

Challenges in managing water resources – Malaysian experience

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JAPAN WATER WORKS ASSOCIATION

2015 JWVA ANNUAL CONFERENCE & EXHIBITION

Water Associations Meeting & International Forum on Water Supply
October 22, 2015, Saitama City, Tokyo, Japan



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INTRODUCTION

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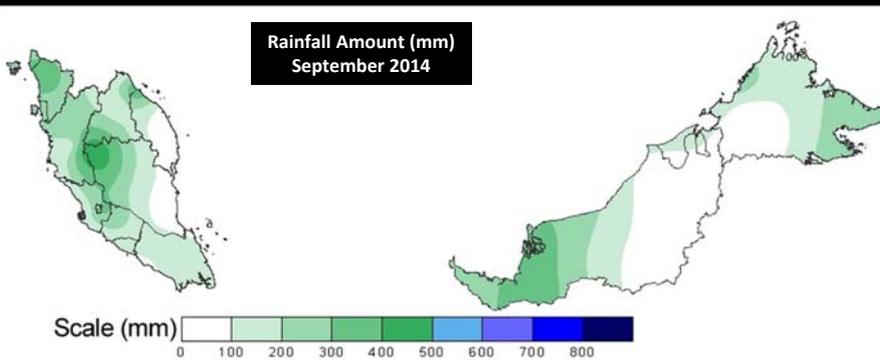
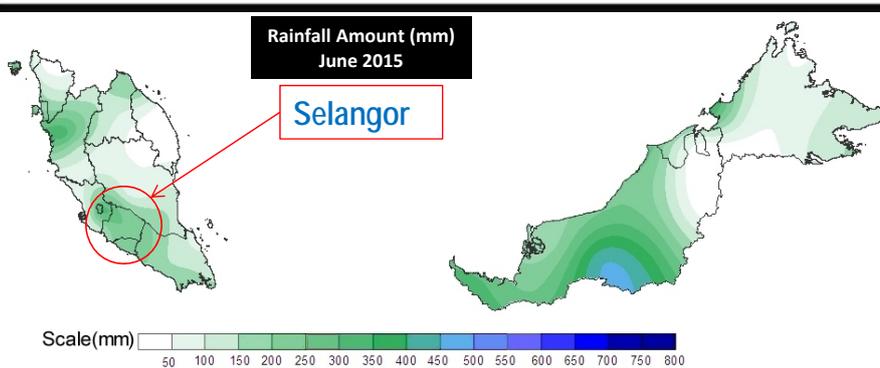
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INTRODUCTION



Malaysia is blessed with heavy rainfall of annual **average** rainfall of 2500mm. However there were several occasions of long drought which affected the comfort of water consumers when rationing becomes the solution. Being the most developed state in Malaysia, Selangor water demand is high as estimated portion utilised for potable purposes is nearly **10%** of what it received from the annual rainfall



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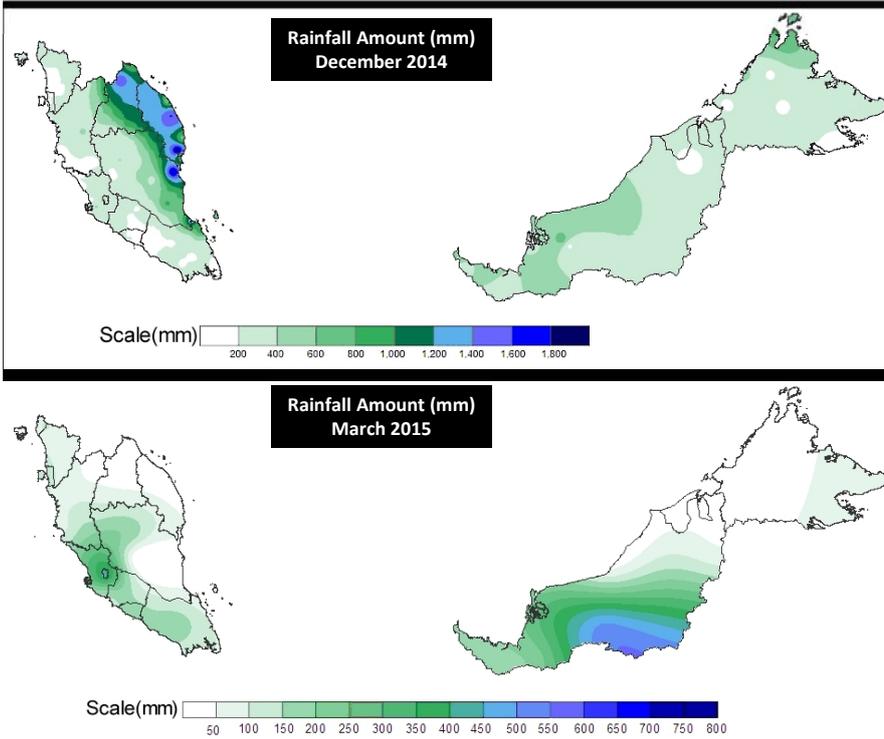
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INTRODUCTION



November and December are normally wet months in most parts of Malaysia where as February and March are drier months in Malaysia. Last year's December witnessed severe rainfall where the monthly rainfall reached nearly 2000mm in several parts of eastern coast of Peninsula Malaysia. On the contrary, March was again dry in eastern coast of Peninsula and most parts of Sabah, vis a vis northern part of Borneo Island.



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INTRODUCTION

- ✓ In 2012, Selangor had revised its projection of demand:
 - Necessary to optimise production at two of its major water treatment plants (WTPs).
 - Plants had the capacity to treat water but restricted by the raw water availability in the river.
- ✓ Initial investigations established the overflow at barrage near the WTPs was high and wasted.
 - Significant amount can be harvested and stored in storages or ponds, enough to cater for WTPs to produce the required capacity.
 - Auxillary storage was an option.



Administrative districts within the Selangor River Basin



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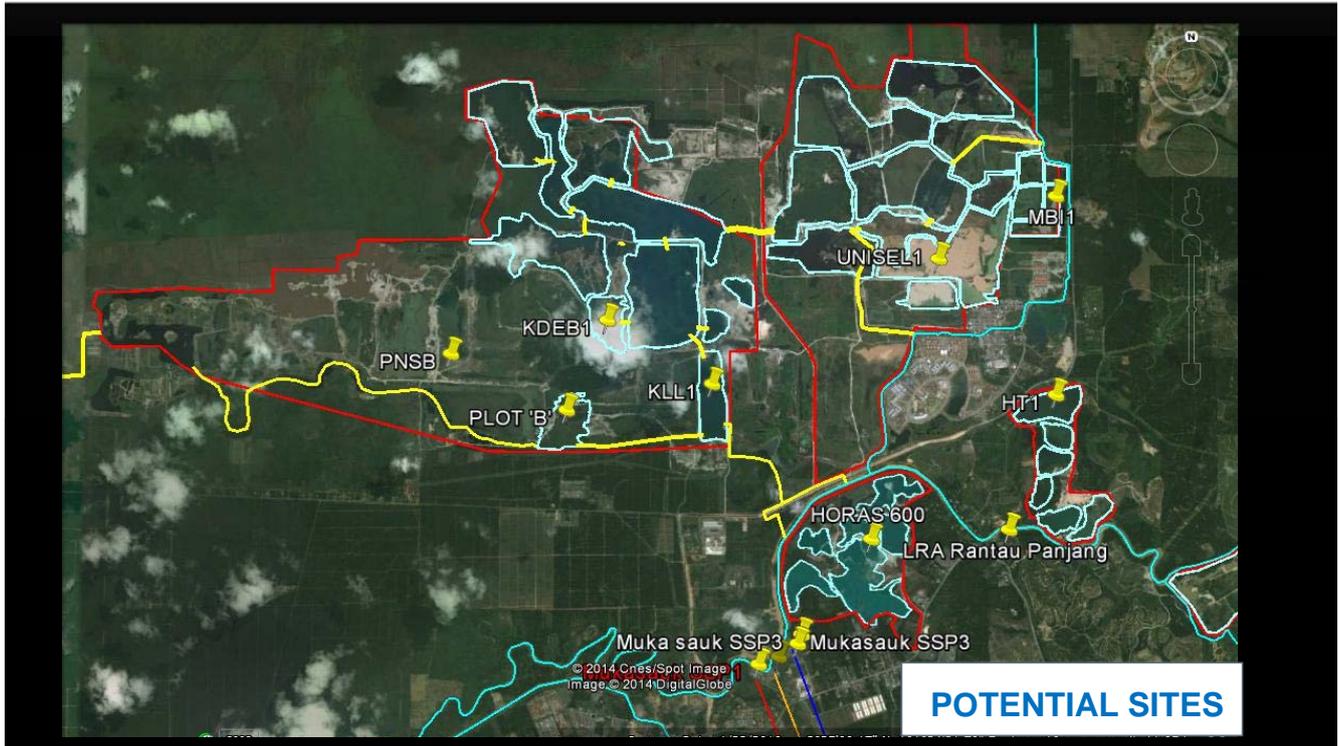
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INTRODUCTION



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ISSUES

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ISSUES

Although rainfall in abundance in Malaysia, the ability to harvest rain is limited to dam in the upper reaches and river base flow

Elements of waste in utilisation was identified to cause the severity of the problems. Taking the cue from the famous Toyota executive, Taiichi Ohno (1912-1990), seven elements of wastes had been assessed and the following had been observed:

- **overproduction** – releasing more water from dam due to uncertainty in mid catchment precipitation
- **waiting time** – current source of water requires more than 20 hours to reach water treatment plants from the SSD and 14 hours for the STD



ISSUES

- **unnecessary transport of materials** – moving materials (raw water) over long distance, approximately 55km and 30km for SSD and STD respectively as compared to between two to six kilometers for the major pond pumping facilities
- **over processing and incorrect processing** – over-release to avoid severe impact of inadequate supply. The saving is observed from the increase in dam level in 2015 after partial supply from HORAS and other temporary ponds
- **excess inventory** – larger storage needed to accommodate uncertainties in availability of rain in the catchment
- **defects** – system exposed to contamination along the river. It was observed that there are several incidents of water contamination along the long distance travelled by the water



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APPROACH

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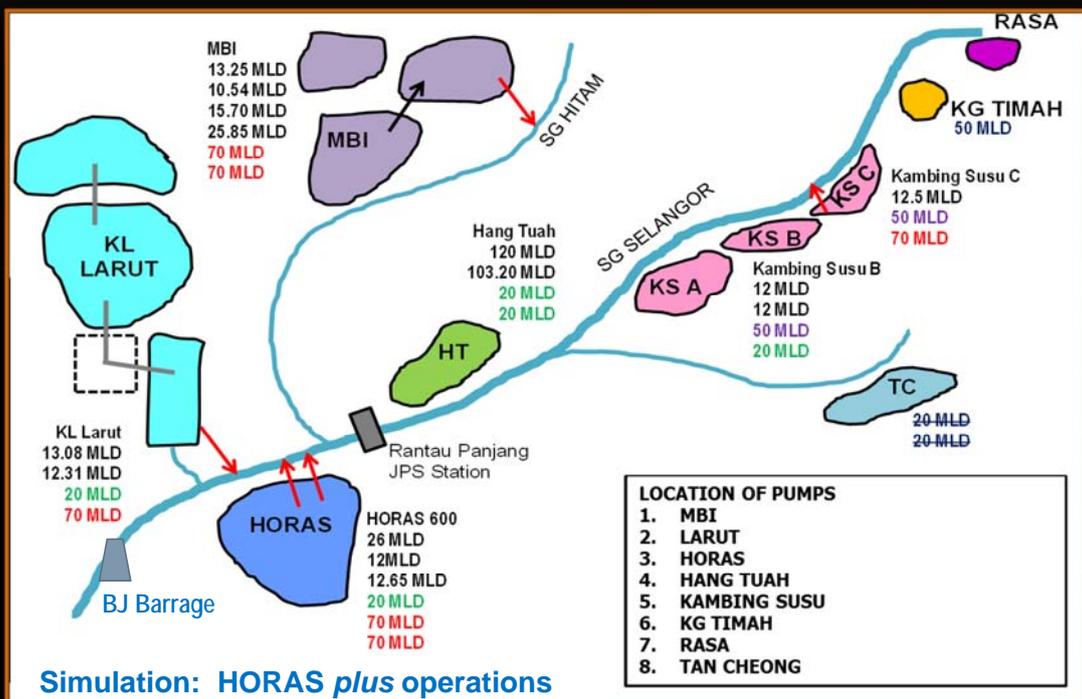
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APPROACH





APPROACH

How the effectiveness is measured?

The effectiveness of reduction of wastage (*muda*) in the system is measured by the following parameters:

- Release from Sungai Selangor Dam (SSD)
- Release from Sungai Tinggi Dam (STD)
- Abstraction at the intake in Bestari Jaya (BJ)
- Pumping from HORAS and other ponds (Horas *plus*)

Results will be based on the assessment of the raw water balance comprising release from SSD and STD, baseflow estimates, abstraction, HORAS *plus* and environmental flow across the BJ barrage

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RESULTS

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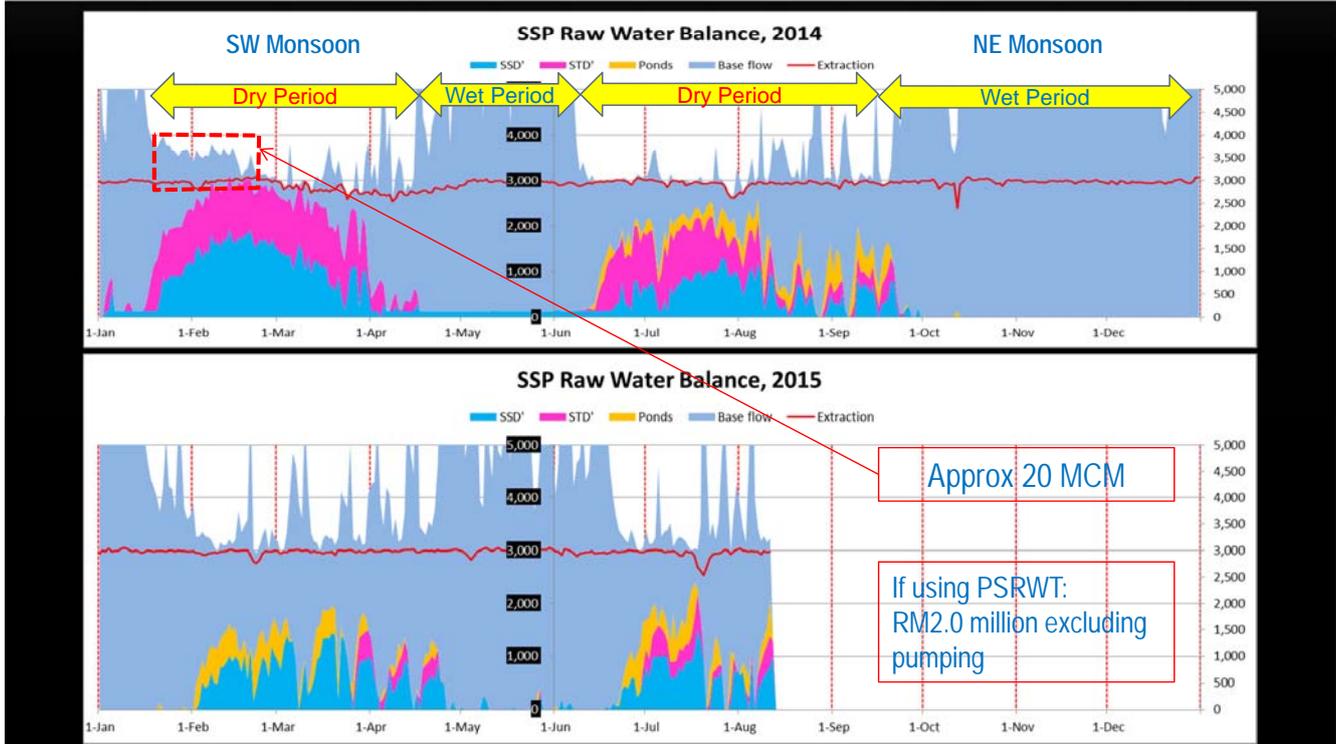
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RESULTS



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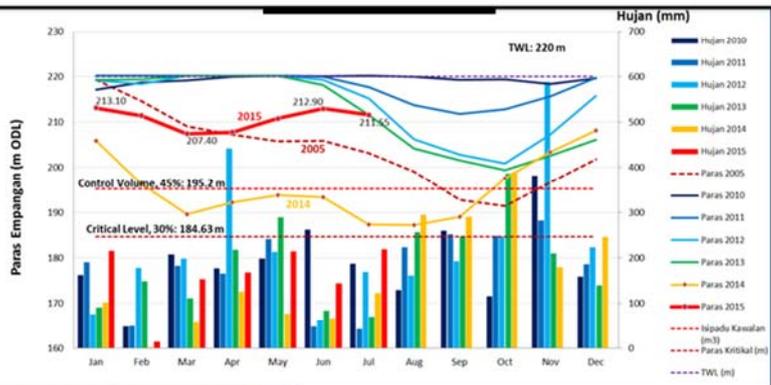
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RESULTS

Sungai Selangor Dam Level 2010 - 2015

Sungai Selangor Dam Level projection 2015



MMD stated that the weather in Malaysia is characterised by two monsoon regimes:

- Southwest Monsoon from late May to September (dry monsoon)
- Northeast Monsoon from November to March (heavy rain to East Coast)
- The transition period in between the monsoons is known as the inter-monsoon period (flash flood)



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DISCUSSION & RECOMMENDATIONS

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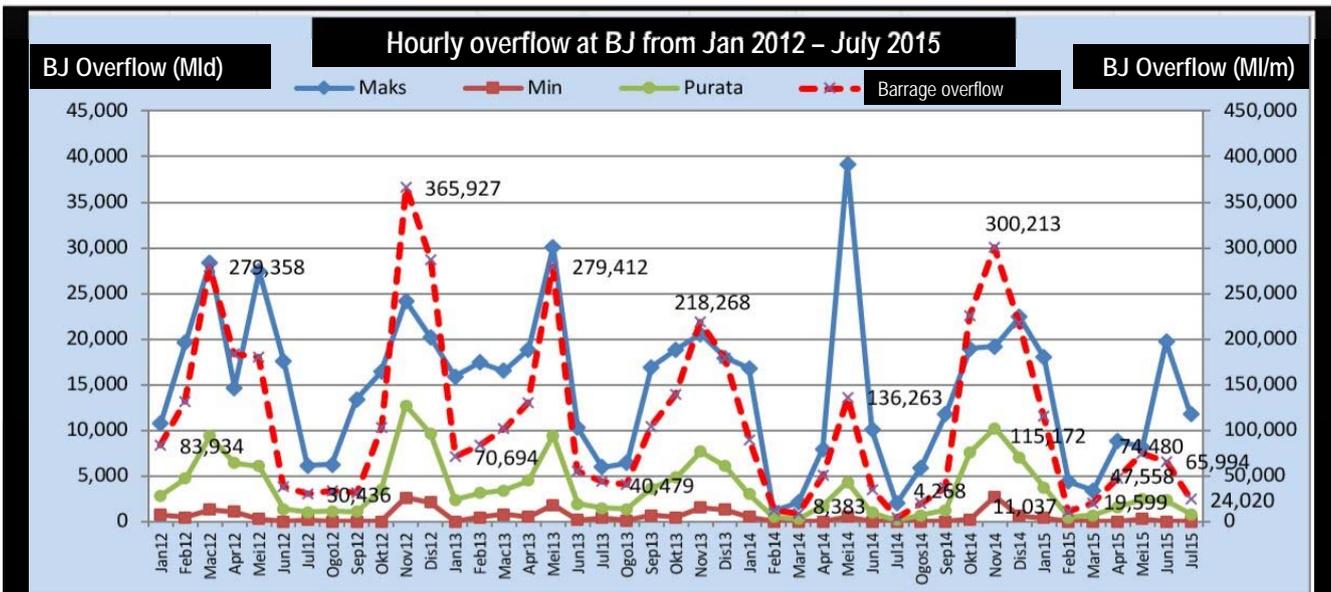
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DISCUSSIONS & RECOMMENDATIONS



The overflow across BJ barrage reached as high as 40,000Mld. The monthly overflow amount at the BJ barrage varied but huge in quantity. It is evident that capturing and storing part of the excess quantity that overflow in HORAS can be sustainable if the storage can last 2 – 3 months.

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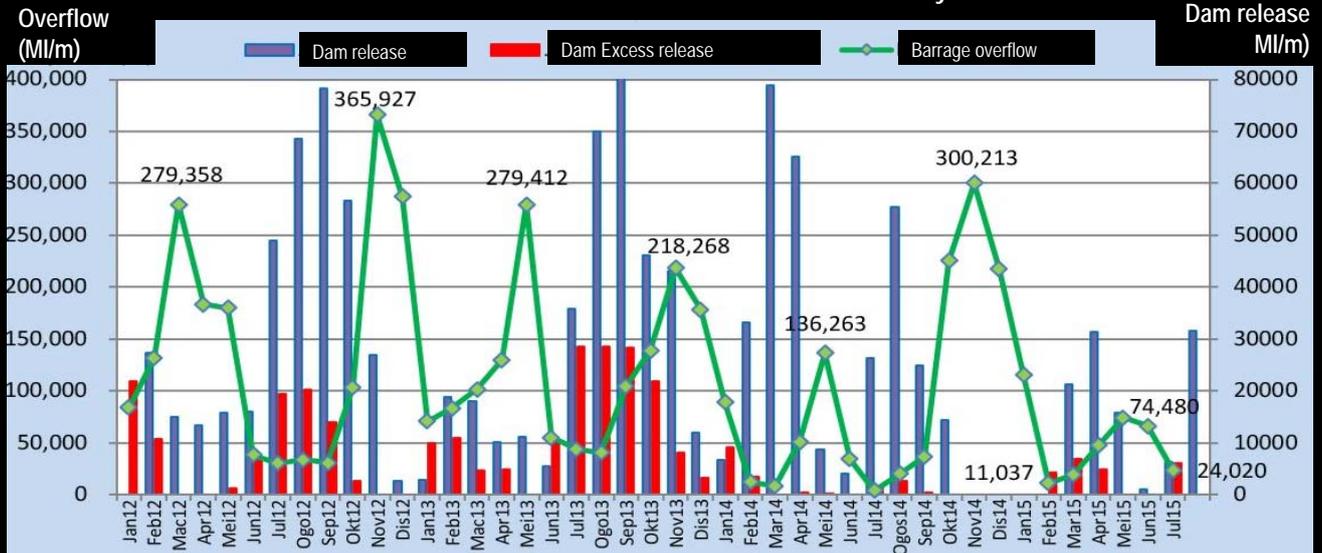
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DISCUSSIONS & RECOMMENDATIONS

Excess Release from Dam Releases from Jan 2012 – July 2015



During the period before pumping of HORAS *plus* was done, it was evident that there was wastage (excess release) from dam (red column). Construction of HORAS was supported by this results and will be able to control the wastage.

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DISCUSSIONS & RECOMMENDATIONS

- The pattern of rainfall had changed and less rain fell in the catchment.
- About 85% of the rainfall images showed that rain did not fall in the dam catchment but it fell in other areas in the WTP catchment
- This phenomenon calls for review on harvesting rain. Middle catchment or midland storage has the quantity but may pose new challenges.

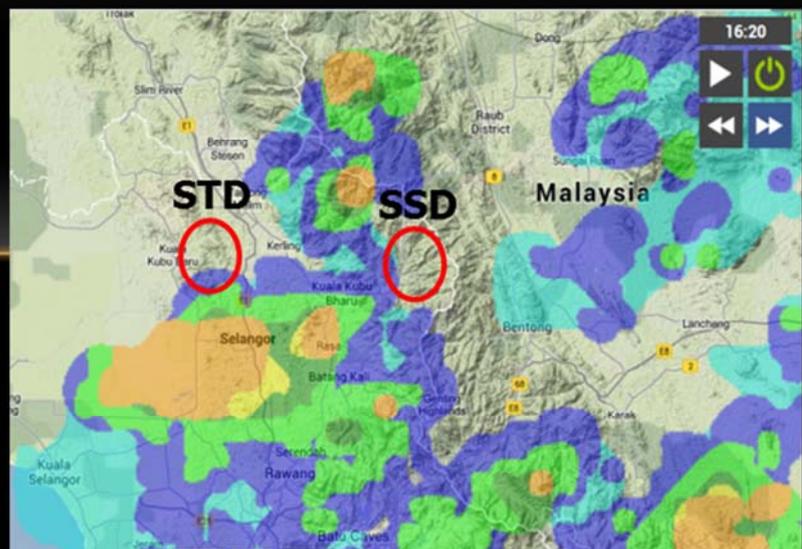


Image taken at 16:20 on 10/5/14

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IMPLEMENTATION

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IMPLEMENTATION

- Harvesting rainfall at the upper reaches is faced with changes in this pattern where less rain was recorded falling in the dam catchment and dam replenishment becomes a challenge.
- It is imperative that rainfall need to be harvested at a bigger catchment and midland reservoir becomes imperative
- Hybrid Off-river augmentation system (HORAS) – a combination of surface and ground water abstraction was recommended. Bunded or Off-river Storage (ORS) also can serve the same purpose as well.
- Implementation of HORAS in sand rich area had reduced construction cost as the excavated material can be used for the construction of the storage area and the excess exported

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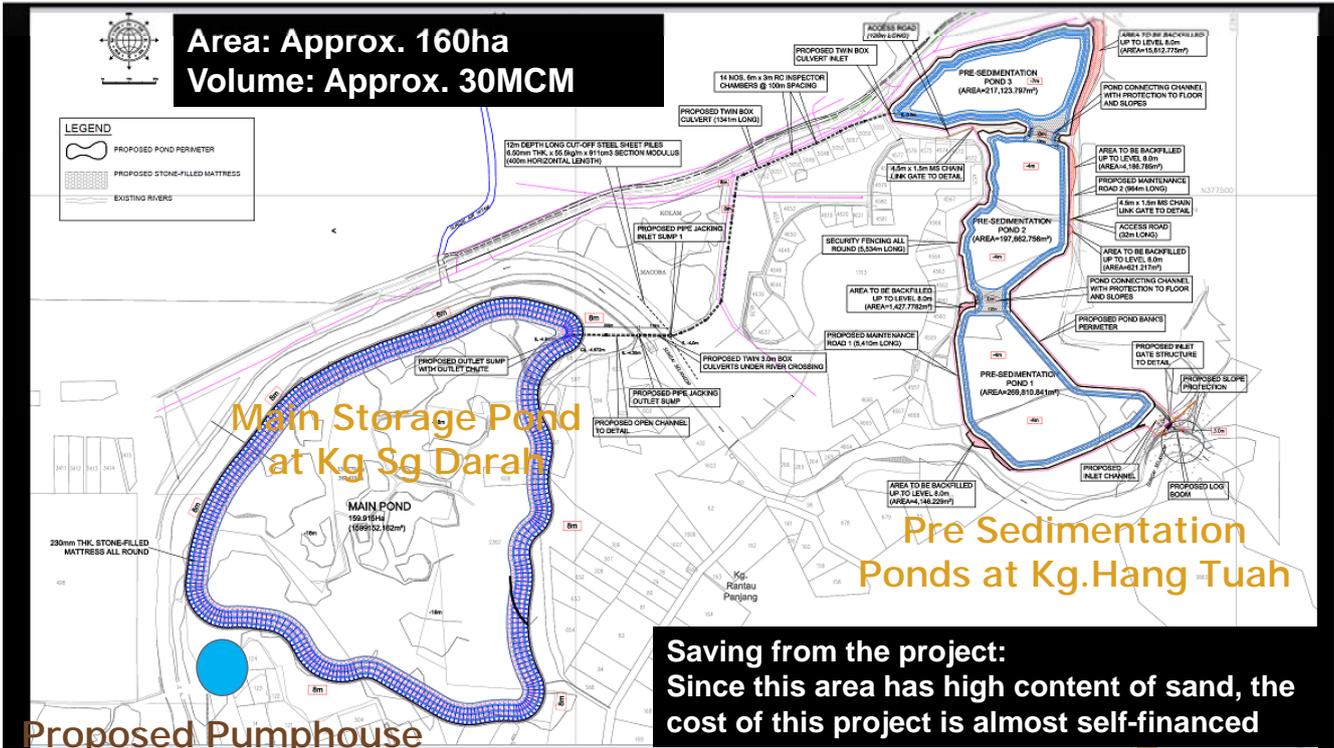
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IMPLEMENTATION



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CONCLUSION



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CONCLUSION

- HORAS implementation is the first step to eliminate waste at the BJ barrage. It created tremendous wealth directly or indirectly.
- There are still more rooms for elimination of waste from the overflow
 - ✓ Increasing the size of the storage
 - ✓ Improving the management of release
 - ✓ Increasing river flow monitoring stations
- The dam replenishment is more challenging as the rainfall pattern has changed.
- Midland reservoir is an option to replace the conventional upper catchment reservoirs
- The current practice of river regulating dams did not take the advantage of quality water at the upper reaches as it flows into rivers and get contaminated

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