Public Participation in Biodiversity Conservation of Chinese Nature Reserves

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Abstract. Based on the Chinese National Biodiversity Strategy and Action Plan, we identified the biodiversity conservation public affairs. This study analyzed the importance of public participation in public affairs, and identified the main participants. The survey results show that the public participates in the importance of public affairs such as the implementation of the ‘grazing and returning grassland project’, ‘supervising the illegal activities of biodiversity’, ‘local traditional knowledge survey’, and ‘protection of folk biodiversity around the nature reserve’. Cognition is higher than 4.0. The percentage of cases in the public that support the implementation of various matters is ≥50%, to ensure the scope of participation of the participants; the highest value of 11.02% of the top four is higher than the percentage of cases, to encourage the scope of participation.

1. Introduction
The primary objective of nature reserves is to protect natural biodiversity and support the environment sustainability. [1] However, this objective could involve contradictory interests. [2] The nature protected areas need as little anthropogenic disturbance as possible, yet local habitants and visitors want access to natural scenery and wildlife [3]. The increasing conflicts between man and nature have produced significant challenges for the nature protected areas management. [4]

Public participation has wildly been concerned in the field of conservation [5-8]. Public participation is presented as an important element of governance and improves the conservation areas sustainability. [9]

In the case of natural reserve management, such groups are usually categorized based on their land use practices (e.g., farmers, visitors), roles in the policy process (e.g., governments, scientists) or interests in its outcomes (e.g., investors, environmental nongovernment organizations). [10] As a consequence, it remains a complex challenge to balance the interests between different groups while coordinating the relationships between man and nature. [11]

China is rich in terms of biodiversity and has many nature reserves which are usually located in rural areas. [12] The first nature reserve was designated in 1956 with a focus on nature conservation. The conflict of the nature resources and human-being well has widely discussed. [13] However, to the best of our knowledge, no empirical study has examined the public affairs on biodiversity conservation in nature reserves of China.

This study aims to: a) investigate local habitants’ intentions towards biodiversity conservation practices; and b) estimate the perceptions and reality of public participation in biodiversity
conservation public affairs in nature reserves, while identifying participants in various public affairs in biodiversity conservation in protected areas.

2. Materials and Methods

2.1. Questionnaire and data collection

The design of the questionnaire followed the “Aichi target” and national biodiversity conservation project guidance and method. [14] There are 9 aspects of biodiversity conservation public affairs, as listed in Table 1. A review of the literature, a pilot study and group discussion were undertaken to design the questionnaire to collect the data. The questionnaire used in this study has three sections. The first part of the questionnaire asked about general information. The second part covered the local habitants’ intentions towards biodiversity conservation practices. The third part collected information about the perceptions and reality of public participation in biodiversity conservation public affairs in nature reserves.

Survey data were collected from 2017 to 2018. A pretest was done in the area before 2017 and feedback collected. The reliability test results show that the reliability coefficient of government personnel questionnaire is 0.950, the overall reliability coefficient is 0.953; the reliability coefficient of general public questionnaire is 0.962, and the overall reliability coefficient is 0.963.

Table 1. Public affairs on biodiversity conservation in natural reserves

| Public affairs                      | Description of the practices                                      |
|-------------------------------------|------------------------------------------------------------------|
| Policy and rules(a)                 | Policy and legal regulations (a1); Returning grazing to grass(a2); Supervision of planning and implementation(a3) |
| Nature reserve governance(b)       | Nature reserve’s development plan(b1); Science education(b2); Collaborative management(b3) |
| Biological information(c)          | Biological genetic resources(c1); Wildlife resources(c2); Local traditional knowledge(c3) |

2.2. Data analysis

The dependent variable for this study is local habitants’ intention to protect the biodiversity of nature reserves. As the statement designed in Table 1 to measure the intention is based on an ordered 5-point likert scale, it is typical to use an ordered regression model to analyses to data as there are more than two categories of response [15]. A likert 5-point method was adopted to measure the intention of local habitants to biodiversity conservation. The answers were designed using two items: 1) the important scale of biodiversity conservation practice in the nature reserves, ‘1’=not at all to ‘5’=very important; and the willingness to participate in the biodiversity conservation practice, ‘1’=strongly disagree to ‘5’=strongly disagree.

This study uses SPSS23.0 to analyse the data, and the reliability test results of the survey data are as follows: the reliability coefficients of Part 2 and Part 3 of the General Public Questionnaire are 0.936 and 0.923, respectively, and the overall reliability coefficient is 0.932; the letter of the first and third parts of the government personnel questionnaire, and the degree coefficient is 0.965 and 0.936, respectively, and the overall reliability coefficient is 0.949. The reliability coefficients of both questionnaires are higher than 0.9, which shows that the survey results of this questionnaire are highly reliable.

3. Results and discussion

3.1. Summary statistics
Table 2 provides a description of the variable used in the questionnaires. The following descriptive statistics are for the full sample \( n=504 \). Females represent 58% of the sample whereas local farmers account for 75.8% followed by scientists 8.6% and business men comprising 7.8% of the sample. Furthermore, 38% of the sample have at least a second level education or higher. The descriptive results further indicate that around 13% of the sample have participate in biodiversity conservation project.

| Explanatory variables | Description                                                                 | Mean  | Std.deviation |
|-----------------------|------------------------------------------------------------------------------|-------|---------------|
| Gender                | Female=1, male=0                                                             | 0.58  | 0.55          |
| Age                   | 1=under 30, 2=between 30 and 39, 3=between 40 and 49, 4=between 50 and 59, 5=60+ | 3.65  | 1.19          |
| Education             | 1=some secondary and above, 0=otherwise                                       | 0.38  | 0.42          |
| Policy                | Participates in the biodiversity conservation project (1=yes, 0=otherwise)  | 0.13  | 0.27          |
| Occupation            | 1=local farmer, 0=otherwise                                                  | 0.71  | 0.56          |
| Awareness/attitude    | '1'=not at all to '5'=very important                                         | 3.99  | 1.32          |
| willingness           | '1'=strongly disagree to '5'=strongly disagree                               | 2.85  | 1.04          |

3.2. The awareness/ attitude

Table 3 provides a descriptive overview of local farmers’ and other participants’ awareness of the importance of participation in biodiversity conservation. The result indicates that there are two items of practice which the importance of public participation is higher than 4.0.

| Practice                                                                 | Local farmers | Otherwise |          |          |
|--------------------------------------------------------------------------|---------------|-----------|----------|----------|
| Policy and legal regulations(a1)                                        | 385           | 119       | 2.9211   | 3.8865   |
| Returning grazing to grass(a2)                                           | 385           | 119       | 4.0789   | 4.2189   |
| Supervision of planning and implementation(a3)                          | 385           | 119       | 3.9879   | 4.0126   |
| development plan(b1)                                                    | 385           | 119       | 3.7990   | 3.998    |
| Science education(b2)                                                   | 385           | 119       | 3.7211   | 3.9873   |
| Collaborative management(b3)                                            | 385           | 119       | 4.0213   | 4.2689   |
| Biological genetic resources(c1)                                        | 385           | 119       | 3.6111   | 3.8921   |
| Wildlife resources(c2)                                                  | 385           | 119       | 3.9899   | 3.8964   |
| traditional knowledge (c3)                                              | 385           | 119       | 3.6123   | 3.7961   |

3.3. The comparison of perceptions and status quo

As shown in Fig1., the participation perceptions of public affairs (a3, c3) was higher than 3.9; the degree of perceptions of public participation (b1, b3, c2) is between 3.5-3.9; and the other items’ degree below 3.5. Meanwhile, the governments’ statement on the status quo of public participation of biodiversity conservation as follows: public affairs’ (b2, c2, c3) degree is above 3.9, affairs’ (a2, b1, b3) degree is between 3.5 and 3.9, and the other affairs’ degree is below 3.5.
By comparing the survey data of “the extent to which the general public is willing to participate in biodiversity conservation related matters” and “the degree to which government officials evaluate the current public participation”, it is found that the two are consistent in most matters. The perceptions and status quo of ‘natures reserve’s development plan’ is 3.06, 3.83 respectively.

Fig 1. A cognitive comparison of status and perceptions to participate in biodiversity conservation affairs

3.4. Participants of biodiversity conservation

The identification of the participants is based on two levels: first, the subjective willingness to participate, that is, those who are willing to participate in biodiversity conservation practice; and second, the objective need to participate, that is, to promote the conservation of biodiversity in nature reserves, taking into account the well-being of humanity, social and economic development, and the public that needs its participation. Specifically, the participating entity should be able to provide useful information for performing related public affairs and can affect the execution of public affairs.

The participating subjects that the public and government personnel believe can support biodiversity conservation are counted in Table 4. Only a very small number of respondents (the cumulative number of cases are 11) believe that some biodiversity conservation services do not require public participation, and most biodiversity conservation issues require the participation of multiple types of public participation entities. As shown in Table 5, we comprehensively analyse the perceptions of the public and government personnel, and the participants in the various biodiversity conservation public affairs are sorted according to the respondents’ choices.

Table 4. Public participation subjects supporting biodiversity conservation public affairs

| Biodiversity conservation practice | Supporting role of various public participants |
|-----------------------------------|-----------------------------------------------|
| Policy and legal regulations(a1) | community (55.08%) ENGO (55.08%) scientists (48.73%) research institutions (47.46%) enterprise (23.31%) local habitants (13.56%) others (5.93%) |
| Returning grazing to grass(a2)    | community (87.29%) local habitants (64.41%) ENGO (50.00%) enterprise (35.59%) scientists (35.17%) research institutions (9.32%) others (3.81%) |
| Supervision of planning and implementation(a3) | community (81.63%) local habitants (64.41%) ENGO (50.00%) enterprise (35.59%) scientists (35.17%) research institutions (9.32%) others (3.81%) |
development plan(b1) research institutions (98.73%) scientists (95.76%) community (83.90%) local habitants (82.20%) ENGO (60.59%) enterprise (57.63%) others (4.24%)

Science education(b2) research institutions (98.31%) scientists (88.98%) community (84.75%) local habitants (63.14%) ENGO (61.44%) enterprise (48.31%) others (1.27%)

Collaborative management(b3) local habitants (95.76%) community (94.49%) ENGO (56.78%) scientists (46.61%) research institutions (41.53%) enterprise (21.61%) others (2.54%)

Biological genetic resources(c1) scientists (69.49%) local habitants (63.14%) research institutions (55.93%) community (51.27%) ENGO (46.61%) enterprise (23.31%) others (2.97%)

Wildlife resources(c2) community (92.37%) ENGO (50.00%) local habitants (56.78%) research institutions (23.31%) scientists (16.53%) enterprise (5.93%) others (1.69%)

traditional knowledge (c3) research institutions (76.27%) community (54.24%) ENGO (49.15%) scientists (47.46%) local habitants (33.90%) enterprise (13.56%) others (1.27%)

| Biodiversity conservation practice | Subjects which should be ensured participating | Subjects which can be encouraged to participate |
|-----------------------------------|------------------------------------------------|------------------------------------------------|
| Returning grazing to grass(a2)    | Community, local habitants                     | enterprise, ENGO, scientists, research institutions, enterprise, scientists |
| Collaborative management(b3)      | Community, local habitants, ENGO               | research institutions, enterprise, scientists |
| Supervision of planning and implementation(a3) | Community, local habitants, ENGO | |
| Wildlife resources(c2)            | research institutions, ENGO, local habitants   | |
| development plan(b1)              | research institutions, scientists, community, local habitants, ENGO, enterprise | |
| Science education(b2)             | research institutions, scientists, community, local habitants, ENGO | |
| Biological genetic resources(c1)  | scientists, local habitants, ENGO              | ENGO, enterprise, scientists |
| traditional knowledge (c3)        | research institutions, community               | ENGO, scientists, local habitants, enterprise |
| Policy and legal regulations(a1)  | Community, ENGO, local habitants               | |

| 4. Conclusion |
|----------------|
The conservation of biodiversity in nature reserves depends on the participation of local residents and social organizations. Different public affairs items have different levels of public participation, and the degree of willingness to participate in the public is different. Biodiversity conservation practices that are highly important to public participation and have a low degree of willingness to participate should...
guide and motivate public participation. For different public affairs items, their participating subjects are different. The research on the status of public participation and the identification of participants in specific public affairs can provide reference for the public protection of the public participation in biodiversity conservation.

In order to promote biodiversity conservation practices in nature reserves, further research is needed on public participation in specific public affairs matters. The practice of biodiversity conservation such as ‘collaboration management of local governments and local residents on nature reserves’ need further study to decide the specific participation procedures.

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