexus in Cameron Highlands

- Selection of GCMs, bias-correction and downscaling

NAHRIM, UT-DIAS, science communities

- Analysis of GCM projection data for upper Bertam catchment and Cameron Highlands

CMIP3, CMIP5, UT-DIAS

- Assessment of potential risk or disaster and effect on water-nexus

TNBR, UNITEN, DID, MMD, DOA, DIAS

PROPOSED ACTIVITIES, CONTRIBUTORS & COLLABORATORS

NO. 5

Develop numerical model for inflow forecasting, early warning system and Decision Support System (DSS) for local authorities and decision-makers

- Develop building capacity, training, short course modules and technology transfer

DID, MMD, DOA, ARSM, TNBR, UNITEN, DIAS, UT, USGS, USBR

- Assessment of climate change impact on reservoir

DID, MMD, DOA, ARSM, TNBR, UNITEN, DIAS, UT, USGS, USBR

- Development of forecasting, early warning system, DSS and SOP

TNBR, UNITEN, DID, MMD, local communities, NGOs, DIAS, UT, USGS, USBR

NAHRIM

EXPECTED OUTCOME

- Reduction of disasters such as floods and landslides
- Provides good agricultural and land development management practice
- Increase and sustain benefit of water-energy & water-food nexus vs climate change
- Acceptable watershed management plan

Thank you