

Sample Survey on Interests in Watershed Environment

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1. Design of survey questionnaire

1.1 Introduction

This survey is intended as an investigation of environmental concern or consciousness. Over the past few decades a considerable number of psychological and sociological studies have been made on environmental concern. On this subject reviews, see, for example, Fransson and Gärling (1999), Brand (2000) and Dunlap and Jones (2002).

But there seems to be little agreement about determinants and the impact of environmental concern. The main reason is that a clear definition doesn't exist about environmental concern. For this reason the questionnaire items about environmental concern are different according to surveys, or else early questionnaire items are used to ensure the reliability of analysis without discussing them.

Dunlap and Jones states that "environmental concern is a multifaceted construct consisting of two conceptual components." (Dunlap and Jones 2002: 486) The concept of environmental concern consists of "environmental" and "concern" conceptual component. Each component has also multifaceted meanings, that is to say "environmental" indicates a lot of environmental areas and "concern" contains various mental consciousness. Therefore it is different what the term "environmental concern" means depending on researchers who use the term.

It may be inevitable that the concept of "environmental concern" is ambiguous, as Dunlap and Jones put it. When we conduct a survey study on environmental concern, we must clarify the concept of it as much as possible.

1.2 Two dimensions of environmental concerns

To define the concept of environmental concern which we measured, in this survey, main items about environmental concern were classified from two dimensions: land covers and values of environment. The land cover is classified into three kinds, forests, crop fields or pastures, and river or lakes. This classification is derived from IGBP.

The values of environment originate from studies of environmental ethics. It is also classified into three kinds, direct use value (instrumental value), indirect use value, and inherent value. Direct use value is the value which is related to the use of resources. Forests, for example, have a value on the grounds that they produce timber. On the other hand, indirect use value is the value which is also related to use of resources. Although the value relates to utilization of resources, people do not use them directly. If we can enjoy recreational activities in lakes, those water areas have indirect use value. Inherent value is the value which is not related to use of resources. When we feel a wonderful of nature by a forest, it has an inherent value.

Since our survey questionnaire is based on the concept of environmental value, we can make this survey relevant to not only psychological and sociological studies on environmental concern but also economical studies of cost-benefit analysis on natural environment.

Ideas for designing the questionnaire is documented in the Zheng's report.

1.3 Questionnaire items of people's interests

In this survey, the questionnaire was designed limiting the meaning of concept on environment and concern. The main theme of our survey is people's concern on watershed environment. Watershed environment contains three land areas: forests, crop fields or pasture, and rivers or lakes. In turn, environmental concern to each area is classified into three environmental values: direct use value, indirect use value, and inherent value, and questionnaire items are designed corresponding to three environmental values.

Each concept corresponds to questionnaire items as follows.

1. Forest [Q4]

Direct use value: Q4 (1), (2)

Indirect use value: Q4 (3), (4), (5), (6), (7), (8), (9)

Inherent value: Q16

2. Crop field or pastures [Q9]

Direct use value: Q9 (1), (2), (3)

Indirect use value: Q9 (4), (5), (6)

Inherent value: Q17

3. Rivers or lakes [Q12]

Direct use value: Q12 (1), (2), (3)

Indirect use value: Q12 (4), (5), (6)

Inherent value: Q18

As question items on forest direct use value, for example, we prepared questions about an interest on timber production [Q4 (1)] and production of forest products other than timber [Q4 (2)]. And as question item on forest indirect use value, for example, we prepared questions about an interest on forest's providing scenery and recreation sites [Q4 (3)]. In the items of different forms, question of inherent value was prepared. As the item of forest inherent value, for example, we asked whether to have or not wonderful experiences in forests [Q16, 17, 18].

1.4 Other items

We prepared some questionnaire items other than interests on watershed environment. Many psychologists and sociologists assume a process model about human behavior. In attitude-behavior theory, for example, people's attitudes make beliefs, the beliefs cause

intention, and the intentions lead to behaviors. In addition, socio-economical status or knowledge about environment is taken into consideration as an external factor which has an effect on the behaviors.

In the same way, we assume that there is a causal relation between interest items and the others. We may explain those variables under the following heads: (1) independent variable; (2) dependent variable. Some variables are classified into both independent and dependent variable since they may have interactive causal relation with the interest items.

1.4.1 Independent variables

We assumed the following variables as an independent variable that influenced the interest on the environment. They can be classified into four main groups.

1. Knowledge

Environmental information obtaining [Q20]

2. Concern

Spiritual experience [Q16, Q17, Q18]

General environmental concern [Q22]

Lifestyle belief [Q24]

3. Behavior

Recreation activity [Q6, Q11, Q14]

Environmental conservation activity [Q7, Q15]

4. Ascription

Surrounding environment (currently) [Q2 (1)]

Surrounding environment (in childhood) [Q2 (2)]

Sex [Q26 (1)]

Age [Q26 (2)]

Education [Q27]

Occupation [Q28]

Family income [Q30]

1.4.2 Dependent variables

We also assumed the following variables as a dependent variable that influenced the interest on the environment. They can be classified into three main groups. Numerous attempts have been made to show the relationship between environmental concern and pro-environmental behavior. Using Q23 of this questionnaire we can construct a model to answer the following question: which of direct or indirect use value cause people to take environmentally responsible behavior?

1. Knowledge

Environmental information obtaining [Q20]

2. Concern

Satisfaction with surrounding environment [Q1]
Images of environment [Q3 (1), (2)]
Concern about forest landscape [Q8]
Spiritual experience [Q16, Q17, Q18]
Concern about watershed [Q19 (1), (2)]
Satisfaction with life in general [Q25]

3. Behavior

Recreation activity [Q6, Q11, Q14]
Environmental conservation activity [Q7, Q15]
Pro-environmental behavior [Q23]

2. Method

We have to inquire into a structure of people's interest in watershed environment. The approach employed in this analysis was as follows. First, we used exploratory factor analysis to investigate the structure of people's interests. Second, we used confirmatory factor analysis to verify our assuming models. All score of items was reversed so that the high concern becomes a high score.

The reason why we used factor analysis is that it enables us to construct latent variable models. In factor analysis, the causal relation from a latent variable to measurement variables is assumed. We adopt the hypothesis that people have environmental value concerns behind the interests in watershed environment. Our questionnaire, however, has not included question items of environmental values. Therefore, we need to deal with the environmental values as latent variables.

3. Results

3.1 Exploratory factor analysis

To assess the structure of people's interests in watershed environment, we subjected all 21 items of interests to a maximum likelihood factor analysis with direct oblimin rotation. We adopted six-factor solution because of its actual validity. The six-factor solution accounted for 69.2% of the variance.

The results of exploratory factor analysis about 21 items of people's interest is shown in Table 1. The meaning of the each factor is as follows.

Factor 1: Forest function of environmental conservation
Factor 2: Direct use value of crop fields or pastures
Factor 3: Scenery and recreation sites
Factor 4: Direct use value of forests
Factor 5: Direct use value of rivers or lakes

Factor 6: Habitat of plants and animals

We can interpret these factors from the viewpoint of the environmental values. Factor 2, Factor 4, and Factor 5 are classified into direct use values of environment. Likewise, Factor 1, Factor 3, and Factor 6 correspond to indirect use values. It was found that people's direct use value concern might be different according to the each land cover. On the other hand, in some indirect use value, namely scenery and recreation sites and habitat of plants and animals, same valuation criteria might be applied to even different areas.

3.2 Confirmatory factor analysis

To verify the factor structure of the people's interest in watershed environment, a confirmatory factor analysis was used. Latent variables of direct use value and indirect use value are introduced into the model as secondly factors.

The result of the confirmative factor analysis is shown in Figure 1 (standardized solutions). The direct use value affects direct uses of forests crop fields or pastures, and rivers or lakes as secondly factors. On the other hand, indirect use value has an effect on forest function, scenery and recreation sites, and habitat of plants and animals.

Because of a large sample size (n=802, samples with missing values was excluded), the result of test of goodness of fit was not acceptable. But goodness-of-fit indices, though they were not very excellent, could be acceptable.

Using the secondary factors of direct use value and indirect use value, further analyses will be extended. Figure 2, for example, shows that impacts of direct and indirect use values on the motivation to participate in voluntary activities of forest conservation by using structural equation modeling (the coefficients are standardized solutions). The result of test of goodness of fit was also not acceptable since the sample size was large (n=766). But goodness-of-fit indices, though they were not very excellent, could be acceptable. From the result of the analysis, it is reasonable to suppose that indirect use values produce the motivations of conservation activities.

4. Conclusion

In concluding, we should note that it is possible to apply environmental values, such as direct and indirect use values, to the analysis of people's interest of watershed environment. However, further modification of models is necessary to confirm the conclusion. We will have to look more carefully into the structure of people's environmental values which include not only direct or indirect use values but also inherent values.

References

- Brand, Karl-Werner, 2000, "Environmental Consciousness and Behaviour: The Greening of Lifestyles", Radclift, Michael R., and Graham Woodgate (eds.), *The International Handbook of Environmental Sociology*, Edward Elgar: 204-217.
- Dunlap, Riley E., and Robert Emmet Jones, 2002, "Environmental Concern: Conceptual and Measurement Issues", Dunlap, Riley E., and William M. Michelson (eds.), *Handbook of Environmental Sociology*, Greenwood Press: 482-524.
- Fransson, Niklas, and Tommy Gärling, 1999, "Environmental Concern: Conceptual Definitions, Measurement Methods, and Research Findings", *Journal of Environmental Psychology*, 19: 369-382.

Table 1. Loadings for Direct Oblimin Rotated Six-factor Solution for The Interest Items (Maximum Likelihood).

Item	Factor loading					
	1	2	3	4	5	6
Forest: Purification of water [Q4(6)]	.84	.01	.03	-.04	.06	-.05
Forest: Prevention of landslides and floods [Q4(5)]	.64	-.03	.00	.14	.08	.00
Forest: Ease of drought [Q4(4)]	.63	.03	.03	.21	.04	.00
Forest: Protection of living environment [Q4(7)]	.60	-.05	.13	.03	-.06	-.07
Forest: CO ₂ sequestration [Q4(9)]	.49	-.04	.01	.03	.01	-.30
Crop field: Production of grains [Q9(1)]	-.04	-.89	-.06	.08	.05	.02
Crop field: Production of vegetables or fruits [Q9(2)]	.05	-.88	.02	.03	-.01	.04
Crop field: Production of dairy products or meat [Q9(3)]	-.06	-.56	.14	.01	-.01	-.15
Crop field: Conservation of water and soil quality [Q9(5)]	.38	-.38	.07	-.03	.24	-.02
River: Providing scenery and recreation sites [Q12(4)]	-.03	.08	.78	-.01	.18	-.04
Crop field: Providing scenery and recreation sites [Q9(4)]	.06	-.19	.71	-.02	-.07	.01
Forest: Providing scenery and recreation sites [Q4(3)]	.21	.01	.51	.21	-.13	-.04
Forest: Production of forest products [Q4(2)]	-.05	-.06	.01	.90	-.03	.02
Forest: Timber production [Q4(1)]	.09	.01	-.01	.65	.07	-.04
River: For industrial and agricultural uses [Q12(2)]	.19	-.15	-.03	.12	.57	-.01
River: Fisheries [Q12(3)]	-.10	-.02	.23	.14	.49	-.12
River: For residential uses [Q12(1)]	.29	-.23	.03	.00	.43	-.03
River: Self-purification process [Q12(6)]	.26	-.10	.10	.01	.37	-.19
Forest: Habitat of plants and animals [Q4(8)]	.28	.03	-.02	.10	-.13	-.68
River: Habitat of plants and animals [Q12(5)]	-.11	.00	.17	.06	.32	-.59
Crop field: Habitat of plants and animals [Q9(6)]	.02	-.25	.07	.02	.08	-.56

* All item is Reverse-scored

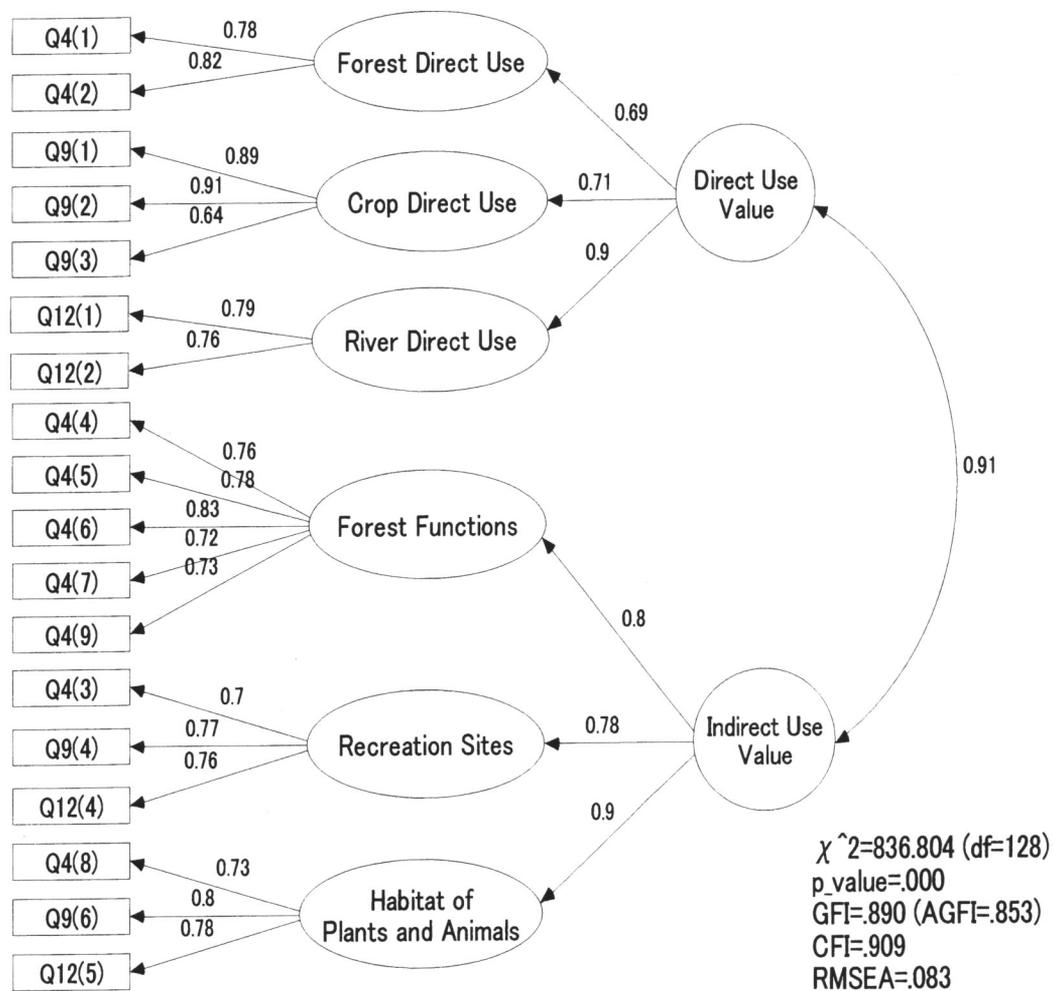


Figure 1. Secondly Factor Analysis Model of Interests in Watershed Environment (Standardized Solutions).

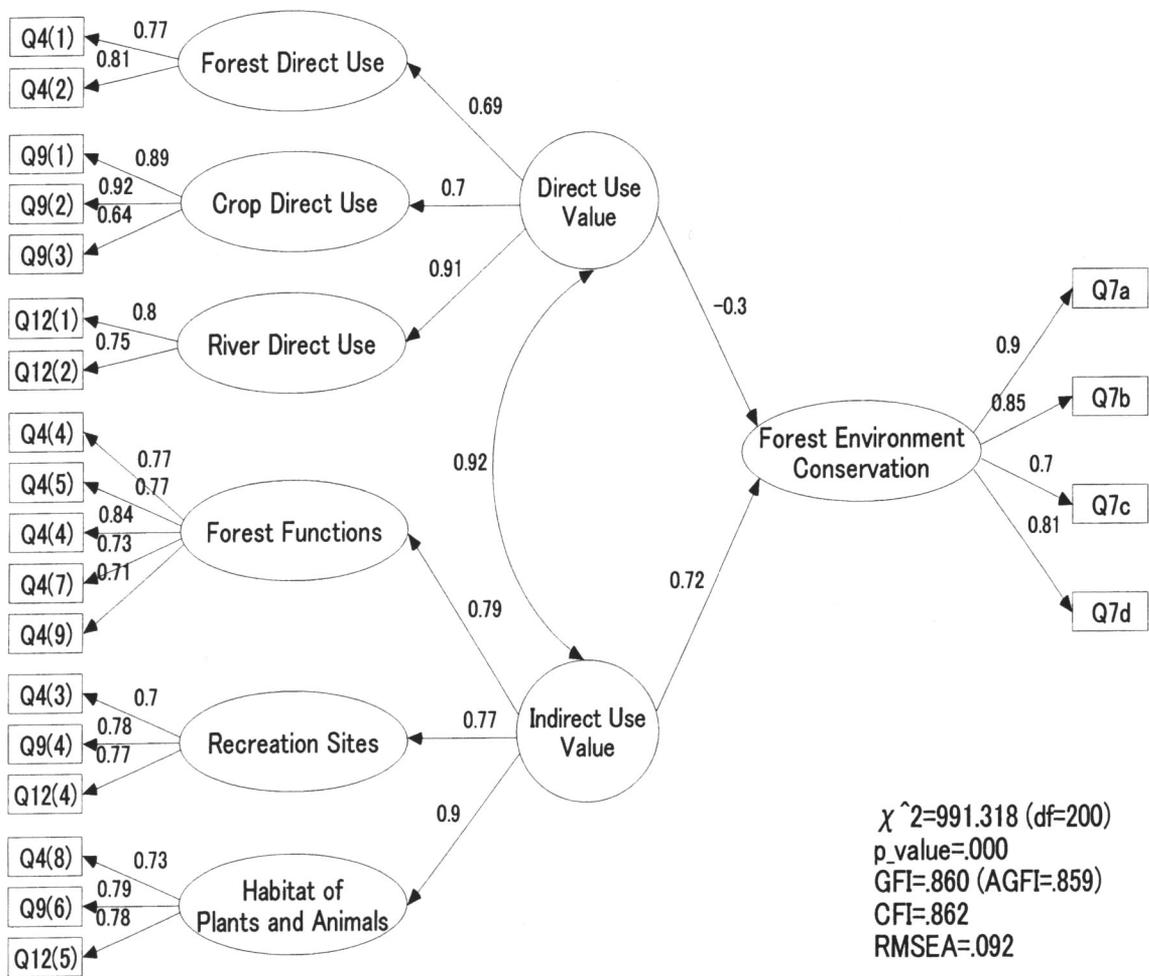


Figure 2. Causal Model of Forest Conservation Activities (Standardized Solutions).