

## 〈特集〉

**Water Services Management in Malaysia**Mohmad Asari Daud<sup>1)</sup>, Megat Johari Megat Mohd Noor<sup>2)</sup> and Zaini Ujang<sup>3)</sup><sup>1)</sup>Universiti Teknologi Malaysia, PhD candidate

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<sup>2)</sup> Professor, EGT, MJIIT, Universiti Teknologi Malaysia-KL<sup>3)</sup> S. G PTD, Ministry of Energy, Green Technology and Water, Malaysia (KeTTHA)**Abstract**

Water industry in Malaysia has undergone several changes in its form and structure with the objective of making the industry sustainable and self-sufficient. The last introduction of Water Services Industry Act (WSIA) and Suruhanjaya Perkhidmatan Air Negara (SPAN) Act in 2006 was an important milestone in the transformation of the industry. However, there still remain some fundamental problems such as non-uniform standards and practices among the states in Malaysia. KeTTHA (The Ministry of Energy, Green Technology and Water) is the ministry that is in charge of both water and wastewater sectors in Malaysia. SPAN (the regulator), PAAB (Pengurusan Aset Air Berhad, the custodian of assets) and the operators are the main players in the water sector, but SPAN regulates the water operators only in the 12 states in Peninsular Malaysia.

The current issues that the water industry sector in Malaysia is facing include migration to the new regime, pricing, management of sludge discharged for water treatment plants and water resources. These issues are addressed and countermeasures are proposed in the article.

**Keyword** : tariff, NRW, aluminium, enactment

原稿受付 2017.1.7

EICA: 21(4) 48-54

**1. Introduction**

Water industry in Malaysia had been undergoing several changes in its form and structure with the objective of making the industry sustainable and self-sufficient. The introduction of Water Services Industry Act (WSIA) and Suruhanjaya Perkhidmatan Air Negara (SPAN) Act in 2006 was an important milestone in the transformation of the industry.

**2. Water Industry Structure**

Since enacted, WSIA together with SPAN Act were supposed to change drastically the water and wastewater from a segmented industry to a uniform and holistic one. However the fundamental problem of non-uniform standards and practices between the states is still prevailing.

Ministry of Energy, Green Technology and Water (KeTTHA) is in-charge of the water industry which comprise both water and wastewater sectors. The main players are SPAN (Regulator), Pengurusan Aset Air Berhad (PAAB — custodian of assets) and the operators.

SPAN regulates 12 state water operators in Malay-

sia which excludes Sabah and Sarawak. The state water operators currently exist either as water department, State owned company or state agency. The final outlook of water operators in Malaysia will be state owned companies with light assets. The next step thereafter will be integration of water and wastewater sectors.

Roles of PAAB and SPAN are shown in the **Figure** while the **Table** below describes the Status and Statistics of water operations in Malaysia (Next Page).

**3. Law and Regulation**

Water was traditionally a state matter and only in 2006 the Federal Constitution was amended to put water services in the Concurrent list while water resources remains in the state list. Hence there are laws enacted at state while some at the Federal level.

**3.1 Waters Act 1920 (Revised 1989)**

The Waters Act 1920 is an Act of Parliament but implemented by almost all States in Peninsula Malaysia. It provides for the management of rivers, its banks, water abstraction and discharge of poisonous,

Ownership of WAM Co (PAAB)

Potential investors include private institutional investors, State and Federal related parties.

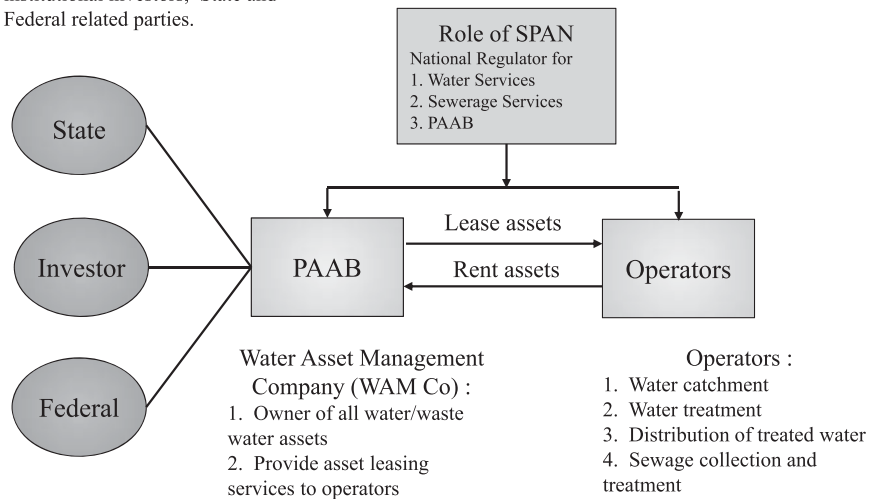


Fig. 1 Interaction Diagram of Main Players in Water Industry

Table 1 Status of Water Operation Migration to Asset Light Regime

No	State	Operator	Migration Status	Email Address
1	Perlis	State Company – Syarikat Air Perlis Sdn Bhd (SAP)	Migrated	www.airperlis.com.my
2	Kedah	State Company – Syarikat Air Darul Aman Sdn Bhd (SADA)	Not migrated	www.sada.com.my
3	Pulau Pinang	Public listed – Perbadanan Bekalan Air Pulau Pinang Sdn Bhd (PBA)	Migrated	www.pba.com.my
4	Perak	Government agency – Perak Water Board (LAP)	Migrated	www.lap.com.my
5	Selangor	State Company – Pengurusan Air Selangor Sdn Bhd (Air Selangor)	Migration in progress	www.airselangor.com.my
6	Negeri Sembilan	State Company – Syarikat Air Negeri Sembilan Sdn Bhd (SAINS)	Migrated	www.sainswater.com
7	Melaka	State Company – Syarikat Air Melaka Berhad (SAMB)	Migrated	www.samb.com.my
8	Johor	State Link Company – SAJ Holdings Sdn Bhd (SAJ)	Migrated	www.saj.com.my
9	Pahang	State Company – Pengurusan Air Pahang Berhad (PAIP)	Not migrated yet	www.paip.com.my
10	Terengganu	State Company – Syarikat Air Terengganu Sdn Bhd (SATU)	Not migrated yet	www.satuwater.com.my
11	Kelantan	Air Kelantan Sdn Bhd (AKSB)	Migrated	www.airkelantan.com.my
12	Labuan	Government Department – Jabatan Bekalan Air Labuan (JBAL)	Not migrated yet	www.jba.gov.my
13	Sabah	Government Department – Jabatan Air Negeri Sabah (JANS)	Not subjected to WSIA	www.sabah.gov.my
14	Sarawak	Government Department – JBA Luar Bandar Sarawak (JBALB)		www.jbalb.sarawak.gov.my
15		Government Agency – Lembaga Air Kuching (LAK)		www.kwb.gov.my
16		Government Agency – Lembaga Air Sibul (LAS)		www.swb.gov.my
17		Government company – LAKU Management Sdn. Bhd (LAKU)		www.lakumanagement.com.my

Table 2 Statistics of Water Supply and Wastewater in Malaysia

States	2015				
	No of accounts (all categories)		% Population Served/connected		
	Water	Sewerage	Urban	Rural	State Total
Johor	1,081,115	317,462	100.0	99.5	99.8
Kedah	559,054	136,010	100.0	96.3	98.3
Kelantan	238,760	3,751	61.5	66.4	64.0
Labuan	17,461	6,096	100.0	100.0	100.0
Melaka	282,158	131,539	100.0	100.0	100.0
N Sembilan	395,052	189,380	100.0	99.8	99.9
P Pinang	575,747	414,810	100.0	99.7	99.9
Pahang	397,566	76,669	100.0	96.0	98.0
Perak	741,987	296,326	100.0	99.2	99.6
Perlis	71,837	6,716	100.0	99.0	99.5
Sabah	329,749	NA***	99.8	76	87.9
Sarawak*	545,286	NA***	99.8	78	94.2
Selangor**	2,060,990	1,845,283	100.0	99.5	99.8
Terengganu	280,264	16,886	99.1	92.9	96.0
<b>National Average</b>	<b>Total</b>	<b>Total</b>	<b>97.2</b>	<b>93.0</b>	<b>95.5</b>
	<b>7,577,026</b>	<b>3,440,928</b>			

Notes : \* Whole of Sarawak State Includes LAKU, Kuching & Sibul

\*\* Includes WP. Kuala Lumpur & WP. Putrajaya

\*\*\* NA – data not available

SOURCE : MWIG 2016

noxious or polluting matter into rivers.

### 3.2 WSIA Act 2006

In 2006, the Parliament approved the Water Services Industry Act 2006 as a new law and the establishment of National Water Service Commission (SPAN) as a regulatory body of water supply and sewerage sector. Hence two new acts were tabled at Parliament and enforced vis-à-vis :

- Suruhanjaya Perkhidmatan Air Negara Act 2006 (Act 654)
- Water Services Industry Act 2006 (Act 655)

### 3.3 Environmental Quality Act 1974

The legislation that is related to the prevention, abatement, control of pollution and enhancement of the environment in Malaysia is the Environmental Quality Act, 1974. The Act restricts the discharge of wastes into the environment in contravention of the acceptable conditions. A person is deemed to have polluted any inland waters if :

- Places waste in or on any waters or in any place where it may gain access to water ;
- Places any waste in a position where it can gain access to water ;
- Causes the temperature of the receiving waters to be raised or lowered by more than the prescribed limits ;

There are penalties for discharge of environmentally hazardous substances, pollutants or waste in Malaysian waters exceeding acceptable conditions.

Specific regulations pertaining to the Sewerage sub-sector are as below :

- Environmental Quality (Sewage) Regulations 2009
- Environmental Quality (Industrial Effluent) Regulations 2009

### 3.4 Sabah Water Resources Enactment 1998

It is an Enactment to provide for the sustainable management of the water resources of the State of Sabah, so as to promote the orderly, equitable and efficient use of water and to maximise its economic, social and environmental benefits for the future, and for other matters connected therewith and incidental thereto. The Sabah Water Resources Enactment (1998) provides the water resource-related legislation and establishes rules relating to the sustainable management and efficiency of water activities.

### 3.5 Sabah Water Supply Enactment 2003

It is an Enactment to provide for the control and regulation for the supply and distribution of water and for matters in the state of Sabah. The Water Supply Enactment (2003) establishes Sabah's rules relating to the distribution and supply of water and matters related.

### 3.6 Sabah Drainage and Irrigation Ordinance, 1956

Sabah Drainage and Irrigation Ordinance, 1956 states that The Yang di-Pertua Negeri may declare any land in Sabah within the area affected or to be affected by any drainage or irrigation works, wholly or in part carried out or sanctioned by the Government, to be a drainage area or an irrigation area or both. Such declaration shall define the boundaries of such area and may include headworks and main canals.

### 3.7 Sarawak Water Ordinance, 1994

An Ordinance to regulate the conservation, protection, development and management of water resources of the State and the supply and distribution of water and for matters connected therewith and incidental thereto.

### 3.8 Selangor Waters Management Authority (LUAS) Enactment 1999

The LUAS Enactment 1999 provides LUAS with legal provisions and enforcement power to carry out its responsibility and functions effectively. It applies to all rivers wholly within Selangor and to all river basins, catchment areas, wetlands, ground water, coastal waters and water bodies within the Selangor state except those wholly within the Federal Territory of Putrajaya. LUAS is responsible to ensure the state's water resources, including river basin, groundwater and surface water, lakes and coastal area is protected. These functions and responsibilities are executed through Integrated River Basin Management and Integrated Coastal Management approaches.

### 3.9 Pahang Water Resources Enactment 2007

It is an enactment regarding the control of water resources and raw water production in the state of Pahang.

### 3.10 Kedah Water Resources Enactment 2007

It is an enactment regarding the control of water

resources and raw water production in the state of Kedah.

#### 4. Current Issues

There are several issues of concern of the water industry in Malaysia, some are listed below :

##### 4.1 Water operator not migrating to the new regime

Since enforcement of Water Services Industry Act 2006 (WSIA) in 2007, there are several states that had migrated to the new regime. However it has not achieved the target of having all the states to migrate by 2009 as targeted. This is not only affecting the long term targets but also had slow down the economic activities in the industry and fund are limited by the statutory constraints due to the transitional period of the migration.

##### 4.2 Pricing

There is still a big range of water tariff pricing between the states in Malaysia. However it is evident that some of the water companies are losing in their operations. Although this paper does not assess audited reports of the companies, the main reference made to assess the health of the water companies is the Annual Malaysia Water Industry Guide published by the Malaysian Water Association in conjunction with KeTTHA and Water and SPAN.

It was evident that the water industry suffered defi-

cits in expenditure. The exact numbers could not be assured as there was no in depth auditing of the financial reporting used by each water company. However the trend is quite clear of the difficulties of water companies to come into the surplus.

##### 4.3 Categorisation of WTP Sludge as Scheduled Waste

A study conducted by together by MWA and UiTM in 2007/2008 shows that most samples have very low chemical concentrations, often below their detection limits. Though there are no specified limits for potable water treatment plant residue in main developed countries like USA (USEPA, 2000), UK (Northumbrian Water, 2008), Australia (Hamann and McMurrich, 2004), Canada (INAC, 2008) and South Africa (Titshall and Hughes, 2005), the study by MWA had used the Total Threshold Limit Concentration as specified in Department of Environment, Malaysia Guidelines for the Application of Special Management of Scheduled Waste (TTLC) to compare with the elements present in the sludge. As most of the plants used alum, PAC or other aluminium based coagulants, aluminium concentrations were expected to be the high. **Table** (next page) shows that the values of Aluminium concentrations range from 1,100 mg/L to 79,200 mg/L with an average of 29,677 mg/L. However, it is interesting to note that there is no aluminium threshold limits specified in the TTLC.

From the table, aluminium though present in the sludge do not have any threshold limits specified.

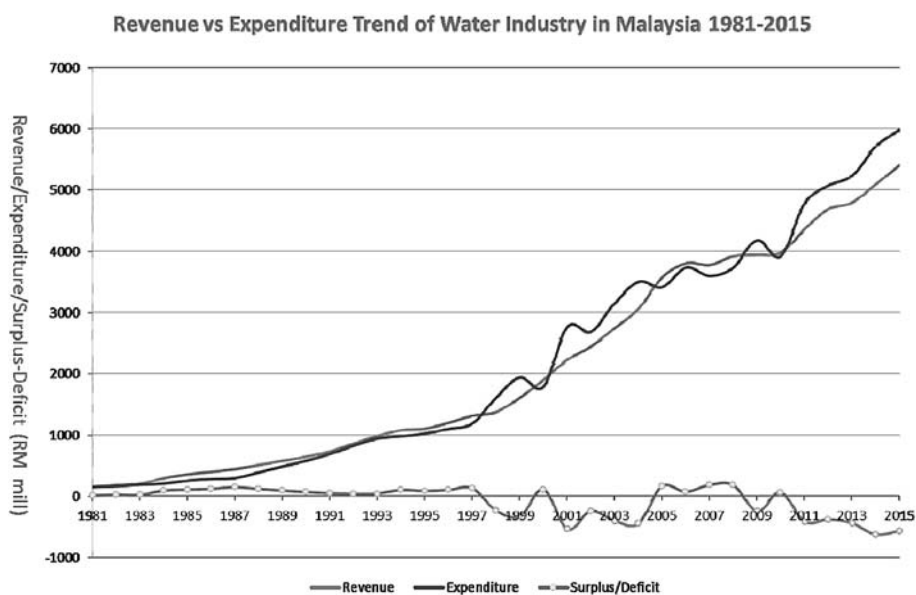


Figure 2 Revenue-Expenditure 1981-2015

**Table 3** Chemical Analysis of Residues — Statistics

Parameters/site	Unit	LOR	TTLC	MEANS	MAX	MIN
Antimony	mg/kg	10.0	500	ND	ND	ND
Arsenic	mg/kg	5.0	500	53.50	91.00	16.00
Barium	mg/kg	5.0	10000	49.50	115.00	2.00
Beryllium	mg/kg	1.0	75	2.22	6.00	1.00
Cadmium	mg/kg	1.0	100	2.00	2.00	2.00
Chromium	mg/kg	1.0	2500	14.21	23.00	2.00
Chromium IV	mg/kg	10.0	500	3.00	3.00	3.00
Cobalt	mg/kg	1.0	8000	4.33	7.00	2.00
Copper	mg/kg	1.0	2500	10.29	33.00	2.00
Lead	mg/kg	1.0	1000	23.54	42.00	6.00
Mercury	mg/kg	1.0	20	ND	ND	ND
Molybdenum	mg/kg	1.0	3500	2.00	2.00	2.00
Nickel	mg/kg	1.0	2000	3.50	6.00	1.00
Selenium	mg/kg	10.0	100	ND	ND	ND
Silver	mg/kg	1.0	500	ND	ND	ND
Thallium	mg/kg	1.0	700	7.33	9.00	5.00
Vanadium	mg/kg	1.0	2400	30.93	79.00	9.00
Zinc	mg/kg	1.0	5000	38.60	95.00	2.00
Aluminium	mg/kg	1.0	N/A	29,677	79200	1,110
Pentachlorophenol	mg/kg	1.0	17	ND	ND	ND
2,4-Dichloropenoxy Acetic Acid	mg/kg	1.0	100	ND	ND	ND
2,4,5-Trichloropenxy propionic Acid	mg/kg	1.0	10	ND	ND	ND
Trichloroethylene	mg/kg	0.5	2040	ND	ND	ND
Aldrin	mg/kg	0.5	1.4	ND	ND	ND
Chlordane	mg/kg	0.5	2.5	ND	ND	ND
DDT, DDE, DDD	mg/kg	0.5	1	ND	ND	ND
Deldrin	mg/kg	0.5	8	ND	ND	ND
Endrin	mg/kg	0.1	0.2	ND	ND	ND
Heptechlor	mg/kg	0.5	4.7	ND	ND	ND
Kepone	mg/kg	0.5	21	ND	ND	ND
Lindane	mg/kg	0.5	4	ND	ND	ND
Methoxychlor	mg/kg	0.5	100	ND	ND	ND
Mirex	mg/kg	0.5	21	ND	ND	ND
PCBs	mg/kg	0.5	50	ND	ND	ND
Toxaphene	mg/kg	0.5	5	ND	ND	ND

NOTE :

TTLC : Total Threshold Limit Concentration as specified in Department of Environment, Malaysia Guidelines for the Application of Special Management of Scheduled Waste.

LOR : Lowest Detectable Limit

ND : Not present or below detection limits

Based on the comparison against the TTLC levels stipulated by the DOE, the residues do not exhibit any schedule waste characteristics.

The study by MWA recommended that the residues should not be considered as scheduled waste, but as ordinary wastes which are subjected to other existing regulations, such as effluent standards for direct discharge or threshold limits for landfill and land applications. Specific exemption is recommended for the potable water treatment sludge residues, based on findings on the characteristics and based on practices in other countries, where the residues are not considered hazardous wastes.

#### 4.4 Unsecured Water Source

It is observed that there have been several occurrences of water services interruption due to drying of river and dams coupled with cases of water contamination. There has been rationing in several locations in the last two years which impacted more than a million consumers. Rainfall pattern changes, limited catchment area and invasion into catchment have been common problems related to dams operations and risks.

### 5. Proposal For Change

#### 5.1 Changing public perception on tariff

Tariff increase is a sensitive issue in Malaysia.



Currently the tariff is not sustainable, and there is a need to review the tariff towards full cost recovery (FCR). This would allow operators to invest in operation and preventive maintenance. Apart from the domestic water consumption, water usage by industries is also high. Hence, there is a need for new tariff setting mechanism to include the hidden cost.

Subsidising should be targeted to those eligible and needy. The need for public engagement through opinion poll would gauge the readiness of the consumers to pay more for their water bill. The acceptance of the public would reflect between the affordable and willingness to pay, probably due to poor water services and sometimes water quality. It is important to get the buy-in from consumers on a reasonable price for water by ensuring “**quality water at tap**” all the time. Consumers should be allowed to make random tests by third parties should they feel unsatisfied with the tap water quality.

## 5.2 Assessing the true value of water

The consumers are not really concern about the hike of water tariff as they perceive the current rates are cheap or relatively reasonable. Their concerns are more on the water supply and services, which need to be continuous. The quality of water too is of great significance, particularly on issues of safe, palatable drinking water.

The tariff setting should be transparent and tuned to the true value of water. It is of pertinence to educate the public the true value of water. This can be communicated through multimedia as well as close linkages between the water industries and the consumers. The enactment of policies and regulations pertaining to water management needs to be declared to the public.

Openness and transparency helps in building the public confidence, where the cost of production historical data is accessible to the public. Hence, from the discussion it could be seen that, in order to achieve long-term sustainability, the water industry must work towards a full-cost recovery regime.

Full-cost recovery is not meant for the recovery of an inefficient operation or a blown out costing made for an operation. What is essential is for the regulator to make a jump start in taking the water services industry en route to efficiency and effectiveness.

## 5.3 Strategies towards reducing NRW

### 5.3.1 Political will

The Government must be able to push for either funding for NRW reduction and right value for water. This will push down the NRW faster as public and policy makers are both pushing for the performance and supporting the efforts of water operators to achieve them. The open opportunity for funding lies in PAAB as the custodian of assets and “banker” to the water industry. The debate whether NRW efforts is CAPEX or OPEX is not supposed to prolong as the final analysis will show that the cost needed to reduce NRW to what is targeted (25% in 2010) is almost unbearable even the tariffs are increased gradually.

### 5.3.2 Pipe Condition Evaluation

Two major challenges in NRW reduction in Malaysia particularly the physical losses is the high percentage or asbestos cement pipe (AC) and leaking communication pipes. The quantity of AC pipes though decreasing is still daunting as indicated below, together with the number of connections in the country. The 42,976 kilometres of pipes shown in **Table 4** comprised about a third of the national distribution network system are supposed to be replaced gradually as it reaches its serviceability limit of its lifespan which estimated at 50 years, depending on the working environment and pipe condition.

**Table 4** Statistic of AC pipes 2007-2015

Year	Total Length of Pipes	Total lengths of AC pipes	% AC
2007	113,085	42,867	37.9%
2008	118,580	42,999	36.3%
2009	126,421	44,282	35.0%
2010	127,994	43,874	34.3%
2011	130,543	44,050	33.7%
2012	134,495	43,890	32.6%
2013	138,686	43,390	31.3%
2014	141,206	43,470	30.8%
2015	144,528	42,976	29.7%

### 5.3.3 Inventorisation

Asset management must be properly mapped and tagged. Not all states had Geographical Information System (GIS) and hence not all assets are mapped. Unless a lot of information is gathered about the assets little can be done to manage it well. The asset management system too will tie well with the water safety plan in ensuring reliable water supply at all time.

### 5.3.4 Awareness and understanding

It was quite evident of the lack of exposure to economic level of leakage (ELL) which should be the

pre-requisite in deciding how much should be spent to manage NRW in the water company. It is important that water awareness should be incorporated in the education system. Water education has been all along driven by NGOs and Government departments like Water Supply Department. This idea is well accepted by but needed another driver to push it through the Education Ministry.

#### 5.4 Implementation of Downstream Reservoirs

As rivers have become more susceptible to pollution, dams are not getting as much water as it used to be. The new concept to adopt for resilience of water

source is downstream reservoir located near to water treatment plant. This offer several advantages vis-à-vis :

- Bigger catchment, intensify the storage capacity of raw water
- Reduced exposure to pollution due to short conveyance of raw water
- Quick isolation in case of pollution upstream

It is hoped that these proposed countermeasures to the issues addressed in the article can make contributions to establish truly sustainable and self-sufficient water industry in Malaysia.

## マレーシアの水事業管理

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マレーシアにおける水事業は、これまでにも、持続可能性と自立性の確立を目的に何度か体制の変更が行われている。中でも、2006年に施行された水事業産業法（WISA, Water Services Industry Act）と全国水事業委員会法（SPAN, Suruhanjaya Perkhidmatan Air Negara Act）は、機構改革の大きな転機であった。しかし、全州一律の水質基準や実施体制が確立されていないといった基本的な問題がまだ残っている。現在の体制では、エネルギー・環境技術・水省（KeTTHA, Ministry of Energy, Green Technology and Water）が上水、下水の両方を管轄しており、SPAN（規制組織体）、PAAB（資産管理組織体）ならびにプラントを運転管理する組織体が実務を担当しているが、現時点のSPANの規制は半島部12州のみが対象となっている。

マレーシアの水事業が直面している問題は、新しい体制への移行、単価の設定、水処理汚泥の処理ならびに水資源の確保である。本稿ではこれらの問題について論じ、対策を提案する。

キーワード：水道料金, NRW（無収水）, アルミニウム, 法令・方針