

Human-Nature Interactions over Distances

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17.1 Introduction

Human–nature interactions are key factors shaping global sustainability and human well-being. They have been widely studied within a particular area, but the world has become increasingly connected over distances, both socioeconomically and environmentally. Distant interactions such as trade, migration, and spread of invasive species are now more widespread than they ever were before (Liu et al., 2013a). For instance, human societies obtained much of their food, water, and fuel locally in the past, but now increasingly rely on sources at opposite ends of the Earth via global trade (Kastner et al., 2011, Konar et al., 2011). Global food exports have increased tenfold over the past several decades (United Nations Statistics Division, 2012). Water scarcity has also led to large-scale water transfer schemes, such as China’s South-North Water Transfer Scheme, which aims to transfer 45 billion m³ of water across the nation each year (Liu and Yang, 2012). These distant interactions have profound implications for sustainability and human well-being, often exacerbating social and environmental problems such as climate change, famine, land degradation, species extinctions, and social unrest (Liu et al., 2013a).

These and other distant connections have often been separately studied. For example, studies on

climate teleconnections concentrate on linkages between climate systems that are hundreds and even thousands of kilometers apart (Avisar and Werth, 2005) but largely ignore relevant socioeconomic linkages. On the other hand, studies on economic globalization (e.g., Levitt, 1982) focus on distant socioeconomic relationships. They pay relatively little attention to environmental interactions, although there have been some separate recent studies on greenhouse gas (GHG) emissions associated with trade (Peters et al., 2011). Furthermore, previous studies often treat distant factors as drivers of changes in a particular area (e.g., DeFries, 2010, Lambin and Meyfroidt, 2011, Stevens et al., 2014). But little research has been done on the feedback and impacts on other areas (Folke et al., 2011). While previous studies provide useful information, the results may be incomplete or partial. This shortcoming occurs due to the lack of simultaneous consideration of distant socioeconomic and environmental interactions, feedbacks, impacts beyond the systems being focused on, and relationships among various distant linkages.

To address these crucial issues, umbrella concepts need to be developed to bring together multiple different interactions and disciplines. A prominent example of the umbrella concept is ecosystem services (Daily, 1997), which include diverse benefits that nature provides to humans (e.g.,

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countries, including procurement of cars, renewable energy, and other resources by China (Buckingham et al., 2013). For instance, the loan of pandas to the Edinburgh Zoo in 2011 was part of a £2.6 bn (US\$3.94 billion) collection of business deals, including China securing rights to oil from a Scottish oil refinery (*The Guardian*, 2011).

17.4 Discussion

This chapter represents the first effort to study multiple telecouplings across borders and across local to global scales. It uncovers many similar and different spatiotemporal patterns and relationships among multiple telecouplings. The distance-defying patterns illustrated by tourism and panda loans suggest that geographical proximity is not necessarily the only determinant of telecouplings. For example, tourist destination choices are mainly determined by distance and cost, but this process is also heavily shaped by tourist motivations such as discovering new places and experiencing other cultures (Fesenmaier et al., 2006, Nicolau and Mas, 2006).

Telecouplings illustrated in this study are quite common around the world. Some telecouplings may be independent of scale and context, behaving in a similar manner across systems at different scales and in different contexts. For example, almost all rural areas import industrial products such as fertilizers produced elsewhere. On the other hand, many farmers sell agricultural products to outside markets (Jacoby, 2000). Many rural areas are destinations for tourists who live in cities (Lane, 1994). Information about various places is disseminated worldwide through publications, mass media, the Internet, and other communication channels. Financial support from external sources for conservation (e.g., payments for ecosystem services) is increasingly common worldwide (Chen et al., 2009, Yang et al., 2013c). Pandas are endemic to China and panda loans are relatively limited at the global scale. But many countries or places offer other wildlife species such as tigers, zebras, alligators, lions, and wolves to numerous zoos (Braverman, 2010). In many ways, the presence of other wildlife species in zoos plays roles (e.g., education) similar to the role of loaned pandas.

It is much more challenging to study telecouplings than local couplings (human–nature interactions within a system) because telecouplings involve many components that go beyond a single location, across multiple scales, and across administrative boundaries. Naturally it is even more challenging to study and quantify multiple telecouplings simultaneously than one telecoupling at a time. As a result, many research gaps exist. The biggest unknown ones are the spillover systems. In some cases, it is even unclear where the spillover systems are. Furthermore, many other environmental and socioeconomic effects across the telecoupled systems are not measured quantitatively. Feedbacks and relationships among multiple telecouplings require further quantification. While much remains to be done, this study lays a good foundation for future research and management to enhance positive effects and reduce negative effects of telecouplings on environmental sustainability and human well-being.

17.5 Summary

Many studies have focused on human–nature interactions within a particular area. There is little research on multiple reciprocal interactions, simultaneous socioeconomic and environmental impacts, and relationships with other areas. This chapter addressed these important knowledge gaps by applying the new integrated framework of telecoupling (socioeconomic and environmental interactions among two or more areas over distances). Results show that even the small and remote model coupled system of Wolong Nature Reserve had multiple telecoupling processes with the rest of the world. These included panda loans, tourism, information dissemination, conservation subsidies, and trade of agricultural and industrial products. The telecoupling processes exhibited non-linear patterns and have varying socioeconomic and environmental effects in various areas across the world. For example, as of 2010, 85 pandas had been loaned from Wolong to zoos in several countries. These loans have diverse effects such as introducing considerable economic costs to the receiving zoos and creating diffuse CO₂ emissions via animal transport. The chapter explored the substantial similarities, differences, and

relationships among different telecouplings, which cannot be detected by traditional separate studies. For instance, most of the telecouplings examined have been increasing over time. Telecouplings may also offset one another. Tourism was at odds with agricultural production and trade. Households in Wolong that participated in tourism had on average 50% less farmland compared to households not engaged in tourism in 2006. Such an integrated study leads to a more comprehensive understanding of distant human–nature interactions and has important implications for global sustainability and human well-being.

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