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Urbanization and environmental change during the economic transition on the Mongolian Plateau: Hohhot and Ulaanbaatar



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ABSTRACT

Driven by drastic socioeconomic changes in China and Mongolia, urbanization has become one of the most significant driving forces in the transformation of the Mongolian Plateau in the past 30 years. Using Hohhot and Ulaanbaatar as case studies, we developed a holistic approach to examine the socioeconomic and natural driving forces for urbanization and to investigate the impact on the urban environment. We used a multidisciplinary approach and relied on a variety of data sources to assess the changes of the landscape and environment of the two cities. We detected a rapid urbanization in Hohhot and Ulaanbaatar, both in terms of urban population growth and urban land expansion, from 1990 to 2010, with a much faster speed in 2000–2010. The local geo-physical conditions have constrained the spatial direction of expansion. Ulaanbaatar lagged behind Hohhot for about a decade when measured by indicators of urban population and urban land. Both cities have a degraded urban environment and a growing air pollution epidemic. While Hohhot had worse air pollution than Ulaanbaatar in the early 2000s, the gap between the two cities became smaller after 2010.

The research presented here highlights the following as key determinants for urbanization and environmental change: (1) the co-evolution of urbanization, economic development, and environmental change; (2) the urbanization of transitional economies driven by the change of the economic structure, i.e., the development by both manufacturing and tertiary sectors and the change in the primary sector; and (3) the recent institutional changes and increased integration with the global economy.

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1. Introduction

As one of the most pronounced changes on the Mongolia Plateau in the past three decades, urbanization continues to affect the interactions of the human-natural system since the market reform in China in the 1980s and liberalization in Mongolia since the early 1990s (Qi et al., 2012; Chen et al., 2015a, 2015b). Both Mongolia and Inner Mongolia have leapt into an urban era, fueled by the massive rural-urban migration that is reflected in the rapid expansion of urban built-up areas. This transformation has unleashed dramatic impacts on the environment within the cities as well as far beyond their administrative boundaries (Fan et al., 2013; Huang et al., 2013; John et al., 2013; Qi et al., 2012)

Urbanization in the Mongolian Plateau is highly associated with the economic development and transformation in the region. The

ratio of the population that lives in an urban area to its total population, known as the urbanization ratio, increased in Mongolia from 52% in 1980 to 70% in 2013 and from 23% in 1980 to 59% in 2013 in Inner Mongolia—higher than the average level in China (54% in 2013) (World Bank, 2015). Corresponding to urban population growth is the rise and fall of employment opportunities in different sectors and the restructuring of the national/regional economy, particularly in urban areas, over recent decades (Asian Development Bank, 2008; Schran, 2014). The primary economic sector, including grazing and agricultural activities, is located in rural areas, while the secondary and tertiary sectors, such as construction, manufacturing, and various types of services are located primarily in urban areas. Mongolia's Gross Domestic Product (GDP) per capita (GDPpc) doubled within three decades, increasing from \$692 USD in 1981 to \$1474 USD in 2011 (Chen et al., 2015b; World Bank, 2015). While the industrial contribution to GDP increased from 25% in 1980 to 37% in 2010, value added from the service sector slightly decreased from 58% to 46% of GDP in the same period; thus, the primary sector had the same contribution of GDP (17%) in Mongolia in 2010 as in 1980 (World Bank, 2015).

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Furthermore, a more dramatic change had occurred in Inner Mongolia. At the beginning of economic reform in 1978, Inner Mongolia had a GDPpc of \$206 that was distributed near even among the industries (i.e., 33%, 45%, and 22% in). In 2010, the region reached a GDPpc of \$9677, which is ~47 times of its 1978 level, with an annual growth rate of 13%. As a result, Inner Mongolia had transformed into an economy with a stronger focus on non-primary sectors, distributing 9%, 55%, and 36% of its GDP among the primary, secondary, and tertiary sectors, respectively.

Urban built-up areas, meanwhile, expanded at an unprecedented rate for major cities in Mongolia and Inner Mongolia. For example, Ulaanbaatar increased its urban built-up area from 82 km² in 1990 to 142 km² in 2010, whereas Hohhot had more than doubled within 15 years, growing from 105 km² in 1995 to 229 km² in 2010; most expansion occurred in the first decade of the new millennium for both cities. This expansion did not come without a cost and the environmental impact of urban expansion and spatial transformation has since been placed on the residents. The severity of air, water, and soil pollution resulting from the urbanization and changed economic structure on the Mongolia Plateau, as well as their direct and indirect impacts on human health and ecosystem services, have been highlighted in various reports from international organizations such as the World Bank, the United Nations Development Program (UNDP) and in scholastic research.

Despite being an important element in understanding the transformation of the Mongolia Plateau and its coupled human-natural system, current literature on urbanization and its drivers,

as well as its environmental impact, have been limited. Past research on urban landscape and environmental change on the plateau tends to focus on one aspect, such as analyzing urban land-use change through RS/GIS (Amarbayasgalan, 2008; Amarsaikhan et al., 2009; Fan et al., 2013), its driving forces (Tsogtsaikhan, 2003), rural to urban migration (Miller, 2013; Tsogtsaikhan, 2003; Wang, 1997), the efficiency of land use (Du, 2003; Mei and Hai, 2009; Mei and Han, 2010), evaluation of environment change (Dong et al., 2008; Ji et al., 2009; Luo, 2000; Sun, 2005; Zhang et al., 2008; Amarsaikhan et al., 2008, 2009, 2011; Bagan et al., 2009), or the consequences on the health of urban residents (Allen et al., 2013; Bolormaa, 2011; Dong et al., 2008; Guttikunda, et al., 2013; Sonomjamts et al., 2014; UNDP, 2011; Warburton et al., 2013; World Bank, 2004). To date, there has not been an integrated assessment of urbanization and the consequential impacts on the urban environment. Using Hohhot and Ulaanbaatar as case studies, we took a holistic approach and examined the socioeconomic and natural driving forces in urbanization on the Mongolia Plateau, which is reflected in urban land and urban population changes, and investigated the impact on the urban environment. As the two most important cities in their respective country and region, Hohhot and Ulaanbaatar share the similar geophysical and cultural and historical context. Recent economic reforms in the Mongolian Plateau have significantly influenced both cities. A comparative analysis of urbanization and environmental changes of these cities can reveal useful insights for policy makers and urban planners in the region.

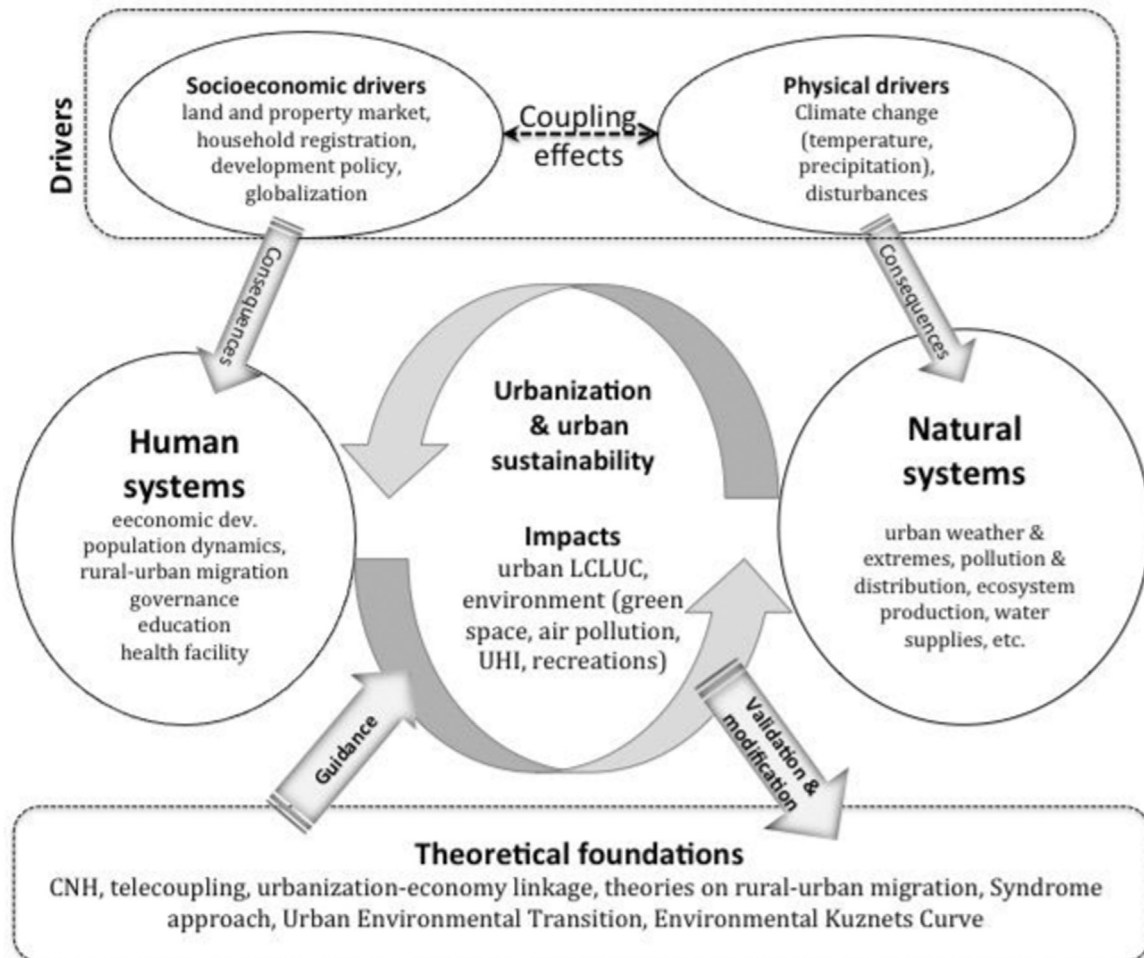


Fig. 1. Conceptual framework for understanding the complex relationships among the physical, socioeconomic, and environmental conditions in the two urban systems.

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