

The Role of Gender in Domestic Water Conservation in Malaysia

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ABSTRACT

While the role of gender in water management is vital in many countries experiencing water scarcity, such as in the African continent and Indian Sub-continent, it is rather undefined in the case of Malaysia. This is strange considering the escalation of water problems in the country in recent decades due to climate change and social, political and economic reasons. Though the country is rich in water resources, mismanagement causes water supply to lag far behind water demand. As a result, Malaysia is facing water problems which have severe impacts, particularly on gender. This paper demonstrates that women are the main water managers both at home and in the office, and they wield tremendous influence on the ways families and businesses use and conserve water. The role of women is pivotal in curbing domestic wastage, but ensuring wise use and conservation. Since domestic consumers use roughly more than half of the country's total water demand, Water Demand Management (WDM) is a vital conservation tool. Women are the managers of the family's water budget. Because of the fact that women use water for most of the domestic chores in the home, they are considered vitally important in water conservation. Women also make decision on the installation of water saving devices. When women save water in the home, they also educate their children and family members about the importance of water conservation. Finally, women themselves need to cut down on water use via substitution of water-saving methods and other personal adjustments. Women who work can similarly exert their influence in the office by impressing upon colleagues and the employer about the benefits of water conservation. Overall, water conservation via involvement of the public can be effective when women are actively involved as they are the key players towards achieving sustainable management of water resources.

ABSTRAK

Peranan gender dalam pengurusan air adalah amat penting di banyak negara yang mengalami kekurangan air seperti di benua Afrika dan benua kecil India, tetapi tidak di Malaysia. Perkara ini agak janggal memandangkan masalah air

yang meningkat di negara ini dalam beberapa dekad yang lalu atas sebab-sebab perubahan iklim, sosial, politik dan ekonomi. Walaupun negara ini kaya dengan sumber air, pengurusan yang kurang cekap menyebabkan bekalan air tidak dapat memenuhi permintaan. Lantas Malaysia menghadapi masalah air yang mempunyai impak yang teruk terutamanya terhadap gender. Kertas ini menunjukkan bahawa kaum wanita merupakan pengurus air utama di kedua-dua rumah dan pejabat, dan mereka mempunyai pengaruh yang hebat dalam dalam rangka bagaimana keluarga dan perniagaan mengguna dan menjimatkan air. Peranan wanita amat penting dalam mengekang pembaziran domestik, tetapi memastikan penggunaan yang baik dan jimat. Oleh kerana pengguna domestik menggunakan lebih daripada separuh jumlah permintaan air negara, pengurusan permintaan air (WDM) adalah merupakan suatu alat penting untuk penjimatan. Kaum wanita adalah pengurus bajet air keluarga. Ini adalah kerana kaum wanita menggunakan air untuk kerja-kerja di rumah dan dianggap amat penting daripada segi penjimatan air. Kaum wanita juga berperanan menentukan pemasangan alat-alat penjimatan air. Apabila kaum wanita menjimatkan air di rumah, mereka juga mengajar anak-anak dan ahli keluarga yang lain tentang kepentingan penjimatan air. Tambahan lagi kaum wanita perlu mengurangkan penggunaan air dengan menggantikan cara penjimatan air dan penyesuaian lain. Kaum wanita yang bekerja juga boleh mempengaruhi rakan sekerja di pejabat dan majikan tentang keuntungan menjimatkan air. Lagipun, penjimatan air melalui penglibatan orang awam boleh menjadi berkesan apabila kaum wanita melibatkan diri secara aktif kerana mereka adalah pemacu ke arah pencapaian pengurusan sumber air berterusan.

INTRODUCTION

Malaysia is considered rich in water resources with an annual average rainfall of about 3,000 mm generating 556 billion m³ of surface runoff and renewable water resources amounting to 120 billion m³ per year (or 5,400 m³ per capita) (Salmah Zakaria & Rafidah Kassim 1999). Yet, despite the richness of water resources, the main focus on water management is heavily in favour of the top-down and techno centric approach, leaning heavily towards privatization (Chan & Nitivattananon 2006a). This is futile as water resources are finite but water demand doubles on the average every 20 years or so. Since independence in 1957 until today, the predominant approach has been to build dams, treatment plants and main pipes to deliver water to the public. Very little effort has been centred on teaching water consumers (industry, business and domestic) to control their demands. As a result, there is a lot of wastage

and “unwise” use of water, very little recycling, and a galloping demand scenario (Jamaluddin Aziz & Chan 2006). More tragically, the important role played by women in managing water within the family as well as within the community, which has been highlighted by many (Hajar et al. 2002; Chan & Nitivattananon 2006a) has not been recognized and put into good use.

Chan (2004) has demonstrated that Water Supply Management (WSM) from the top cannot work in the modern scenario of population explosion and rapid industrial development, but has to give way to a more comprehensive strategy employing both WSM and WDM. Until now, a large pool of stakeholders, viz. the consumers have not been factored into the equation. Without their support and cooperation, water demand continues to escalate resulting in many states facing water shortages. The public can determine the success or failure of water management as they are domestic water users who consume roughly more than half of the country’s total water demand. Because of this huge volume, any reduction in consumption can save the country a lot of water (Chan & Nitivattananon 2006b). In terms of public participation, it is imperative that women, as individuals, are allowed to play a more active role as they are the “managers” (albeit unpaid ones) at home. Women are usually the ones who manage the family’s water budget. Because of the fact that women use water for most of the domestic chores in the home, they are considered vitally important in water conservation. When women save water in the home, they also educate their children and family members about the importance of water conservation.

Many women are teachers and they can contribute immensely towards the education of our young in the ultimate creation of a water saving society in Malaysia (Chan & Nitivattananon 2006c). Finally, even if women fall short of their important role to disseminate the water conservation message, the future of water resources management in the country would still be secured if the majority of women do their part and practise water conservation. This is because women make up about half the population. In terms of educational level, it is noted that females accounted for 67 % of places in pre-university level and 63.4 % of places in tertiary/university level (Malaysia 2006). Given this scenario, the future certainly bodes well for women as they will be more and more influential in decisions regarding the family, including water conservation.

CROSS CUTTING ROLE OF GENDER IN WATER MANAGEMENT

The role of gender in development in a multitude of areas is recognised world-wide, ever since the global women's movement (Antrobus 2004). In the area of water, Hajar et al. (2002) illustrates succinctly how women in the older generation have used water wisely. In many parts of the world, notably India and Africa, only a third of the rural population and two-thirds of the urban population have access to piped water. Those who do not are forced to seek water from far away untreated sources and women bear the brunt of this struggle to get water. Women often walk up to 15 kilometres to fetch water everyday. Based on such a scenario, a girl aged 14 years fetching water for the first time and doing it every day, would have walked round the earth (around the Equator) when she reaches the age of 21 years 4 months. The story of grassroots women organizations in successfully managing water resources where authorities have failed in India is heartening (Panda 2007). Women, of course, need water more than men as they tend to weigh less and have lower percentages of total body water than men. Women also need to use more water for washing, cooking and managing the hygiene of the home (SEWA 2003).

In the global arena, the Women for Water Partnership (WfWfW), launched and registered at the 12th session of the UN Commission on Sustainable Development in April 2004, highlights the many important roles of women in water (<http://www.womenforwater.org/> 19/10/06). Many researchers have found that that the role of women in Water Supply and Sanitation (WSS) has gained salience and importance, especially after the declaration of the International Drinking Water Supply and Sanitation Decade and the Fourth World Conference for Women at Beijing (Fong et al. 1996). Increasingly, women are now widely recognized as having a crucial role to play in the water and sanitation sector. However, the reality is that on the global arena, gender equality is more lip service than action. What is important is for water managers to show why attention to gender is important and how much attention can be ensured in any project. Water managers (including governments) need to be convinced of the rationale for considering gender issues in water and sanitation. Often, this can be achieved by profitability and sustainability. Fong et al. (1996) provide ten salient lessons learned from experience in the WSS sector around the world as proofs that gender inclusion is viable and effective. They further document what has and has not worked as well as problems encountered

and solutions found. They also provide many examples of good practices by country in detail, especially of international bank supported projects in the WSS sector that have utilized effective gender strategies.

Experience from ADB and around the world has shown that focus on gender brings multiplier effects. Inclusion of gender inputs into projects leads to benefits that go beyond good WSS project performance as manifested in such aspects as enhanced image, better procurement, O & M, recycling and cost recovery, and hygiene awareness. There may also be other benefits such as *Economic benefits* (For example, better access to water gives women more time for income-generating activities, the needs of family members, or their own welfare and leisure. The economy, as a whole, therefore also benefits); *Benefit to children* (For example, children, especially girls, can go to school without having to spend long hours fetching water. Girls can then improve their education and be better prepared for better jobs); and *Empowerment of women* (For example, involvement in WSS projects empowers women, especially when project activities are linked to income-generating activities, productive resources such as credit, and equipping women with better skills) (http://www.adb.org/Documents/Manuals/Gender_Checklists/Water/water200.asp 9 Aug 2006).

The role of women in decision-making has also been recognised in the 1992 Earth Summit Agenda 21 as well as subsequent international conference agreements, including the comprehensive 1995 Women's Conference Platform for Action, Third World Water Forum 2003 (Kyoto) and Fourth World Water Forum 2006 (Mexico). In these forums, governments have largely agreed on the need for gender analysis to reflect the differential impact that policies and programs have on both women and men. However, the reality is that most of these are mere rhetoric, including the "mainstreaming a gender perspective into policy-making" and acceptance of women as equal partners in decision-making relating to the water sector. As such, much remains to be achieved in terms of gender-equity in the water sector. Currently, there is much disparity between the ways in which men and women use and control water. Traditionally, in Asian societies, women are responsible for managing water in the home because of gender-based roles that assign women responsibility for household care. Gender perspectives on water management have become important (Kusakabe 2005). Water is a vital resource crucial for survival. But as the world runs "dry", water has become a scarce resource, even nicknamed "blue gold". Within this scenario, water is being fought over and conflicting use compete against

one another – for example there are conflicts between industry and agriculture, industry and domestic use, environmental flows and water supply abstraction, ecosystem health and development opportunities, etc. Within all these conflicts somewhere is women. Notwithstanding their vulnerability to water hazards, governments must take into account women's expertise and experience in the water sector to ensure environmentally sound water policies and programmes. Certainly, history has shown the value of women's holistic approach in contributing towards creating sustainable communities (Chan & Nitivattananon 2006a).

WOMEN ORGANISATIONS AND WATER CONSERVATION IN MALAYSIA

In Malaysia, the role and status of women have improved significantly since independence in 1957. In the Ninth Malaysia Plan 2006-2010, an entire chapter (Chapter 13) has been allocated for women development (Malaysia 2006). During the Eight Malaysia Plan 2000-2005, women continued to advance in various fields of development, mostly because of equal access to education and training, health care and improved employment opportunities. The Ninth Malaysia Plan also confirmed that gender mainstreaming will be given emphasis and gender considerations included in the formulation of government policies and programmes. The Malaysian Government has set up a Cabinet Committee on Gender equality and there is now a Ministry of Women, Family and Community Development (KPWK) Malaysia to look after the interests of women in the country (http://www.ilo.org/pubcgi/links_ext.pl?http://www.kpwkm.gov.my/ 10 Aug 2006). Its minister is a lady. The objectives of this Ministry include promoting the interest of women and their participation in national development and to coordinate family development programmes. It implements the National Policy on Women and relevant Departments of the Ministry include the Departments of Women's Development, National Unity and the National Population and Family Development Board. However, it is rather unfortunate that there is no apparent link between women and water.

Women NGOs are also strong in Malaysia. The All Women's Action Society (AWAM) in Selangor State formed in 1988 (<http://www.awam.netfirms.com/home.htm> 10 Aug 2006) is an independent feminist organisation committed to improving the lives of women in Malaysia. Its vision is to create a just and equitable society where women are treated

with respect, and free from all forms of violence and discrimination, but it does not deal with water issues. The Asian-Pacific Resources and Research Centre for Women (ARROW) in Kuala Lumpur, established in 1993 is a regional NGO and NPO organization ([http://www. arrow.org.my/](http://www.arrow.org.my/) 10 Aug 2006). Its goal is for women in Asia and the Pacific to be better able to define and control their lives, particularly in the area of women's health and women's rights. Unfortunately, none of their key areas of concern regarding women touches on water. In Kota Bharu, the Murni Women's Development Foundation of Kelantan (YAYASAN MURNI) objectives are mostly to provide assistance to women in need paying special emphasis to socially underprivileged women, single mothers, widows and victims of violence and their family members. (<http://www.newwomen.net/networkingwomen/yayasanmurni> 10 Aug 2006). It does not get involved in water issues. The National Council of Women's Organizations, Malaysia (NCWO) is the main Women's NGO Consultative Coordinating Council and has 61 Affiliates the portfolios of which cover the social, political, economic, religious, professional and trade union sectors but is by and by its constitution non-racial, non-religious, non-political (<http://www.ncwo.org.my/> 10 Aug 2006). The NWCO promotes and enhances women's participation and contribution in all sectors of national development. Hence, the NWCO appears a potentially suitable candidate for gender and water issues in the country. However, hitherto, it does not deal with water.

Hence, despite the abundance of women organizations in Malaysia, all actively pursuing the interests and role of women, none of them has a focus on gender and water issues. Hence, this is one aspect of women organizations in Malaysia that needs to be improved. As Malaysia is very concerned with poverty reduction and equality in income distribution, as well as gender equality, the inclusion of gender provides the platform for women participation and poverty reduction, two other key determinants of the effectiveness and sustainability of WSS management. Gender inclusion ties in very well with their national plans and policies. It is therefore strange to note that both countries have hitherto not embarked on a massive endeavour to include women and gender inputs into water projects in a more institutionalized way. Most current projects with gender inputs are largely ad hoc. If a water project allows women participation, and includes women right from the beginning in the areas of project design, construction, operation and maintenance (O & M), training, and monitoring and evaluation (M & E), as well as water

conservation, then the results on poverty reduction and income redistribution would materialize (Chan 2006a).

DOMESTIC WATER MANAGEMENT AND CONSERVATION

A research carried out by Chan (2006b) indicates that the role of women in domestic water management is of paramount importance. Out of 100 households surveyed in Pattaya, 56 % of households reported that the mother was the main water manager in the home compared to 36 % for the father. In the same study in a survey of 111 households in Georgetown, 61.3 % of households indicated that the mother was the main water manager in the home as compared to 19.8 % for the father. In Pattaya, when water supply breaks down, 80.0 % of the time it is the mother who has to go out of the house to fetch water (either buy bottled water, fetch water in plastic bottles from public taps/water tankers or from relative houses, or from a nearby well/river). Only 20.0 % of fathers did the fetching. In the case of Georgetown, when water supply breaks down, 77.8 % of the time it is the mother's job to fetch water from outside the house, the remaining 22.2 % of the time being carried out by the son or daughter. None of the households reported that the fathers ever did any water fetching. This may have been due to the fact that most men are breadwinners of the homes and are most likely working in the office. Nevertheless, these results clearly show that the role of women, especially mothers, is vital in managing water in the home, both in Pattaya and in Georgetown. Interestingly, it was also noted that households with female heads were likely to adopt more water conservation measures than those headed by men. However, in terms of total monthly water use as well as per capita water use in the home, there was no significant difference between households who had women or men as water managers. Overall, when combined, all households in both cities used on average 34.9 m³/household/month. However, households in Georgetown use substantially more water (40.0 m³/household/month) than households in Pattaya (29.6 m³/household/month). Table 1 gives an indication of water problems in Georgetown and Pattaya, with the former performing better than the later.

There is no doubt that women can play a very vital role in the sustainable management of water. Chan and Nitivattananon (2006a) show that one area that women can contribute significantly would be to reduce domestic water consumption through education of family members, teaching school children, and auditing of the household water budget.

Table 1. Comparison of household water indicators in Georgetown and Pattaya, 2006

Indicator	Georgetown	Pattaya
Area	119 km ²	208 km ²
Population	400,000 (Include Suburbs)	111,543 (Include Suburbs)
Number of Households Interviewed	111	100
Average Monthly Usage of Water	40.0 m ³ /Household/ Month	29.6 m ³ /Household/ Month
Percentage of households with mothers as main water manager	61.3 %	56.0 %
Percentage of households with fathers as main water manager	19.8 %	36.0 %
Percentage of households with others as main water manager	18.9 %	8.0 %
Percentage of households with father fetching water during water cuts	0.0 %	20.0 %
Percentage of households with mother fetching water during water cuts	77.8 %	80.0 %
Percentage of households with others fetching water during water cuts	22.2 %	0.0 %
Water use per household with father as main water manager	32.7 m ³ /household/month	(Georgetown-Pattaya Combined)
Water use per household with mother as main water manager	32.6 m ³ /household/month	(Georgetown-Pattaya Combined)
Percentage of Households With water Problems	64.9 %	82.0 %
Percentage of households reporting bad water quality	27.0 %	23.0 %
Percentage of Households reporting 3 or more water problems	28.0 %	49.0 %
Percentage of Households reporting frequent water cuts	11.7 %	13.0 %
Percentage of households reporting low water pressure	25.2 %	64.0 %
Percentage of households reporting foul smell and odour in water	14.4 %	27.0 %
Percentage of households reporting colour in water	30.6 %	28.0 %
Percentage of households reporting excessive impurities in water	15.3 %	34.0 %
Percentage of households reporting high chlorine content in water	14.4 %	16.0 %
Percentage of households reporting unsatisfactory taste of water	8.1 %	4.0 %
Percentage of households reporting excessive hardness of water	1.8 %	6.0 %
Percentage of households reporting other problems with their water	0.9 %	30.0 %
Percentage of households using bottled water as a main source of drinking water	22.5 %	64.0 %

Domestic Water Audit (DWA) refers to calculating the amount of water that a household uses. This includes water use for indoor water usage such as laundry, in the kitchen, for bathing, for flushing toilets, and other chores as well as outdoor water usage such as watering gardens and lawns, washing tiled/cemented floors, paths and driveways, washing cars, and other installations. All these water usage are in the control of women managers of the home. Based on a study on domestic water audit, selection of the type of washing machine and pattern of usage will determine the amount of water use. A water efficient washing machine will use only 45 litres per wash (3 kg of clothes) whereas a large Automatic Washing machine will use 120 litres, i.e. 2.7 times the amount of water. When a washing machine is half-full, using the “half-full” function will additionally save half of water per wash. This may seem insignificant but if one adds up the number of washes per year, the amount of water and money saved is huge.

Table 2 illustrates how Mrs. Chan from Penang (Malaysia) managed to save water by using a water efficient washing machine (Chan & Nitivattananon 2006a). It should be pointed out that the water savings is only from one activity, i.e. washing clothes. If we consider water savings from other activities as well, it would be much more. However, because of the low water tariffs in Malaysia (average 50 sen per 1000 litres); the

Table 2. Amount of water saved using a twin-tub washing machine over a large automatic washing machine, and the amount saved using the half-full function

Type of Machine	Water Used Per Wash 3 kg (Litres)	Water Used Per Month (30 Washes)	Water Saved Per Month Using Water Efficient Type	Water Saved Per Year Using Water Efficient Type	Money Saved Per Year (Based on average of 50 sen per 1000 litres)
Water Efficient Type	45	1,350	-	-	-
Medium Efficient Type	90	2,700	1,350	16,200	RM8.10*
Normal Non-Efficient Type	105	3,150	1,800	21,600	RM10.80
Large Automatic Non Efficient Type	120	3,600	2,250	27,000	RM13.50

*RM = Ringgit Malaysia (RM1 = US\$0.27)

amount of money saved is very small. Hence, one cannot look at water savings in terms of money in Malaysia. In order for water saving to be effective, one has to educate the public, especially women who have to be aware and sensitized towards water conservation.

Table 3. Amount of water saved using half-full sinks over using a dishwasher or full sinks for dishwashing

Depth of water in sink	Water Used Per Wash (Litres)	Water Used Per Day (Average 3 Washes)	Water Saved Per Day Using 2 Half-full Sinks (Average 3 Washes)	Water Saved Per Month Using 2 Half-full Sinks (Average 3 Washes/Day)	Water Saved Per Year Using 2 Half-full Sinks (Average 3 Washes/Day)	Money Saved Per Year (Based on average of 50 sen per 1000 litres)
2 Half-Full Sinks	20	60	-	-	-	-
2 Three-Quarters Full Sinks	30	90	30	900	10,800	RM5.40
2 Full Sinks	40	120	60	1,800	21,600	RM10.80
1 Water Efficient Dishwasher	40	120	60	1,800	21,600	RM10.80
1 Normal Dishwasher	60	180	120	3,600	43,200	RM21.60

Mrs. Chan also practices wise-dishwashing via using two half-full sinks (one sink for washing with dishwashing liquid and the other for rinsing). This has proven to be able to save a large amount of water. Table 3 illustrates how Mrs. Chan saved between 30 to 120 litres of water a day by her dishwashing method compared to other dishwashing methods that use more water. Using a dishwasher is definitely not advisable as it uses too much water, even for water-efficient types. A large amount of water can also be saved in the bathroom. Women can control and audit not only their own bath/shower water usage but also their children and husband. Table 4 illustrates the huge amount of water that has been saved (between 12 to 370 litres per day) in Mrs. Chan's house in bathing/showering alone. Again, it is noted that the amount of money saved may be minimal due to the low water tariffs. Another area that the lady of the house can control to reduce water use is the toilet. Selecting the type of toilet flush and controlling the amount of flushes can be vital in saving a lot of water. Table 5 indicates the huge amount of water saved with a water efficient dual-flush system compared to a conventional single-flush system. Mrs.

Chan puts two pieces of bricks into the cistern of one of her WCs, effectively reducing the volume of water flushed from 9 litres to 4.5 litres. She has designated this WC "For Urinating Only". For defecating, her family members have to use the other toilet which has a normal flush of 9 litres.

Under the DWA, the water usage of outdoor areas is also important to calculate and control. Watering gardens and lawns, especially during hot days where evaporation can be high, can lead to a lot of water being used. Washing paved areas such as driveways, tiled areas and cemented areas as well as cars also consumes a lot of water if a running hose is used. Table 6 gives an indication as to the amount of water that can merely by changing the pattern/type of washing by using a few buckets of water instead of a running hose. In Mrs. Chan's case, she controls water use by switching to a bucket and mop for washing floors and Mr. Chan uses a bucket and a piece of cloth/sponge for washing cars. A bucket should also be used in watering plants as using the hose may lead to a lot of wastage as some of the water may miss the plants' pots. Water sprinklers that are set on an automatic mode should not be used as they not only use an enormous amount of water but also go off during thunderstorms when watering is unnecessary. Needless to say, having a swimming pool, even a small one, at home is a big user of water. Often, as it is the rich people who can only afford a pool, they do not have the time to use it. Hence, more often than not, swimming pools are unnecessary.

If we add up all the water saved from the above DWA activity, it would be substantial. Table 7 indicates that Mrs. Chan was able to save between 161,100 and 324,900 litres per year by merely using the DWA. The total amount of water saved in just this one house was a maximum of 324,900 litres. This is equivalent to the average usage of 3,249 persons in India for a day. In terms of money, the amount saved via all these activities would be RM162.40. If we can convince all households (via women) to cooperate and carry out their DWA in each household across the country, the total water savings would be 5,000,000 households X 324,900 litres = 1,624.5 billion litres of water saved. This amount of water is equivalent to about 77 Teluk Bahang dams (21,000 million litres capacity) in Penang. In terms of monetary savings, the country would have saved RM162.40 X 5,000,000 households = RM812 million. This amount of money will certainly be very useful in addressing the 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. More importantly, making people reduce water use means that the building of dams can be postponed to the distant future, i.e. these future dams reserved for future generations. This will ensure that our water resources remain sustainable instead of being depleted.

If mobilized throughout the country in a national water saving campaign, the influence of women on water conservation can be phenomenal. Considering per capita water use, Malaysia exhibit high rates, i.e. about 310 litres (<http://www.seawun.org/benchmarking/> 17 may 2006). If the UN recommended usage of 165 litres per capita per day is applied, then Malaysians are wasting 145 litres per capita per day. In urban areas, particularly large cities such as Kuala Lumpur and Georgetown, the per capita usage are much higher averaging above 500 litres per capita. Hence, the urban wastage is about 335 litres per capita. If we multiply the wastage figures by the country's population of 26 million, the wastage will be 8.71 billion litres of water per day. Such a high level of water wastage is certainly not sustainable. Women can contribute effectively towards reducing this wastage via conservation and education via the following ways. Say if each woman manager of a home manages to reduce 10 % of their water use per day, 31 litres of water is saved per person per day. For the entire country, this is equivalent to 806 million litres per day. Annually, the amount of water savings is about 294,190 million litres, i.e. equivalent to about 14 mid-sized dams. If the water demand reduction is reduced to 20 %, the water saved would be able to fill 28 mid-sized dams. Also, besides reducing water use, women in rural areas are the ones who have to fetch water from wells or rivers. Here, they act as the primary means of sourcing alternative sources of water and reduce dependence on piped water.

In the area of education, mothers can mould their children into responsible water saving adults by starting them young. They can take their children for outings to rivers instead of to supermarkets or shopping complexes. They can lead the children in "River Walk" along the banks of rivers such as the Sg. Air Terjun inside the Botanical Gardens. Mothers can request help from WWP experts who will brief the children on the importance of water conservation and hence the need to keep rivers clean. The children can then be treated to some basic water monitoring exercises whereby they would go into the shallow river to conduct themselves. Many women are school teachers and this is an area where water education becomes important. Women teachers can teach students to conserve water the way they teach their own children. In many developed countries, schools have "River Watch" programmes whereby

school children monitor the “health” of an adopted river (usually one that is adjacent to their school). This way, they can report any major changes in water quality of rivers due to dumping of toxic materials, rubbish, and oil spill or otherwise. In Penang, one of WWP’s activities is the continuous education programme to instil awareness and love for our rivers. The objective is to get one school to adopt a river or part/section of a river and monitor the "Health" of the river via simple indicators. Because participants actually get into the river to perform various tasks, they really enjoyed themselves. Hence there is tremendous potential for women teachers to take advantage of this interesting water education activity. Children need to get out into the field to learn about rivers (Chan et al. 2003). Women control the water budget in the house as they are engaged in watering of plants/vegetables, wash floors and toilets, and other chores needing water. Hence, women can either save or waste water. There may be many other areas in which women can play an important role in water saving. Since the Government is now preaching the use of Water Demand Management (WDM) to complement Water Supply Management (WSM) that has been largely employed by Government so far, WDM in the household will determine whether WDM succeeds or fails. This is because more than half the water demand is from domestic households. Hence, the family unit holds the key to WDM (Chan & Nitivattananon 2006c).

CONCLUSION

Malaysia is a country where women are given equal opportunities to excel in all arenas. This has resulted in a proliferation of women organizations championing for all sorts of issues except water. This is strange considering the fact that women probably work closer to water than men, and are usually the water managers at home. In recent decades the country has been affected by mounting water problems, as there is inefficient use and high wastage. This paper has demonstrated that women can effectively reduce water demands in the home. Hence, there is a vital role for women to play, especially in managing and reducing domestic water use. Via WDM, a non-technological tool, women can help curb domestic wastage, ensuring wise use and conservation of water. In the domestic area, women can play a vital role as they are the “water managers” at home. Women such as Mrs. Chan can use Domestic Water Audit effectively to audit their household water use, and make adjustments to the water use pattern to reduce demand. Significant savings, both in

terms of the volume of water and money can be saved. As women use water for most of the domestic chores in the home, they are effective water conservation agents in the home. When women save water in the home, they also educate their children, family members, neighbours and friends about the importance of water conservation. Women can also cut down on water use via substitution of water-saving equipment and methods, and other personal adjustments. A sustained national WDM initiative whereby women are the key players towards achieving sustainable management of water resources is needed. As domestic water consumption is about half of the country's total water demand, the reduction of domestic water demand would be vital in achieving water sustainability. When every family cooperates, led by women, the reduction in consumption can save the country a lot of water and postponed the building of dams which can be saved for future generations.

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REFERENCES

- Antrobus, P. 2004. *The global women's movement: origins, issues and challenges*. London: Zed Books.
- Chan, N.W. 2004. *Managing water resources in the 21st Century: involving all stakeholders towards sustainable water resources management in Malaysia*. Bangi: Environmental Management Programme, Centre for Graduate Studies, Universiti Kebangsaan Malaysia.
- Chan, N.W. 2006a. River catchment awareness and monitoring programme for Pinang River, Penang State, Malaysia: role of Water Watch Penang, private sector and local community. In *Proceedings of the International Symposium on Community Activities for the Conservation of Water Environment – Lessons Learnt from Community Activities*. Tokyo: Ministry of the Environment, Japan: 48-51.
- Chan, N.W. 2006b. Water resource management in Malaysia and Thailand. In *UEM Newsletter, Asian Institute of Technology*, 7(3): 3, December.

- Chan, N.W., Hajar Abdul Rahim, Khor, H.T. & Baharulnizam Baharum (Eds.). 2003. *Learning about water – Training Manual*. Penang: Water Watch Penang.
- Chan, N.W. & Nitivattananon, V. 2006a. Women's role in water conservation in Malaysia. *Proceedings of Regional Conference on Urban Water and Sanitation in Southeast Asian Countries, Vientiane, Lao PDR, 22-24 November*. Pathumthani: Asian Institute of Technology: 323-335.
- Chan, N.W. & Nitivattananon, V. 2006b. Water demand management for sustainable water resources management in Malaysia. *Proceedings of International Conference on Environment (ICENV 2006): Knowledge-based Environmental Management and Sustainable Development, Penang, 13-15 November 2006*. Penang: Universiti Sains Malaysia. Published in CD Rom (ISBN 983-3391-54-0)
- Chan, N.W. & Nitivattananon, V. 2006c. Gender perspectives in water demand management: examples from Malaysia and Thailand. In Jamaluddin Md. Jahi, Kadir Arifin, Azahan Awang & Muhammad Rizal Razman (Eds.). *Managing Changes. Proceedings 3rd Bangi World Conference on Environmental Management*. Bangi: Environmental Management Programme, Centre For Graduate Studies, Universiti Kebangsaan Malaysia, Environmental Management Society (EMS) of Malaysia and Institute of History and Patriotism Studies (IKSEP) Malaysia: 200-220.
- Fong, Monica S.; Wakeman, Wendy; Bhushan, Anjana. 1996. *Gender Toolkit Series No. 2*. Geneva: World Bank.
- Malaysia. 2006. *Ninth Malaysia Plan 2006 – 2010*. Kuala Lumpur: Government of Malaysia.
- Hajar Abdul Rahim, Radiah Yusoff, Noraini Ismail & Chan, N.W. 2002. The role of women in water conservation in Malaysia. In Ramlan Omar, Zulfahmi Ali Rahman, Mohd Talib Latif, Tukimat Lihan and Jumaat Hj. Adam (Eds.). *Proceedings of the Regional Symposium on Environment & Natural Resources: Utilization, Management & Sustainable Development of the Environment and Natural Resources*. Bangi: School of Environmental Science and Natural Resources, UKM: 161-170.
- Jamaluddin Aziz & Chan, N.W. 2006. Water Watch Penang and community participation in water resource management in Penang, Malaysia. *Proceedings of Regional Conference on Urban Water and Sanitation in Southeast Asian Countries*. Pathumthani: Asian Institute of Technology: 291-302.
- <http://www.womenforwater.org/> 19/10/06
- http://www.adb.org/Documents/Manuals/Gender_Checklists/Water/water200.asp
9 Aug 2006
- <http://www.arrow.org.my/> 10 Aug 2006
- <http://www.awam.netfirms.com/home.htm> 10 Aug 2006
- http://www.ilo.org/pubcgi/links_ext.pl?http://www.kpwkm.gov.my/ 10 Aug 2006
- <http://www.ncwo.org.my/> 10 Aug 2006

- <http://www.newwomen.net/networkingwomen/yayasanmurni> 10 Aug 2006
<http://www.seawun.org/benchmarking/> 17 may 2006
- Kusakabe, K. 2005. Gender situation in urban environmental management in the sub-region. Paper presented at the Sub-regional dissemination meeting on gender equality in UEM, 6 December 2005, Surabaya, East Java, Indonesia.
- Panda, S.M. 2007. Negotiation processes in institutionalising grassroots level water governance: case of Self Employed Women Association, Gujarat, India. *Proceedings of International Forum on Water Environment Governance in Asia – Technologies and Institutional Systems for Water Environmental Governance*, Ministry of Environment, Japan, Tokyo, 39-45.
- Salmah Zakaria & Rafidah Kassim. 1999. Issues and challenges in integrated river basin management. In *Sustainable Management of Water Resources in Malaysia: A Review of Practical Options*. Kuala Lumpur: Global Environment Centre: 25-30.
- SEWA. 2003. *Women's struggle for water*. Ahmedabad: Self Employed Women Association (SEWA).

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