

# **A Case Study on Public Participation for the Conservation of a Tropical Urban River**

**Ming Huey Chun, Wan Nor Azmin Sulaiman\*, Mohd Armi Abu Samah**

Department of Environmental sciences, Faculty of Environment Studies, University Putra Malaysia,  
43400, Serdang, Selangor

*Received: 1 July 2010*

*Accepted: 8 December 2011*

## **Abstract**

Population pressure and land use activities in urban areas are deteriorating the health of ecologically rich tropical rivers. Despite various programs and enforcement carried out by government agencies, most river conservation projects are not sustained according to the expected objectives. Much of the blame is due to lack of public environmental awareness and participation. However, there is a lack of adequate local field data to explain this scenario. This case study was specifically conducted to evaluate the local public perception and willingness to participate on a river conservation project of an urbanized Temiang River watershed located in Peninsular Malaysia. This survey was carried out on 200 randomly selected respondents. Contrary to blame, results indicated that awareness was not the major issue; instead, it is their voluntary involvement in protecting the river. Overall, the respondents show a high willingness to be involved in the conservation program. However, factors of age, educational background, gender, income level, marital status, and residential locations determine the level of their willingness to participate.

**Keywords:** public participation, willingness, satisfaction, river conservation, common knowledge

## **Introduction**

Over the past few decades there has been a paradigm shift in approaches to managing a river basin in most developed countries. Traditionally, the management of a river basin is the sole responsibility of the government or public agencies. However, due to the increase in complexity of water related problems and awareness of public in environmental protection, an integration of the public participation involving non governmental organizations (NGOs) as well as stakeholders have been incorporated in many governmental policies on water resource management [1, 2]. The Hazel River Basin program under the European WFD [3] and the White River Watershed program in Vermont, U.S. [4], are pertinent examples of river basin programs that involved public participation. In addition, the EU research

program on new approaches to adaptive water management under uncertainty (NeWater) has also engaged in conducting a community-based approach [5]. Shrestha [6] reviewed community participation in wetland conservation in Nepal. Williams [7] explored four case studies where community participation has led to success and failure in managing lakes in Australia. One of the benefits of promoting public awareness and involvement in rehabilitating urban streams and watersheds may foster a sense of place and community [8]. Examples of research involving public involvement in river management such as river restoration are extensive. Issues pertaining to the main players [9], participant's value and knowledge, continuous involvement [10], and disparities between socio-cultural boundaries and river basin boundaries [11] are commonly addressed.

Based on successful examples from developed countries, water-related agencies in developing countries such as Malaysia try to follow and adopt a similar approach of

---

\*e-mail: wannor@env.upm.edu.my

involving public participation in managing rivers [12]. One such example is on a river restoration and conservation program with the aim of improving both flood protection and water quality locally. Even though awareness of this issue among the managing agencies is increasing, the understanding of the issue at the grass root level is limited. There has been a lack of local examples and studies on the success and effectiveness of public participation in the conservation of a river basin in tropical regions such as in Malaysia. For example, the “Love Our Rivers” campaign, a program that was launched in 2007 throughout the country by the Department of Irrigation and Drainage of the Malaysian government, was considered a failure [13] since most of the major rivers are not getting cleaner but instead more polluted. Statistically more than half of the 400 rivers in Malaysia are badly polluted and degrading in quality. Furthermore, out of 120 river basins monitored, 62 were classified as polluted in 2004 [14]. The main causes of urban river pollution in Malaysia are point and non-point source emissions of effluent from industrial areas and sewage that lacks proper treatment, uncontrolled dumping of rubbish into river, sedimentation due to land development, sand mining and effluent from animal husbandry and agriculture. The effects of river pollution are known to increase in cost to drinking water treatment plant, extinction of aquatic lives, destruction of natural recreation places, increasing the cost to rehabilitate the river, flash floods, affect the tourism activities, and human health [15]. There were many possible reasons for the failure of the “Love Our Rivers” campaign, including:

- (a) lack of enforcement on regulation and lack of promoting the campaign
- (b) lack of public participation and awareness of the program
- (c) lack of monitoring and continuous maintenance work

“One State, One River” is yet another government development program under the Ninth Malaysia Development Plan (2006-10). Under this program, about RM 5 million (US\$ 1.3 million) was allocated to each state to manage their rivers. The purposes of this program are:

- (a) to make sure that river water quality will achieve a minimum of second class in the water quality index (based on the country’s adopted water quality index classification for rivers) by 2015
- (b) that rivers become recreational areas and free from floods and rubbish. Despite several programs that have been conducted at local levels by government agencies; the success of such programs has yet to be seen.

Is the local public really aware of the government’s efforts in managing their river? And what kind of contribution the locals could contribute toward maintaining the cleanliness of the river? Often prior knowledge on these issues is greatly needed by the managing agencies when they want to start and implement the programs, especially at grass root level, unless proper study is employed locally. The aims of this study were to determine the status of public satisfaction on the existing conservation program of a select river basin, to find out how far the public can contribute toward future conservation programs, and to determine the level of general knowledge on river health of the

locals residing along the river. Having a clean and clear Temiang River is not an impossible task. Cooperation between the public, government agencies, and all stakeholders could help to conserve the river in a more sustainable way. To achieve the sustainable level in river health, public participation should be given more room for involvement than before. It is envisaged that through this survey study, the public satisfaction and willingness to contribute in restoring a river can be understood and may serve as a reference on ways for the river authority to plan their involvement in future conservation work.

## Methodology

### Study Area

The selected study area is the Temiang river watershed. This area was selected because an example of a typically problematic urban river in Malaysia and it has been selected by the state government for a river conservation project. The main river channel is 9 km long and the watershed area is 34 km<sup>2</sup>. The river flows through Seremban Town, draining the sewage from the housing areas, shop houses, workshops, hawker centre, schools, market, and shopping complex (Fig. 1). The river finally flows into Linggi River, which is a major water supply catchment for the city of Seremban with approximately 400,000 people. The Linggi River Water Treatment Plant and intake point is situated in this river basin.

The Temiang River was formally used for recreation, domestic purposes and can support many aquatic lives. However, development activities within the watershed have significantly polluted this river. Residential development and commercial development has increased the sedimentation rate, resulting in the river channel becoming shallower. In addition, some irresponsible citizens treat the river as a natural dumpsite, making the problem worse. Odor, floating

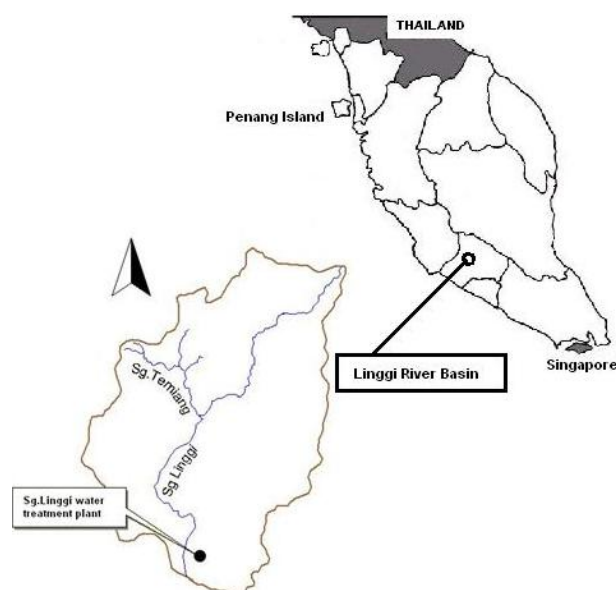


Fig. 1. Location of Temiang sub-basin within the Linggi River basin.

debris, and floods are the first impression the Temiang River has given to local people. The government has implemented several projects to upgrade and conserve the river, such as installing L-shaped concrete, and widening, deepening, and straightening the river channel. The government agency has also organized activity such as cleaning up the river together with residents in the council area. In July 2005, a water quality monitoring station was established for this river. Fig. 2 shows the current water quality of the Temiang River monitored by the state Department of Environment, Negeri Sembilan. Water quality fluctuated between Class III and Class IV (Adopted Malaysian River Water Quality Index for rivers) [16]. Water quality Class III means an extensive treatment is required for water supply, it can support hardened river aquatic species, and it can also be the source of drinking for animals. While Class IV water is suited only for irrigation purpose. The Seremban Municipal Council has allocated RM 70,000 (US\$ 29,000) to clean up this river for the year 2006. They also held "Program Gotong – Royong PerdanaPeringkat Negeri Sembilan 2006," which was a volunteer program involving local residents cleaning up Temiang River on 10 September 2006.

Temiang River was also chosen by the state government of Negeri Sembilan for the "One State, One River" program (Implemented under the federal governments 9<sup>th</sup> Malaysia Development Plan, (2006-10). In order to achieve the objectives of the program the respective government agencies need to apply integrated river basin management (IRBM), which involves preventive measures, curative measures, and applied management.

### Data Collection

This survey was carried out among those who reside as well as having activities along the Temiang river watershed. Two hundred respondents were chosen from five strategic zones with 40 people to represent each of the following zones:

- Flat PKNS residential area
- Kampung Lobak village
- The wet market
- Bazaar Lee Sam Road commercial area
- Wisma Puncak Emas commercial area

Locations (a) and (b) represent residential areas, while the remainders are commercial areas.

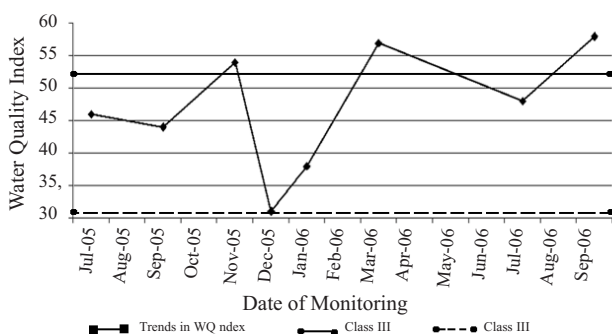


Fig. 2. Water quality index for the Temiang River.

Survey questionnaires were designed in three languages (representative of the three different racial groups): English, Bahasa Malaysia, and Chinese. The respondents consisted of 96 Malays, 64 Chinese, and 40 Indian, which represent the ratio of races in Seremban City [17]. The first part of the questionnaire concerns the respondent's background. Ten close-ended questions were asked with multiple choice categorical, and numerical answers. The second part is about respondents' satisfaction based on the condition of the Temiang River. Ten close-ended questions with Likert-scale were asked in this section. The respondents indicated how closely their feelings matched the question or statement on a rating scale of 1 to 5, of which indicates:

- (1) strongly disagree
- (2) disagree
- (3) no opinion
- (4) agree
- (5) strongly agree

The third part of this survey is composed of eleven questions about the respondent's willingness to take part in conserving the river. The last part deals with a respondent's general knowledge in river management and related environmental problems. In this section, there are eleven true or false questions. The survey was done with a face-to-face method [18]. This method can help the researcher in asking more questions and be able to know whether the person is confused. The possibility of getting "no opinion" answers could be reduced because the researcher can explain to the respondent about the question.

A pilot test was run before the actual survey was carried out with twenty copies of questionnaires to the respondents from the same areas. This is to make sure that the questionnaires are generally comprehensive and understandable to the respondent in the actual survey. The questionnaires were delivered, which involved face-to-face interviews. The respondents of this pilot test involved the three races (Malay, Chinese, and Indian) and they represented communities that reside in the upper and lower parts of the catchment. The age of the respondents was between 20 and 70. All 20 copies of the survey questionnaire were collected and analyzed. Analysis of the returned questionnaire indicated that 95% of the respondents did not have any problem answering all of the questions asked. However, the other 5% of the respondents indicated that they have problems in answering the questions related to the general knowledge in river management and problems. Therefore, simplified version of the questionnaire was written to suit the background of the respondents and used for the actual survey.

### Analysis

All surveyed data was analyzed with Statistical Package for Social Science (SPSS). The tests that are used include: Reliability, Frequencies, Crosstab, Chi-square, Paired Samples T-Test, and Null Hypothesis Significance Testing Procedure (NHSTP) [19]. Reliability analysis measured whether the answers of a questionnaire are random or not. Frequencies and crosstabs are used to see the trend of the variables.

### Results and Discussion

The respondent's background in the study included 96 Malay, 64 Chinese, and 40 Indian, which represent the population of races in the Seremban City (Fig. 3). According to [17], there are 173,393 Malay (48%), 117,360 Chinese (32%), and 71,007 Indian (20%) residing in Seremban City.

Fig. 4 shows the distribution of age for the respondents, where most of them belong to the middle-aged group. There are 30 respondents younger than 20, 39 respondents between 20 and 29 years old, 48 between 30 and 39, and 43 in the group 40-49. 19 respondents are in the group of 50-59 and 21 are 60 years old and above.

#### Respondents' Satisfaction with the Condition of the Temiang River

Results showed that (66%) of respondents agree that the existing condition (such as aesthetics and cleanliness of river water) of the Temiang is getting better (Question 1), they can also accept (59%) the smell of the river water (Question 2), but they worry (46%) about the water quality of the river (Question 7). They agreed (79%) with the suggestion that public awareness in protecting the river is getting better (Question 3). Most of them (66%) agree that the "Love Our River" campaign did not succeed due to lack of

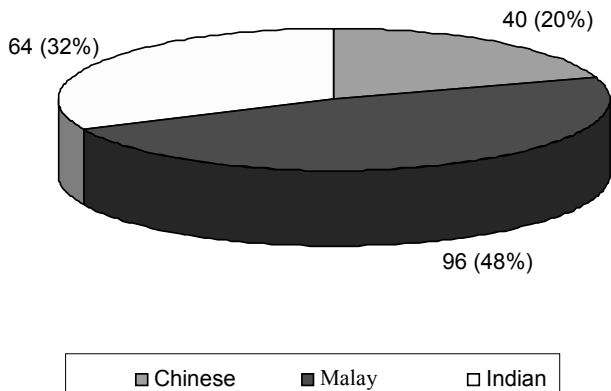


Fig. 3. The distribution of respondents according to race.

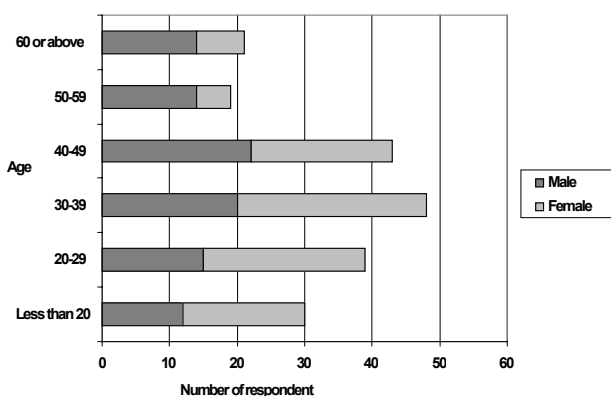


Fig. 4. The distribution of respondents' age and gender.

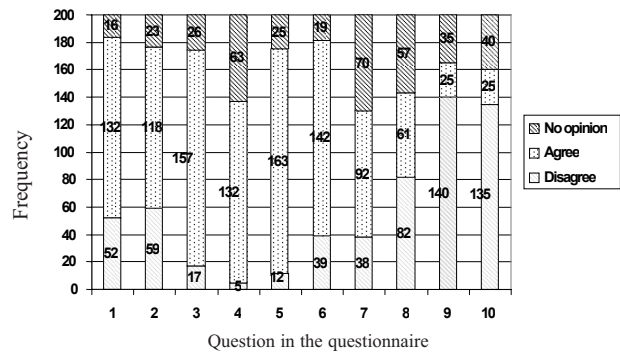


Fig. 5. Respondent contentment with the condition of the Temiang.

public participation (Question 4), and (82%) development activities within the watershed is the main reason for river pollution (Question 5). Most of them (71%) agree that the government's efforts had prevented the flood problem effectively (Question 6). However, they are not satisfied (41%) with law enforcement in protecting the river (Question 8), and (70%) say that the effluent from the central market has not been treated well before entering the river (Question 9). They also agreed (68%) that public involvement in conserving the Temiang is weak (Question 10). Fig. 5 listed the results according to the questions on respondent's contentment.

Total scores on the satisfaction of respondents on existing river conditions are further divided into two general groups, viz: those with lower satisfaction and higher satisfaction groups (with the mean as a dividing line between the two groups). Those higher than the mean value of 2.24 were categorized as higher satisfaction score and the rest are considered lower satisfaction. Score analysis shows that there are 106 (or 53%) of total respondents who are less satisfied with the existing condition of the Temiang (Fig. 6). Cronbach's alpha statistical significance of this portion is 0.703. There are significant differences with the respondent's age, gender, marital status, and race.

Respondent ages are divided into two groups: below 30 and above 30 [20]. Surprisingly, 85.8% of the respondents that are more satisfied with the existing condition of the river belong to the age group above 30 years old, and 57% of those with less satisfaction on the condition of the river area are below 30 years old, which means older people are more satisfied with the existing condition of the Temiang.

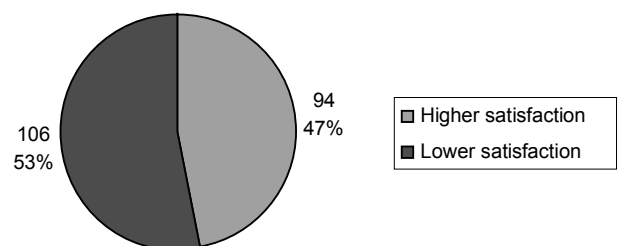


Fig. 6. Overall respondent satisfaction on the existing condition of the Temiang.

The respondents above age 30 agreed that the condition of the Temiang is getting better and they can accept the smell of the river water. According to [21], if the odor persists, there will be adoption to the odor after prolonged exposure, or in another word, habituation. Where people have already gotten used to the smell they tolerate the condition. Odor perception is, however, a way for a person to justify the quality of air. Thus, it will definitely influence a person's judgment of river quality, because it is where the smell comes from. For people who live or work near the river, their perception on the quality of the river might be affected because of long-time exposure to this smell. They also agreed that the government's efforts had prevented the flood problem effectively and they are satisfied with the law enforcement in protecting the river. However, most of them have no option or opinion on whether they are worried about the water quality of the Temiang.

On the other hand, those younger than 30 years old disagreed that the condition of the river is getting better and they cannot accept the smell of the river water. They also disagree that the government's effort had prevented the flood effectively and they are unsatisfied with law enforcement in protecting the river. The root cause is that projects that were carried out by the Drainage and Irrigation Department (DID) to overcome flood woes were implemented during the 1980s and 1990s and it is a long-term process, where the younger generation is too young to notice these projects before and after changes. The results also indicated that the younger generation has greater environmental awareness; they are more exposed to environmental issues and show concern about them. In a study by [22], age was negatively correlated to the egoistic, altruistic, and biospheric concerns. As people get older, their environmental concerns will normally be lowered.

Analysis also indicates that male respondents are most satisfied with the river's condition. This study showed that women tend to worry more and show concern compared to men. Women generally have higher thought, suppression, and negative problem orientation compared to men. They have a ruminative style of coping when depressed, while men have active strategies of distraction [23]. These might have caused them to be more worried with the condition of the river and thus unsatisfied with it. Moreover, women have a higher environmental concern than men [24]. In his finding, women scored higher on altruism, egoism and biospheric than men. Female respondents cannot accept the smell of the river water, and they also disagree with the statement of "public awareness in protecting the river" is getting higher and that the government's efforts prevented the flood problem effectively.

Married respondents tend to be more satisfied with the condition of the river. This is due to most of the married respondents being above 30. The Chinese are more unsatisfied with the condition of the river when compare to the other two races. Most of the Chinese are from downstream locations, and because the pollution occurs downstream; this might be why they are not satisfied with it.

Fig. 7 shows the frequencies of response from different locations. There are differences among locations where

respondent lived; people living up stream are more satisfied with the condition of the river. The analysis shows that there is a significant difference for location 2-4,  $t(39)=3.139, P<0.05$  and location 2-5,  $t(39)=2.360, P<0.05$ . Respondents from location 1 are more content with the condition of the Temiang River compared to respondents from locations 4 and 5. Referring back to Fig. 3, these two locations are both situated downstream. The river water flows from location 1 to location 4, and 5 will pass by a wet market. Effluent from the central market is not well treated before entering the river, causing more pollution. Even though the Seremban Municipal Council had inserted a trap to screen out rubbish and debris, the effectiveness of the instrument is low.

There were several projects run by the government for the past 20 years in order to modify the river channel. However, there is still flash flooding (for example the one that occurred on 20 November 2006 [25]). The effectiveness of a structural approach to overcome flooding is questionable. The straightening and widening of certain stretches of the river channel has increase the capacity of the river and at the same time increased the speed flow of the water, in the end causing downstream flooding.

### Respondent's Willingness to Take Part in Restoring River

An incorrect assumption of general attitudes like "an environmental concern determines specific behavior" speaks to the weak relationship between environmental concern and specific environmentally related behaviors [26]. Only specific situation cognition can determine specific behavior. In his study, Bamberg [26] found that there was good correlation between intention and behavior, which means people with a higher intention to conserve the river do have a tendency to behave in such a way as to conserve the river. According to [27], verbal commitment does affect a person's behavior. An individual who expressed his or her intention to behave in a specific way is more likely to perform the behavior as well. As can be seen from Fig. 8, the overall willingness of respondents is rather high; 68.5% or 137 of the respondents are willing to contribute in river conservation. Fig. 9 shows the results of the willingness of respondents in restoring the river. The reliability for the questions on respondent willingness is 0.791.

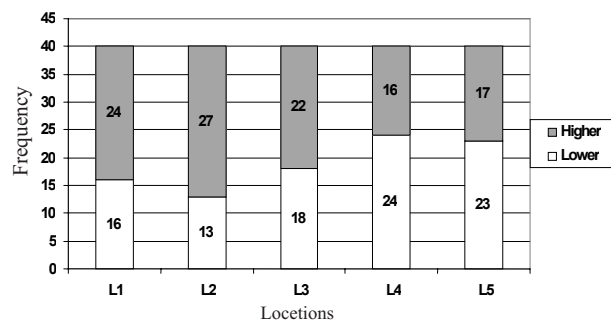


Fig. 7. Overall respondent satisfaction by locations of their residence within the basin.

Most of the respondents will take part in a campaign for river conservation (Question 1). Respondents who are single and below age 20 are more willing to take part in such activities. Younger people are more concerned with environmental deteriorations than older persons [27]. They are more supportive of actions against environmental deteriorations. In developing countries, more youth care about environmental issues because older people are less exposed to information of environmental issues, whereas youngsters are well exposed to the informative world.

According to [27], support from family or parents is higher compared to friends. In his finding, the respondents who were university students, their parents are more likely to agree with and give encouragement. However, in this case, when they were asked whether they would lead their friends (Question 5) and family (Question 6) to take part in such activities, the score for friends are slightly higher compared to the family. This means that people are more willing to invite their friends to join them in taking part in river restoration as compared to inviting their family. Analysis also shows that willingness is influenced by a respondent's age and marital status. Respondents below age 20 and single are more willing to do it. The same thing happened regarding willingness to increase their knowledge through reading articles on restoring the river; the younger generation seems to have higher willingness.

Most of the respondents are willing to donate money for this kind of activity (Question 11) and almost all of them said they would not throw rubbish into the river (Question 3). Those who are not willing to donate money said they already paid the tax and they do not want to pay double. Obviously, a few of them answered they will throw rubbish into the river. 145 of the respondents said they would read

articles on restoring the river (Question 7) and significant differences existed for respondent's age and marital status; respondents with age below 20 and those who are single are more supportive.

However, only half of them are interested in getting to know the water quality of the river (Question 2). This is because they are not directly consuming the water and they are willing to rely on the government, specifically the Department Of Environment, to maintain river water quality. Respondents with certain specific backgrounds are more interested in knowing the quality of the river water. Most of the respondents who are under 20 years old and single gave positive responses as are the respondents who are Hindu. Respondent with higher annual income RM 40,000-RM 49,999 are also interested.

When it comes to circumstances that high behavioral costs are needed, their willingness to contribute becomes very low. Situations such as whether they will stop people from throwing rubbish into the river (Question 4), or write to the newspaper (Question 8), or call to the radio station (Question 9), or to show their concern about the problem of river pollution and report to the authorities if they see people polluting the river (Question 10), their willingness becomes weak. 61 out of 200 respondents will stop people from throwing rubbish into the river. Most of them are below 20 years old. Only 12 of the respondents are willing to write to the newspaper and nine are willing to call the radio station. In addition, only 10 out of total respondents will report to the authorities when they see people polluting the river. They also commented that authorities take a long time to react to complains, thus they will not be able to catch the person and as such their efforts are useless. There is not much different within locations surveyed for respondents' willingness, most of them are willing to contribute to the conservation of the Temiang River.

Socio-demographics is weakly correlated to environmental concern, but there are certain factors that showed a consistence of influence on individual's environmental concern [27]: age, education, residential area, and political ideology showed a noticeable effect. In this case, we found that a factor affecting the most is respondent's age, in which the younger generation has a higher intention to contribute in river conservation. There are also other factors such as marital status, but this is affected by the respondents' age. Their willingness is low and when involved strenuous work they will do only what is easy to perform.

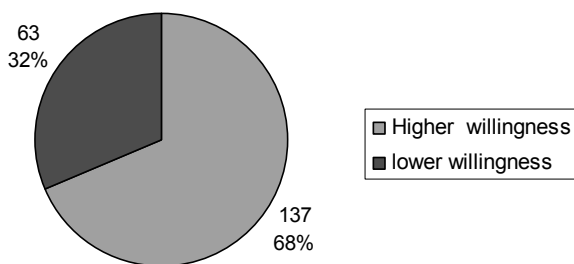


Fig. 8. Overall willingness.

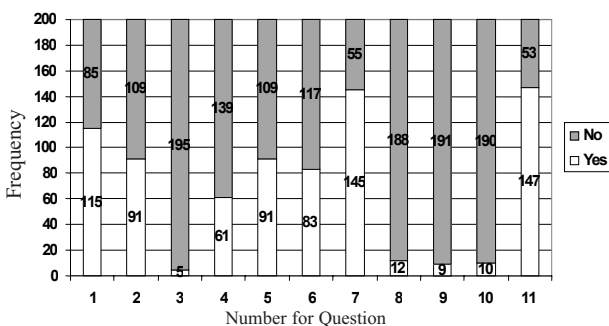


Fig. 9. Respondent's willingness to contribute to a river conservation program.

### Respondent's General Knowledge of River Management and Problems

According to [27], knowledge is one of the factors affecting people's behavior; it is closely related to a person's intention. People will not react in the opposite way as they are not convinced that the action will cause an environmental problem. However, there are also other factors affecting an individual's behavior, which are situation factors. For example, the economic constraints, social pressures, and opportunities to choose alternative behaviors.

Table 1. Questions and scores for general knowledge.

| No.   | Questions   | True  | False         |
|---|---|-------|---------------|
| 1   | It is the responsibility of the Department of Irrigation and Drainage to manage our river | 155   | 45            |
| 2   | The “One state, One River” campaign is an activity to restore our river                   | 190   | 10            |
| 3   | Water pollution can be determined through its color, smell, and taste.                    | 195   | 5             |
| 4   | Water pollution can be recognized through analytical methods.                             | 176   | 24            |
| 5   | Water is polluted if the fish in the river die  | 194   | 6             |
| 6   | The Department of the Environment monitors river water quality                            | 190   | 10            |
| 7   | Population growth is the main cause for river pollution.                                  | 155   | 45            |
| 8   | Public participation in managing environmental problems is receiving much more attention. | 143   | 57            |
| 9   | River water quality can be classified into classes I, II, III, IV, and V.                 | 151   | 49            |
| 10  | Land development is the main cause of river pollution.                                    | 154   | 46            |
|   |   | A lot | A fair amount |
| Which of the following best describes your knowledge about river management and problems? |   | 26    | 174           |

Most of the respondents get higher scores for this part; 88 respondents get the maximum score of 10 out of 10 and six of them get a minimum score of four. It is different with respondent’s point of view in describing their general knowledge of river management and problems as shown in Table 1, where 174 of them said they have only a fair amount of knowledge of river management and problems. Fig. 10 shows the frequency of total score for the respondents, frequency increased as the score increased.

Table 1 shows the total scores of every question. The reliability of this part is 0.680. They were asked whether it is the responsibility of the Department of Irrigation and Drainage to manage our river. 155 of them answered the question correctly. However, there is no significant difference between their backgrounds. The same goes for the second question about the “One State, One River” campaign being an activity to restore our river, where 190 of them gave the correct answer. 195 of the respondents agreed that water pollution can be determined through its color, smell, and taste. There are significant differences for the gender of the respondents; all the male respondents

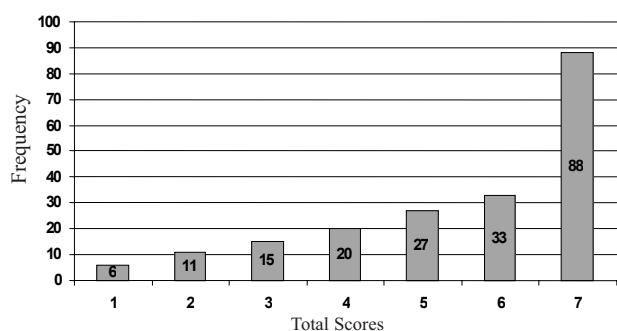


Fig. 10. Total score for general knowledge of respondents.

answer it correctly. 176 of them agreed that water pollution can be recognized through analytical methods. Respondents from age 30-39, 50-59 answered this question 100% correctly. 194 of the respondents agreed that the water is polluted if fish die. There are significant differences with respondent’s age and household size. All the respondents of age 20-59 answered the question correctly. Six respondents with household size five to six gave the wrong answer.

While asking the respondents about the responsibility of the Department of the Environment, 154 of them gave the correct answer. The respondents from ages 20-29, 40-49, and 50-59 give significant differences; all of them answered the question correctly. The gender of the respondents is the only characteristic that showed there is significant difference between groups when they were asked whether population growth causes river pollution. Male respondents give a higher score, which is 82 out of 97. Overall, 111 respondents answered the questions correctly. The same thing happened to the next two questions, gender is the only characteristic that gave significant differences. The last question is on land development as the main causes for river pollution. 154 of them answered it correctly. There are significant differences for respondent’s gender, education level, and annual income. All the respondents with annual income of RM 20,000-RM 29,999 (US 5,000-US 7,000) and RM 40,000-RM 49,999 (US 10,000-US 12,000) answered the question correctly. Moreover, most of the degree holders and male respondents gave the correct answer. There is no difference within survey locations for the score of respondent’s general knowledge. However, there is significant different when comparing respondents’ general knowledge and satisfaction. Respondents who scored 10 out of 10 tend to be more satisfied with the condition of the Temiang River.

## Conclusions

The constant pressure on environmental crisis at the river basin level such as polluted surface water supply are felt in many parts of the country. At the same time, limited government resources such as manpower and funds are major constraints for successful management of the affected rivers. The concept of sharing the responsibility in river management is gaining popularity in many developed countries' however, the level of public participation toward environmental sustainability in Malaysia is comparatively low as shown from this survey.

The majority of the respondents are aware of the conservation programs implemented by various government agencies for the river, and recognize the improvement on health conditions of the river. They also pointed out that lack of law enforcement as well as lack of proper treatment of waste effluent contributes to river pollution. However, their voluntary involvement in protecting the river is rather weak. The younger generation and female groups of respondents are more sensitive and conservative toward environmental problems compared to the older generation. It seems that to many of the older group, their awareness on the importance of water as a central attraction is still low. Those who reside in the upper part of the river are more content with the river conditions compared to those who stay in the downstream area. Most of those who stay in the lower parts are mostly ethnic Chinese. Generally, respondents aged 30 years and younger are willing to participate and contribute to future programs. However, the degree of contribution varies when it involves voluntary work and funding. The analysis showed that the willingness is very much influenced by the respondent's age, marital status, and income.

The implication of these surveys toward improving future programs on river conservation can be summarized as follows:

- (a) Satisfaction on the existing river conditions has been viewed differently among the locals. Obviously the government needs to raise the level of awareness and understanding on the issues and problems of the rivers among local people as environmental views and tastes differ significantly between age and gender of the local people. For example, beautifying certain sections of the river banks with gardens may attract more locals to appreciate the aesthetic values of the river.
- (b) Willingness to be involved in future programs has been gaining support from the younger generations. However, a properly organized voluntary program needs to be planned to initiate their continuous interest. We need to involve them in a way that allows them to use their skills and knowledge effectively.
- (c) Different sections of river may need different conservation programs. Upper parts of the river are cleaner in water quality compared to the lower sections. Thus, the situation of the river at their location may contribute toward their perception of river conditions.
- (d) The need of special programs especially for school kids to constantly change the behavior and habits that regularly impact the river.

- (e) The most basic thing to do is instill a sense of ownership to local people so that they can appreciate the sustainability of river functions.

## Acknowledgements

We would like to acknowledge the Seremban Municipal Council, the Department of the Environment, Negeri Sembilan, and the Department of Irrigation and Drainage for providing relevant information for this project.

## References

1. UNITED STATE ENVIRONMENTAL PROTECTION AGENCY (US EPA). Watershed analysis and management (WAM) guide for states and communities. Washington, DC: EPA Office of Water. **2003**.
2. EUROPEAN COMMISSION. Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy, Official Journal L 327, 22/12/2000 0001-0073, **2000**.
3. JESSEL B., JACOBS J. Land use scenario development and stakeholder involvement as tools for watershed management within the Havel River Basin. *Limnologia*. **35**, 220, **2005**.
4. HERMANS C., ERICKSON J., NOORDEWIER T., SHELTON., A. KLINE., M. Collaborative environmental planning in river management: an application of multicriteria decision analysis in the White River Watershed in Vermont. *J. Environ. Manage.* **84**, 534, **2007**.
5. HIRSCH D., ABRAMI G., GIORDANO R., LIERSCH S., MATIN N., SCHLÜTER M. Participatory research for adaptive water management in a transition country – a case study from Uzbekistan. *Ecol Soc.* **15**, (3), 23, **2010**.
6. SHRESTHA U. Community participation in wetland conservation in Nepal. *J Agric Env.* **12**, 140, **2011**.
7. WILLIAMS W.D. Community participation in conserving and managing inland waters. *Aquatic Conserv: Mar. Freshw. Ecosyst.* **12**, 315, **2002**.
8. MCGINNIS M.V. Making the watershed connection. *Policy Stud. J.* **27**, (3), 497, **1999**.
9. JUNKER B., BUCHECKER M., MÜLLER-BÖCKER, U. Objectives of public participation: Which actors should be involved in the decision making for river restorations? *Water Resour Res.* **43**, W10438, pp. 11, **2007**.
10. KORFMACHER K. S. The politics of participation in watershed modeling. *Environ. Manage.* **27**, (2), 161, **2001**.
11. NELSON L. S., WESCHLER L. F. The watershed as a focus for public administration: Conventional and bioregional approaches. *Admin Theor Prax.* **23**, (1), 10, **2001**.
12. RASAGAM G., CHAN N. W. The Role of Non-Governmental Organisations in Public Awareness and Environmental Education Towards Protection, Conservation and Rehabilitation of Rivers: Some Examples from the Work of Water Watch Penang. In N W Chan (Ed) *Rivers: Towards Sustainable Development*. Penerbit Universiti Sains Malaysia, Penang pp. 470, **2002**.
13. UNDERWATER TIMES. Report: Malaysia's 14-year Campaign to Clean-up Rivers a Failure; 10 Percent Unsafe to Touch. **2007**.
14. DOE. Department Of Environment Malaysian; Environmental Quality Report pp 71. **2005**.



15. MILLENNIUM ECOSYSTEM ASSESSMENT. Ecosystems and human well-being: Current state and trends – findings of the condition and trends working group. (Eds) Hassan R., Scholes R., and Ash N. URL: <http://www.millenniumassessment.org/en/Condition.aspx>, **2005**.
16. DOE. DOE-WQS Phase 1 Study: Development of water Criteria and Standards for Malaysia Department of environment, Ministry of Science, technology and the Environment, Kuala Lumpur Malaysia. **1986**.
17. DEPARTMENT OF STATISTICS MALAYSIA. Population and Housing Census of Malaysia. pp. 255, **2000**.
18. GORARD S. Quantitative Methods in Social Science. Continuum, New York. **2003**.
19. RATNESAR N., MACKENZIE J. The Quantitative-Qualitative Distinction and the Null Hypothesis Significance Testing Procedure. *J Philos Educ.* **40**, (4), 501, **2006**.
20. CHERRY A.L. A Research Primer for Helping Professions Methods, Statistics and Writing. Thomson Learning, Australia. **2000**.
21. ENGEN T. Perception of odor and irritation. *Environ Int.* **12**, 177, **1986**.
22. SCHULTZ V. Women “before” the law: Judicial stories about women, work, and sex segregation on the job. In J. Butler and J.W. Scotts (Eds.), *Feminists theorize the politic*. New York: Routledge. pp. 297, **1992**.
23. ROBBICHAUD C. Hydrometeorological factors affecting the risk of breakup jams at Fort McMurray, AB. M.Sc. Thesis, Dept. of Civil and Environmental Engineering, University of Alberta, Fall. **2002**.
24. SCHULTZ P.W. The structure of environmental concern: Concept for self, other people, and the biosphere. *J Environ Psychol.* **21**, 327, **2001**.
25. BERNAMA. Parts of Seremban town hit by flash floods. BERNAMA, the Malaysian National News Agency November 20, **2006**.
26. BAMBERG S. How does environment concern influence specific environmentally related behaviors? A new answer to an old question. *J Environ Psychol.* **23**, 21, **2003**.
27. FRANSSON N., GARLING T. Environment concern: conceptual definitions, measurement method and research findings. *J Environ Psychol.* **19**, 369, **1999**.

