

Water Tariff and Development: The Case of Malaysia

Cassey Lee
Faculty of Economics & Administration
University of Malaya
50603 Kuala Lumpur
Malaysia
E-Mail: cassey@um.edu.my

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1. Introduction

The impressive economic growth and development witnessed in Malaysia since her independence in 1957 is partly due to the adequate provision of infrastructure services in the country. In this regard, water services have played a crucial role in both alleviating poverty in the rural sector and supporting industrial development in the modern sector. Despite the positive role played by the water sector in Malaysia economic development in the past, there are indications today that reforms of the water sector is essential to ensure that its continued contribution to the economy.

A reflection of this is the considerable media attention that the water services have received in Malaysia in recent years. The current perception amongst the public is that the quality of water services is very low and that major investments are needed to improve this situation. In response to this problem, the Federal government is currently attempting to shift the regulation of water resources and supply from the state to the federal level.

Concomitantly, politicians have emphasized the need to revise current water tariffs to pay for some of the projected investments. This implies that the past and current levels of water tariffs in the country have been very much below the levels that ensure sustainability of water service provision and that the (state) governments have not been able to finance investments to further improve water services. As result, the reduction of water subsidies will figure prominently in water reforms in Malaysia in the near future.

This paper examines the extent of water subsidies in Malaysia. This is undertaken within the broad context of the general state of water services in Malaysia. The paper begins a discussion of the historical context of water and development in Malaysia in Section 2. This is followed by a review of the present state of water supply and consumption in the country in Section 3. Section 4 examines water institutions in Malaysia. Water tariff is the focus of our discussion

in Section 5. The impact of water tariff is discussed in Section 6. Section 7 concludes.

2. The Historical Context of Water and Development in Malaysia

Infrastructure services played an important role in the economic growth and development of Malaysia since its independence.¹ Despite its importance, very little work has been done to document the contributions of specific sectors (such as the water sector) to achieving the country's development goals such as poverty eradication and wealth redistribution.

There are very few official statements on the role of water tariffs in economic development. One exception is the first five-year plan that came after the racial riots in 1969. In the *Second Malaysia Plan (1971-1975)*, the government made specific statements on the use of tariff rates to promote development:

"The tariff structure employs the widely used block tariffs for domestic and commercial consumers and the two-part tariff with a demand charge for industrial consumers. A special industrial promotion tariff which offers power at rates slightly above production costs has been established by National Electricity Board (NEB) as one element of the government's policy to assist industrial development. These tariff rates allow NEB to meet costs and generate reasonable percentage of its financing requirements for expansion ... The Board's tariffs are designed to reflect the actual operating costs, which are lower in the case of supplies from the national grid than those from isolated diesel and rural power stations. " (p.215)

The above statements clearly indicate that consumption and commercial (industrial) tariffs were generally set at cost recovery levels. This is confirmed in a World Bank Study in 1976 (cited in Meerman (1977), p.197) where it is noted that "In general, in Malaysia, in contrast to the situation in many other countries, full-cost pricing of water is widely accepted. Consequently, water tariffs generally are sufficient to meet operating costs and dent service and yield a small surplus".

¹ See Naidu and Lee (1997).

However, the full-cost recovery principle applied mostly to tariffs in urban areas, which at that time accounted for 50-75 percent of total water consumption.² There are some indications that water tariffs in rural areas were subsidized. This is again hinted in the *Second Malaysia Plan (1971-1975)*:

“One of the major objectives of the New Economic Policy is the dispersal of industries and the development of new industries in those areas of the country now largely dependent on traditional activities ... Of importance is the availability of adequate power at reasonable rates in the areas involve. The absence of power availability will not be permitted to become the limiting factor even though grid extension or new individual plants may not be fully justified in strictly economic terms.” (p.216)

There are also some research references to the contribution of water to rural development. For example, Bruton (1992, p.243) highlights the importance of irrigation projects in the government’s poverty eradication program targeted at the rice sector since the mid-1950s until the 1970s. Thillainathan’s (1977, p.244) emphasizes that the water tariffs applied in such irrigation projects were well below levels required to recover operations and maintenance expenditures.

Meerman (1979) provides a detailed analysis of the distributive impact of water supply in the 1970s. His main findings are worth repeating for comparison with the current situation. Due to the fact that water is a state matter, much of the Federal allocation for water sector under the Second Malaysia Plan was used to improved water systems in major metropolitan areas. This resulted in a bias (2/3) in favour of urban areas which exacerbated of the uneven distribution of access to water. In the less developed states in the Northern region (which includes as Perlis, Kedah, Kelantan and Terengganu), only 30 percent of the population had access to piped and treated water. The average figure for Peninsular was 57 percent. Furthermore, only 49 percent of the rural population (including small urban population) used piped and hygienically treated water. Meerman also found that forty percent of the poorest who bought piped and treated water claimed to pay for more than 5 percent of their household income for it. Even more surprisingly, he estimated that more than a third of the poverty population was priced out of

² Meerman (1977), p.197.

the piped and treated water market at the prevailing tariff levels.³ Thirty years later, the situation is much improved. The next section discusses the current state of water markets in Malaysia.

3. Water Supply and Consumption in Malaysia

3.1 Water Resources

Water resources are fairly evenly distributed across the different regions (state) in Malaysia (see **Table 1**). The state of Selangor (including Kuala Lumpur) has, by far, the largest source of water resources. The method of direct extraction from river is the most important source of water resource in Malaysia. Due to the uneven distribution of economic activities across states, hence demand for water, inter-state transfer of water occurs. These include from Kedah to Pulau Pinang.

Table 1: Raw Water Resources in Malaysia, 2002
(c.u.m. per year)

State	Direct Extraction from River	Storage Dam	Groundwater	Total
Kedah	335,894,301	1,650,213	0	337,544,514
Sarawak*	58,035,000	0	0	58,035,000
Labuan	10,093,020	3,513,276	0	13,606,296
Perlis	15,834,000	13,706,000	2,210,000	31,750,000
Pahang	246,827,600	0	0	246,827,600
N.Sembilan	137,100,000	83,450,000	0	220,550,000
Sabah	187,521,531	63,948,365	11,293,830	262,763,726
Perak	321,127,000	0	0	321,127,000
Melaka	94,895,207	52,130,632	0	147,025,839
Kuching**	107,968,985	0	0	107,968,985
Sibu**	32,357,181	0	0	32,357,181
Pulau Pinang	256,981,791	26,179,206	0	283,160,997
Terengganu	75,360,025	59,264,413	87,203	134,711,641
Selangor***	106,430,711	939,680,294	0	1,046,111,005
Johor	137,885,518	256,073,108	0	393,958,626
Kelantan	37,700,940	1,501,530	39,690,500	78,892,970
LAKU**	58,093,353	0	1,775,568	59,868,921
Total	2,220,105,863	1,501,097,037	55,057,101	3,776,260,301

Note: * Excluding the province of Kuching, Sibu and LAKU;

**Province within Sarawak

*** Includes Kuala Lumpur and Putrajaya

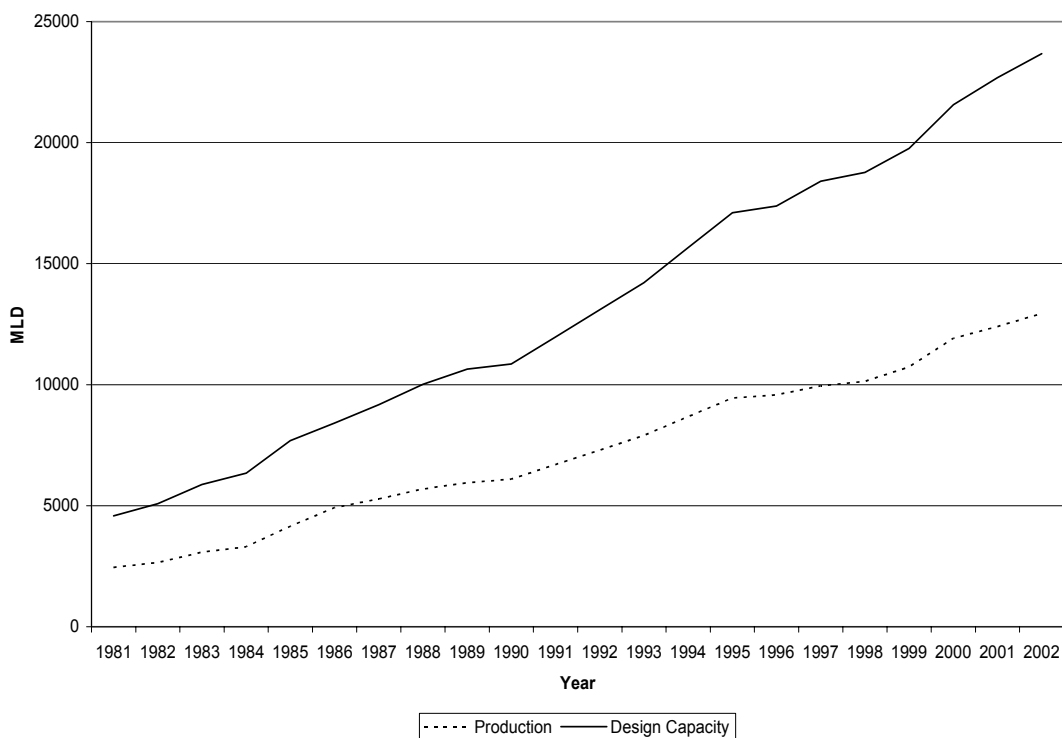
Source: MWA (2004)

³ Meerman (1977), p.208.

3.2 Water Supply

The water supply design capacity and production in Malaysia has grown rapidly for the past 20 years (see **Figure 1** below). During the period 1981-2002, water supply design capacity grew at an average rate of 7.9 percent per annum while production grew at a rate of 7.6 percent per annum. By 2002, water supply design capacity and production reached 12,945 MLD (million litre per day) and 10,733 MLD, respectively.

Figure 1: Water Supply Design Capacity and Production, 1981-2002



3.3 Water Access and Consumption

About 93 percent of the Malaysian population has access to water supply (**Table 2**). Access to water supply is higher in urban areas (97 percent) than in rural areas (86 percent). Per capita water consumption is also higher in the more developed states such as Pulau Pinang, Melaka, N.Sembilan and Selangor.

Low per capita water consumption is recorded in a few less developed states such as Sabah and Kelantan. Access to water

supply in these states is relatively very low (72.9 percent in Sabah and 61.7 percent in Kelantan). The relationship between per capita water consumption and GDP per capita is depicted in **Figure 1**. On average, an increase of RM0.01 in per capita GDP is associated with an increase consumption of one litre per day.⁴

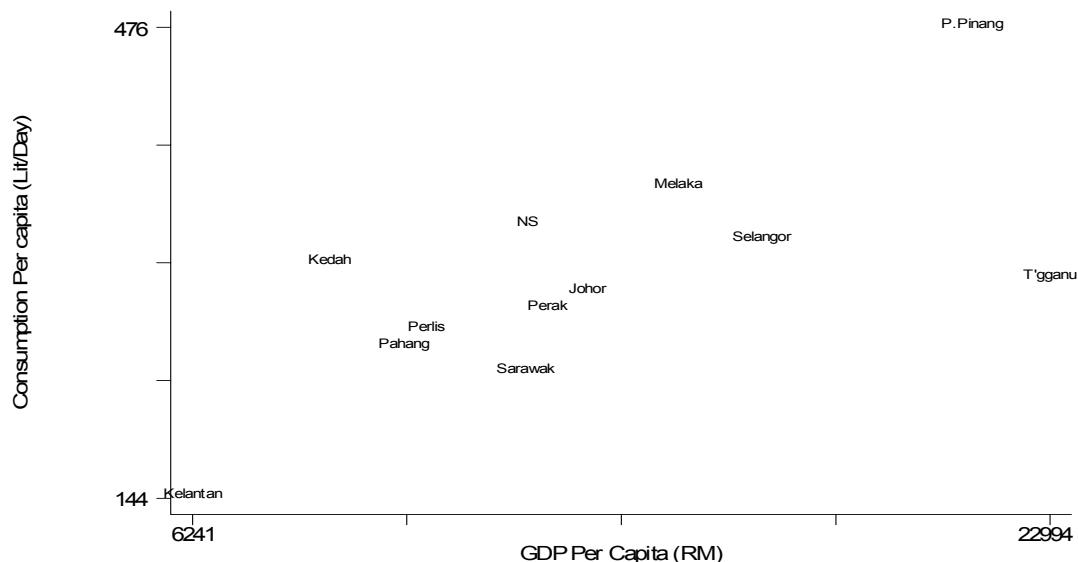
Table 2: Access to Water and Water Consumption, 2002

State	Population Served	% Population Served			Consumption Per Capita (litre/cap/day)
		Urban	Rural	Total	
Kedah	1,621,827	100	98	98.7	309
Sarawak	2,136,274	100	92	95.8	232
Labuan	80,000	100	-	100	338
Perlis	200,091	100	98	99.2	262
Pahang	1,306,342	98	89	92.7	250
N.Sembilan	852,379	100	99	99.5	336
Sabah	2,001,123	88	59	72.9	90*
Perak	2,093,833	100	99	99.5	277
Melaka	662,949	100	99	99.6	363
Pulau Pinang	1,292,981	100	99	99.8	476
Terengganu	832,037	97	79	87.7	299
Selangor	5,688,556	100	98	99.7	325
Johor	2,931,650	100	99	99.6	289
Kelantan	827,405	71	57	61.7	144*
Total/ Average	22,527,447	97	86	93.2	283

Source: MWA (2004)

* Low consumption per capita due to insufficient supply

Figure 2: Consumption Per Capita and GDP Per Capita Across Different States in Malaysia, 2002



⁴ This is obtained from a regression involving GDP per capita and consumption per capita across 12 states.

Overall, the total domestic water consumption is twice the amount of non-domestic consumption in Malaysia (Table 3). Such differences are even greater in some states e.g. Kedah, Perlis, Sabah, and Pulau Pinang. However, the average water consumption of non-domestic accounts are about three times the average water consumption of non-domestic accounts.

Table 3: Domestic and Non-Domestic Water Consumption (m³), 2002

State	Domestic	Non-Domestic	Total
Kedah	141,055,593	42,133,489	183,189,082
Sarawak*	28,825,262	14,326,328	43,151,590
Labuan	5,620,598	4,240,100	9,860,698
Perlis	16,297,280	2,865,442	19,162,722
Pahang	74,186,060	45,027,407	119,213,467
N.Sembilan	61,771,174	42,919,044	104,690,218
Sabah	57,344,442	8,568,709	65,913,151
Perak	160,367,293	51,186,283	211,553,576
Melaka	47,131,780	40,624,995	87,756,775
Kuching**	42,016,790	27,015,851	69,032,641
Sibu**	13,214,941	6,635,664	19,850,605
Pulau Pinang	135,541,879	89,090,321	224,632,200
Terengganu	54,251,838	36,542,930	90,794,768
Selangor***	451,420,199	223,480,450	674,900,649
Johor	218,245,217	91,457,688	309,702,905
Kelantan	32,119,120	11,325,691	43,444,811
LAKU**	23,815,431	24,680,142	48,495,573
Total	1,563,224,897	762,120,534	2,325,345,431

Note: * Excluding the province of Kuching, Sibu and LAKU;

**Province within Sarawak

*** Includes Kuala Lumpur and Putrajaya

Source: MWA (2004)

3.4 Non-Revenue Water

A significant amount of treated water does not generate any revenues. Such 'water losses' can be measured by non-revenue water (NRW), namely the difference between the quantity of water that leaves the treatment plants and the quantity billed to users based on metered consumption. The average percentage of NRW in Malaysia is very high at 40.6 percent in 2002 (see Figure 3). This problem is more serious in some states than in others (Table 4). The states with the highest levels of NRW include:

- Sabah (73.9 percent);
- N.Sembilan (53.8 percent);
- Kelantan (44.9 percent); and
- Selangor (44.7 percent).

The main causes of water losses are leakages (16-30%), meter under registration (3-7%) and pilferages (1-8%).⁵

Table 4: Non-Revenue Water, 2002

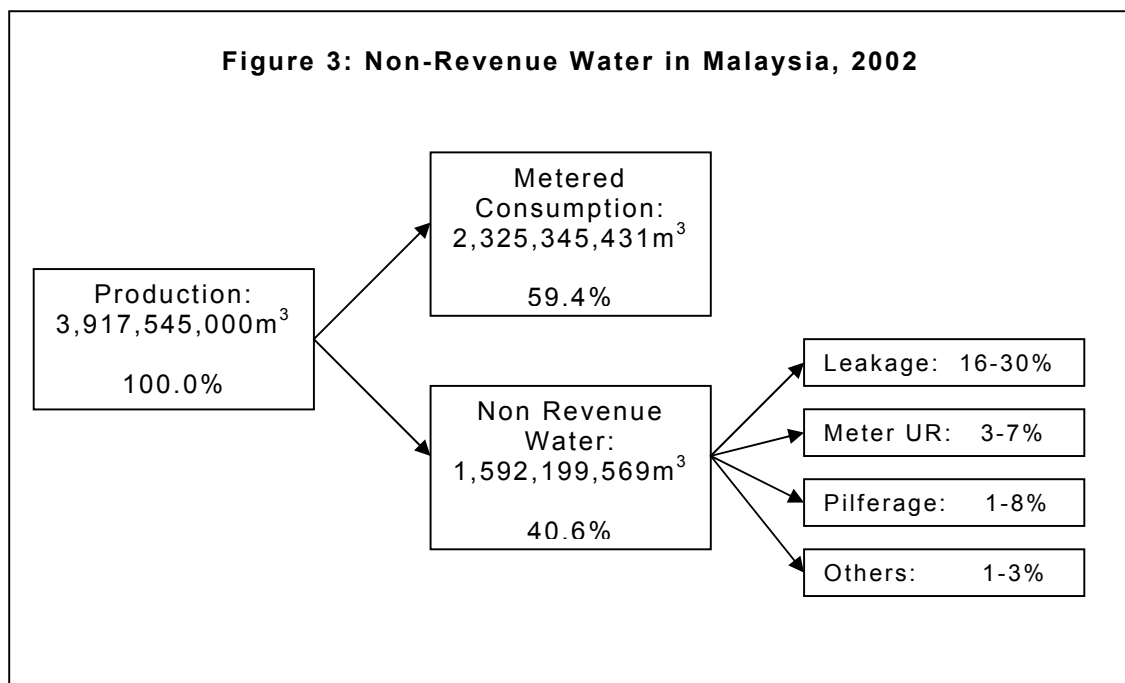
State	Metered Consumption	Non-Revenue Water	Production	% NRW
Kedah	183,189,082	132,097,188	315,286,270	41.9%
Sarawak*	43,151,590	11,598,410	54,750,000	21.2%
Labuan	9,860,698	2,410,967	12,271,665	19.6%
Perlis	19,162,722	12,809,453	31,972,175	40.1%
Pahang	119,213,467	111,355,573	230,569,040	48.3%
N.Sembilan	104,690,218	121,830,972	226,521,190	53.8%
Sabah	65,913,151	186,236,149	252,149,300	73.9%
Perak	211,553,576	91,407,374	302,960,950	30.2%
Melaka	87,756,775	38,405,110	126,161,885	30.4%
Kuching**	69,032,641	33,807,204	102,839,845	32.9%
Sibu**	19,850,605	8,068,610	27,919,215	28.9%
Pulau Pinang	224,632,200	55,528,660	280,160,860	19.8%
Terengganu	90,794,768	43,916,877	134,711,645	32.6%
Selangor***	674,900,649	545,898,791	1,220,799,440	44.7%
Johor	309,702,905	150,182,495	459,885,400	32.7%
Kelantan	43,444,811	35,448,479	78,893,290	44.9%
LAKU**	48,495,573	10,663,627	59,159,200	18.0%
Total	2,325,345,431	1,591,665,939	3,917,011,370	40.6%

Note: * Excluding the province of Kuching, Sibu and LAKU;

**Province within Sarawak

*** Includes Kuala Lumpur and Putrajaya

Source: MWA (2004)



⁵ See MWA (2004), p.14.

3.5 Water and Poverty

Poverty is more serious in some states than others in Malaysia. The states with the highest incidence of poverty in Malaysia are Sabah (20.1%), Terengganu (14.9%), Perlis (13.3%), Kelantan (12.4%) and Kedah (10.7%). With the exception of Perlis and Kedah, the proportion of population with access to treated and piped water is relatively low in these states (see **Table 5**). This is particularly true in the rural sector.

Table 5: Access to Water and Poverty, 2002

State	Incidence of Poverty (%)	% Population Served			Consumption Per Capita (litre/cap/day)
		Urban	Rural	Total	
Kedah	10.7	100	98	98.7	309
Sarawak	6.7	100	92	95.8	232
Perlis	13.3	100	98	99.2	262
Pahang	3.8	98	89	92.7	250
N.Sembilan	2.2	100	99	99.5	336
Sabah	20.1	88	59	72.9	90*
Perak	7.9	100	99	99.5	277
Melaka	2.7	100	99	99.6	363
Pulau Pinang	1.4	100	99	99.8	476
Terengganu	14.9	97	79	87.7	299
Selangor	1.1	100	98	99.7	325
Johor	1.8	100	99	99.6	289
Kelantan	12.4	71	57	61.7	144*
Total/ Average	7.5	97	86	93.2	283

Source: MWA (2004), Mid-Term Review of Eighth Malaysia Plan

* Low consumption per capita due to insufficient supply

3.6 Water Quality

In Malaysia, river water quality is monitored by the Department of Environment under the Ministry of Science, Technology and Environment. The quality of treated piped water supply is monitored by another agency, the Environmental Health Engineering Section under the Ministry of Health. Overall, the quality of river water has declined in recent years (Eighth Malaysia Plan, p.541).

4. Water Institutions

Historically, water falls under the respective state jurisdiction under the Malaysia's Federal Constitution. Under this setting, the treatment and distribution of water is undertaken by state agencies. These can be either

- State Public Works Department (PWD);
- State Water Supply Department (WSD); or
- State Water Supply Board (WSB).

Since the early 1990s, more states have opted to establish water supply companies via corporatization (via establishment of limited liability firms wholly-owned by the state). In some cases such companies are privatized via partial or full divestiture of equity in these companies. Table 6 summarizes the current situation of water institutions in Malaysia.

Some states have fully privatized the provision of water services. These include the more developed states (in terms of GDP per capita) such as Selangor, Pulau Pinang and Johor. In some cases, the state government continues to hold equity in the privatized water entities. A few states (Labuan, N.Sembilan and Sabah) have chosen a dual structure water system - whereby distribution is undertaken by state agencies and water treatment is privatized via concessions. Some of the smaller states (Melaka and Perlis) and less-developed states (Kedah, Sarawak and Pahang) have generally chosen to maintain a public water provision system.

This institutional setting is however poised to change in the future. On 18 January 2005, the Malaysian Parliament amended the Constitution to affect the transfer of the jurisdiction of water supply management from the respective states to the Federal government. With this change, the Federal Government now has full control over water supply management in the country.

At present, the government is planning to enact two legislations to further transform the industry, namely the Water Services Industry Act (WSI) and National Water Service Commission Act (NWSC). Both legislations will pave the way for the establishment of a government-owned Water Asset Holding Company (WAHCO) and an industry regulator, namely the National Water Service Commission.

Table 6: Water Supply Institutions in Malaysia

Public Works Dept	
Kedah	(1) Production and distribution by PWD (2) Privatized production and distribution by Taliworks Consortium at Langkawi Island (3) Privatization of 5 treatment plants - Syarikat Air Utara
Sarawak	(1) Production and distribution by PWD (2) Privatized production and distribution for Miri, Bintulu and Limbang – LAKU Management Sdn Bhd
Labuan	(1) Distribution by PWD (2) Management contract of production by Encorp Utility Sdn Bhd
Perlis	Production and distribution by PWD
Water Supply Dept	
Pahang	Production and distribution by WSD
N.Sembilan	(1) Distribution by WSD (2) Privatization of 2 water treatment plants – Taliworks Consortium, 10 year concessions
Sabah	(1) Distribution by WSD (2) Privatization of 3 water treatment plants – Jetama Sdn Bhd, Timatch Sdn Bhd, Lahad datu Water Supply - 10 year concessions
Water Supply Board	
Perak	(1) Distribution by WSB (2) Privatization of 3 water treatment plants - 20 year concessions
Melaka	Production and distribution by WSB (Perbadanan Air Melaka)
Water Supply Co	
Pulau Pinang	Privatized in 2001: Production and distribution by PBA Holdings Berhad (state government share 55%)
Terengganu	Corporatized in 1999: Production and distribution by Syarikat Air Terengganu Sdn Bhd (state government share 100%)
Selangor	Privatized: (1) Monopoly distribution by Perbadanan Urus Air Selangor (state government share 30%) since 2002 (2) 7 water treatment plants (4 existing, 3 BOT) operated by 5 firms with concession period 10-30 years
Johor	Privatized in 2001: Production and distribution by SAJ Holdings Sdn Bhd (state government share 0%), Concession period 30 years
Kelantan	Privatized in 1996: Production and distribution by Air Kelantan Sdn Bhd (state government share 70%)

Source: MWA (2004)

These proposed changes are expected to overcome some of the perceived shortcomings and weaknesses of the existing water institutions in Malaysia, namely:⁶

- Lack of coordination amongst various stakeholders;
- Ineffective regulatory structure and poor enforcement;
- Capital expenditure constraints; and
- Varied success of privatization of water supply projects.

The problem of capital expenditure constraints is attributed to the inability of existing operators to obtain sufficient revenues to cover capital expenditures (investment). This, in turn, is due to water tariffs being currently set at less than full-cost recovery levels. Under the proposed plans, WAHCO is established to overcome this problem by providing financing to upgrade water supply infrastructure in the country. The Minister of Energy, Water and Communications envisaged WAHCO as a temporary entity that “will be relevant until the water services industry reached a full cost recovery level”.⁷ This implies a gradual reduction of water subsidies in Malaysia in the future.

5. Water Tariffs in Malaysia

There is currently no study on the present level of water subsidies in Malaysia. We examine this issue from a few perspectives.

5.1 Average Water Tariff Levels

Generally, domestic water tariff is cross-subsidized by industry tariff in Malaysia. Hence, industry rates are higher than domestic rates (**Table 7**). Most of the developed states (such as Selangor and Johor) have relatively higher industry water tariff (**Figure 4** and **Figure 5**). The exception is Pulau Pinang which may explain the high per capita water consumption noted earlier.

⁶ See Lim (2004).

⁷ “Ministry Needs Over USD500 million to Get WAHCO Going,” Bernama Report, 31 March 2005.

Table 7: Domestic and Industry Water Rates, 2004

(RM / m³)

State/Area	Domestic Rate	Industry Rate
Kelantan	0.31	0.70
Pulau Pinang	0.31	0.94
Terengganu	0.52	1.15
Kedah	0.53	1.20
Sarawak	0.56	1.19
Perlis	0.57	1.30
Pahang	0.57	1.40
Melaka	0.59	1.40
Bintulu	0.61	1.21
Kuching	0.62	1.06
Sibu	0.62	1.06
Sri Aman	0.62	1.06
Limbang	0.62	1.06
Sarikei	0.62	1.06
Kapit	0.62	1.06
Perak	0.67	1.45
N. Sembilan	0.68	1.59
Selangor	0.72	1.91
Labuan	0.90	0.90
Sabah	0.90	0.90
Johor	0.90	2.93

Source: MWA (2004)

Figure 4: Domestic Water Tariff and GDP per Capita, 2002

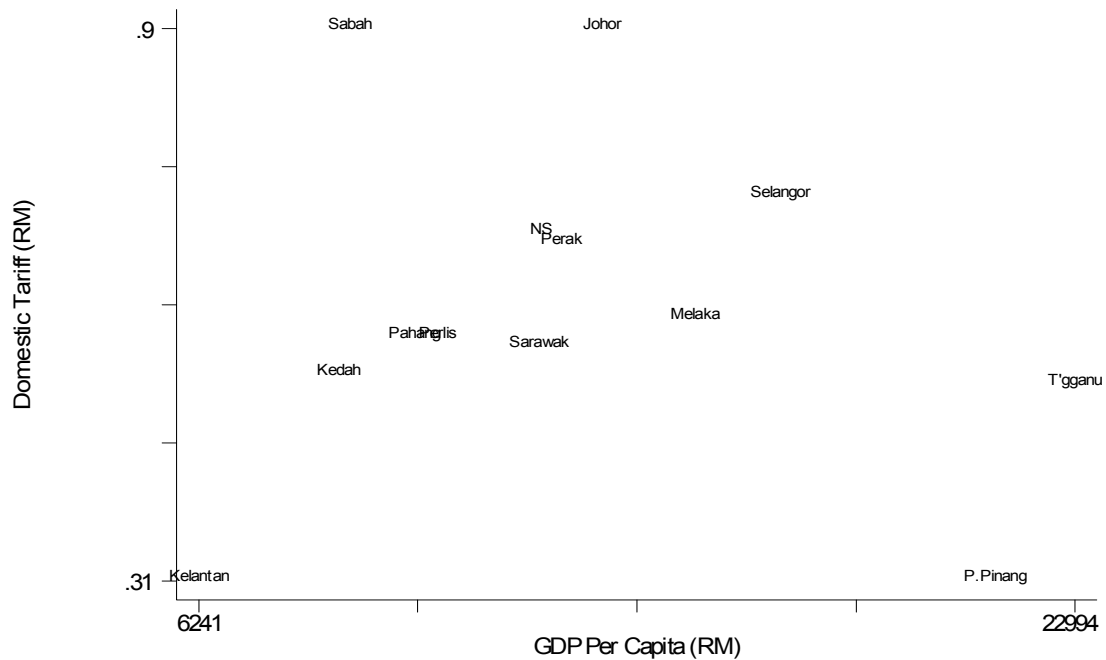
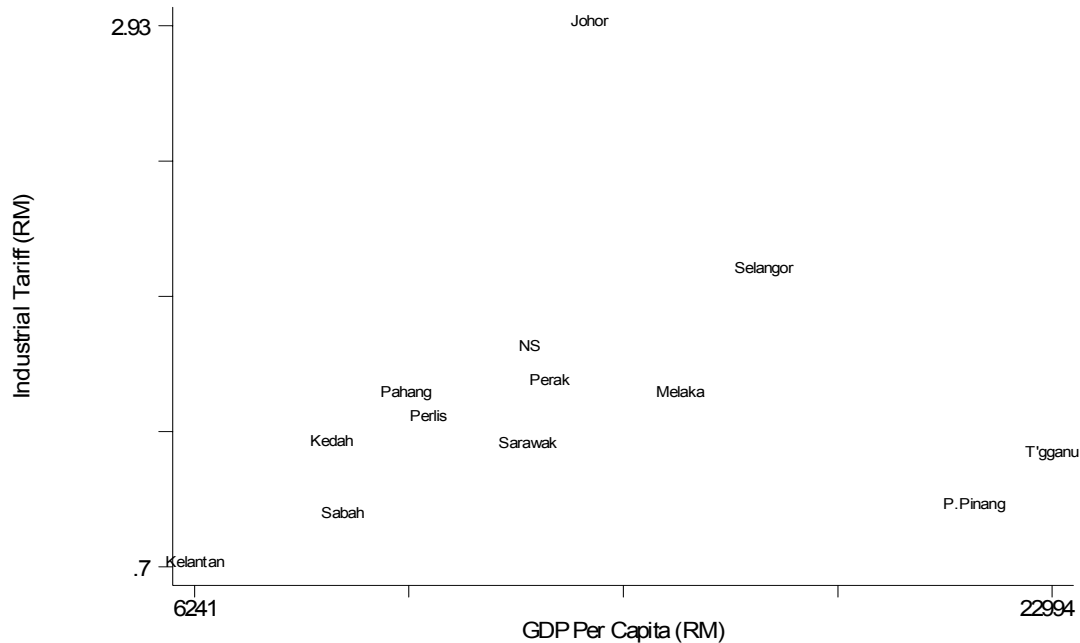


Figure 5: Industrial Water Tariff and GDP per Capita, 2002



5.2 Water Tariff Structure

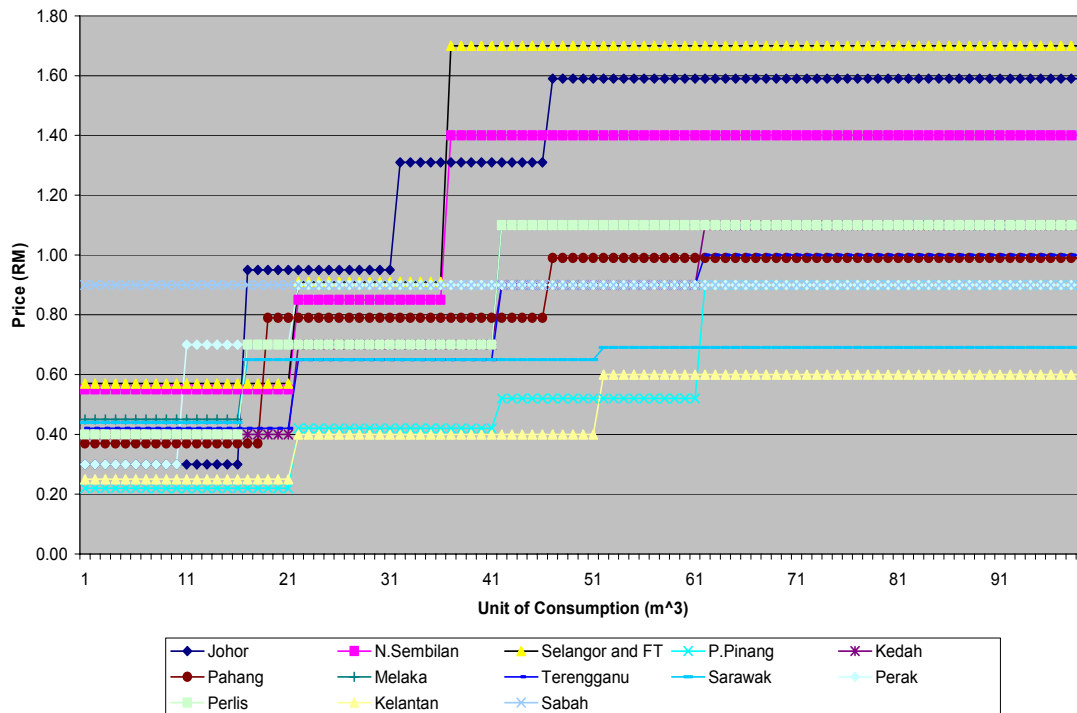
The general principles underlying the present water tariffs in Malaysia include the following⁸:

1. Higher rated for higher consumption to discourage wastage.
2. Cross-subsidy for domestic consumers by industrial consumers.
3. A very low 'lifeline' rate to meet the 'ability to pay' criterion of the lower-income group to cover basic everyday need for domestic purposes.

The incentives for efficient use of water are applied through the use of volumetric charges (based on measured water use) under an increasing block structure (where block price rises with use rise). This approach is used for the water tariffs for residential homes (with the exception of Sabah which uses a flat rate). There are significant differences in the structure of residential water tariffs between the different states (see **Figure 6**).

⁸ MWA (2003), p.45.

Figure 6: Residential Water Tariffs in Malaysia, 2003



Similarly, many states use an increasing block tariff structure for industrial and commercial water tariffs (Figure 7). However, such block structures are not very steep i.e. the block increments are relatively small. There are also quite a few states (Melaka, Terengganu, Perlis, Kelantan and Sabah) that use flat rate tariffs for industrial and commercial users.

Overall, in almost all states (with the exception of Sabah), residential water users are subsidized by industrial/commercial water users. For example, for the first 15 m³ of water consumption, the level of industrial/commercial water tariff is 2 - 5 times the corresponding level for residential water tariff (Figure 8).

Figure 7: Industrial & Commercial Water Tariffs in Malaysia, 2003

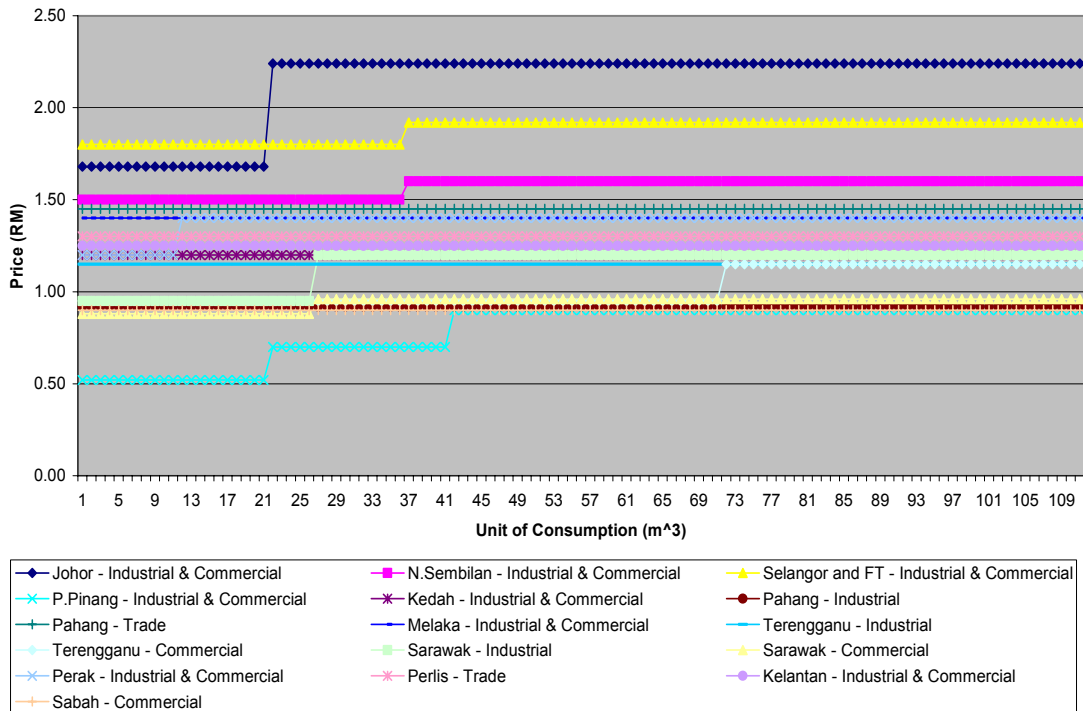
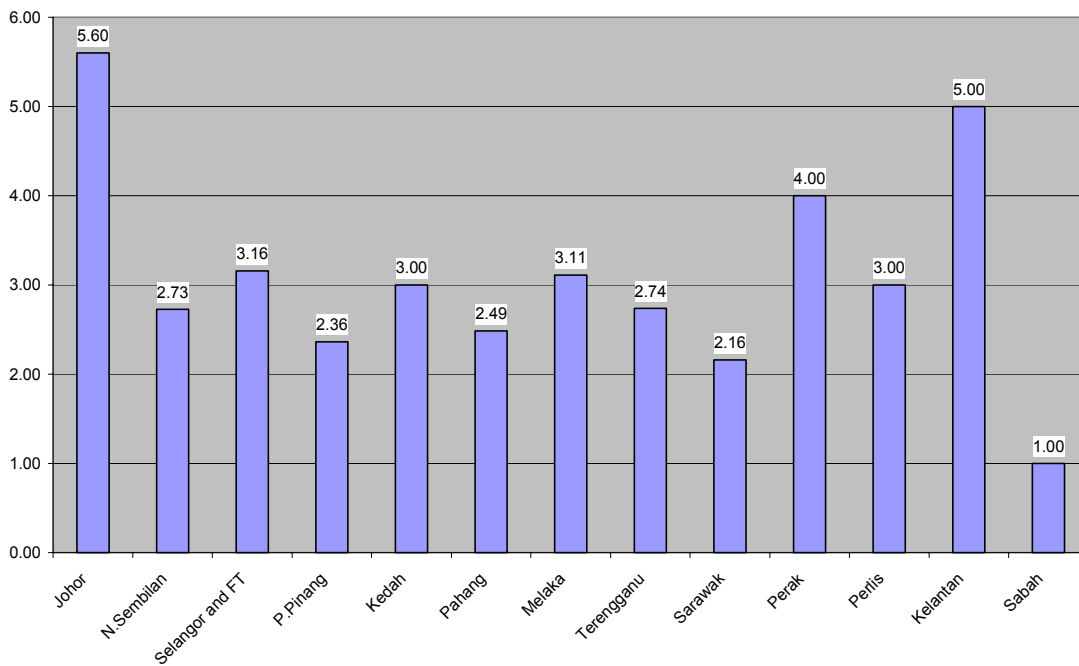


Figure 8: Ratio Between Industrial/Commercial Tariff to Residential Tariff, 2003



The 'lifeline' rate to meet the 'ability to pay' criterion of the lower-income group can be measured by the minimum charge that are imposed for residential water consumption. These typically range from RM2.50 to RM5.00 per month. Dividing these charges by the tariff rates, we can obtain the level of consumption related to the minimum charge (**Figure 9**). This computed level of consumption can be used as a proxy of the minimum level of consumption affordable by lowest income households. The WHO (2005) standards for water consumption are as follows:⁹

- short-term survival: 20 litres per person per day (0.02 m³ per person per day). Assuming an average household size of 4.4 persons (DOS, 2002), this translates into 2.6 m³ per household per month).
- Medium-term maintaining: 70 litres per person per day (0.07 m³ per person per day or 9.2 m³ per household per month).

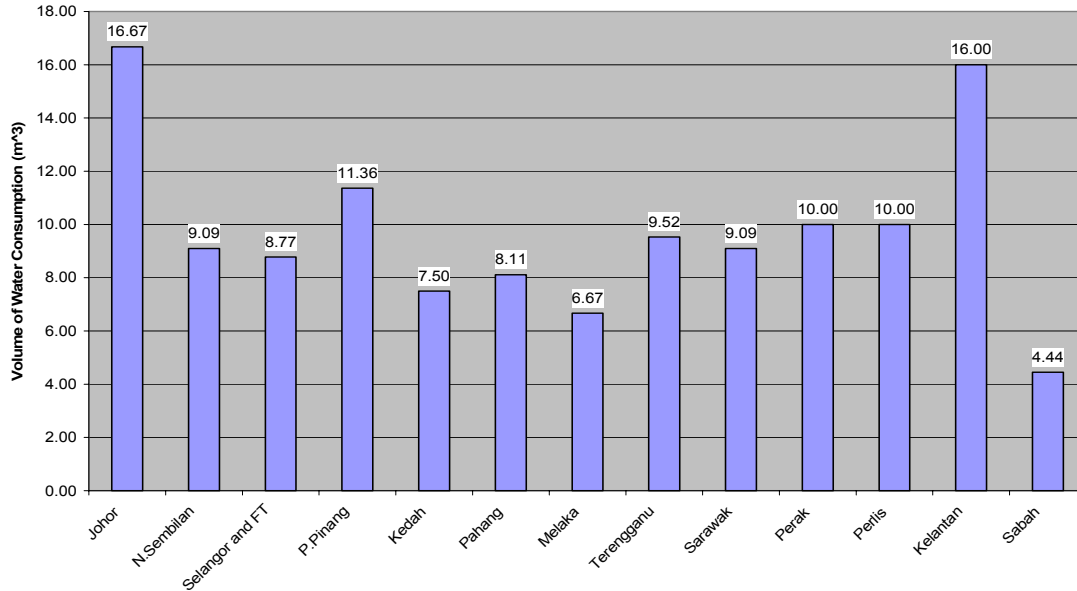
Based on a comparison between the computed consumption (associated with the minimum charges and minimum tariff rates) and the WHO standards, we estimate that water tariff levels exceed the medium-term 'lifeline' level (corresponding to 9.2 m³ per household per month) in only six out of the 13 states surveyed (**Figure 9**). This indicates that the prevailing lifeline tariff rates in the other remaining states are too high.

Aside from lifeline rates for residential consumption, it is also important to discuss connection charges. In most cases, connection charges are borne entirely by users. Typically, users pay for the connection work that is undertaken by a private contractor (provided by the water supplier). The water supplier merely charges for the water meter and levies a deposit. Overall, no subsidy is provided for connection charges in Malaysia. Examples of such charges in two states with lowest level of water access are as follows:

- **Kelantan:**
Meter: RM150, Deposit: RM30 normal house, RM100 bungalow, RM250-2,500 commercial.
- **Sabah:**
Meter: RM130, Deposit: RM100 deposit house, RM500 shophouse, RM2,000-2500 factory depending on usage.

⁹ Short term survival includes drinking and cooking. Medium term maintaining include drinking, cooking, personal washing, washing clothes, cleaning home, growing food (domestic use) and waste disposal.

Figure 9: Level of Residential Water Consumption Associated with Minimum Charge



6. Impact of Water Tariffs

6.1 Financial Performance: Cost-Revenue Gaps

Overall, the Malaysian water sector experiences a revenue-cost deficit of about RM245.5 million (or about 9.1 percent of cost – defined as operating and maintenance costs). However, only about half of the states in Malaysia are currently experiencing a financial deficit in their water operations (see **Table 8**). Of these, states with large deficits include Selangor (-RM449.1 million) and Sabah (-RM125.0 million). Interestingly, the unit revenue exceeds the unit cost in all the states experiencing financial deficits in water operations, with the exception of Labuan (**Table 8**).¹⁰

A major reason for these financial deficits is the loss of revenues from non-revenue waters (NRW) i.e. water that are produced but not billed to consumers due to leakages, under-meter registration, and pilferage. In **Table 9**, we compute the level of losses in

¹⁰ Unit cost is derived by dividing total operating and maintenance costs by total production while unit revenue is derived by dividing total revenue by total metered water sold.

revenues from NRW and compare them with the financial deficits from each state's water operations. Clearly, the financial deficits in state water operations can be reduced if the level of NRW is lower. For some states, the magnitude of reduction in NRW is small to achieve a breakeven point e.g. Perlis (10 percent) and Pahang (11 percent). Others require more substantial reduction in NRW to achieve breakeven e.g. Sabah (58 percent), Selangor (64 percent) and Sarawak (71 percent).

Part of the financial deficit experienced by state water operations are due to the subsidy on residential water consumption. Generally, water subsidies are only available for residential water consumption (see **Table 10**). These subsidies usually apply only for the first block of consumption (around 10-20 m³). These subsidies range between 7 percent (in Perlis) to as high as 49 percent (in Johor). With the exception of the island of Labuan, there is no subsidy for industrial water consumption.

Table 8: Financial Performance of Water Operations in Malaysia, 2003

State	Cost	Revenue	Revenue – Cost Gap	% Deficit	Unit Cost	Unit Revenue
Kedah	117,110,842	148,520,086	31,409,244		0.37	0.81
Sarawak	26,209,664	22,001,870	-4,207,794	16.1	0.48	0.51
Labuan	16,555,975	9,640,336	-6,915,639	41.8	1.35	0.98
Perlis	13,748,304	12,849,629	-898,675	6.5	0.43	0.67
Pahang	109,257,244	98,722,938	-10,534,306	9.6	0.47	0.83
N.Sembilan	72,752,318	99,561,120	26,808,802		0.32	0.95
Sabah	200,872,317	75,850,000	-125,022,317	62.2	0.80	1.15
Perak	166,221,930	201,056,555	34,834,625		0.55	0.95
Melaka	77,837,946	105,486,723	27,648,777		0.62	1.20
Kuching	55,743,344	62,795,270	7,051,926		0.54	0.91
Sibu	21,247,969	19,508,893	-1,739,076	8.2	0.76	0.98
P.Pinang	107,501,332	167,950,719	60,449,387		0.38	0.75
Terengganu	45,619,654	80,750,864	35,131,210		0.34	0.89
Selangor	1,310,523,468	861,421,335	-449,102,133	34.3	1.07	1.28
Johor	270,722,202	382,373,342	111,651,140		0.59	1.23
Kelantan	34,183,814	45,704,857	11,521,043		0.43	1.05
LAKU	40,283,687	46,679,330	6,395,643		0.68	0.96
	2,686,392,010	2,440,873,867	-245,518,143	9.1	0.69	1.05

Table 9: Reducing Financial Deficits via NRW Reduction in Water Operations in Malaysia, 2003 (RM)

State	Revenue – Cost Gap	NRW Losses	Augmented R-C Gap	% Reduction in NRW for Breakeven
Kedah	31,409,244	107,097,462	138,506,706	
Sarawak	-4,207,794	5,913,727	1,705,933	71%
Labuan	-6,915,639	2,357,088	-4,558,551	
Perlis	-898,675	8,589,423	7,690,748	10%
Pahang	-10,534,306	92,215,667	81,681,361	11%
N.Sembilan	26,808,802	115,862,095	142,670,897	
Sabah	-125,022,317	214,312,496	89,290,179	58%
Perak	34,834,625	86,871,856	121,706,481	
Melaka	27,648,777	46,164,290	73,813,067	
Kuching	7,051,926	30,752,590	37,804,516	
Sibu	-1,739,076	7,929,715	6,190,639	22%
P.Pinang	60,449,387	41,517,104	101,966,491	
Terengganu	35,131,210	39,058,702	74,189,912	
Selangor	-449,102,133	696,767,541	247,665,408	64%
Johor	111,651,140	185,422,163	297,073,303	
Kelantan	11,521,043	37,292,547	48,813,590	
LAKU	6,395,643	10,264,256	16,659,899	
	-245,518,143	1,670,743,514	1,425,225,371	

Table 10: Residential and Industrial Water Tariffs and Subsidies, 2003

State	Unit Cost	Residential			Industrial	
		1st/2 nd Block (m ³)	Rate (RM/m ³)	Subsidy	1st/2 nd Block (m ³)	Rate (RM/m ³)
Kedah	0.37	20	0.40	-8.1%	10,000	1.20
Sarawak	0.48	15	0.44	8.3%	25	0.97
Labuan	1.35	Flat	0.90	33.3%	Flat	0.90
Perlis	0.43	15	0.40	7.0%	Flat	1.10
Pahang	0.47	18	0.37	21.3%	227	0.92
N.Sembilan	0.32	20	0.55	-71.9%	35	1.50
Sabah	0.80	Flat	0.90	-12.5%	Flat	0.90
Perak	0.55	10	0.30	45.5%	10	1.20
Melaka	0.62	15	0.45	27.4%	Flat	1.40
Kuching	0.54	15	0.48	11.1%	25	0.97
Sibu	0.76	15	0.48	36.8%	25	0.97
P.Pinang	0.38	20	0.22	42.1%	20	0.52
Terengganu	0.34	20	0.42	-23.5%	Flat	1.15
Selangor	1.07	20	0.57	46.7%	35	1.80
Johor	0.59	15	0.30	49.2%	20	1.68
Kelantan	0.43	20 21-40	0.25 0.40	41.9% 7.0%	Flat	1.25

6.2 Household Expenditure

The impact of water subsidy on households can be seen from the proportion of household expenditure that is spent on water charges. Published data is only available at the aggregate level and these are presented in **Table 11**. The overall level of water charges as a proportion of household expenditure is around 1.04 percent. This figure is comparable to or higher than the level of water charges as a proportion of household income in most OECD countries i.e. between 0.3 - 1.2 (see **Table 12**). This may imply that the subsidy levels in Malaysia maybe too low.

Table 11: Water Charges and Household Expenditure, 2003

(RM)	Malaysia		
	Total	Rural	Urban
(1) Water Charges	16.97	19.27	14.31
(2) Average Monthly Expenditure	1,631.06	1,943.18	1,269.99
(3) = (1)/(2) , % Share	1.04	0.99	1.13
	Peninsular Malaysia		
	Total	Rural	Urban
(1) Water Charges	17.36	18.86	15.41
(2) Average Monthly Expenditure	1,647.76	1,925.20	1,288.95
(3) = (1)/(2) , % Share	1.05	0.98	1.20
	Sabah		
	Total	Rural	Urban
(1) Water Charges	14.75	22.54	10.82
(2) Average Monthly Expenditure	1,215.16	1,663.90	988.68
(3) = (1)/(2) , % Share	1.21	1.35	1.09
	Sarawak		
	Total	Rural	Urban
(1) Water Charges	15.12	22.34	9.33
(2) Average Monthly Expenditure	1,871.08	2,396.07	1,449.83
(3) = (1)/(2) , % Share	0.81	0.93	0.64

Table 12: Water Charges as a Proportion of Household Incomes (%)

	Existing Tariffs	Full Cost Recovery Tariffs
Portugal	0.5	2.8
Greece	0.4	2.1
Ireland	0.3	1.9
Spain	0.4	1.6
France	1.1	1.5
UK (England & Wales)	1.2	1.3
Germany	1.0	1.2
Denmark	0.8	0.9
Korea	0.6	0.9

For Peninsular Malaysia, water charges as a percentage of average monthly household expenditure in urban areas exceed those of rural areas. The reverse is true for the states of Sabah and Sarawak. The level of water charges in the rural areas is twice that in the urban areas for Sabah and Sarawak. Hence, rural households consume twice as much water as urban households in these states.

7. Conclusions

The provision of adequate water infrastructure and affordable water services are important contributors to the impressive economic growth and development witnessed in Malaysia for the past 50 years. Increasingly, many of the larger and more-developed states has opted to privatize the provision of water services in an attempt to improve such services.

Despite such reforms, the water sector in Malaysia continues to experience a number of problems. Significant proportions of the rural population in some of the least developed states (such as Kelantan and Sabah) still have no access to treated water. The level of subsidized tariff levels for the initial block of consumption may also be too high to ensure affordable access by low-income households in some states.

Non-revenue water is also a very serious problem in Malaysia. Much of this problem can be attributed to lack of investments to upgrade or replace existing water infrastructure. This in turn can be attributed to the inability of water companies/agencies to find funds for such investments. This problem is further exacerbated by the non-revenue water problem.

The Federal government is currently planning to reform the sector further to break this vicious cycle in the deterioration of the water sector. It proposes to put water under federal jurisdiction and create a national water asset company to undertake long-term investments in the sector. It remains to be seen whether such initiatives is the answer to improving the water sector in the country.

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