UNESCO REGIONAL DIALOGUE ON SUSTAINABILITY SCIENCE POLICY TO SUPPORT THE POST-2015 DEVELOPMENT AGENDA
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Sustainable Water Resource Management in Brunei Darussalam

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Ministry of Development
Negara Brunei Darussalam

INTRODUCTION

A) COUNTRY BACKGROUND

- Northwest Borneo, tropical rainforest weather
- 5786 sq km land size, Coastline of 161km
- 4 Districts, population approx. 400,000 (2011 national census)
- Capital: Bandar Seri Begawan in Brunei-Muara District, with 71.2% of country population
- GDP per capital is USD 24,184.67

INTRODUCTION

B) BRUNEI VISION 2035 – STRATEGIES AND GOALS

- Educated, qualified and highly skilled to international standard
- Quality of life by reference to the United Nations Human Development Index and aim to be among the top 10 nations in the world.
- Dynamic and sustainable economy – top 10 countries of the world

Achieving Vision 2035, 8 well-coordinated national strategies, a few such as:

- Education strategy
- Economic strategy
- Infrastructure development strategy
- Environment strategy

INTRODUCTION

C) UN MILLENNIUM DEVELOPMENT GOALS - ACHIEVEMENTS

- Potable water supply – 100% of Brunei population
- Improved Sanitation – over 91% of Brunei population (56% is centralized system)
- Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources

INTRODUCTION

D) WATER INSTITUTIONS

i) Department of Water Services > > Water supply

ii) Department of Drainage & Sewerage > Drainage, flood management & sanitation

iii) Department of Agricultural > > Irrigation

- (i) & (ii) are under the jurisdiction of Ministry of Development
- (iii) under the jurisdiction of Ministry of Industry and Primary Resources

RAW WATER & POTABLE WATER IN BRUNEI DARUSSALAM

Annual rainfall: 2500mm along the coast and over 4000mm in the hilly interior

Tropical climate with year-round hot weather and high humidity.

River catchment covers 75% of country's land

Raw water is extracted directly from river for treatment

Dams are constructed to regulate flow & for flood mitigation

3 MAJOR BASINS :

- Tutong river)
- Belait river) total yield = 11,640 MLD
- Temburong river)

5 DAMS

- Brunei-Muara District: Tasek Dams & Mangkubau Dams
- Tutong District: Benutan Dam & Ulu Tutong Dam (completing end of 2015)
- Belait District: Kargu Dam

2 BARAGES

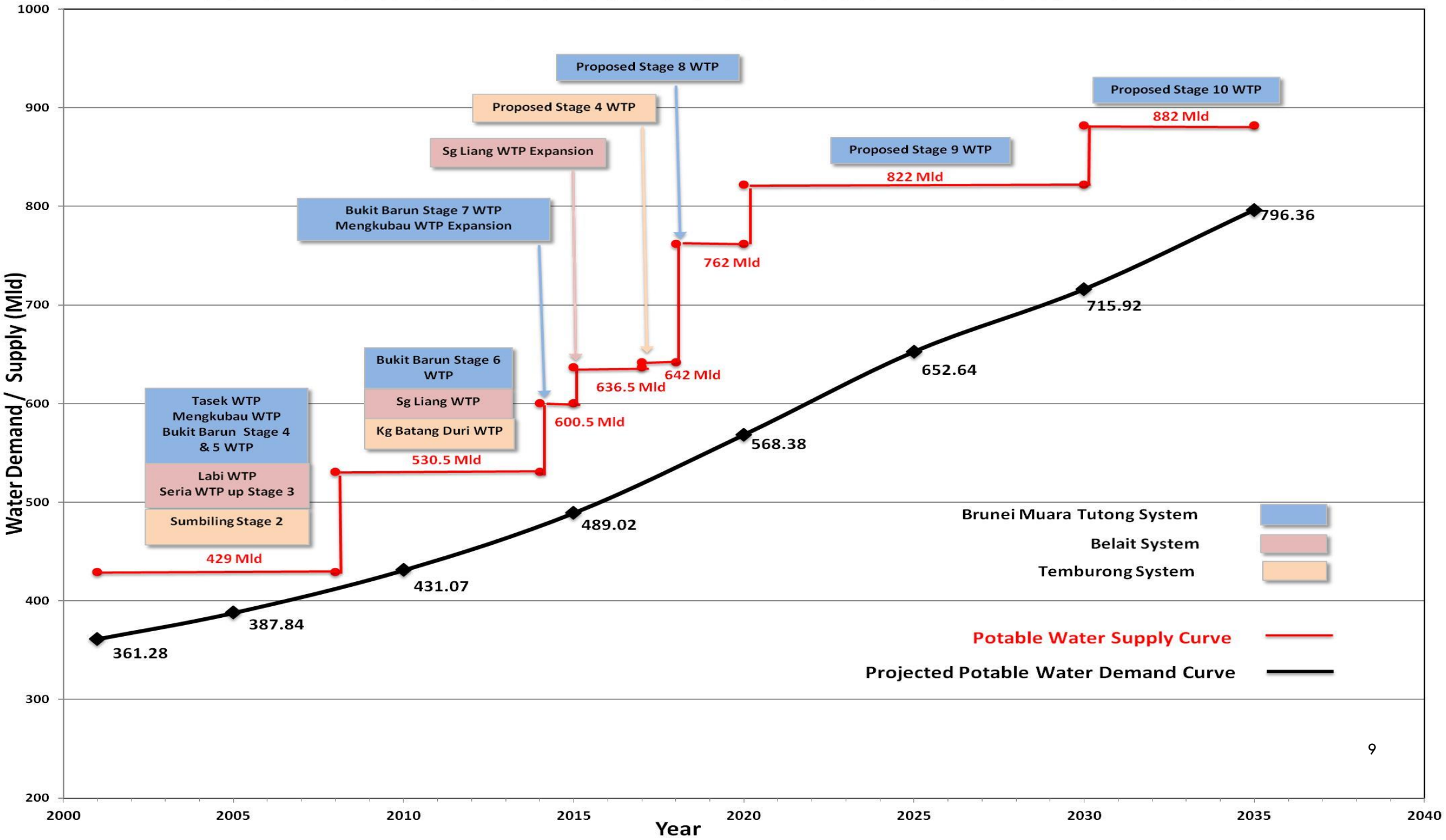
HRH Crown Prince at Membrane Plant

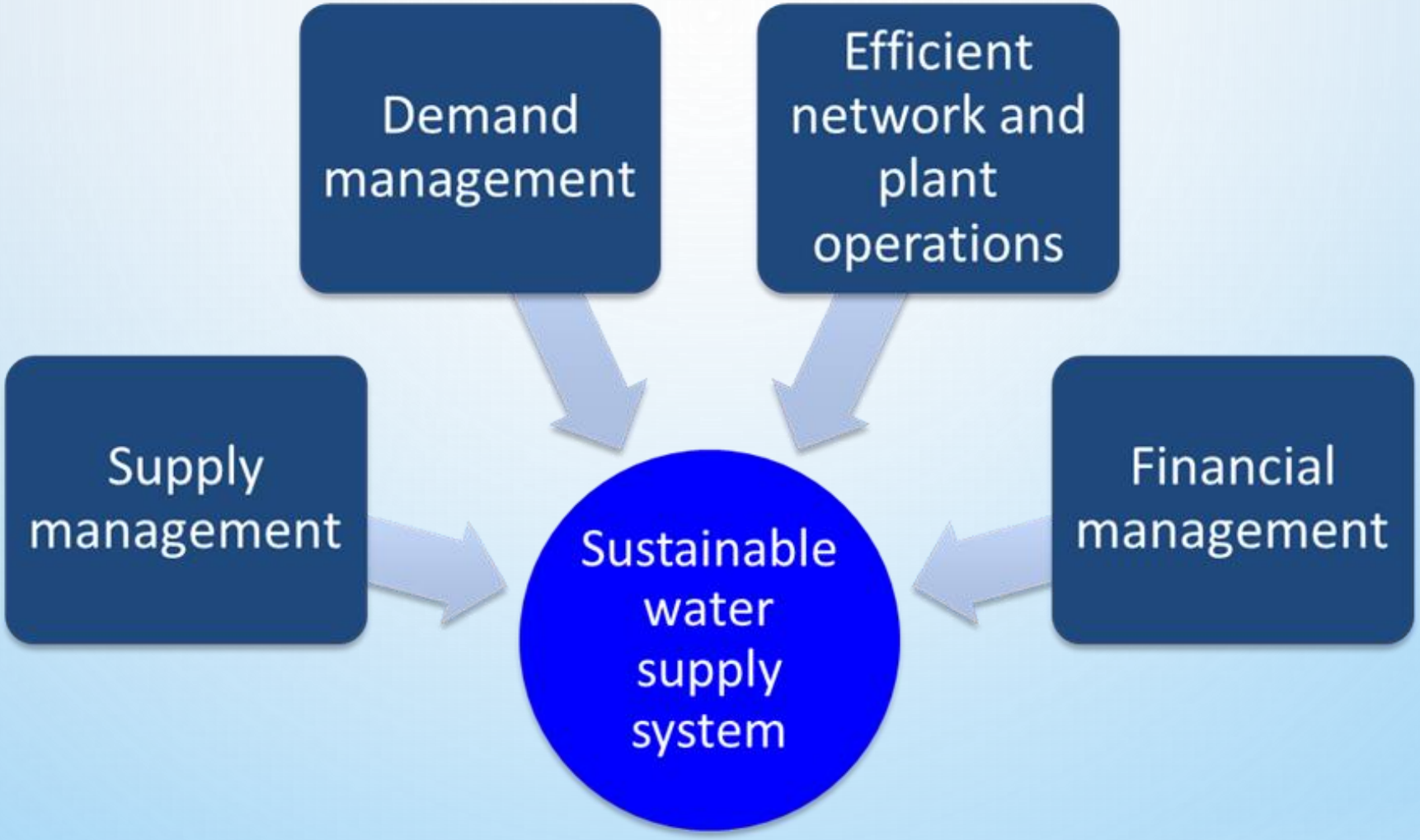
9 Treatment Plants

- Brunei-Muara District: Tasek & Mangkubau
- Tutong District: Bukit Barun Stages 5, 6, 7 & Membrane Plant
- Belait District: Agis –Agis & Seria
- Temburong District: Sembiling

96 Service reservoirs

POTABLE WATER SUPPLY PLANNING CURVE FOR NEGARA BRUNEI DARUSSALAM




Demand management
Efficient network and plant operations
Supply management
Financial management
Sustainable water supply system

CURRENT STATE

- SUPPLY MANAGEMENT
  - Water Resources Are Adequate (UTD, UBD Planning)
  - Heavy Reliance On Single Source (Sg Tutong) For Brunei Muara & Tutong
  - Production Capacity Currently Adequate But Need Upgrades For Near Future
  - Transmission System Needs Increase In Capacity
- DEMAND MANAGEMENT
  - High Per Capita Consumption
  - High NRW
  - High Leakage
  - Losses

CURRENT STATE

- OPERATIONS EFFICIENCY
  - Average / Unknown
  - Asset Management System Being Introduced
  - Operational Audit To Be Done
  - Aged (And Leaky) Pipes Needs Replacement

ACTION PLANS

Supply Management

ACTION PLANS
SUPPLY MANAGEMENT
Water Resource Assessment

1. National Supply and Demand studies – long term
2. Ulu Tutong Dam – under construction
3. Geological, geotechnical and Hydrological studies - UBD
4. Environmental and social impact assessment – Proposed to be carried out
5. Risk Assessment – Proposed to be carried out

Production capacity

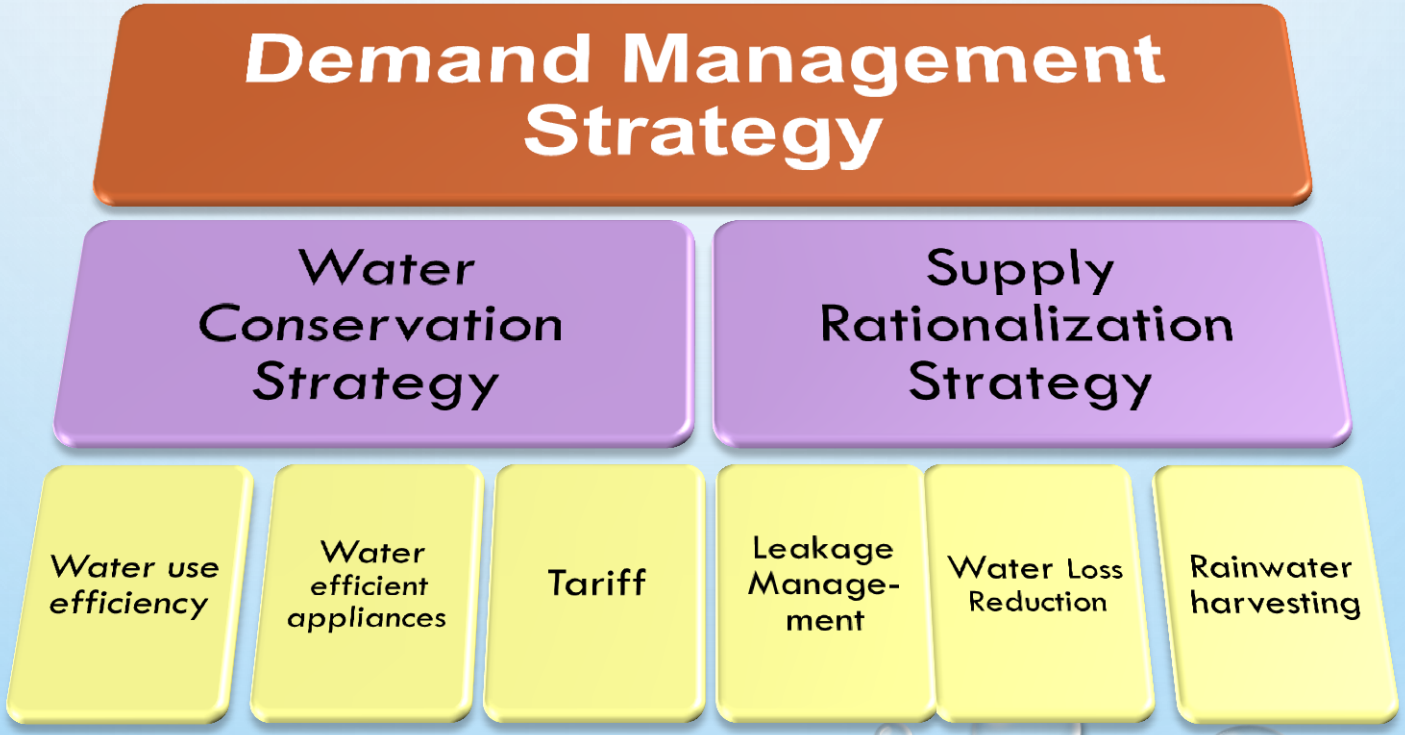
Stage 8 being tendered – 120 MLD
Mangkubau upgrade ongoing – 40 MLD
Sg Liang upgrading planned – 36 MLD

Transmission

Coastal pipe project ongoing – 1.20m, 70 km long

Service reservoirs under construction

Action Plans
Demand management & Conservation



DEMAND MANAGEMENT & CONSERVATION ACTION PLANS

Dam inspection

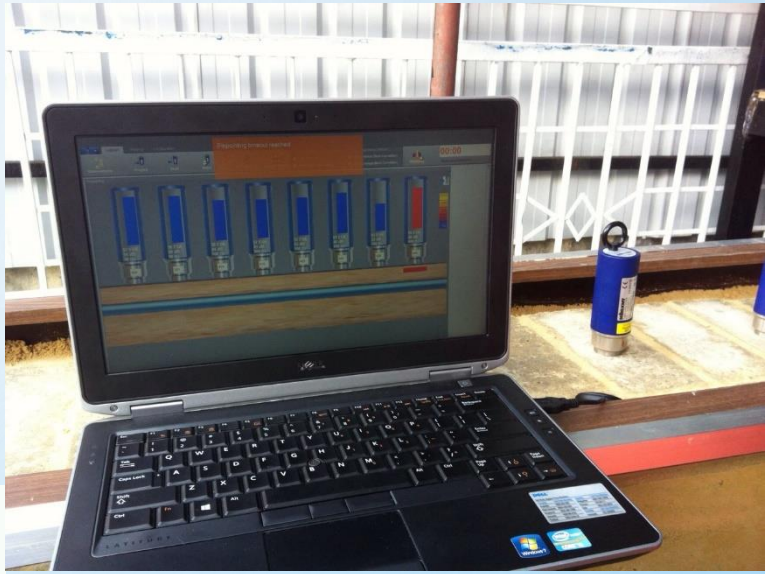
Supply Rationalization Strategy:

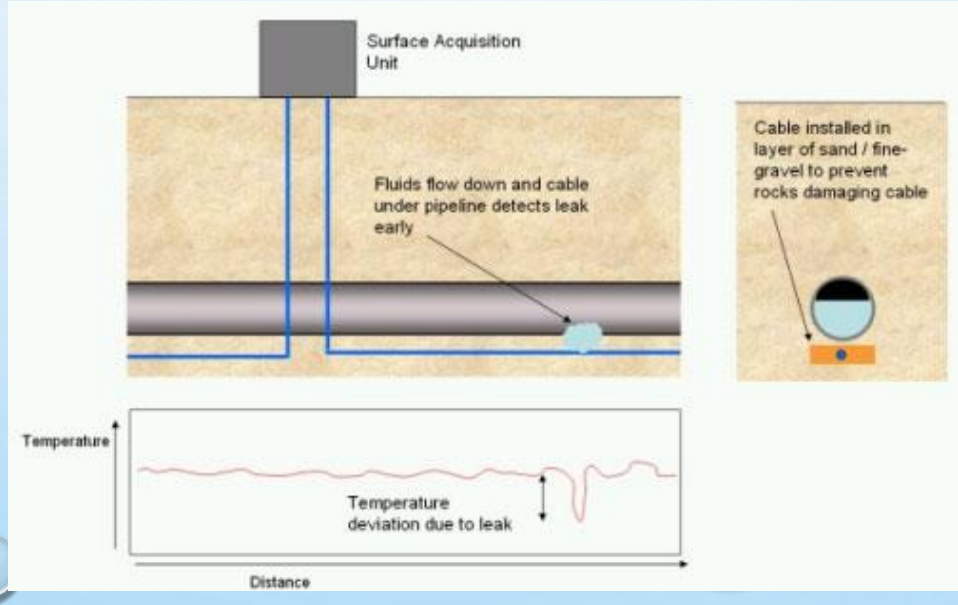
- Management of Non-Revenue Water (45%!)
- Leakage control through Pressure Management & leakage detection
- Night flow analysis and interpretation of the Minimum Night Flows
- Evaluation of treatment plant production efficiency
- Rehabilitation & refurbishment works on dams
- Training on aspects of water demand management

Evaluation of treatment plant production efficiency - some examples:

- Addition of VSDs to raw water pumps that currently lack VSD
- Regular check & repair of surge suppressor system
- Installation of controller on chemical feed pumps and telemetry to allow flow pacing of chemical
- Automation of lime/chalk flushing system

Leakage Detection





DEMAND MANAGEMENT & CONSERVATION ACTION PLANS

Supply Rationalization Strategy:

Need to be done on:

- Design & implementation of customized software to monitor and reduce leakage in national water reticulation system
- Development & implementation of small scale public private partnership involving leakage reduction interventions
- Real time data acquisition and internet display using software
- Rainwater harvesting
- Continuous training on all aspect of water demand management

DEMAND MANAGEMENT & CONSERVATION ACTION PLANS

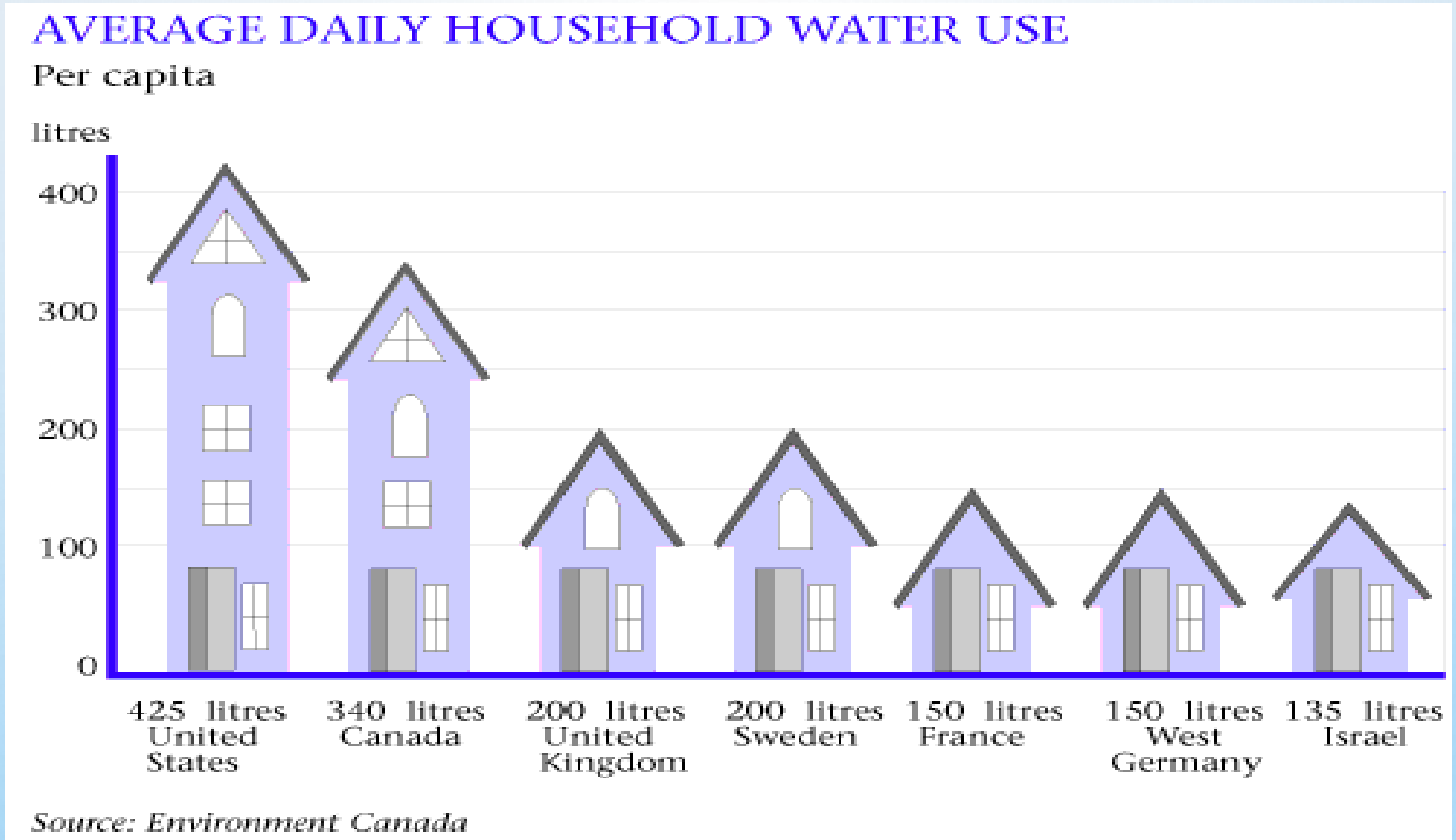
Water Conservation Strategy:

- Continuous development & implementation of water conservation plans
- Introduction of water efficient appliances
- Training on aspects of water demand management
- Tariff review
- 3 R – reuse, reduce & recycle

More need to be done on:

- More collaboration/PPP
- Stakeholders involvement & commitment
- Education – young school children

- **Low water tariff:**
  - **domestic B$0.11 per m3 (up to 54m3)**
  - **USD 0.08 per m3**
  - **Commercial B$0.66 per m3**
  - **USD 0.51 per m3**

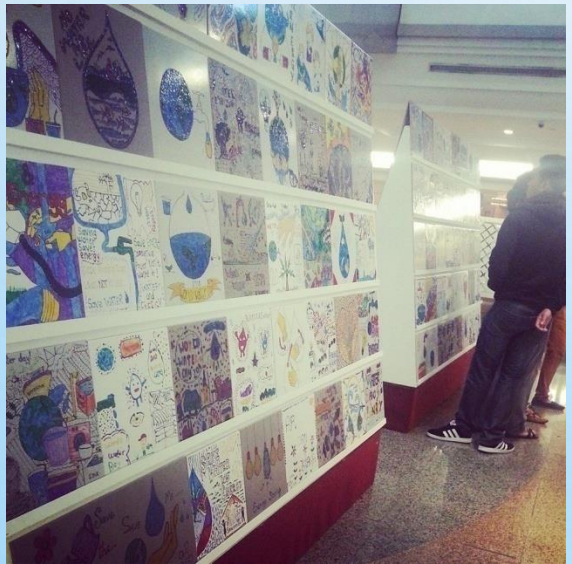


Brunei per capital consumption: 420-450 liter/day


GUNAKAN AIR DENGAN
BIJAKSANA


Hari Rabu, 21 Rejab 1435H / 21 May 2014
The Mall, Gadong


Stung By BEES Co.
World Water Day 2014
I ♥ WATER
Yang Berhormat
Menteri
Pembangunan
21 Mei 2014




20.04.2011

WWD Activities

FINANCE

- Operations cost relatively high
- Billing operations is improving
- Collection increasing
- Enforcement Is being improved

TARGET: FINANCIAL SUSTAINABLE ??

CAPACITY BUILDING

- ✓Match skill to job
- ✓Strengthen technical skill-based training specific for the roles
  - Attachment with PUB, SG
  - Expertise workshops with TSS, Japan
- ✓Develop professional & specialist engineers, CIWEM, IMECHE, ICE
- ✓In-Service Training for technical staff

Borneo Bulletin, Wednesday 4 March 2015 — Homepage

Minister of Development Pehin Orang Kaya Indera Pahlawan Dato Seri Setia Awang Haji Suyoi bin Haji Osman and senior officials in a group photo with the graduates

Day of celebration for 19 MoD officials

SYAZWANI HJ ROSLI

NINETEEN individuals from the Ministry of Development (MoD) yesterday received their Postgraduate Diploma certificate in Civil Engineering, marking the completion of their Further Learning Programme (FLP) Course.

Minister of Development Pehin Orang Kaya Indera Pahlawan Dato Seri Setia Awang Haji Suyoi bin Haji Osman was the guest of honour at the event, which was held at The Empire Hotel & Country Club.

The graduation ceremony opened with a recitation of the Surah Al-Baqarah and its interpretation by Haji Mohammad Eddy Huzaimi bin Haji Mat Yassin, the champion of the 2014 Tilawah Al-Quran competition for the Ministry of Development and its departments.

In his speech, Permanent Secretary (Administration and Finance) at the Ministry of Development Haji Muhammad Lutfi bin Haji Abdullah expressed hopes the programme will continue to produce more professional and skilled human resources not only at the ministerial level, but also at the national level, thereby allowing the country to realise the Brunei Vision 2035.

The 30-month-long part-time programme equipped students with various technical and non-technical skills not only in engineering, but also in the construction and building industry. They were also enlightened in areas spanning across finance management, accounting, information technology, project management and laws, as well as health and safety issues.

Speaking on behalf of the graduates, Haji Mohamad bin Haji Tuah explained that the programme had provided them exposure and opened their minds.

The ceremony continued with the certificate presentation to the first intake graduates of FLP.

This followed with the presentation of awards to two outstanding graduates

TETAMU KEHORMAT

The minister presenting the Excellent Award to Pengiran Roslan bin Pengiran Haji Badruddin (pic left) and Muhammad Mansur Najib bin Dr Haji Mohd Yussof (pic right)

- Pengiran Roslan bin Pengiran Haji Badruddin from the Department of Water Services for achieving excellent results and Muhammad Mansur Najib bin Dr Haji Mohd Yussof from the Housing Development Department for his active participation throughout the programme.

Speaking to the Bulletin, Pengiran Roslan Diploma Course, before sharing the steps he had taken to overcome challenges he faced.

"When I started the course, I was holding the housing project (about $100 million worth of projects) while attending the programme part time. Within the time period as well, I got married and then my wife gave birth. It was a whirlwind experience I had to go through, but it was

Civil Engineers completed Further Learning Programme (Post-Grad Diploma) of Institution of Civil Engineers, UK, pre-requisite for Chartered Civil Engineers

CAPACITY BUILDING

- ✓Continuous capacity development – include soft skills and attitude training to prepare staff in their readiness to deliver efficient services, adaptive to changes, committed, resilient and high adversity
- ✓Strengthen core group for 24/7/365 O & M
- ✓Incentive & promotion scheme
- ✓Successor planning as key priority

FLOOD MITIGATION PROJECTS – URBAN DRAINAGE SYSTEM

Up to end of 2014, flood mitigation measures have reduced the areas (urban) susceptible to flooding from 280 sq kilometres to 180 sq kilometres.

Flood mitigation programme and plan implemented based on 2006 Floodplain Mitigation Study

Measures introduced by the DDS included:

- Setting up of detention ponds with water pumps (example Jalan Subok, Burong Pingai, Ban Areas)
- River diversion and surface ran-off diversions
- Deepening of river tributaries,
- Dredging of drains, ensuring drains are unclogged to reduce risk of flooding
- Widening and realignment of rivers and drainage outlets in parts of country which are prone to flooding

The major features and forcing of anomalous rainfall in Brunei Darussalam based on three cases of interest (January 2009, 2011 and 2014), as well as triggers of floods and landslides in the country have been found to include:

1. Strong variability and unpredictability of anomalous rainfall events;

2. Variability of anomalous rain-fall forcing or inducing mechanisms;

3. Socio-geographical and environmental factors that aid in triggering floods and landslide disasters

Consequence of heavy rainfall >> Flood & landslide:

1. Geography – little slope in the flat coastal areas
2. Rapid Urbanization (esp capital district)

   – resulted in canalization of rivers & streams

   - limited/shallow storms drains insufficiently allow flood water flow off quickly
3. Intense monsoon rainfall
4. Soil nature = deeply weathered, highly leached & susceptible to erosion
5. Human action/behavior = carelessness of residents, contractors & land developers
6. House/buildings built with insufficient drainage

The government of Brunei Darussalam partnered with IBM Research – India to apply deep expertise in using data analytics and weather modeling to improve agriculture and energy development. In a three-year joint partnership with the Universiti Brunei Darussalam (UBD), the UBD | IBM Centre will develop precision weather forecast models.

These weather forecasts are further used for various applications like analyzing the effects of climate change, flood forecasting and sustainable flood management, solar and wind power forecasts and agro-technologies like mobile applications for rice farmers.

From results, flood adaptation and mitigation measures were recommended. These recommendations focused on integrating sustainability, environmental protection and amenity value into the overall approach of flood management.

Eco-regeneration of urban river system (Sg Kedayan)

- Sustainability eco-corridor of the city
- Green network along the river connected to green area in the city
- Conserve and restore mangrove along the river
- Create detention space to absorb storm water and release it slowly

Concluding

Science Is The Enabler For Tailored Solutions

Sustainability in science for our children in future

Water = Our Life, Our future. Value it!

Dam	Storing capacity MM^3	Raw water from River, MLD	Raw water from this dam, MLD	Raw water use for treatment MLD	Surplus, MLD
Kargu	14	150	350	140	210
Mangkubau	9.6	-	35	30	
Mangkubau – raised capacity	15.5			40	
Ulu Tutong Dam	100	503	566	400	669
Ulu Belait Dam	109		1882	Future inter basin transfer	