MALAYSIA WATER RESOURCES MANAGEMENT FORUM 2012

"Time for Solutions"

26 & 27 NOVEMBER 2012

Perbadanan Putrajaya, Putrajaya

"Water Resource Users in Malaysia – Issues and Challenges"

by

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World Water Vision Report (2000)
“A Water Secure World”

"There is a water crisis today. But the crisis is not about having too little water to satisfy our needs. It is a crisis of managing water so badly that billions of people - and the environment - suffer badly."

GWP Vision for a Water Secure World

- A water secure world is vital for effective green growth and a sustainable future in which there is enough water for social and economic development and for ecosystems. It thus incorporates a concern for the intrinsic value of water, with its diverse uses for human survival and well-being. Water security is becoming increasingly critical in many countries.
- Water security has been defined as the availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems and production, coupled with an acceptable level of water-related risks to people, environments and economies.

Source: GWP Policy Brief for RIO+20 Earth Summit, June 2012

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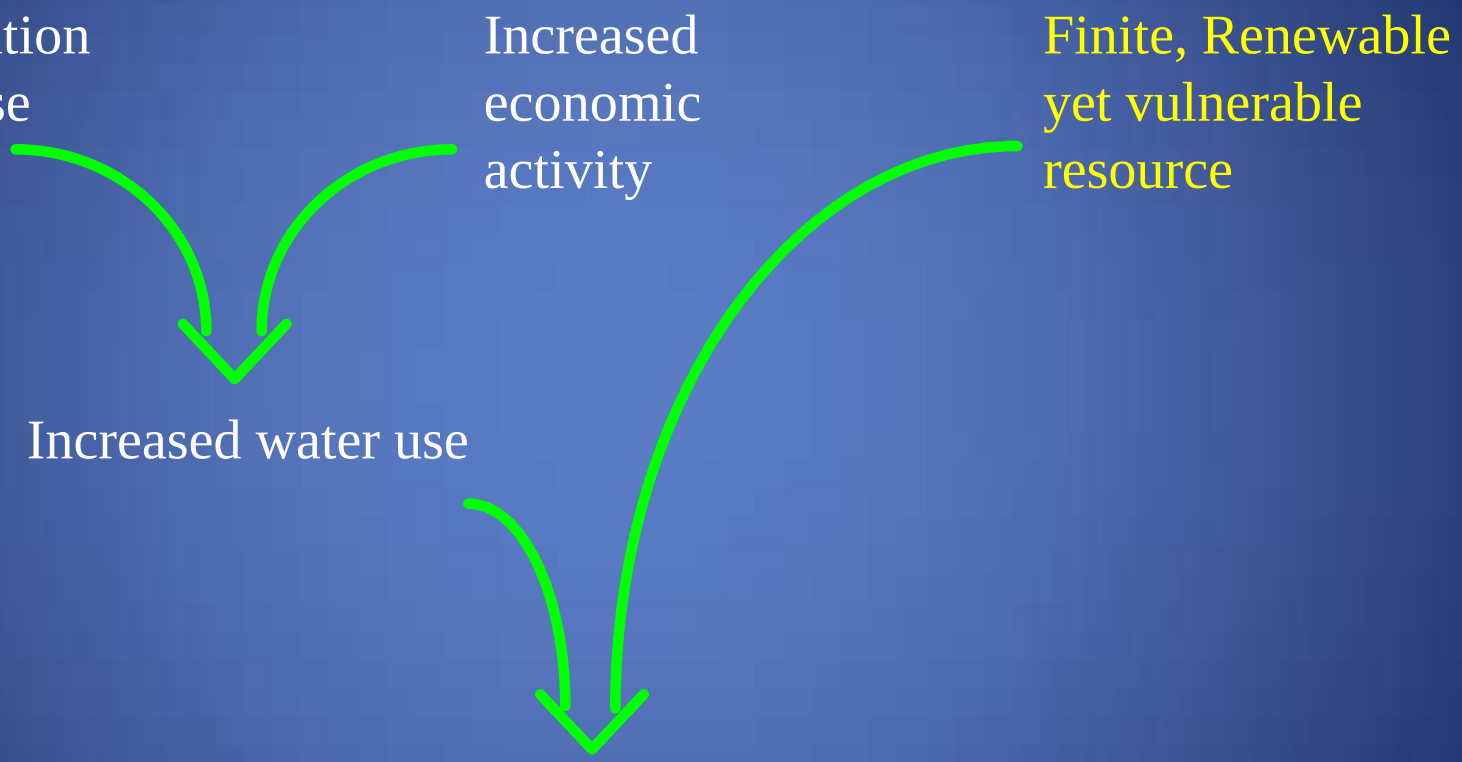
1. The Water Problem and the Malaysian Water Setting

The Global Water Scenario

- Resources are scarce
- Demands are outstripping supplies
- Environmental/Ecological issues are serious
- Policy and institutional issues are complicated
- Current approach is sectoral and fragmented
- Financing is poor and options are expensive
- New emerging impacts from climate change

The Water Problem



Problem exacerbated by new emerging impacts of Climate Change

The Malaysian Water Setting

- Land Area – 330, 803 sq. km.
- Population:
  - 2010 – 28.9 million*
  - 2020 - 34.1 million*
  - 2050 – 42.1 million*
- GDP Projections by Economic Sectors (see Table)
- Fairly abundant resources:
  - Annual Rainfall – 973 BCM
    - Evapotranspiration – 414 BCM
    - GW Recharge – 63 BCM
    - Surface Runoff – 496 BCM
- Consumptive Water Demand:
  - 2010 – 14.8 BCM *
  - 2020 – 17.2 BCM *
  - 2050 – 18.2 BCM *

- Temporal and spatial variability - some 'water-stressed' growth regions (Deficit States: Perlis, Kedah, Pulau Pinang, Selangor, Melaka)*
- Increased flooding
- Deteriorating water quality of water sources (rivers, lakes and reservoirs, and groundwater)
- Emerging Climate Change Impacts
- Fragmented management and growing conflicts among sectors
- Way Forward since turn of the 21st Century - IWRM

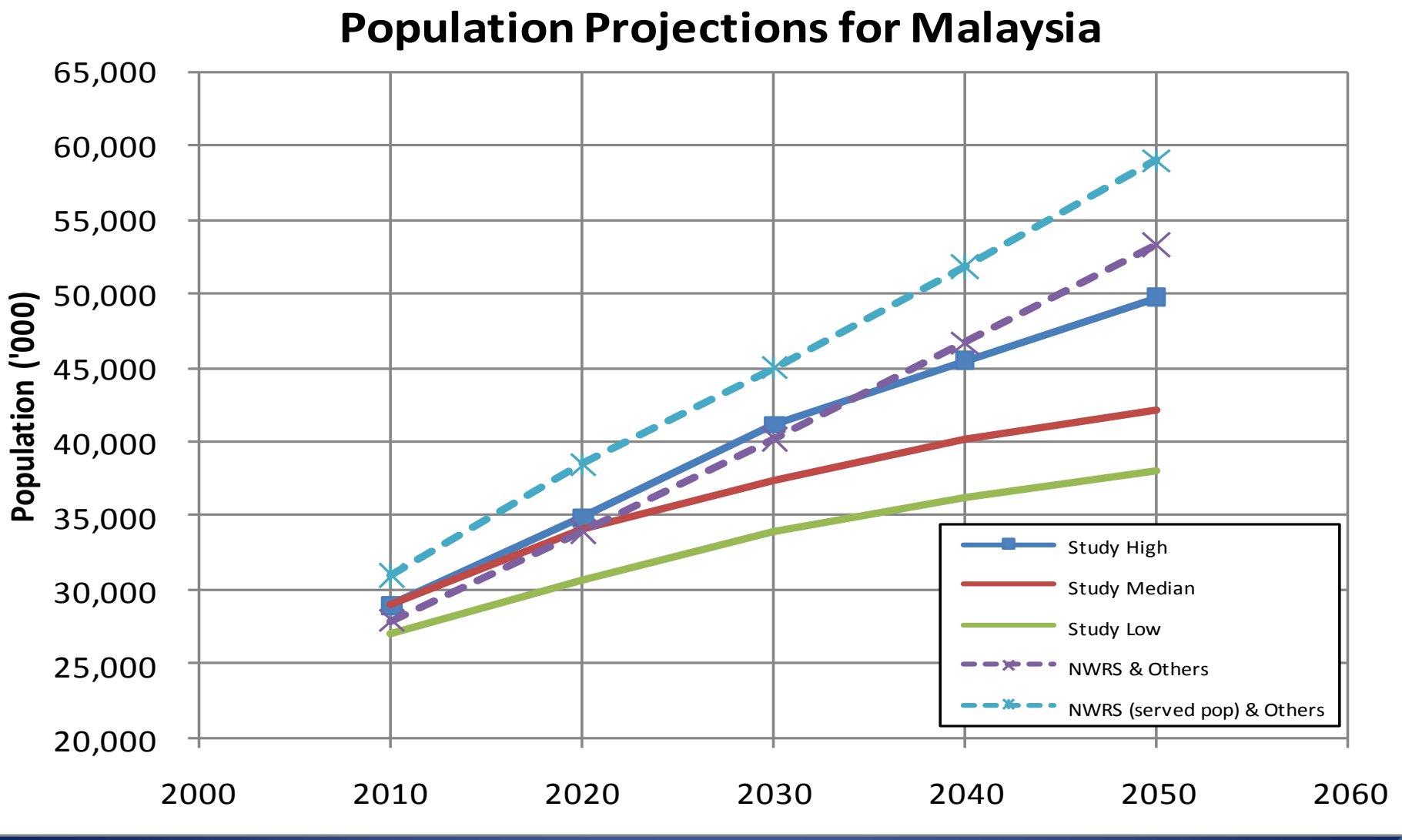
** Source: NWRS 2011*

Malaysia: Population Projections

State	Population ('000)				
	2010	2020	2030	2040	2050
Perlis	246	291	319	343	361
Kedah	2,043	2,440	2,695	2,906	3,065
Pulau Pinang	1,609	1,841	1,958	2,064	2,133
Perak	2,441	2,810	3,004	3,177	3,294
Selangor & Kuala Lumpur	6,970	7,951	8,443	8,896	9,195
Negeri Sembilan	1,032	1,190	1,274	1,348	1,399
Melaka	785	925	1,008	1,078	1,129
Johor	3,458	4,117	4,533	4,879	5,140
Pahang	1,573	1,867	2,050	2,203	2,317
Terengganu	1,149	1,445	1,672	1,854	2,006
Kelantan	1,677	2,104	2,427	2,686	2,901
Peninsula Malaysia	22,983	26,981	29,383	31,434	32,940
Sarawak	2,660	3,127	3,505	3,839	4,117
Sabah	3,267	3,874	4,400	4,719	4,958
Labuan	88	101	110	115	118
East Malaysia	6,015	7,102	8,015	8,673	9,193
Malaysia	28,998	34,083	37,398	40,107	42,133

Source: NWRS 2011

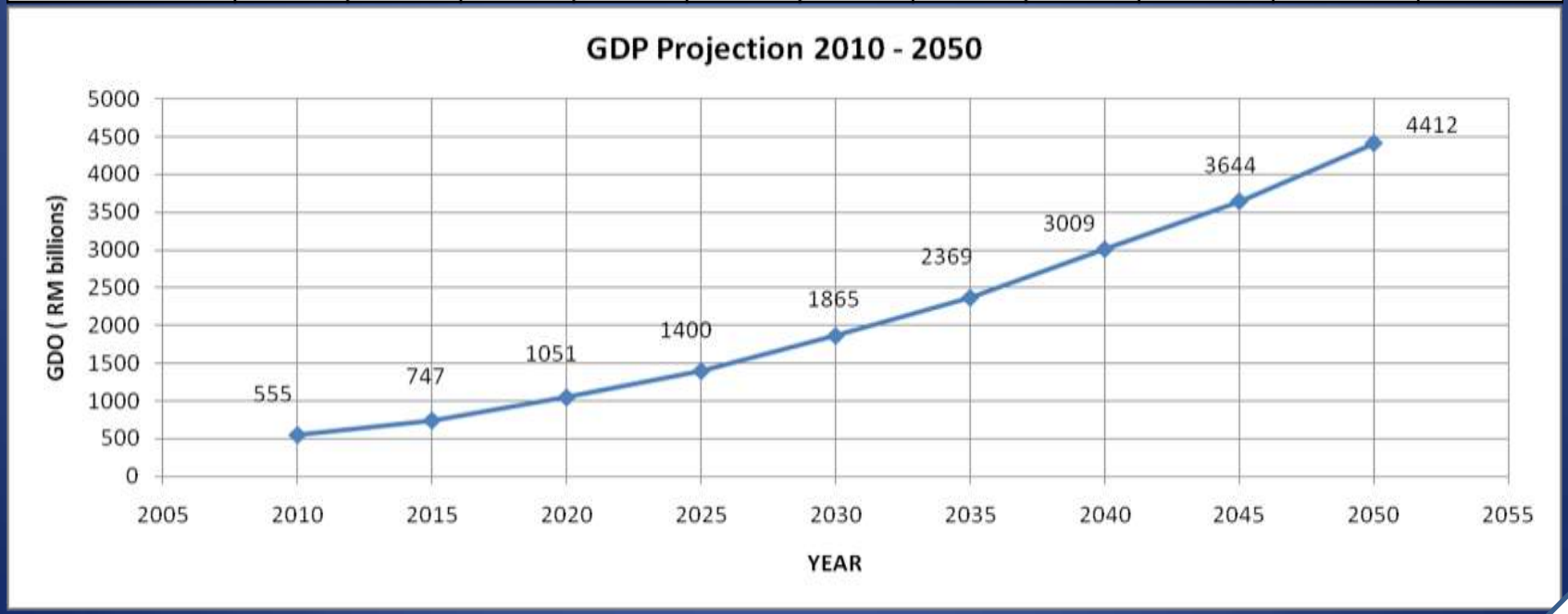
Population Projections for Malaysia



Source : NWRS 2011

Malaysia Projected GDP by Key Economic Sectors, 2010 – 2050

Year	Value in RM billion									AAGR (%)	
	2010	2015	2020	2025	2030	2035	2040	2045	2050	2010-2020	2020-2050
Agriculture	40	47	53	70	93	118	120	146	176	2.8%	4.10%
Mining	42	44	47	41	54	69	75	91	110	1.0%	2.90%
Manufacturing	139	181	245	308	410	521	662	802	971	4.3%	4.70%
Construction	17	21	24	34	45	57	66	80	97	3.5%	4.80%
Services	317	454	682	948	1,263	1,604	2,085	2,525	3,058	7.9%	5.10%
GDP Total	555	747	1,051	1,400	1,865	2,369	3,009	3,644	4,412	6.5%	4.90%



Source: NWRS 2011

Available Rainfall in Malaysia

State	Area	Unit in Billion Cu M per year			
	(sq km)	Rainfall	Actual Evaporation	Ground water Recharge	Surface Runoff
Peninsular Malaysia	132,631	330.98	170.28	19.56	141.11
Sabah	73,631	188.50	87.62	13.99	86.89
Sarawak	124,450	453.00	155.56	29.87	267.57
FT Labuan	91	0.28	0.13	0.01	0.14
East Malaysia	198,172	641.78	243.31	43.87	354.60
Malaysia	330,803	972.78	413.60	63.45	495.71

Source: NWRS 2011

Available Rainfall in Malaysia

State	Area	Unit in Billion Cu M per year				
	(sq km)	Rainfall	Actual Evaporation	Ground water Recharge	Surface Runoff	Effective Rain BCM/Year
Perlis	821	1.54	1.06	0.10	0.38	0.06
Kedah	9,500	21.95	13.59	1.24	7.12	1.07
P Pinang	1,048	2.46	1.50	0.13	0.83	0,13
Perak	21,035	52.17	27.77	3.58	20.82	3.14
Selangor	8,396	18.39	10.75	1.26	6.38	0.96
Negeri Sembilan	6,686	12.24	8.09	0.87	3.28	0-64
Melaka	1,664	3.13	2.01	0.17	0.95	0.14
Johor	19,210	47.45	21.71	3.84	21.90	3.29
Pahang	36,137	89.26	45.17	4.34	39.75	6.46
Terengganu	13,035	43.15	19.16	1.96	22.03	3.31
Kelantan	15,099	39.26	19.48	2.11	17.67	2.65
Pen Malaysia	132,631	330.98	170.28	19.56	141.11	21.17
Sabah	73,631	188.50	87.62	13.99	86.89	16.21
Sarawak	124,450	453.00	155.56	29.87	267.57	27.44
FT Labuan	91	0.28	0.13	0.01	0.14	0.03
East Malaysia	198,172	641.78	243.31	43.87	354.60	53.19
Malaysia	330,803	972.78	413.60	63.45	495.71	74.35

Source: NWRS 2011

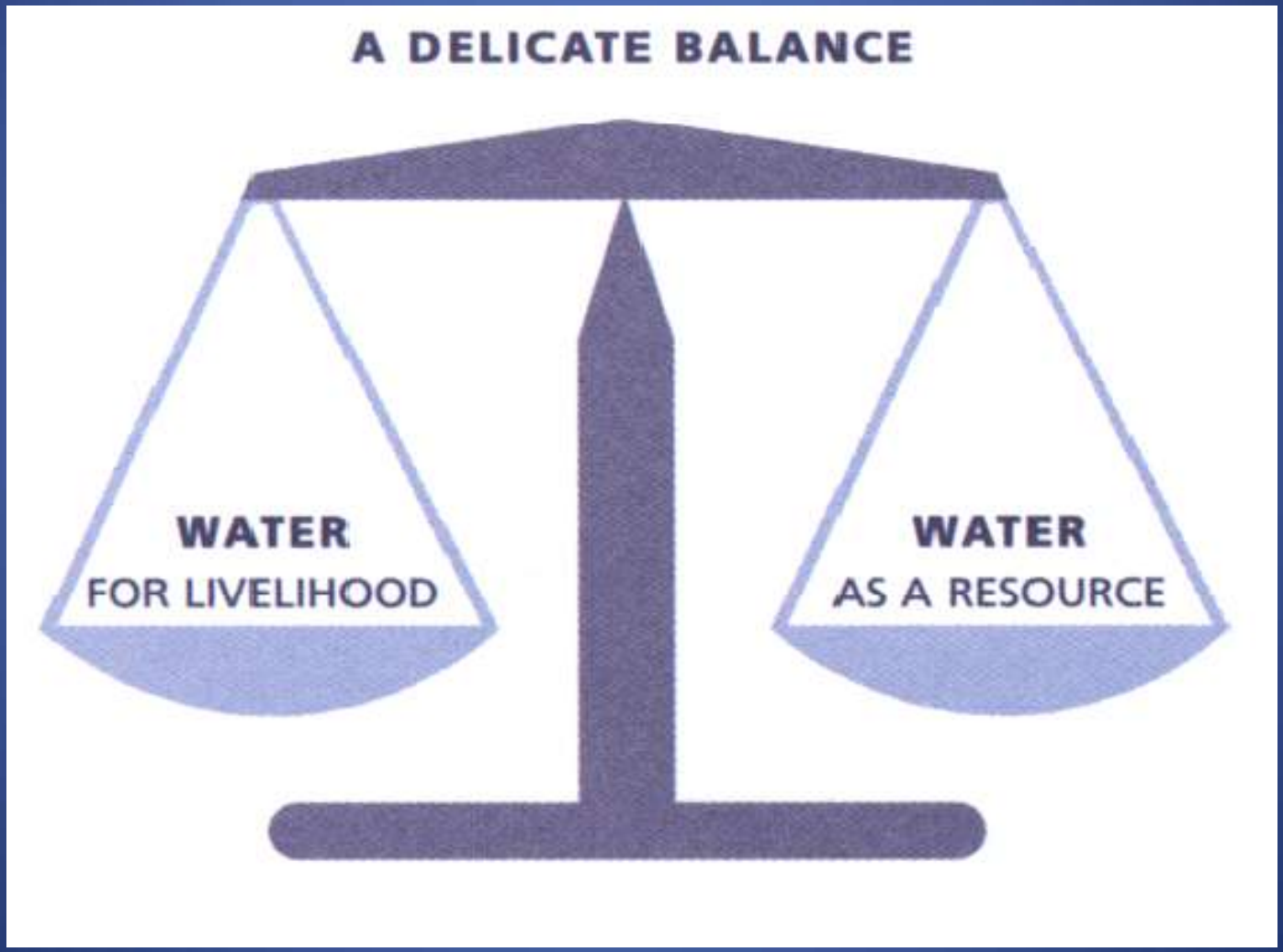
Total consumptive Water Demand Against Total Surface Water Availability For All Sectors

States	Land Area sq km	Total Consumptive Water demand (MCM)					Effective rain (MCM/Year)	Excess/deficit (MCM) - Unregulated Flows				
		2010	2020	2030	2040	2050		2010	2020	2030	2040	2050
Perlis	821	306	299	286	284	281	60	(246)	(239)	(226)	(224)	(221)
Kedah	9,500	2,922	2,976	2,842	2,873	2,876	1,070	(1852)	(1906)	(1772)	(1803)	(1806)
Pulau Pinang	1,048	765	829	835	874	894	130	(635)	(699)	(705)	(744)	(764)
Kelantan	15,099	1,632	1,619	1,586	1,600	1,604	2,650	1018	1031	1064	1050	1046
Terengganu	13,035	884	975	970	999	1,026	3310	2426	2335	2340	2311	2284
Perak	21,035	1,949	1,923	1,798	1,801	1,811	3,140	1191	1217	1342	1339	1329
Selangor	8,396	2,238	2,491	2,570	2,760	2,922	960	(1278)	(1531)	(1670)	(1800)	(1962)
Pahang	36,137	726	946	897	911	959	6,460	5739	5514	5563	5549	5501
Negeri Sembilan	6,686	340	361	358	366	374	640	300	279	282	274	266
Melaka	1,664	323	366	376	409	439	140	(183)	(226)	(336)	(269)	(299)
Johor	19,210	715	881	1,033	1,164	1,301	3,290	2575	2409	2257	2126	1989
Pen Malaysia	132,631	12,800	13,664	13,551	14,040	14,488	21,170	8370	7506	7619	7130	6682
Sabah	73,631	912	1,356	1,392	1,442	1,469	16,210	15298	14854	14818	14768	14741
Sarawak	124,450	1,054	2,162	2,125	2,175	2,247	27,440	26386	25278	25375	25265	15193
WP Labuan	91	18	24	26	28	29	30	12	6	4	2	1
East Malaysia	198,172	1,985	3,541	3,542	3,645	3,745	53,190	51205	49649	49648	49545	49445
Total Malaysia	330,803	14,785	17,205	17,093	17,685	18,233	74,350	59565	57145	57257	56665	56117

2. The IWRM Water Balance

IWRM is a balance:

Separation of powers between 2 sides of the scale



Integrated Water Resources Managment (IWRM)
(Applicable to both sides of the scale)

Natural System Integration

Freshwater <=> Coastal zone

Land <=> Water

Water <=> Wastewater

Surface water <=>Groundwater

Quantity <=> Quality

Upstream <=> Downstream

Human System Integration

Mainstreaming of water resources in National Policies:

- ***economic policy***
- ***food policy***
- ***environment policy,***
- ***health policy,***
- ***energy policy***

IWRM Water Balance: Malaysian Context

FEDERAL

Water Resource Management

NRE – (NWRC/IWRM)

- JPS (Surface Water)
- JMG (Groundwater)
- DOE
- Meteorology (MOSTI)

Environmental Flows (?)
Water-related Hazards & Climate Change

Resource Use

KeTTHA

- Water Supply
- Sewerage
- Hydropower

MOA

- Agri. D&I
  - Food Crops
  - Livestock
  - Fisheries
  - Plantation Crops (MP IC)

KPKT

- Urban Drainage
- Recreation Lakes
- Parks & Gardens

OTHERS

- Navigation (MOT)
- Rural Water Supply (MOH)

STATE

- IWRM &IRBM (State Water Resources Authorities - LUAS, LUAK, SWRC, etc. - ,State Water Resources Committees, SEPUs)

Environmental Flows

- Water Supply (JBA, Water Concessionaires)
- Agricultural D&I (JPS)
- Rivers & Waterways (JPS)
- Urban Drainage & Recreational Lakes (Local Authorities)

3. NWRP 2012 and Guiding Tenets

NWRP 2012 - Policy Statement

"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.

NWRP 2012 - Policy Principles

- Water Resources Security

  Water resources must be secured to ensure their availability to meet the needs and demands of both man and nature, through optimization of their potential and minimization of damaging impacts

- Water Resources Sustainability

  Water resources are the catalyst for environmental wellbeing and national development, therefore they should be sustained for present and future uses and the Federal and State Governments will look at minimizing wastage of water resources. It also opens up the opportunity to explore the use of alternative sources, and aspects related to demand management

- Collaborative Governance

  Stakeholder inclusiveness and collaboration is essential towards ensuring the security and sustainability of water resources as well as achievement of common goals towards addressing multiple resources governance concerns and priorities

NWRP 2012 – Guiding Tenets

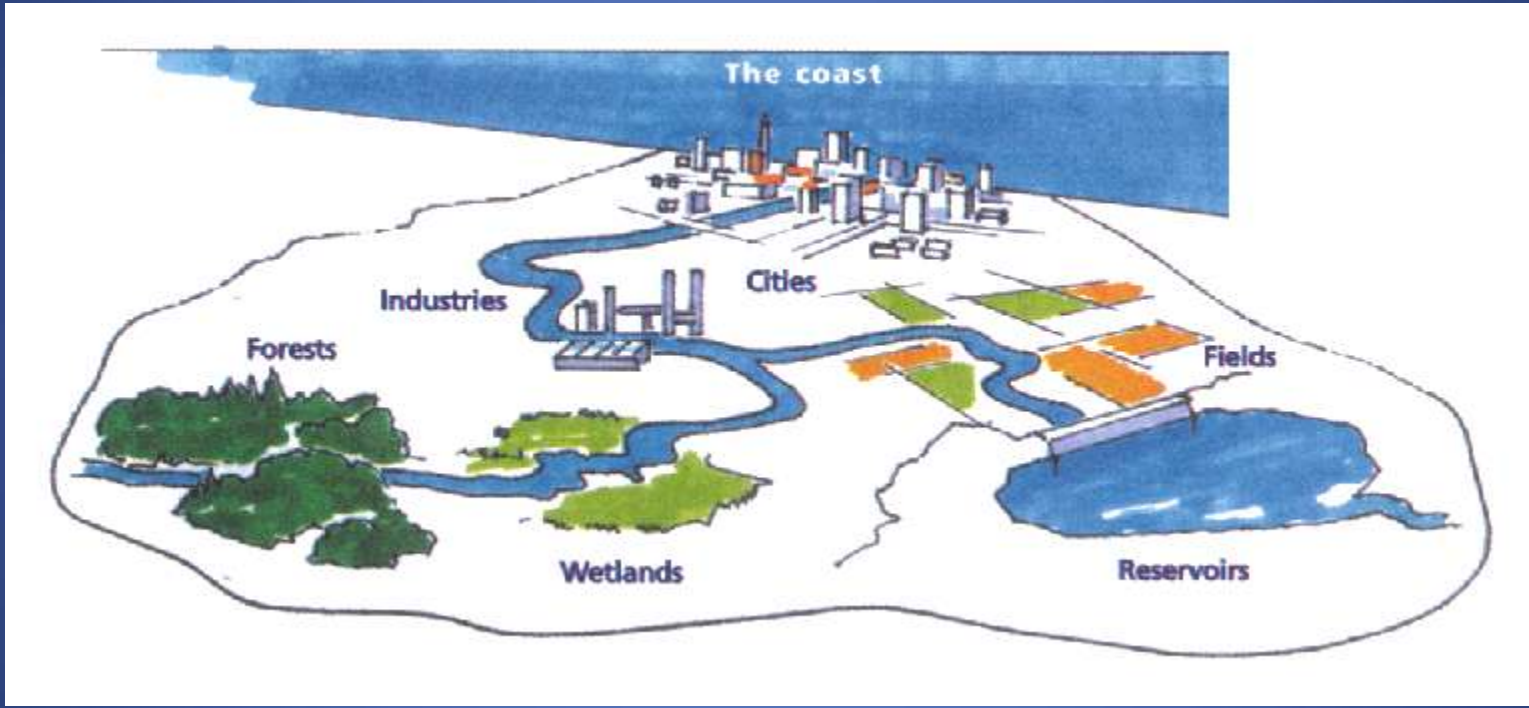
Water for People: All to have access to adequate and affordable water supply, hygiene and sanitation
Water for Food and Rural Development: provision of sufficient water that will ensure national food security and promote rural development
Water for Economic Development: provision of sufficient water to spur and sustain economic growth within the context of a high income economy
Water for the environment: protection of the water environment to preserve water resources (both surface water and groundwater) and natural flow regimes, biodiversity and cultural heritage, along with mitigation of water-related hazards

4. Water Allocation – Issues & Challenges

21st Century World Water Vision (year 2000) Statement Excerpt

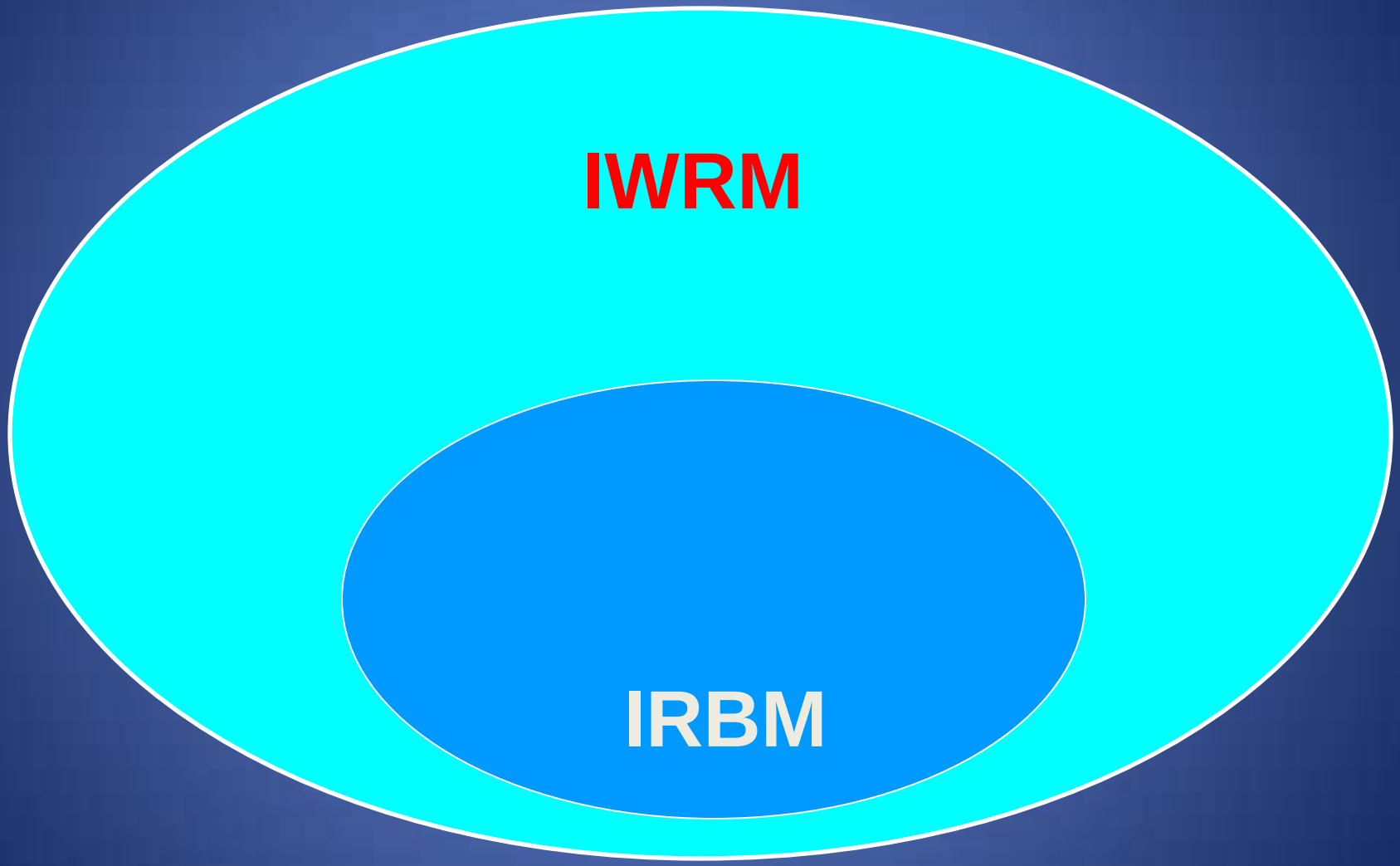
- A holistic, systemic approach relying on Integrated Water Resources Management (IWRM) must replace the fragmentation that currently exists in managing water – This is best done at the level of River basins

IWRM recognises that water follows according to hydrological boundaries!



-from small <u>local</u> basins to larger <u>inter-state</u> or <u>international</u> river basins!

- and builds on river basin management



- from a water quantity *and* water quality perspective

Water Allocation by Sectors – Issues and Challenges

- Burden falls on the Water Resource Managers at basin, state and national levels to be the lead player /"champion" to implement the IWRM agenda in close consultation with all stakeholders (institutional, private, and community)
- Balance development goals and competing sector users
- Maintain database of comprehensive assessment of all water resources (traditional and alternative) and water demand by sectors at local, basin, state and national scales.
- Have access to decision support systems including use of physical and socio-economic models and techniques for water allocation at various scales.
- Engage stakeholders to resolve conflicts and broker trade-offs
- Allocate and maintain appropriate levels of river environmental flows for ecosystem livelihoods and biodiversity
- Undertake R&D programs pertaining to water security and sustainability.
- Develop competent resource managers at all levels through capacity building programs supported by complementary advocacy and awareness programs targeting all stakeholders (users and communities)

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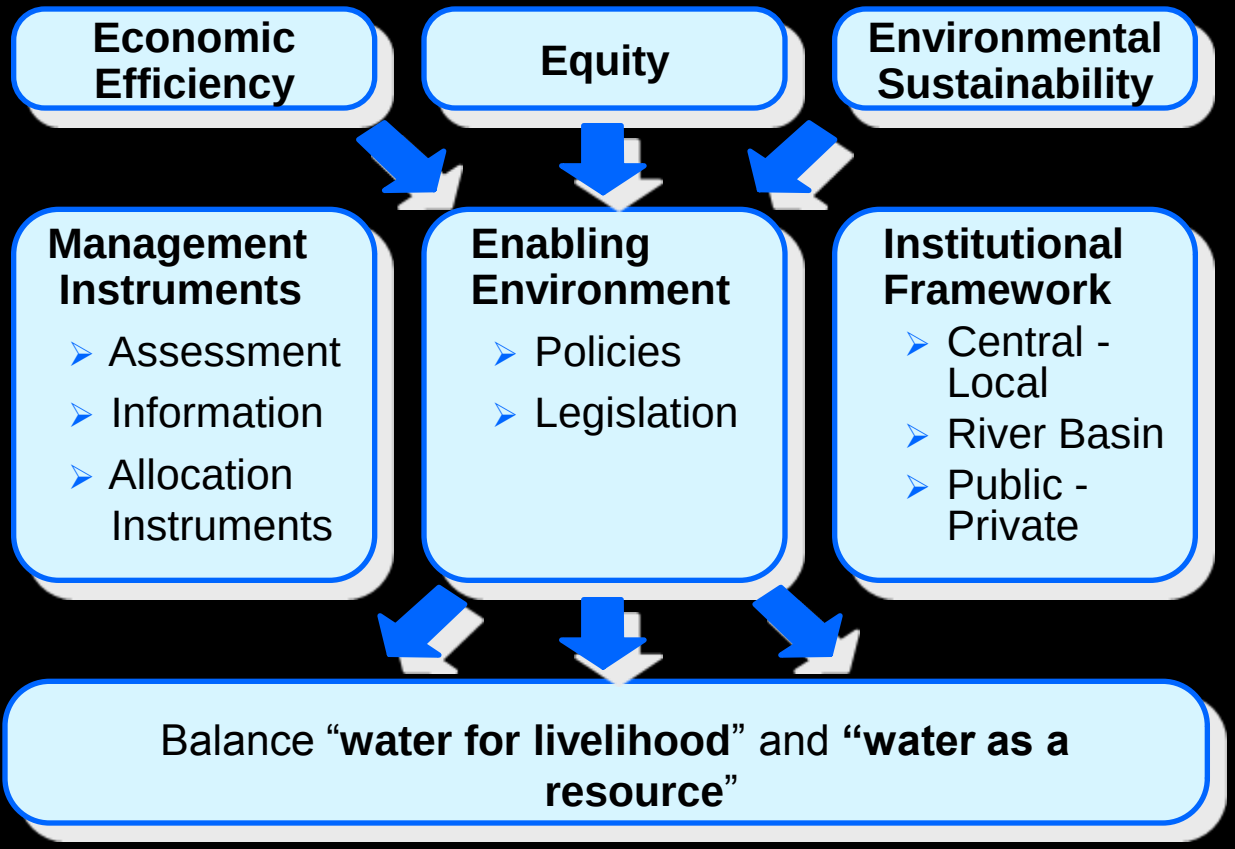
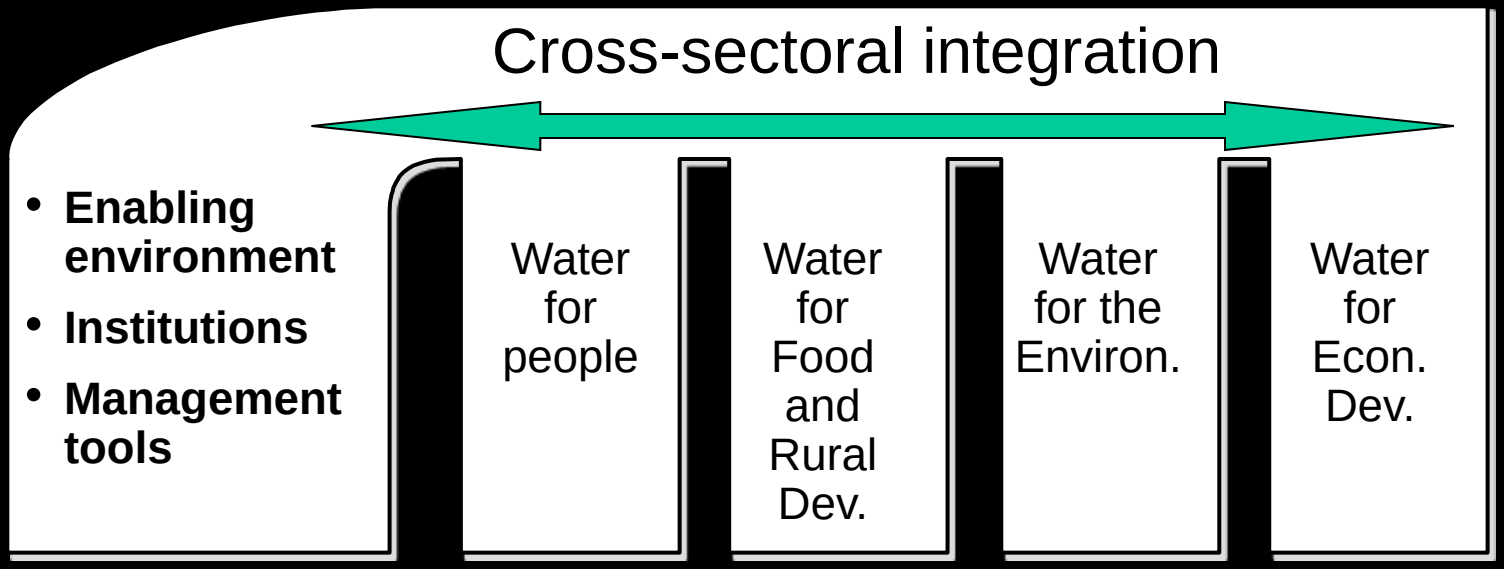
Balancing development goals



The three "E"s
The three pillars of IWRM

Balancing competing sector uses:



Need for emphasis on *multi-disciplinary and multi-sector perspectives*

Available Rainfall in Malaysia

State	Area	Unit in mm per year				Unit in Billion Cu M per year			
	(sq km)	Rainfall	Actual Evaporation	Ground water Recharge	Surface Runoff	Rainfall	Actual Evaporation	Ground water Recharge	Surface Runoff
Perlis	821	1,880	1,290	120	470	1.54	1.06	0.10	0.38
Kedah	9,500	2,310	1,430	130	750	21.95	13.59	1.24	7.12
P Pinang	1,048	2,350	1,430	120	800	2.46	1.50	0.13	0.83
Perak	21,035	2,480	1,320	170	990	52.17	27.77	3.58	20.82
Selangor	8,396	2,190	1,280	150	760	18.39	10.75	1.26	6.38
Negeri Sembilan	6,686	1,830	1,210	130	490	12.24	8.09	0.87	3.28
Melaka	1,664	1,880	1,210	100	570	3.13	2.01	0.17	0.95
Johor	19,210	2,470	1,130	200	1,140	47.45	21.71	3.84	21.90
Pahang	36,137	2,470	1,250	120	1,100	89.26	45.17	4.34	39.75
Terengganu	13,035	3,310	1,470	150	1,690	43.15	19.16	1.96	22.03
Kelantan	15,099	2,600	1,290	140	1,170	39.26	19.48	2.11	17.67
Pen Malaysia	132,631	2,495.5	1283.8	147.6	1064.0	330.98	170.28	19.56	141.11
Sabah	73,631	2,560	1,190	190	1,180	188.50	87.62	13.99	86.89
Sarawak	124,450	3,640	1,250	240	2,150	453.00	155.56	29.87	267.57
FT Labuan	91	3,100	1,480	150	1,470	0.28	0.13	0.01	0.14
East Malaysia	198,172	3,238.5	1,227.8	221.4	1,789.3	641.78	243.31	43.87	354.60
Malaysia	330,803	2,940.6	1,250.3	191.8	1,498.5	972.78	413.60	63.45	495.71

Source: NWRS 2011

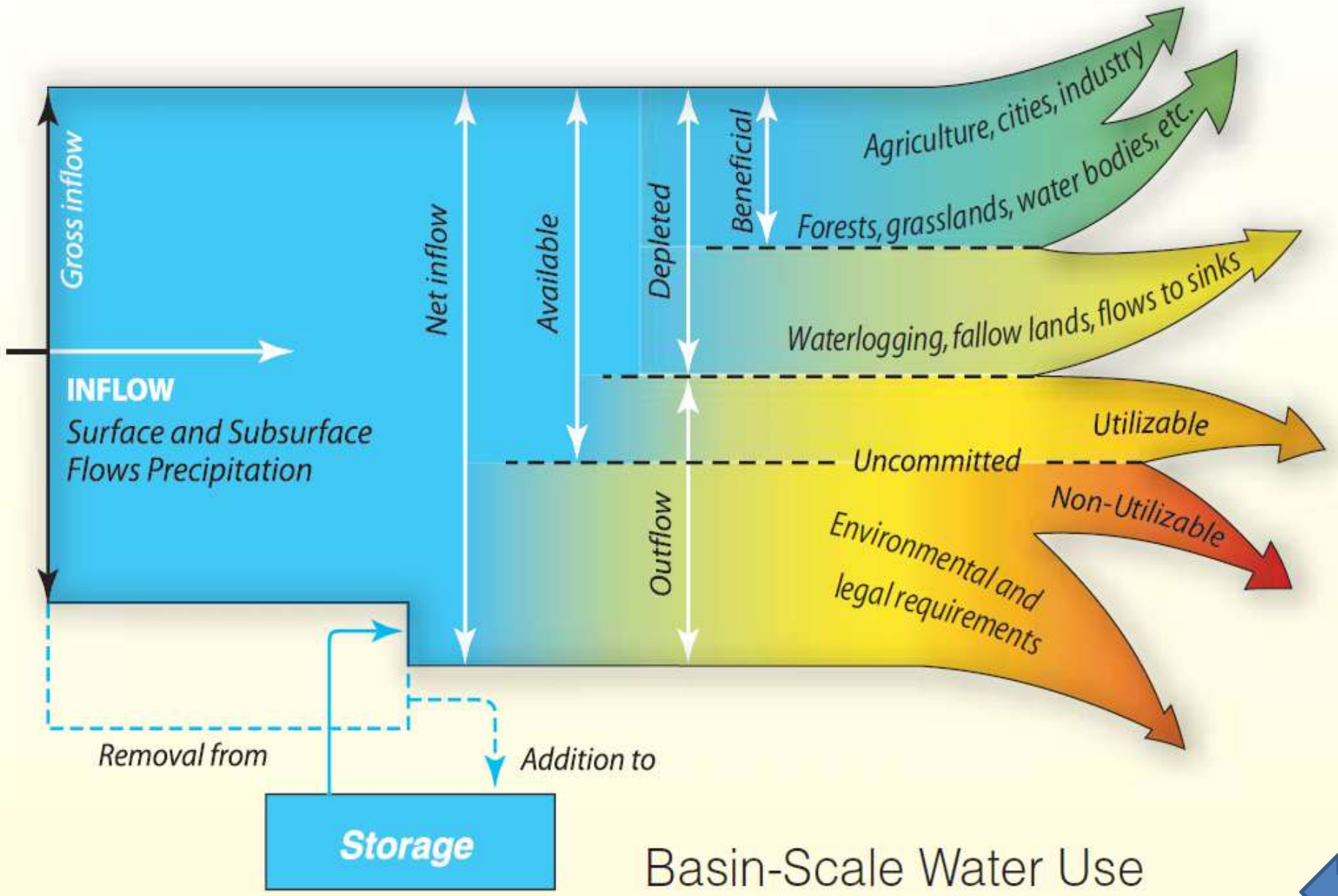
Priorities for Development for Alternative Water Resources

Alternative Water Source	Priority Rating													
	Perlis	Kedah	P Pinang	Kelantan	Terenggan	Pahang	Perak	Selangor	N Sembilan	Melaka	Johor	Sabah	Sarawak	Labuan
Rainfall Harvesting	H	N	H	L	L	L	L	H	N	N	N	N	N	H
Recycling of Treated Sewerage	N	NA	H	L	L	L	L	H	L	L	L	L	L	H
Desalination	N		H	L	L	L	L	N	L	L	L	L	L	H
Natural Lakes / Pond / Wetlands	H		H	L	L	L	L	N	L	N	L	L	L	H
Interbasin/State Transfer	H		H	NA	NA	NA	NA	H	NA	N	NA	NA	NA	H
Island Water Supplies														
Water Importation Via Pipelines and Barges	NA	H	H	NA	H	NA	NA	H	NA	NA	H	H	H	H
Groundwater		H	H		H			H			H	H	H	H
Groundwater Dams		H	H		L			H			H	H	H	H
Water Reuse For Non-potable Purposes		H	H		L			H			H	N	H	H
Surface water collection		H	H		N			H			H	N	H	H
Desalination		N	H		N			N			H	N	H	H

Source: NWRS 2011

Total consumptive Water Demand Against Total Surface Water Availability For All Sectors

States	Land Area sq km	Total Consumptive Water demand (mm)					Effective rain (mm)	Excess/deficit (mm) - Unregulated Flows				
		2010	2020	2030	2040	2050		2010	2020	2030	2040	2050
Perlis	821	372.1	364.2	348.1	345.7	342.8	70.5	(301.6)	(293.7)	(277.6)	(275.2)	(272.3)
Kedah	9,500	307.6	313.2	299.1	302.4	302.8	112.5	(195.1)	(200.7)	(186.6)	(189.9)	(190.3)
Pulau Pinang	1,048	729.9	790.9	797.1	834.2	853.3	120.0	(609.9)	(670.9)	(677.1)	(714.2)	(733.3)
Kelantan	15,099	108.1	107.2	105.0	106.0	106.2	175.5	67.4	68.3	70.5	69.5	69.3
Terengganu	13,035	67.8	74.8	74.4	76.6	78.7	253.5	185.7	178.7	179.1	176.9	174.8
Perak	21,035	92.7	91.4	85.5	85.6	86.1	139.5	46.8	48.1	54.0	53.9	53.4
Selangor	8,396	266.6	296.6	306.1	328.7	348.0	114.0	(152.6)	(182.6)	(192.1)	(214.7)	(234.0)
Pahang	36,137	20.1	26.2	24.8	25.2	26.5	165.0	144.9	138.8	140.2	139.8	138.5
Negeri Sembilan	6,686	50.9	54.0	53.6	54.7	56.0	73.5	22.6	19.5	19.9	18.8	17.5
Melaka	1,664	194.1	219.9	225.9	245.7	263.7	85.5	(108.6)	(134.4)	(140.4)	(160.2)	(178.2)
Johor	19,210	37.2	45.8	53.8	60.6	67.7	171.0	133.8	125.2	117.2	110.4	103.3
Pen Malaysia	132,631	96.5	103.0	102.2	105.9	109.2	159.0	62.5	56.0	56.8	53.1	49.8
Sabah	73,631	12.4	18.4	18.9	19.6	20.0	177.0	164.6	158.6	158.1	157.4	157.0
Sarawak	124,450	8.5	17.4	17.1	17.5	18.1	220.5	212.0	203.1	203.4	203.0	202.4
WP Labuan	91	197.7	264.3	285.0	304.0	318.0	322.5	124.8	58.2	37.5	18.5	4.5
East Malaysia	198,172	10.0	17.9	17.9	18.4	18.9	268.5	258.5	250.6	250.6	250.1	249.6
Total Malaysia	330,803	44.7	52.0	51.7	53.5	55.1	225.0	180.3	173.0	173.3	171.5	169.9



Basin-Scale Water Use

What is Environmental Flow?

- International Union for Conservation of Nature (IUCN) (Dyson *et al.*, 2003) used the term "environmental flow" to identify the water left in the water body in order to support the aquatic ecosystems.
- The health and sustainability of river systems depend on adequate amounts of water passing through them.

Estimation of Environmental Flows

No.	Approach/Estimation
1	**10% Average Annual Flow (AAF)** • **NWRS, 1999, applied as "rule-of-thumb value of 10% of the average annual flow has therefore been adopted in the planning of the source works"**
2	**Low flow of 7Q1, 7Q5 and 7Q10** **(7-day low flow, for 1, 5 and 50 years)**
3	**Tennant (Montana) Method**
4	**Smakhtin and Eriyagama Method (Recommended by NWRS 2011)**

5. Water Use – Issues and Challenges

Water Use by Sectors

Consumptive Use	Non-consumptive Use
• Potable Water ❖ Domestic ❖ Industrial ❖ Commercial ❖ Institutional • Agricultural Water – Irrigated Paddy – Non-paddy Crops (oil palm, rubber, fruits, flowers and vegetables – Livestock – Fisheries	• Hydropower • Navigation • Recreation • Eco-tourism Issues and challenges mainly with regards to regulatory and pollution control through appropriate licensing and accompanying regulations, guidelines and enforcement

Consumptive Water Use – Issues and Challenges

- Major challenge is mindset change among all Water User agencies (public and private) to shift from current sectoral to integrated management ("Think IWRM, Act Sectoral")
- Need also for a Cultural Shift to seek a viable balance between Water Supply Management(WSM) and Water Demand Management (WDM)
- WDM Colloquium 2009 – ASM Task Force on WDM currently working on a Strategy Plan targeted at all water use sectors
- NWRS 2012 projections for consumptive water demand by sectors as follows:
  - Potable Water to meet Domestic, Industrial, Commercial, and Institutional needs; and
  - Agricultural Water for Irrigated Paddy, Non Paddy Crops, Livestock and Fisheries
- Develop appropriate strategies and action plans to ensure all water use sector targets are met through stakeholder consultations, collective action and shared partnerships
- Undertake R&D programs based on RNAs for each sector
- Conduct continuing AACB programs to ensure competent personnel at all levels to perform optimally according to the new paradigm

IWRM Water Balance: Malaysian Context

FEDERAL

Water Resource Management

NRE – (NWRC/IWRM)

- JPS (Surface Water)
- JMG (Groundwater)
- DOE
- Meteorology (MOSTI)

Environmental Flows (?)
Water Hazards & Climate Change

Resource Use

KeTTHA

- Water Supply
- Sewerage
- Hydropower

MOA

- Agri. D&I
  - Food Crops
  - Livestock
  - Fisheries
  - Plantation Crops (MP IC)

KPKT

- Urban Drainage
- Recreation Lakes
- Parks & Gardens

OTHERS

- Navigation (MOT)
- Rural Water Supply (MOH)

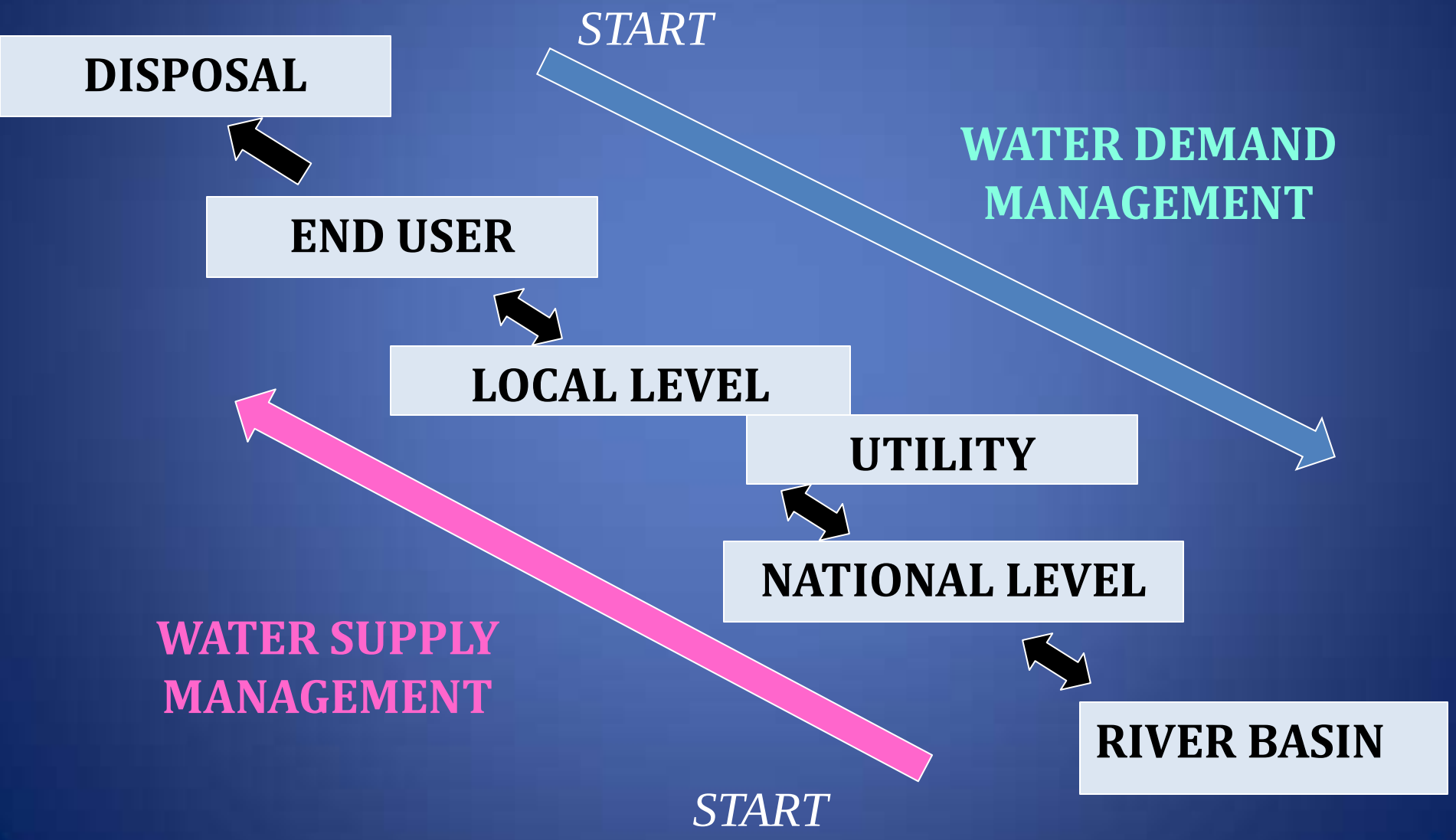
STATE

- IWRM &IRBM (State Water Resources Authorities - LUAS, LUAK, SWRC, etc. - ,State Water Resources Committees, SEPUs)

Environmental Flows

- Water Supply (JBA, Water Concessionaires)
- Agricultural D&I (JPS)
- Rivers & Waterways (JPS)
- Urban Drainage & Recreational Lakes (Local Authorities)

A cultural shift



Defining Water Demand Management

Water Demand Management - A critical element of the IWRM approach.

WDM - ”Any measure or initiative that will result in the reduction of the expected water use or water demand”

Or simply put

“… making the most of the available water”
“ … let every drop of water count”
“ … living within ones means”
“ … more crop per drop” in agriculture

"Narrow" and "Broad" approach to WDM

The "narrow" definition:

WDM influencing water demand only

The "broad" definition:

WDM includes:

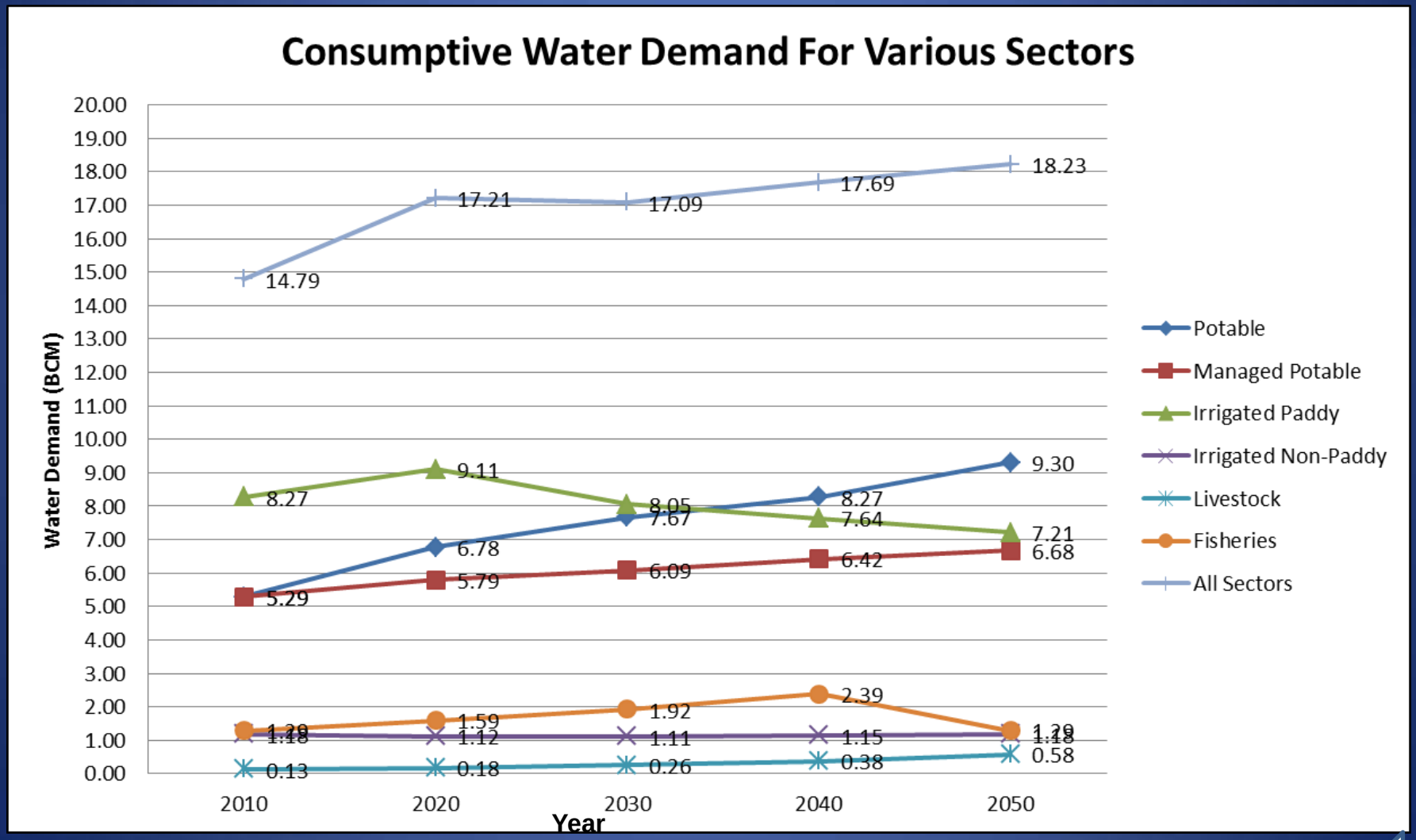
- **Increased supply from non-traditional water sources:**
  - ✓Recharge, Recycling, Reuse (the 3 R's)
  - ✓Leakage control
  - ✓Rainwater harvesting
  - ✓ Desalination
  - ✓Etc.
- **Water Footprint and "Virtual Water" considerations**

Consumptive Water Demand Projections (BCM)

Sector	2010	2020	2030	2040	2050
Potable	5.29	6.78	7.67	8.27	9.30
Managed Potable	5.29	5.79	6.09	6.42	6.68
Irrigated Paddy	8.27	9.11	8.05	7.64	7.21
Irrigated Non-Paddy	1.18	1.12	1.11	1.15	1.18
Livestock	0.13	0.18	0.26	0.38	0.58
Fisheries	1.29	1.59	1.92	2.39	1.29
All Sectors	14.79	17.21	17.09	17.69	18.23

Source: NWRS 2011

Consumptive Water Demand Projections (BCM/Year)



Source : NWRS 2011

Potable Water Sector – Issues and Challenges

- NWRS 2011 water demand projections based on following factors:
  - Population
  - Per capita consumption (PCC)
  - Water demand in 4 main sectors:
    - Domestic , Industrial, Commercial, and Institutional
  - Non-revenue water (NRW)
  - Service factor
- Main challenge is to meet NRW annual reduction rates and PCC targets

NRW Reduction

- The NRW is influenced by
  - Deterioration of pipe network
  - System pressure
  - Metering inaccuracies & billing inefficiencies
  - Illegal connections
- WDM 2009, SPAN reported Peninsular Malaysia average of 36%, with a high of 53.2% (NS) and a low of 16.9%(Pg)
- SPAN also reported on successful NRW reduction between 2003 and 2008 from 43.9% to 33.9%
- Projected reduction achievable but requires CAPEX and strict enforcement

PCC Targets

- NWRS 2011 Study – PCC for 2010 noted an average 230 l/c/d for urban areas and 160 l/c/d for rural areas. Projection for progressive reduction to 150 l/c/d and 80 l/c/d by 2050 which is the current norm in many developed countries (see below)

Country	Belgium	Germany	UK	France	Denmark	Austria	Singapore
PCC	112	130	153	139	159	153	156

- Requires multi-stakeholder collective action involving:
  - Domestic/Commercial Consumers
  - Industrial Consumers
  - Water Treatment Plant Operators
  - Water Supply Operators
  - Consultants / Developers
  - Government

Stakeholder Role in PCC reduction

Domestic/Commercial Consumers	Industrial Consumers
• Cultivate habit of saving water. • Invest on water saving fittings. • Re-use of used water and rain water collection for non-potable purposes. • Report pipe bursts, leaking pipes, reservoir overflows and water theft.	• Adopt strategies to reduce consumption and re-use of used water. • Recycle used water. • Rainwater collection for non-potable purposes.

Stakeholder Role in PCC reduction (2)

Water Treatment Plant Operators	Water Supply Operators
• Reduce in-plant use of water	• Promote water saving/water conservation through Stakeholders Engagement Programme and Educational Outreach Programme

Stakeholder Role in PCC reduction (3)

Consultants / Developers	Government
• Install water saving devices and fittings in new houses. • Incorporate rain water harvesting in new houses and buildings. • Strict supervision and quality materials.	• Appropriate tariff setting. • Public education to promote water saving and impact of water demand management. • Step up enforcement especially on water theft. • Benchmarking

Agricultural Water – Issues and Challenges

- NWRS 2011 focus is on 4 areas, namely irrigated paddy, non-paddy crops, livestock and fisheries. Recommends improved irrigation efficiencies and expand water demand management practices to achieve the projected water demand for each sub-sector.

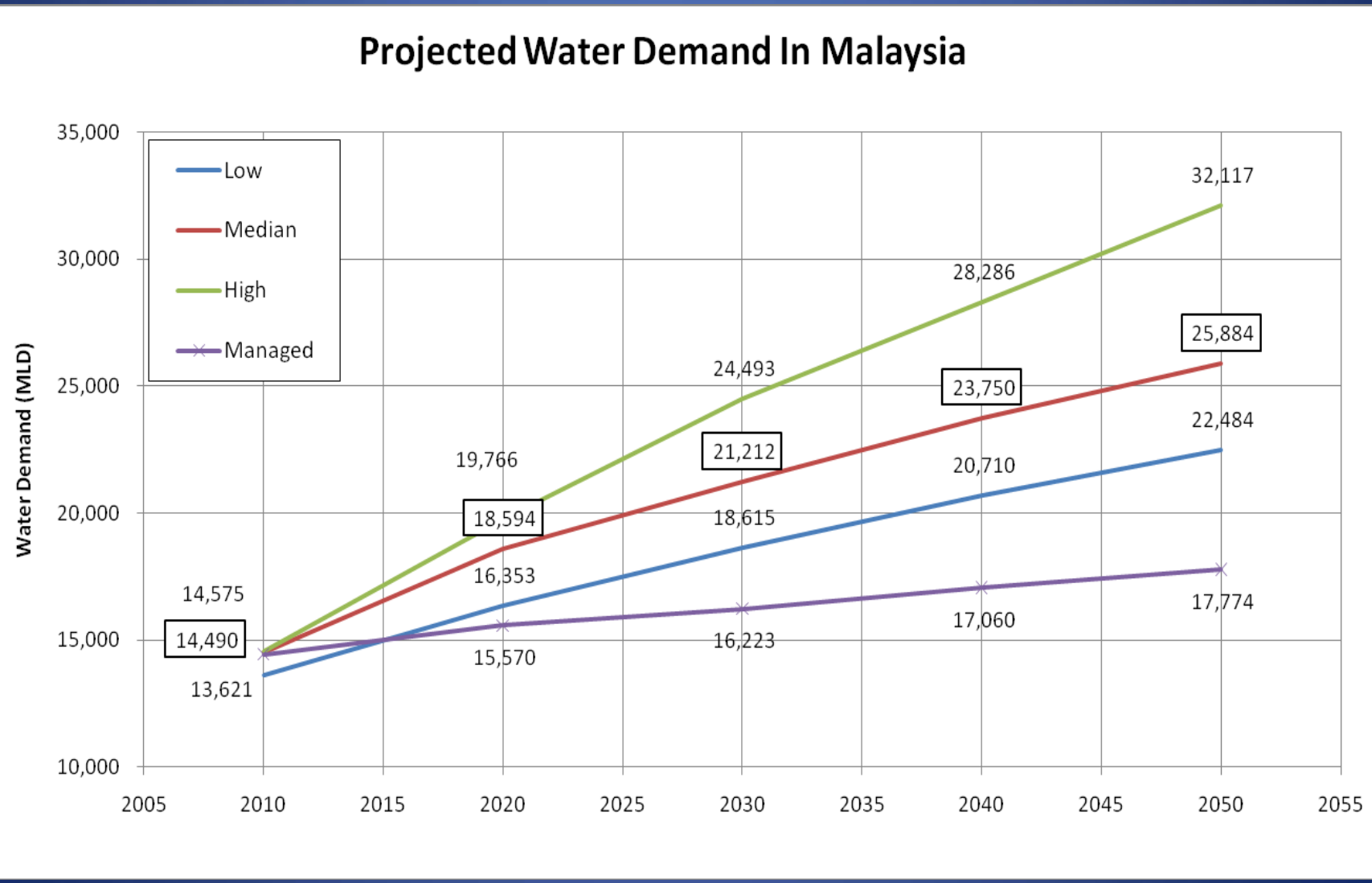
- While the recommended options are necessary, the sector is in need of a mind-set change to a more expanded role from the traditional provider of D&I infrastructure to a more holistic Agricultural Water Supply Development and Management role in order to achieve "more crop per crop" to support the recent Dasar Agro-Makanan Negara and National Commodity Policy . It would entail the upgrading of rain-fed agriculture and revitalizing irrigated agriculture together with the introduction of instruments and mechanisms such as realistic water pricing, investment in better technologies, improving on-farm water management, and "virtual water" or agricultural water footprint considerations.

NWRS 2011 - WATER DEMAND FOR POTABLE WATER

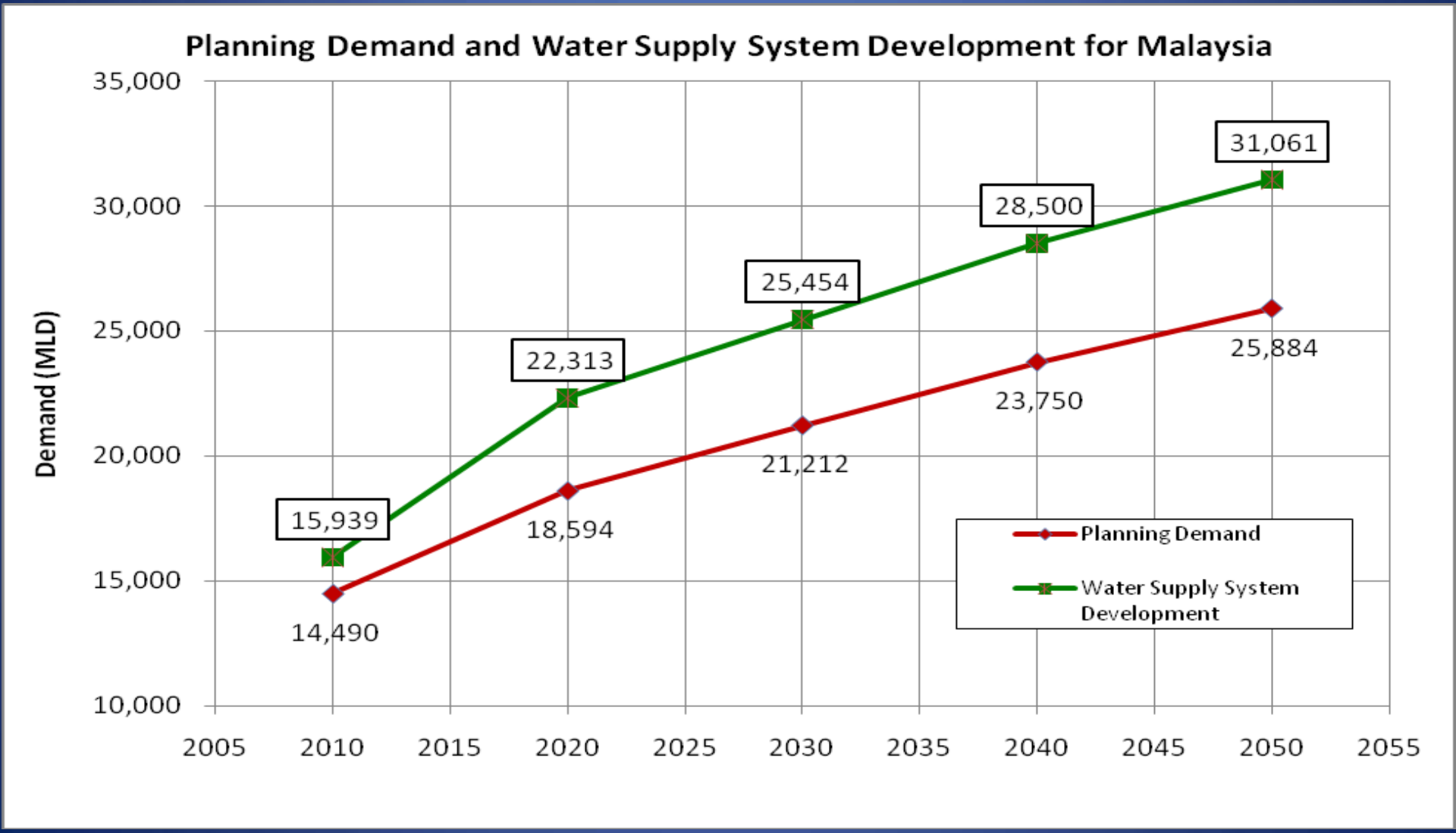
States	Land Area km²	Projected Potable Water Demand (m/l/d)					Potable Water demand (mm)				
		2010	2020	2030	2040	2050	2010	2020	2030	2040	2050
Perlis	821	150	168	179	192	206	66.7	74.7	79.6	85.4	91.6
Kedah	9,500	1,333	1,529	1,630	1,738	1,855	51.2	58.7	62.6	66.8	71.3
Pulau Pinang	1,048	974	1,225	1,376	1,525	1,633	339.2	426.6	479.2	531.1	568.7
Perak	21,035	1,058	1,306	1,462	1,639	1,812	18.4	22.7	25.4	28.4	31.4
Selangor	8,396	4,037	4,896	5,371	5,975	6,477	175.5	212.8	233.5	259.8	281.6
Negeri Sembilan	6,686	731	790	786	802	814	39.9	43.1	42.9	43.8	44.4
Melaka	1,664	443	554	638	715	776	97.2	121.5	139.9	156.8	170.2
Johor	19,210	1,506	1,925	2,280	2,526	2,716	28.6	36.6	43.3	48.0	51.6
Pahang	36,137	974	1,054	1,099	1,156	1,231	9.8	10.6	11.1	11.7	12.4
Terengganu	13,035	632	971	1,094	1,211	1,319	17.7	27.2	30.6	33.9	36.9
Kelantan	15,099	395	564	745	933	1,118	9.5	13.6	18.0	22.6	27.0
Pen Malaysia	132,631	12,233	14,982	16,660	18,412	19,957	33.7	41.2	45.8	50.7	54.9
Sabah	73,631	1,049	1,695	2,005	2,250	2,405	5.2	8.4	9.9	11.2	11.9
FT Labuan	91	53.1	72.2	83.9	92.5	100.6	197.7	264.3	285.0	304.0	318.0
Sarawak	124,450	1,126	1,875	2,259	2,631	3,014	3.3	5.5	6.6	7.7	8.8
East Malaysia	198,172	2,225	3,636	4,335	4,956	5,498	4.1	6.7	8.0	9.1	10.1
Total Malaysia	330,803	14,458	18,618	20,995	23,368	25,455	16.0	20.5	23.2	25.8	28.1

Source: NWRS 2011

NWRS 2011 – Potable Water Demand



NWRS 2011 - Planning Demand and Water Supply System Development Capacity for Malaysia



Potable Water Projections – PCC targets and NRW Reduction Rates

- NRW Reduction Rates

NRW	Annual Reduction	5 year
>55%	1.20%	6.0%
45% to 55%	1.00%	5.0%
35% to 45%	0.70%	3.5%
30% to 35%	0.50%	2.5%
25% to 30%	0.30%	1.5%
20% to 25%	0.10%	0.5%
<20%	0%	0%

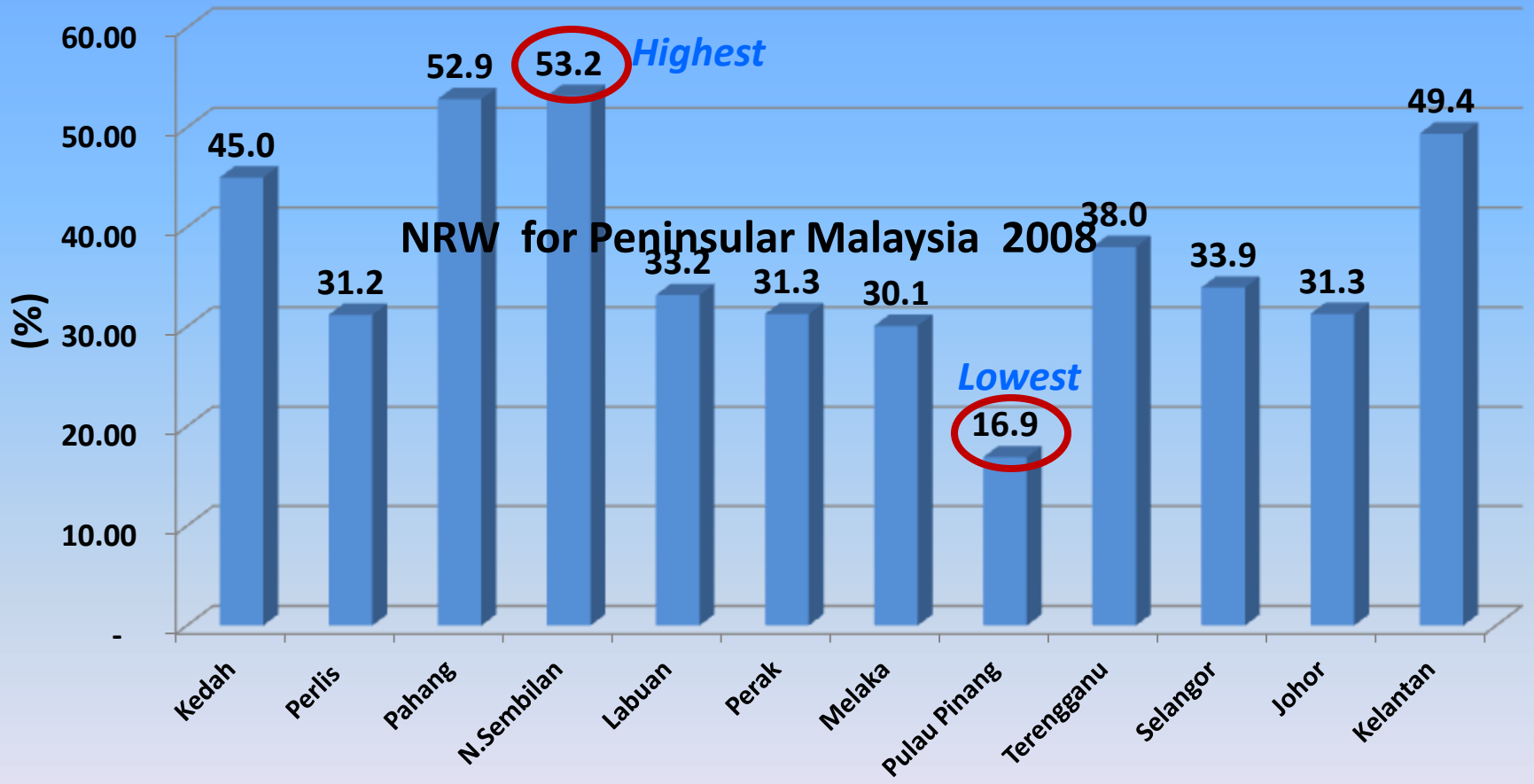
Target PCC for Managed Demand case

	PCC l/c/d					
	2010	2015	2020	2030	2040	2050
Urban	230	215	200	180	165	150
Rural	160	145	130	110	95	80

Source: NWRS 2011

MANAGING NON REVENUE WATER LOSSES

NRW FOR PENINSULAR MALAYSIA 2008

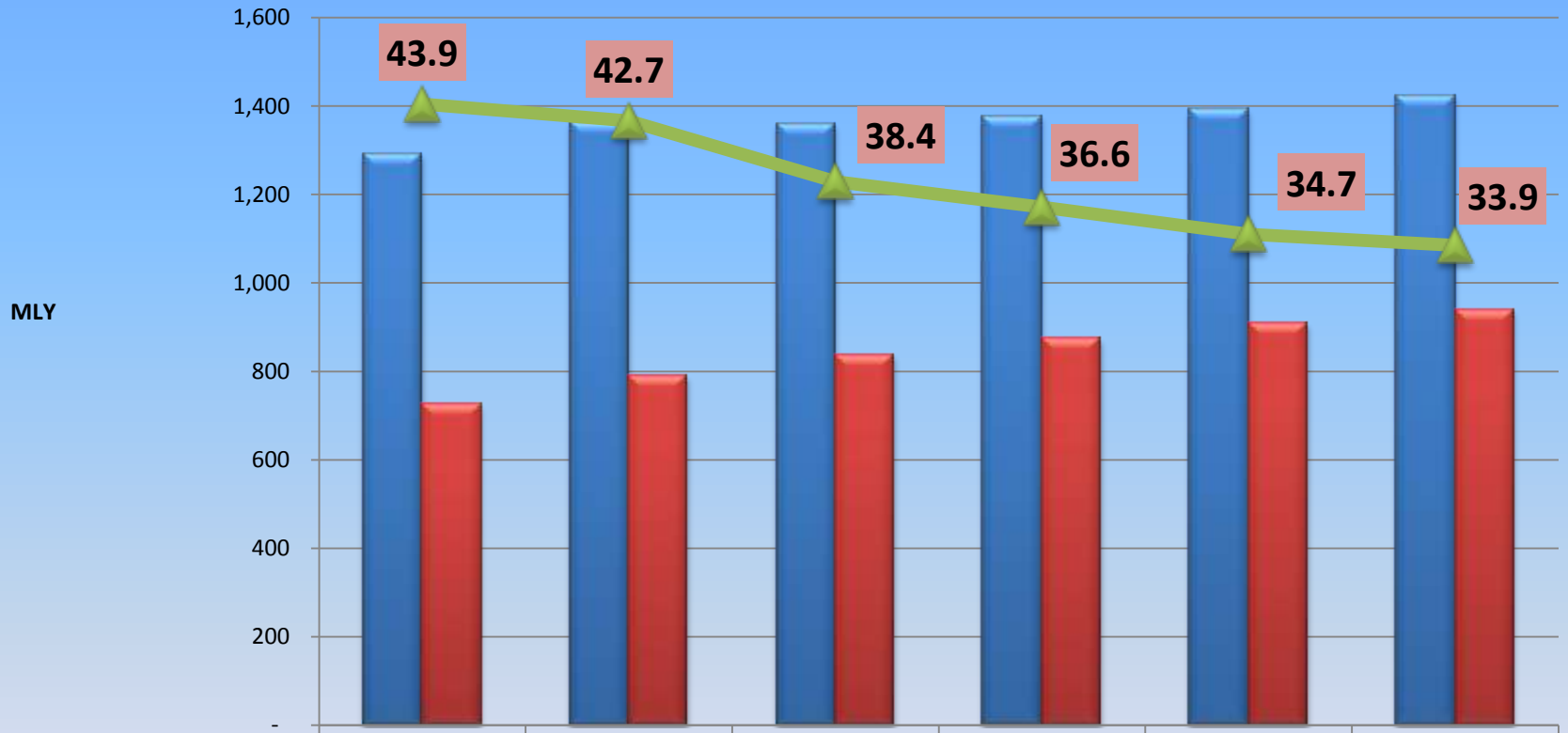


Current average NRW is 36%

SPAN
Suruhanjaya Perkhidmatan Air Negara

MANAGING NON REVENUE WATER LOSSES

NRW% FOR SELANGOR BETWEEN 2003 AND 2008



	2003	2004	2005	2006	2007	2008
Production	1,291	1,364	1,361	1,378	1,392	1,423
Metered Consumption	724	791	838	873	908	940
NRW%	43.9	42.7	38.4	36.6	34.7	33.9

NWRS 2011 - WATER DEMAND FOR IRRIGATED PADDY CULTIVATION

States	Land Area km²	Projected Irrigation Water Demand (mcm)					Irrigation Water Demand (mm)				
		2010	2020	2030	2040	2050	2010	2020	2030	2040	2050
Perlis	821	198	184	165	155	141	241.2	224.1	201.0	188.8	171.7
Kedah	9,500	2,283	2,263	2,089	2,076	2,030	240.3	238.2	219.9	218.5	213.7
Pulau Pinang	1,048	358	330	281	265	245	341.6	314.9	268.1	252.9	233.8
Perak	21,035	1,476	1,352	1,160	1,084	1,010	70.2	64.3	55.1	51.5	48.0
Selangor	8,396	720	655	555	516	482	88.3	80.3	68.1	63.3	59.1
Negeri Sembilan	6,686	45	41	37	34	32	6.7	6.1	5.5	5.1	4.8
Melaka	1,664	86	86	62	62	62	51.7	51.7	37.3	37.3	37.3
Johor	19,210	43	39	35	33	30	2.2	2.0	1.8	1.7	1.6
Pahang	36,137	330	514	436	405	379	9.1	14.2	12.1	11.2	10.5
Terengganu	13,035	464	428	373	351	323	35.6	32.8	28.6	26.9	24.8
Kelantan	15,099	1,190	1,112	1,010	948	873	78.8	73.6	66.9	62.8	57.8
Pen Malaysia	132,631	7,193	7,004	6,203	5,929	5,607	54.3	52.9	46.9	44.8	42.4
Sabah	73,631	450	655	575	533	496	6.1	8.9	7.8	7.2	6.7
FT Labuan	91	0	0	0	0	0	-	-	-	-	-
Sarawak	124,450	623	1,453	1,271	1,179	1,102	5.0	11.7	10.2	9.5	8.9
East Malaysia	198,172	1,073	2,108	1,846	1,712	1,598	5.4	10.6	9.3	8.6	8.1
Total Malaysia	330,803	8,266	9,112	8,049	7,641	7,205	25.0	27.6	24.3	23.1	21.8

Source: NWRS 2011

IRRIGATION DEMAND- EFFICIENCIES

Irrigation Scheme	Irrigation Efficiencies (%)				
	2010	2020	2030	2040	2050
Granary	50	50	55	55	60
MADA*	70	70	75	75	75
Mini Granary	40	40	50	50	50
Minor Schemes	40	40	50	50	50

Water Demand Management

i. Farming Practices
   a. System of Rice Intensification (SRI) – no standing water weed control
   b. Group farming to enable higher level of mechanisation and water management
   c. On-farm water management - Stop irrigation supply at 15 days before scheduled drainage date.

ii. Water Pricing by Metering
   a. Measure and record all water used
   b. Charge use of irrigated water by metering (for group commercial farming)

NWRS 2011 - WATER DEMAND FOR NON-PADDY CROPS

States	Land Area km^2	Non-Paddy Crops Demand (mcm)					Non-Paddy Crops Demand (mm)				
		2010	2020	2030	2040	2050	2010	2020	2030	2040	2050
Perlis	821	51.9	52.0	52.1	52.2	52.4	63.25	63.31	63.42	63.57	63.84
Kedah	9,500	145.9	146.1	146.5	147.0	148.0	15.36	15.38	15.42	15.48	15.58
Pulau Pinang	1,048	39.5	39.5	39.6	39.8	40.1	37.65	37.72	37.83	38.01	38.29
Perak	21,035	64.9	65.4	66.3	67.7	69.9	3.08	3.11	3.15	3.22	3.32
Selangor	8,396	36.0	37.3	39.4	42.7	48.2	4.29	4.44	4.69	5.09	5.73
Negeri Sembilan	6,686	23.6	23.7	23.8	24.0	24.4	3.53	3.54	3.56	3.59	3.65
Melaka	1,664	69.3	69.6	69.9	70.5	71.5	41.66	41.80	42.01	42.37	42.96
Johor	19,210	99.0	101.3	104.9	110.9	120.7	5.15	5.27	5.46	5.77	6.28
Pahang	36,137	32.8	33.4	34.6	36.3	39.3	0.91	0.93	0.96	1.01	1.09
Terengganu	13,035	183.9	184.1	184.3	184.6	185.2	14.11	14.12	14.14	14.16	14.20
Kelantan	15,099	292.0	292.0	292.0	293.0	294.0	19.34	19.34	19.34	19.41	19.47
Pen Malaysia	132,631	1038.8	1044.3	1053.3	1068.8	1093.6	7.83	7.87	7.94	8.06	8.25
Sabah	73,631	72.6	73.3	74.2	75.2	76.6	0.99	1.00	1.01	1.02	1.04
FT Labuan	91	0	0	0	0	0	0	0	0	0	0
Sarawak	124,450	5.1	5.4	5.5	5.8	5.9	0.04	0.04	0.04	0.05	0.05
East Malaysia	198,172	77.7	78.8	79.7	81.0	82.5	0.40	0.40	0.40	0.40	0.40
Total Malaysia	330,803	1,117	1,123	1,113	1,150	1,176	3.38	3.40	3.43	3.48	3.55

Source: NWRS 2011

NWRS 2011 - Water Demand for Livestock

States	Land Area km²	Livestock (mcm)					Livestock (mm)				
		2010	2020	2030	2040	2050	2010	2020	2030	2040	2050
Perlis	821	0.9	1.7	3.3	6.5	12.8	1.07	2.09	4.07	7.97	15.62
Kedah	9,500	6.5	8.4	11.2	15.2	21.3	0.68	0.89	1.18	1.60	2.24
Pulau Pinang	1,048	11.9	12.2	12.5	12.8	13.1	11.35	11.64	11.93	12.23	12.54
Perak	21,035	22.1	28.6	38.5	51.2	69.4	1.05	1.36	1.83	2.43	3.30
Selangor	8,396	8.6	11.3	14.9	20.2	27.9	1.00	1.30	1.80	2.40	3.30
Negeri Sembilan	6,686	4.9	8.1	10.8	14.8	21.1	0.74	1.21	1.61	2.22	3.16
Melaka	1,664	6.0	8.1	11.1	15.4	22.0	3.58	4.86	6.65	9.27	13.22
Johor	19,210	23.4	37.8	60.5	97.8	158.6	1.22	1.97	3.15	5.09	8.26
Pahang	36,137	8.1	14.2	25.7	47.9	91.6	0.22	0.39	0.71	1.33	2.54
Terengganu	13,035	5.1	8.1	12.9	21.4	36.5	0.39	0.62	0.99	1.64	2.80
Kelantan	15,099	6.1	8.7	12.1	18.8	28.5	0.40	0.58	0.80	1.25	1.89
Pen Malaysia	132,631	103.6	147.2	213.6	322.1	502.9	0.78	1.11	1.61	2.43	3.80
Sabah	73,631	6.9	8.5	10.7	13.8	18.5	0.09	0.12	0.10	0.17	0.25
FT Labuan	91	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sarawak	124,450	18.3	24.2	32.1	42.7	56.9	0.15	0.19	0.26	0.34	0.46
East Malaysia	198,172	25.2	32.7	42.8	56.5	75.4	0.13	0.17	0.22	0.29	0.38
Total Malaysia	330,803	128.8	179.9	256.4	378.6	578.3	0.39	0.54	0.78	1.14	1.75

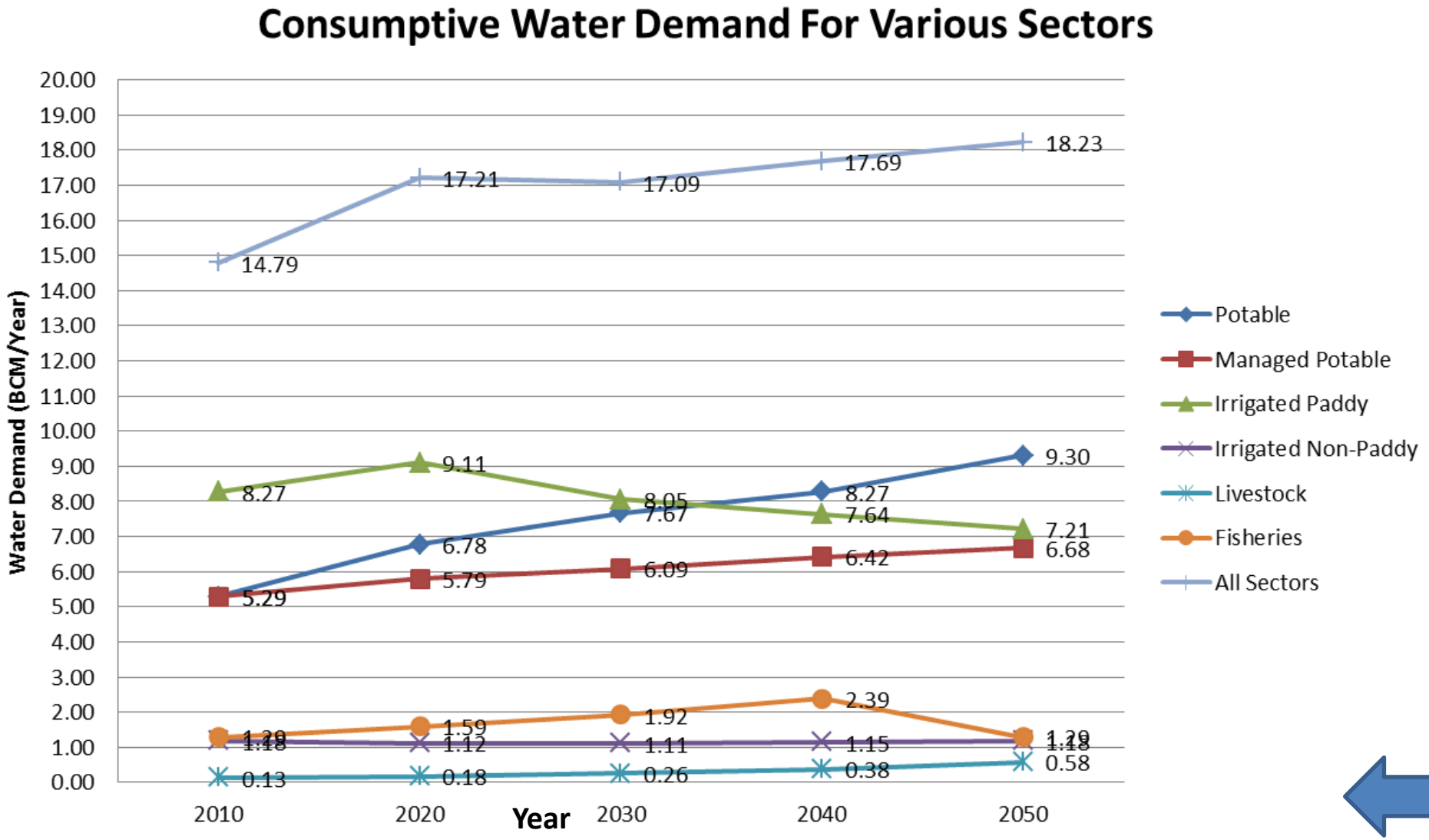
Source: NWRS 2011

NWRS 2011 - Water Demand for Fisheries

States	Land Area sq km	Fisheries Water Demand (MCM)					Fisheries Water Demand (mm)				
		2010	2020	2030	2040	2050	2010	2020	2030	2040	2050
Perlis	821	9.4	10.4	11.5	12.7	14.1	11.5	12.7	14.0	15.5	17.1
Kedah	9,500	136.1	157.9	183.2	212.7	246.8	14.3	16.6	19.3	22.4	26.0
Pulau Pinang	1,048	58.6	68.0	78.9	91.5	106.2	55.9	64.9	75.3	87.3	101.4
Perak	21,035	325.4	416.6	533.3	682.6	873.8	15.5	19.8	25.4	32.5	41.5
Selangor	8,396	159.2	194.1	236.6	288.4	351.5	19.5	23.8	29.0	35.4	43.1
Negeri Sembilan	6,686	55.1	64.0	74.3	86.2	100.0	8.2	9.6	11.1	12.9	15.0
Melaka	1,664	63.9	70.5	77.9	86.1	95.1	38.4	42.4	46.8	51.7	57.1
Johor	19,210	158.4	235.4	286.9	349.7	426.3	8.2	12.3	14.9	18.2	22.2
Pahang	36,137	206.4	239.6	278.0	322.5	374.4	5.7	6.6	7.7	8.9	10.4
Terengganu	13,035	35.2	42.9	52.3	127.6	155.5	2.7	3.3	4.0	9.8	11.9
Kelantan	15,099	37.1	43.1	50.0	58.1	67.4	2.5	2.9	3.3	3.8	4.5
Pen Malaysia	132,631	1,245	1,543	1,863	2,318	2,811	9.4	11.7	14.1	17.5	21.2
Sabah	73,631	21.1	25.3	30.4	36.5	43.8	0.3	0.3	0.4	0.5	0.6
FT Labuan	91	-	-	-	-	-	-	-	-	-	-
Sarawak	124,450	20.7	24.9	29.9	35.8	43.0	0.2	0.2	0.2	0.3	0.3
East Malaysia	198,172	42	50	60	72	87	0.2	0.3	0.3	0.4	0.4
Total Malaysia	330,803	1,287	1,593	1,923	2,390	2,898	3.9	4.8	5.8	7.2	8.8

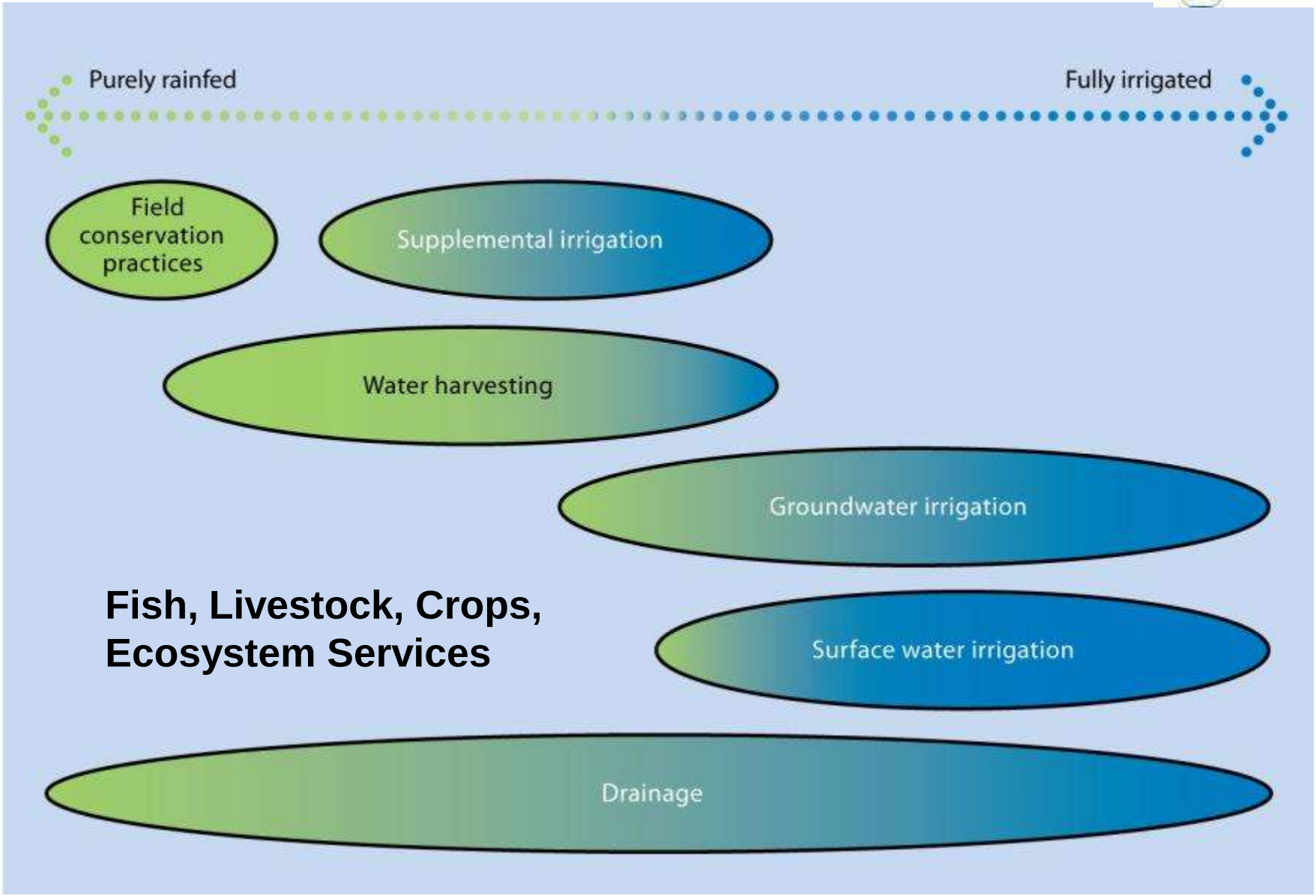
Source: NWRS 2011

Consumptive Water Demand Projections (BCM/Year)



Agricultural Water Management in Malaysia

Consider the Full Range of Agricultural Water Management Options



Agricultural Water Management in Malaysia

Points to Ponder against CA Policy Action Recommendations, DAN and NWRP 2012

1. Change the way we think about Water and Agriculture;
   - Agriculture is a major user of water resources and a major stakeholder at the river basin level
   - Water management for agriculture should account for the complete spectrum from pure rain-fed, via rainwater harvesting, to supplemental or deficit, to full irrigation.
   - Agricultural Water Supply and Management:
     - MOA – food crops, floriculture, livestock, fisheries and aquaculture
     - KPPK – Plantation crops: oil palm, rubber, timber, cocoa, pepper and tobacco
   - IWRM and IRBM under NWRP requires shared governance at the river basin level addressing Q&Q of water withdrawals and return flows.
   - Case for an expanded and multi-disciplinary role of BPSP (MOA)!

Agricultural Water Management in Malaysia (2)

Points to Ponder against CA Policy Action Recommendations, DAN and NWRP 2012

2. Fight poverty by improving access to agricultural water and its use;
   - Need for targeted program to improve productivity through innovative water supply and management services especially to those living in more remote rural areas currently practicing subsistence farming or shifting agriculture
3. Manage agriculture to enhance ecosystem services;
   - Little attention currently more due lack of awareness
   - Knowledge enhancement through awareness programs and training
   - Need to build into the planning process when implementing or managing agricultural systems

Agricultural Water Management in Malaysia (3)

Points to Ponder against CA Policy Action Recommendations, DAN and NWRP 2012

4. Increase the productivity of water;
   - Essential component of water demand management
   - Though the concept of "more crop per drop" has been around for sometime and exhorted frequently in public statements, yet to see concerted action taken, monitored and reported periodically based on appropriate productivity indices (such as Kg/Cu.m)
   - Earlier efforts made in MADA and Krian in collaboration with IWMI merit further pursuance and implementation as a national program towards improved efficiency and performance targets
5. Upgrade rain-fed systems – *a little water will go along way*;
   - Relevant for both small-holder farming and in the plantation sector
   - Controlled drainage systems augmented by minimal supplemental irrigation to meet crop requirements during critical periods is known to substantially improve yields and crop productivity

Agricultural Water Management in Malaysia (3)

Points to Ponder against CA Policy Action Recommendations, DAN and NWRP 2012

6. Adapt yesterday's irrigation systems to tomorrow's needs;
   - Review and revitalize existing irrigation systems for greater system performance and productivity
   - Efficiency improvements to mono-crop D&I systems at the primary, secondary, tertiary and on-farm levels especially in the granary areas
   - Innovative and flexible systems in other areas to enable multiple cropping of high value food crops and floriculture targeted under DAN
   - Reuse and Recycling to improve system efficiency (Case example: MADA)
   - Use of waste water for agriculture (such as in fodder for livestock), groundwater recharge, and soil moisture enhancement
   - Aquaculture support systems

Agricultural Water Management in Malaysia (4)

Points to Ponder against CA Policy Action Recommendations, DAN and NWRP 2012

7. Reform the reform process – targeting state water institutions;
   - Shared Governance required under NWRP 2012 requires participation of all water users and stakeholders to ensure greater efficiency and performance especially at the river basin scale.
   - Capacity building in IWRM to acquire the desired skills & competence
8. Deal with tradeoffs and make difficult choices *(Water Storage – Safeguard against Climate Change).*
   - Tradeoffs especially in "closed" river basins opting for lesser quality water for agricultural purposes when in competition or in conflict with domestic and industrial water supply
   - Adopt and implement ILBM in managing lakes and reservoirs developed for agricultural use and in collaboration with other users when they are multi-purpose dams.

6. STI and Water

ASM Mega Science Framework Study for Sustained National Development (2011-2050)

- The mission of ASM is to pursue, encourage and enhance excellence in the field of science, engineering and technology for the development of the nation and the benefit of mankind
- The above mentioned Study begun in the year 2010 is to establish the framework or roadmap and identify the type and impact of science, technology and innovation (STI) and the areas of development on which STI will be applied to generate maximum sustained economic growth and prosperity for the country. The Study initially focused on the following sectors:
    - Water
    - Energy
    - Health
    - Agriculture
    - Biodiversity

ASM Mega Science Framework Study for Sustained National Development (2011-2050) –(2)

- The Study has since been completed and the highlights pertaining to the Water Sector report are as follows:
  - The Study noted that 10 Economic Sectors influenced by water are as follows:

Agriculture	Ecosystem Services
Forestry	Urban/domestic
Fisheries	Health
Industry	Education
Tourism	Water management

ASM Mega Science Framework Study for Sustained National Development (2011-2050) –(3)

- STI opportunities found in 2 discrete areas:
  1. Sustaining the Resource
  2. Creating new wealth
- The Study went on to identify some 70 STIs which were then subject to a Return-Risk Analysis from which 11 promising STIs emerged under the first category while another 10 STIs fell under the second.
- The total of 21 STIs are listed under 7 themes:

21 STIs in 7 water themes

Water Supplies

- Urban runoff
- Rainfall
- Ground water
- Conjunctive use

Waste Management

- Zero waste
- Point & non-point source pollution
- Advanced Wastewater Treatment

Water Management

- Tourism
- Urban
- Coastal
- High value ecosystem

21 STIs in 7 water themes (2)

Agriculture

- Sustainable Aquaculture
- Irrigation Flow

Support Exports

- Bottled Water
- Water Purification Unit

Knowledge Product

- Tourism
- Urban
- Coastal
- High value ecosystem

Knowledge/ Education

- Research centre
- Value ecosystem services
- Reform education

Concluding Remarks

- Malaysia has already begun feeling the pressures on its water resources, the outcome of population growth, increased economic activity, improved standards of living , rapid urbanisation, and lack of effective pollution control measures. Blessed with fairly abundant rainfall, these problems can easily be overcome through effective water governance. Despite the adoption of IWRM since the turn of this century, sectoral approaches to water resources management have dominated and still prevail.
- The much awaited NWRP 2012 was formally unveiled in March 2012 which has underlined WR security, WR sustainability, and collaborative governance as its policy principles. Malaysia has also subscribed to the green economy which further reinforces and adds another dimension to the IWRM agenda with linkages to the so-called Water-Food-Energy nexus.
- "The Future We Want" report, the outcome from the recent Rio+20 Earth Summit held in June 2012 includes similar aspirations for resources management.
- Turning policy into action and concerted and collective efforts by all stakeholders from both sides of the IWRM divide of "resource management" and "resource use" is now the key towards achieving the future we want under Vision 2020. It should be accompanied by the development of competent human capital and the application of sound STI to ensure sustainability.
- **It is indeed now a "Time for Solutions" and to "Walk the Talk"**

Integrated Water Resource Management in Malaysia



Flood Mitigation




Potable Water Supply

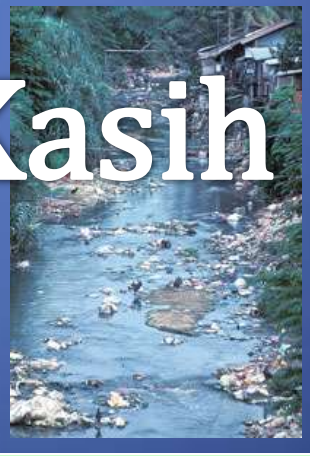


Hydropower




Agricultural Water Management

Terima Kasih


Environment