BOOK OF ABSTRACTS

1. SESSION DESCRIPTION

ID: T7

Title of session:

The role of social sciences in the ecosystem services valuation

Hosts:

	Name	Organisation	E-mail
Host:	Sebastian Villasante	University of Santiago de Compostela (Spain)	sebastian.villasante@usc.es
Co-hosts:	Shang Chen	Res. Center for Marine Ecol., First Inst of Ocean., State Oceanic Adm. (China)	schen@fio.org.cn
Co-hosts	Hua Zheng	Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences (China)	zhenghua@rcees.ac.cn

Session description:

Human always have benefited from terrestrial, marine and ecosystems, either obviously in the form of food resources, or more subtly in the form of cultural and recreational opportunities. Extensive work has been done

around the ecosystem services (ES) research worldwide during the last decade.

However, the analysis of social patterns of ES across the seascape/landscape remains largely unknown. Ecological availability of ES across the territory, studied in the previous task, does not guarantee equal access to the benefits from these services for people across the landscape. Access to the benefits of a given services often depends also on other factors such as customs, technology, capital, markets, or knowledge. These spatial patterns of ES' uses are also influenced by socio-cultural factors such as preferences, income, profession, working location, residence, etc.

In addition, considerable management efforts are undertaken by governments to reverse abrupt and large changes of ES after crossing tipping points. Yet such efforts are often ineffective or unaffordable since they are applied after rather than before, resulting in mitigation actions, usually with higher economic and social costs for administrations, industries and the society. Crossing tipping points usually leads to large transformations of social-ecological ecosystems and the ES they provided. Until very recently, most of the research done on ES was focused on the transformations of ecosystems and their ecological functions. However, it is difficult to address today's great challenges in global terrestrial and marine change and sustainability without a better understanding of desirable social transformation that can be initiated, promoted or redirected.

This session provides a platform for sharing research on the role of social sciences in terrestrial, marine and coastal ecosystems. By using different frameworks, approaches, methods and tools, we welcome contributions to address (but not limited to) the following themes:

- Exploring the role of socio-cultural factors in the co-production processes of ES
- Understanding the role of social sciences in the multidimensional valuation of ES
- Identifying key socio-cultural drivers that determine the demand and supply of ES and their environment consequences
- Sharing empirical evidence of how economic, financial and market factors facilitate abrupt socio-cultural transformations
- Knowing governance practices and adaptive strategies that stakeholders can develop to avoid tipping points and/or promote positive social transformations to inspire novel pathways of resilient ES.

Goals and objectives of the session:

The objective of the session is to bring together researchers from all over the world, who have an interest in terrestrial, coastal and marine ecosystem services. Thereby we aim at stimulating the exchange of ideas and knowledge, the establishment of new networks and research collaboration.

Planned output / Deliverables:

We consider producing two outputs from this session. First, we plan to synthesize the results and findings by publishing a joint publication to stimulate the cooperation among the presenters. Second, we consider co-organizing a Special Issue about these topics in a scientific journal (e.g., Ecosystem Services). The outputs will be also shared thought the Working Group on Economic and Monetary Valuation of Ecosystem Services platform and PICES' Studying Group on Marine Ecosystem Services(Chen is the Chair of this group) and be further populated also by members who

were not able to attend.

Related to ESP Working Group or National Network:

TWG 7 – Economic & Monetary valuation

2. SESSION PROGRAM

Date of session: 14 December 2017
Time of session: 14:00 – 17:30

Timetable speakers

Time	First name	Name	Organization	Title of presentation
14:00	Luis	Castro	Alexander von Humboldt Research Institute for Biological Resources	Linking wellbeing priorities at the local scale and ecosystem services management at regional scale: the case of the Orotoy River (Colombia)
14:15	Zhuo	Chen	Ocean University of China	Balancing social economic profits and ecosystem preservation – an approach of evaluating the carrying capacity of the Yellow Sea

Time	First name	Name	Organization	Title of presentation
14:30	Andy	Choi	National Institute of Ecology	Economic valuation of ecosystem services from intertidal mudflats in South Korea: a choice experiment study
14:45	Bin	Fu	Institute of Mountain Hazards and Environment, Chinese Academy of Sciences	Assessment the ecosystem services of ponds in the hilly area
15:00	Linhua	Hao	First Institute of Oceanography, State Oceanic Administration	Evaluation of the maintenance service values of ecosystem diversity of marine protected areas and marine species diversity in Sanya city based on contingent valuation method

Time	First name	Name	Organization	Title of presentation
15:15	Johan-nes	Lange-meyer	Institute of Environmental Science and Technology (ICTA), Universitat Autònoma de Barcelona (UAB). Hospital del Mar Medical Research Institute (IMIM)	Participatory multi-criteria decision aid to operationalize an integrated assessment of ecosystem services
15:30	Taka-hiro	Ota	Nagasaki University	Selecting capital indicators of ecosystem management activities for the framework of Inclusive Wealth: a case of integrated coastal management governance in Omura Bay, Nagasaki, Japan
15:45	Anna	Phelan	UQ Business School, University of Queensland	Ecosystem-based business development model for strengthening coastal community resource management in the Coral Triangle

Time	First name	Name	Organization	Title of presentation
16:00	Sarai	Pouso	AZTI-Tecnalia	The recovery of estuarine quality and the perception of cultural ecosystem services increase by beach users
16:15	Yujie	Ren	Nanjing Forestry University	Ecological mapping of wind environment based on optimization of urban and rural ecological environment
16:30	Siyi	Wang	Beijing Forestry University	Study on the evaluation of the subsidy policy effect of China's biomass power generation
16:45	Liyan	Wang	State Key Laboratory of Urban and Regional Ecology, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences	Xingan League Gross Ecosystem Production (GEP) accounting

Time	First name	Name	Organization	Title of presentation
17:00	Hua	Zheng	Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences	Multiple scale delivery of ecosystem services and management in southern Shaanxi Province and the Haihe River Basin
17:15	Lixuan	Zhou	South China Institute of Environmental Sciences, Ministry of Environmental Protection	Study on compensation responsibility sharing between provincial, municipal and town governments based on ecosystem service value density: a case study of Zhongshan City in China

3. ABSTRACTS

Type of submission: *Abstract*

T. Thematic Working Group sessions: T7 The role of social sciences in the ecosystem services valuation

Linking wellbeing priorities at the local scale and ecosystem services management at regional scale: the case of the Orotoy River (Colombia)

Author(s): Luis Castro, Olga Hernández-Manrique

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At the Orinoco region in Colombia, ecosystem fragility converges with land use transformations, high demand for water resources, socially vulnerable population and weakness in water governance; processes that have leaded to environmental conflicts.

Seeking for methods that link wellbeing priorities at the local scale and ecosystem services management at regional scale,

the Humboldt Institute (Colombia) developed a methodology for the Integral valuation of Ecosystem Services, which includes an environmental history analysis, identification of environmental conflicts and discussion of priorities related to landscape and ecosystem services management in the future. This methodology was implemented at the Orotoy river basin (Meta, Colombia) as study case, in which more than 150 representatives of local communities and productive sectors participated.

Results indicate that most people has arrived at the territory by migratory waves that date from the colony until this days, when oil palm production and extractive activities created a diverse sociocultural configuration, with people economically dependent of productive bonanzas. Currently, local people recognize 14 ecosystem services that the territory provides, 12 of them having a decrease tendency in the last 15 years, meanwhile direct benefits such as livestock products and those generated by the oil palm industry tend to improve.

The main environmental concerns perceived by the inhabitants are that (1) local governments prioritize a vision of territorial development with a national focus, but not a vision of local development and well-being, and (2) the

preference of assigning water for productive uses instead of the domestic use. Participants conclude that the priorities for future land management related to ecosystem services should be (1) provision of water for human consumption, (2) food security and (3) cultural inclusion.

By including these priorities in land management, it is possible to direct landscape transformation to a sustainable and desirable scenario that optimally fulfill well-being priorities of local communities, through ecosystem services management, reducing the appearance of new environmental conflicts.

Keywords: wellbeing, integral valuation of ecosystem services, land management, Orotoy River, Colombia

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Type of submission: *Abstract*

T. Thematic Working Group sessions: T7 The role of social sciences in the ecosystem services valuation

Balancing social economic profits and ecosystem preservation - an approach of evaluating the carrying capacity of the Yellow Sea

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The Yellow Sea is a densely populated area where the countries that surround it are highly industrialized and are steadily growing. Since social economic development can only be sustained within the carrying capacity of an ecosystem, it is becoming increasingly important to explore the regional carrying capacity of the Yellow Sea area. The sustainable development of the Yellow Sea is beyond the ability of any single country to address, requiring a reasonable and practical cooperation

framework among Northeast Asian countries. Exploring the carrying capacity of the Yellow Sea, therefore, is a prerequisite in developing an ecological cooperation framework. This study aims to identify the carrying capacity evaluation criteria of the Yellow Sea and examine the carrying capacity status of major corresponding countries, i.e. China, Korea and Japan.

Keywords: carrying capacity, evaluation criteria system, Yellow Sea, ecosystem preservation

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T. Thematic Working Group sessions: T7 The role of social sciences in the ecosystem services valuation

Economic valuation of ecosystem services from intertidal mudflats in South Korea: a choice experiment study

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Yellow Sea intertidal mudflats, as one of the major coastal wet lands, provide diverse ecosystem services, such as stopover sites for shorebirds, storm protection, coastal stabilization, food production, water purification, and tourism opportunities. However, in 2006, the Seocheon intertidal mudflats, which are located in the South Korean side of Yellow Sea, were subject to an intensive conflict as per the future usage of this area between conservation and

coastal reclamation for an industrial development project. Although the development project was cancelled, estimation of the economic value accrued from the Seocheon intertidal mudflats conservation is imperative in understanding the importance of resource protection vis-à-vis destruction. This study aims to estimate the economic value of the ecosystem services provided by the Seocheon mudflats. A choice experiment was carried out in 2015 with four choice attributes: number of migratory birds, annual shellfish products, annual tourists and livelihoods of local residents in the project site. The results from a national sample showed that the average amount of willingness to pay (WTP) per person was estimated to be about 10,000, 3,800, 6,600, and 13,6000 KRW(Korean Won), respectively for keeping 90,000 migratory birds from disappearing, 200 tons of shellfish products, 50,000 tourists, and 1,000 local households. In order to showcase a symbolic aggregation value, economic benefits accrued from these ecosystem services were added up to be 34,000 KRW per person. Considering the size of the population of South Korea, the total economic benefit was estimated to be about 1.4 trillion KRW (US$1.1 billion). Accordingly, the intertidal mudflats offer highly-valued ecosystem services

that might be difficult to justify any form of destructive activities. This study not only highlighted a legitimacy case for a conservation path involving mudflats, but contributed to the future policy-making process by providing a new analytical framework.

Keywords: ecosystem services, intertidal mudflats, choice experiment, willingness to pay, nonmarket valuation

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T. Thematic Working Group sessions: T7 The role of social sciences in the ecosystem services valuation

Assessment the ecosystem services of ponds in the hilly area

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Ponds are the ubiquitous ecosystem types in rural landscapes, which play an important role in water conservation, providing aquatic products and protecting biodiversity. Based on the the field survey and the rural household questionnaire in a small watershed in the Three Gorges Reservoir area, we analysed the quantity, type and distribution of the pond. Then, the InVEST model is used to evaluate the water conservation service and the product

supply service of the pond. The results show that the ponds density in hilly areas is high, reaching 20 ponds per square kilometre. Mainly distributed in the middle and lower part of the basin. Pond has significant multi-functional characteristics, with 45% ponds for irrigation, 15% for drinking, and rest for fish breeding. Water conservation is the primary service provided by pond, with the average water amount of 1000-3500 mm. Aquatic products are the main value source of ponds. With the transformation of mountain agriculture, irrigation and drinking service has declined, but fish breeding has become increasingly prominent. Fishing can further enhance the value of breeding since full use of pond space to achieve high-density farming. It is necessary to guide the farmers to carry out pond ecological management to adapt the new changes of population Immigrant and land use change in mountainous areas.

Keywords: pond, ecosystem service, InVEST model, multifunction, mountain

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Type of submission: *Abstract*

T. Thematic Working Group sessions: T7 The role of social sciences in the ecosystem services valuation

Evaluation of the maintenance service values of ecosystem diversity of marine protected areas and marine species diversity in Sanya city based on contingent valuation method

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Based on the contingent valuation method (CVM), a questionnaire was developed to survey the willingness to pay (WTP) to maintain the maintenance service values of ecosystem diversity of marine protected areas (MPAs) and marine species diversity in Sanya city in December 2014. The results suggested that the WTP of the local urban residents represents the costs that people are willing to

pay for keeping the sustainable ecosystem diversity from 4 MPAs and marine species diversity. The average WTP among urban residents were 82.923 CNY and 90.841 CNY per person for MPAs and species diversity, respectively, Based on the 2014 survey, the total maintenance service values of ecosystem diversity of MPAs and marine species diversity were 0.156 billion CNY and 0.154 billion CNY, separately. It was found that the higher the annual family income, the greater the WTP and the higher the education level, the greater the WTP for local urban residents. So the education degree and the annual family income are the main factors that affect the maintenance service values of ecosystem diversity of MPAs and marine species diversity. Given it is hard to get promoted for the education degree and annual family income in a short time, therefore it is suggested that the relevant departments should strengthen the publicity and education activities of MPAs and marine species biodiversity to improve the cognition and protection consciousness of residents on MPAs and marine species. For better protection of marine ecosystem diversity and marine biodiversity, both economic development policy and environmental protection policy are necessary. The local government should pay more

attention to how to balance and coordinate these two policies well.

Keywords: contingent valuation method, willingness to pay, ecosystem diversity, marine species diversity, maintenance service value

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T. Thematic Working Group sessions: T7 The role of social sciences in the ecosystem services valuation

Participatory multi-criteria decision aid to operationalize an integrated assessment of ecosystem services

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Ongoing ecosystem alterations underscore the need for ecosystem service assessment to urgently enter policy making. Participatory frameworks and a systematic inclusion of stakeholders effected by and effecting decisions are crucial yet underdeveloped cornerstones for

environmental policy making. This study aimed at a transparent and legitimised integrated assessment of ecosystem services that rigorously involves stakeholder knowledge and values. To this end, participatory multi-criteria decision aid was applied to the case of declining vineyard ecosystems surrounding the National Park of Doñana in South-West Spain. Data was gained by means of a survey (178 local respondents), interviews (conducted at two stages with 21 stakeholders) and three stakeholder workshops (each with 15 to 21 participants). We found stakeholder engagement to improve all steps of policy-making, including problem structuring, policy evaluation and operationalization. Our results thereby reinforce two major arguments for participation in integrated ecosystem service assessments: (1) the inclusion of stakeholders and their objectives adds legitimacy to policy making; and (2) the integration of stakeholder knowledge adds important information to policy making.

Keywords: ecosystem services stewardship, integrated valuation, multi-criteria evaluation, participatory decision making, local knowledge

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T. Thematic Working Group sessions: T7 The role of social sciences in the ecosystem services valuation

Selecting capital indicators of ecosystem management activities for the framework of Inclusive Wealth: a case of integrated coastal management governance in Omura Bay, Nagasaki, Japan

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The framework of Inclusive Wealth (IW) has applied to sustainability assessment. This framework is underpinned by stock and flow concept. Stock or capital can cover natural, human, and man-made aspects interdisciplinary (Pearson et al., 2013). Uehara et al. (2016) suggested revised IW framework integrating ecosystem services (ESs)

concept, which can assess sustainability of a region doing ecosystem management. It is important to select suitable capital indicators for ESs, but few description of actual trial to date.

The study aims to show how to select capital indicators for a specific cultural ES in a case of integrated coastal management (ICM) for an enclosed sea in Nagasaki, Japan. Especially, we assume that “coastal management activities” can be a cultural ES or a flow and focus on one ES to describe importance and challenge of capital indicator selection. In Japan, ICM concept becomes one governance tool to attain Satoumi condition. Satoumi requires socio-cultural intervention to manage appropriate material circulation and sustainable ecosystem use (Yanagi 2013). We made questionnaire survey about three capitals for coastal management activities to all nine groups of local fisheries cooperatives in Omura Bay (321km2), Nagasaki. We set three criteria to select capital indicators: Indicators should respond to implemented policy, include qualitative aspects of the group members, and cover both scale of one group and all groups of the Bay. We found importance of socio-cultural information for capital indicators. For example, leader ship level of specific members, creative

development tools and satisfaction level toward management activities are essential. These points can be included in especially human capital. Challenges are relatively high cost to collect information and difficulty of complementing different geographical scales of activities. We discuss improvement of indicator selection criteria and its application to other type of groups such as volunteers or education.

Keywords: Inclusive Wealth, capital indicator, integrated coastal management, Satoumi

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T. Thematic Working Group sessions: T7 The role of social sciences in the ecosystem services valuation

Ecosystem-based business development model for strengthening coastal community resource management in the Coral Triangle

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The ecosystems in the Coral Triangle Marine Area located in the western Pacific Ocean are under threat from overfishing, unsustainable development, destructive fishing practices and climate change. The Coral Triangle is considered to be the world's epicentre for marine biodiversity and its biological resources sustain over 120 million inhabitants. For coastal communities in this region, economic development must include a delicate balance

between protecting marine biodiversity and maintaining a sustainable and direct access to ecosystem services. Aimed towards addressing the socio-economic challenge of coral reef fisheries decline this study is based on Selayar Island in South Sulawesi Province in eastern Indonesia. It examines how micro, small and medium size enterprises in coastal communities can support marine ecosystem services. We look at three complementary pathways of sustainable small-scale fisheries, responsible tourism and small-scale home industry to enhance primary income and support local livelihoods through value capture and sustainable enterprise development. This presentation presents a system dynamics analysis of opportunities to strengthen coastal management through sustainable livelihoods. The findings from this study offer guidance for ecosystem-based business development initiatives in coastal communities that address both the impacts of human activities and the need to sustain or restore the goods and services that are generated by healthy ecosystems.

Keywords: marine ecosystems, coastal communities, alternative livelihoods, sustainable enterprise development,

market access

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T. Thematic Working Group sessions: T7 The role of social sciences in the ecosystem services valuation

The recovery of estuarine quality and the perception of cultural ecosystem services increase by beach users

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In Europe, the quality of coastal bathing waters improved considerably in the last decades, mainly due to a more demanding legislation and to the water sanitation plans adopted. In Nerbioi estuary (North Spain), the Wastewater Treatment Plan implemented between 1990 and 2001, caused an abrupt decrease in microbial concentration, leading to the compliance with bathing waters legislation and allowing recreational activities again, in the three

beaches of the estuary. However, little is known about how improvements in bathing waters influences the provision of cultural ecosystem services and human well-being. A questionnaire was used to study beach users´ behavior and perceptions and compared with environmental time-series data (microbial concentration and water transparency). Most respondents perceived an improvement in bathing waters quality and linked it to the estuarine sanitation. Nerbioi beaches are important recreational areas, mainly for local visitors, and water quality improvement was found to be a critical factor for deciding to visit these beaches. Furthermore, most visitors answered that they would not come back if water conditions deteriorate. Significant differences existed between beaches, with the most inner beach presenting worse environmental conditions than the other two beaches; and matching user´s perceptions. Our findings highlight that water sanitation actions are important for the recovery of degraded coastal environments, for the maintenance of ecosystem service benefits, and for increasing human well-being.

Keywords: wastewater treatment, long-term monitoring,

questionnaire, social valuation, social-ecological systems

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Type of submission: *Abstract*

T. Thematic Working Group sessions: T7 The role of social sciences in the ecosystem services valuation

Ecological mapping of wind environment based on optimization of urban and rural ecological environment

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Wind environment is an important factor in urban and rural landscape design and urban and rural planning. Good wind environment can optimize the ecological environment of urban and rural areas. Wind rose diagram is the most typical wind environment mapping expression mode. It is the only wind basic data in many areas. But due to its spot characteristics, the actual representation is very limited. There is no uniform wind direction and wind speed spatial

distribution in the region. If the planning and ecological system construction of wind rose diagram are used simply, there will be great hidden danger. Based on this situation, this paper through the research of Nanjing urban and rural development, the wind rose diagram layout and landscape resource distribution, to verify the limitations of existing wind environment mapping may exist, and put forward a kind of based on geographic information system and multidimensional, optimizing the ecological environment in urban and rural areas of large scale wind environment ecological mapping method, and then realize the wind environment visual areas, monitor and optimize urban and rural ecological environment from the wind speed and direction, air temperature, relative humidity and other multi angle. It provides new ideas and methods for urban and rural planning and smart city construction within the region.

Keywords: wind environment, wind rose, ecological mapping of wind environment, urban and rural ecological environment optimization

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T. Thematic Working Group sessions: T7 The role of social sciences in the ecosystem services valuation

Study on the evaluation of the subsidy policy effect of China's biomass power generation

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Although the biomass power generation industry has great potential for development, if there is no subsidy policy support and rely solely on the market mechanism, the industry may not be able to go beyond the early development predicament of the industry. For the sake of measuring the effect of subsidy policy, biomass power generation sample corporations have been taken as objects of study. Taken production and operating activities convert to the situation of biomass power generation pioneer

enterprise, taken expanding production function as theoretical model, the influence of subsidy policy for the production of biomass power generation enterprise has been estimated by panel data under the action of the specific subsidy, preferential tax policies and the combined action of these two factors. It has been discovered: the production of enterprise can indeed be increased by current subsidy policy, the profit level can be improved, and specific subsidy has more obvious effect than implement tax preferences simply.

Keywords: subsidy, biomass power generation, listed company

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Type of submission: *Abstract*

T. Thematic Working Group sessions: T7 The role of social sciences in the ecosystem services valuation

Xingan League Gross Ecosystem Production (GEP) accounting

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Ecosystem products and services are essentials for human survival and development. Gross ecosystem product (GEP) is defined as total values of ecosystem products and services for human welfare and sustainable development. The purposes of GEP accounting are to analyze and evaluate the total of economic value supporting for human survival and well-being and the ecological protection effects, meanwhile ,it is the needs of ecological civilization

in our country. In this paper, GEP of Xingan League which includes ecosystem provisioning value, ecological regulation services value and ecological cultural services value was accounted as a case study. The paper analyzed the tradeoff and synergies in different ecosystem services. GEP accounting provides an instrument to understand and assess efficiency and effectiveness of ecosystem protection management and restoration.

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T. Thematic Working Group sessions: T7 The role of social sciences in the ecosystem services valuation

Multiple scale delivery of ecosystem services and management in southern Shaanxi Province and the Haihe River Basin

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Societal demand for food, water and other life-sustaining resources is growing at unprecedented levels. Both ecosystem service and human development policies aimed to improve human well-being through the conservation of ecosystems that provide valuable services. Yet, how ecosystem services deliver at multiple scales, influence multiple stakeholders, and change through time is rarely carefully analyzed. Here we examine two different policies

in China, both of which ostensibly aim to protect and provide ecosystem services. The programs are (1) the Relocation and Settlement Program (RSP) of Southern Shaanxi Province that pays households who opt voluntarily to resettle from mountainous areas and aims to reduce disaster risk, restore important ecosystem services, and improve human well-being; (2) the Key Shelterbelt Construction Program (KSCP) in North, Northeast and Northwest China that aims to improve ecosystem sand fixation service. We compare and contrast the different approaches of these programs using household surveys and biophysical data in an integrated economic cost-benefit analysis for multiple stakeholders (local residents, the Municipal government, and cross-region and global beneficiaries) in the RSP, and using field monitoring data and eco-hydrological models for local and watershed scale impact assessment in the KSCP. The ecosystem service delivery influences multiple stakeholders at multiple scales during the program implementations. However, different stakeholder groups have very different profitable responses to the programs. Our results from these two cases indicate accounting over various scales of time and space is required to understand the ways that local

changes can influence ecosystem service and human wellbeing outcomes. These have important applications for achieving multi-win goals in ecosystem service conservation programs.

Keywords: ecosystem services, scale characteristics, household livelihood, ecosystem management

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Type of submission: *Abstract*

T. Thematic Working Group sessions: T7 The role of social sciences in the ecosystem services valuation

Study on compensation responsibility sharing between provincial, municipal and town governments based on ecosystem service value density: a case study of Zhongshan City in China

Author(s): Lixuan Zhou, Xijun Yu

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The core of the eco-compensation policy is to eliminate the environmental externality, and the way to achieve it is rationally distributing the eco-compensation responsibility. However, most studies were focused on standards and allocation of eco-

compensation, there are few studies on the allocation of eco-compensation responsibility among multiple providers. Choosing Zhongshan City as a case for study, responsibility allocating among the compensation providers, including Guangdong Provincial government, Zhongshan municipal government and its subordinate township government, was studied, in case of an increased demand for compensation funds due to standards increasing and elements adding. In order to achieve two goals of Beneficiary-Pays and Fundinge-Ensuring at once, a model comprising three eco-compensation providers, including the provincial, municipal and township governments was constructed. After analyzing the spatial distribution of important ecological function areas, a model of compensation responsibility allocation among townships in connection with regional ecosystem services value density and the gap between demand and supply of ecosystem service value was built. At the end, the results of compensation responsibility allocation among the three eco-compensation providers in Zhongshan City under five scenarios was simulated.

Keywords: eco-compensation, ecological value density, compensation responsibility allocation, horizontal and vertical compensation