

Gender Differences in Public Environmental Behaviors and Their Changes
_____ based on data taken during 2006 and 2009 in Xi'an, China

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ABSTRACT: As China's economy has been developing rapidly, the government is making efforts to initiate the construction of ecological civilization and the development of low-carbon economy. And at the same time, positive changes have taken place concerning environmental awareness and behaviors on the part of women in China. This article, based on the new paradigm Dunlap Theory by adopting the cross-section data during the period from 2006 to 2009, compares and analyzes the present situation and changes of women's involvement in environmental behaviors. Empirical evidence shows that female shallow environmental behaviors score 47.56 points increasing 16.26% as compared with 40.91 points in 2006. Women's deep environmental behaviors score 57.23 points, increasing 23.26% as compared with 46.43 points in 2006. The gender sensitive analysis is reported as follows: the gender difference in shallow environmental behaviors in 2006 was not significant ($p=0.358>0.05$); the gender difference in shallow environmental behaviors in 2009 was not significant ($p=0.359>0.05$); the gender difference in deep environmental behaviors in 2006 was not significant ($p=0.462>0.05$); the gender different in deep environmental behaviors in 2009 was not significant ($p=0.375>0.05$).

This suggests that at the present stage the gender gap in the public environmental activities is not significant both in 2006 and 2009. This is in disagreement with mainstream point of view that women have more active environmental actions in environmental protection. This article further analyzed the vital reason for this is that women have got less environmental knowledge through school education and medias or other social information. It is suggested that countermeasures should be taken to promote women's participation in environmental protection actions.

Key words: Public environmental behavior; Environmental knowledge;

Environmental importance; Gender gap

1 *Introduction*

Attention has been paid to the studies on gender sensitivity in the field of environmental protection. A more common view is that more women than men have a more positive attitude towards environmental behaviors. Francoise d'Eaubonne in

1974, first proposed "eco-feminism", describing the women's potential impact on the environment, and pointing out that women should take a more active role in environmental protection. In the 1990's, researches turned up in the field of environmental protection mainly focusing on gender issues, and many empirical studies confirm that the involvement of women in environmental protection action is more active than that of men. Brent S. Steel (1996) , based on the American data, found that women were more likely than men to form a large number of environmental behaviors and to participate in related policy issues. This gender difference in performance is more significant in the elderly population. The main causes of this difference: firstly, it is due to the different social experience on the part of men and women, and the different social experiences result in the concept that women would like to better protect the mother nature and the ecological center as well. Secondly, the division of labor between men and women in the modern family is different. Women are still playing a main role in family labor, so as to participate in household environmental protection more than men in the family.

However, the empirical research findings on the Chinese data are not consistent with the mainstream view. China's Ministry of Environmental Protection conducted a national survey of public participations in environmental protection in 1998 and 2006 respectively, and Ren Liying concluded, based on the data analysis in 1998, that the performance of men is more active in environmental protection than that of women. National City Public Environmental Awareness Survey Report (2006) concluded that the environmental behaviors have nothing to do with gender. Hong Dayong came to

the conclusion, by means of the Data in General Social Survey (Urban Section), that analytical results show that more men have higher levels of environmental concern than women. Based on these empirical results that have already been open, the writer judged that: at the present stage, more women participate in the behaviors of environmental protection than men, which is inconsistent with the mainstream view that women did not show the kind of advantages and leading role that scholars and experts had expected.

Between 2006 and 2009, the author carried out in Xi'an, a questionnaire survey of public environmental awareness so as to form cross-sectional data at different time points. Through the analysis of gender-sensitive data, and the study of the gender differences of the public acts in the public environment, the underlying causes can be analyzed, and specific measures for improvement can be put forward.

2 *Methods*

2.1 *Study site*

The study area, Xi'an is the Capital city of Shaanxi, which is known for being the capital city for 13 dynasties and probably most readily identified with the terra cotta soldiers of the Emperor Qin Shi Huang. Shaanxi Province, located in the center of China, has a population of over 36 million people living in 200,000 square kilometers (roughly 77.2 thousand square miles). Shaanxi is landlocked and bordered by Inner Mongolia, Shanxi, Henan, Hubei, Sichuan, Gansu and Ningxia. Shaanxi includes most of the middle stretch of the Yellow River, one of the earliest cradles of ancient Chinese civilization. In terms of GDP per capita and per capita consumption income, Xi'an is far closer to the national average than

the major cities of Beijing, Shanghai and Guangdong.¹ Residents of Shanghai, the most commonly studied city, have almost twice the disposable income of the average Chinese citizen. The following is the part of statistical data for Beijing, Shanghai, Guangzhou and Xi'an (See Table 1).

2.2 *Questionnaire design and sample selection*

The questionnaire design was based on the Central Government's "National Survey of Urban Environmental Awareness, 2006," a survey which was part of a new Central Government policy promoting public awareness of environmental issues; hence, one could expect the level of knowledge would have increased somewhat between the national survey and this study. The questionnaire includes sections of environmental knowledge, environmental significance, environmental importance, individual environmental protection behaviors, public environmental protections behaviors and demographics.

In 2006, the modified questionnaire was pretested on 30 students in Shaanxi province. The final questionnaire was distributed by 20 second-year students from the School of Economic Management of Northwestern University. These students were assigned to collect 20 interviews, 10 from males and 10 from females. Collectively, the students originated from a wide range of areas in Shaanxi province. They collected 386 valid questionnaires (500 issued) in Xi'an, a response rate of 77%.

In 2009, the survey design was still on the basis of the questionnaire census of 2006 trying

¹ the per capital disposable income (in dollars) in 2006 of the most commonly studied cities and surrounding areas (Beijing, urban, 2506; rural, 1038; Shanghai, urban, 2592; rural, 1146; Guangdong, urban, 2009; rural, 637) is markedly higher than the nation as a whole (urban, 1475; rural 450), while Xi'an 's disposable income slightly lower (urban, 1368; rural, 478) than the national average.

to be consistent with a few adjustments for some specific contents. For example, the problems from B9 to B14 in the original questionnaire have been deleted, which has nothing to do with this research, so that the interviewees can be basically guaranteed to concentrate their efforts on answering a questionnaire within 30 minutes or so; The new problem B9 on the satisfaction of the environmental policy issues has been added. The question B507 “sending cards to friends and relatives on holidays and spring festival” in the original questionnaire has been left out.

A random sample of 400 households was used to select the samples, but the investigation in 2009 had better response rate. This resulted from investigators have been professionally trained, among whom five are postgraduates majoring in environmental economics. They finished making household-to-household interviews within 30 days (including return visits), and they took back 400 pieces of effective questionnaire. The time span between the surveys was not long enough to be affected by cultural changes of the survey participants. Therefore, the samples to be surveyed were narrowed in the capital City Xi’an, and after all, cultural changes and information passage in the provincial capital city are faster than in other areas in the province so that the difference can be seen more clearly by comparison. The method of crosstabs analysis was adopted for the categorical variable data in 2006 and 2009, which was completed by SPSS16.0.

2.3 *Scale construction*

Behavior was separated into individual and public acts. Individual behaviors were considered private (household-level) acts or shallow green behavior, generally acts for which the individual received some direct benefit. This level of behavior is commonly a target of educational campaigns, and includes activities such as: using non disposable tableware when

eating out, turning off tap water, using alternatives to throwaway plastic bags, and using energy saving products. These behaviors lend themselves particularly well to educational campaign since they are easily identifiable as a specific act and have direct benefits, including in many cases economic benefits, for individuals in the target audience.

Public behaviors or deep green activities are most closely aligned to advocacy behavior, either at a general level -- publically voicing concern about environmental protection or stopping others from environmentally destructive actions (e.g., littering) -- or as part of an organized government or advocacy group activity -- volunteering for government or NGO sponsored events, petitioning against environmental pollution. Public behaviors are more closely the responsibility of individuals as stewards and citizens than as private actors and are considered 'deeper' or more profound environmentalism because the actions do not specifically have a direct economic benefit (private good). Both scales were developed from aggregated scores for self-reported statements about activities in the past two years using a scale ranging from often to never.

2.4 *Environmental knowledge*

The environmental knowledge scale was formed from combining the answers for questions asking respondents to identify (a) white pollution, (b) the correct date of World Environmental Day, (c) what wastes were separated for waste collection, and (d) what are the major environmental pollutants (the "three wastes"). Each was presented as a series of questions which started with the general introduction of "have you heard of ____" and followed with specific questions "what is _____?" that allowed the interviewer to determine actual level of knowledge. Environmental significance and environmental importance **and** Environmental policy scales were

developed from aggregated scores for questions using a four point scale from strongly disagree to strongly agree that reflected basic orientation to the environment as favoring conquest versus harmony (environmental significance) and assessments of potential environmental problems (e.g., reduction of arable land, sandstorms etc.) using a four point scale from not serious to very serious. Environmental policy was measured using the combine responses based on public policy topics such as plastic-bag ban, no-driving-car day on September 22, public hearing on the environmental impact assessment, environmental administrative reconsiderations, public hearing on water price, and reporting system of quality of the environment for media (networks).

3 Results

3.1 Characteristics of sample

Data results show average value of the variables is in a stable level with strong representativeness. (See Table 2). The difference of the results of descriptive statistics in 2006 and 2009 surveys are as follows:

⊖ The average education is different being college level in 2009, and the high school level in 2006.

⊖ The average income level is different with the average family income of 2001 to 2500 RMB in 2009 and 1500 to 2000 RMB in 2006.

⊗ Gender ratio is different with samples of 230 males accounting for 57.5% in 2009 and the equal samples of both males and females in 2006.

↓ The career distribution is different, and the sample ratio of self-employed managers, peasants, students, soldiers, police, non-governmental organizations, and social organizations in 2009 is slightly higher than that in 2006.

⤴ The sample ratio of children is different, and there were more of those who had children than the ones who had no children in 2009 with no data of the kind was asked for in 2006.

The same results of descriptive statistics in 2006 and 2009 surveys are as follows:

- ⊖ The average age is of 36 years.
- ⊖ The married samples are a little more than the unmarried sample.
- ⊗ The residence before the age of 18 is in small towns and medium-sized cities.

The variables of environmental policy were newly added to the survey in 2009 with the lowest score of the assignment being 1 and the highest being 5. The average score of the samples is 3.93, which means 78.6 points in a hundred terms. This shows that the evaluation of the citizens about environmental policy is satisfactory, but has not reached a very satisfactory level.

3.2 *Environmental attitudes and behaviors*

On the basis of descriptive statistics in percentage terms (see Table 3), the score of individual environmental behaviors in 2009 was 47.56 points, 6.65 points more than that in 2006 increasing 16.26%; the score of public environmental behaviors was 57.23 points, 10.8 points higher than that in 2006, up 23.26%. The score of environmental knowledge was 81.77 points, 1.09 points less than that in 2006, down 1.32%; the score of environmental significance was 71.79 points, 3.12 points higher than that in 2006, increasing 4.54 percent; the score of the environmental importance was 52.56 points, 0.22 points higher than that in 2006; thus the level of the public environmental knowledge and the environmental importance and the environmental significance improved a little in 2009; the personal statement of environment behaviors had also improved, especially the individual environmental behaviors were changed greatly, within a short span of three years with nearly 30% increase, which is a very alarming figure. Public environmental behaviors have improved in some extent, but the level of the public participation is still low, remaining in a failing state .

3.3 *Reliability Testing*

Crobach alpha test showed the following: internal reliability of .734 for environmental knowledge, $\alpha = 0.734$; individual environmental behaviors, $\alpha = 0.672$; public environmental behaviors, $\alpha = 0.713$; environmental significance, $\alpha = 0.753$; environmental importance, $\alpha = 0.661$; environmental policy, $\alpha = 0.850$ of which the proportion of true value surpasses 70%, which can explain the observation value of the variables of public environmental behaviors, environmental knowledge, environmental significance and environmental policy,

but the reliability of variables of individual environmental behaviors and the environmental importance is close to 70%.

3.4 Contingency Table Analysis

The results in Chi-Square Tests on the basis of the data for the year 2006 show(see table 4) : In the 5% confidence level, there are no significant gender differences in the shallow environmental behavior ($p = 0.358 > 0.05$), deep environmental behavior ($p = 0.462 > 0.05$), environmental knowledge ($p = 0.436 > 0.05$), and environmental significance ($p = 0.138 > 0.05$) and environmental importance ($p = 0.726 > 0.05$).

However, the results in the data of the year 2009 is slightly different(see table 4) : In the 5% confidence level, there are no significant gender differences in variables of the shallow environmental behavior ($p = 0.359 > 0.05$), deep environmental behavior ($p = 0.375 > 0.05$), and environmental significance ($p = 0.817 > 0.05$), but there are striking differences in environmental knowledge ($p = 0.032 < 0.05$), and environmental importance existing ($p = 0.012 < 0.05$). That's to say women show a higher level of environmental knowledge and awareness of environmental importance.

By comparing the analytical results for the period between 2006 and 2009, it can be seen that the changes are not obvious on the part of men and women in terms of environmental behaviors and environmental significance as times goes on. There are clear changes in the environmental importance variable and environmental knowledge variable, and women are more active than men in the environmental knowledge and environmental importance. We believe that thanks to the publicity and promotion of environmental knowledge made by television, newspapers and other media, however, from the change of consciousness to the stage of putting it into practice, there is delay of action, and the public changes of environmental behaviors require a long time interval.

4 Conclusion

From 2006 to 2009, women had improved themselves in varying degrees in the environmental behaviors (shallow and deep environmental behaviors), environmental

knowledge, environmental significance and environmental importance, indicating that as time goes on, women's environmental knowledge and awareness of the environment will gradually improve, and with sufficient time given, Chinese women will show more positive environmental behaviors recognized by the mainstream view. However, the two-time-point gender-sensitive analysis has shown that there does not exist significant gender differences in the public environmental behaviors. Women have not put up much more active environmental behaviors whether shallow or deep environmental behaviors are concerned. This paper argues that the low level of environmental behaviors on the part of women is not due to the fact that female domestic labor is not reduced, nor is the lack of emotional character, but that too few women can obtain professional knowledge, thereby affecting their own environmental awareness and environmental behaviors. To this end, the following three causes and policy recommendations are made as follows.

4.1 Increase the strength of environmental education

Women usually undertake more responsibilities in families than men do. Women enjoy higher status in the family, and nearly 60% of wives have more family real-power. Social survey results show that the wife in more than 50% of the families has more real-power². Women's family responsibilities (family burden) are significantly higher than men's, specifically expressed in female housework time, which is much longer than men doing housework. Sampling data results show that in 2000, the average household-consuming time was 3.34 hours for urban women, 2.08 hours longer than men, and 4.27 hours for rural women 2.92 hours than men³. Women in the family have their real disposable income increased substantially. An increasing number of women have been employed, continuing to

² <http://www.china.com.cn/chinese/zhuanti/fnfzbg/1156313.htm>, 《Family living conditions of Chinese women 》.

³ Tan lin: 《1995-2005: gender equality and women's development report》, Beijing: social sciences academic press, 2006,page 65.

broaden the field of their employment so as to directly increase the women's income at the same time.

With the increase of women's self-employment abilities and the addition of their income, they have more real power under control in families, and they still play a main role in the domestic universe. Women should more often take part in environmental behaviors, the survey data of which does not show such a result. So there must be some other factors that affect women's participation. Generally speaking, the higher the level of education people have had, the higher the level of environmental knowledge so that they will have more positive environmental awareness and behaviors as well.

Women received less school education than men. The proportion of women who graduated from junior high school or below such level is comparatively larger. The gender gap of educational status at levels of junior high school and above the same is more striking at present in our country⁴, and ratio of men and women is 61:43 in rural areas and 87:78 in urban areas. That means the overall level of educational qualification in China is lower than the world educational level, and under such situation women's educational level is significantly lower than men's, which seriously affects women's overall level of environmental knowledge. There is no environmental education in school education. On the one hand, environmental education started late in school education in our country, and environmental education was not formally included in the new courses of national basic education curriculum until 2004, which was seen in basic educational courses in large and medium-sized cities; on the other hand, environmental education is a mere formality in school education, not regarded as an examination subject and easily overlooked. To some extent, even if people have certificates of higher education, they may not have more professional knowledge of the environment quality and good shallow environmental convention.

In consideration of China's current educational system, school education is still the main source for the student groups or young people to obtain environmental knowledge, and also an important battle field for girls aged 3 to 18 to obtain environmental education and to popularize environmental knowledge. To this end, it is, on the one hand, necessary to increase

⁴ Tan lin: «1995-2005: gender equality and women's development report», Beijing: social sciences academic press, 2006,page 27.

the content of environmental knowledge, classified as an independent "course of environmental protection", mainly including some of the basic content of environmental knowledge, means of environmental litigation, and the cultivation of basic environmental habits, which will be more conducive to attract students' attention and to the concept of inheritance of environmental aspects. On the other hand, in order to ensure that the course content can really be part of the promotion of education and the content can be implemented in a real way among the students, it can be considered to be included in the contents of the exam. School education will continue to enhance women's environmental awareness, and to enhance their environmental behaviors in their everyday lives.

4.2 Expanding the media channels of publicity and community education

The Government makes more use of propaganda and education to perform its environmental responsibilities, among which TV media is a major propaganda channel. However, the multi data show that TV media prevented women from getting the quality and quantity of environmental knowledge, further aggravating the situation in which women lack environmental knowledge. Deep environmental knowledge is more often obtained from the television media, rather than school education. The investigation shows that 60% of people think the television media as far as the environmental impact in terms of communication channels is concerned; in particular the main groups, namely occupational groups 16 to 49 years of age or those high school students or above who implement environmental behaviors, mainly get access to environmental knowledge by means of television⁵. However, the TV media, as the most important channels of communication, on the one hand, lacks specialized environmental protection programs, and on the other hand, the programs on environmental knowledge and environmental education are more often arranged in non-prime time, coupled with women's preference for viewing, further deteriorating TV effective transfer of environmental knowledge. Preference ratings for females are more than literary entertainment⁶, film and television drama, etc., while men prefer news.

⁵ 《The survey report of urban environmental consciousness in China 2006》.Page51.

⁶ Yang Ying: 《The survey and analyse of television competition and audience rating in middle part (take the city of Zhengzhou for example) of China 》.http://academic.mediachina.net/academic_xsqq_view.jsp?id=1854

In order to enhance women between the ages of 18 to 49 in most non-student groups to participate, together with the backbone of women, in environmental protection so that the report coverage may be expanded to include professional environmental knowledge in television media. It should increase the daily environmental knowledge, environmental information, the ecological environment, nature reserves, the world's cultural heritage, environmental protection, participation, promotion of professional knowledge of the environment, so that "how to participate" is really known at deep levels. The second is to encourage more artists to produce some movies or series on the drama themes of environmental protection, and to actively burst into television's "golden time" programs. No matter what kind of specific program content it is, the goal is to increase the use of television media to strengthen influencing women in this sector about environmental knowledge.

4.3 Give the role of NGO as the main channel

The first is to increase the NGO's activities in environmental protection and to enhance the publicity to make their work much more close to women's daily work and life. The second is to start from the everyday environmental practices to carry out a series of more specific in-depth environmental protection activities, to start from women's everyday environmental practices, and then again to promote high-level participation behaviors. Environmental NGO community can make use of the power of management to organize various forms of environmental protection activities, and the core task is the dissemination of professional knowledge of environmental protection in order to enhance women's participation in environmental knowledge and enthusiasm for environmental action.

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Table 1.

Statistical data for Beijing、Shanghai、Guangzhou and Xi'an

Year	Region	GDP (100Million-yuan)	Per capita GDP (RMB)	Per capita annual disposable income of urban households (RMB)	Per capita annual net income of rural households (RMB)
2006	Nationwide	211923.5	16165	11759	3587
	Xi'an	1473.35	18089	10905	3808
	Beijing	7861.04	50467	19978	8275
	Shanghai	10366.37	57695	20668	9193
	Guangzhou	6073.83	63100	19851	7788
2007	Nationwide	249529.9	18934	13786	4140
	Xi'an	1763.73	21339	12662	4399
	Beijing	9353.32	58204	21989	9440
	Shanghai	12188.85	66367	23623	10145
	Guangzhou	7109.18	71808	22469	8613

	Nationwide	300670	22698	15780.8	4760.62
	Xi'an	2190.04	26259	15207	5212
2008	Beijing	10488.03	63029	24724.89	10661.92
	Shanghai	13698.15	73124	26674.9	11440.26
	Guangzhou	8215.82	81233	25317	9828

Note : data derived from the state statistics bureau website, the statistical information web sites in Xi'an and Guangzhou

Table 2

Descriptive statistics

Variables	N		Minimum		Maximum		Mean		Std. Deviation	
	2009	2006	2009	2006	2009	2006	2009	2006	2009	2006
Time	400	386	17.00	12.00	76.00	82.00	36.0125	36.5389	14.43497	11.99523
Age	400	386	1.00	1.00	6.00	7.00	3.7350	4.4689	1.28214	1.37333
Education	400	386	1.00	1.00	7.00	7.00	3.4100	2.7089	1.55819	1.50108
Income	400	386	.00	.00	1.00	1.00	.4250	.5026	.49496	.50064
Gender	400	386	1.00	1.00	2.00	2.00	1.6275	1.7850	.48408	.42990
Marital Status	400	386	1.00	.00	5.00	4.00	2.3250	2.3290	1.23620	1.28449
Residence	400	386	1.00	.00	11.00	11.00	6.0275	5.4404	3.02235	2.60126
Career	400	—	1.00	—	2.00	—	1.5775	—	.49458	—
Children	400	386	.00	.00	8.00	8.00	6.7725	6.5544	1.57860	1.88456
Environmental knowledge	400	386	1.14	1.00	5.00	5.00	4.0014	3.6947	.71925	.69158
Environmental Significance	400	386	2.17	2.17	5.00	4.92	3.7499	3.5833	.57044	.55928
Environmental Importance	400	—	1.00	—	5.00	—	3.9258	—	.83766	—
Environmental Policy	400	386	1.00	1.00	4.00	4.00	2.7600	2.1995	.56409	.59753
Individual Behaviors	400	386	.33	.00	3.83	4.00	2.0363	1.8853	.64512	.74348
Public Behaviors	400	386								
Valid Sample (listwise)	400	386								

Table 3

Percentage Comparisons of Scores of female Environmental Behaviors

variables	Score in 2006	Score in 2009	Absolute change	Percentage change
Female Individual environmental behaviorus	40.91	47.56	6.65	16.26
Female Public environmental behaviours	46.43	57.23	10.80	23.26
Female environmental knowledge	82.86	81.77	-1.09	-1.3%
Female environmental significance	68.67	71.79	3.12	4.54
Female environmental importance	52.34	52.56	0.22	0.42%

Table 4

Chi-Square Tests of gender gap between environmental behaviors

Variables	Value		DF		Sig. (2-sided)	
	2009	2006	2009	2006	2009	2006
Individual environmental behaviors	47.56	40.91	398	384	0.359	0.358
Public environmental behaviors	57.23	46.43	398	384	0.375	0.462
Environmental Knowledge	81.77	82.86	398	384	0.032	0.436
Environmental Significance	71.79	68.67	398	384	0.817	0.138
Environmental Importance	52.56	52.34	398	384	0.012	0.726

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