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# Examining the Relationship between Factors Influencing Environmental Behavior among Polluted River Communities

Wan Nor Azilawanie Tun Ismail , Aziz Amin

*Faculty of Applied Social Science (FSSG), Universiti Sultan Zainal Abidin, Gong Badak Campus, 21300 Terengganu, Malaysia*

***Abstract***

*Rivers are sources of life, providing water supply for the people, irrigation for agriculture, cheap and efficient transportation, rich sources of food, hydro-electric power, and water use for industries. Pollution in rivers can cause disease and affect the surrounding ecosystem. Human activities are a major cause of such water pollution. This research explores the significant factors affecting environmental behavior among polluted river communities in Terengganu. The approach of this research is the survey through questionnaire. Using cluster sampling, 373 respondents from selected area in polluted river in Terengganu were identified as sample. Data is analyzed using structural equation modeling. Environmental knowledge and media exposure to environmental message affected environmental behavior. Meanwhile, environmental values, attitudes, perceived behavioral control, self-efficacy, subjective norms and recycling facilities not affected environmental behavior. This study is expected to elevate community awareness, change the behavior and to involve them through participation in environmental rehabilitation activities and responsible for combating environmental pollution in their attempt to eradicate activities that destroy and pollute the environment. The river environment needs to be conserved in order to enable the river to perform all its natural functions and for a sustainable, healthy and an enhanced quality of life.*

***Keywords:*** *environmental behavior, environmental knowledge, media exposure, polluted river, sustainability*

## 1. Introduction

Today, all environmental systems (forests, mountains, rivers, seas and oceans) ask from us to be careful and systematic in using them as rationally and properly as possible. All across the world, people are facing a wealth of new and challenging environmental problems every day. Some of them are small and only affect a few ecosystems, but others are drastically changing the landscape of what we already know.

The various environmental problems that we are facing today such as global warming and climate change, air pollution, water shortages, depletion of natural resources, and loss of biodiversity are indeed rooted in human behavior. It is a human impact on the environment and remains a serious environmental issue in many countries that can affect the quality of life [1]-[3].

The impact of environmental degradation that disrupts human well-being has also been taken seriously by the world community. Awareness of the impact of environmental development has led the United Nations (UN) to host a conference in Stockholm called the United Nations Conference on the Human Environment (UNCHE) in 1972 [4], [5]. The conference was the starting point for the international agenda and pay attention to the environmental crisis.

In Malaysia, more than 2500 rivers are the natural resources that must be conserved to be inherited by future generations. Freshwater is the single most essential good for our well-being. Like a giant engine working day and night, the water cycle and inherent ecosystems are the life support of the planet. Unfortunately, the river is increasingly approaching human civilization, increasingly exposed to pollution. Due to the fact that few people know about the value of the river and its importance, river cleanliness is often neglected and contaminated thereby affecting its interests and benefits to the public [6], [7].

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The results of the monitoring carried out by the Department of Environment show that the quality of river in this country has reach an alarming stage. Reports from the environmental quality of Malaysia show that there are still a large number of rivers classified as polluted and moderately polluted in Malaysia. Out of 477 rivers monitored, 224 (47%) were found to be clean, 207 (43%) slightly polluted and 46 (10%) polluted. The river water quality in terms of Water Quality Index had shown a decrease in 2016. The percentage of clean rivers has decreased to 47% in 2016 compared to the 58% in the previous year. The percentage of polluted river has increased from 7% to 10% in 2016 [8].

Water pollution has been of major importance in Malaysia as it affects the quality of river water. Humans around the world litter every day. Rivers are very prone to pollution due to the varied human activities that contribute to pollution for example, generation of domestic wastewater, industrial effluent and runoff from solid waste disposal sites [9], [10]. Terengganu Department of Environment Malaysia reported that the Water Quality Index for each station in the upstream Hiliran River is identified mainly from villages, supermarkets, IWK plants, workshops, crackers, batik, fish markets, restaurants and restaurants. According to officials from the Terengganu State Irrigation and Drainage Department, RM3.3 million is allocated for the cost of treating and restoring the Hiliran River.

Additionally, according to officials from the Terengganu State Irrigation and Drainage Department, the irresponsible attitude of the local community by throwing rubbish into the river and making garbage traps as a place to dispose of garbage is absolutely unnecessary. Surveys conducted in residential areas around the river in Terengganu found that there were still a lot of junk piles stuck in the rocks in the river besides garbage scattered at the landfill.

Hence, following the attitude of the people who like to take easy steps with the drainage of sewage residues from their homes such as washing water, faces and garbage directly into the river contributes to the pollution [11]-[13]. All of these human activities affect our water sources [14]-[16]. We have to constantly remind ourselves that the quality of the environment depends almost entirely on human behavior patterns.

Therefore, it is time for people to change their mentality so they do not throw away trash evenly. Increased environmental awareness and lifestyle practices are one of the key elements in building country capacity towards sustainable development. Awareness rising can also create a community that is concerned and responsible for river conservation [17], [18].

Hence, there has been significant research conducted to investigate environmental behavior. In addition to the desire to learn about people's environmentally behaviors, scholars are interested in determining the factors affecting these behaviors. This research analyzes the causal relationships of environmental knowledge, environmental values, attitudes, perceived behavioral control, self-efficacy, subjective norms, media exposure to environmental message, recycling facilities and environmental behavior among polluted river communities in Terengganu. Therefore, the 8 hypothesis is proposed:
Hypothesis 1 (H1): Environmental knowledge has significant effects on environmental behavior.
Hypothesis 2 (H2): Environmental values has significant effects on environmental behavior.
Hypothesis 3 (H3): Attitudes has significant effects on environmental behavior.
Hypothesis 4 (H4). Perceived behavioral control has significant effects on environmental behavior.
Hypothesis 5 (H5): Self-efficacy has significant effects on environmental behavior.
Hypothesis 6 (H6): Subjective norms has significant effects on environmental behavior.
Hypothesis 7 (H7): Media exposure to environmental message has significant effects on environmental behavior.
Hypothesis 8 (H8): Recycling facilities has significant effects on environmental behavior.

## 2. Methodology

Researchers have chosen polluted rivers in the state of Terengganu as a location. It is based on the status of river water quality for polluted rivers in Terengganu state which is monitored by the Department of Environment. The sample of this study consists of 373 respondents were selected using cluster sampling. The way for determining of sample size is based on [19]-[21].

Questionnaire is using 5 point Likert scale with value 1 (very disagree) to 5 (strongly agree). Whereas for frequency (behavior) questions, 5 point scales were used 1 (never), 2 (rarely), 3 (moderate frequent), 4 (often) and 5 (very frequent). Two statistical software which is Statistical Package of Social Science 21.0 (SPSS 21.0) and Analysis of Moment Structure 22.0 (AMOS 22.0) have been used for the data analysis process [22].

Descriptive analysis was conducted on the data collected by using SPSS version 21. Followed on, two step approach of structural equation modelling was employed in the analysis of the data by using AMOS 22 software. Firstly, confirmatory factor analysis (CFA) was executed to estimate the reliability and validity of measurement model and secondly, structural equation model (SEM) was carried out to assess the relationships among the eight constructs of this study.

This includes the $X^2$ statistics, Root Mean Square Error of Approximation (RMSEA), Composite Fit Index (CFI), Normative Fit Index (NFI) and $X^2$/ degree of freedom ratio [20]. Structural equation modeling examined the proposed hypotheses, and the research framework is shown in Fig. 1.

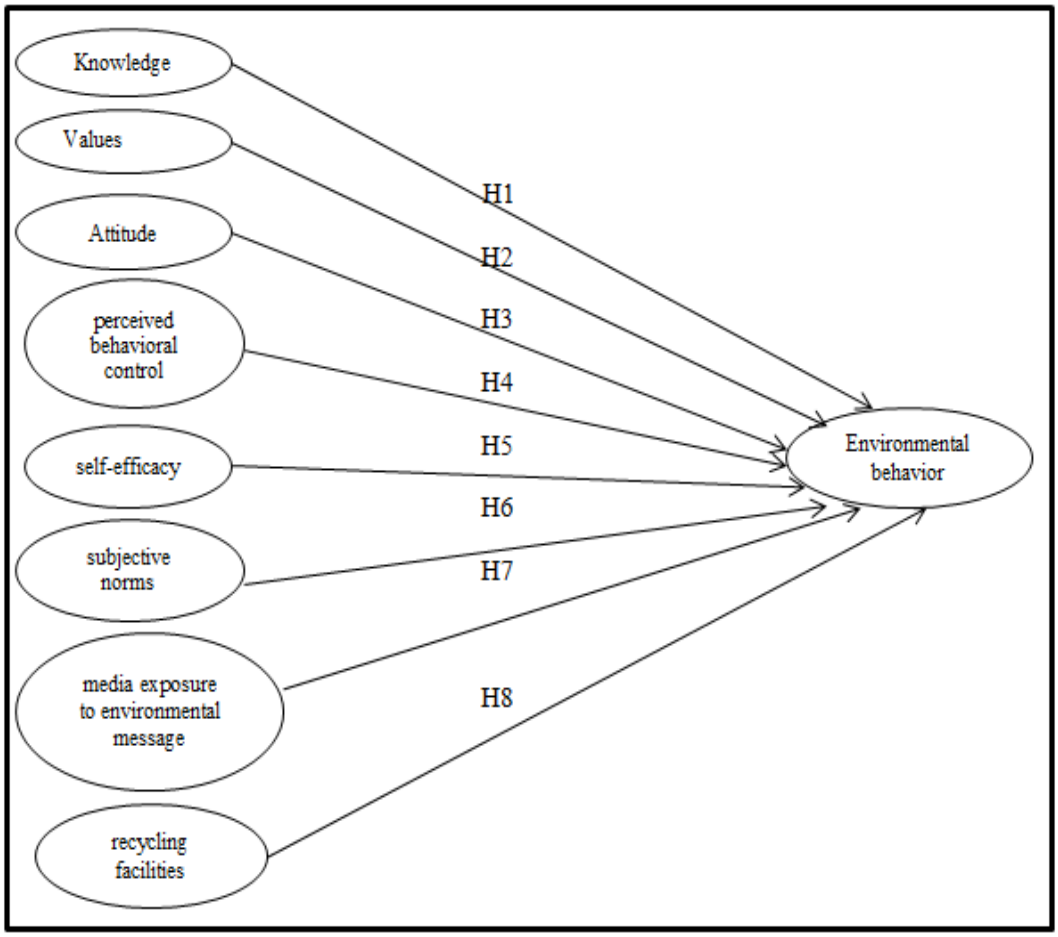


**Fig. 1: Conceptual model**

# 3. Results and Discussion

## 3.1. Profile of Participants

Table 1 contains the demographic information of the respondents. The largest age group ranges between 30 to 39 years (25.7%), followed by 20 to 29 years (24.9%), 40 to 49 years (20.9%), 50 to 59 years (12.1%),16 to 19 years (11.5%) and below 60 (4.8%).

The respondents consist of 55.5% female and 44.5% male. Regarding the level of education, a total of 48.0% of the respondents were Malaysian education certificates, 19.0 % were lower Malaysian certificates, 11.5% were diploma holders, 6.7% were Malaysian higher school certificates, 6.4% were primary school and degree holders, 1.1% were master or PhD holders whereas only 0.8% no formal education.

Lastly, in terms of job categories, majority of the respondents were housewife which are 24.9%, followed by self-employed 22.0%, private sector 21.2%, unemployed 11.5%, students 9.7%, government sector 8.8% and retiree 1.9%.

**Table 1: Demographic profile of respondents (n=373)**

| Demographic Factor | | Frequency (n) | % |
|---|---|---|---|
| Age | 16 to 19 | 43 | 11.5 |
| | 20 to 29 | 93 | 24.9 |
| | 30 to 39 | 96 | 25.7 |
| | 40 to 49 | 78 | 20.9 |
| | 50 to 59 | 45 | 12.1 |
| | ≥ 60 | 18 | 4.8 |
| Sex | Male | 166 | 44.5 |
| | Female | 207 | 55.5 |
| Educational level | No formal education | 3 | 0.8 |
| | Primary school (UPSR) | 24 | 6.4 |
| | Lower Malaysian certificates (SRP/PMR) | 71 | 19.0 |
| | Malaysian education certificates (SPM/SPVM/MCE) | 179 | 48.0 |
| | *Sekolah Menengah Tinggi* (STPM/HSC) | 25 | 6.7 |
| | Diploma | 43 | 11.5 |
| | Degree | 24 | 6.4 |
| | Master/ PhD | 4 | 1.1 |
| Job categories | Government sector | 33 | 8.8 |
| | Private sector | 79 | 21.2 |
| | Self employed | 82 | 22.0 |
| | Housewife | 93 | 24.9 |
| | Student | 36 | 9.7 |
| | Retiree | 7 | 1.9 |
| | Unemployed | 43 | 11.5 |

## 3.2. Measurement Model

Confirmatory factor analysis (CFA) was conducted to test measurement reliability and validity. CFA results indicated an acceptable model fit, including (chisq/df = 2.290, CFI = 0.903

or TLI = 0.890, and RMSEA = 0.059). The results of assessing the structural model fits for direct model indicated that the model fit the data with; The Goodness-of-fit indices of structure model showed that the GFI, CFI, NFI, TLI, and IFI significantly close or pass its cutoff value (0.9). In addition, the RMSEA was .059, which fall between the recommended range of acceptability (between .03 and .08).

As shown in Table 2, the factor loadings, Average Variance Extracted (AVE) and Composites Reliability indices of all factors are with high value. The composite reliability values all above 0.70 shows that the measurement of the constructs is all reliable [20].

The AVE values indicate environmental knowledge variables with AVE values, .481 and CR, .735, environmental values variables with AVE values, .724 and CR, .887, attitude variable with AVE values, .500 and CR, .750, perceived behavioral control with AVE values, .538 and CR, .823, self-efficacy with AVE values, .649 and CR, .880, subjective norm variables with AVE values, .581 and CR, .847, variable media exposure with AVE values, .567 and CR, .867, recycling facilities with AVE, .741 and CR values, .895, and variable behavior with AVE, .597 and CR values, .880. The AVE value for knowledge variables is only 0.481 but the CR values meet the criteria of 0.735. The AVE value below 0.5 is still acceptable when the reliability value has been met. This does not concern if the value is less than 0.5, as long as the reliability value is acceptable. In fact, the value approached the value of 0.5.

**Table 2: Results of confirmatory factor analysis**

| Variables | FL>.5 | AVE>.5 | CR>.6 |
|---|---|---|---|
| Knowledge | | .481 | .735 |
| A1 | .72 | | |
| A2 | .68 | | |
| A3 | .68 | | |
| Values | | .724 | .887 |
| C5 | .81 | | |
| C6 | .90 | | |
| C7 | .84 | | |
| Attitude | | .500 | .750 |
| Ee1 | .74 | | |
| Ee2 | .68 | | |
| Ee3 | .70 | | |
| Perceived behavioral control | | .538 | .823 |
| F2 | .76 | | |
| F3 | .69 | | |
| F4 | .78 | | |
| F5 | .70 | | |
| Self-Efficacy | | .649 | .880 |
| G3 | .76 | | |
| G4 | .83 | | |
| G5 | .90 | | |
| G8 | .72 | | |
| Subjective Norms | | .581 | .847 |
| H2 | .75 | | |
| H4 | .79 | | |
| H5 | .83 | | |
| H8 | .67 | | |
| Media exposure | | .567 | .867 |
| I2 | .70 | | |

| | | | |
|---|---|---|---|
| I3 | .80 | | |
| I4 | .71 | | |
| I5 | .77 | | |
| I6 | .78 | | |
| Recycling Facilities | | .741 | .895 |
| J1 | .81 | | |
| J3 | .88 | | |
| J4 | .89 | | |
| Behavior | | .597 | .880 |
| L2 | .63 | | |
| L5 | .72 | | |
| L6 | .82 | | |
| L7 | .85 | | |
| L8 | .82 | | |

Table 3 shows the correlation table of the constructs. To achieve discriminant validity, the coefficient for a correlation between a pair of constructs should be lower than the square root of AVE of each construct. Most constructs in the model achieved this requirement, indicating adequate discriminant validity.

**Table 3: Correlation table**

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | **.481** | | | | | | | | |
| 2 | .027 | **.724** | | | | | | | |
| 3 | .441 | .069 | **.500** | | | | | | |
| 4 | .152 | .300 | .413 | **.538** | | | | | |
| 5 | .018 | .260 | .165 | .540 | **.649** | | | | |
| 6 | .192 | .041 | .383 | .448 | .282 | **.581** | | | |
| 7 | .001 | .077 | .055 | .057 | .115 | .052 | **.567** | | |
| 8 | .000 | .079 | .015 | .080 | .186 | .049 | .137 | **.741** | |
| 9 | .005 | .118 | .041 | .102 | .166 | .063 | .458 | .110 | **.597** |

### 3.3. Structural Model

With the aim of determining the direct contribution of each construct of independent variable entered in the equation in relation to the dependent variable, as aforementioned the structural equation modeling have been used. The results are presented in Table 5. The results of assessing the structural model fits for direct model indicated that the model fit the data with; ($\chi 2$ = 1419.792, $\chi 2$/DF = 2.290, p = .000, GFI = .830, CFI = .903, IFI = .904, TLI = .890, RMSEA = .059). The Goodness-of-fit indices of structure model showed that the GFI, CFI, NFI, TLI, and IFI significantly pass its cutoff value (0.9). In addition, the RMSEA was .059, which fall between the recommended range of acceptability (between .03 and .08).

The value of coefficient of determination $R^2$ is .53. Fig. 2 indicates the contribution of environmental knowledge, environmental values, attitudes, perceived behavioral control, self-efficacy, subjective norms, media exposure to environmental message and recycling facilities in estimating environmental behavior is 53%.

As depicted in Table 4, the result shows that there is a significant relationship between environmental knowledge ($\beta$ = -.224, $p < 0.05$) and media exposure ($\beta$ = .072, $p < 0.05$) towards environmental behavior, supporting H1 and H7. Furthermore, the result of the structural model, according to Table 4 indicated that the environmental values, attitudes, perceived behavioral control, self-efficacy, subjective norms and recycling facilities ($\beta$ = .116, $p > 0.05$; $\beta$ = .074, p >

0.05; β = .046, p > 0.05; β = .066, p > 0.05; β = .060, p > 0.05; β = .038, p > 0.05) had no significant relationship with environmental behavior. The H2, H3, H4, H5, H6 and H8 was rejected. Table 4 summarizes the results for the proposed hypotheses.

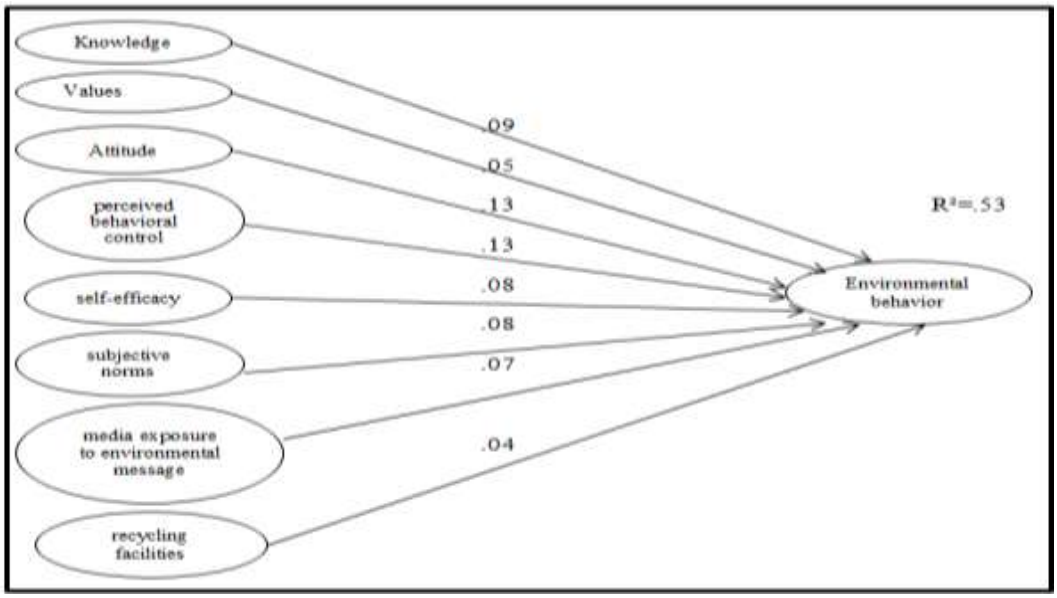


**Fig. 2: Structural model**

**Table 4: Results of the hypothesized paths**

| Paths | | | S.E. | Std. Reg. Weights Beta | p | Hypothesis |
|---|---|---|---|---|---|---|
| EK | → | EB | .091 | -.224 | .010 | supported |
| EV | → | EB | .046 | .116 | .076 | Not supported |
| A | → | EB | .125 | .074 | .507 | Not supported |
| PBC | → | EB | .128 | .046 | .709 | Not supported |
| SE | → | EB | .082 | .066 | .454 | Not supported |
| SN | → | EB | .081 | .060 | .471 | Not supported |
| ME | → | EB | .072 | .575 | *** | supported |
| RF | → | EB | .038 | .012 | .827 | Not supported |

## 4. Conclusion

Since the percentage of polluted river has increased, it is important to examine the determinants of the environmental behavior in order to identify the core solution for the purpose to increase the level of behavior of the communities. Humans need to change their behavior to protect the environment. The result of the current study revealed that environmental knowledge and media exposure was the strongest predictor to the environmental behavior among the

community in polluted river at Terengganu. Societies must be encouraged and made sensitive to water pollution to ensure proper consumer behavior in disposal of waste.

Involvement of society in maintaining river health is important as rivers are a common property and correct individual behavior cannot be achieved without society-wide efforts. Implementation awareness and environmental education programs and activities as well as disseminate information to various levels of the society should promote as an effort and long term measure towards building a caring and environmentally friendly society in the country [23], [24]. Protecting environment by adopting environmental friendly practices should be part and parcel of our daily activities.

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