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Improving Community Water Conservation Behaviour in Chachoengsao, Thailand

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ABSTRACT

The issue of water supply throughout the world is of concern for many reasons. A major factor is water pollution by industry, agriculture and residential sectors. Less than 3% of water is fresh and potable, while the remainder is saline. It is projected that by the year 2025, two-thirds of the world's population will encounter moderate to severe water shortages. As a result of unsustainable development over the past decade, Thailand has faced pollution problems as well as the depletion of many natural resources. These problems have impacted the country's main rivers (Chaopraya River, Thachine River, and the Bangpakong River), that are crucial to a sustainable economy, society, and culture. There needs to be a concentrated effort at all levels (individual to community) to address this problem. Individuals from specific communities can directly influence water quality in their own settlement or neighbourhood. This paper reports on a collaborative water conservation project undertaken in the Talad Banmai and Talad Bone communities in Chachoengsao province, Thailand. Two hundred and nineteen community volunteers participated for five months in the Water Conservation Campaign (WCC).Many different types of activities were implemented in the communities with pre and posttest data being collected on a range of behaviours. This paper will discuss the campaign as well as the results which demonstrated the effectiveness of the WCC on the intervention group, compared with the control group in posttest and partial effectiveness in the follow up. Community involvement in a water conservation campaign is an effective, empowering and useful approach to address the issue of water pollution in the Bangpakong River.

INTRODUCTION

Water is of paramount importance for the sustainability and development of society. Less than 3% of the world's water is fresh, while the remainder is saline (Tolba & El-Kholy. 1999, UNESCO 2003).Over the past century, global demand for fresh water has increased more than six-fold, compared to the threefold increase in world pollution. By the year 2025, two-thirds of humanity will suffer from severe or moderate shortages, unless we have better water resource management within our different ecosystems (Matsuura 1999). Fresh water is becoming increasingly scarce. Human-beings are not only contaminating the water supply but we also are consuming water at a rate faster than the groundwater reserves which can only be replaced by precipitation (Barlow & Clarke 2002.). The rate of water consumption is increasing two-fold every 20 years, which is greater than twice the human population growth rate (Barlow & Clarke 2002). The only way to ensure the positive development of society is to improve water management and conservation at the micro and macro levels. One way in which this may be accomplished is by making necessary changes to the attitudes and behaviour of people regarding their daily water consumption and management.

Water Resource in Thailand

Thailand is a country in South East Asia known for its large natural water resources. In the past, Thai people have been closely connected to the river. People relied on river water for their daily activities. Due to the close relationship between the Thai people and the river or canals, most Thai's settled along the riverside and their groups became communities. Thailand covers approximately 200,000 sq. km and has a population of almost 66 million. Approximately 6 million people reside in Bangkok, the capital of Thailand. Bangkok is located on the Chaopraya River, while Chachoengsao, a province in the Eastern Region, is located on the Bangpakong River. Both rivers flow into the Gulf of Thailand .The total water resources in Thailand cover 45,450 sq. km and include manmade reservoirs, groundwater, and other type of fresh water bodies. These water

resources can be divided into five regions: Central, Eastern, Northern, Western, and Southern. The quality of the water in many of Thailand's rivers is generally below acceptable standards especially in the dry season. Groundwater has become contaminated by wastewater from solid waste piles, and residues from toxic agricultural chemicals (Pollution Control Department, 2002).

The Bangpakong River in Chachoengsao Province

The Bangpakong River is the main artery of Chachoengsao Province. This river is of vital importance for daily water consumption, transportation of export products from the Eastern and Central regions, and as a food resource. The Chachoengsao region is undergoing significant economic development due to its proximity to Bangkok. However, economic development has brought with it increasing environmental pollution problems, which if allowed to continue, will endanger long-term sustainable growth, natural resources, and community members' quality of life. Approximately 1.2 million people live in the river basin. Pollutants discharged directly into the river are from domestic wastewater, industrial wastewater, and agricultural pollution. Generally, wastewater from communities is discharged into the river water after partial treatment or without any treatment.

As reported by Chachoengsao's Public Health Division (2000), the level of oxygen in the Bangpakong River at Wad Sothorn Wararam, Ampure Muang,Chachoengsao was 3.7 ppm, which is lower than the minimum acceptable level of 4.0 ppm. Furthermore, the level of nitrate was 39 units, which is much higher than the standard level of 5.0 units. Heavy metals were also found in the water. Similar results were detailed in the Pollution Control Department's reports in 2001 and2002. In these reports, the water quality of the 49 main rivers in Thailand was monitored, and placed into categories of good, moderate, low and extremely low. The water quality of the Bangpakong River was categorized as low level in both 2001 and 2002 (Pollution Control Department 2001-2002). Throughout Thailand household waste, carcasses, solid garbage, waste water from toilets, and animal farms contaminate the river everyday. This problem requires urgent action.

A Potential Water Pollution Solution

The Thai government is aggressively addressing wastewater and solid waste disposal problems. A substantial portion of the national budget has been allocated to support major wastewater treatment programs. However, it is not enough to invest only in modern technology and infrastructure to overcome the increasing scarcity of water resources. Changing human behaviour should be of equal concern.

In the past, citizens of Thailand were not only discouraged from public participation in local affairs, but were also encouraged to play a passive role in natural resource development. This situation has changed somewhat in recent years, corresponding to the Ninth National Social and Economic Developmental Plan (2001-2006). The Thai government declared strong support for conservation and the rehabilitation of natural resources by encouraging public involvement (Ngamcharoen, 2001).

It is clear that the solution of environmental problems requires community involvement, where members see themselves as direct stakeholders. River pollution is a community problem, therefore the solution to this problem is the responsibility of not only the individual but also the community (Nelson & Prilleltensky 2005). Citizens must make a commitment to resolve this problem together. Inevitably the local leaders must play a lead role in encouraging the community members to stop polluting the river they all share (Nelson & Prilleltensky2005).

Theoretical Framework

Although there are many rivers throughout Thailand, the Bangpakong River is a major waterway within the eastern province. It is also the main river system for six provinces and affects almost one million people in Chachoengsao province alone. Few research studies exist that have examined water pollution, and the role community members' play in the conservation of the Bangpakong River. This study will utilise Ajzen's Theory of Planned Behaviour (TPB) integrated with other

factors to achieve a better understanding of the motivation and constraints that exist among community members in conserving water along the Bangpakong River.

During the past decade, TPB has been widely applied with considerable success, to explain the casual factors of such social behaviour: premarital sex (Chang 1998) health behaviour and dieting (Conner and Sherlock 1998).In terms of environmental behaviour, many studies have been undertaken utilizing the TPB such as: waste paper recycling (Chueng et al.1999), and recycle household waste (Knussen et al.2004). Consequently, it can be argued that TPB is useful tool in explaining the development of behaviour change (Chueng et al.1999).

TPB (Ajzen 1991) proposes that behavioral intention is the proximal determinant of future behaviour. Intentions are assumed as the motivational factors that have an impact on the behaviour. Further intentions may signal, how hard people are willing to try, and how much effort they are planning to exert, in order to perform an act (Ajzen1988a).Ajzen stated that the behaviour is in fact under volitional control, the wilful intention produces the desired act.

The independent determinants of intention are attitude toward a behaviour, subjective norm and perceived behaviour control, and they interact to predict the intention to act. Moreover, perceived behavioural control has direct implication for the intentions to act. People who believe that they have no resources and a chance to perform a particular behaviour, find it difficult to form strong behavioural intentions, even if they hold positive attitudes toward the behaviour and believe that the significant others would approve of what they are doing. This implies that perceived behaviour control and intention directly correlate without being mediated by attitude and subjective norm (Ajzen 1988b). It can be concluded that all variables of TPB (Attitude, Subjective Norm, and Perceived Behavioural Control) can effectively predict the intention to conserve water.

The Additional Factors

The prediction of behaviour from intention is problematic because of a variety of factors in addition to identifying intention, and whether or not the specific behaviour is actually performed. Meta-analytic reviews indicate that attitudes, subjective norms, and perceived behaviour control explain a variance of intention (Armitage and Corner 1999). The prediction of behaviour from TPB variable is less impressive (Sheeran et al.1999). Intention and perceived behaviour control explained only 40% of the variance in behaviour.

Many past research results showed that previous behaviour often provides better prediction of future behaviour than perceived behaviour control (Oullette & Wood 1998; Sutton 1994). Cheung et al. (1999) indicated that general environmental knowledge plays a significant role within TPB framework. Therefore in this study past habit is one of the additional factors taken into consideration when assessing the intention to conserve water. In fact, actual behaviour is the function of continuous processes of multi directional interaction between the individual and the situation (Magnusson & Endler, 1977).The psychological meaning of an individual's situation in terms of belongings, and physical environment were also important determining factors. The connection to the residential community provides a sense of security, safety and privacy from outsiders(Chavis & Wanderman1990). In term of pro environmental behaviour, a sense of community play a catalytic role in mobilizing members' perceived quality of environment, which can serve as motivation for action (Chavis & Wanderman 1990). In Thailand, based on scoping interviews with the community, some community members indicated that insufficient numbers of garbage bins, and the unsafe placement of bins were the main constraints that contribute to the disposal of garbage into the river. This indicates that not only psychological factors influence their water conservation behaviour, but also situational factors. For these reasons, Sense of Community (SOC) and Situational Support (SS) were also added to the study. In conclusion, four additional factors; namely Knowledge, Past Behaviour, Sense of Community, and Situational Support were included as causal factors predicting the Intention to Conserve Water (ICW).

Research Objectives and Research Questions

This study investigates the main factors contributing to water conservation behaviour, leading to the development of a Water Conservation Campaign (WCC) to improve community members'

intention to conserve water, which in turn would lead to enhance water conservation behaviour. Two research questions were addressed. First, what were the significant factors that affect the Intention to Conserve water (ICW)? Second, did the Water Conservation Campaign (WCC) affect all 8 factors Attitude (Att.), Subjective Norm (SN), Perceived Behaviour Control (PBC), Past Behaviour (PB), Knowledge (Kn), Sense of Community (SOC), Situational Support (SS), and Intention to Conserve Water (ICW) in the Community Group and Control Group on pretest, posttest, and follow up study?.

In order to answer Research Question 1, three factors from the TPB namely: Attitude toward water conservation, Subjective Norm, Perceived Behaviour Control, and four external factors; (Past Behaviour, general Knowledge of water conservation, Sense of Community, and Situational Support) were proposed as predictors of Intention to Conserve Water. To test the effectiveness of the Water Conservation Campaign (WCC) in Research Question2, WCC was the independent variable, while the eight variables used to answer Question1 became dependent variables.

METHOD

Participants

Targeted Community: Sampling of the targeted communities was purposive. Talad Banmai and Talad Bone are more than 100 years old, with riverside markets communities along the banks of the Bangpakong River. The community members are in very closely aligned to the river. The river provides not only for daily consumption, but also for wastewater and garbage disposal. Talad Banmai and Talad Bone communities are becoming the new tourist centre of Chachoengsao Province, because of their over 120 wooden shop-houses. Therefore, the community committees make an effort to develop attractive riverside market scenery. The community members need to be aware of how to keep the river clean.

Two hundred and nine community members and leaders from four communities volunteered to take part in the study. The sample was composed of 41%male and 58%female. Forty five percent of participants were 31 to 50 years old. Primary and secondary education accounted for 40% and 34% respectively. Forty seven percent of participants had lived in these communities for more than 30 years. The participants were split into two groups, corresponding with the locations of their communities. One hundred and ten in Talad Banmai and Talad Bone Communities were the intervention group, while one hundred and nine participants in Bang Wua and Bang-Khla Communities acted as the control group. An agreement form requesting their participation in the study was distributed. The experimental communities participated in the Water Conservation Campaign (WCC), whereas the other two communities were a naturally occurring control group. The distance between treatment and control communities was approximately 20 kilometers, minimizing contact between the two groups.

Materials

Participants were asked to complete a questionnaire including demographic information. Rating water conservation behaviour was administered in a pretest, posttest and follows up study three months later. The scales consisted of 8 parts: 17 items were used to measure the participants' ICW, 14 items were used to rate attitude (Att) towards water conservation; 15 items were measured SN; 11 items measured PBC; 12 items were assessed PB; 13 items were measured SS. Each part was measured as 5 points on the scales (agree to disagree). The water conservation knowledge (Kn) was assessed using 23 questions, four multiple choices. The final part, measuring the concept of SOC as described by McMillan and Chavis (1986) a questionnaire consisting of four domains; membership, influence, integration, and connection. The SOC was Cronbach's Alpha= 0.71-0.80. The present study's questionnaire was pilot tested with 100 participants and Cronbach's alpha was calculated at Pretest 0.86; Posttest 0.87 and follow up 0.90.

Process

The Water Conservation Campaign (WCC) was held during February to July 2004. At the beginning of the study, the participants in both groups were asked to complete a pre-test. A posttest was administered after WCC, and follow up study was conducted three months later.

The Water Conservation Campaign (WCC) was a community-base which consisted of a variety of activities during which the members and leaders cooperated to learn ways to conserve the Bangpakong River. Multimedia presentations were also provided to all participants in a community forum and small group discussions, including personal contacts which the leaders and members discussed together, focusing on the water conservation issues. The WCC was designed by the leaders as part of their involvement in three workshops as shown in the figure1.

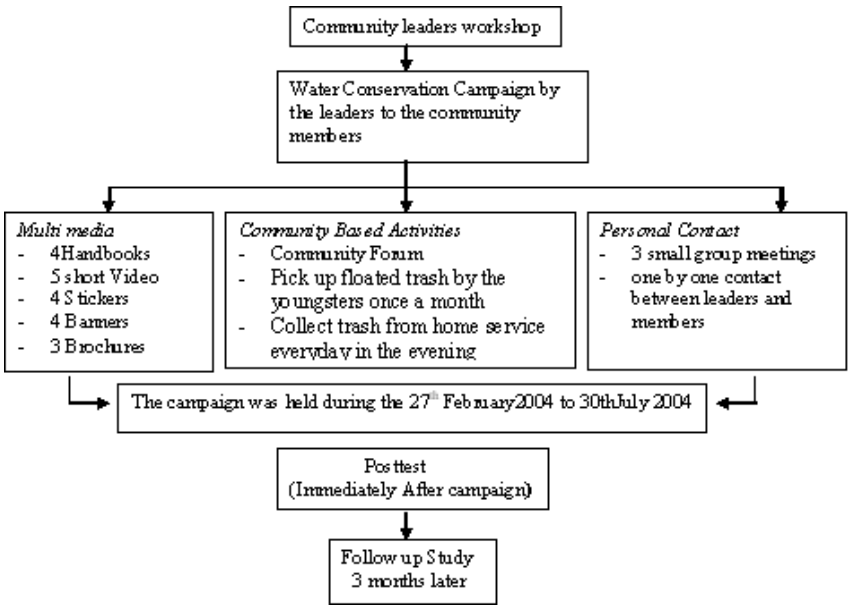

Figure1: Illustrated the design of Water Conservation Campaign.

RESULTS

Data were screened using SPSS which identified a number of outliers. As a result, the researcher chose to use Epsilon values because of its power (Hinton 2004). The Epsilon values are taken into consideration as suggested by Field. In this case, when Epsilon was >0.75, the Huynh-Feldt correction was used and Epsilon is <0.75 or nothing, the Greenhouser-Geisser correction is used (Field 2003).

In order to answer research question one; What were the factors that have significant effects on the Community group's Intention to Conserve water (ICW) in the study; a Multiple Regression analysis was conducted .The results are displayed in Table1.

Table1
The Effects of 7 Independent Variables on the Community group's Intention to Conserve the Water (ICW) in the study [Pretest, Posttest and Follow up Study]N=219.

Model		Un-standardized Coefficients		Standardized Coefficients	T
		B	Std. Error	Beta	
1	(Constant)	10.94	6.19		1.77
	Pretest (Subjective Norm)	.08	.07	.08	1.16
	Posttest (Attitude)	.08	.08	.07	1.03
	Follow up (Attitude)	.58	.08	.53	7.58*
	Follow up (Subjective Norm)	.36	.08	.36	4.52*
	Follow up (Situational Support)	-.15	.07	-.143	-2.05

* p<0.05

Table 1 showed that there were only two variables having significant effects on the community subjects' ICW during the entire study [pretest, posttest and follow up].They were the participants' Attitude towards water conservation and their Subjective Norm (SN), their Beta weights (effects) were 0.528 and 0.359 correspondingly. The rest of the variables were not significant. It should be noted that, as a whole, the community subjects' Situational Support (SS) was not significant on their intention to conserve the water.

Results for research question two , Did the Water Conservation Campaign (WCC) affect all eight factors in the Community and Control Groups during pretest, posttest, and follow up study?, was addressed through the use of MANCOVA. A repeated measure MANCOVA was calculated to test the effect of WCC to all eight dependent Variables in both groups on posttest and follow up. The results are shown in Tables 2, 3, 4 and 5.

Table 2
Basic Statistics of the Variables of all participants in the Posttest.

	GROUP	Mean	Standard Deviation	N	Possible range
Knowledge	community	17.38	2.54	110	
	control	15.48	4.24	109	
	Total	16.43	3.61	219	0-23
Sense of Community	community	33.50	4.35	110	
	control	33.64	3.81	109	
	Total	33.57	4.08	219	12-60
Intention to Conserve Water	community	70.93	6.96	110	
	control	63.53	6.65	109	
	Total	67.24	7.73	219	17-85
Attitude	community	59.28	5.97	110	
	control	54.09	5.01	109	
	Total	56.70	6.08	219	14-70
Subjective Norm	community	63.82	6.09	110	
	control	54.31	6.64	109	
	Total	59.09	7.95	219	15-75
Past Behaviour	community	46.50	5.81	110	
	control	41.02	5.14	109	
	Total	43.77	6.12	219	12-60
Perceived Behavioural Control	community	42.02	5.43	110	
	control	38.59	4.35	109	
	Total	40.31	5.20	219	11-55
Situational Support	community	42.74	4.95	110	
	control	41.06	3.75	109	
	Total	41.90	4.46	219	13-65

Table 2 indicates the means and standard deviations of each variable in both the community and control groups in the posttest. The difference between the means of each variable is illustrated Table 3.

Table 3
The Differences of Means of each Variables of all participants between the two groups in the Posttest
N1=110,N2=109.

Dependent Variable		Sum of Squares	df	Mean Square	F	Partial Eta Squared	Observed Power
Knowledge	Contrast	123.41	1	123.41	10.21*	.05	.89
	Error	2587.15	214	12.09			
Sense of Community	Contrast	2.13	1	2.13	.130	.00	.07
	Error	3492.57	214	16.32			
Intention to Conserve Water	Contrast	2549.28	1	2549.28	55.70*	.21	1.00
	Error	9795.05	214	45.77			
Attitude	Contrast	1070.27	1	1070.27	35.62*	.14	1.00
	Error	6429.80	214	30.05			
Subjective Norm	Contrast	3921.97	1	3921.97	96.00*	.31	1.00
	Error	8743.07	214	40.86			
Past Behaviour	Contrast	1251.22	1	1251.22	41.51*	.16	1.00
	Error	6450.58	214	30.14			
Perceived Behavioural Control	Contrast	372.42	1	372.42	15.33*	.07	.97
	Error	5200.42	214	24.30			
Situational Support	Contrast	130.13	1	130.13	6.74*	.03	.73
	Error	4130.82	214	19.30			

* $p<0.05$

As indicated in Table3, when Knowledge in water conservation (Kn), Perceived Behavioural Control (PBC), and Situational Support (SS) in the pretest were controlled (co varied) in a MANCOVA. The results indicated that, there was a significant difference between the means of the participants in the community and control groups in each variable ($p<0.05$) in the posttest except their Sense of Community (SOC).When taking the means from Table 2 into consideration, it was found that, the community participant's Knowledge in water conservation (Kn), their Intention to Conserve Water (ICW), their Attitude towards water conservation (Att), their Subjective Norm (SN), their Past Behaviour (PB), their Perceived Behavioural Control (PBC), and their Situational Support (SS) were all significantly higher than those in the control group ($p< 0.05$).

Therefore, the posttest demonstrated that the water conservation campaign had a significant and positive effect on the community participants except their SOC.

Table 4
Basic Statistics of the Variables of all participants in the Follow up study.

	GROUP	Mean	Standard. Deviation	N	Possible range
Knowledge	community	16.83	3.36	110	
	control	13.66	4.19	109	
	Total	15.25	4.11	219	0-23
Sense of Community	community	32.67	4.149	110	
	control	33.43	4.85	109	
	Total	33.05	4.52	219	12-60
Intention to Conserve Water	community	70.02	7.03	110	
	control	68.04	6.99	109	
	Total	69.03	7.06	219	17-85
Attitude	community	57.69	6.37	110	
	control	57.44	5.60	109	
	Total	57.57	5.99	219	14-70
Subjective Norm	community	61.51	6.92	110	
	control	57.70	7.61	109	
	Total	59.62	7.50	219	15-75
Past Behaviour	community	46.88	5.66	110	
	control	43.17	7.53	109	
	Total	45.03	6.89	219	12-60
Perceived Behaviour. Control	community	43.03	5.76	110	
	control	42.00	4.49	109	
	Total	42.52	5.18	219	11-55
Situational Support	community	41.52	6.83	110	
	control	45.13	6.22	109	
	Total	43.32	6.77	219	13-65

Table 4 shows basic statistics, especially means and standard deviations of each variable in both community and control groups in the Follow up study. The difference between the means of each variable was tested in Table 5.

Table 5
The Difference of Means of each Variable of all participants between the two groups in the Follow up study.N1=110, N2=109.

Dependent Variable		Sum of Squares	df	Mean Square	F	Partial Eta Squared	Observed Power
Knowledge	Contrast	262.06	1	262.06	20.53*	.09	1.00
	Error	2731.82	214	12.77			
Sense of Community	Contrast	25.23	1	25.23	1.23	.01	.20
	Error	4390.60	214	20.52			
Intention to Conserve Water	Contrast	65.42	1	65.42	1.36	.07	.21
	Error	10324.40	214	48.25			
Attitude	Contrast	42.63	1	42.63	1.23	.07	.20
	Error	7411.56	214	34.63			
Subjective Norm	Contrast	545.04	1	545.04	10.63*	.05	.90
	Error	10969.19	214	51.26			
Past Behaviour	Contrast	616.11	1	616.11	13.93*	.06	.96
	Error	9467.69	214	44.24			
Perceived Behaviour Control	Contrast	10.96	1	10.96	.41	.00	.10
	Error	5723.18	214	26.74			
Situational Support	Contrast	473.57	1	473.57	11.00*	.05	.91
	Error	9210.06	214	43.04			

When the Knowledge in water conservation (Kn), Perceived Behaviour Control (PBC) and Situational Support (SS) in the pretest were controlled (covaried) in a MANCOVA, the results (table5) showed that there were only four significant differences and four non-significant ones between the means of the participants in the community and control groups ($p = 0.05$) in the follow up study. When taking the means from Table4 into consideration, it was found that, on average, the community participants' Knowledge in water conservation (Kn), their Subjective Norm (SN) and their Past Behaviour (PB) were all significantly higher than those of the control group ($p< 0.05$). For example, the means of the community participants' Knowledge in water conservation (Kn) was significantly higher than that of the control's $F (1,217) = 20.529$, $p<0.05$. However, it was found that the means of the Situational Support (SS) of the control group was significantly higher than that of the community group.

Therefore, the water conservation campaign still had significant and positive effects on the community participants in the 3 mentioned aspects, and a significant but negative effect on their Situational Support in the follow up study.

DISCUSSION

The present study results provide evidence for the applicability of the Theory of Planned Behaviour(Ajzen 1985) to understand and predict community member's intention to conserve water. Attitude toward water conservation was the main predictor, followed by subjective norms of Intention to Conserve Water. The results are supported by those obtained by Cheung et al (1999) and Chan (1998).

According to the results of the intervention (posttest), the Water Conservation Campaign (WCC) had positive effects on all measured factors: Attitudes towards water conservation, Subjective Norm, Perceived Behaviour Control, Past Behaviour, Knowledge in water conservation, Situational Support, and Intention to Conserve Water, except Sense of Community. All these factors in the intervention group were significantly higher than those in the control group. Furthermore, the Water

Conservation Campaign still had significant and positive effects in follow up study on three variables of the community group (Knowledge in water conservation, Subjective Norm, and Past Behaviour).

The influence of multimedia material becomes crucial source of social pressure to encourage water conservation and educate the participants. Moreover, a variety of community-base activities; such as the example shown by those community youngsters and leaders picking up floating trash from the river, could demonstrate what kind of behaviours are pro environment (Chan 1998).Therefore, leaders and youngsters need to be encouraged by local government to be models for the rest of the community.

However, it was found that the WCC had negative effect on Situational Support (SS). It showed that the participants were not receiving the situational support they require. According to some leaders, during the WCC period, many local garbage bins were removed, because households litter was to be picked up by municipal garbage truck instead. After some community people complained, the municipality did not put the garbage bin in the same place. This was likely to have led to feeling of frustration and could contribute to a reduction in conservation behaviour.

The results also demonstrated that while Attitude towards water conservation, Perceived Behaviour Control, and Intention to Conserve Water, which had significantly positive effected in posttest after WCC, but became non significant in the follow up study. This indicated the inconsistency of respondents' behaviour in the community group. In the present study, as with previous studies, people were willing to engage in voluntary pro environmental behaviour, but they no longer had enough time to expand on waste disposal or waste reduction problems (Chan 1998).This suggested that publicity campaign should be conducted continuously and steadily to empower community leaders and members to share the responsibility for taking care of their own natural resources. In addition, to fully realize effective water conservation behaviour, the local government needs to contribute appropriate incentives to the leaders and also allocates fund.

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