

ENVIRONMENT

China's Road to Sustainability

Jianguo Liu

Although China has achieved exceptional economic growth and has endeavored to protect the environment since its founding in 1949, it ranked 133rd among 146 countries assessed for environmental sustainability in 2005 (1). Many forces (e.g., socioeconomic, political, demographic, and technological) influence China's environmental sustainability. Any individual force can cause positive and negative impacts on sustainability directly or indirectly. This forum illustrates the complexity of forces that have affected China's sustainability over the past six decades and offers perspectives for the future.

Both internal and external forces vary across space and time. They can enhance or offset each other differently depending on the context, which often leads to nonlinear and unexpected consequences. During the past 60 years, negative impacts have been stronger than positive ones, with most environmental conditions worsening. The "Great Leap Forward" movement (1958–1961) caused the loss of at least 10% of China's forests to fuel backyard furnaces for steel production (2). The "Learn from Dazhai in Agriculture" movement (1964–1978) transformed numerous landscapes and filled countless lakes, wetlands, and coastal areas for crop production with little regard for topographic, climatic, and socioeconomic conditions (3). Since the economic reform and open-door policy started in 1978, the massive production of many export goods has caused further resource depletion and environmental pollution.

Of the >100 environmental laws and policies enacted since the 1970s, most have ineffective implementation and enforcement. Although sustainable development has been a national strategy since 1994, short-term economic gain still has priority. Some positive actions, such as the calculation of green GDP in 2004–2005 (4) (i.e., discounting gross domestic product by incorporating environmental costs) were short-lived because many government officials were concerned about their jobs and promotions, which were solely or mainly based on economic performance. The widespread ideology of "de-

velopment first, environmental protection later" or "pollute first, then clean up" is a root cause of China's low ranking in environmental sustainability (5).

There are some positive signs, however. The nature reserve system now occupies 15.1% of China's territory (higher than the world average) (6). The Natural Forest Conservation Program (7) banned logging of natural forests after the devastating floods of 1998 that were widely believed to be the result of deforestation and soil erosion. China's economy, dominated by polluting, low-efficiency industry, is gradually being replaced by a circular economy that applies the principles of "reduce, reuse, and recycle" and uses one facility's waste as another facility's input. Since attending the 1972 United Nations Conference on the Human Environment, China has begun to recognize environmental problems, signed international environment-related treaties, imported green technologies, and collaborated with foreign countries and international organizations to undertake environmental actions in China. The National Climate Change Program has aimed to lower energy consumption per unit of GDP by 20% between 2006 and 2010 (8) through economic restructuring and closing outdated factories. Furthermore, China plans to reduce CO₂ emissions per unit of GDP by 40 to 45% from its 2005 level by 2020 through developing a low-carbon economy and more renewable energy (9).

In many cases, the government's intention has been good but has been met with surprises. Extensive efforts to plant trees in many arid and semiarid regions have caused environmental deterioration because trees consume too much of the limited soil moisture, reduce overall vegetation cover, and lead to more severe wind erosion (10). The one-child policy, started in 1979, responded to inaction that had led to a population of 975 million, 80% higher than in 1949 (11). It averted more than 300 million births by 2005 (8), which has had debatable social effects but can be seen as beneficial to the environment. However, the number of households has increased much faster than the population since 1979 owing to such factors as more divorces and a lower proportion of multigenerational households. Reduction in household size alone added 80 million households from

Complex interactions of various forces create a bumpy road to environmental sustainability in China.

1985 to 2000 (12). More households consume more resources and generate more waste, and smaller households lower the efficiency of resource use.

What will China's future road to sustainability look like? It will depend on the timing, durations, strength, and complex interactions of existing and emerging forces in China and elsewhere. Bolder actions are needed to weaken negative impacts and to strengthen positive ones. Here are two examples. Efforts to promote environmental sustainability should be a major criterion for evaluating government officials nationwide (13). More sustainability actions should take place in households, the basic socioeconomic units of consumption. Households can increase resource use efficiency and reduce emissions in many ways (14). Formation of new households can be slowed by discouraging divorce (e.g., implementing a longer waiting period for couples seeking to divorce) (15). Government incentives such as tax credits and subsidies can promote co-housing and thus increase sharing of household goods.

China's transition to sustainability should take advantage of its ability to implement massive programs that can infiltrate every aspect of society rapidly. Furthermore, China's economic strength gives it an unprecedented opportunity to become a global leader in sustainability through institutional, scientific, and technological innovations.

References and Notes

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Center for Systems Integration and Sustainability, Michigan State University, East Lansing, MI 48823, USA; Guest Professor, Chinese Academy of Sciences, Beijing, China. E-mail: jlui@panda.msu.edu.

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