Iran. J. Environ. Health. Sci. Eng., 2006, Vol. 3, No. 4, pp. 223-228

A COMPARATIVE STUDY OF WATER RESOURCES USAGE BY HOUSEHOLDS IN GEORGETOWN-MALAYSIA AND PATTAYA-THAILAND

N. W. Chan

School of the Environment, Resources and Development, Asian Institute of Technology, Klong Luang, Pathumthani 12120, Thailand

Received 8 August 2006; revised 30 August 2006; accepted 26 September 2006

ABSTRACT

Malaysia and Thailand are tropical countries relatively rich in water resources, but both suffer numerous water problems, chief of which is excessive domestic wastage. A lop-sided approach focusing on water supply management and neglecting water demand management have caused water problems to escalate in both countries in recent decades due to population explosion, rapid urbanization, industrial expansion and climate change. As the total quantity of available water is finite but demand increasing at geometrical rates, Malaysia and Thailand are facing water problems which have severe impacts, particularly on women. This study compares the main water issues faced by two cities, Georgetown in Malaysia and Pattaya in Thailand, both medium sized and major tourist destinations. This paper compares various water indicators for both cities, water use characteristics of consumers, and consumers' perception and willingness to pay. It also attempts to highlight the role of gender, documenting how women can manage water via water demand management in addressing water shortages. The paper concludes that water users need to be involved in a bottom-up approach in a sustained national water demand management initiative towards achieving sustainable management of water resources in both cities.

Key words: Domestic water management, water demand management, domestic water audit, key water service indicators, willingness to pay

INTRODUCTION

Since the 1970s, both Malaysia and Thailand have progressed rapidly in economic development and social transformation. Both countries have been touted either as two of the "Asian Tiger Economies" or "Newly Industrialising Countries (NICs)" chasing after Singapore, which is considered the "developed country standard" in Southeast Asia. Against a background of rapid development, with high GDP growth rates averaging between 5-10 % per annum (with the exception of the Asian Financial crisis during 1997-1999), both countries have experienced and are still experiencing mounting environmental degradation, and Urban Environmental Management (UEM) problems in their main cities, especially in terms of water services. Prioritizing rapid economic development and growth has increased income levels and reduced poverty, but at the same time has inevitably brought about a number of UEM problems, chief of which are frequent occurrence of environmental hazards, deteriorating air quality, water pollution, poor sanitation and inadequate low cost housing (Research Centre for Water Environment Technology, 2006). There are many water problems in the two selected cities of Georgetown and Pattaya. Firstly, both receive rainfall unevenly through out the year causing droughts at times while at other times causing severe flooding. Secondly, both cities depend on their hinterland for water supply. In the case of Georgetown, more than 80 % of its water supply flows in from another state where it has no jurisdiction. This has caused severe problems in the past as plans were put up (by the neighbouring state) to log the water catchment which will destroy the city's water supply. Thirdly, both cities are major tourist destinations where millions of tourists arrive each year. This has seen hundreds of hotels being built

*Corresponding author-Email: *nwchan@ait.ac.th*
Tel: 6 04 6533888 , Fax: 6 04 6563707

over the years, currently more than a hundred hotels each in both cities. This has caused a tremendous strain on water supply as some large international hotels are known to use more water than entire villages or small towns (Chan, 2004). However, the problem of growing demand is not unique to both cities as it is a universal phenomenon in almost all cities in developing countries in the Southeast Asian region (Sethaputra and Promma, 2006). Fourthly, both cities are affected by the unsustainable water supply management (WSM) approach while at the same time neglecting to employ water demand management (WDM). Chan and Nitivattananon (2006a) have demonstrated that excessive water demands by all consumers due to low levels of awareness, low water tariffs and apathetic attitudes are the key issues. Hence, in order to ensure the sustainability of water resources now and in the future, Chan (2006a) stressed that it is imperative that these key issues be addressed as soon as possible. Chan and Nitivattananon (2006b) also stressed that since the real issues dealt with consumers and their attitude and consumption patterns, the role of women is vital in addressing water resources sustainability in Malaysia. Fifthly, both cities are affected by unpredictable water supply quality, although Georgetown's water supply has been privatized to a water company PBAPP Sdn Bhd while Pattaya's water supply is still in the hands of the PWA, a government owned provincial water authority. Finally, both cities face precarious water supply sustainability in the long run and must come up quickly with plans to address the water problems.

This study hypothesizes that the obsolete top-down WSM approach has to give way to a more comprehensive strategy employing both WSM and WDM in order to sustain water resources. 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 both cities a lot of water. The study also hypothesizes that 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 at home, they are considered vitally important in water conservation. When women save water at home, they also educate their children and family members about the importance of water conservation. Finally, 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. 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 (Government of 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. Water, or the lack of it, is anticipated to be the stumbling block for development in cities in the new millennium. This is all the more true in the case of cities that are major tourist destinations such as Pattaya and Georgetown. This comparative study aims to discover the major water issues faced by both cities and how they are being addressed by the relevant authorities. The study also examines domestic water consumers' perception, usage, practices and willingness to pay for water services in both cities. Finally, the study examines the role of gender in the context of domestic water resources management.

MATERIALS AND METHODS

The research methodology is based on a mixture of quantitative and qualitative research methods. A quantitative research questionnaire was administered for domestic households. All domestic questionnaires

(100 households for Pattaya and 111 households for Georgetown) were completed by interviews carried out by trained interviewers. Secondary data was also collected to form the background of the study.

RESULTS

In terms of major water issues, it was found that both cities are affected by uneven rainfall that often caused droughts at times; usually during the Northeast Monsoon period from November to March) while at other times causing severe flooding (usually during the Southwest Monsoon period from May to September). Results from the study also indicates that both cities are affected by the unsustainable WSM approach while at the same time neglecting to employ water demand management (WDM). Results from this study also show that the role of women is vital in addressing water resources sustainability in Malaysia. Finally, results indicate that both cities are affected by unpredictable water supply quality, but Georgetown's water supply is more efficient and the majority of consumers are generally satisfied and support privatization, since the PBAPP Sdn Bhd is doing a good job. In contrast, water consumers in Pattaya, in which the water supply is still in the hands of the PWA, are generally dissatisfied with their water supply. Consumers in Pattaya are also likely to experience more water problems than their counterparts in Georgetown. In general, consumers in both cities experience a variety of water problems ranging from poor water quality to water cuts, low water pressure, high chlorine content, unsatisfactory taste, odour and colour, etc. To address these problems, both water service providers have to improve water quality, attend to pipe breakage faster, have a long term plan to change existing old cast iron pipes, and increase storage to plan for droughts.

Results of the domestic household surveys regarding to water problems are shown in Table 1.

Table 1: Comparison of household water indicators between Georgetown and Pattaya, 2007

Indicator	Georgetown	Pattaya
Area	119 km^2	208 km^2
Population	400,000 (Include Suburbs)	111,543 (Include Suburbs)
Main Sector of Economy	Tertiary (Tourism)	Tertiary (Tourism)
Number of Households Interviewed	111	100
Average Number of Persons Living in Household	5.25	4.06
Average Monthly Usage of Water	40.0 m^3/Household/Month	29.6 m^3/Household/Month
Percentage of Households With water Problems	64.9 %	82.0 %
Per capita daily water use	310 L	256 L
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	22.5 %	64.0 %
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 %
Percentage of households considering water bill as cheap	29.7 %	8.0 %
Percentage of households considering water bill as moderate	51.4 %	48.0 %
Percentage of households considering water bill as expensive	13.5 %	41.0 %
Percentage of households satisfied with the quality of their piped water	81.0 % %	57.0 %
Percentage of households dissatisfied with quality of their piped water	16.2 %	41.0 %
Percentage of households willing to support a tariff increase	4.5 %	4.0 %
Percentage of households opposed to a tariff increase	55.8 %	76.0 %
Percentage households ranking "Good job, income and property" highest	36.0 %	19.8 %
Percentage households ranking "Good health and clean environment" highest	31.0 %	55.9 %
Percentage households ranking "Peace and religion" lowest	75.0 %	40.5 %

DISCUSSION

To address this issue, both cities will have to increase their storage capacities by either building more dams or raising the height/storage capacities of existing dams. Georgetown is currently planning to increase the height of its Mengkuang Dam and also negotiate to buy water via inter-state transfer from neighbouring states. Pattaya has plans for building more dams. Such plans also address the second water issue, which is the fact that both cities depend on their hinterland for water supply. For Georgetown, more than 80 % of its water supply flows in from its neighbour Kedah State which has plans to log the water catchment of the Muda River, the main source of the city's water. The Penang State Government, on behalf of Georgetown, is negotiating with Kedah for future water supply. To ensure sustained supply, Penang is also willing to fund the building of dams along the Muda River. The issue of both cities being major tourist destinations where millions of tourists arrive each year can be solved by imposing increased tariffs for hotels and mandating water recycling for hotels. Currently, both cities do not mandate hotels to recycle. As water tariffs for both cities are very cheap (Georgetown – average US$0.22 per m^3 and Pattaya - US$ 0.39 per m^3), there is no incentive for hotels to install recycling plants which cost a lot of money. Another recommendation is that government in both cities mandate hotels to acquire ISO 14,000 Certification and/or embark on a Corporate Social Responsibility (CSR) annual programme (Chan, 2007). Snider *et al*., (2003) documents the success stories of the world's most successful firms that have embraced CSR. This is necessary as more and more hotels are being built and many are also expanding their capacities. It is socially not acceptable that hotels' water demands jeopardize a city's water sustainability, even though the city depends on tourism. During times of water stress, hotels are known to get priority over water supply than villages or small towns and this is ethically unacceptable.

The problem of WSM and WDM can be addressed by focusing more on WDM as water runs out. Chan (2006b) argues that while cheap water rates are politically correct, they failed to stamp the abuse and wastage on water resources. Hence, the effective way to address this is to impose higher tariffs. However, the tariff structure must not deprive the poor of access while at the same time deter wastage of water. Awareness and education must be increased as excessive water wastage is caused by consumers who have low levels of awareness and apathetic attitudes. Hence, in order to ensure the sustainability of water resources now and in the future, it is imperative that these key issues be addressed as soon as possible. Pattaya residents had more water problems than their Georgetown counterparts. Percentage of households with water problems was significantly higher for Pattaya. The percentages reporting 3 or more problems for Pattaya and Georgetown were 49.0 % and 28.0 % respectively. The Chi-Square Test confirmed that the number of respondents reporting poor pipe water quality was also significantly higher in Pattaya (16.0 %) than in Georgetown (6.3 %). While no respondent dared to drink water straight from the tap in Pattaya, 6.3 % of Georgetown households did so. Significantly also, 55.0 % of households in Pattaya said they only drink bottled water but none in Georgetown did so. Overall, the amount of water usage per household per month was much higher in Georgetown (40.0 m^3) compared to Pattaya (29.6 m^3). Likewise, per capita water use per day was also higher in Georgetown (310 L) compared to Pattaya (256 L).

The preliminary results of the study 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 m^3/household/month. However, households in Georgetown use substantially more water (40.0 m^3/household/month) than households in Pattaya (29.6 m^3/household/month). This could be due to the fact that water is very cheap in Georgetown, 2.20 Baht per m^3 (for the first 10 m^3) whereas for Pattaya it is about 7.70 Baht. In Pattaya the water supply is managed by PWA. In recent years residents are very aware of the shortage of water as they were affected by water cuts frequently.

In the case of Georgetown, which is managed by the PBAPP Sdn Bhd, arguably the most efficient and successful water company in Malaysia, there have been few cases of water cuts.

The percentage of households satisfied with the quality of their piped water was significantly higher in Georgetown than in Pattaya. In contrast, the percentage of households dissatisfied with the quality of their piped water was reversed. In terms of willingness to pay for tariff increase, households in 76.0 % of households in Pattaya were opposed to it compared to 55.8 % in Georgetown. Only 4.0 % in Pattaya supported a tariff increase while the figure for Georgetown was 4.5 %. When asked to rate what was most important to life, households in Pattaya rated "Good job, income and owning property" the highest while those in Georgetown rated "Good health and clean environment" the highest. Strangely enough, households in both cities rated "Peace and religion" the lowest. In conclusion, both cities are generally blessed with abundant water, but water has turned into a critical issue due to mismanagement, inefficient use, high wastage and little involvement of water consumers. As water availability diminishes, this study shows that a comprehensive strategy incorporating WSM and WDM must be put in place. There is a role for consumers to play, especially women. Via WDM, a non-technological tool, women can help curb domestic wastage, ensuring wise use and conservation of water. For both cities which rely heavily on tourism, it is imperative that large water consumers such as hotels are mandated to recycle, acquire ISO 14,0001 certification and/or implement CSR programmes. In the domestic area, women can play a vital role as they are the "water managers" at home. Women 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. A city-wide year-round water saving campaign employing all the mass media would be useful to increase awareness and ensure involvement of all water consumers. As water availability capacity is reached, there is no choice but for consumers to reduce their water demands. If not, there would be insufficient water for all.

In terms of gender, the study indicates that the role of women in domestic water management is of paramount importance. In Pattaya, 56 % of households reported that the mother was the main water manager in the home compared to 36 % for the father. Likewise, 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 domestic 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, 77.8 % of the time it is the mother's job to fetch water during water cuts, the remaining 22.2 % of the time being carried out by the son or daughter. None of the households in Georgetown reported that the fathers ever did any water fetching. This may have been due to the fact that most men are bread-winners of the homes and are most likely working in the office.

Results also indicate that the majority of households in Pattaya considered their water bills moderate to expensive, while their counterparts in Georgetown considered theirs between moderate to cheap.

ACKNOWLEDGEMENTS

The authors would like to express their thanks to the CIDA-AIT Partnership 2003-2008 Southeast Asia Urban Environmental Management

Applications Project, and the Urban Environmental Management, School of Environment, Resources and Development, Asian Institute of Technology, for funding and administrative support in the project from which this paper is produced.

REFERENCES

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). Water Resource Management in Malaysia and Thailand. In UEM Newsletter. Asian. Inst. Technol., **7** (3).

Chan, N. W., (2006b). Water Tariffs and The Poor. Water Malaysia Issue., **12**: 22-23.

Chan, N. W., (2007). The Perbadanan Bekalan Air Pulau Pinang Sdn Bhd (PBAPP): A Good Example of Corporate Social Responsibility of a Private Water Company. In Proceedings of International Forum on Water Environment Governance in Asia Technologies and Institutional Systems for Water Environmental Governance. Ministry of Environment, Japan, Tokyo., 19-25.

Chan, N. W. and Nitivattananon, V., (2006a). Water demand management for sustainable water resources management in Malaysia. Proceedings of International Conference on Environment Knowledge based Environmental Management and Sustainable Development**,** Penang, 13-15 November. Penang: Universiti Sains Malaysia.

Chan, N. W. and Nitivattananon, V., (2006b). Gender Perspectives in Water Demand Management: Examples from Malaysia and Thailand. In Jamaluddin Md. Jahi, Kadir Arifin, Azahan Awang and Muhammad Rizal Razman Managing Changes. Proceedings 3rd Bangi World Conference on Environmental Management, 5-6, Bangi, Malaysia. Bangi: Environmental Management Programme, Centre For Graduate Studies, Universiti Kebangsaan Malaysia and Environmental Management Society of Malaysia: 200-220.

Research Centre for Water Environment Technology, (2006). Proceedings of the Fourth International Symposium on Southeast Asian Water Environment. Bangkok: Research Centre for Water Environment Technology, School of Engineering, University of Tokyo.

Sethaputra, S. and Promma, K., (Editors) (2006). Proceedings of the International Symposium on Managing Water Supply for Growing Demand. IHP Technical Documents in Hydrology No. 6.

Snider, J., Hill, R. P., Martin, D., (2003) Corporate Social Responsibility in the 21st Century: A View from the World's Most Successful Firms, J. Bus. Ethics., **48**: 175-87.