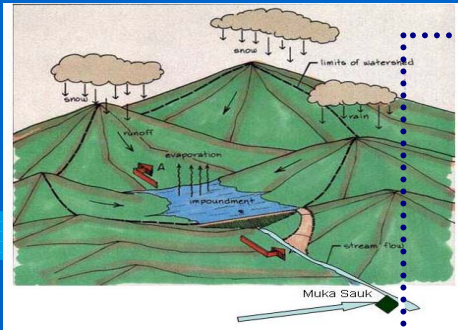


Operational Aspects of Water Demand Management - For Domestic & Industrial Use

**IR.NOOR AZAHARI B.ZAINAL
JABATAN BEKALAN AIR
KeTTHA**



Kolam Imbangan

Bukit

Kolam Servis

Rumah Pam Air Mentah

Rumah Pam Air Bersih

Taman Perumahan

Loji Rawatan Air

Kolam Servis

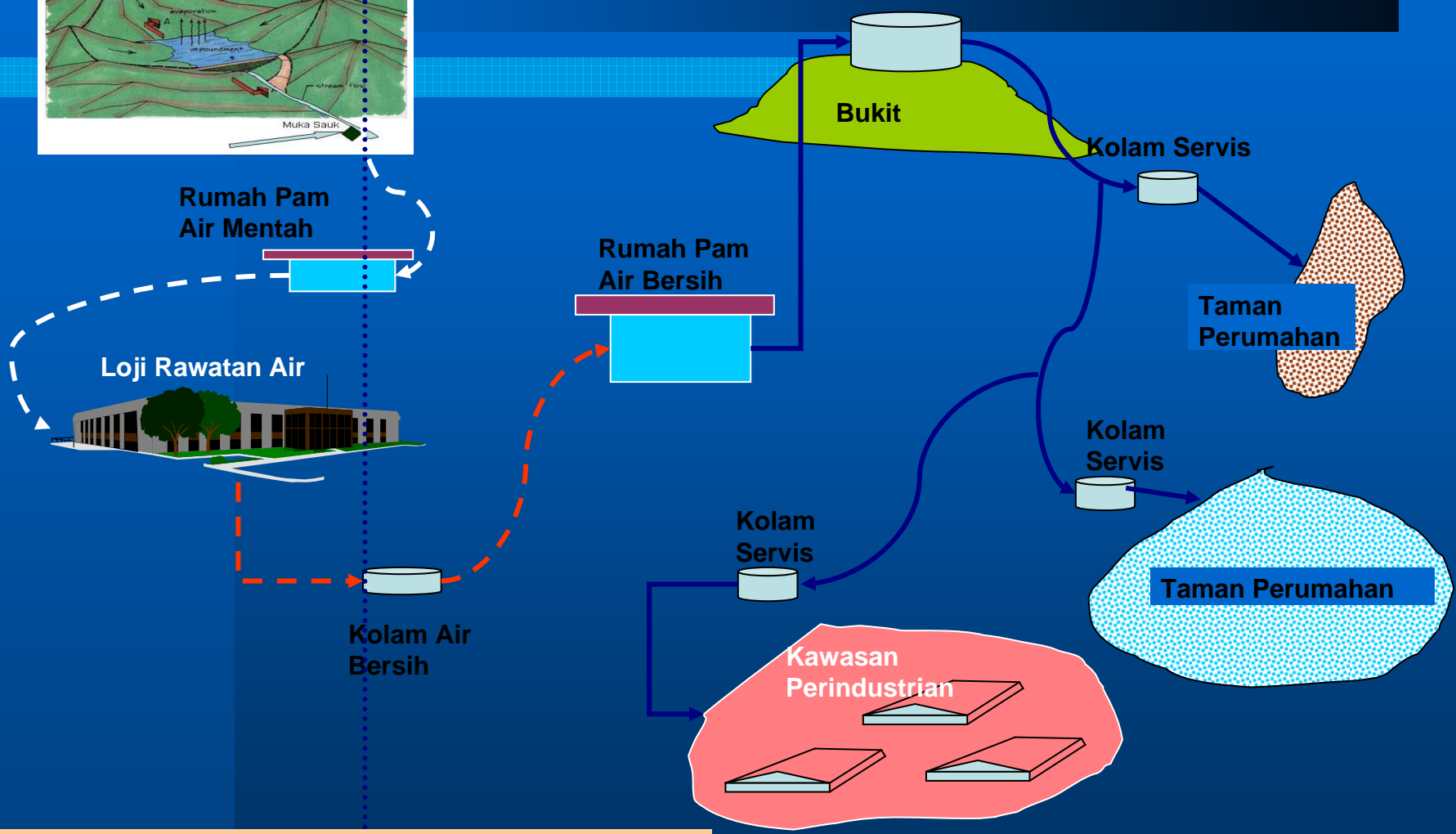
Kolam Air Bersih

Kolam Servis

Taman Perumahan

Kawasan Perindustrian

CONTOH SISTEM BEKALAN AIR



Contents

1. Water Resource Facts in Malaysia
2. Water Crisis in Malaysia
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10. Use of Water Saving Devices
11. Discouraging Excessive Use of Water by Introducing Tariff Policy
12. Recycling of Water and Effluent Reuse
13. Promoting Rainwater Harvesting
14. Conclusion

WATER RESOURCES FACTS IN MALAYSIA - QUANTITY

- Average annual rainfall of 2470 mm or 324 billion m³
- Annual water demand 17.7 billion m³ in 2050 or 5.5 %
- Rainfall not uniformly distributed temporally or spatially
- Problems with supply and demand especially during prolonged drought
- Regulation of river flow required to overcome shortages by construction of dams
- Groundwater supplies are relatively small

Ministry of Health National Guidelines For Drinking Water Quality (Raw Water)

Parameters Group 1	<u>Acceptable Value</u>
1. Turbidity	< 1000 unit NTU
2. Colour	< 300 Hazen
3. pH	5.5 - 9.0
4. Total Coliform	< 5000 counts per 100 ml

Parameters	<u>Acceptable Value</u>
1. Total Dissolved Solids	< 1500 ppm
2. BOD	< 6 ppm
3. COD	< 10 ppm
4. Iron	< 1.0 ppm
5. Ammonia	< 1.5 ppm
6. Chloride	< 250 ppm
7. Fluoride	< 1.5 ppm

WATER RESOURCES FACTS IN MALAYSIA - QUALITY

- Rivers generally exhibit increasing degradation trend
- DOE graded river into 5 quality
 - Class I - Excellent
 - Class II – Good Quality (conventional treatment)
 - Class III – Require advanced treatment
 - Class IV – For agricultural activities
 - Class V – Very poor
- Source of Pollution – agro-based and manufacturing industries, livestock farming, domestic waste, earthworks and land clearing



WATER CRISIS IN MALAYSIA



1998 Klang Valley Water Crisis

The main reasons for the water crisis were due :

- development of the resource and treatment facilities could not meet the rapid pace of urbanisation and industrialisation;
- a prolonged drought causing the reduction of flows in the rivers and the subsequent decrease in the reservoir levels;
- the low flows in the rivers were insufficient to dilute the pollutant loads resulting frequent closures of water treatment plants and
- High water losses due to leakages in the distribution systems and pilferages



Confusing reports frustrate residents

PUNCAK Niaga and the Selangor Waterworks Department (JBA) must be consistent in their reports, the MP for Bandar Tun Razak Datuk Tan Chai Ho said.

He said both departments should work together in solving the water crisis effectively instead of misleading the public with false hopes.

"Puncak Niaga reported earlier that water rationing would end by July 16, while JBA later



Catuan air perlu adil

AMPANG: Jabatan Bekalan Air (JBA) Selangor diminta memastikan sistem pengagihan dan catuan bekalan air di kawasan yang sering mengalami masalah terputus bekalan dilakukan secara adil.

Ahli Parlimen Ampang Jaya, Datuk Ong Tee Keat, berkata beliau masih tidak berpuas hati dengan sistem pengagihan dan catuan yang dilakukan kerana masih terdapat banyak kawasan yang menghadapi masalah untuk mendapatkan bekalan.

"Saya masih tidak berpuas hati dengan apa yang dilakukan oleh JBA dalam usaha mereka menangani masalah bekalan air terutama di kawasan Ampang Jaya. Mereka perlu lebih pri-

Taman Bukit Permai," katanya selepas melawat Taman berkenaan, semalam.

Beliau mengadakan lawatan ke kawasan berkenaan selepas penduduk membuat aduan berhubung kesulitan mereka untuk mendapatkan bekalan air bersih sejak dua minggu lalu.

Kawasan perumahan itu di kawasan bukit menyebabkan lori JBA Selangor menghadapi keuzuran untuk menghantar bekalan air kepada kira-kira 500 rumah di situ. Ong berkata, sebelum masalah bekalan air di Lembah Klang berlaku, kawasan perumahan itu sering terputus bekalan berikutan tekanan rendah.

"JBA perlu mengatasi

Kadar air dua meroso

KUALA LUMPUR: Kadar pengeluaran air di Loji Pembebasan Skim Sungai Langat dan Sungai Semenyih semalam merosot sebanyak 9.1 peratus dan 12.1 peratus masing-masing kepada 67.3 peratus dan 87.9 peratus berbanding kelmarin.

Menurut kenyataan Jabatan Bekalan Air (JBA), Selangor pengeluaran semasa air di Loji Pembebasan Skim Sungai Langat menurun daripada 409.69 juta liter sehari (JLD) kepada 361.04 JLD manakala skim Sungai Semenyih pula merosot daripada 638.26 JLD kepada 561.25 JLD.

Carut-harut sebanyak 4.1 mililitir (ml) di Kempegan Langat tidak membolehkan paras air di empangan itu yang kekal pada aras

Kawasan banyak air di kenal pasti

Oleh Rasid Rahaman

KLANG, Jumaat — Kerajaan Selangor mengenal pasti sekurang-kurangnya sembilan lombong dan tasik berhampiran Sungai Semenyih di Hulu Langat mempunyai air yang banyak sekaligus dapat membantu meningkatkan jumlah air untuk diproses ke tahap maksimum sehingga melepasi musim kemarau oleh Loji Rawatan Air Sungai Semenyih dan Bukit Tampor dekat sini.

Pengerusi Jawatankuasa Tetap Perikanan, Pertanian dan Penerangan, Datuk Abdul Fatah Iskandar, berkata kawasan air yang banyak itu membabitkan empat lombong dan lima tasik yang mana lapan daripada

ngai Langat.

"Tasik berkenaan membabitkan tasik di Pusat Jagaan Lanjutan seluas empat hektar, Kampung Pasir (40 hektar), Kampung Kacau (12 hektar), Sukida Resort (empat hektar), Kampung Pasir Baru (lapan hektar) yang semuanya di Semenyih dan tasik Timah Langat di Dengkil, Sepang (empat hektar)," katanya dalam kenyataan yang dikeluarkan di sini, hari ini.

Menurutnya, bagilombong pula yang dikenal pasti mempunyai kualiti air yang banyak ialah di Kampung Sungai Buah, Jenderam seluas empat hektar, Kampung Sungai Kembang dan Bangi Lama (24 hektar) dan

galian kajian kesesuaian kualiti air di kawasan terbabit sudah diperolehi manakala sebahagian lagi, kajian masih dijalankan oleh Jabatan Kesihatan dan Jabatan Kimia yang mana keputusannya akan diketahui dalam beberapa hari lagi," katanya.

Menurutnya, kajian itu untuk mengenal pasti keadaan terbaik bagi mengalirkan air dari tasik dan lombong itu ke dalam sistem Sungai Beranang dan Sungai Semenyih untuk dirawat di loji.

Beliau berkata, pada masa ini kedua-dua jabatan itu sedang menjalankan kajian terhadap kemungkinan air di Tasik Sungai Kembang dan

Dengan adanya mena pencarian, nya, bahan-bahan melebihi piawaian tidak membahayakan itu COD dan nitro mungkin akan di tahap boleh dirawat air minum di Sungai Semenyih Loji Bukit Tampor.

"Saya percaya sik dan lombong ini disalurkan ke Semenyih, ia dapat meningkatkan paras ngai itu untuk dip ke loji rawatan.

"Saya juga berkrisis kekurangan Lembah Klang dan selesai dengan Ian air dari tasik lombong berkenaan utamanya di ka pengagihan yang

SEMENYIH DAM

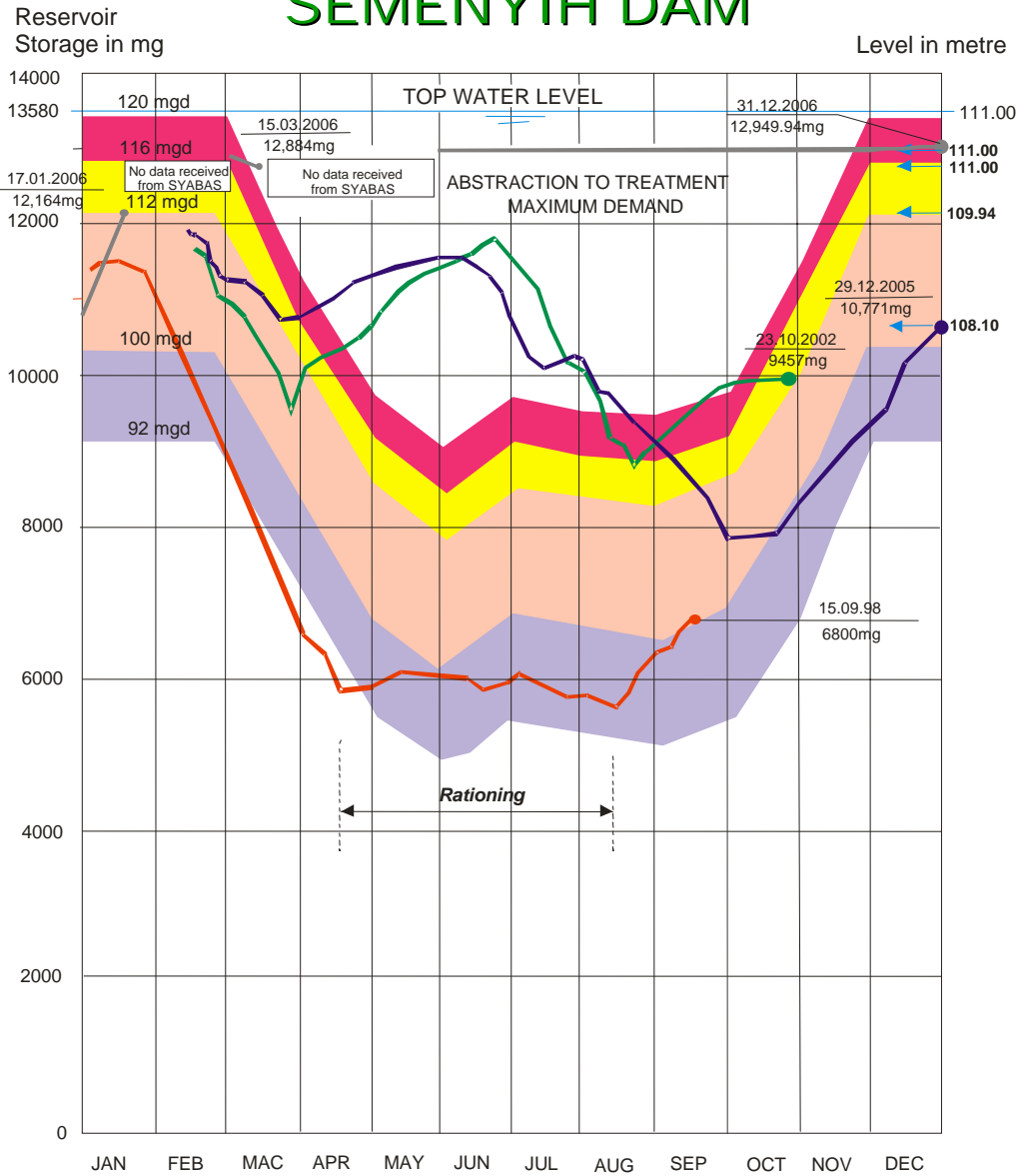


Figure above shows total storage
Dead storage = 1580mg

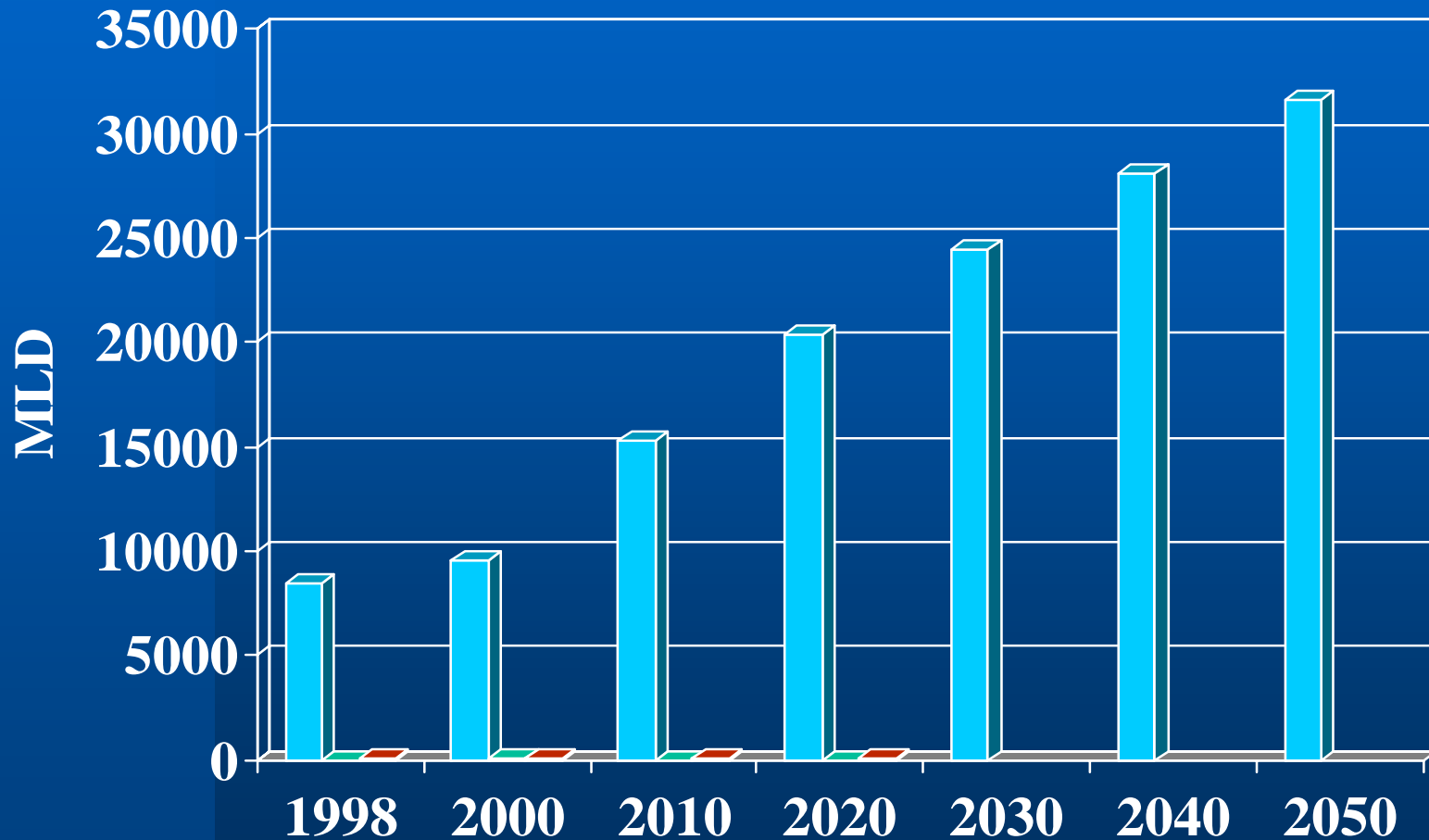


PAST, PRESENT AND FUTURE WATER DEMANDS



Domestic and Industrial Water Demand for Peninsular Malaysia

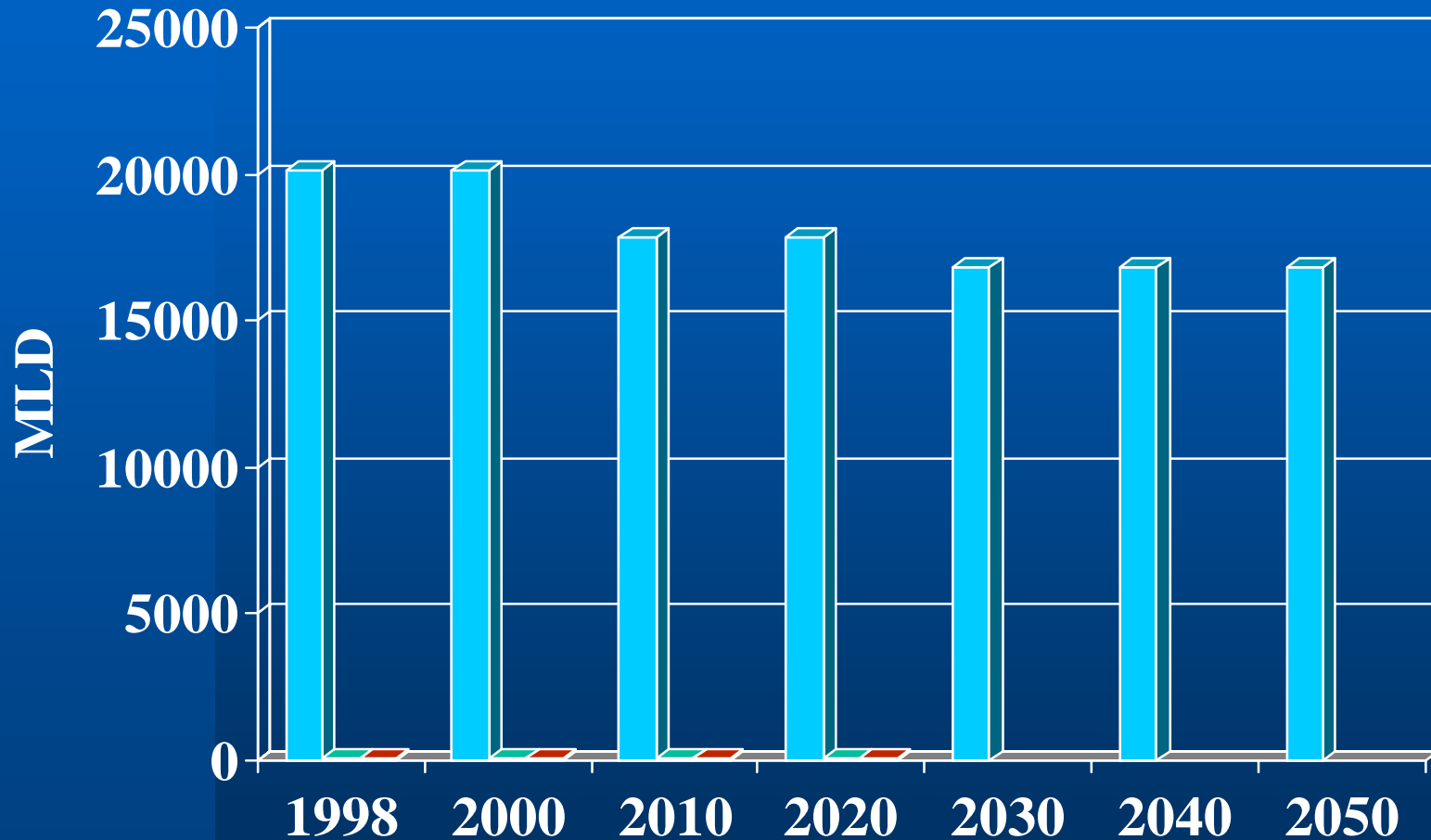
From 1998 - 2050



* From Table 1, Page ES-2, Jilid 1 Kajian Sumber Air Negara 2000 - 2050

Irrigation Water Demand for Peninsular Malaysia

From 1998 - 2050



* From Table 1, Page ES-2, Jilid 1 Kajian Sumber Air Negara 2000 - 2050

DEFINITION OF DEMAND MANAGEMENT

The combination of management, financial, economic, engineering and other practices applied to meet consumer demand while at the same time optimizing service levels and the amount of water required from the treatment plants. It is widely accepted that to ensure a sufficient supply to consumer, supply must always meet demand

Traditional Approach to Water Demand

Water supply development which focused on developing new supplies and structures to manipulate available supplies in order to meet perceived water needs. Hallmarks of this strategy include large dams, river intakes, diversions, large water supply treatment works, reservoirs, pipes and others.

DISADVANTAGES

- Overuse resources
- Overcapitalization
- Resource wastage
- Pollution problems
- Adverse Environmental Impact
- Temporary and not cost-effective solutions
- Social/Political Issues

WATER SUPPLY KEY STATISTICS (2007)

- T/Plant Installed Capacity **14,278 Mld.**
- Water Demand **12,330 Mld.**
- Serves **99 %** Urban
60 % Rural
- Population : **27 Million** (2007)
- Future Population: **47 Million** (2050)

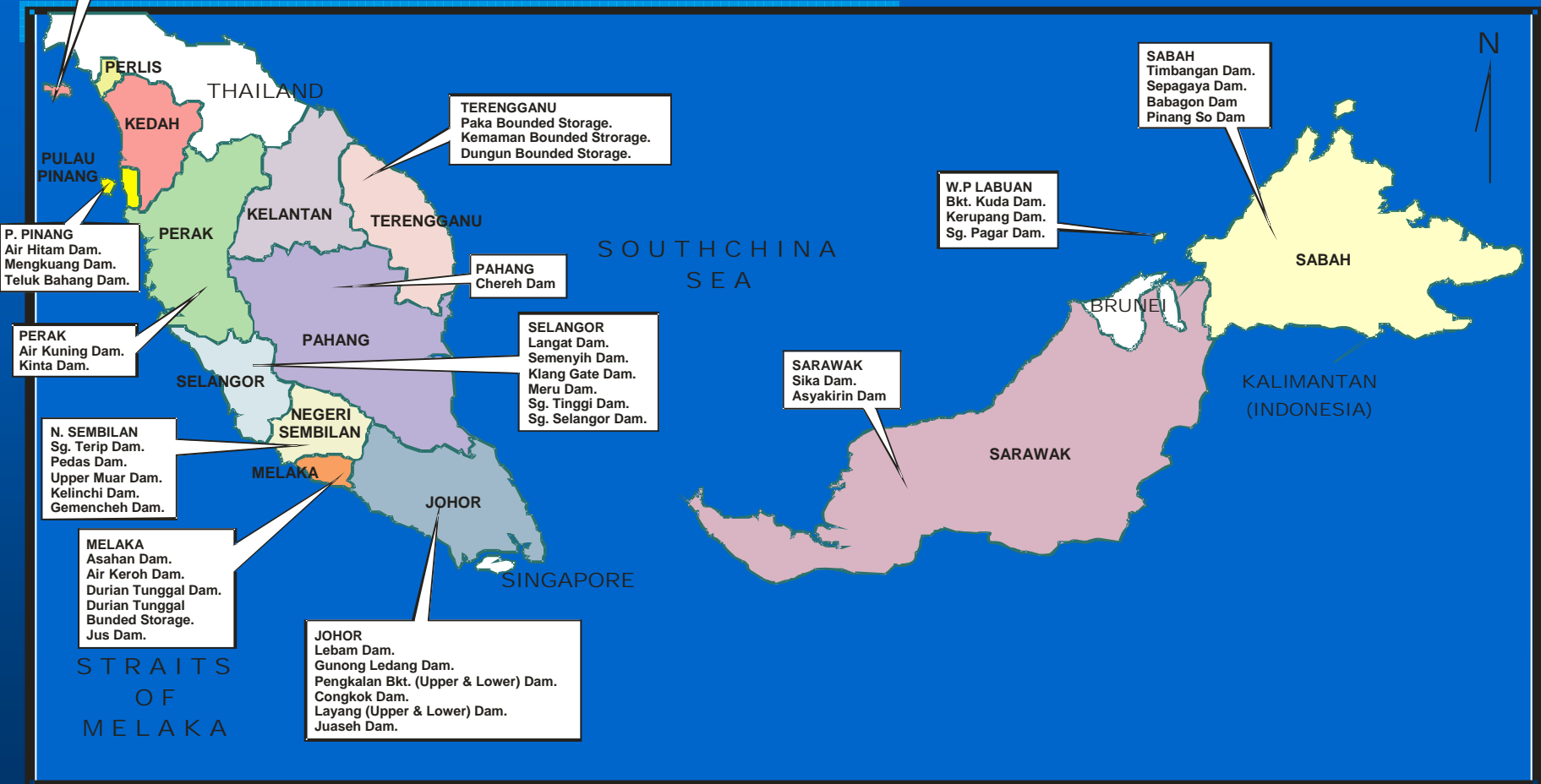
462 treatment plants

Length of water mains in service is 96,976 km
with 3623 no. of water towers and storage tanks

Number of connections is 5.585 million



DAMS OPERATED BY WATER AUTHORITIES



Jumlah Empangan Air Di bawah PBAN – 36 Semenanjung dan 9 di Sabah, Sarawak dan Labuan

NEW APPROACH TO WATER DEMAND

STRATEGIES TO LOWER OR MITIGATE THE PROPOSED WATER DEMANDS IN A MORE SOCIALLY BENEFICIAL MANNER EMPLOYING SOCIOECONOMICS TECHNIQUES LIKE ECONOMIC ANALYSIS, ESTABLISHMENT OF INCENTIVES AND DISINCENTIVES, WATER CONSERVATION TECHNOLOGIES, REDUCTION OF NON-REVENUE WATER, WATER RECYCLING, PUBLIC EDUCATION, WATER EQUITY RIGHTS MODIFICATION AND OTHERS.



Strategies For Water Demand Management



Consumer's Perspective

- **WATER SAVING CAMPAIGN**

Promoting wise use of water and raising awareness on the importance of water conservation.

PR campaigns and audits on heavy water consumer, advising them on how best to save water.

- **EFFICIENT USE OF WATER BY USING WATER SAVING DEVICES**

Encouraging use of water saving devices and appliances such as thimbles, cistern insert, low capacity cisterns of 4.5 lit/flush compared to 9 lit/flush

- **RAINWATER HARVESTING**

Provide incentives/subsidies for installation of rainwater harvesting system

Operator's Perspective

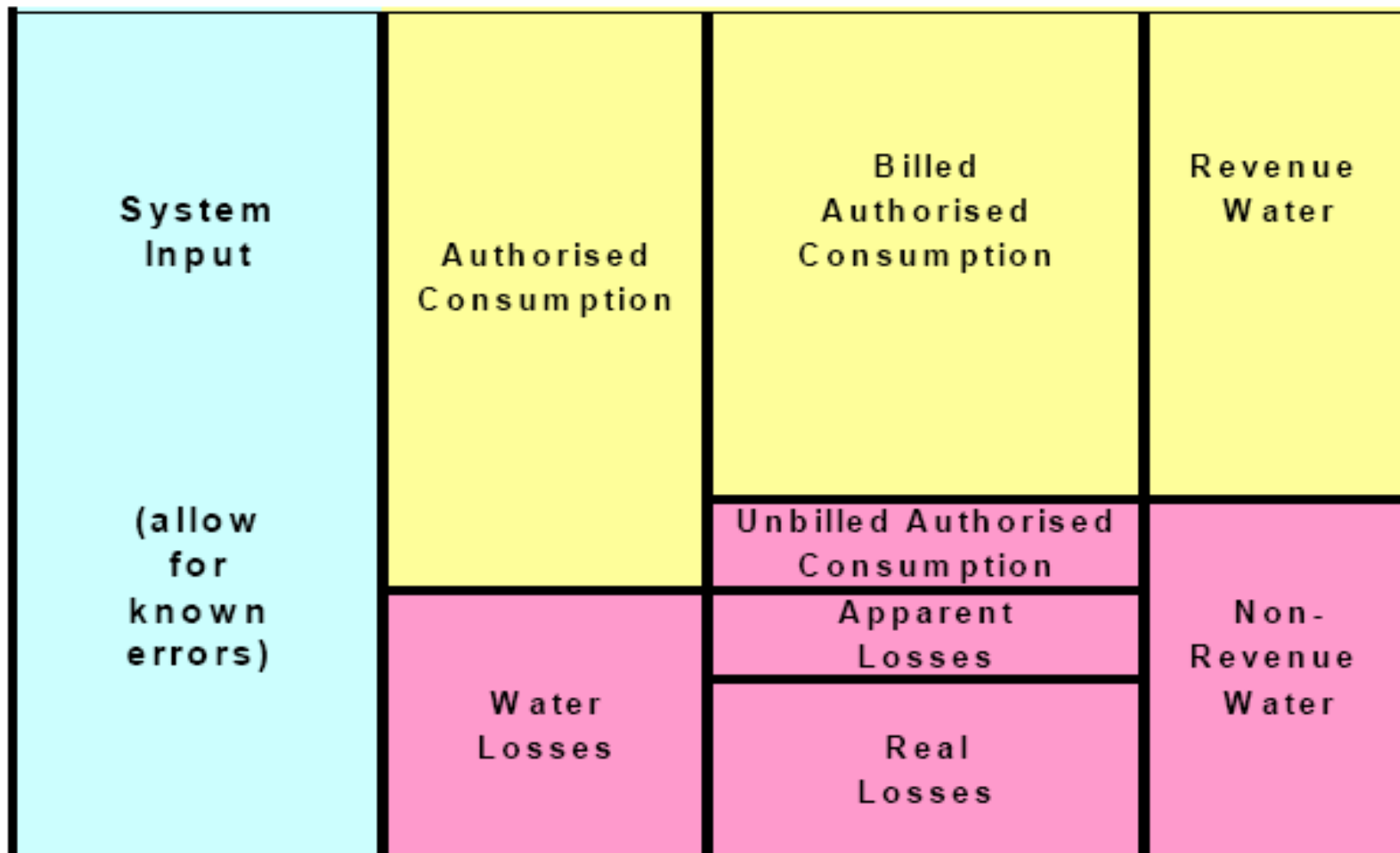
- **EFFLUENT REUSE**

Regulations have been legislated in order to increase the quality levels of sewage treatment plants and its effluents to maximize its reuse potential and minimize the health and environmental risks as well as enhancing the trading potential for its exchange for fresh water allocations, mainly for irrigation purposes

- **IMPLEMENT NRW CONTROL PROGRAMME**

In Penang, the NRW is 20% compared to 38% for Selangor

IWA Best Practice Water Balance (simplified)



Detailed IWA Water Balance

Own Sources	System Input	Water Exported	Authorised Consumption	Billed Authorised Consumption	Revenue Water	Billed Water Exported
		Water Supplied				Unbilled Authorised Consumption
Billed Unmetered Consumption						
Water Losses	Apparent Losses		Unbilled Metered Consumption			
			Real Losses	Unbilled Unmetered Consumption		
	Leakage and Overflows at Storages		Unauthorised Consumption			
			Leakage on Service Connections up to point of Customer Metering	Customer Metering Inaccuracies		
		Leakage on Mains				

Table 1: Components and Definitions of the IWA/AWWA Water Balance

Water Balance Component	Definition
System Input Volume	The annual volume input to the water supply system
Authorized Consumption	The annual volume of metered and/or unmetered water taken by registered customers, the water supplier and others who are authorized to do so
Water Losses	The difference between System Input Volume and Authorized Consumption, consisting of Apparent Losses plus Real Losses
Apparent Losses	Unauthorized Consumption, all types of metering inaccuracies and data handling errors
Real Losses	The annual volumes lost through all types of leaks, breaks and overflows on mains, service reservoirs and service connections, up to the point of customer metering.
Revenue Water	Those components of System Input Volume which are billed and produce revenue
Non-Revenue Water (NRW)	The difference between System Input Volume and Billed Authorized Consumption

The 4 Basic Methods of Managing Real Losses





Strategies To Reduce & Control Physical Losses From NRW



- Carryout leak detection programme
- Carryout Pressure Control

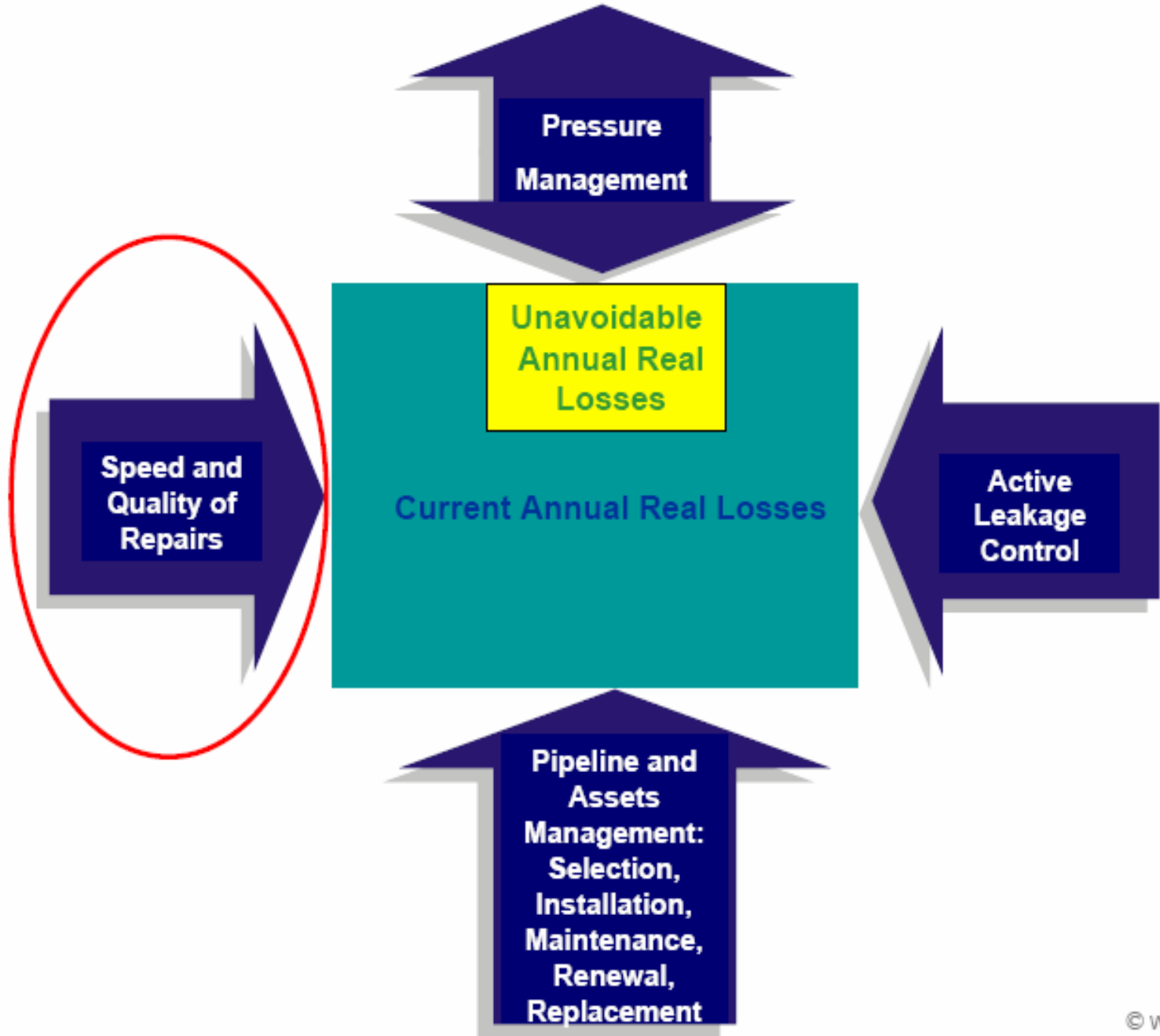
Pressure reduction in areas where system pressures are excessive

- Enforcement against theft
- Rehabilitation of distribution mains

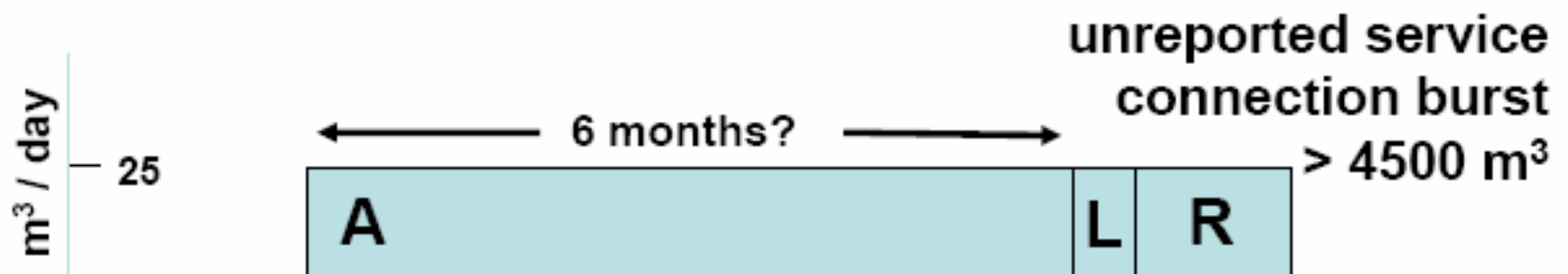
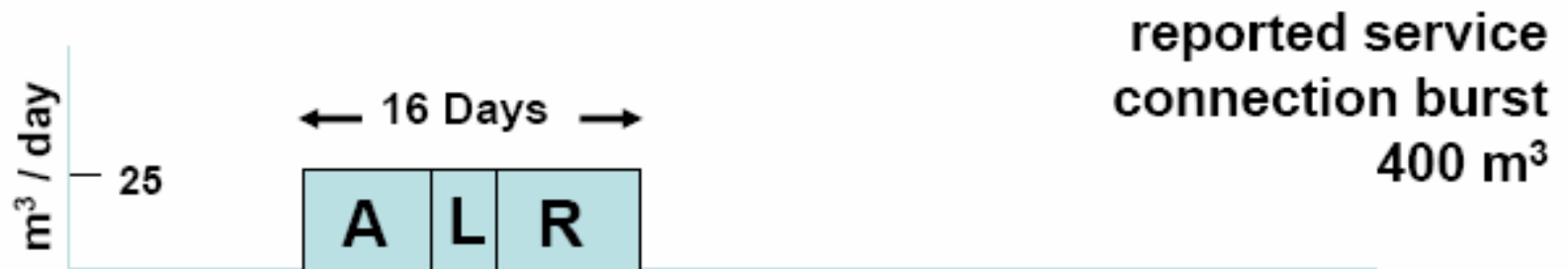


SPEED AND QUALITY OF REPAIRS





Influence of Run Time on real losses





ASSET MANAGEMENT



WHAT IS ASSET MANAGEMENT

Asset Management is the systematic process of maintaining, upgrading and operating physical assets

- **In the case of a water distribution systems physical assets includes the network components such as pipelines, storage reservoirs, pumps, valves**

OBJECTIVES

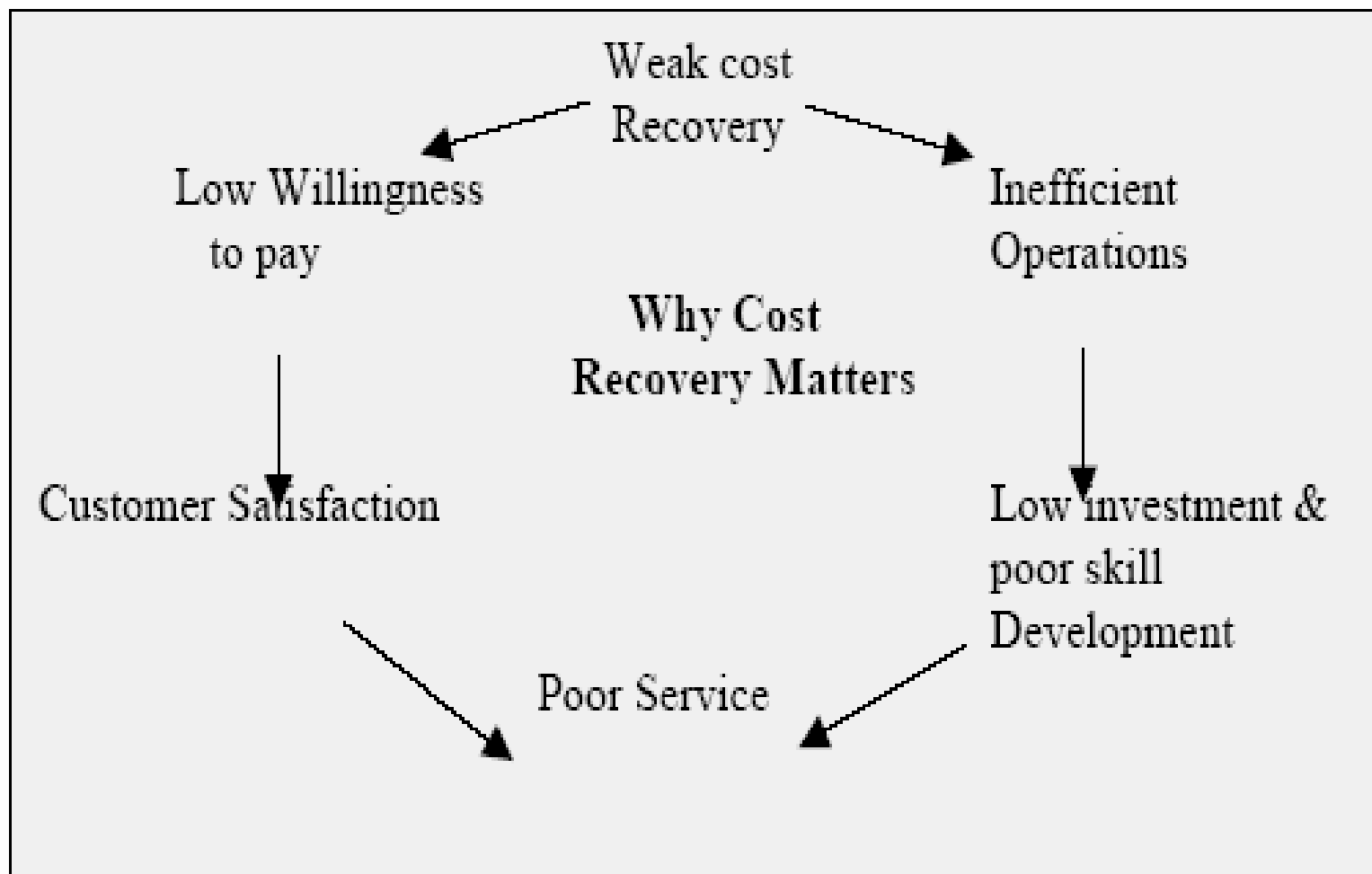
- **ASSET DETAILS AND VALUE**
- **TO MONITOR BREAKDOWNS ,MAINTENANCE JOBS, RECORDS, BACKLOGS**
- **TO PLAN FOR ROUTINE MAINTENANCE**
- **TO PLAN FOR ASSET REPLACEMENT PROGRAM**
- **FOR WATER AUDITING**
- **PLANNING FOR PLANT PRODUCTION, WATER DISTRIBUTION, PUMPING HOURS ETC.**

Other Strategies

• DISCOURAGING EXCESSIVE AND INEFFICIENT USE OF WATER BY INTRODUCING TARIFF POLICY

- Water should be treated as a commodity
- Water pricing is an important and effective mechanism persuading customers to conserve water.
- Desirable should have two-tier tariff i.e. affordable and expensive rates
- Should avoid subsidy elements.
- Application of Full Cost Recovery (FCR) FCR primarily covers all costs associated with operating, maintaining and financing the capital cost of the water system.

Fig. 2.1: Why Cost Recovery Matters



Source: "Water Demand Management Strategies and Implementation Plan for Gwalior (2006), TERI Pvt. Ltd.

Conclusion

- **Freshwater is finite and water should be treated as a commodity.**
- **Should have the political will and strong government support to implement Water Demand Management.**
- **Implementing new schemes is not the only solution to overcome water shortage.**
- **Element of subsidy should be avoided and proper pricing of water tariff should be implemented to prevent over usage and wastage of water.**

cont

- **Rainwater harvesting can only be effective if the pricing of potable water is expensive.**
- **The success of an Non-Revenue Water programmed is highly complex when dealt within a comprehensive way. Its required concerted efforts within the water agencies.**

THE END