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## Integrating ecosystem services into coastal and marine governance

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# Summary

The ecosystem approach has been promoted worldwide and widely accepted to deal with complex governance issues in coastal and marine areas, including ecosystem degradation and use conflicts across scales. Ecosystem service (ES) thinking is at the center of this approach, which focuses on understanding the relationship between human society and the ecosystem, and which explores how this understanding can inform management decisions. However, the international understanding of coastal and marine governance still falls short of a substantial investigation of the role of ecosystem services in existing processes and institutional arrangements. Therefore, the main objective of this thesis is to provide a comprehensive institutional understanding of the extent to which ES thinking is integrated into coastal and marine governance. The thesis takes an economic institutionalist perspective, which provides a useful lens to understand and reinforce ES governance by focusing on how institutions can coordinate transactions among ES-related actors. This research mainly draws on Chinese practices and attempts to clarify the importance of attuning institutional arrangements with coastal and marine ecosystems, thereby providing lessons to improve coastal and marine governance.

This study emphasizes the following two key challenges regarding the integration of ES thinking. The first challenge is about highlighting ESs and their interrelationships, particularly in coastal strategic planning. This challenge is about uncovering the implicit and explicit references to ESs, the conceptual understanding of nature's benefits, and the consideration of interrelationships among ESs in coastal strategic planning. The second key challenge involves ensuring institutional support for ES integration. More integrative and cooperative institutional arrangements are expected to respond to ecological dynamics and facilitate ES-related instruments. The first challenge is dealt with in Chapters 2 and 3, while the second challenge is emphasized in Chapters 2, 4, and 5. These chapters consist of four individual articles, which present the main part of this thesis.

Chapter 2 presents an explorative study of the two challenges through the case of Jiaozhou Bay. The content analysis of the selected coastal strategic plans provides explicit references to benefits that are derived from coastal and marine nature, without referring to the terminology "ecosystem services." In addition, there are different extents of dependence of coastal development on ESs. In particular, fundamental services, including some supporting and regulating ESs, have not been sufficiently incorporated. Therefore, adopting ES thinking to conceptualize and categorize ESs is suggested. It may be helpful to identify and coordinate all possible ESs. Chapter 2 also explores institutional strengths and weaknesses, which are relevant to the consideration of different ESs. Based on a multi-level institutional analysis and

a comparison with other international case studies, Chapter 2 reveals that the partial consideration of ESs may be mainly caused by fragmented institutional structures and limited ES assessment. This partial consideration is also relevant to the strong emphasis on economic development at all levels of institutions in China, which has led to economic priorities over the conservation of non-profit ESs. The exclusive responsibility of the Chinese government is also striking, affecting the governance emphasis on different ESs in various ways. Overall, this chapter offers an initial exploration of the existing institutions in relation to the integration of ESs, providing a general context for the analyses in the following chapters.

Apart from specific ESs, the explicit and integrated inclusion of ESs interrelationships, namely trade-offs and synergies, is also important to improve coastal and marine governance. Chapter 3 presents a four-step method for identifying ES interrelationships that may be considered in coastal strategic planning. The first step involves the selection of coastal strategic plans based on certain criteria to demarcate the research scope. The second step involves identifying the ESs themselves, providing a foundation for discussions on ES trade-offs and synergies. Subsequently, a more aggregated coding step is required to identify coastal activities, ESs, and their effects, relying on a clear cause-effect mechanism promoted by Bennett et al. (2009). This is the third step. Finally, the identified interrelationships are presented in the relational diagrams, which may improve the communication of use conflicts. Supported by the Jiaozhou Bay case, the application of the four-step method shows the usefulness of improving the legibility of ES interrelationships in coastal strategic plans. For instance, this could help identify some overlooked ES interrelationships with respect to regulating and supporting services. Overall, this chapter shows a possible way of identifying and structuring ES interrelationships, which enables the analysis of complex human-nature relationships in coastal strategic planning, linking ES thinking with coastal and marine governance.

Subsequently, Chapter 4 explores how the rules-in-use may facilitate the integration of ES thinking within coastal and marine governance. This is an important point in meeting the second challenge of this thesis. Chapter 4 starts with a theoretical basis, namely the generic rules from the Institutional Analysis and Development (IAD) framework. By reviewing previous studies on coastal and marine governance, it proposes an evaluative framework based on ES-specific rules. This evaluative framework is subsequently examined in a specific action situation, namely coastal strategic planning with regard to Qingdao, in East China. The analyses demonstrate different focuses and ways to facilitate ES thinking through different types of rules. For instance, the position rules need to focus on the involvement and the role of governments, scientific groups, and non-governmental stakeholders. The selection of specific participants normally depends on certain criteria, which should be clarified through boundary rules by considering the responsibilities of the actors, their ecological and social knowledge,

as well as the potentially affected users of ESs, to accommodate more ES perspectives. Aggregation rules are required to stimulate a mix of top-down and bottom-up decisions to coordinate local uses and higher-level goals regarding ESs. Choice rules should clarify what actions are allowed, obliged, and prohibited, by setting choice limitations per coastal and marine zone, based on social-ecological conditions. Payoff rules are needed to influence the benefits and losses from ESs to establish incentives and deterrents for coastal activities. In relation to the scope rules, the fitness of existing institutions with regard to geographical scales and ES interactions should be emphasized to achieve better governance outcomes. Finally, as an essential support for the other six types of rules, information rules are required to specify the provision of knowledge concerning the conditions, demands, values, uses, impacts, and spatial distributions of ESs, which is critical to support ecosystem-based decisions. Taken together, these discussions reveal how ES-specific rules may be developed and adopted in practice, while implying further efforts for the integration of ES thinking through institutional design.

Chapter 5 continues the investigation of the required institutional support for the integration of ES thinking. It zooms in on market-based instruments (MBIs), which can be understood as a range of institutional arrangements for dealing with ES issues and an operational means to achieve ES thinking. Chapter 5 examines how coastal and marine governance may facilitate MBIs to sustain ESs by focusing on four distinctive governance aspects, including price, regulatory support, coordination, and spatial consideration. Supported by the case of Chinese coastal and marine governance, as well as two types of Chinese MBIs, various differences between theoretical discussions and empirical practices are determined. For instance, previous studies have suggested that the governance of MBIs should integrate ES values by setting prices on ESs or related proxies, as well as draw on the required regulation as a significant support. Previous studies have also required better coordination that enables actors to make free choices, based on the spatial scales at which coastal ES causality occurs. However, the Chinese practices show a strong reliance on hierarchical support to provide economic incentives. On the one hand, the hierarchical support facilitates ES valuation and impact assessment to a certain extent, benefiting the understanding of transactions and ES allocations. In addition, Chinese coastal and marine governance clearly emphasizes policy coordination in order to keep transaction costs low for MBI implementation. On the other hand, hierarchical efforts restrict free negotiations between the supply and demand sides of ESs, in relation to, for instance, finance allocation and price setting. Additionally, Chinese coastal and marine governance shows little concern for the scale at which ES causality occurs, which may be less efficient and effective in addressing ES issues. Therefore, it is important to gain more insight into the role of free choices and the way in which coastal and marine policies deal with complex ES interactions.

Chapter 6 synthesizes results and draws conclusions from the four individual studies. Generally, this thesis emphasizes the importance of clarifying ESs and their interrelationships in coastal and marine governance. Moreover, this study demonstrates the crucial role of institutions and the different ways in which they accommodate market-oriented arrangements for ES thinking. Based on the analyses, specific suggestions have also been provided for governance efforts that Chinese planners and policymakers could follow to improve coastal and marine governance. First, the acknowledgment of ESs is implicit in Chinese coastal and marine policies, particularly regarding fundamental services and relevant indirect impacts. This requires planners and policymakers to characterize more broadly all possible ESs and account for complex interrelationships among ESs. Second, Chinese practice lacks evidence on developing institutional solutions to ecological issues at an appropriate geographical scale. To increase the capacity of dealing with complex ES issues, coastal and marine governance demands institutional adjustments and cooperation to integrate ecological entity and different geographies. Third, the valuation of ESs has been embedded in the Chinese strategic discourse rather than being grounded in daily language or in coordination efforts between organizations. Planners and policymakers should strengthen the acceptance of ES values by clarifying the concept of ESs, improving knowledge learning and communication, and increasing the reliability of valuation. Finally, this research clearly shows that institutional arrangements can significantly influence the ES integration. Chinese policies highlight regulatory support for facilitating economic incentives as a way to allocate ESs. However, more freedom for making choices should be delegated to local governments, private sectors, and individuals. A higher level of voluntary negotiations and exchanges between actors should be encouraged under the required regulations.