Supplementary Material

Table S1. International legislative experience in PWES.

Country	Legislative Design for PWES
Costa Rica	The Forestry Law established the Payment for Environmental Services Program and the National Forest Fund (FONAFIFO). Payment includes carbon fixation, capture and storage, water resources, biodiversity conservation, and scenic natural beauty.
Ecuador	The Forest Partners National Program was introduced in 2008 following the new constitution. The Ministry of Environment is the authority that manages PES schemes. Payment targets include carbon storage, water cycle regulation, and habitat for biodiversity.
Colombia	The Ministry of Environment and Sustainable Development Decree 953 was issued in 2013 to regulate PES schemes. The Environmental Law designates the Ministry of Environment as the lead authority and delegates responsibilities such as watershed management to regional environmental authorities.
Peru	The Payment for Ecosystem Services Law designates the Ministry of Environment as the national authority for PES. Parties are free to agree on compensation methods and financing structures associated with PES schemes.
Brazil	The Oasis Project was implemented in Apucarana, São Paulo and São Bento do Sulin, focusing on watershed protection. Municipal laws No. 058/09 and No. 241/09 established a financial partnership with the Water Supply and Sanitation Company of the State of Paraná. Santa Catarina promulgated law No. 15.133 to establish the state PWES policy and scheme.
The United States	The Federal Safe Drinking Water Act was introduced to improve water quality and has driven PWES development. Federal funding grants under the Federal Clean Water Act provide funds for states to allocate to local projects, to mitigate diffuse pollution.

Source: The author, based on Jackson, S. 2018, Comparative legal frameworks for payment for ecosystem services, University of Dundee.

Table S2. Relevant PWES policies and laws in China.

Laws/Policies	Year	Content
Water and Soil Conservation Law	2010	Compensation for ecological benefits of soil and water conservation can be incorporated into the ecological benefits compensation system established by the state.
Environmental Protection Law	2014	The state should establish and improve the PES mechanism, increase financial transfers to ecologically protected areas, and guide the government in ecological protection areas in negotiating or following market rules for compensation.
PWES system	2015	The Opinion on Accelerating the Ecological Civilization Construction and Integrated Reform Plan for Promoting Ecological Progress was released, to define the obligations and rights of the protectors and beneficiaries.
PWES mechanism	2016	The State Council issued the Opinion on Improving the Compensation Mechanism for Ecological Protection, requiring protection of ecological red lines and achieving full coverage of major ecosystems such as forests, grasslands, wetlands, deserts, oceans, watersheds, and farmland, areas where development is prohibited, and major ecological function zones.
PWES mechanism	2016	The Guidance on Accelerating the Establishment of Ecological Protection Compensation Mechanisms Upstream and Downstream of Watersheds was issued for improving watershed conservation.
Water Pollution Prevention and Control Law	2017	The state should adopt financial transfer payments and other means to establish compensation mechanisms for drinking-water protected areas and upstream of rivers, lakes, and reservoirs.
PWES mechanism	2018	The Action Plan for Establishing Market-Based and Diversified Ecological Protection Compensation Mechanisms was issued for improving the market-oriented and diversified compensation mechanisms to effectively increase the participation of the whole of society in ecological protection.
Forest Law	2019	The state should establish a forestry ecological efficiency compensation fund.
PWES pilot schemes	2019	A Pilot Program for Comprehensive Ecological Compensation was established to further improve the ecological protection compensation mechanism.

Table S3. Sample size determination.

Population	10% Margin of Error	5% Margin of Error	1% Margin of Error	95% Confidence Level	99% Confidence Level
100	50	80	99	80	88
500	81	218	476	218	286
1000	88	278	906	278	400
10,000	96	370	4900	370	623
100,000	96	383	8763	383	660
>1,000,000	97	384	9513	384	664

The population does not have a proportional relationship to the sample size. The survey sample size is determined based on the overall proportion P of simple random sampling at the 95% confidence level, according to the requirement that the margin of error does not exceed 4%. The calculation is as follows:

$$n = \frac{u_\alpha^2 p(1-p)}{d^2} = 601 \quad \text{(S1)}$$

where, d is the margin of error, u_α^2 is 1.96 at the 95% confidence level, and $P(1-P)$ is taken as 0.25.

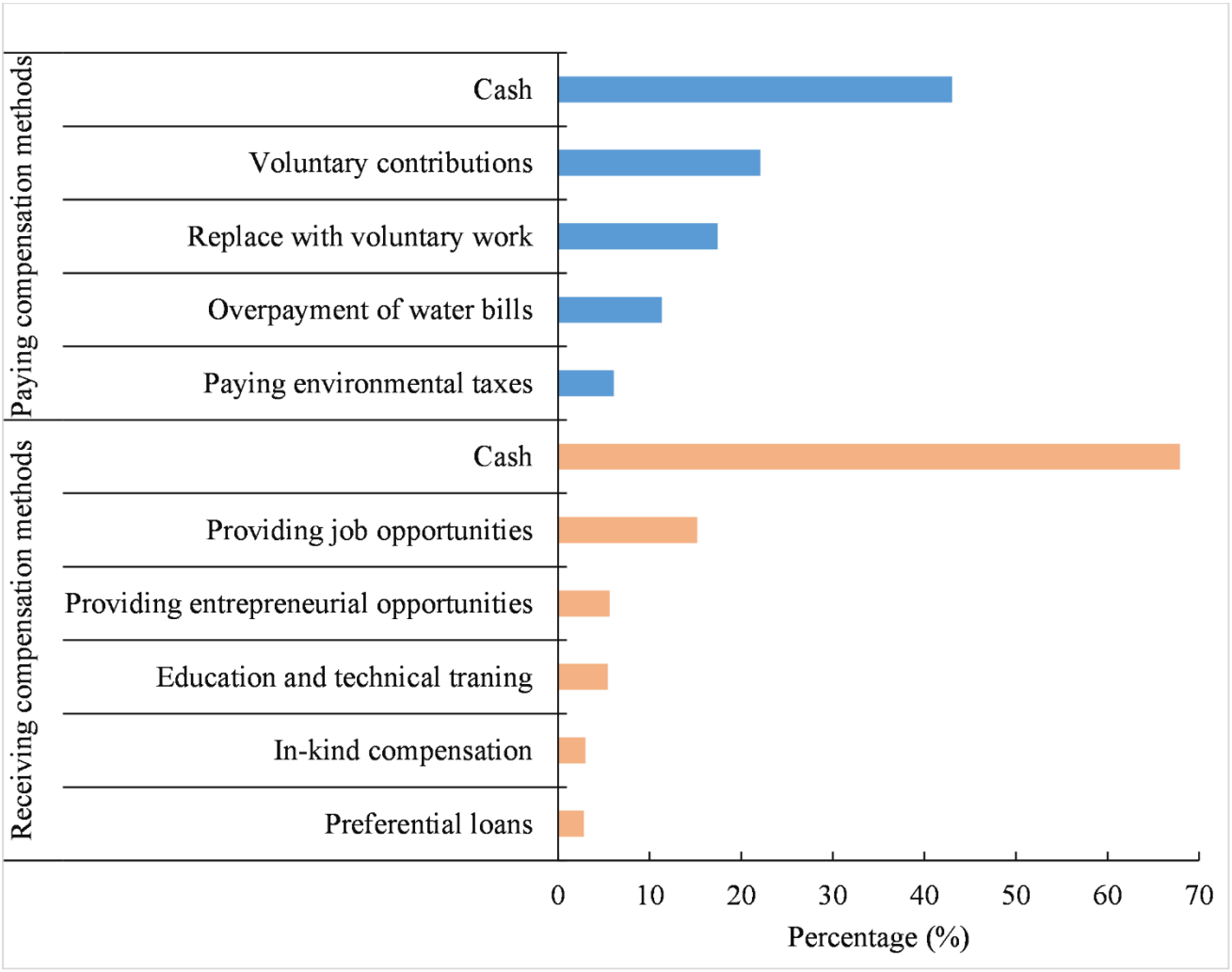


Figure S1. The public's expected methods regarding WTP and WTA in the Yongding River watershed, China.

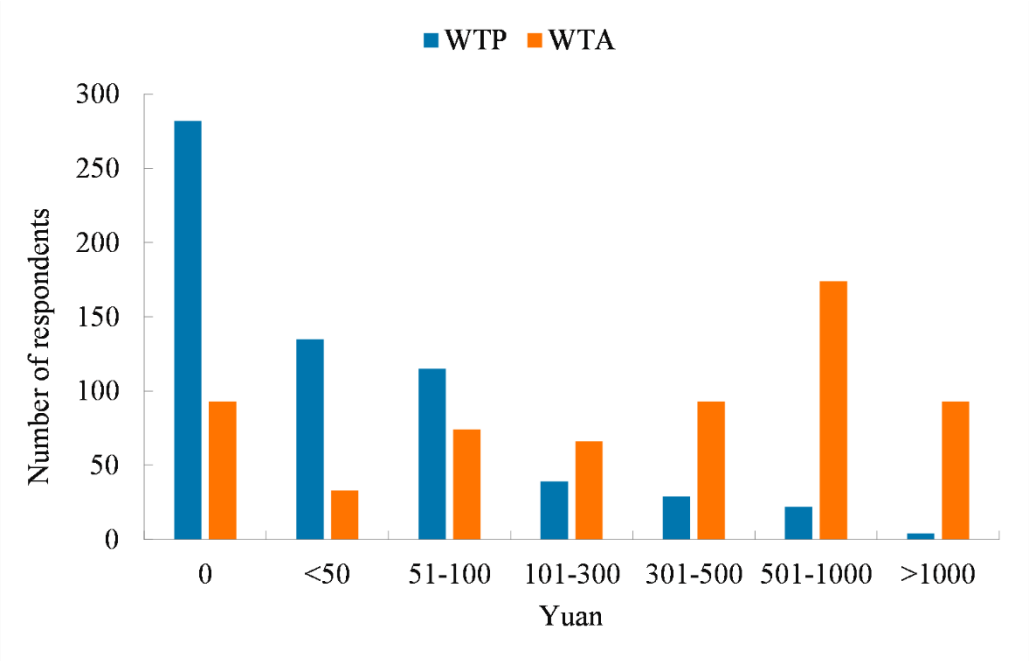


Figure S2. Public willingness to pay and willingness to accept in the Yongding River watershed, China.

Appendix SA: Questionnaire

Part 1: Public perceptions, attitudes, and willingness regarding ecological compensation.

1. To what extent do you think watershed ecosystem services are important?

Watershed Ecosystem services	Not Important	Neutral	Important
Soil and water conservation (reducing erosion of surface runoff and maintaining soil fertility)			
Water conservation, flood regulation, water flow regulation			
Filtration, water purification			
Landscape value (recreation, entertainment, eco-tourism, etc.)			
Key ecological functions (transit of migrant birds, barriers of desertification, etc.)			
Climate regulation, carbon fixation (watershed)			
Habitat and biodiversity conservation (habitats for living, foraging, and breeding of plants and animals)			
Cultural and environmental education regarding watershed			
Nutrient cycle, acting as source and sink			
Product supply (fresh water, fish, and other resources)			

2. To what extent do you know about policies implementation in environmental protection and promoting coordinated economic and environmental development?

(1) Don't know at all, (2) Don't know much, (3) Neutral, (4) Some knowledge, (5) Good knowledge.

3. Do you know that the downstream area of Yongding River (Guanting Reservoir to Beijing) will benefit (suffer) from the protection (destruction) of water resources and the ecological environment in the upstream area?

(1) Yes, (2) No.

4. What kind of management measures do you think are more effective in solving the ecological and environmental problems in the Yongding River watershed?

(1) Administrative orders, (2) Laws and regulations, (3) Economic instruments such as compensation and credit, (4) Voluntary consultation, (5) Publicity and education, information disclosure, (6) Technical means.

5. To what extent do you know about the term "payment for watershed ecosystem services PWES"?

(1) Don't know at all, (2) Don't know much, (3) Neutral, (4) Some knowledge, (5) Good knowledge.

6. Which of the following watershed ecological compensation projects do you know of? (Multiple-choice questions).

(1) Since 2008, Hebei has implemented transboundary target assessment and ecological compensation in five cities of the Ziya River Basin.

(2) In 2011, the pilot PWES was officially launched in the Xin'anjiang River Basin in Zhejiang and Anhui.

(3) Zhejiang carried out pilot projects in eight major river basins and transferred payments to the cities and counties where the sources of rivers are located.

(4) Jiangxi implemented PWES for "Five Rivers and One Lake" and Dongjiang Source Protection Area.

(5) Beijing set up special funds to support the implementation of the "Paddy to Dry Land" project in Zhangjiakou City and Chengde City in Hebei Province in the upper reaches of Miyun Reservoir and implemented the construction of 1 million mu of headwater forest project.

7. Have you participated in the construction of transboundary PWES projects and mechanisms?

(1) Yes, (2) No.

8. To what extent do you think policymaking is important if the PWES is to be established in Yongding River Watershed?

(1) Not important at all, (2) Not important, (3) Neutral, (4) Relatively important, (5) Very important.

9. How important a role do you think you will play in the implementation of the PWES in the Yongding River watershed?

(1) Not important at all, (2) Not important, (3) Neutral, (4) Relatively important, (5) Very important.

10. If the PWES policy is to be implemented, to what extent do you think it will potentially influence you?

(1) Minimal influence, (2) Slight influence, (3) Neutral influence, (4) Large influence, (5) Larger influence, (6) Do not know.

11. Which areas do you think would be the most suitable object for PWES?

(1) Poor and backward areas, (2) The upstream areas protecting the environment, (3) The downstream areas suffering from pollution, (4) The areas where the environment is damaged due to overexploitation, (5) Don't know.

12. If PWES is carried out in Yongding River Basin, who do you think should be the payment subject?

(1) Central government, (2) Local governments representing beneficiaries, (3) Beneficiaries of all watersheds, (4) River users, (5) Enterprises that cause water pollution and damage to the environment, (6) Residents of the entire basin should participate together, (7) Social donations from non-governmental organizations, charitable organizations, etc.

13. What is the payment method that you most expect for compensation in Yongding River Basin?

(1) Cash provided by the government, (2) Relevant subsidies policy, (3) Construction of ecological and environmental projects, (4) In-kind compensation, (5) Education and employment training, (6) Industrial support compensation, (7) Low-interest-rate microfinance and concessional loans, (8) Joint watershed development, (9) Provision of technical assistance.

14. What do you think are the sources of funds for PWES in the Yongding River Basin?

(1) Funds raised by transfer payment from central to local government, (2) Funds raised by transboundary provincial, municipal, and county government, (3) Funds raised by resource taxes, environmental taxes, etc., (4) Funds raised by market-oriented methods such as carbon sink transactions, emissions trading, water-rights trading, etc., (5) Funds raised by the joint development of regional tourism and other resources, (6) Funds raised by crowdfunding platforms, (7) Funds raised by donations from the public and charitable organizations.

15. What do you think is the payment standard for the Yongding River Basin?

(1) Meeting the basic needs of individuals, (2) Direct economic losses caused by environmental protection, (3) Reaching the average income level in the basin, (4) Equivalent to paying, (5) Investment in environmental protection, (6) The opportunity cost of abandoning economic development.

16. What do you think the funds should be used for?

(1) Regional water conservation, (2) Water-saving facilities construction, (3) Comprehensive improvement of water environment and cleaning of floating objects, (4) Treatment of non-point-source agricultural pollution, (5) Pollution prevention and control of key industrial enterprises, (6) Construction of treatment facilities and systems for removal of rural garbage, (7) Construction of urban and rural sewage treatment facilities and supporting pipe network, (8) Treatment of tailings slag along with the water conveyance and the upstream areas, (9) Banning fish farming and reducing cage culture, (10) Environmental supervision capacity building, (11) Construction of engineering and other environmental protection projects.

17. If you live downstream and are the beneficiaries of the environmental improvement, are you willing to provide some funds for the upstream areas to improve the environment and increase the ecological reconstruction and restoration?

(1) Willing to pay, (2) Unwilling to pay (skip to Q21).

18. How much will you pay at most each year?

(1) CNY <10, (2) CNY 11-20, (3) CNY 21-30, (4) CNY 31-40, (5) CNY 40-50, (6) CNY 51 -60, (7) CNY 61-70, (8) CNY 71-80, (9) CNY 81-90, (10) CNY 91-100, (11) CNY 101-150,

(12) CNY 151-200, (13) CNY 201-300, (14) CNY 301-400, (15) CNY 400-500, (16) CNY 501-600, (17) CNY 601-700, (18) CNY 701-800, (19) CNY 801-900, (20) CNY 901-1000,

(21) CNY >1000, the specific amount of CNY _____)

19. If it was one-off fundraising, you would provide CNY_____ from your family income.

20. How would you like to pay?

(1) Cash, (2) Pay more water bills, (3) Pay more environmental taxes, (4) Replace with voluntary labor, (5) Voluntary donation, (6) Other ways_____

21. If you are unwilling to pay, your reasons are:

(1) Low household income and inability to pay, (2) Environmental changes have little impact on individuals, (3) The upstream areas will not achieve the expected goals, (4) Not interested in environmental protection, (5) The government should take the responsibility, so the funds should raise by the government not by individuals or families, (6) Personal payments are insufficient to improve the environment of the watershed, (7) The funds should be raised by the enterprises that caused environmental deterioration, not by individuals, (8) Unclear.

22. If you live upstream and are contributors to the environmental improvement or disruptors of the environmental deterioration, are you willing to accept some compensation?

(1) Willing to accept, (2) Unwilling to accept (skip to Q25).

23. What is the minimum amount of compensation you are willing to accept each year?

(1) CNY <10, (2) CNY 11–20, (3) CNY 21–30, (4) CNY 31–40, (5) CNY 40–50, (6) CNY 51–60, (7) CNY 61–70, (8) CNY 71–80, (9) CNY 81–90, (10) CNY 91–100, (11) CNY 101–150,

(12) CNY 151–200, (13) CNY 201-300, (14) CNY 301–400, (15) CNY 400–500, (16) CNY 501–600, (17) CNY 601–700, (18) CNY 701–800, (19) CNY 801–900, (20) CNY 901–1000,

(21) CNY >1000 yuan, the specific amount of CNY _____.

24. In what ways are you willing to accept the compensation?

(1) Cash, (2) Preferential loans, (3) Compensation objects, (4) Education and technical training, (5) Provision of job opportunities, (6) Other ways_____.

25. If you are unwilling to accept this compensation policy, what are your main reasons?

(1) Family's income is high, and no compensation is required, (2) Not a victim of environmental damage and degradation in the Yongding River Basin, (3) No contribution to water resources and environmental protection in the Yongding River Basin, (4) Compensation funds should not be given to individuals and families but to the corresponding organization, (5) The current water resources and environment of the Yongding River Basin are OK without compensation, (6) Unclear.

26. What benefits do you think the PWES policy can bring to you?

(1) Guarantee drinking-water safety, (2) Guarantee food safety, (3) Maintain production, (4) Protect the environment and improve the quality of life, (5) Increase the cost of pollution control, (6) Obtain more financial support for environmental protection, (7) Some governments or groups gain political benefits, (8) Enterprises failing to meet pollution control standards can be closed, (9) Increase the economic income of tourism, etc., (10) Protect the biodiversity, (11) Increase responsibility and work pressure for certain institutions, (12) Improve regional image, (13) Promote local environmentally sustainable development, (14) Reduce production costs of enterprises, (15) Obtain more aid funds and improve the speed of local development.

27. Do you know and participate in other PWES or subsidy policies for the Guanting Reservoir and its upstream area?

(1) Subsidies for returning farmland to forests, (2) Subsidies for changing paddy fields to dry land, (3) Subsidies for ecological forests, (4) Subsidies for the governance of small watersheds, (5) Subsidies for ecological agriculture and ecological farms, (6) Subsidies for investment in ecological restoration of rivers and lakes, (7) Subsidies for agricultural resources recuperation and pilot compensation schemes, (8) No participation (skip to question 42).

28. The amount of land with ecological compensation or subsidy in your family is_____mu.

The average income per mu is CNY _____.

29. Before and during the implementation of PWES, have any relevant personnel (such as government staff, village officials, etc.) consulted you or other villagers for opinions and suggestions?

(1) Yes, (2) No.

30. If you were involved in the decision-making process for PWES, would you like to participate?

(1) Willing, (2) Not willing, (3) Don't know.

31. Do you support the PWES projects implemented in your area?

(1) Support, (2) Do not support, (3) Don't know.

32. What are the reasons for choosing to support?

(1) Can improve the ecological environment, (2) Ensure the safety of the water supply, (3) Obtain subsidies, (4) Engage in other non-agricultural industries, (5) Other

33. Why did you choose not to support?

(1) It will limit economic development, (2) Low standards for ecological compensation (subsidy) and limited improvement in quality of life, (3) No better employment opportunities, (4) The rural industrial structure is simple, and local government has not done enough to guide the transformation of rural industries, (5) Other.

34. How is the PWES (subsidy) implemented by your local government?

(1) Cash (subsidy), (2) Non-cash (subsidy).

35. What do you think is the standard of PWES implemented by the local government?

(1) Very low, (2) Low, (3) Neutral, (4) High, (5) Very high.

36. How has your household income changed before and after implementing the ecological compensation (subsidy) policy in your area?

(1) Significantly reduced, (2) Decreased slightly, (3) Unchanged, (4) Increased slightly, (5) Significantly increased.

37. Do you think the quality of the environment (water quality) has improved since the implementation of PWES (subsidy) projects in your area?

(1) Worsened, (2) Not improved, (3) Not much improved, (4) Much improved, (5) Unclear.

38. What do you think about the impact of PWES on the environment and the improvement of your living standards?

(1) Not obvious at all, (2) Not obvious, (3) Neutral, (4) Obvious, (5) Very obvious.

39. If the government stops the PWES project, will your life be affected?

(1) Yes, (2) Maybe, (3) No, (4) Don’t know.

40. If the government stops the PWES project, what will you choose to do?

(1) Engage in the previous agriculture, (2) Maybe engage in the previous agriculture, (3) Engage in agricultural and sideline industries with better returns, (4) Don't know.

41. After the government in your area stops PWES, will you consider environmental impact and water consumption when choosing to engage in different industries?

(1) Yes, (2) No.

Part 2: Information sources and public trust

42. How do you know about water conservation and PWES?

(1) Broadcasting, (2) Newspapers, (3) Television, (4) Scientists, (5) Government documents and reports, (6) Relatives and friends, (7) Enterprises, (8) Non-governmental organizations, (9) Periodicals and magazines, (10) Mobile Internet, (11) We-media, such as blogs, Weibo, WeChat, forums, etc., (12) Environmental protection groups.

43. To what extent do you think information is disclosed on PWES in the Yongding River Basin?

(1) Not public at all, (2) Rarely public, (3) Neutral, (4) More public, (5) Very public.

44. How much influence do traditional media such as radio, newspapers, TV, and magazines have on your views on PWES?

(1) No influence at all, (2) Very small influence, (3) Little influence, (4) Large influence, (5) Very large influence.

45. How much influence do emerging media, such as the Internet, WeChat, etc., have on your views on PWES?

(1) No influence at all, (2) Very small influence, (3) Little influence, (4) Large influence, (5) Very large influence.

46. Who do you think is the most trustworthy in the design and implementation of PWES policy?

(1) Officials of central government agencies such as decision-making officials of the National Development and Reform Commission and the Ministry of Ecology and Environment, (2) Officials of the local city/county government, local Development and Reform Commission, Ecology and Environment Bureau, and other departments, (3) Scientists and experts who study and participate in demonstrations, (4) Reporters from domestic news media who participate in the report, (5) Enterprise personnel involved in the implementation of ecological compensation projects, (6) Non-governmental environmental protection organizations (NGOs) and groups concerned with river basin ecological compensation, (7) Don't trust anyone.

47 What do you think are the most important measures to ensure the implementation of PWES?

(1) Jointly promote the institutional framework and top-level design of the PWES policy and establish and improve regulations and rules, (2) Clarify the rights and responsibilities of beneficiaries and protectors, (3) Strengthen systematic research into PWES mechanisms, (4) promote diversified compensation methods such as carbon sink trading, emissions trading, water trading, etc., (5) Speed up the establishment of PWES standard systems, (6) Improve the awareness of PWES in the whole of society and promote public participation, (7) Increase investment in PWES funds, (8) Strengthen monitoring, supervision, evaluation, and tracking of the implementation of PWES, (9) Improve basic supporting systems, including property rights systems, provincial main functional area planning, technical support, etc., (10) Promote effective negotiation platform and mechanism construction between the upstream and downstream areas of the river basin.

Part 3: Basic information on respondents

48. Age _____.

49. Gender: (1) Male, (2) Female.

50. Education level: (1) Primary and below, (2) Junior high, (3) Senior high/vocational school, (4) College/university, (5) Master's and above.

51. Occupation: (1) Farming, (2) Official of government agency or institution, (3) Staff of commercial enterprise, (4) Teacher, (5) Scientist/researcher, (6) Self-employed worker/self-employment, (7) Student, (8) Retired worker, (9) Staff of non-governmental organization, (10) Media practitioner, (11) Other____.

52. How relevant is your occupation and work to the water resources and environmental protection of the Yongding River and Yanghe River?

(1) Very little relevance, (2) Little relevance, (3) Neutral (4) Sufficient relevance, (5) Very sufficient relevance (6) Unclear.

53. What role does your individual work or your cooperative work play in the management or change of the watershed environment?

(1) People have direct interests and influence, (2) People have no direct relationship, (3) Government and institution with relevant management functions, (4) Government and institution with no relevant relationship, (5) Enterprise affecting the environment of the river basin, (6) Enterprise unrelated to watershed environment change, (7) Non-governmental organization participating in watershed management, (8) Non-governmental organization with no participation in watershed management, (9) Other____.

54. Family number_____, among them _____ engaged in agricultural production.

55. Annual household income in CNY (ten thousand) _____, agricultural income in CNY (ten thousand)____.

56. What is the source of your household income?

(1) Wage income, (2) Livestock breeding, (3) Forestry, fruit trees, (4) Fishery, (5) Plantation, (6) Individual business, (7) Do work for others, (8) Other.

57. How long have you lived here? _____ years.