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RESEARCH ARTICLE

INFLUENTIAL FACTORS OF THE ENVIRONMENTAL PERCEPTIONS AND PRO-ENVIRONMENTAL BEHAVIOR OF RESIDENTS IN WESTERN CHINA

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ABSTRACT

On the basis of theory of planned behavior, this paper investigated local residents from four dimensions and analyzed their individual perceptions and behavioral intentions from such dimensions, starting from individual perception of environment. In addition, the study is conducted relative to an intermediate mechanism, i.e., environmental behavioral intentions. The conclusions of the research help ascertain the key influential factors of the environmental perception and behavior of local people and provide crucial guidance for improving the environmental perception and behavioral intentions. The current study also provided case support for examining the relationship between the local residents and the economic development or environmental changes and can facilitate the resolution of the currently prominent environmental problems in China.

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INTRODUCTION

Western China is a region covering 71% of China's total land area and cradles the Yangtze and the Yellow Rivers. It plays a critical role in safeguarding the ecology and environment of Central and East China and holds an extremely important strategic position. As Western China undergoes urbanization and industrialization, the effective prevention and reduction of the damage and pressure on the fragile ecological environment and the management of existing environmental problems are crucial issues for the development of the western region. Such concerns are also decisive for the economic and social development of China. Heishui County in the Aba Tibetan and Qiang Autonomous Prefecture of Sichuan Province is a national-level poverty-stricken county in China with more than 95% of its permanent population belonging to minorities. In addition to the advantages from the golden tourism circle of "Jiuzhaigou–Huang long," the natural landscape of the area also benefits residents. However, the economic development of Heishui County is sluggish, and its residents are impoverished and have low education. In the course of economic planning, the local government has failed to consider the significant impact of human activities on the environment. Consequently, the unique natural resources of the area were continuously destroyed, and economic development and environmental protection presented a major contradiction on the ground.

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Therefore, taking residents in Heishui County as the research object, the results of this investigation will be helpful for testing and expanding relevant theories and providing references for solving the contradiction between economic development and environmental protection in the poverty-stricken areas in Western China.

Literature review

Environmental perception

Environmental perception indicates the direct feelings of a person for the environment in broad and narrow ways. This study adopts a narrow definition of environmental perception, that is, environmental perception refers to the image formed of the environment in the human mind (He Aizhong, Tang Yu and Dai Zhili, 2012). Environmental perception is an important link between the environment and mankind. Furthermore, accurate environmental perception is a prerequisite for human environmental behaviors (Peng Jian *et al*., 2001). Gold J R. (1980) affirmed that the environmental perception of an individual may be affected by factors such as sensory organs, physical qualities, and living environment, which may elicit a vague feeling. In an investigation of the influential factors of the environmental perception of farmers in Northern Shaanxi, Guo Lingxia (2015) claimed that the length of residence, level of education, social capital, and human capital of local farmers are the main factors affecting their environmental perception, awareness, and behaviors.

Pro-environmental behavior

Pro-environmental behavior (PEB) is a concept widely used by western scholars. Presently, it has no unified definition. For instance, Kasier (1998) affirmed that it should be an ecological behavior, Stern (2000) considered PEB an important and positive environmental behavior, Cottrell (2003) proposed an account of responsible environmental behavior, Thogersen (2006) regarded PEB as the environmental responsibility of an individual for some reason, and Huddart-Kennedy (2009) *et al*. considered it an environmental support act. On the basis of the research results of Kollmuss and Agyeman (2002), we define PEBs is that behaviors by human beings minimize the negative impact of their activities on the ecological environment. In terms of the factors influencing PEB, Noppers *et al*. (2014) validated that individual PEBs are primarily influenced by individual internal factors and by situational, normative, and affective factors. Prior studies notably include PEB as a type of environmental behavior and emphasize that positive environmental behavior arises from the positive effect on daily life of the improvement of environmental conditions and environmental quality. Moreover, they offer no strict distinction between PEB and environmental protection. However, the two concepts should be differentiated.

Theory of planned behavior

Theory of planned behavior (TPB) posits that behavioral intention is the key influencing factor in the final actual behavior of an individual. The five elements of TPB include Attitude, Subjective Norm, Perceived Behavioral Control, Behavior Intention, and Behavior. Three variables directly affect behavioral intentions: Attitude, Subjective Norm, and Perceived Behavioral Control (Fig. 1).

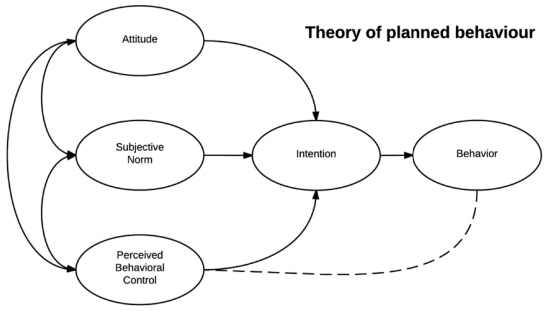

Fig. 1. TPB Model

As evident, the Attitude of an individual toward Behavior, Subjective Norm, and Perceived Behavioral Control form the intention of individual behavior in TPB. Generally, the more favorable the Attitudes and Subjective Norms, the greater the Perceived Behavioral Control, and the stronger their Behavior Intention. People are expected to likely implement their intentions when opportunities arise and are highly liable to commit to actual actions.

Research model and hypothesis

In the past, scholars mostly regard individuals as homogeneous and seldom consider the impact of individual differences on environmental perception when using TPB to study the environmental perception of residents. Extant PEB literature mostly studies the influence of individual attitudes, values, and intentions on PEB from an individual perspective but fail to consider the impact of different environmental perceptions. This study adds a new observation dimension to the TPB model, "perception dimension," and investigates the behavior of residents through four dimensions. Moreover, the factors influencing the environmental behavior of residents are summed up in eight aspects: perception dimension (perception of the natural and social environment), regulation dimension (individual and social norms), attitude dimension (environmental attitude and consequence awareness), control dimension (self-efficacy), and the environmental behavioral intentions (Fig.2). Environmental behavior intention is considered as intermediate mechanism (Fig. 2).

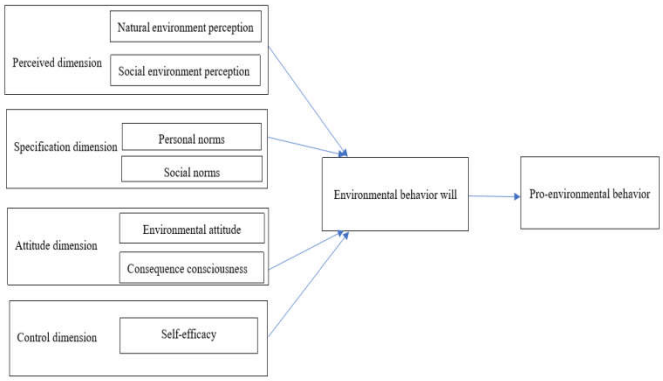

Fig. 2. Research theory model

Perception dimension hypothesis on the PEB of residents

Schultz (2000) and Berenguer *et al*. (2007) interpreted PEBs from the perspective of empathy with nature. Gray (2007) argued that feeling one's emotions in the natural environment will be pleasant or unpleasant for individuals, which, in turn, will lead to their environmental intentions and behaviors. Hunter, Hatch, and Johnson (2004) claimed that people's perception of the natural environment can be manifested in PEBs. Moreover, compared with their perception of the natural environment, people's perception of the social environment is highly abstract. However, similar to their perception of the natural environment, when people perceive that the social environment is deteriorating, they are more likely to discuss environmental issues with others and collaborate to solve environmental problems. On the basis of these findings, the following hypotheses are proposed:

H1A: The worse the residents' perception of the natural environment is, the higher the willingness of residents to engage in environmental activities,

H1B: The worse the residents' perception of the social environment is, the higher the willingness of residents to engage in environmental activities.

Norm dimensional hypothesis on the PEB of residents

This study divides the norm dimension into individual and social norms. Individual norms mainly refer to the social norms accepted by individuals and represent the feeling of people's moral obligation to take actions. Wynveen (2015) claimed that individual norms have a direct impact on the willingness of an individual to improve or preserve the state of environment. Individuals may have a sense of pride if they respect individual social norms (Song Chendi, 2002). By contrast, social norms are rules or standards that can be accepted by the vast majority of society (Sherif, 1965). Certain

scholars have verified that PEBs can be predicted, including reduced littering (Cialdini *et al*., 1990),enhanced recovery (Fornara *et al*., 2011; Nigbur *et al*., 2010; Schultz, 1999), and increased energy conservation behaviors (Gockeritz *et al*., 2010; Nolan *et al*., 2008). Therefore, the following hypotheses are proposed in relation to the norm dimension:

H2A: The higher the individual norms, the higher the willingness of residents to engage in environmental activities,

H2B: The higher the social norms, the higher the willingness of residents to engage in pro-environmental behavior.

Attitude dimension hypothesis on the PEB of residents

Attitude dimension includes environmental attitude and consequence consciousness. The strength of consequence consciousness is a necessary precondition for the individual's willingness to take responsibility (De Groot and Steg, 2007; Hansla *et al*., 2008; Steg *et al*., 2014). Consequentially, individuals with weak consciousness may not produce environmental awareness, nor environmental intention and behavior, and they may even exerta negative impact on the environment (van der Werff *et al*., 2013; Gossling *et al*., 2009; Lorenzoni *et al*., 2007). Attitude refers to the continuous, long-lasting positive (like) or negative (dislike) feelings of an individual for a particular object or problem (Fishbein and Ajzen, 1975). In certain studies, attitude is considered an important predictor of individual behavioral intentions and behaviors (Fishbein and Ajzen, 1975; Ajzen and Fishbein, 1980; Ajzen, 1988). Bissing (2013) verified that environmental attitude has a positive impact on PEBs. The hypotheses regarding the attitude dimension are as follows:

H3A: The stronger the consequence consciousness, the higher the willingness of residents to engage in environmental activiti es.

H3B: The higher the environmental protection attitude, the hig her the willingness of residents to engage in environmental acti vities.

Control dimension hypothesis on the PEB of residents

Control dimension chiefly indicates self-efficacy. Bandura (1977) argued that self-efficacy refers to the confidence of individuals in their ability to plan and perform actions and accomplish or solve problems. Environmental self-efficacy can affect the environmental behaviors of people (Lee *et al*., 2014). Moreover, self-efficacy promotes the recovery behaviors of residents (Tang *et al*., 2011). Self-efficacy also triggers power-saving behaviors (Thøgersen and Grønhøj, 2010) and various other forms of PEBs (Meinhold and Malkus, 2005; Walton and Austin, 2011). Accordingly, the following assumption is proposed.

H4: The higher the self-efficacy, the higher the willingness of residents to engage in environmental behavior.

Hypothesis on the willingness to engage in PEB and the PEB of residents

Behavioral intentions are instructions that people give themselves to behave in a certain way and are decisions people make about a particular course of action (Triandis, 1980). Cheung *et al*.(1999) confirmed the positive relationship between behavioral intention and PEB through garbage collection. Taylor and Todd (1995) verified that the intention of implementing this behavior is significantly positive influence. Furthermore, intention, as the motivational factor influencing behavior and the core factor predicting actual behavior, has a positive effect on the PEBs of residents. Therefore, this study proposes the following hypotheses:

H5A: The higher the willingness of residents to engage in environmental activities, the more likely they are to take actions to protect the environment,

H5B: The willingness of residents to engage in PEB splays an intermediary role between antecedent variables and PEBs.

Data acquisition and analysis

Located in the middle of the Aba Tibetan and Qiang Autonomous Prefecture of Sichuan Province, Heishui County is a national-level poverty-stricken county with an average altitude of 3544 meters. Tibetans and Qiangs represent 95% of the county's population. Data collection was conducted in Heishui County through a questionnaire survey. A total of 1113 questionnaires were distributed, and 656 questionnaires were collected for this study. The reason for the low number of returned questionnaires is that local residents have a low level of education and consequently have difficulty understanding the surveyor even recognizing Chinese characters. The questionnaire pretreatment yielded 639 valid questionnaires, at a recovery rate of 91.28%. Table 1 shows the demographic characteristics of the surveyed samples. For testing reliability and validity, this study usedSPSS19.0 data statistical analysis software to conduct Cronbach'sα test on related variables. In the test of the PEBs of residents, Cronbach's α value is 0.731, the KMO value is 0.857, and the factor loading matrix after each rotation is greater than 0.5. For the test on the environmental perception of residents, Cronbach's α value is 0.866, the KMO value is 0.829, and the corrected factor loading matrix of each item after rotation is greater than 0.5. Hence, reliability and validity are acceptable.

Analysis of factors affecting the PEB intention of residents

Regression analysis was applied to test the hypotheses. Table 2 exhibits the test results. The regression results of Model 2 affirm that social norms ($r = 0.215$, $p < 0.05$), social consequences ($r = 0.197$, $p < 0.05$), and self-efficacy ($r = 0.462$, $p < 0.001$) have significant positive impacts on the willingness of residents to engage in environmental activities. By contrast, natural environmental perception, social environmental perception, individual norms, individual consequence awareness, and environmental attitude have no significant effect on such willingness. Assuming that H1A, H1B, H2A, and H3B have not been validated, whereas H2B, H3A, and H4 have been validated, the following factors are listed by weight: self-efficacy, social norms, and awareness of social consequences.

Analysis of the influence of the PEB intention of residents on environmental behaviors

Hypothesis H5A posits that the higher the willingness of residents to engage in environmental behaviors, the more likely they are to take actions to protect the environment. The

analysis results of H5A are shown in Model 5 in Table 3.1, showing that after controlling for the related control variables and environmental factors, the pro-environmental intention of residents displayed a significant positive impact on the residents' environmental behavior ($r = 0.309$, $p < 0.001$), thereby validating H5A.

Intermediary effect analysis on the PEB intention of residents

This study draws on the intermediary effect stepwise regression test method proposed by Baronand Kenny (1986) to ascertain the intermediary effect on the PEB intention of residents.

In the analysis of pro-environmental behavior, social norms ($r = 0.176$, $p < 0.05$), social consequences ($r=0.276$, $p<0.01$) and self-efficacy ($r=0.333$, $p< 0.001$) have significant positive impacts on the environmental behavior of residents. Model 2 shows that those three factors have significant positive impacts on the PEB intention of residents. With the addition of independent variables and mediating variables, the PEB intention of residents has a significant positive impact on the environmental behaviors ($r = 0.309$, $p < 0.001$) and social norms ($r=0.142$, $p<0.05$) of residents. Self-efficacy ($r=0.132$, $p<0.05$) has a significant impact on the environmental behaviors of residents, where as the awareness of social consequences ($r=0.060$, $p>0.05$) is less significant.

Table 1. Demographic description of samples

Demographic variables		Composition ratio (%)	Demographic variables		Composition ratio (%)
Gender	Male	51.1%	Average	≤2000 RMB	51.2%
	Female	48.9%	monthly	2001-4000 RMB	19.1%
Age	≤20 years old	2.1%	household	4001-5000 RMB	17.5%
	21-30 years old	33.3%	income	5001-6000 RMB	10.3%
	31-40 years old	58.9%		≥ 6000 RMB	1.9%
	≥40 years old	5.7%	Occupation	Full time student	14.9%
Length of Residence	≤10 years	14.3%		Business staff	7.8%
	11-20 years	29.1%		Farmer	20.6%
	＞20 years	57.6%		Teacher & research worker	17.7%
Education background	Primary School	22%		Private owner	5.0%
	Junior high school	58.9%		Personnel at institutions	19.8%
	High school	15.6%		Freelancer	6.4%
	Specialty and above	3.5%		Others	7.8%
Type of Household	Agricultural household	60.9%	Current	Country	39.8%
	Non-agricultural household	39.1%	residence	City (Town)	60.2%

Table 2. Regression analysis of environmental variables on the environmental behaviors of residents

	Pro-environmental behavior will		Pro-environmental behavior		
	Model 1	Model 2	Model 3	Model 4	Model 5
Control variables					
Gender	-.031	.067	.060	.004	.024
Age	-.151	-.025	-.189	-.075	-.117
Length of residence	-.111	-.042	-.044	-.023	-.015
Education	.015	-.091	.137	.092	.143
Average monthly household income	-.005	-.038	-.083	-.036	-.078
Occupation	.077	0.085	-.015	-.083	-.003
Type of household	.094	.113	.003	.048	-.033
Current residence	-.060	.006	-.086	-.008	-.046
Independent variable (IV)					
Natural environment perception		.021		.131	.018
Social environment perception		.034		.074	.002
Personal norms		.091		-.123	.018
Social norms		.215*		.176*	.142*
Personal consequence consciousness		-.012		.185*	-.009
Social consequence consciousness		.197*		.276**	.060
Environmental attitude		-.044		.074	-.013
Self-efficacy		.462***		.333***	.132*
Mediation variables (MV)					
Pro-environmental behavior will					.309**
R^2	.034	.517	.071	.418	.460
ΔR^2		.483***		.347***	.042*
F	.573	7.608	1.243	5.473	5.153

Table 3. Hypotheses test results

Hypothesis	Verify or not
H1A: The worse the resident's perception of the natural environment, the higher the willingness of the residents to engage in environmental activities.	No
H1B: The worse the residents' perception of the social environment, the higher the willingness of residents to engage in environmental activities.	No
H2A: The higher the individual's norms, the higher the willingness of residents to engage in environmental activities.	No
H2B: The higher the social norms, the higher the willingness of residents to pro-environmental behavior.	Verified
H3A: The worse the consequences, the higher the willingness of residents to engage in environmental activities.	Partially verified
H3B: The higher the environmental protection attitude, the higher the willingness of residents to engage in environmental activities.	No
H4: The higher self-efficacy, the higher the willingness of residents to engage in environmental behavior.	Verified
H5A: The higher the willingness of residents to engage in environmental activities, the more likely they are to take actions to protect the environment.	Verified
H5B: Residents' willingness to behave in an environmentally friendly way plays an intermediary role between antecedent variables and pro-environmental behaviors.	Partially verified

These findings corroborate that the intention of residents to engage in PEBs plays a partial intermediary role in the social norms, self-efficacy and resident PEBs and plays a complete intermediary role between social consequence awareness and the PEBs of residents.

In addition, the study examines the relationship between each influential factor and the PEB intentions and the environmental behaviors through data collection and analysis and hypothesis testing. Results are shown in Table 3.

Research conclusion

This research investgates Heishui County, an impoverished area in Western China with a population predominantly consisting of minorities, as a study case. On the basis of TPB, the current study examines the environmental perception and behavioral influential factors of local residents through a questionnaire survey. Among the factors affecting the environmental perceptions of residents, significant differences are present in the natural environment perception among different genders, levels of education, average monthly household incomes, and the lengths of residence. Moreover, significant differences exist in the social environmental perception among different academic qualifications, lengths of residence, and average monthly household incomes of the population. Interestingly, in terms of pro-environmental factors, residents perceive the local environment as poorer than before, but such belief does not have any significant impact on their pro-environmental behaviors. That outcome indicates that the environmental behaviors of people should also be changed from other aspects. In addition, this study also affirms that social norms, social consequences, and self-efficacy have significant positive impact on the residents' PEB intention. The factors are listed below according to decreasing degree of significance: self-efficacy, social norms, and awareness of social consequences. Moreover, the residents' PEB intentions have a significant positive impact on the environmental behaviors of residents as well.

Research limitations

This study investigated the residents of Heishui County as its research object. However, during the actual investigation, the survey population concentrated on the people living in the county, as the survey samples of local rural residents and pastoral residents were insufficient. Moreover, as it is based on TPB, this research has certain limitations, and the selection of specific indicators in all dimensions was incomplete. Several concepts and indicators may be selected in future research for a highly detailed measurement of factors at the interactional level from the cognitive and structural aspects (such as social network analysis) to test the main theoretical ideas and validate the universality of these findings. Deviations may also be present in the selection of measurement tools in the research design. Finally, limitations may arise regarding the control of irrelevant variables in the research process. Factors such as affective factors and cognitive levels may be added in future research.

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