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# A structural equation model of environmental attitude and behaviour : the Hong Kong experience

Oi Ling SIU  
siuol@ln.edu.hk

Kui Yin CHEUNG

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A STRUCTURAL EQUATION MODEL OF  
ENVIRONMENTAL ATTITUDE AND BEHAVIOUR:  
THE HONG KONG EXPERIENCE

by

Dr. Oi-ling Siu and  
Dr. Kui-yin Cheung

香港屯門  
嶺南大學

公共政策研究中心  
Centre for Public Policy Studies  
Lingnan University  
Tuen Mun, Hong Kong

Tel: (852) 2616 7432  
Fax: (852) 2591 0690

Lingnan University  
Hong Kong

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Dr. Oi-ling Siu and  
Dr. Kui-yin Cheung

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Dr. Oi-ling Siu is Assistant Professor of Department of Politics and Sociology, Lingnan University, Hong Kong.

Dr. Kui-yin Cheung is Associate Professor of Department of Economics, Lingnan University, Hong Kong.

Centre for Public Policy Studies  
Lingnan University  
Tuen Mun  
Hong Kong  
Tel: (852) 2616 7432  
Fax: (852) 2591 0690  
Email: [cpps@ln.edu.hk](mailto:cpps@ln.edu.hk)  
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**A Structural Equation Model of Environmental Attitude and Behaviour:**

**The Hong Kong Experience**

Oi-ling Siu, Lingnan University

Kui-yin Cheung, Lingnan University

Running Head: Environmental Attitude and Behaviour in Hong Kong

Correspondence concerning this article should be addressed to Oi-ling Siu at:

Department of Politics and Sociology  
Lingnan University  
Tuen Mun, N. T.,  
Hong Kong  
Fax: 852-28917940  
Email: [siuol@ln.edu.hk](mailto:siuol@ln.edu.hk)

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## A Structural Equation Model of Environmental Attitude and Behaviour: The Hong Kong Experience

### Abstract

The present study aims at establishing a structural equation model relating affect, verbal commitment, and actual commitment using a sample of 271 university students (119 males, 152 females) by applying the theory of reasoned action (Aizen & Fishbein, 1980). A linear structural equation relation (LISREL) model was developed to verify that verbal commitment is a function of affect, and in turn, determine actual commitment. Sixty percent of the variance of verbal commitment could be explained by affect, and 19 % of actual commitment could be explained by verbal commitment; yet only a small percentage of the variance of actual commitment could be explained by affect. It can be concluded that verbal commitment is a good mediator of the affect-actual commitment relationship, and therefore the theory of reasoned action of having intention as the mediator of the attitude-environment relationship can be generalized to a Chinese sample.

### Introduction

During the past three decades there have been numerous studies on environmental awareness done in North American and European Countries (Maloney & Ward, 1973, 1975; Arbuthnot & Lingg, 1975; Smythe & Brooke, 1980; Schahn & Holzer, 1990; Hausbeck, Milbrath & Enright, 1992; Vogel, 1996; Dillon & Gayford, 1997; Kaiser, Wolfing & Fuhrer, 1999). It is believed that, as advocated by Maloney *et al.* (1973, 1975) and Schahn *et al.* (1990), eliminating maladaptive behavior and promoting individual environmental awareness are very important to solve environmental problems. Recently, the importance of environmental attitude has been reiterated as the most important concept in determining an individual's ecological behaviour (Newhouse, 1990; Kaiser *et al.*, 1999). Yet one question has still to be adequately answered, and that concerns the causal relationship between attitude and behaviour. The current study attempts to provide some empirical results by establishing a structural equation model relating affect, verbal commitment, and actual commitment using a sample of university students in Hong Kong.

### Environmental Attitude and Behaviour

An attitude is an theoretical construct and cannot be feasibly measured by direct observation (Fishbein & Aizen, 1975). An attitude consists of three components - cognitive, affective and intentional components. As defined by Vining and Ebre (1992), an attitude towards the environment refers to environmental concern. Some researchers used the terms 'environmental awareness' and 'environmental concern' interchangeably (Vogel, 1996).

Research adopting this three component-attitude approach in studying environmental attitude and behaviour can be traced back to the classic studies

conducted by Maloney and his co-workers (Maloney & Ward, 1973; Maloney *et al.*, 1975). They proposed that the affect scale (measures the affective component), factual knowledge (measures the cognitive aspects), and verbal commitment (measures the behavioural component of environmental attitude) predict actual commitment (measures ecological behaviour).

Later studies in Western and Chinese societies corroborated their findings (Smythe & Brook, 1980; Sia, Hungerford & Tomera, 1985/86; Siu, 1991, 92; Berger & Corbin, 1992; Axelrod & Lehman, 1993). For instance, the first author conducted a study in 1990 to measure 233 college and 350 non-college people in Hong Kong, and found that the affect subscale was positively correlated with the verbal commitment and actual commitment subscales; and verbal commitment and actual commitment were positively correlated (Siu, 1991). She replicated the study in the year after using a sample of 222 undergraduates and 220 housewives in Hong Kong, and yield similar results (Siu, 1992).

However, studies investigating the relationship between environmental awareness/concern and behaviour did not find very high correlation, and some even showed very low correlation (e.g., Hines, Hungerford, & Tomera, 1987). Vogel (1996) attributed this to the need of employing highly complex models to analyse such relationships. Recently, a structural equation model has been developed by path analysis to relate environmental attitude and ecological behaviour (Vogel, 1996; Kaiser *et al.*, 1999), and demonstrated success.

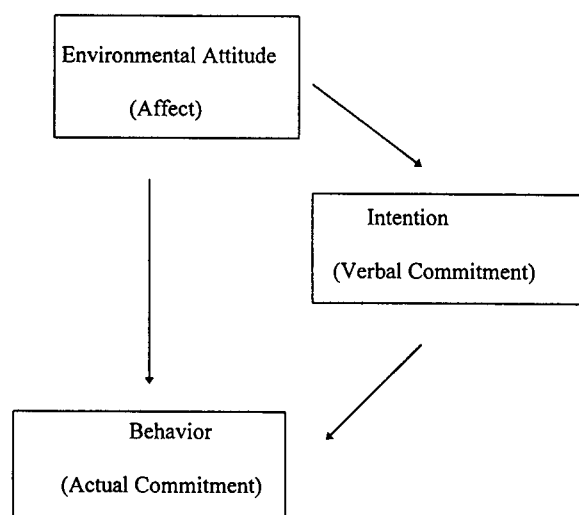
Even though the aforementioned Hong Kong studies yielded statistically significant relationships between affect, verbal commitment, and actual commitment, the causal relationships between the different components of environmental attitude and behaviour remained an untouched research area in Hong Kong.

As we are approaching the end of the 1990's, we aim at replicating the studies conducted at the beginning of the 1990's to a sample of university students in Hong Kong in order to arrive at a higher reliability of measures. Another purpose of the present study is to establish a structural equation model relating affect, verbal commitment, and actual commitment, in order to contribute to generalizability of environmental attitude theory in environmental psychology.

### **Theoretical Framework and Hypothesis for the Study**

The theoretical framework for the study modeled from the theory of reasoned action (Ajzen & Fishbein, 1980) (see Figure 1). Based on previous evidence that intentions are good predictors of behaviour (Ajzen, 1988), it is hypothesised that intention (verbal commitment to protect the environment) is the immediate antecedent of behaviour (actual commitment to protect the environment); and intention, in turn, is a function of one's environmental attitude (affect). In other words, intention mediates the attitude-behaviour relationship. In addition, it is also hypothesised that positive affect towards the environment is also a precondition of actual commitment in protecting the environment.

Figure 1. Theoretical Framework for the Study



### Method

Self-administered questionnaire survey method was used to collect data.

### Sample and Procedure

The target population for the study was students of the seven tertiary institutes in Hong Kong. Simple random sampling method was used to select three tertiary institutes from the seven, and seventy students of each chosen institutes were invited to participate in the research by accidental sampling method. The data collection was conducted from late January to the middle of February in 1999. One in every ten students encountered outside the library of each selected institute was approached to complete the questionnaire.

The other sample includes 61 students from two classes taught by the two authors. The students were asked to fill in the questionnaires during lecture hours. These make up a total sample of 271 (3 x 70 + 61).

### Measures

The questionnaire consists of three scales measuring Affect (9 items), Verbal Commitment (9 items), and Actual Commitment (9 items) which were used by Siu's (1991, 1992) studies. All of the items are depicted in Appendix I. They are all 6-point Likert Type scales ranging from 'strongly disagree' to 'strongly agree' (with high scores denoting high affect and commitment). Questions asking for background information (such as age, gender, major, and institute) are also included in the questionnaire.

### Results and Analysis

#### Sample Distribution

The average age of the student sample was 21 years old, with 43.9% (N = 119) males and 56.1% (N = 152) females. There was an even distribution of year of study with 38.4% of them studied in year 1, 28% in year 2 and 33.6% in year 3. About half of the respondents majored in Arts (57.2%) and 40% majored in Social Science (42.8%).

#### Comparisons of Means and Reliabilities of Attitude and Behaviour Scores

A series of *t* - tests of affect, verbal commitment, and actual commitment scores between gender, year of study, and major revealed that there was only a gender difference in verbal commitment, with female students scored statistically significantly higher than male students ( $t = 3.33$ ,  $df = 269$ ,  $p < .001$ ). The mean of affect was statistically significantly higher than verbal commitment ( $t = 8.83$ ,  $df = 270$ ,  $p < .001$ ).

and that was statistically significantly higher than actual commitment ( $t = -28.09$ ,  $df = 270$ ,  $p < .001$ ) (see Table 1). In Table 1, the results show that the internal consistencies of three scales ranged from .70 to .78, which are acceptable.

#### *Relationship between Affect, Verbal Commitment, and Actual Commitment*

Table 1 also presents the interrelations among affect, verbal commitment, and actual commitment. It can be seen from Table 1 that affect was highly and positively related to verbal commitment; and verbal commitment was highly and positively related to actual commitment. Affect was also positively significantly related to actual commitment, but relatively this relationship was weaker than the other two. These three variables were then further studied with path analysis.

#### *Empirical Results of Attitude and Behaviour*

All of the items of each subscale were used as input variables for the structural equation analysis. A LISREL (Linear Structure Relation) model describing the structural relationship between affect (A1 to A9), verbal commitment (VC1 to VC9) and actual commitment (AC1 to AC9) variables is tentatively specified and tested by the program of AMOS 3.6.

Figure 2 shows the completely standardised outcome of AMOS programme estimation. Some of the items in the questionnaire were excluded in the equation in order to get a higher Goodness of Fit Index (GFI). This was done on the base of modification index. The deleted items were A5, A8, AC7, and VC2. The model after some modifications fits data well evidenced by  $\chi^2$  of 283.22 ( $df = 214$ ), GFI of .916, RMSR (Root Mean Square Residual) of .059. These results look acceptable. They suggest that the hypotheses that verbal commitment is a function of affect, and in turn,

determine actual commitment are accepted from an empirical point of view. Sixty percent of the variance of verbal commitment could be explained by affect (standardized path coefficient = .78); and 19% of actual commitment could be explained by verbal commitment (standardized path coefficient = .44). Since only a small percentage of the variance of actual commitment could be explained by affect, verbal commitment is believed to be a good mediator of the affect-actual commitment relationship. In other words, intention is a mediator of the attitude - environment relationship.

The direct paths were added from observed variables of VC1 and VC6 to AC2, from VC3 to AC3, and from VC4 to AC1; for each of these paths represent the same measured issue. For instance, VC3 and AC3 are related to plastic bags; VC1 and AC2 are related to walking/cycling rather than driving; VC4 and AC1 are related to paper recycling. These results provide further evidence of the empirical relationship between verbal commitment and actual commitment, or intentions are good predictors of behaviour.

#### **Discussion /Contribution of the Study**

Our findings show that the mean of affect is statistically significantly lower than that of verbal commitment, and that is statistically significantly lower than that of actual commitment. These results are similar to those reported in past research in Hong Kong and in Western societies (Maloney *et al.*, 1975; Schahn & Holzer, 1990; Siu, 1991, 1992; Hausbeck *et al.*, 1992). It is always easy to express positive affect towards the environment, or having high intention to protect the environment, but it is not easy to commit in actions to protect the environment. Therefore environmental education at university level is needed to enhance students' daily habits of performing



environmental protection behaviour. Perhaps some sort of incentives, at policy level, can be implemented such as using records in working for the environment as a certain percentage of continuous assessment in general education courses at the universities.

The proposed model of applying the theory of reasoned action (Aizen & Fishbein, 1980) (see Figure 1) was verified by the current study. As it was found in some other studies, intention is the immediate antecedent of behavior, and intention, in turn, is a function of one's environmental attitude (Vogel, 1996; Dillon & Gayford, 1997; Kaiser *et al.*, 1999). These causal relationships between attitude, intention, and behaviour found point to the importance of having intention to solve environmental problems. Intention, as it was found, is a good predictor of behaviour, and is a good mediator of the attitude-behaviour relationship. These results further suggest that environmental education is important to arouse the students' awareness, and at the same time to focus on intention as well. Having students to express the intention to protect the environment will likely to find them committed to act environmentally. For instance, as evidenced by the high path coefficient yielded by the current study, having students to express verbally they prefer a seldom use of plastic bags will likely to find them not to use plastics bags so frequently in reality (standardized path coefficient = .21).

The structural equation model established by this study is similar to those conducted in Western societies (Vogel, 1996; Kaiser *et al.*, 1999). These results provide support to the claim that an advanced and complex model, such as structural equation model, is needed to verify the causal relationship between attitude and behaviour (Vogel, 1996). Therefore the current study contributes to generalizability of theory in environmental psychology.

The three studies on environmental attitude and behaviour conducted by the first author from 1990 to 1999 have found similar findings. These contribute to convergent validity of results. In addition, the instrument for the study, which was firstly used in early 1990's, has been found to be still reliable. Therefore these results suggest that our instrument measuring environmental attitude and behaviour can further be used in future research in Chinese societies.

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## Appendix I

### *Twenty-seven items measuring environmental attitude and behaviour*

#### **Affect**

- A1. Protecting the environment is everyone's responsibility.
- A2. Raising the standard of living is not one of the reasons to pollute the environment.
- A3. Human beings should not give up the well-being of the world just for the sake of joy and benefit.
- A4. Try every means to protect endangered species even losing some of our benefits.
- A5. Even we have to pay more, we should enforce that restaurants should use paper containers instead of the cheaper plastic containers.

- A6. Behaviour destroying the environment infuriate me.
- A7. Reporting vehicles emitting too much leaded exhaust gas.
- A8. The media should report more news about environmental protection.
- A9. Save energy immediately.

#### **Verbal Commitment**

- VC1. I'd be willing to walk or ride a bicycle instead of using cars.
- VC2. I'd be willing to use different means to support green bodies, such as donation.
- VC3. I'd be willing to use recyclable containers to carry products instead of plastic bags.
- VC4. I'd be willing to support paper recycling campaigns.
- VC5. I'd be willing to use non-fire cooking methods.
- VC6. If possible, I'd be willing to use stairs instead of taking lift.
- VC7. I'd be willing to use less plastic utensils.
- VC8. I'd willing to turn on air-conditioners or heaters less.
- VC9. I'd be willing to use less hair spray or mouse.

#### **Actual Commitment**

- AC1. I join paper recycling campaigns.
- AC2. I seldom use cars or lift; instead I always walk or riding a bicycle.
- AC3. I buy products in recyclable containers.
- AC4. I report cars emitting excess leaded exhaust gas.
- AC5. I use rechargeable batteries.
- AC6. I use handkerchief instead of tissue paper.

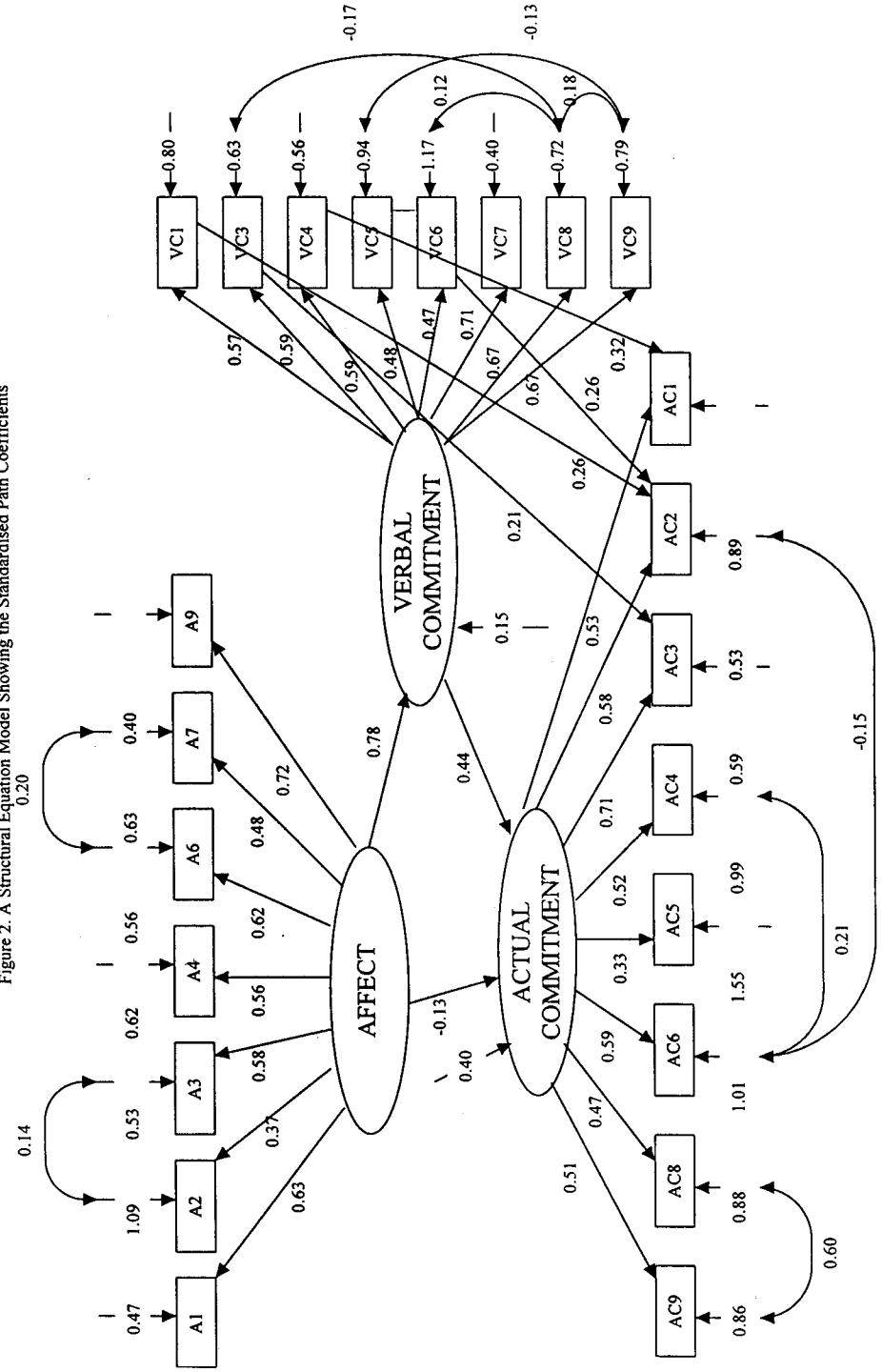
- AC7. I turn off unused electrical appliances.
- AC8. I buy and read ecological publications.
- AC9. I join activities organized by green bodies.

Table 1. Means, Standard Deviations, Reliability Coefficients, and Intercorrelations between Affect, Verbal Commitment, and Actual Commitment

|       | Affect (A) | Verbal Commitment (VC) | Actual Commitment (AC) |
|-------|------------|------------------------|------------------------|
| A     | —          |                        |                        |
| VC    | .37***     | —                      |                        |
| AC    | .18**      | .36***                 | —                      |
| Mean  | 43.73      | 39.44                  | 26.44                  |
| SD    | 7.14       | 7.15                   | 6.30                   |
| Alpha | .70        | .73                    | .78                    |

\*\*  $p < .01$     \*\*\*  $p < .001$

Environmental Attitude and Behaviour in Hong Kong  
 Figure 2. A Structural Equation Model Showing the Standardised Path Coefficients



e: Arrows indicate relationship between constructs, and path coefficients represent their strength. Two-sided arrows indicate Pearson correlation coefficients. Measurement errors are indicated with a

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