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**Eje temático:** Educación

**Título de la ponencia:** *Water Watch Penang: using water demand management (WDM) for water sustainability via changing lifestyle and water use habits*

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### **Summary**

Malaysia is a country with rich water resources but mismanagement, wastage and pollution have led to water problems. Hence, Water Watch Penang (WWP), a non-profit organisation was set up in 1997 to help address water issues. Its vision is based on 5 principles of: (i) ecological sustainability; (ii) social justice; (iii) economic productivity; (iv) cultural vibrancy; and (v) popular participation. WWP teaches parents who play a vital role as “water managers” at home and in the work place. Parents manage the family’s water budget and educate their children about water saving. WWP promotes water demand management (WDM) to ensure that water resources are not depleted but remain sustainable. Via WDM, the amount of water saved nationally is significant and WDM can lead to saving mega-water projects for future generations. Through domestic water audit (DWA), a form of WDM, water recycling and saving techniques become key strategies in addressing water scarcity and other water problems in Malaysia. WWP also work with government and water service providers in reducing high rates of non-revenue water, upgrading water treatment plants, increasing awareness, public education and other important water related issues. The ultimate objective of WWP is to create a “Water Saving Society” in Malaysia.

**Key Words** Malaysia, Water Watch Penang, Water Demand Management, Domestic Water Audit, Water Saving Society.

## **Introduction**

Water Watch Penang (WWP) is the first truly “Water NGO” in Malaysia. It is a non-profit organisation set up in November 1997 to establish a process for public consultation in developing and using sustainable indicators for monitoring the sustainable management of water resources in the State of Penang, Malaysia ([www.waterwatchpenang.org](http://www.waterwatchpenang.org) 1/8/08). Its vision is based on 5 principles of: (i) ecological sustainability; (ii) social justice; (iii) economic productivity; (iv) cultural vibrancy; and (v) popular participation. Its aim is to promote study, awareness, knowledge, conservation, protection and the practice of a water saving society. Its activities include: (i) Creating awareness and water saving practices amongst the public, industry and government agencies; (ii) Publishing and distributing articles, pamphlets, journals, periodicals and books; (iii) Organising and conducting field trips, educational camps seminars, forums, conferences, lectures and talks; (iv) Act as “Watch Dog” for water pricing, water pollution, non-revenue water, destruction of catchments and other issues relating to water; (v) Networking with other societies dedicated to similar aims and objectives; and (vi) Carry out Water and water-Related Projects.

In Malaysia, as is the case in many parts of the world, water problems are mostly caused by the fact that water quantity is finite but population, industry and development (all need water) are not. The trend is that water demands are increasing at geometric rates but water supply is limited and this will deplete water sources, leading to disastrous consequences. Malaysia has experienced rapid economic development and population increase. It is a “Newly Industrializing Country (NIC)” hoping to become a developed country by 2020, but this is not possible without water. Life itself needs water, and everything else that we consume needs water for its production – crops, cars, computers, clothes, etc. Traditionally, water management in Malaysia was (and still is) largely based on the water supply management (WSM) approach via a government-centric approach. This approach was feasible in the old days when population and economy was small. However, a top-down WSM approach in the modern era is not feasible and cannot guarantee sustainable water management. Many rivers (our main source of water) have reached their maximum capacities but the population and the economy continue to grow. Currently, many river basins in the country have reached their maximum supply limits. In addition, this approach does not involve water consumers (Hj Keizrul Abdullah, 2002). Members of WWP strongly believe that it is imperative that “Water and Society” be closely linked via involvement of both suppliers and consumers.

WWP’s work demonstrates that WDM is the key towards sustainable water resources management as water availability becomes scarce. WDM is no longer an option. It has become a necessity. Such a situation is happening all over Southeast Asia where countries are developing rapidly and populations exploding. More and more people are also moving to cities resulting in rapid urbanization that puts added pressures on dwindling water sources. As the amount of water is finite but water demand infinite, except through expensive and technologically high desalination and re-treatment of wastewater, lack of water will increasingly become a critical issue in developing countries if water supply management (WSM) remains the primary management approach. As long as water consumers do not heed the call to save water, WSM will not be able to supply all that is demanded. Hence, there is an urgent need for the water consumers (industry, businesses, universities and schools, and households) to play a more active role in helping to conserve water resources, by reducing their water demand (Sharma et al., 2004). Examples from this paper demonstrate how water consumers can apply WDM measures to save water that contributes towards sustainable development of water resources.

Currently, domestic water users consume roughly more than half of Malaysia’s total water demand. Because of this huge volume, any reduction in consumption can save the country a lot of water, as shown by several water saving scenarios. Parents (especially mothers) can play a vital role as they are the “water managers” at home. Many mothers are also teachers in schools and they can play the role of educationists. In particular, mothers can manage the family’s water budget and because they use

water for most of the domestic chores in the home, and they educate their children about water saving, they are vitally important in water conservation. On the national front, WDM will ensure that our water resources are not depleted but remain sustainable. The amount of water saved nationally is significant if all consumers come on board and this will postpone mega-water infrastructure projects for future generations. It is firmly believed that WDM via DWA, water recycling and other water saving techniques are key strategies in addressing water scarcity and other water problems in Malaysia. Likewise, government and water service providers must significantly reduce high rates of non-revenue water (i.e. replacing old pipes that are prone to breakage), upgrading water treatment plants, maintaining existing dams, educating the public on water awareness and other important water related issues. Finally, WWP will continue to work hard to realize its vision of creating a “Water Saving Society” to replace the current “Water Wasting Society” in Malaysia (Chang et al., 2004).

## **Materials and Methods**

This paper is based on a combination of primary and secondary data. Primary data is collected via questionnaires and face to face interviews with respondents, government officers, staff of water service providers, staff of private sector firms, and the general public. Based on the information collected, options for sustainable water management measures and approaches for sustainable water communities will be evaluated. Secondary data include existing water data obtained from the government, water service providers, private firms, and the public. Both primary and secondary data were processed and analysed. The results were used to form the basis of discussion and conclusions of the paper.

The data collection and interview activities are as follows:

- Detailed project planning and scoping
- Formulation of criteria for representative respondents
- Initial survey of the selected water authorities, service providers and firms
- Identification of key informants and water consumers
- Selection of possible and willing respondents
- Literature review and search
- Pilot Survey and secondary data collection
- Interviews with selected respondents
- Reevaluation of approaches in water management
- Analysis of sustainable water communities
- Writing of report and paper

## **Results and Discussion**

Results of this study indicates that Malaysia has a high level of water usage in comparison to other countries (Figure 1). Malaysia is a country blessed with abundant water resources, receiving more than 3000 mm of rain annually. However, uneven distribution and seasonal variation of rainfall, mis-management, pollution, low tariffs, wastage, abuse, general apathy and other reasons have resulted in water crises that have caused untold hardships (Chan, 2004a). The challenge is how to best address these issues. Furthermore, government and water authorities have traditionally managed water resources based on a sectoral and top-down approach, largely based on supply management. More recently, the approach has shifted towards privatization but this has caused more problems than it has solved. This has not gone down well with consumers. Currently, the majority of Malaysians are already well educated, informed and affluent and they are demanding for change in the water sector. The public wants greater transparency, accountability and to be allowed to play an active role as a “partner” of the government in the water sector. Realising this, Government is also gradually changing by adopting a more “citizen friendly” approach via public consultation, open tender bidding

for water projects as well as discussion with NGOs over tariffs review. However, the process is slow and many old habits are still endemic within the Government sector.

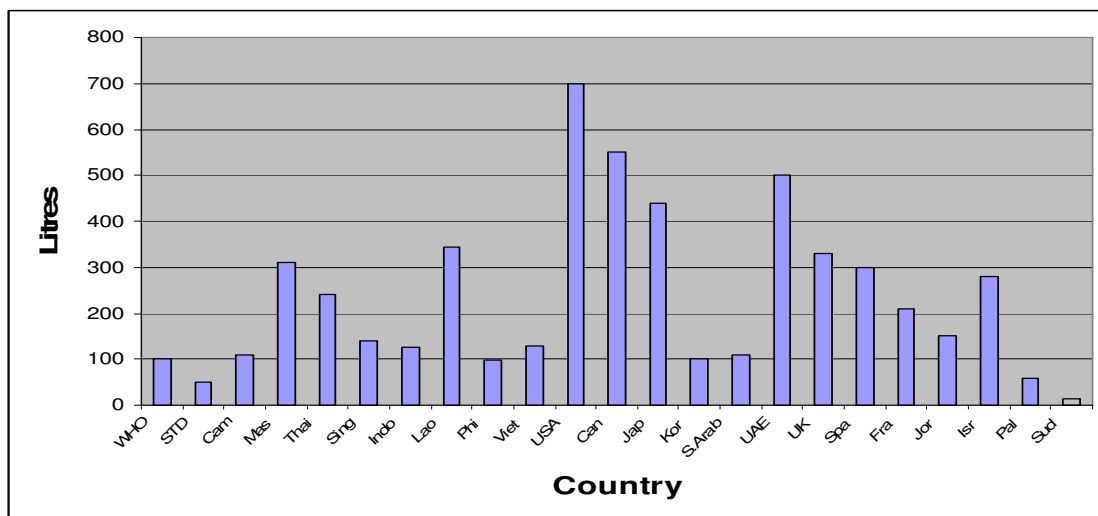


Figure 1: Per capita water use (litres per capita per day) in Malaysia (MAS) in comparison to selected countries.

The major water challenges facing Malaysia are discussed as follows. The 1990s have witnessed many water crises leading to a great deal of suffering and economic losses in Malaysia. Unfortunately, Malaysians only take note when a crisis happens. The vast majority, including the relevant government authorities and water companies, tend to forget quickly as they have short memory spans. Consequently, water is still treated like “dirt” since water is extremely cheap, costing the average consumer less than a tenth of what they normally pay for electricity. As a result, people continue to waste water, or at least not take positive actions to conserve water. Water pollution is rampant, the chief culprits being factories, farmers and households. Water catchments continue to be destroyed as more and more forested catchments are opened for development, both legally and illegally. Deforestation is a great challenge facing the Malaysian Government. More so, when State Governments are different from that of the Federal Government, policies are often not compatible.

Pollution of water sources is a big challenge. Despite its vital importance to life and development, everywhere we go in Malaysia we see water in rivers (which supply 97% of our water supply) being polluted (often deliberately). Industries dump their hazardous wastes that get into the water system, eventually polluting it. Untreated wastes from old houses, old hotels, small towns and farms (both animals and crops) are threatening to further pollute our waters. The Malaysian Environmental Quality Report 1998 reported that out of 836 water samples collected from all over the country, 94.5 % did not comply with standards for oil and grease, 73.7 % did not comply for total suspended solids, and 29.7 % for E.coli (Reported in the *New Straits Times*, 3 Dec 1999). The most alarming fact is that less than 17 % of the 5,409 wastewater treatment plants run by Indah water Konsortium (IWK) comply with the discharge standards detailed in the Environmental Quality (Sewage and Industrial Effluent) Regulations 1979 of the Department of Environment (*The Star*, 23 Dec 1999). In terms of toxic wastes, the high tariffs charged for treating industrial wastes have resulted in many factories dumping their wastes illegally. Of these, a small number of these culprits are caught but the rest that are not tells us that somewhere the ground is poisoned and this will eventually poison our waters as well. Every year the Department of Environment receives hundreds of complaints about water pollution from all sources: factories; companies; farms; moving sources (e.g. motorised vehicles) as well as individuals.

Another major challenge facing Malaysia is one of misconception amongst its policy makers with regard to the water resources base. Certainly, the majority of those in charge are of the opinion that

Malaysia has no water shortage problems (until the water crises that hit many parts of the country in 1991, 1997 and 1998). The high frequency of flooding may have reinforced such a belief. Yet, despite the country's wet humid equatorial climate regime with heavy year round rainfall averaging more than 2,000 mm (equivalent to about 990 billion cubic metres (BCM) (1 BCM = 1 million Megalitres) per annum, and the more than 150 river systems which are the country's major sources of water supply, many parts of the country suffer from periodic water stress. Theoretically, the total surface runoff is the amount of available water (about 556 BCM per annum), giving Malaysia a per capita renewable water of more than 20,000 cubic meters per year, as compared to some many middle eastern water starved countries with per capita renewable water of less than 1,000 cubic metres per year. That means one person in Malaysia has access to more than 20 times the water available to someone in Yemen. Yet, ignorance amongst policy makers with regard to total available water resources has contributed to water crises in many parts of the country.

Poor attitude and general apathy with regards to water policies amongst government officers (in charge of decision-making) is another major challenge that needs to be addressed if the country harbours any hope of sustainable water supply in the 21st Century. It is not just the individuals who have an apathetic attitude but also private companies, water authorities and politicians (policy makers). For example, the Selangor State authorities have been warned repeatedly about over-logging and its effect on the destruction of water catchments since the National Water Resources Study was completed in 1982. In 1991, it was again warned by the Selangor Forestry Department to restrict excessive logging. Even the Prime Minister then advised the State to impose a total ban on logging in 1991. Again, in 1993, the authorities made the same call and in 1995, it was the Selangor Waterworks Department which projected a severe water shortage from 1997. However, while appearing to heed some of these calls with minor actions, the Selangor State government did not do enough. Its obsessive aim of "rapid development" overshadowed everything else. Hence, its apathetic attitude towards its forest, water catchments and the natural environment in general. In the year 2003 the Kedah State Government proposed a massive plan to log the Ulu Muda Forests. This would have destroyed water catchments which supply three states of Kedah, Perlis and Penang. Fortunately public outcry and pressure from other states persuaded the Cabinet to reject the plan. Now, in 2008, the Kedah Government has once again put up a similar proposal. Despite numerous studies that have shown how logging and hill development have led to excessive soil erosion, landslides, destruction of water catchments, water pollution and downstream flooding, States continue to pursue logging as a cheap and convenient way to get income. This is huge challenge facing State Governments as well as the Federal Government.

Of course, to be fair to the authorities, the general public's apathy towards water use and the environment in general is also to be blamed for much of today's water woes. For example, while the authorities have to take part of the blame for the destruction of water catchments and the siltation of the lake in Cameron Highlands for allowing too much development, vegetable farmers in the area must surely be responsible for their apathetic attitude towards the environment for the loads of pesticides, weedicides and chemicals from fertilisers that they have poured into the soil and the water system (Barrow et al., 2005). Here again, profits take priority over everything else and hence farmers have no qualms about poisoning the land and water. The general Malaysian public must also take part of the blame for being apathetic when it comes to littering and rubbish disposal. One only needs to look at the condition of our rivers to see the proof of such apathetic attitude. Rivers are Malaysia's main water sources (since underground water is rare) but are treated as raw sewers by the public as everything from domestic rubbish to furniture and even old cars are dumped into rivers. Sources in the Municipal Council of Penang Island confirmed that at least 10 lorry loads of rubbish are cleared from the Sg Pinang everyday. Hence, one of the major causes of flash flooding in urban areas is the clogging of drains and waterways due to irresponsible rubbish dumping. Finally, not many Malaysians (barring those affected by the recent water crisis) have embarked on saving water. The time has come for all Malaysians to practise a less wasteful lifestyle. There is no need to save water to the extent of endangering one's family hygiene, as

prudent and careful use of water should suffice. Apathetic attitude must change for the better if we are to conserve our water resources. More importantly, the Malaysian public must surely do something now that those responsible are losing the battle to conserve as well as supply enough water to all. Since the authorities and water companies can only do so much (not forgetting their inadequacies), the public must do its part, at least by saving water. Hence, notwithstanding what the authorities and the private water companies have done or are still doing to alleviate water woes, the public must not “wait and see” but take proactive action. Other than saving water, the public must exercise their rights and see to it that water companies (a relatively new phenomenon in their infancy) perform and be accountable. The public should not be docile and inactive until such a time when a water crisis strikes. They must now play a more active role by telling water authorities and water companies that they will not sit still if negligence is found.

Another challenge is climate change. Increasingly, abnormal weather has hit Malaysia. That the years 1997/1998 are El Nino years are unquestionable (Chan, 1998). What is questionable, however, is the blaming of everything ranging from forest fires, haze, drought, flood, crop loss, water shortages, etc. on El Nino. Pointing fingers will serve no purpose, even though it is a common habit amongst Malaysians, especially amongst those responsible. Putting the blame on the El Nino is an exercise in futility. Certainly, if Malaysia wants to be recognised as a developed nation, then there is absolutely no place for using the weather as a scapegoat for one’s mistakes and incompetence. The culprits responsible for mismanagement of water resources need to be identified and taken to court.

Privatisation of the water industry is another contentious issue posing a challenge in the water sector. Since the Mahathir era beginning in the 1980s, privatization was fiercely promoted, including water. However, water is a vital resource where everybody is entitled to its access. Hence, the government has a moral responsibility to provide the people with adequate and quality water supply. Many claimed that water should never be privatized and irresponsible NGOs criticised privatization as evil. In Malaysia, with the exception of Penang State, all other states that have privatised part or all its water industry are now having problems. Many privatised water companies are in fact losing money and government has to compensate them or buy back the insolvent companies. While privatisation may not be entirely bad, the appointment of suitable candidates for the privatisation exercise is vital. Here, meritocracy must be the only criteria. The company taking over the water industry must be established and have adequate experience in the field. This is not the case in many water companies in Malaysia. Whatever the choice, the authorities should make it transparent to the public, a policy so preached by the government. Arguably, privatisation has created more problems than it has solved. Arguably, there are areas in which privatisation has worked, but such cases are few and far between (Chan, 2004b). When privatised, water will no longer be treated as a necessity. Instead, the companies appointed would simply treat water on a monetary basis or based on the principle “You pay you get”. Private companies are not welfare companies. They will only supply the water if they are making profits. What if it a company is running at a loss due to some unforeseen circumstances? Is it going to increase its tariffs? What would the effect on price be if there was a great drought that lasts for years? In the worse scenario, what if the water company collapses? Where will the water come from then? Water is simply too precious a resource to leave it to the hands of private companies. The government must keep this responsibility at all costs. It is its moral responsibility to the people. For states which have already privatised their water functions, they must ensure that the appointed water companies be controlled by the State in some ways. Getting enough funds to run the water sector is a great challenge facing the Malaysian Government.

Low water tariffs posed a great challenge towards sustainable water management. Water prices are just too cheap in the country. In Penang State, tariff for the first 20 cubic metres average out to US\$0.08 a cubic metre. The average water tariff for all States in Malaysia is between US\$0.08 to US\$0.30 a cubic metre. Such cheap tariffs, while good for the public, do not encourage water savings. The main reason for cheap pricing is that it is a sensitive issue that is politically linked. In the State of Selangor, which was taken over by opposition government in 2008, the newly formed

State Government has even offered “free water” for the first 20 cubic metres to all its citizens. This move has been declared as “suicidal” by NGOs as Selangor State does not have enough water resources. In fact, by 2010, it would have to pipe in raw water from Pahang State via inter-state water transfer. Raising water tariffs has been a taboo amongst most politicians, and this remains a major challenge in ensuring the sustainability of water supply in the country (Chan, 2008). In the State of Penang, NGOs such as WWP ([www.waterwatchpenang.org](http://www.waterwatchpenang.org)) have been advocating for the implementation of a phasing of tariffs to penalize large users. It was proposed that domestic consumers in Penang be charged at the following tariff rates: US\$0.08 per cubic metre for the first 20 cubic metres (i.e. no change); US\$0.16 per cubic metre for the subsequent 21 to 30 cubic metres; and US\$0.32 per cubic metre for the subsequent 31 to 40 cubic metres, and so on – with the tariffs doubling all the time. If this is not implemented, it is clear that no one will pay any attention to save water. The current rates are simply too dirt-cheap! Such a cheap tariff, while ensuring that everybody has access to water, is counter-productive as it inadvertently encourages over-usage and wastage.

Another challenge is that water management in Malaysia has always been one of Supply Management, possibly because of the misconception that water resources are abundant in the country. Hence, the “Top-down” approach is adopted. Government has always been responsible for water supply and should rightly remain so as it has a moral obligation to the citizens for providing adequate, uninterrupted, safe and quality water to all. However, water management cannot be sustainable if the users do not co-operate with the suppliers as many river systems have probably already reached their supply limits. It is therefore imperative that users play an equally vital role in reducing water demand via conserving water. This is where NGOs can play a vitally important role. Government must not view NGOs as enemies (though admittedly, there are some irresponsible politically-driven NGOs with ulterior motives). Government must in fact view NGOs as “partners” in the country’s development and involve NGOs as much as possible, especially in water conservation and management. NGOs form the link between government and people as well as between government, industry and consumers.

As a result of over-emphasis on supply management, consumers are not educated and sensitized on saving water. Hence, another major water challenge facing Malaysia that needs to be urgently addressed is that of the high domestic water usage per capita. In the 1970s, Malaysians use only about less than 200 litres of water per capita per day (LPD). This figure then increased to about 250 LPD in the 1980s and then to more than 300 LPD now. In urban areas, it has been estimated that the average person uses about 500 LPD. If we consider the fact that the International Standard for water use recommended by the United Nations is 200 LPD, then Malaysians now are guilty of wasting 100 LPD. Malaysians living in the urban areas waste more than 300 LPD, i.e. an amount that can be used to sustain six persons in Sudan. In Malaysia, most of the wasted water goes to flushing toilets, bathing, washing cars, clothes, floors, watering plants (gardening) and other unnecessary chores - i.e. activities which we can reduce and hence reduce water use. As a comparison, an average Indian (in India) uses only 100 LPD and a Sudanese uses even less, about 50 LPD. You may ask me why and how they can get by with so little water. The answer is in our urban way of life! Hence, reduction of usage is a key to water saving amongst Malaysians. If only each person could reduce his/her water use, even by a small amount per day, the amount of water saved can be significant. Picture the following scenario: If every person in Malaysia reduces his/her consumption of water by a mere 10 % of his/her daily needs, i.e. 30 litres per capita per day, the total amount saved by the 23.26 million people in the country would be about 697.8 million litres per day (MLD). This amounts to about 20.9 billion litres per month or 251.2 billion litres per year. If a saving of 20 % of daily needs is achieved, i.e. 60 litres per capita per day, the country could save about 502.4 billion litres per year. Finally, if Malaysians were to live like their Singaporean counterparts (average usage is 150 LPD) and cut daily usage by 50 % to 150 litres per day, the country could save about 1256.0 billion litres per year. This is equivalent to having 63 mid-sized dams. Hence, dams could be saved for the future and need not be built now if such savings are implemented. The big challenge is how to change consumers’ habits.

Singapore has managed to do it. So, there is no reason why Malaysia cannot. The Malaysian Government must embark on a serious year-round and sustained water saving campaign to create awareness and educate its people who are still largely ignorant and apathetic about water issues.

WWP was specifically formed to tackle the issue of water conservation. Via Water Demand Management (WDM), i.e. the use of various methods/measures to reduce our water demand (i.e. water consumption), WWP hopes to change the way consumers use water from water wasting to water saving. WDM is necessary when water supply is limited or has reached maximum capacity. For example, when a person is given a fixed amount of water to use per day (e.g. 200 litres), he/she has to plan properly the amount of water to be used for various daily usage such as drinking, cooking, washing, flushing and other tasks. WDM changes the way in which water is consumed and used. Hence, it requires changes in lifestyle that are related to water. WDM is a form of water conservation as it is concerned with the ways in which we conserve water and use water in an efficient manner. Some examples of WDM are as follows: installing water efficient equipment, fixing water leaks, introducing automatic faucets/taps, using drip irrigation for plants instead of sprinklers, using pails of water to wash the car or floors, replacing the 9 litres flush cistern with 4.5 litres cistern or the dual-flush cistern, etc.

There are many benefits of WDM. Many countries and cities have benefited from WDM and proven that it is feasible. For example, due to the lack of water resources, Singapore has managed to apply WDM effectively. In Africa, after the 1992 droughts, the city of Windhoek put in place WDM practices and reduced water consumption by 30-50% from 1992 onwards. In South Africa, in the Greater Hermanus area, WDM strategies reduced water demand by 16.5% in the first 12 months. In all these examples, significant savings, both water and money, were made. WDM can also significantly reduce a country's capital expenditure (CAPEX) as water infrastructures can be postponed and reserved for future generations. WDM also increases a country's water security, and resilience to drought/water stress. Furthermore, reduced demands will result in more water flowing in rivers and less opening up of catchments, both of which mean conservation for the environment.

As an example of WDM, Domestic Water Audit (DWA) can be carried out in the home (Chan, 2007). In the home, one can calculate water use by assessing where and how much water is used in various activities within the household. Table 3 illustrates how one can estimate the total household water use (daily, weekly, monthly or yearly). Such an estimate should not be carried out and viewed as a task but should involve the entire family and made into a fun activity. To carry out one's estimate, one can start by recording the number of times each of the activities in the table are carried out and calculate the total amount of water use for the entire household (by multiplying with the number of people). Based on the estimate, one can find out how much water is used for each activity, who uses the most water, and where (toilet, kitchen, garage etc) water is used the most. Once this is done, one can plan how and where to reduce water usage. This paper demonstrates that WDM is the key towards sustainable water resources management as water availability becomes scarce. WDM is no longer an option. It has become a necessity. Such a situation is happening all over Southeast Asia where countries are developing rapidly and populations exploding. More and more people are also moving to cities resulting in rapid urbanization that puts added pressures on dwindling water sources.

The amount of water is finite but water demand is infinite. Since there is no way we can create water, though desalination and re-treatment of wastewater are expensive and technically prohibitive solutions, the lack of water will increasingly become a critical issue in Southeast Asian countries if water supply management (WSM) remains the primary management approach. As long as water consumers do not heed the call to save water, WSM will not be able to supply all that is demanded. Hence, there is an urgent need for the water consumers (industry, businesses, universities and schools, and households) to play a more active role in helping to conserve water resources, by



reducing their water demand. Examples from this manual have demonstrated how water consumers can apply WDM measures to save water.

## **Conclusions**

In conclusion, despite being blessed with abundant water resources, Malaysia is still saddled with numerous water problems that pose great challenges to its efforts to manage water resources sustainably. While not much can be done about the past challenge of uneven distribution of rainfall over space and time, a lot needs to be done on addressing the current challenges of mis-management, pollution, low tariffs, wastage, abuse, general apathy and NRW. Government and water authorities have to manage water resources holistically using a multi-stakeholders approach based on IWRM. The privatization challenge is to how best ensure transparency, accountability and professionalism, while at the same time ensuring equity and accessibility. Government must also adopt a more “citizen friendly” approach via public consultation, open tender and other smart-partnerships involving government, private sector and NGOs. Equally, the apathetic attitude of the Malaysian public towards water issues needs to be addressed via awareness, education and capacity building. Pollution needs to be tackled via stricter enforcement. In this respect, corruption must be weeded out. Both government and the public must understand that current water tariffs are too low. A multi-level tariff structure based on phasing and usage level should be implemented to encourage water savings but discourage wastage. NRW rates are too high and this needs to be addressed via changing of old pipes, installing better meters, stricter enforcement, etc. Water is finite but water demand infinite and it will create severe water stress if human society does not change the ways it consumes water. The current approach of managing water supply via solely managing water supply is not sustainable. Not only is this approach capital intensive and costly, it is also unsustainable given the fact that water sources are finite and many water sources (e.g. rivers) have reached their capacities. Malaysian society, both the business as well as domestic sectors, use and waste a lot of water. It is imperative that all consumers start to manage water use wisely. Finally, the Malaysian Government needs to move away from dam building to implement a more comprehensive approach encompassing both supply and demand management. Successful best management practices of both supply and demand management can then be replicated all over the country.

Consumers and NGOs such as WWP can play a crucial role in the area of WDM. Currently, domestic water users consume roughly more than half of Malaysia’s total water demand. Because of this huge volume, any reduction in consumption can save the country a lot of water, as shown by several water saving scenarios. Parents can play a vital role as they are the “water managers” at home. In particular, mothers can manage the family’s water budget and because they use water for most of the domestic chores in the home, and they educate their children about water saving, they are vitally important in water conservation. On the national front, WDM and DWA will ensure that our water resources are not depleted but remain sustainable. Money saved without having to embark of mega-water infrastructure projects will certainly be very useful in addressing other water problems in the country such as the high percentage of non-revenue water (i.e. replacing old pipes that are prone to breakage), upgrading water treatment plants, maintenance of existing dams, educating the public on awareness and other important water related projects.

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