



Strategic Plan for Groundwater Development in Malaysia

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11 November 2016

LAWS GOVERNING GROUNDWATER MANAGEMENT

FEDERAL LEGAL ASPECTS

LAWS OF MALAYSIA

Act 129

GEOLOGICAL SURVEY ACT, 1974

Development of certain wells to be notified

13. (1) Any person who bores, drills, digs or otherwise develops a well for the purpose of searching for or extracting water there from shall notify the Director General of such details as may from time to time be prescribed.

FEDERAL LEGAL ASPECTS



12 September 2013
12 September 2013
P.U. (A) 288

WARTA KERAJAAN PERSEKUTUAN

*FEDERAL GOVERNMENT
GAZETTE*

**PERATURAN-PERATURAN PENYIASATAN KAJI BUMI
(PEMBERITAHUAN PEMAJUAN TELAGA DAN KOREKAN)
2013**

***GEOLOGICAL SURVEY (NOTIFICATION OF DEVELOPMENT
OF WELLS AND EXCAVATIONS) REGULATIONS 2013***

FEDERAL LEGAL ASPECTS

- Malaysia Environmental Quality Act 1974 – Section 25 (Restriction on pollution of inland water- Department of Environmental
- Food Act 1983. Rule 60A (Natural Mineral Water) – Ministry of Health
- Town and Country Planning, 1976.
Item 19.(2)(c) : *For any excavation, including excavation of or for wells, made in the ordinary course of agricultural operation in area zoned for agriculture*

STATE LEGAL ASPECTS

- Kedah : Water Resource Enactment (2008) – Sec.26
- Perak : Water Act (1920, Revise. 2009) – Sec. 18(2)
- Selangor : Selangor Water Management Board 1999) – Sec.44 & 52
- N.Sembilan : Water Act (1920, Rev. 2007) – Sec.7
- Sarawak : The Water Supply Regulation (1995) – Sec.153
- Johor : Waters Enactment (1921) – Part.3
- Pahang Water Resource Enactment (2007) – Sec.53
- Terengganu : Water supply Enactment (1998) – Sec. 62
- Kelantan : Water supply Enactment (1955) – Sec.51
- Sabah Water Resource Enactment (1998) – Sec.16
- Melaka: Water Resource Act (2016)

GROUNDWATER DEVELOPMENT HISTORY

- 1903 – Geological Survey Department (GSD) and Public Work Department (PWD) involved in Preliminary Groundwater development
- 1930s – Groundwater Development in Kelantan for public water supply, cooperation between Water Supply Division, PWD and GSD.
- 1953-1957 – GSD actively involved in Groundwater Exploration in Arau, Perlis.
- 1955-1958 – GSD and United Nations Technical Assistance Administration (UNTAAs) jointly studied the groundwater potential to increase groundwater usage in Malaysia.

- 1960s – GSD & PWD Sabah Working together to Develop Groundwater resource in Sandakan.
- 1971 – Hydrogeology Section at GSD was officially established.
- 1970s – GSD & JKR Sarawak collaborated to explore Groundwater Resource.
- 1974-1977 - BGR (German Geological Survey) gave Technical aid to GSD in Groundwater exploration in the eastern coastal areas of Peninsula Malaysia.
- 1980s - Japan International Cooperation Agency (JICA) carried out Water Resource (including Groundwater) study in Peninsular Malaysia.

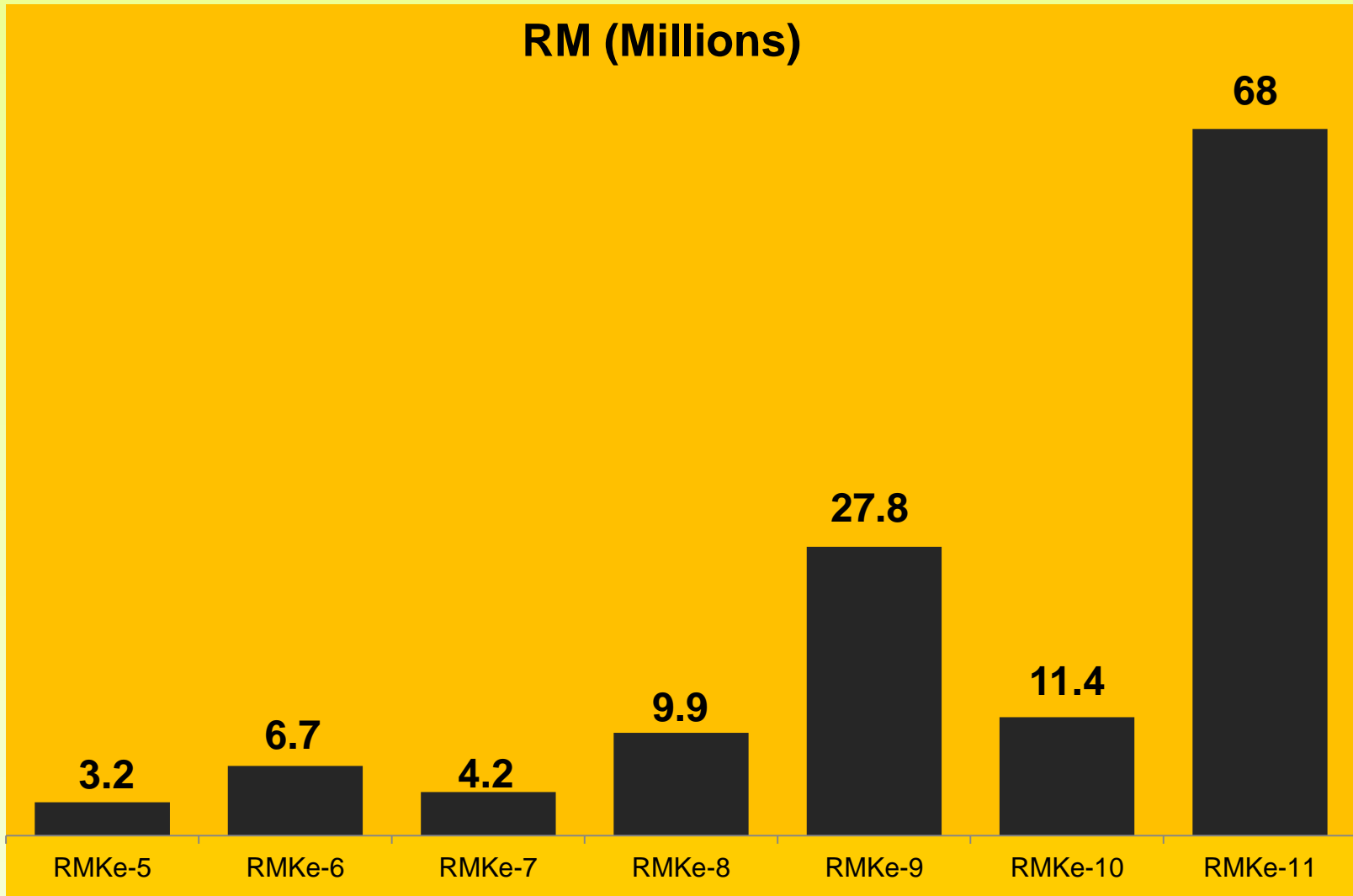
- 1982-1985 Groundwater Investigation in the areas of Rembau-Tampin-Gemas and Muar were carried out - 60 wells were drilled.
- 1983-1985 – Bank Infiltration Study in Felda Lepar Hilir, Tenggaroh and Nitar by GSD and PWD Funded by World Bank.
- 1986-2015 – GSD/JMG implemented six of 5 years Groundwater Development Project in Peninsular, Sarawak and Sabah.
- 2000-2003 – JICA and JMG Carried out Study On The Sustainable Groundwater Resources And Environmental In Langat Basin.

**ACHIEVEMENTS UNDER THE
FIVE MALAYSIA PLAN
PROGRAMME**

ACHIEVEMENT JMG IN RMKe-5 TILL RMKe-10 (1986-2015)

- **JMG/GSD allocated RM63.2 million for exploration and well development.**
- **400 wells were drilled with an estimated 30mld of water, enough to supply 650,000 peoples.**
- **420 monitoring wells have been constructed for water quality and quantity , land subsidence and climate change monitoring.**

Allocation Breakdown under RMKe-5 Till RMKe-11 (1986-2020)



RMKe-11

PROJECT 1:

Development of Groundwater in Water Stress Areas

Allocation : RM41 juta

Scope:

- **Well Construction, water analysis, and simple water treatment and reticulation system.**
- **Well Monitoring**

Output:

- **200 wells constructed with simple water treatment systems**
- **420 well monitored.**

RMKe-11

PROJECT 2:

Basin Groundwater Reserve Assessment

Allocation: RM27 Million

Scope:

5 Major River Basins - Sungai Pahang, Sungai Muda (Kedah), Sungai Selangor, Sungai Kedamaian-Tempasok (Sabah), Sungai Baram (Sarawak)

Output:

Estimate groundwater reserves in each Basin.

**TO MEET THE
INCREASING DEMAND
IN GROUNDWATER**

INCREASE IN WATER DEMAND



Durian Tunggal Dam, Melaka 1991

- Increase of population
- Expansion of Industrial and agriculture
- Decrease of surface water quality
- Long drought – El Nino
- Increase of Water supply Interruption



Exploration and development of Groundwater in water stress areas.



Development of Groundwater during the water crisis



Official ceremony of tube well by Tan Sri Joseph Kurup in Kg. Biah Skim1, Keningau, Sabah in 2012

Royal Officiating of the water supply from tube well in Pulau Sibul on 22.8.2016



Groundwater Monitoring



**Quality and Water level, 2 times a year
Sampling for Chemical Analysis**

GEOPHYSICS STUDY

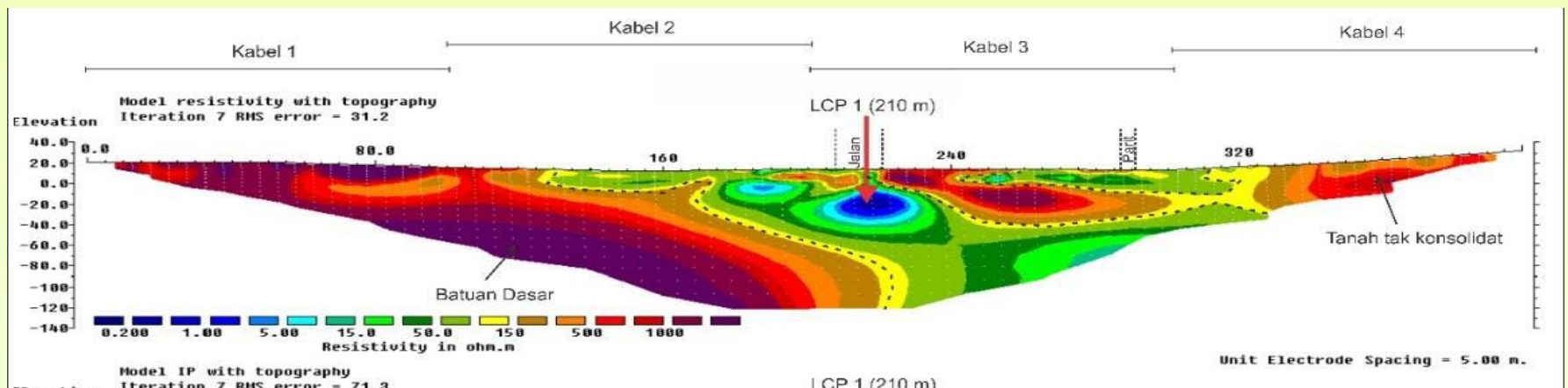
Resistivity



Transient EM

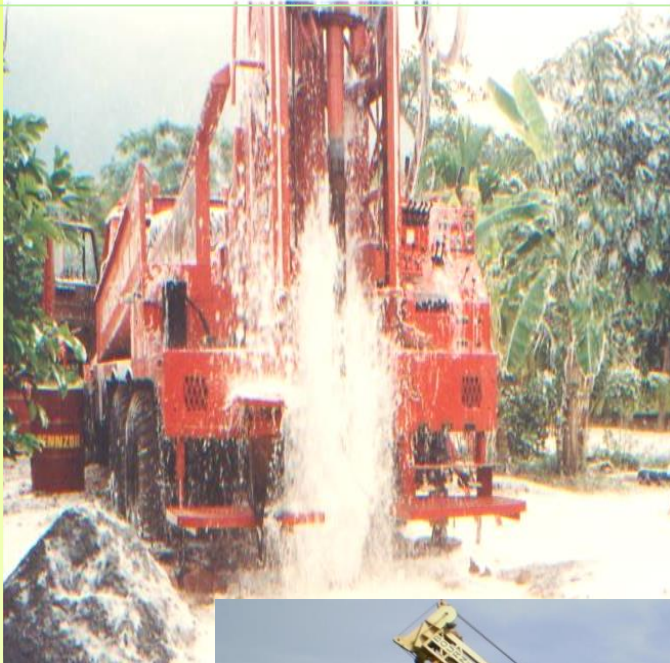


Downhole Logger



DRILLING

Ingersoll Rand for hardrock



Bourne Drill for alluvium



Drilling and well
result- Discharge
>100 m³/jam

GROUNDWATER DEVELOPMENT



Vertical Well –
Normal Practice



Horizontal Collector Well –
Recent Approach to
increase well yield

LABORATORY FACILITIES

Akredited (MS ISO/IEC 17025)



NATIONAL WATER RESOURCE COUNCIL (MSAN) KE-11

26th May 2016, MSAN approve Groundwater development as a backup supply for water treatment plant which is facing surface water low flow and not enough

Allocation:

RM33 juta for 2yrs
(2017-2018)

Scope

19 Water Treatment
Plant in Semenanjung,
Sabah dan Sarawak.



Simple Water Treatment and Reticulation System



Comparison before and after n



Genset & Pump



Colum filter



Ultra Membrane

GROUNWATER TO MITAGATE THE PEAT FIRE



PEAT FIRE MITIGATION



**Study visit by the
Indonesia and Brunei
delegation in Kuala
Baram, Sarawak**

OUTPUT AND OUTCOME

DATABASE AND MANAGEMENT

HIDROdat Database and HydroGIS Application

Statistic

State	WELL
Johor	434
Kedah	404
Kelantan	378
Melaka	192
N. Sembilan	312
Pahang	533
Perak	282
Perlis	227
Pulau Pinang	72
Sabah	238
Sarawak	220
Selangor	553
Terengganu	465
WP Kuala Lumpur	26
WP Putrajaya	0
WP Labuan	22

Location

Location: Pumping Test, Geophysics, Grain Size

General Information: Project Name: PROJEK PEMBANGUNAN AIR BAWAH TANAH: Penggerudan Dan Pembedaan Telaga

Sub Project: Malaysia: RMK-9, Plan: Well No: PB000780

Field No: BKLTV08, Inclination: Vertical

Type of WELL: Tube Well, Aquifer: District: Kuala Langat

Mukim: TANJUNG DUA BELAS, Basin: 19

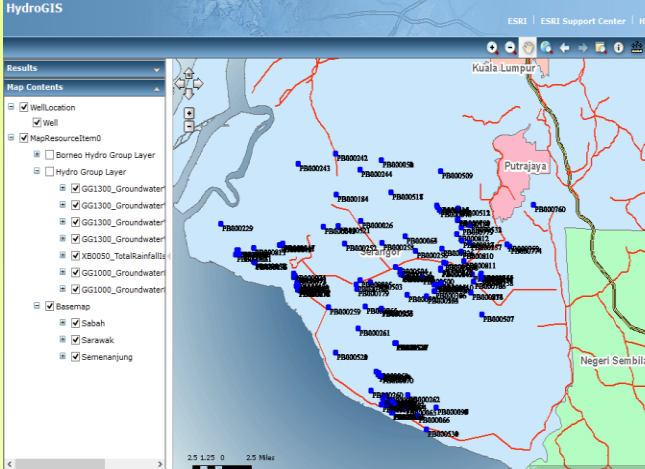
Location: lot pt 8959, ha(d) 5289, mukim of tanjung duabelas, Positioned By: GPS

Northing: 318828.00

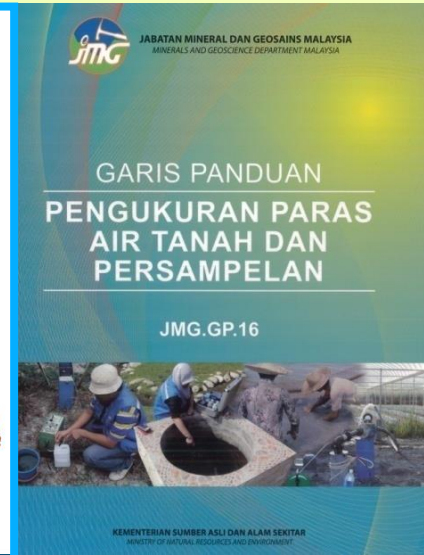
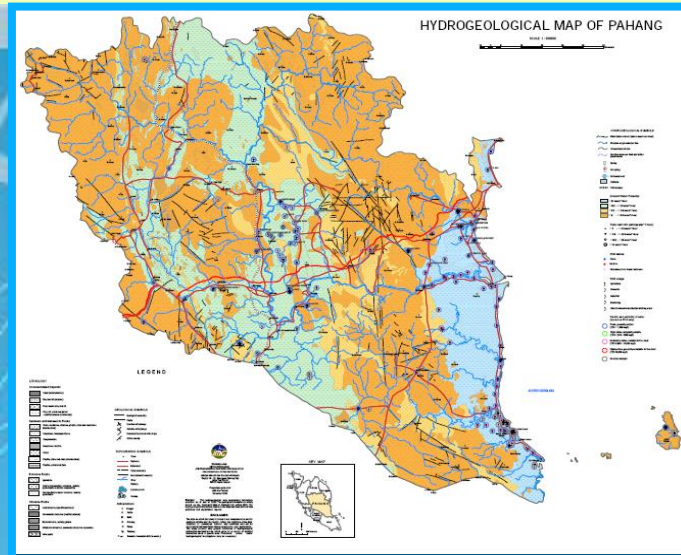
HydroGIS

Map Contents:

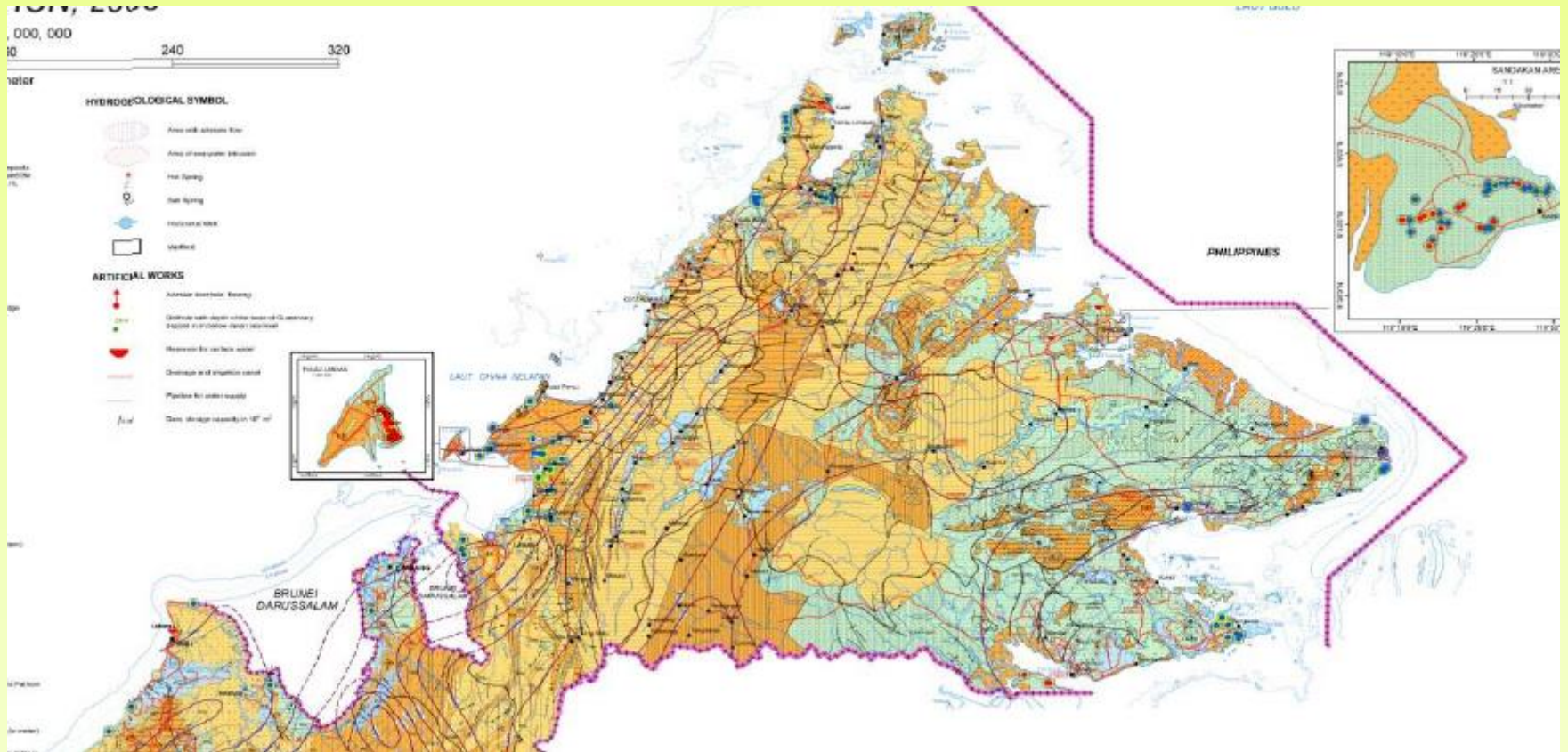
- WellLocation
- Well
- MapResourceItem0
 - Borneo Hydro Group Layer
 - Hydro Group Layer
 - GG1300_Groundwater
 - GG1300_Groundwater
 - GG1300_Groundwater
 - GG1300_Groundwater
 - KB0050_TotaiRainfall
 - GG1000_Groundwater
 - GG1000_Groundwater
- Basemap
 - Sabah
 - Sarawak
 - Semenanjung



Publication, report, maps and guideline



SABAH (2008)



ISSUES AND CHALLENGES

ISSUES AND CHALLENGES

- Drought and El Nino - Vulnerable and Rationing of Public Water Supply
- Water Pollution
- Increase in Water Demand
- Current Water Management
- Public Awareness

Issues: Drought and El Nino

- ❑ In the event of drought, the public water supply will be very vulnerable and "rationing" had to be enforced as experienced in March 2014 in the State of Selangor and the Federal Territories of Kuala Lumpur, Labuan and Putrajaya
- ❑ Similar conditions have been experienced in the past particularly in 1998 and 2008
- ❑ These conditions causes distress to people and disrupt economic activities.

Issues: Drought and El Nino



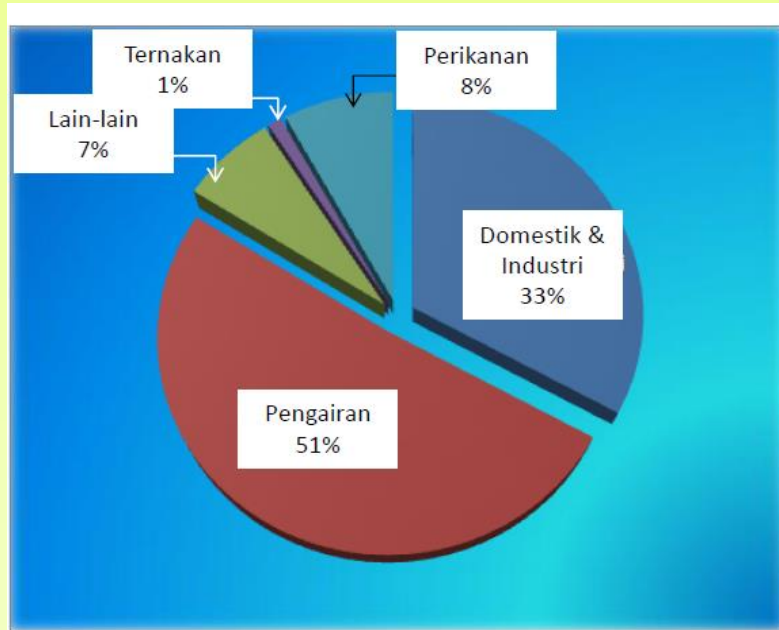
Issues: Water Pollution

- The destruction of hills and forests in the catchment area has caused the lowering of water level and water quality of the river which is the main source of water supply.
- Heavy run off in the disturbed forest area has also lead to the soil erosion resulting of high turbidity and sedimentation thus reducing the river capacity.
- Water pollution from industry/agriculture etc

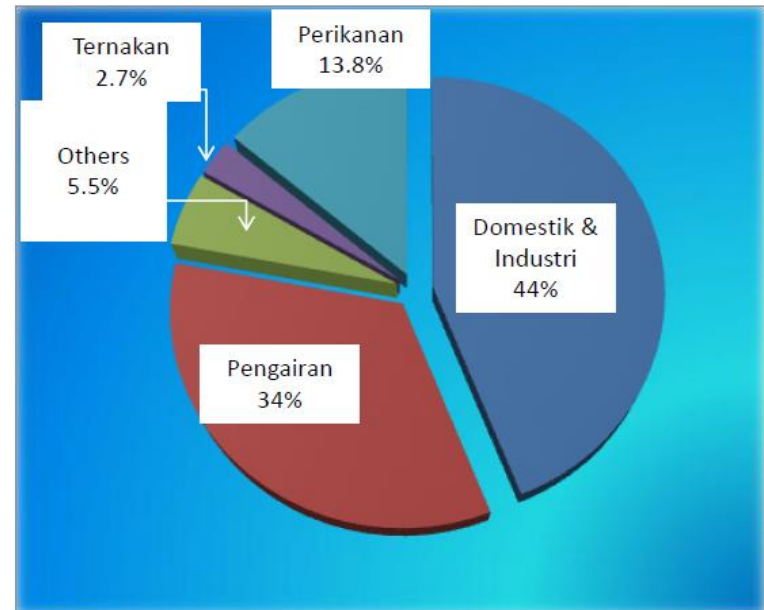


Issues: Increase in Water Demand

Water Demand From Various Sectors



Demand Projection 2010



Demand Projection 2050

Public Awareness

To enhance the understanding and to overcome the misconception by public on groundwater resource and usage

AGENCIES INVOLVED IN GROUNDWATER DEVELOPMENT AND SUPPORTED BY JMG

1) Minerals and Geoscience Department (JMG)

- Groundwater exploration and development.
- Groundwater development for preventing and mitigating peat fire.
- Groundwater Assessment in major River Basin
- Systematic groundwater monitoring

2) National Hydraulic Research Institute of Malaysia (NAHRIM)

- Research and development
- Riverbank Filtration (RBF)
- Managed Aquifer Recharge (MAR)

3) Agensi Nuklear Malaysia (ANM)

- Groundwater studies using nuclear technique:
 - Quantifying groundwater recharge
 - Groundwater age dating
 - Groundwater pollution

4. Jabatan Alam Sekitar (JAS)

- Monitoring of groundwater quality at specific areas:
Dumping site, industrial area, golf course
Agriculture and aquaculture area, husbandry, etc.

5. Agensi Remote Sensing Malaysia (ARSM)

- Groundwater basin study using satellite techniques.

6. Kementerian Kesihatan Malaysia (KKM)

- Rural environmental sanitation program for rural areas
- Mineral water industry

7. Kementerian Pertanian dan Industri Asas Tani (MOA)

- Groundwater for Irrigation

8. State Authorities

- groundwater for public water supply
- State water resources regulators

**THE WAY FORWARD
5-YEAR STRATEGIC PLAN**

NATIONAL WATER RESOURCES POLICY

The "Review of The National Water Resources Study (NWRS) 2000-2050 and Formulation of National Water Resources Policy" for Economic Planning Unit (EPU) which was completed in August 2011 has recommended an assessment of groundwater resources to be implemented nationwide for the 26 river basins.

National Strategic Plan For The Management of Groundwater Resources

The National Water Resources Council endorsed Six Strategic Plan for the management of groundwater resources as follows:

- a. Legal Augmentation and Enforcement
- b. Assessment and Development of Resources
- c. Monitoring of Groundwater
- d. Capacity Building
- e. Promotion and Awareness
- f. Research and Development

JMG STRATEGIC PLAN FOR 2016-2020

- Adopt NRE's six Strategic Plans
- Establish accurate groundwater reserves in the country
- Sustainable groundwater development and monitoring in islands
- Establish the use of groundwater to combat peat fires
- Establish the use of groundwater to support raw water supply to Water Treatment Plants during dry seasons

- ❑ Inventories all water wells and related assets within and outside JMG
- ❑ Update and inform National Water Resource Council, National Groundwater Resource Steering Committee and relevant water agencies and institutions from time to time in the progress of groundwater policies and activities in the country
- ❑ Collaboration with Regional and International groundwater institutions

ACTION PLANS

1.1 Legal Augmentation And Enforcement

- Compile all laws and regulations in force and review their purposes.
- Identify and place-in-order all committees and task forces governing the National Water Resources Council

1.2 Assessment And Development Of Resources

- ❑ Two hundred tube wells to be developed in all 13 states in Malaysia in water stress areas under RMK-11 (2016-2020).
- ❑ Determine ground water resources in five aquifer basins under RMK-11, that being: Lembangan Sg Muda in Kedah, Lembangan Sg Selangor in Selangor, Lembangan Sg Pahang in Pahang, Lembangan Sg Baram in Sarawak and Lembangan Sg Kedamaian-Tempasok in Sabah

1.3 Monitoring of Groundwater in Malaysia

- ❑ Revise the monitoring procedures so as to address new issues of climate change, El Nino and response in aquifer regimes.
- ❑ Develop a dedicated groundwater database with time series analysis to interpret and address above issues.
- ❑ Develop real-time monitoring network and inter-link with other monitoring network, if and when present.

1.4 Capacity Building

- Officers in JMG having Masters and PhD in groundwater.
- In-house training on well design and development.
- Application of geophysics and remote sensing in aquifer basin studies.
- Conduct a groundwater driller's course.
- Introduce groundwater module in University Graduate Course.

1.5 Promotion And Awareness

- Revise existing guidelines on groundwater.
- Produce pamphlets for distribution.
- Public awareness during launching ceremony of new wells.
- Education on proper use of groundwater

1.6 Research and Development

- ❑ Understanding water balance in groundwater resources in islands.
- ❑ Flood water for artificial recharge in aquifers.
- ❑ Lowering of iron contents in groundwater to permissible values for good drinking water.
- ❑ Affiliation with universities in providing data for MSc and PhD studies on selected groundwater topics of importance

2. Establish Accurate Groundwater Reserves In The Country

- Establish accurate groundwater reserves in 5 major river basins; 3 in Peninsula Malaysia, 1 in Sabah and 1 in Sarawak by 2020
- Revise the hydrogeological map in JMG which should include water well distribution and estimated reserves.

3. Sustainable Groundwater Development And Monitoring In Islands

- All the data of groundwater exploration in islands need to be compiled and studied in detail.
- Aquifers in islands are small and sensitive to environment and hazardous/prone to saltwater intrusion. As a result, detail studies need part of NBOS programme.

4. Establish The Use Of Groundwater To Combat Peat Fires

- In 2009, groundwater was introduced by JMG to combat peat fire to pump the groundwater and flood the area
- Seven States were involved – Sarawak, Sabah, Johor, Pahang, Kelantan and Selangor and Terengganu.
- A total of 66 wells were developed under RMK-9 to RMK-10 with a total cost of RM 17.22 million.
- The project is funded by JAS and jointly carried out by JMG-JAS-JPS-BOMBA.

5. Establish The Use Of Groundwater To Support Raw Water Supply To Water Treatment Plants During Dry Seasons

- On 26 May 2016, MSAN approved JMG's proposal to supply groundwater as an alternative raw water supply to the Water Treatment Plants (WTP) when shortage in surface water.
- To study in-depth the occurrence of aquifer within the vicinity of 19 WTPs that is facing surface raw water shortage in dry seasons.
- Develop well-fields and well designs to produce optimum yield of groundwater to sustain the minimum water intake capacity to operate the WTP.

6. Inventories All Water Wells And Related Assets Within And Outside JMG

- No proper and complete inventory on water wells exists in JMG at the moment.
- Interact with MoF and JKR to compile and inventories all water well assets for systematic and effective groundwater management.
- Based on inventory assets, request for maintenance budget from EPU.
- Establish a special committee in JMG to undertake the task.

7. Update And Inform NWRC, NGRSC And Relevant Water Agencies And Institutions From Time To Time In The Progress Of Groundwater Policies And Activities In The Country

- Establish a Groundwater Technical Working Group (GTWG) in JMG to formulate and monitor the progress of the groundwater activities in JMG and outside JMG.
- Quarterly meetings are held that will assist in reporting to NWRC and NGRSC from time to time.
- Prepare project proposal papers to NWRC for budget request.

8. Collaboration With Regional and International Groundwater Institutions

- ❑ Institutions like UNESCO, UNDP, IGRC, and CCOP
- ❑ Attend meetings and training sessions overseas
- ❑ Organise training workshops with invited speakers from these institutions for technology transfer in groundwater exploration, exploitation and monitoring.
- ❑ Share groundwater data with international bodies for joint collaboration studies on transboundary and global issues.

CONCLUSION

POLICY STATEMENT ON WATER RESOURCES



The security and sustainability of water resources shall be made a national priority to ensure adequate and safe water for all through sustainable use, conservation and effective management of water resources enabled by a mechanism of shared partnership involving all stakeholders

OUTCOME

- Upgrade people standard of living
- Water supply treatment plant working continuously without any disruptions even though during dry season.
- Groundwater reserves in basins.
- Minimize peat fire and haze
- More accurate in prediction of climate change, environmental sustainability and groundwater quantity and quality
- Cooperation among the countries or states to manage sustainably transboundary aquifer.



