UNIVERSITY OF FORWARD THINKING WESTMINSTER

Market-based instruments for the governance of coastal and marine ecosystem services: An analysis based on the Chinese case

Li, R., Woltjer, J. and van den Brink, M.

Market-based instruments for the governance of coastal and marine ecosystem services: An analysis based on the Chinese case

Ruiqian Li, Johan Woltjer, Margo van den Brink (2016) Market-based instruments for the governance of coastal and marine ecosystem services: An analysis based on the Chinese case; *Ecosystem Services* (accepted).

1. Introduction

Increasingly, both market-based instruments (MBIs) and the concept of ecosystem services (ESs) have gained favor in the environmental policy, planning and ecological conservation world (Pirard & Lapeyre, 2014). ESs are the benefits people obtain from ecosystems, which frames the relationship between humans and the rest of nature (Costanza et al., 2014; MA, 2005). The close linkages between human well-being and natural resource management has required better policies and instruments to enable sustainable governance outcomes. Accordingly, MBIs – a generic term referring to a range of approaches (e.g., cap and trade schemes, payment schemes, and levies) to address environmental policy issues in an economically efficient way – have attracted much attention (Muradian et al., 2013; Pirard & Lapeyre, 2014). These instruments attempt to build supply-demand connections and create incentives to affect actors' behavior (Boisvert et al., 2013). MBIs mainly support market mechanisms, such as voluntary transactions between actors, competition for services, and price signals (the EC Green Paper, European Commission, 2007; Lockie, 2013). Specifically, MBIs internalize the external costs of an action through taxes, or they create a market for ESs and individual property rights that favors competition (Dargusch & Griffiths, 2008). By doing so, MBIs seek to solve negative environmental externalities or even benefit positive externalities, such as inshore overfishing, sewage discharge into the sea, and utilization of environmentally-friendly tourism products (Engel et al., 2008; Greiner et al., 2000; Muradian et al., 2010). The main motive underlying MBIs is that they constitute more flexible responses and cost-effective options, which are superior to traditional regulation for ES conservation (Bräuer et al., 2006; Davis & Gartside, 2001; Hahn & Stavins, 1992).

MBIs have been gradually adopted to serve the governance of coastal and marine ESs. There are wetland mitigation banks, tradable development rights of flooding zones, eco-labels of fish products, and payment for ecosystem services (Binet et al., 2013; Filatova, 2014; Froger et al., 2014; Ressurreição et al., 2012). Coastal and marine ESs play a critical role in sustaining socio-economic development in coastal regions. However, there is a challenge for coastal and marine governance worldwide: managing ES complexity in relation to, for instance, ecological uncertainty, bio-physical dynamics between land and sea, and stakeholders' interests across geographical and institutional scales (Koch et al., 2009). MBIs have been advocated as being desirable to address this challenge (Davis & Gartside, 2001). Nowadays, they are considered to be the preferred tools for improving coastal and marine governance in both developed (e.g., the U.S., and Australia) and developing countries (e.g., Latin American countries and China; Douvere 2008; Greiner, 2014; Womble & Doyle, 2012; Zhao et al., 2015).

Previous studies concerning MBIs have mainly emphasized initiative development in forest reservation, watershed protection, agriculture, biodiversity, and carbon sequestration (Chobotová, 2013; Hejnowicz et al., 2014; Schomers & Matzdorf, 2013). A strong focus has also been on the performance evaluation of MBIs by measuring and modeling their benefits and the cost-effectiveness

of investment (Connor et al., 2008; Crossman et al., 2011; Bryan et al., 2016). Next to these empirical experiences, theoretical studies have presented conceptualizations, classifications, and potential governance modes that may strengthen the application of MBIs (Muradian et al., 2010; Pirard & Lapeyre, 2014). The governance of MBIs for ESs needs to facilitate economic incentives to influence actors' behavior and allocate natural resources. This should be in combination with regulations to draw on different motivations to sustain ESs cost-effectively (Matzdorf et al,, 2013). In other words, the use of MBIs for ESs has required hybrid governance that combines both market and regulatory elements (Muradian & Gómez-Baggethun, 2013). However, to date, MBIs for ESs in the coastal and marine field have received limited attention. In particular, an empirical understanding of the required governance has been lacking. To improve the implementation of MBIs for ESs, it is critical to gain insights into how existing coastal and marine governance facilitates MBIs in practice.

The objective of this paper is to gain theoretical and empirical insights into the utilization of MBIs for governing coastal and marine ESs. For this purpose, this paper develops an analytical framework to investigate the governance of MBIs from four distinctive aspects; namely price, regulatory support, coordination, and spatial consideration (e.g., Boisvert et al., 2013; Muradian & Rival, 2012). The empirical focus is on experience from China. China has experienced a fast-paced economic development in the past thirty years. Its complex environmental issues and huge pressures on ecosystems (e.g., air pollution, biodiversity losses, and depleted fisheries) are among the most severe of any major country (Liu & Diamond, 2005). China's traditional command-and-control arrangements have gradually facilitated the evolution of MBIs for ESs to tackle these issues in a more flexible and effective way. This evolution is visible in China's national coastal and marine governance. Many national policies have tended to integrate economic incentives, ES valuation, impact assessment, and spatial allocation. This makes China an interesting case when discussing how MBIs are implemented in national policies that focus on coastal and marine ESs, and understanding to what extent a market environment can be created for ESs.

The structure of this paper is as follows. Section 2 explains the theoretical relevance of understanding MBIs for ESs. It also presents an analytical framework formulated around four distinctive governance aspects of MBIs to guide further empirical investigation. Section 3 introduces the case of China. The research strategy is explained in Section 4. Results on the governance of the selected MBIs are shown in Section 5. Subsequently, merits and shortcomings of Chinese coastal and marine governance are reflected on regarding their relevant to MBIs. Efforts to improve MBIs' utilization in general are emphasized. The final section presents the main conclusions.

2. MBIs for ES governance

2.1 Theoretical relevance of understanding MBIs for ESs

The use of MBIs for ES governance has emerged in recent international discussions and sparked a broad theoretical debate (Muradian & Gómez-Baggethun, 2013; Tacconi, 2012). Within this debate, it has been argued that MBIs need to emphasize a typical market feature; namely, the voluntary nature of the choice for related actors (Engel et al., 2008). MBIs should facilitate freedom of choice for interactions among related stakeholders (Jack et al., 2008; Tacconi, 2012; Wunder, 2015). This implies that coastal and marine governance should, for instance, establish negotiation platforms and stimulate bargaining processes to achieve voluntary agreements on effective allocation of ESs (Filatova, 2014; Liu & Guo, 2015; Tennent & Lockie, 2013). Reinforcing coordination has also been emphasized in

terms of the transaction costs for MBIs. Markets for ESs normally involve considerable transaction costs when aligning interrelated actions, such as contract bargains and performance monitoring (Jack et al., 2008; Muradian & Rival, 2012). The governance of MBIs seeks to reduce transaction costs by building up necessary trust, using regulatory power, providing cost assessment, and stimulating competition (Stavins, 2003; Vatn, 2010). For MBIs to be worthwhile, coastal and marine governance should keep transaction costs sufficiently low.

Moreover, ES valuation has been perceived as an important basis for MBIs. Commoditizing ES-related proxies has been promoted and rationalized as a way to integrate ES values into MBIs (Nelson et al., 2009). Observable and measurable ecosystem properties and regulatory factors have gained favor in valuation to inform costs and benefits in ES transactions (Jack et al., 2008; Tacconi, 2012). This theoretical discussion implies more instrumental innovations with respect to coastal spatial allocation through land/sea uses and economic incentives. Last, but not least, MBIs are envisioned to incorporate the idea of dealing with complex causalities of ES issues (e.g., spill-over influence, trade-offs and synergies among ESs). MBIs are supposed to reveal cost-effectively causal information, internalize multiple costs, and allocate benefits that diverge according to spatial range (Corbera et al., 2009; Lockie, 2013; Muradian et al., 2010; Pirard, 2012). MBIs may offer the possibility to clarify affected actors, handle impacts that cross land-sea borders, increase co-benefits from different ESs, and prescribe offsite measures for compensation.

In summary, there is a need to gain a better understanding about market features and ES governance complexity. This should be based on empirical studies about MBIs and related governance. Next, an analytical framework will be presented to guide further empirical understanding.

2.2 An analytical framework

Against the aforementioned theoretical context, this paper presents an analytical framework. This draws on existing qualitative studies about MBIs for ESs which use three perspectives: governance, institutions, and ecological economics (e.g., Boisvert et al., 2013; Chang, 2008; Muradian & Rival, 2012; Schomers & Matzdorf, 2013). These schools of thoughts have suggested four distinctive governance aspects of MBIs in relation to coastal and marine ESs. This framework enables a structured method to gain insights into the utilization of MBIs. Table 1 presents the four distinctive aspects.

Table 1 Four distinctive governance aspects of MBIs concerning coastal and marine ESs

Aspects	**Specified aspects**	**Examples**
Price	Evaluate specific services	Attach prices to sea foods and wetland forests
	Evaluate ES-related proxies: negative and positive externalities; measurable regulatory elements	Attach prices to pollution and coastal reservation; Land/sea uses, developing rights, permits, and credits
Regulatory support	Assessment rules	Assess land/sea uses, impacts and ecological changes
	Rights and duties	Secure property, permits, and sanction of incompliance
	Transaction rules	Set allowable trading types, forms, scope and total amount, well-defined baselines, and rules on fair distribution
Coordination	Include related actors for voluntary participation	Involve services providers, users, and intermediary agencies

	Coordination methods for making free choices	Arrange meetings, negotiations, platforms, and trading places
	Information sharing and communication	Understand transaction costs, ES social meanings, and agreed measurement and currencies
Spatial consideration	Implementation at the scale where causality occurs	Make offsite allocation between upstream and downstream, and establishment of watershed-based authority
	Address site differences and specification	Set zones, boundaries, and types to differentiate impacts/prices/trading rules

115 2.2.1 Price

116 Generally, MBIs either rely on ESs directly, or on ES-proxies, partially, in regulatory terms, to realize
117 commodification. A price could be attached "to different degrees and in different ways…whether for
118 market exchange or for direct deals between a limited number of stakeholders, or whatever other
119 purpose" (Pirard, 2012). Social and economic values of services have been incorporated into MBIs,
120 such as direct fishery losses. Previous studies (e.g. Bräuer et al., 2006; Grafton, 1996; Greiner et al.,
121 2000) have provided a considerable evaluation of ES-related proxies for hard-to-commodify ESs,
122 including artificial prices for externalities (e.g., upstream pollution), and measurable regulatory
123 elements (e.g., land use/cover, fishing quotas, and carbon credits). In this context, land/sea uses have
124 played a critical role, as these are assumed to generate desirable ESs, connect ecological functions, ES
125 provision, and coastal and marine spatial allocation (Corbera et al., 2009; Schomers & Matzdorf,
126 2013).

127 2.2.2 Regulatory support

128 Regulations support markets for ESs in various ways. Generally, they are an important part of MBIs.
129 The following three formal regulations normally impose essential preconditions upon which MBIs
130 should depend: (1) rules for the assessment of uses, ecological changes and impacts are usually
131 formulated by defining, e.g., measurement units and feasible methods; (2) rights and duties are
132 required to be clarified (e.g., specify and deliver permits of fishing rights, and guarantee compliance
133 with agreements); (3) transaction rules are normally specified, such as defining allowable trading
134 types, forms, scope, total amount, and baselines, and fairly distributing financial resource (Boisvert et
135 al., 2013; Chang, 2008; Harman & Choy, 2011; Mansfield, 2006). Regulations are prone to cultivate
136 and provoke a market-oriented environment. Therefore, the frontier between market and regulation
137 tends to be blurred for MBIs used in ES governance (Lambin et al., 2014), including in the coastal and
138 marine field.

139 2.2.3 Coordination

140 It is essential that coordination be inherent in the related governance of MBIs and, thereby, play an
141 essential role in dealing with coastal and marine ES externalities and interactions among various
142 interest groups. Previous studies have noted that MBIs should stimulate voluntary participation of
143 service providers, users, and intermediary agencies, and, coordination methods should be in place to
144 enable those actors to make free choices within market interactions (Sarker et al., 2008; Scherr &
145 Bennett, 2011). Collective meetings, bilateral negotiations, and platforms for learning and trading are
146 needed to improve effective ES delivery and long-term transactions (Sarker et al., 2008). Information

147 sharing and communication are also critical components of coordination to smooth MBIs in terms of
148 supporting ES measurement and exchange currencies, achieving collectively agreed payments, and
149 capturing ES ‘‘social meanings’’ that determine economic incentives (Aronson et al., 2011; Boisvert et
150 al., 2013; Muradian, 2013; Muradian & Rival, 2012). Therefore, coordination is generally considered
151 crucial for negotiating an equitable and efficient scheme regarding ES allocation to facilitate MBIs.

152 2.2.4 Spatial consideration

153 The governance of MBIs for ESs has gradually been featured by spatial consideration on causal issues
154 (e.g., trade-offs and synergies between ES provision) and site-based specification. First, concerns have
155 been raised on the implementation scale of MBIs where ES causality occurs (Kemkes et al., 2010).
156 For example, to deal with offsite externalities, such as the effect of upstream water uses on
157 downstream uses, Wunder (2015) noted that payments contracts should take a spatial division between
158 the provision and utilization of ESs into account. Therefore, it is necessary to address the interplay
159 between ES causality and scales in governance structures; that is, to try to match political boundaries
160 and jurisdictions with ecological scales (Gómez-Baggethun et al., 2013). Second, when some MBIs
161 are established on the basis of land/sea use changes, place-based conditions are important for
162 analyzing ES costs and benefits (Chang, 2008; Harman & Choy, 2011). Specific ecological, economic,
163 and social conditions in situ determine different measurements of ESs and proxies (zones, types,
164 prices, and impacts), affecting outcomes of MBIs. Taken together, the spatial nature of MBIs
165 formulates the way in which cross-border and site-specific issues are dealt with.

166 **3. Case study: China**

167 **3.1 The development of MBIs for ESs in China**

168 Social and economic development strategies at different historical stages have determined the
169 characteristics and performance of Chinese environmental governance (Zhang & Zhao, 2007). In the
170 1970s and early 1980s, China’s environmental protection featured command-and-control methods
171 under a centrally planned economy. Later, “economic transformation of a market-oriented growth
172 model and decentralization dynamics” has triggered a change (Carter & Mol, 2013, pp.3). After the
173 enforcement of the State Environmental Protection Law in 1979, an environmental regulatory system
174 was formulated with a rapid acceleration of sectoral regulations and standards; starting with marine
175 environment protection in 1982. A four-tier management system, including national, provincial,
176 municipal, and county levels, took charge vertically (Carter & Mol, 2013). Meanwhile, simple
177 economic instruments (e.g., pollution charges) gained popularity, but by no means with a wide range
178 of influence (Zhang & Zhao, 2007). Since 1992, sustainable development was set down as a basic
179 national strategy and within which socialist market economy institutions were preliminarily
180 established (Zhang & Wen, 2008). In this context, MBIs, such as tradable permits of pollution,
181 subsidies, and environmental fees, have been introduced.

182 Chinese coastal and marine governance has provided space for market-oriented policy to face
183 ecological degradation, land-source pollution, biodiversity losses, eutrophication risk, coast erosion
184 and other challenges (SOA, 2014a; Wang, 2006). Particularly in 2002, the Administration of the Use
185 of Sea Areas created a critical institutional shift from free use to compensatory use of sea areas. This
186 change marks a milestone in the move towards a market-oriented governance of coastal and marine
187 public resources. It required coordination among administrative, legal and economic instruments to

deal with complex interrelationships of actors (Chen, 2012). Consequently, regulations about, for example, sea-use permits, trading platform, impact assessment, and sea-use grades, have been developed to support some market mechanisms (Li, 2006).

3.2 Selected MBIs for analysis

Chinese national coastal and marine policies have increasingly emphasized the development of MBIs. Generally, two types have thrived that directly affect the allocation and protection of coastal and marine ESs. The first type is property rights trading for access rights of public resources. A typical instrument is the Bidding and Auction for Sea Use Rights (BASUR). The instrument is applied within the inland waters or territorial seas of China. It is a market-type exchange whereby users (e.g., fishermen and port companies) set a price that they are willing to offer to gain a sea use right, which allows for an exclusive use of natural resources in certain spatial and temporal scopes. In 2012, the State Oceanic Administration issued the Notice on the Full Implementation of Market-oriented Approach to Sell the Use Right of Marine Sand Mining (SOA, 2012). A range of local regulatory initiatives of trading sea use rights has also been launched within recent years. These aimed to create incentives of sufficient and efficient sea uses and to increase the value of public marine resources (ZJOFD, 2013). These efforts have created a market in China that restricts the use of marine ESs and increases competition and scarcity of access rights to, for instance, marine sand resources, fisheries, and coastal space for engineering construction.

The second type of MBI to have thrived in China is payments for ESs. This aimed to motivate actors to preserve ESs at low costs through different payment mechanisms. According to the classification developed by Raes et al. (2016), commonly-used mechanisms in China have included compulsory payments imposed on private sectors and the internal determination of government payments. Accordingly, the Charges for Marine Ecological Damage Compensation (CMEDC) and the Subsidies for Fishery Restoration (SFR) accurately represent the two mechanisms, respectively. CMEDC requires sea users to pay for ecological damage (e.g., pollution, wetland damage, and species loss) caused by their activities to compensate the loss of benefit incurred by aquaculture farmers and/or coastal communities. It attempts to address negative externalities by defining a liability and increasing the costs to consumers. SFR is a hierarchical payment from the government to the private sector for carrying out habitat restoration, establishing artificial fish reefs, and boosting fish population. Its focus is on internalizing positive externalities by encouraging a sustainable provision of fishery to meet seafood demands. The two instruments have been developed through national policies, such as the Measures for the State's Loss of Marine Ecological Damage, and the Implementation Guidance on the Protection of Fishery Resources and Job Transfer Project. These policies have been refined in terms of local regulations and implemented in coastal governance practice.

The development of the two types of MBIs remains an ongoing process and their related governance shows clear presence of regulatory and market elements. Thus, it is interesting to investigate the current state of these policy instruments and to analyze the extent to which existing coastal and marine governance facilitate these instruments from the four distinctive governance aspects of MBIs. BASUR is used as an example to explore governance of the first type of MBIs. CMEDC and SFR are analyzed in a bundle as examples to understand the governance of the second type of MBIs.

4. Research Strategy for analyzing MBIs in China

This study used a combination of two methods: namely content analysis and semi-structured interviews. To begin with, existing national policy documents and local pilots on coastal and marine governance and the two types of MBIs were collected. The national policy documents included legislations, administrative regulations, statements, program reports, technical guidelines, and standards (Appendix A). These documents were collected between May and September 2015 from key official websites, such as the Central Government, the State Oceanic Administration, and the Ministry of Agriculture. Data about local pilots and initiatives were derived from newspapers and provincial and municipal government websites to reveal more operational details on each MBI. For instance, the administrative measures on marine compensation in Shandong province, the bidding for sustaining marine sand resources in Guangdong province, as well as the implementation of fishery subsides in Qingdao city.

Next, we interviewed ten key stakeholders to gain insights into the thinking behind the design and application of each selected MBI in practice. They were either selected according to their position in the relevant government agencies or their expertise regarding coastal and marine governance (Appendix B) and whether they were capable of reflecting on the processes, outcomes, developing trends, and suggestions on the MBIs for ESs. Semi-structured interviews guided questions following the analytical framework in Section 2.2.

Finally, both the policy documents and the interview transcripts were analyzed with the computer program of Atlas.ti for content analysis. Table 1 was adopted as a preliminary coding scheme to code all relevant text passages fitting under each distinctive governance aspect. Those text passages were aggregated and interpreted accordingly. This led to an in-depth understanding of the empirical implementation of the studied MBIs.

5. Results: MBIs for ESs in Chinese coastal and marine governance

After analyzing the data from the case, we summarized the key findings in Table 2. The results are explained in the remainder of this section.

255 Table 2 Findings on the four distinctive governance aspects of the selected MBIs used in Chinese coastal and marine governance

MBIs	BASUR	CMEDC & SFR
Price		
Evaluate specific services		Losses of natural fisheries and water purification service (CMEDC) Evaluate intangible ESs in pilots of National Marine Nature Reserves
Evaluate ES-related proxies	Sea use rights (inputs for activities or measureable benefits gained from ESs)	Input for ecological conservation and restoration Opportunity costs of alternative uses
Regulatory support		
Assessment rules	Conduct assessment on potential environmental impacts Analyze function and location rationality Evaluate standard price of different sea areas	Integrate compensation in environmental impact assessment Assess direct input and measurable output from ESs as a basic value Assess losses of marine ESs as a theoretical reference for upper limit value
Rights and duties	The State owns the property rights of sea areas Adopt a registration and certificate system for uses The State determines ES supply and maximum tenures of rights Sanction of noncompliance of both users and government agencies	The State owns the property rights of sea areas Integrate compensation liability with sea use rights (CMEDC) Require collective government finance to stimulate private incentives against common property setting (SFR) Administrative sanctions of noncompliance for government agencies
Transaction rules	Local specification on transaction methods and processes Set allowable transaction for certain use objectives and patterns Determine national qualification thresholds Require collective allocation of payments	Set allowable method and period of compensation, and facilitate an agreed amount of payments (CMEDC) Governments' internal determination of budget amount and project-based allocation (SFR)
Coordination		
Include related actors for voluntary	Users are free to participate but remain rather hierarchically affected	Sea users are obligated to pay, but have free choices of compensatory methods (CMEDC)

participation	Marine administrative agencies act as both providers and 'management intermediaries' with the cooperation among other related government agencies A few third parties exist to organize trading platforms Assessment agencies are involved as 'assessment intermediaries'	Marine administrative agencies act as both 'intermediary providers' and 'management intermediaries' (CMEDC) Service providers are voluntary to participate (SFR) Marine administrative agencies play roles of 'intermediary users' and 'management intermediaries' to assign budgets; beneficiaries do not participate directly (SFR) Limited non-governmental organizations are inclusive Assessment agencies are involved as 'assessment intermediaries'
Coordination methods for making free choices	Trading platforms Contractual agreements Official documentation and joint meetings	Negotiation on compensatory prices (CMEDC) Less bargaining space for providers in setting top-down payments (SFR) Official documentation and joint meetings
Information sharing and communication	Transparent information on traded areas Explicit transaction costs Unclear socially optimal prices	Transparent information on ecological losses, impact scope, extent, and mitigation measures (CMEDC) Limited understanding of social perceptions of ESs (SFR) Clear transaction costs
Spatial consideration		
Implement at the scale at which causality occurs	Draw on administrative scales and functional zones	Accord with administrative boundaries Address cross-border compensation by higher-level government agencies
Address site differences and specification	Consider place-based geographical, ecological, social, and economic differences to set starting prices	Identify and clarify principle ESs for each geographical unit to take compensatory priority

256

5.1 BASUR

5.1.1 Price

Making sea use rights tradable has been increasingly adopted in China. In 2012, the State Oceanic Administration issued a policy on fully promoting the instrument of BASUR for marine sand mining (SOA, 2012). Subsequently, such market-type exchange of rights has been expanded to coastal aquaculture, reclamation, and engineering construction. The focus of BASUR is on sea uses that are expected to provide ESs; thereby prices are tied to the proxy. As a planner from the National Oceanic Technology Center explained: "It is a trade of usufruct rights to natural resources. The value of natural resources is considerably illustrated by how to produce value, namely, utilization, which finally leads to sea use rights." To illustrate the value, payments are usually made in two ways: by attaching prices to inputs for activities (e.g. infrastructures, environmental costs, and administrative costs); and by evaluating the measureable benefits from ESs, such as aquaculture output and tourism incomes (SOA, 2013a).

5.1.2 Regulatory support

What guarantees an equitable, open, and standardized market for sea use rights is the regulatory element as that defines assessment, liability, and transaction processes. First, formal assessment is a precondition for delivering sea use rights. This includes assessing potential environmental impacts induced by coastal uses, discussing rationality of function and location, and evaluating standard price of different sea areas (CNSC, 2014; SOA, 2010). Sea assessment and standard prices are emphasized by the State to maintain elementary values of public natural resources and to avoid a dramatic shift in price (SOA, 2013a). This emphasis has been refined locally through a formulation of starting prices and evaluation schemes for bidding in, for instance, the provinces of Jiangsu, Zhejiang, and Fujian (SOA, 2008). However, the assessment illustrates less flexibility in performance. As an expert from the Ocean University of China noted: "Standard price should be dynamic…Current evaluation hardly captures market changes that may take place rapidly or slowly under the influence of society, economy, and natural conditions."

Second, BASUR has followed a set of predefined rules on property rights and duties. Access rights to natural resources are constrained by a registration and certificate system of sea use rights and zoning (SOA, 2006). According to ecological and social conditions per zone, governments have determined the supply of ESs, as well as who has access rights (i.e. issue a certificate as the only legitimate symbol) and for how long (i.e. set a maximum tenure of right for different uses). Such property settings have created political pressures on exchanges. One example is short tenures of rights gained by users. As a planner from the National Oceanic Technology Center explained:

> "Governments are not willing to transfer a long-period use right to a risky or large-scaled production like fish farming. Rapid economic development normally leads to revoking rights for certain areas for new economic development. It means the longer tenure possessed by a user, the more costs for compensation governments have to bear."

BASUR is also conditioned by sanctions for noncompliance of both users and government agencies. Users who cheat in transactions and change the approved utilization should be fined; government agencies that fail to conduct supervision should accept penalties (QDHDG, 2015).

Finally, the regulatory operation of transactions is central to BASUR. Although there is no national policy that specifies methods or processes for BASUR, local initiatives have brought this aspect forward, such as in Gunagxi, Guangdong, and Zhejing provinces (ZJOFD, 2013; Zhao et al., 2015). To assure trading efficiency and justice transparency regarding process, results, and information has been underlined. Allowable transactions for certain use objectives and patterns have also been set locally to clarify the scope of tradable objects (QDHDG, 2015). At the national level, thresholds have been qualified on, e.g., spatial resources for reclamation and maintenance of natural coastal lines (SOA, 2011). This creates a scarcity for certain uses of the sea in markets. Incomes from bidding and auction are required to be collectively allocated for ecological restoration and climate risk prevention as a way of fair distribution.

5.1.3 Coordination

The coordination underpinning BASUR is based on users' voluntary participation, diverse coordinative methods, and information communication. First, users (e.g., individuals, firms, entities) have free and informed choices about how to engage in a bid or an auction. Although users' participation is not legally compulsory, users are prone to enter only when a stable relationship with governments has been developed. This would smooth the subsequent administrative process and prevents users from undesirable costs. This hierarchical effect is relevant to marine administrative agencies. These perform as the State's representatives to provide ESs and approve sea use certificate, as well as 'management intermediaries' for BASUR operation (ZJOFD, 2013). Other related government agencies are obliged to cooperate with marine sectors. In some local cases, the operational role can be done by a third party of organizing trading platforms. These can act independently and without administrative interference (Zhao et al., 2015). BASUR also involves 'assessment intermediaries', since the evaluation of sea uses is quite essential for exchange. Nevertheless, not only marine assessment agencies, but also those from assessment fields of real estate, forest, and land uses, are active to participate. Several interviewees argued that, although experiences have been accumulated, schemes (e.g., a socially organized institute and rules on overcoming assessment rents) are absent to assure the capacity of assessment and the quality of results.

Second, an array of methods acts to provide bridges to support actors' cooperation. Trading centers for sea use rights have been established in cities of Nantong, Qingdao, and Lianyungang to connect supply and demand sides (Li & Liang, 2014; QDHDGO, 2015). Governments (providers) and bidding winners are coordinated through contractual agreements; this method actually formulates conditional payments for gaining a legal certificate of access right. Contracts between assessment agencies and providers or users are different, as they focus on the exchange of technical services, rather than ES-related proxies. Cooperation among government agencies for intermediation depends on official documentation and joint meetings. This allows for discussions about spatial allocation, impacts, and solutions (ZJOFD, 2013). Civil society is also involved through public notices about trading plans and results. People who are potentially affected could inform of their own concerns for ESs.

Information presented in BASUR is partly transparent. Information on traded areas relevant to location, ecosystem quantity, and starting prices is transparent. Transaction costs associated with an exchange (e.g., price evaluation, negations among intermediaries, and certification enforcement) seem clear and helpful to reduce information asymmetries. Generally, socially optimal prices of sea use

rights have not been identified via transaction processes. As an official from the SOA stated: "A sea-use project is inclusive of military, transportation and private business information…its openness cannot be determined by one agency. Outcome of openness is uncertain. No one would like to take a risk." The poor information sharing causes a weak perception of tradable rights on sea uses. This further hinders exchange scales, sufficient frequency of transactions, and the identification of optimal prices.

5.1.4 Spatial consideration

Governance of BASUR demonstrates spatial features in terms of matching administrative scales and functional zones, and taking in situ differences into consideration for starting prices. BASUR takes place within administrative scales since the use rights are administratively secured. Moreover, use purposes of traded areas are required to be consistent with marine functional zones, which define, as an expert from the Ocean University of China explained, "different attributes of marine resources particularly in territorial water and for which purpose those natural resources can be used." This consideration guarantees that activities decided through biddings/auctions are appropriate for a given spatial area. Also, these ecological attributes, together with geographical, social, and economic differences, are critical for designing starting prices (SOA, 2013a). Specifically, national delimitation of sea-use grades and patterns distinguishes place-based values and ecological costs, serving as an essential foundation for setting starting prices.

5.2 CMEDC & SFR

5.2.1 Price

CMEDC and SFR are the current mainstream of payments for ESs in Chinese coastal and marine governance. Both payment mechanisms draw on input for ecological restoration (e.g., costs of infrastructure, monitoring, assessment, and consultation) and the foregone net benefits from ESs (i.e. opportunity costs). CMEDC brings evaluation forward to specific ESs; namely, prices on losses of fisheries and water purification service are taken into account (SOA, 2013b). An official from the National Development and Reform Commission noted that:

> "Current focus is on the quantity loss of material objects. Actually, values of other services like regulating services should be dominant in marine compensation. However, who is willing to believe it and pay? A middle course is thus evaluating tangible or easily-calculated things."

In a recent pilot, more intangible services have been measured and adopted in National Marine Nature Reserves. This scheme cultivates regulatory rigidity and rich data, in which higher ES prices are expected to gain great acceptance.

5.2.2 Regulatory support

As mentioned above, CMEDC is about users' payments for ecological damage caused by their activities to compensate providers' losses. SFR is a hierarchical payment from government to encourage users' positive activities for ES provision. These two payment mechanisms determine a strong reliance on regulations. Assessment on ecological losses and payments has been stimulated by environmental impact assessment (GB/T19485-2014; SOA, 2010). In 2013, the Technical Guidelines for Assessment of Marine Ecological Damage (Trial) (SOA, 2013b) specified a baseline for compensation. The value of damaged ESs, however, is only considered as a theoretical reference for

upper limit compensation (CCICED, 2008).

State-owned property rights of coastal and marine ESs fundamentally affect the two payment mechanisms. For SFR, people without property are normally short of incentives for ES restoration and provision. Private incentives need to be stimulated against the context of common property of public resources. Hence, collective government finance is required to assure the benefits of people who contribute to ES maintenance or restoration, for example, fishermen and oceanic pasture operators. For CMEDC, land/sea developers that gained sea use rights normally consume ESs or damage ecosystems. Sea use rights are helpful to clarify beneficiaries and their liabilities. Thus, the transaction of sea use rights is a vehicle to impose charges of compensation. Nevertheless, not all utilizations of coastal and marine space have been clarified in terms of property and this restricts CMEDC (SC, 2013). Eventually, imposing compensation charges and distributing subsidies are typical government tasks. These activities are associated with administrative sanctions, which have a presence in local pilots, for instance, the Measures on Administration of Marine Eco-compensation in Shandong province (SDFD, 2016).

CMEDC and SFR draw on different transaction rules. Compensation periods and allowable compensation methods are specified for CMEDC. Both users and government should agree on the amount of payment. SFR is more in line with hierarchy. It is a top-down way to determine the total amount of subsidies. The amount varies depending on financial capacities and the value that governments attach to ecological conservation (MAO, 2013). SFR is more like a technical-economic intervention; its application depends on government-planned restoration projects. Outcomes of such projects tend to be easily monitored and measured.

5.2.3 Coordination

The two MBIs demonstrate different coordination. The first concern is about the involved actors. For CMEDC, users are obligated to pay compensation on the demand side, but are free to choose between cash payment and offsite restoration of a degraded habitat. The official from the National Development and Reform Commission explained this compulsory participation as follows:

> "Most beneficiaries still think that ecological services are free to use…If charges of compensation are too high to be accepted by users, it is thus less likely to make a good use of marine resources…Compulsory rules of payment are the result of game."

From the supply side, marine administrative agencies act on behalf of the State or fishermen to claim for compensation (as 'intermediary providers' of ESs), and also perform a role of 'management intermediaries' to operate and monitor CMEDC (SOA, 2014b). The planner from the National Oceanic Technology Center criticized the dual position as follows: "Those agencies are apt to employ power to control more resources through finance distribution…They have a mandate to immunize against CMEDC for industrial programs that would greatly enhance economic outputs." For SFR, freedom of participation is delegated to providers (e.g. fishermen or contractors of artificial fish reef). Local governments can be seen as service providers also when they receive the State's payments for operating public welfare programs. Marine administrative agencies are 'intermediary users' (as representative of final beneficiaries) to assign a revenue from the demand side and take charge of SFR operation and supervision (MAO, 2013). In this case, beneficiaries do not participate directly; similar power-affected distribution, as in CMEDC, also occurs due to the dual position of government

agencies. For both CMEDC and SFR, non-governmental organizations are not engaged in transactions to provide finance or intermediation service. Only assessment agencies are inclusive as independent third parties to serve ecological monitoring, damage assessment, subsidy standard formulation, and project evaluation.

When focusing on coordination methods, negotiation between users and marine administrative agencies facilitates an agreed price for CMEDC. By contrast, the top-down payments for SFR allow for limited bargaining space for ES providers. Coordination mainly takes place between related government agencies in terms of official documentation and joint meetings for budget distribution. The planner from the National Oceanic Technology Center criticized this as follows: "Providers should decide how to use the budget and which ecological project should be launched, since they are the final beneficiaries. Benefits determined by governments may not satisfy providers' desire." This criticism also reveals an insufficient exchange of information about providers' perceptions of ESs in SFR distribution. CMEDC performs better in information sharing to make ecological losses, impact scope, extent, and compensatory mitigation measures available (SOA, 2013b). Transaction costs seem clear for both mechanisms, such as revenue arguments within governments, direct negotiation with users based on assessment, and costs comparison between direct payments and offsite restoration.

5.2.4 Spatial consideration

Spatial consideration is underlined as a foundation for CMEDC and SFR. Ongoing developments of both instruments draw on administrative boundaries, rather than a geographical scale of the ecosystem. Critical ESs for each geographical unit have not been identified and classified to take compensation priority. Local budgets only support restoration projects that take place within local boundaries. Payment rules formulated locally have no cross-border sanction to address upstream-downstream compensation (SDFD, 2016). In this case, a higher-level government agency normally takes charge of coordination, such as proposing solutions to offsite pollution. Moreover, identifying critical ESs for each geographical unit is still ongoing to support compensation priorities. The National Principle Function Zoning (SC, 2015) and the Marine Functional Zoning have built a spatial framework and laid a foundation for the identification (SOA, 2009). A specific marine ecological zoning has been planned to fit the scale and pattern of ecosystems better (SOA, 2009).

6. Reflection and Discussion

6.1 Advantages and shortcomings of the Chinese governance of MBIs for ESs

This paper sought to gain insights into the utilization of MBIs in China for governing coastal and marine ESs using an analytical framework with four distinctive aspects. The results show just how much governance matters for MBIs. Not all of the four aspects are part of the Chinese coastal and marine policy. The results have illustrated certain advantages of Chinese practice. For example: the existing governance of MBIs is capable of reducing transaction costs, maintaining natural capital, stimulating actors' interactions, and integrating place-based features and ES bundles. Meanwhile, shortcomings of Chinese coastal and marine governance are also revealed, including the exclusion of major ES values from price setting, inflexible assessment rules, political pressures on market coordination, and the administrative scales at which MBIs are operated. In the remainder of this section, the advantages and shortcomings for each distinctive aspect will be discussed.

In China, prices are significantly attached to land/sea uses and inputs, rather than to clearly-defined

ESs. This consideration makes evaluation easier and less costly for trading. This advantage has been widely supported in previous studies (Wunder, 2015). Besides, stakeholders' willingness to pay for natural resources remains quite weak in China. Given this situation, emphasizing tangible inputs (e.g., infrastructures) in sea areas is helpful to identify users and increase their participation; and even promote compulsory participation. This merit has been illustrated by CMEDC and accords with other empirical research (Farley & Constanza, 2010). By contrast, the evaluation scope of specific services is quite narrow for the selected MBIs (only includes natural fisheries provision and water purification service). Excluding the major values of other ESs in price setting may reduce the environmental effectiveness of the instruments.

Regulations provide a considerable support for the analyzed MBIs in China. First, assessment rules are helpful to maintain natural capital. Setting standard prices (e.g., the starting price of bidding and the basic price for compensation) informs stakeholders of basic values of natural capital. It guarantees a threshold to maintain coastal and marine values in exchanges. Also, the flat-rate prices show strength in reducing costs that occur in small-scaled transactions (e.g., an exchange of sea use right for aquaculture). It can lighten the burden that poor users have to bear. Second, property rules and liability rules (Raes et al., 2016) in China are useful in overcoming free riding and lower transaction costs. Given the non-excludable attribute of many coastal and marine ESs, access rights to resources are limited through certificates, or a liability of protection defined by law. Government payments (SFR) and compulsory charges (CMEDC) are accordingly set. The results reveal the necessity of hierarchal efforts for ES-related market as many scholars have argued (Kemkes et al., 2010; Wunder, 2015). Meanwhile, hierarchical shortcomings also exist for transactions. For instance, inflexible assessment rules fail to capture market dynamics, and administrative approval of property can easily cause political pressures on trading.

In China, coordination for implementing MBIs has grown in importance. The use of coordination methods, the provision of incentives, and a certain level of freedom to make choices are useful to help reduce transaction costs. The developed trading platforms, joint meetings, and negotiations enable actors to join market interactions directly. Different degrees of incentives are offered to stimulate voluntary participation of ES users (in BASUR) and providers (in SFR). These actors' engagement is crucial to reach agreements and reduce costs (Raes et al., 2016; Tacconi, 2012). Chinese government has an outstanding position in coordination. Government plays the roles of 'management intermediaries' and acts as the representative of users and providers by creating links among actors. Such monopsony situation (i.e., pooling services from providers or funds from users) and the intermediary role can decrease transaction costs by minimizing the number of involved actors (Raes et al., 2016; Vatn, 2015). Nevertheless, those settings do not fully create a favorable environment for actors to have free meetings, form open-market prices, or increase largely voluntary participation. In some cases, users' participation in a bid depends on their relationships with governments. Essentially, the multiple roles played by government are likely to create political pressures on MBIs. This is most obvious in the finance allocation that is subject to power.

Regarding the spatial aspect, the two types of MBIs have integrated place-based features and ES bundles based on spatial zones. Setting starting prices of bids and identifying compensation priorities considerably rely on the ecosystem functions and attributes of each zone. The assessment of sea areas and ecological losses in China illustrates a thinking of assessing ES bundles, since an array of ESs is spatially linked through a certain ecosystem function. Paying for a set of such loosely defined ESs

may maximize social benefits (Farley & Costanza, 2010). Additionally, bundling ESs in MBIs may increase beneficiaries and avoid exclusivity on other services caused by commoditizing a certain service (Kemkes et al., 2010). However, the implementation of the selected MBIs is at administrative scales that express little concern for the scale at which ES causality occurs. Findings show that no specific administrative scale matches upstream-downstream allocation or watershed-based causalities. Existing rules to address those ecological causalities are rather a hierarchical way to realize administrative coordination.

Overall, as the majority of coastal and marine ESs are common pool or public resources, and as their property rights belong to the State, Chinese governments promote MBIs in their own way – with strong reliance on hierarchical support and their past strengths to provide economic incentives. Consequently, the use of MBIs in Chinese coastal and marine governance only shows part of the four distinctive governance aspects of MBIs. Based on the above analysis, governance improvements could be made for a better use of the analyzed MBIs in China.

6.2 Efforts for improvement

To improve the implementation of the analyzed MBIs, three important governance efforts could be made. First, the major value of coastal and marine ESs should be integrated. A comprehensive assessment system that defines which, and how to identify and evaluate, critical ESs is needed. To keep a lower level of transaction costs, such an assessment system could be refined step-by-step based on existing databases and tools (Primmer & Furman, 2012). Moreover, to reveal optimal prices of ESs in a dynamic market and inform assessment settings, the frequency of transactions should be increased. This requires broadening the scope of tradable ES-related proxies and imposing explicit property rules.

Enhancing social learning and recognition for the payments for coastal and marine resources is also worthwhile. Creating better partnership atmosphere and communicating channels to share social, economic, and ecological information can be recommended so that more awareness and support can be built for MBIs (Chobotová, 2013). Through this, compulsory participation may gradually convert into voluntary participation with more willingness of payments. This would increase the environmental effectiveness and socio-economic efficiency of MBIs (Tacconi, 2012).

Last but not least, social and local initiatives on MBIs for ESs should be stimulated to supplement the hybrid governance in which hierarchy retains a major role. More independent third parties should be involved and assigned responsibility for operating ES transactions to mitigate political pressures on markets. Social initiatives on conservation funding need encouragement to change the dominant position of government funding and improve financial sustainability (Scherr & Bennett, 2011). Local initiatives on cooperation also require more attention, since they have potentials to bridge across authorities and overcome sector-by-sector shortages when addressing place-based issues.

7. Conclusion

Previous studies on MBIs for ESs and coastal and marine governance have suggested that the governance of MBIs should integrate ES values by setting prices to ESs or related proxies, as well as draw on required regulation as an important support. These studies also point to a better coordination to enable actors to make free choices based on spatial scales at which coastal ES causality occurs. However, results from the analyses of Chinese practice show different emphases when compared to

545 the general literature about the governance of MBIs for coastal and marine ESs. Chinese policies
546 largely do not depend on market-oriented ways to determine ES provision, set economic price, or
547 facilitate free negotiations between supply and demand sides for ES exchange. The understanding of
548 the role of free choice, and the way in which coastal and marine policies deal with complex ES
549 interactions, is still limited. By contrast, Chinese MBIs mainly provide economic incentives for ES
550 maintenance by relying on regulations. The MBIs tend to integrate a certain level of ES valuation and
551 impact assessment. This contributes to a better understanding of transactions and ES allocations.
552 Moreover, Chinese coastal and marine governance has a clear focus on improving policy coordination
553 by reducing transaction costs in a largely non-market environment.

554 Overall, the analytical framework that emphasizes the four distinctive governance features of MBIs
555 for ESs; namely price, regulatory support, coordination, and spatial consideration, has proven to be
556 useful to gain insights into the utilization of MBIs for the governance of coastal and marine ESs. The
557 empirical analysis of, and the general implications for, Chinese practice contribute to the ongoing
558 discussions about the need to understand MBIs and ES governance complexity better.