

REVIEW OF THE WATER SUPPLY MANAGEMENT AND REFORMS NEEDED TO ENSURE WATER SECURITY IN MALAYSIA

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ABSTRACT

The government of Malaysia is committed to provide better water supply for the general public as well as for the industrial and agricultural sectors. Several policies have been developed and many programs have been initiated to ensure continuous water supply. Nevertheless, rapid urbanisation and industrialisation, together with climate change and increasing number of polluted rivers, make some of the traditional approaches in planning and managing water resources ineffective and requires urgent appraisal. This paper examines the causes of major events of water stress, the management approach in the water sector and related water supply policy, and provides recommendations to prepare Malaysia to face future events of water stress. This paper recommends a shift of reliance from the water supply to water demand management to ensure water security in Malaysia.

Keywords: Water; Water security; Water management; Water stress, Malaysia

1. INTRODUCTION

Rapid development in Malaysia invites more people and industries to town and consequently increases total demand for clean water supply. The need for new township has ended up in land clearance and deforestation which affect catchment areas and natural water flow; while illegal settlements by the river increases the number of polluted rivers. If freshwater sources are not conserved and properly managed, water problems will continue and affect the amount of freshwater for water supply. This paper examines water shortages events, laws and policies, and analyses the normal approaches used in the water sector; water supply management and water demand management. It then determines as to which promotes sustainability and ensures water security for the country.

2. WATER STRESS EVENTS IN MALAYSIA

Malaysia receives an average of 3000 mm of rainfall annually, but the country is facing recurrent water shortages in recent years. In 1998, drought in the Klang Valley and some states in the west coast of the Peninsular Malaysia dried up the dams and resulted in the longest water rationing of 150 days with 3.2 million residents affected (The Star, 2014). The dry spell was caused by the

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drought-inducing El-Nino phenomenon with no rainfall in the catchment area between January and March 1998. In 2014, another severe drought hit the west coast causing water level of major dams to go below the critical level. The Selangor River dam for instance reached 40.53 percent in March compared to 53.38 percent in February (The Star, 2014). As a preventive measure, water cannot be released from the dam and resulted in alternate day water rationing in the Klang Valley from March to May 2014 (The Star, 2014).

The two droughts were the result of El-Nino events which has been intensified by climate change. Zakaria (2010) forecasted that climate change shall bring more droughts in 2028, 2029, 2034, 2042 and 2044, thus more actions are needed to mainstream climate change adaptation in the development process. The increasing drought affected the water dependent agricultural and energy sector or commonly referred to as the water-food-energy nexus. Changes in climate have resulted in changes in crop growing period as the sector can no longer depend on good growing season (Selamat, 2012). It has also been projected that for every 75 ppm increase in carbon dioxide concentration, rice yield increases by 0.5 tons/ha, but for every 1°C increase in temperature, yield reduces by 0.6 tons/ha (Swain, 2012).

Following the 1998 drought, the National Water Resources Council (NWRC) and a task force were established to restructure the water industry. A National Water Services Commission was established to regulate water operators towards water security (Ching, 2012). As Selangor was the worst hit in 1998, the NWRC called for the establishment of the Selangor Water Management Authority (SWMA) or locally known as Lembaga Urus Air Selangor (LUAS) to ensure better integration among water agencies in the sector and effective water management (Khalid, 2014). To date LUAS has published integrated river basin management (IRBM) plan to ensure enough quantity of quality water for Selangor, Kuala Lumpur and Putrajaya (LUAS, 2016).

Besides drought, river pollution is another factor that contributed to the frequent water disruptions. In 2016, foul smell pollution in Semenyih River, a tributary of Langat River, caused the Semenyih water treatment plant to shut down six times leading to a number of water disruptions affecting 1.6 million users in Selangor and Putrajaya (The Sun Daily, 2016). Bad odour from ammonium pollution was also the caused for 90 percent of plant shut down in Johor, while other polluters like wastewater, detergents, oil spills, muddied flow due to floods, deforestation and quarrying have caused the shutting down of treatment plants and disrupted water supply in other parts of the country (The Star, 2016).

It is ironic that although the causes of river pollution were identified, enforcement has been very slow and failed to deter pollution from occurring (The Star, 2015). This is due to the demarcation of different types of pollution and the number of agencies responsible to regulate potential polluting activities along the rivers. As a result, gaps or overlaps of responsibility arise and created uncertainty as to who is responsible to take action if a river is polluted (Khalid et al, 2013). In the Semenyih case, the Department of Environment claimed no responsibility for that point-source pollution as it originated from illegal factories. It argued that the local government must control illegal factories in their localities to avoid such pollution. LUAS as the custodian of the river basin had to wait for all agencies to come to the site for integrated enforcement. The federal and state government had also stepped in and ordered all agencies to enforce their laws albeit their 'not my jurisdiction' claims (LUAS, 2016). This is just one case that illustrated the unintegrated pollution control and enforcement in Malaysia and caused further water stress for all users.

3. WATER SUPPLY MANAGEMENT AND FEDERALISM ISSUES

Water supply management or supply-side management focuses on measures that will increase the capacity of a water resource or water system to supply water through interstate water transfer, new water treatment plants and pipe replacement that will enhance or increase the water supply capacity (GWP, 2011). It is regarded as a traditional approach of hydrologists and water managers as focus is made on the supply side and the assessment of available water resources, rather than managing the demand. Up until 2006, the responsibility to ensure continuous water supply in Malaysia is shared between the federal and state governments. Under the Ninth Schedule of the Federal Constitution of Malaysia, the federal government is responsible for infrastructural work while the state government deals with water resources as well as water supply and services.

Subramaniam (2004) explains that the state government were responsible for the production, operation and maintenance of public water supplies either through the State Public Works or Water Supply Departments or through concession agreement with private companies. However, the concession agreements varied from one state to another and some states ended up in high non-revenue water and the low profit reduced their capabilities to improve service quality. As a result, the federal government initiated the National Water Services Industry Restructuring Initiative (NWSIRI) in 2004 to improve the sector. A constitutional amendment was made in 2005 to transfer item “water supply and services” from the State List to the Concurrent List to allow the federal government to establish a regulated water industry that can improve the water supply sector (Abdul Kader, 2004). Under the NWSIRI, the Ministry of Energy, Green Technology and Water (MEGTW) was established to plan, advise and coordinate all projects related to water supply development; while the Suruhanjaya Perkhidmatan Air Negara becomes the new regulator and enforces the Water Services Industry Act (WSIA) 2006 (Khalid, 2014).

Pursuant to the NWSIRI, a new federal agency, the Water Asset Management Company or locally known as the Pengurusan Aset Air Berhad (PAAB) was established under the Ministry of Finance to be the nation’s water assets owner and manager. PAAB will set-off states’ loan to the federal government with the value of state’s water assets, and state water operators will be transformed into an asset-light entity to provide water services and regulated by SPAN through WSIA. Although the federal government believes that NWSIRI will improve the sector, it can only happen if all states migrate to the new regime (Khalid et. al, 2013). Santiago (2005) argues that when constitutional reform was made to gain legislative control over the sector, it has signalled a move towards complete water privatisation as states water supply department must be corporatized before migration.

It is important to note that despite the fact that WSIA is established through the concurrent list, it provides the executive power to the federal government in the water services sector. The state government will need to get the service license from SPAN regardless if it has not completed the migration process.

Table 1: Types of Water Supply Operator in Peninsular Malaysia

Public Work Department (PWD)/ Water Supply Department (WSD)	Private agencies/ Concessionaires	Statutory bodies/ government-owned companies
Perak Water Board	Syarikat Air Johor Perbadanan Bekalan Air Pulau Pinang <i>Selangor (Pre 2015)</i> Syarikat Bekalan Air Selangor, Puncak Niaga, ABBASS, SPLASH <i>Selangor (Post 2015)</i> SPLASH	Air Kelantan Sdn Bhd Syarikat Air Perlis Syarikat Air Negeri Sembilan Syarikat Air Melaka Syarikat Air Darul Aman Syarikat Air Terengganu Pengurusan Air Pahang Berhad <i>Selangor (Post 2015)</i> Air Selangor Sdn Bhd (ASSB)

The water operator of Johore, Malacca, Negeri Sembilan, Perlis and Kelantan have been transformed to an asset light entity under PAAB and obtain the service license once SPAN satisfied with their business plan. On the other hand, Penang and Perak which have been performing well prior to the NWSIRI have not transferred all of their water assets to PAAB to set-off their debt. Thus they are required to obtain both the service license and the facility licence since they still own parts of the water assets. Up till 2017, Selangor, Kedah, Terengganu and Pahang have not completed the migration process, and their water operator need SPAN's authorization to operate but need not submit their business plan to SPAN as their Key Performance Index (KPIs) are still based on their concession agreements (Khalid et al., 2013).

It is observed that even after the NWSIRI, water resource remains a "state matter". Thus, continuous bureaucracy struggle arise when the federal government share the state's former exclusive jurisdiction. The NWSIRI has yet ensure a holistic and efficient water supply sector. It is also ironic when SPAN cannot interfere with state's water resources management although it must ensure water supply. In Selangor and Kedah where a respective water management authority was established, state governments are still blamed for water supply disruption although it is now under SPAN's jurisdiction.

4. WATER DEMAND MANAGEMENT AND CONSERVATION EFFORTS

Water demand management refers to the adoption of policies or investment to achieve efficient water use by the general public through economic or management strategies (GWP, 2011). It differs from water supply management which requires meeting demand with new resources, i.e. finding new water source such as building dams or interstate water transfer to meet the increasing demand. Butler and Memon (2006) argued that the 'demand-side' aims to manage consumptive demand itself to postpone or avoid the need to develop new water sources. It is seen as a key element in a sustainable development policy as it concentrates on minimising leakage and reduces loss and misuse, while maximising the use of water efficient appliance, grey-water and black water, rainwater harvesting and vacuum toilet, hence reduce environmental impact and save money needed to build new dams and water infrastructure (UNEP, 2006).

Managing water through the demand side is rather alien to Malaysians due to the low water tariff. Ujang (2009) states that the common habit of the general public to drain away washing machine, kitchen and bath shower water has led an average Malaysian to use 300 to 350 litres a day compared to 200 litres used by Singaporeans or Germans. After the 1998 drought, the government saw the potential of rainwater harvesting as an alternative supply of water, but to date, the amount of rainwater tanks across the country is nearly invisible. A review of water tariff is needed to reflect the real cost of water supply and services and acts as a good management tool to reduce water wastages (Othman et al, 2007). Only the state of Penang has increased the state's water tariff in 2013 which includes a water conservation surcharge (PAAB, 2013). If increasing water tariff is not popular amongst the politician and the general public, the authorities may alternatively provide cash rebates or tax exemption for the use of water conservation or water efficient appliances in managing the demand of water users (Rahman, et al, 2013).

Laws and regulations is another tool in water demand management, but it may take longer than what it is intended to be. In the case of water conservation through rainwater harvesting, it has been promoted through the National Urbanization Policy 2000 and the Ministry of Urban Well-Being, Housing and Local Government (MUWHLG) announced that rainwater harvesting will be made mandatory in 2009. This however was delayed until 2011 due to rejection by the developers. The Uniform Building By-Laws (UBBL) was finally amended for this purpose and should be enforced by the local government through the development plan approval (Rahman, et al, 2013). Only few state governments have adopted the new law, and their local government has not enforced it based on the low number of rainwater harvesting use in their localities thus far.

The promotion of rainwater harvesting as a tool to manage water demand in Malaysia requires an integrated approach towards successful implementation. In 2009, the Ministry of Energy, Green Technology and Water (MEGTW) introduced the National Green Technology Policy (NGTP) which promotes green building index. As such, the use of rainwater harvesting and other efficient appliance entitles the developers cash rebates and tax redemption. Nevertheless, the main agency to implement the new law as aforementioned is the MUWHLG and enforced by the local government. It is proposed that application and payment of rebates should be placed under the MUWHLG as the administrator of the new law so that better allocation of resources is given to the local government which enforces the law. The following discussion highlights other strategies to ensure water security, but evaluation will be made whether they promotes water demand or water supply management.

5. WATER MANAGEMENT STRATEGIES IN MALAYSIA

The first effort towards developing a national water strategy in Malaysia was in 1999 when the Malaysian Water Partnership (MyWP) formulated the National Water Vision and Framework for Action to ensure safe and adequate water supply, protects river basin and other water bodies. (Le & Facon, 1999) It emphasises that water must be made available to four sectors; people, food and rural development, economic development and environment, and focuses on the concept of IRBM which is a holistic approach in managing water resources since it considers other environmental management aspects such as land use, pollution control, development pressures and biodiversity conservation (Le & Facon, 1999). Since rivers provide 98% of raw water resources in Malaysia, it is vital for the government to enforce IRBM and promote stakeholders' participation as well as

equitable sharing of water resources. A framework for action enables the NWRC to monitor states' water development and river management, establish river basin authorities which include stakeholders in decision making process, establish monitoring and enforcement mechanism and develop drought and flood control master plan (Ching, 2012). Nevertheless water quality issue remains prevalent in the country and is closely related to management issues in pollution and flood control, catchment protection as well as weaknesses in institutions and legislation (Chan, 2012).

In 2001, the second National Water Resources Study (2000-2050) was completed and it emphasizes on the need to develop a national water resources policy with improved laws and institutional arrangement in the sector. Lee (2004) explains that although similar finding was found in the first National Water Resources Study, it was not translated into policy as focus was rather given to infrastructural improvement of the sector. The Water Vision (1999) however has set out several actions for better water future and amongst them is a 'shift from water-supply to water-demand management'. In this regard, infrastructural improvement made is a part of water supply management as it aims to ensure water security through continuous water supply. This is in contrast to the water demand management which aims to manage the users' water demand through water savings and conservation.

5.1. *Water Management Strategies in the Malaysia Plans*

Following the spirit of the Water Vision, the federal government made important policy statements relating to water in the five-year Malaysia Plan. In Chapter 19 of the Eighth Malaysia Plan (2001-2005) entitled "Environment and Sustainable Resource Management" the government acknowledged that water scarcity was due to increasing demand, pollution at water sources and encroachment into catchments. During the term, the second National Water Resources Study for Peninsular Malaysia was completed and recommended the interstate raw water transfer from Pahang to Selangor to meet increasing demand in the Klang Valley (EPU, 2001). This illustrated that the Plan focuses on the water supply as opposed to the water demand management.

In the Ninth Malaysia Plan (2006-2010) the government adopted the objectives of the Water Vision to improve the quality, coverage and reliability of water supply through stricter regulation under the new water commissioner, water transfer project and flood mitigation program with a massive budget of RM4 billion. To ensure sustainability, the government allocated another RM510 million to clean, preserve and beautify rivers (EPU, 2006). It is clear that the government is depending on infrastructural works to rectify water problems. Unfortunately, as more money being pumped in, flood and pollution continue to occur as they are related to inefficient waste management, illegal squatters and improper drainage system. Le & Facon (2004) explain that during the term, several workshops, dialogues and seminars were held to promote IRBM in the country.

The following Tenth Malaysia Plan (2011-2015) clearly outlined three areas of focus that will ensure water security by developing long term strategy for integrated water resources management (IWRM), restructuring the water services industry and protecting rivers from pollution. These strategies emphasize on the government's commitment towards implementing IWRM and IRBM in planning, managing, protecting and rehabilitating water resources. The government was also determined to complete the migration of all state water operators to the new asset light and licensing regime by 2015 (EPU, 2011). This was a challenging task after the 2008 general election when the opposition party gained control in five states and has been clearly demonstrated in the

federal and state government conflict in restructuring the Selangor water sector (Khalid, et al, 2013).

The Eleventh Malaysia Plan (2016-2020) is dedicated to ensure a complete transformation and implementation of NSWIRI. Towards this end, four strategies are set out in Focus Area D on transforming the new water services industry framework as the following table.

Table 2: Strategies to Transform Water Service Industry

No	Strategy	Program
1	Raising the financial sustainability of the water services industry	Strengthen the tariff system Joint billing for water and sewerage
2	Expanding network and treatment plant capacity through infrastructure investment and use of efficient technology	Develop new treatment plants Increase clean and treated water coverage Expand connected sewerage services in rural areas
3	Increasing efficiency and productivity of water and sewerage services	Implement a holistic non-revenue water reduction program Upgrade sewage treatment plants
4	Strengthening the regulatory framework of the water services industry	Develop the National Sewerage Master Plan Establish water demand management master plan Promote waste to wealth initiatives for sewerage

It can be seen that the Plan provides a mix of water supply and demand management approach in ensuring water security. Improving the tariff and billing system will eventually increase the present exceptionally low water tariff to reflect the true cost of the water supply and services system. This serves as water demand management tools and has a great impact on the water demand as consumers will use less and conserve more. The establishment of the water demand management plan aims to reduce the use of treated water for non-potable uses through alternative sources like rain water harvesting, storm water recycling and treated waste water. The Plan shall also intensify communications, awareness and education programs to promote efficient and prudent use of water (EPU, 2016).

5.2. *Water Management Strategies in the National Policies*

Water policy is a plan or a set of principles which serves as a foundation for future water law or institutional arrangement. It normally describes the powers and duties of various water resources agencies, while its goals and objectives are transpired in the National Outline Perspective Plan and the five-year Malaysia Plans (Lee, 2004). In addition to the Malaysia Plans, the federal government launched the National Policy on Climate Change (NPCC) 2010 to strengthen Malaysia's resilience to the impact of climate change on water and ensuring water security. Strategies are formulated to support climate resilience development and balanced adaptation and mitigation measures will be integrated into environmental policies and plan for public-private and community's collaboration (MNRE, 2010). These strategies can be done at the planning level by applying tools like the Integrated Environmentally Sensitive Areas, the Strategic Environmental Assessment and the Economic Evaluation of Ecological Services (Baral et al, 2014). Under the Town and Country Planning Act 1976, the local government is the local planning authority but financial constraint impedes effective implementation of these tools. Zakaria (2007) argues that enough funding is

required to initiate capacity building programme and efficient management of water resources through local administration. As more is required from the local government, it is pertinent that they are equipped with trained personnel and financial provisions to mainstream climate change adaptation and mitigation strategies in their planning activities.

Until 2011, Malaysia has no specific policy on water resources. The National Water Resources Study (2000-2050) commenced after the promulgation of the Water Vision to look into the state of water demand and supply capacity as well as to solve some of the water related problem in the country. Meanwhile, commitments towards improving the water sector are stated in other policies by related ministries. The Ministry of Natural Resources and Environment (MNRE) for instance has launched the National Forestry Policy 1978, the National Policy on Biological Diversity 1998, the National Environmental Policy 2002 and the National Policy on Climate Change 2009. Water issues have also been addressed by the MEGTW through the National Energy Policy 1979 and the National Green Technology Policy 2009. Other policies which highlight water matters include the National Tourism Policy Study 1992, the National Urbanization Policy 2006, the National Physical Plan (2010-2020) and the National Agro-Food Policy (2011-2020). However, as these policies are not water specific, they do not provide a clear policy direction as to whether the water managers to focus on water supply or water demand management in the pursuit to ensure water security in the country.

The long-awaited National Water Resources Policy (NWRP) was finally launched in 2012 to provide a new direction in the water sector in line with increasing competition for water. The policy focuses on better coordination among water related agencies and stresses that “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). Under the policy, water resources security means that water is secured to meet the demand from man and nature by optimising the potential and minimizing damaging impact; water sustainability means that water is sustained for present and future uses while water partnership refers to the stakeholder’s inclusiveness and collaboration in ensuring water resources security and sustainability (NWRP, 2012). It is apparent that the task of ensuring water security, sustainability and partnership are not the responsibility of a ministry or an agency alone. Each and every person needs water to live, and they must take part in water resources management, but there is lack of emphasis given on public participation, or the general public are unaware of their right to participate.

NWRP serves as a comprehensive guide for water resources allocations. It does not specifically address water services matters but emphasizes on water security and sustainability for human and environmental needs. It sets the strategic direction and framework for strategic action to ensure water resources are used and developed in a sustainable manner based on the collaborative water resources governance amongst all stakeholders through 69 strategic action plans (NWRP, 2012). Among the objectives of NWRP are setting direction and strategy to ensure water security, providing measures to complement existing policy directions to ensure sustainable and equitable use of water, as well as measures for water conservation plans and building stakeholder capacity in water governance (NWRP, 2012). These objectives can be achieved if supported by a correct legislative and institutional framework, and the MNRE through DID will propose a new legal and institutional framework for smooth implementation of the policy. This however must be done with extreme caution as water resource is still under state’s jurisdiction; while Kedah and Selangor have

established their water laws and authorities (Khalid et al, 2013). The general belief of water managers that DID is the main agency in the water sector also conflict with the role of states agencies as the owner and manager of state's water resources.

6. KEY AGENCIES IN THE WATER SECTOR AND THEIR MANAGEMENT APPROACHES

6.1. *Department of Irrigation and Drainage (DID)*

There is yet a department of water resources at the federal level, but DID is seen as the main reference point in the water sector. Formed in 1932 to take over the irrigation and drainage work under the Public Work Department, DID has since then increased areas with irrigation facility and increased rice yield for the country. When flood occurred in many parts of the country in early 1970s, flood mitigation and hydrology was made an additional responsibility for DID in 1972, coastal engineering in 1986 and river engineering in 1990. Following the NWSIRI, DID was transferred from the MOA to the MNRE and becomes the custodian of the National Hydrological Network in charge of flood and stormwater management, urban drainage, river basin management and coastal zone (Chia, 2004). DID introduced the "1 State 1 River" programme which has improved major rivers like the Malacca River. DID has also developed the Urban Stormwater Management Manual in 2001, conducted the National Study for the Effective Implementation of IWRM in Malaysia in 2008 and developed the manual on Implementation of IWRM Best Management Practices in 2009. DID was also entrusted to review the National Water Resources Study (2000-2050) and formulated the National Water Resources Policy.

With so many programs and activities by DID, it is not surprising that DID is seen as the main water agency in Malaysia. It is obvious that DID is mainly involved in the water infrastructural works and is mainly focusing on water supply management. As the main water agency in Malaysia, it is clear that the water management in the country is heavily based on the supply-side rather than the demand. It is also submitted that DID remains a technical agency without legislative authority in the management of rivers and other water resources. Even though DID only implement structural and non-structural initiatives in a river basin, question arises as to whether DID involvement overlaps the state authority's jurisdiction in Selangor and Kedah which has established their respective water resources authority. Other states in the Peninsular Malaysia are still relying on DID's expertise to manage water resources, even when they have established their own water board. As enormous duty has been given to DID both at the federal and state level, uncertainties arise with regard to power delineation between DID and the state's water authority.

6.2. *State Water Management Authority*

Two states in Peninsular Malaysia has set up their own water management authority; the Selangor Water Management Authority Enactment (SWMAE) 1999 established the Selangor Water Management Authority or locally known as Lembaga Urus Air Selangor (LUAS), and the Kedah Water Resources Enactment (KWRE) 2008 which established the Kedah Water Resources Authority or Lembaga Sumber Air Negeri Kedah (LSAN). The main function of LUAS is stated in section 6 (1) of SWMAE 1999 which is to nurture, maintain and facilitate the sustainable development, efficient use and conservation of water sources for public purposes in respect of

which it is established, to regulate and control inter basin transfer of water within the State and implement guidelines, performance standards, methods and procedures pertaining to the management, utilization and conservation of water sources. Similar scope of functions is accorded to LUAN under section 6 of KWRE 2008, with additional power under section 7 of KWRE 2008 to approve the draft river basin, to divide the State into river basin areas and define their boundaries for management of the River Basin Committee, and to approve and issue guidelines, standards Implementation, rules and procedures on management, use and conservation of water resources.

LUAS and LUAN are equipped with powers to regulate the issue of licenses and permits upon such terms and conditions deemed necessary on entry to or exit from any designated or protected areas, or the carrying on of any resource alteration activity within the limits of any water source and to impose fees payable on issue of such licenses or permits under section 6 (2) (i) SWMAE 1999 and Part V KWRE 2008 respectively. It is clear that both authorities are established to ensure a more coordinated water management in their respective states through good water governance and active stakeholder participation in water development and management. In the case of LUAS, the formation of stakeholder organizations to assist the authority in sustainable development and water conservation is encouraged under section 6 (1) (m) SWMAE 1999, while the general public in Kedah need to be consulted by the River Basin Committee when it is carrying out its function under section 15 KWRE 2008 and the Water Resources Director shall submit for the consideration of LUAN all comments and objections received from the public in respect of the draft plan under section 21(7) KWRE 2008. Although both authorities focuses on water protection and pollution control, it is not clear whether they focuses on the demand management. They are obviously not concern with the supply-side as it is the responsibility of SPAN which is the new water supply regulator. It is thus recommended that future regulation passed by LUAS and LUAN concentrates on water demand management as it will directly assist them in water resources conservation.

6.3. *Suruhanjaya Perkhidmatan Air Negara (SPAN)*

As aforesaid, SPAN was established following the NWSIRI and the 2006 constitutional amendment. However, certain provisions in the SPAN Act 2006 seems redundant with the state water authorities' responsibilities. For instance, section 15 (e) of SPAN Act provides that SPAN will advise the Minister of Energy, Green Technology and Water on a fair mechanism for determination of tariff that is fair to both consumers and license. This is redundant with section 6(1) (l) of the SWMAE 1999 where LUAS will protect the interest of consumers in relation to quantity, quality, and price. However, SPAN will only have this power if state government agrees to migrate to SPAN's regime. Apart from this, both SPAN and LUAS has the power to enforce water regulations. These may to some extent overlap with LUAS's functions to regulate the licensees and their water source activities and its duty to develop and implement guidelines, standards and procedures to manage, utilize and conserve water sources.

In Selangor, although SPAN focuses on regulation on water supply and services, LUAS regulations will also affect the liability of operators of water supply and services as they obtain their water supply from the State. Such a conflict can be seen in the civil suits file by the operator against the state government of Selangor. If this continues and aggravates, both the operator and the State Government can lose their focus on ensuring water security. Besides, LUAS is granted with powers under Section 6 (1) (f) SWMAE 1999 to 'adopt and implement policies, plans or projects by the federal government as directed by the state authority'. LUAS will also advise the state government

as to the policies, methods and measures to be adopted to promote, nurture and facilitate sustainable development, efficient use and conservation of water sources for public purposes under Section 6 (1) (g) SWMAE 1999. This advice may differ from those promoted by the federal government through SPAN and this may lead to further conflict.

7. CONCLUSION

The supply and demand in water management can only be balanced if water resources and water supply engineers address both sides of the balance. This will ensure a more holistic and integrated water sector and ensures water security and sustainability. As Malaysia is rapidly developed, water demand management can meet the increasing demand in a more sustainable way since it does not require new dams and water infrastructure. In view of climate change impacts on water resources, all water users must be informed of various methods to conserve water, be that in the household, agriculture or industrial sector. Rainwater harvesting and water recycling must be promoted as they reduce dependency on treated water and increase rating for green building index. As less rain is projected, these efforts will reduce dependency on conventional water supply during dry season, particularly the agricultural sector. Supply-side management through new dams or interstate water transfer may not guarantee water security climate change continues to bring more impact on the water sector. The NWRP 2012 is a good start for developing a new legal and institutional framework for ensuring water security in Malaysia but emphasis has not been given to water demand management. As such a comprehensive water conservation policy is needed to balance rapid development and increasing water demand. It is also vital for all levels of governments to shift their focus to water demand management as it can reduce dependency on costly water projects. It encourages water conservation and provides opportunity for the government to set new tariff which reflect both the value and cost of water supply and services.

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