Mapping Ecosystem Function Conservation Areas to integrate ecosystem services into land use plans in Baoxing County, China

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Key Message

Provincial and county planners in China now base land use plans on 'Ecosystem Function Conservation Areas', which reflect areas of critical importance for ecosystem services and biodiversity. In Baoxing County, an ecosystem service mapping and modeling tool called InVEST was used to design development zones that avoid areas of high ecosystem service provision and importance for conservation. This is helping local policy makers to integrate biodiversity and ecosystem service status into cross-sectoral, multi-objective land-use plans. The mapping exercise highlighted that development activities are planned in areas important for several priority ecosystem services. These developments are now being reconsidered by local government officials as the next Baoxing county Land Use Master Plan is drafted in 2010.

What is the problem?

Over the past two decades, China has experienced double digit rises in GDP, large-scale alleviation of poverty, and overall improvement in livelihoods and physical infrastructure. However, this rapid economic growth and industrialization have generated negative environmental impacts. The death and destruction caused by the floods in the Yangtze River basin in 1998, exacerbated by deforestation on steep slopes, illustrate the economic and social costs of environmental degradation. Many of China's key industries – and its citizens' local livelihoods – depend upon ecosystem services. For example, tourism relies on the unique local natural beauty and biodiversity, while dredging costs in hydropower plants are kept low by the retention of sediment by natural ecosystems.

The government is now placing environmental protection higher on the national agenda. It has developed a range of regulations, policies and economic instruments, such as eco-compensation programs and environmental taxes. However, these efforts have not been sufficient to mitigate the environmental pressures generated by rapid economic growth. Local policies often continue to place economic growth above other objectives, without considering ecosystem services and the economic and social benefits of biodiversity. Local planning is often not effectively coordinated across sectors, with authority scattered among different government departments, such as Planning Commissions, Bureaus of Commerce, and Ministries of Finance, Land Resources, Forestry, Agriculture and Environmental Protection. In addition, existing zoning maps are often too coarse to enable effective local decision making – finer scales are required.

What is being done to solve it and what is the role of local policy?

Since the 1980s, the focus of China's many government plans has shifted to recognize the importance of coordinated consideration of demographic, environmental, social and economic priorities. The most influential plans – the Five-Year Plan for National Economic and Social Development (FYPs) and Land Use Master Plan (LUMP) – must now consider critical ecosystem service areas when designating zones where development is permitted. FYPs set down a general framework and targets for guiding government decisions, while LUMPs are

spatial land-use strategies. Lands are divided into four principal zones that affect the level of development allowed: optimized, intensive, restricted and prohibited development zones. The assignment of these zones is based on a variety of factors, but the first step now involves the identification of 'Ecological Function Conservation Areas' (EFCAs), where no – or only limited – development is allowed. EFCA zoning helps to integrate biodiversity and ecosystem service considerations into plans, including outside protected areas. EFCA's cross-sectoral nature can also help to resolve the inconsistency across different sector plans.

EFCA zoning occurs at national, provincial, county and city scales. While larger scale EFCA zoning provides guidance for deploying overall protection and development projects in China, local scale mapping of EFCA's is critical for implementation. Once adopted by the local People's Congress, EFCA plans become law, governing all sector and development plans. Baoxing is one county that has recently focused on local level EFCA planning. Baoxing is located in the western mountainous area of Sichuan province, in the Upper Yangtze River Basin. Many ecosystem services are important in Baoxing, but sediment and soil retention, water retention, and carbon sequestration are considered to be the highest priorities.

What has been achieved?

InVEST – Integrated Valuation of Ecosystem Services and Tradeoffs – is a software tool developed by the Natural Capital Project (Tallis et al. 2010) that models ecosystem services on the basis of biophysical and economic 'production functions'. These models translate land-use and land-management scenarios into estimates of the supply, location and value of ecosystem services. InVEST was used in Baoxing County to assist Chinese local government with EFCA zoning at finer scales than had been looked at before, in order to integrate ecosystem services into the Baoxing Land Use Master Plan. InVEST's sediment retention, water retention and carbon models were used to estimate and map the annual average delivery of these services. The resulting maps were bundled and overlaid with a biodiversity map to delineate and identify areas suitable for development with minimum negative impacts on important sources of ecosystem service supply (see Figure 1 below). The mapping exercise showed that protected areas cover the boundaries of key ecosystem services, particularly in the north. However, it highlighted that development activities are planned in areas important for several priority ecosystem services. These developments are now being reconsidered by local government officials as the next Baoxing county Land Use Master Plan is drafted in 2010.

If the revised Land Use Master Plan is designed and implemented such that it successfully conserves biodiversity and priority ecosystem services, a number of local development benefits are likely to arise for the people of Baoxing. Avoiding development in areas that are important for erosion control and water retention is likely to reduce the risk of flooding, mudslides and related natural disasters, both in the Baoxing region and downstream in the Upper Yangtze River Basin. Three industries that are key to economic development in Baoxing – tourism, hydropower and marble – are also likely to benefit. Preservation of biodiversity is essential to continue to draw tourists to the region that is the homeland of the Giant Panda. Meanwhile ensuring sediment is retained by natural ecosystems will reduce the costs of erosion control and sediment dredging by local hydropower stations. According to Baoxing's hydropower development plan, 8 cascade hydropower stations are planned in the region, with 4.33 billion kwh electricity generation capacity (Min. 2010). The marble industry in Baoxing relies on a clean, regular water supply for the marble mining and production process.

The health of communities also relies on medicines made using local herbal plants. In the longer term, conservation of forests may provide an additional source of income through carbon market trading, as carbon markets develop, and assuming necessary forest tenure reform occurs.

Figure 1: Planned 'development' areas compared to important ecosystem service areas (based on water retention, carbon storage, soil retention, and biodiversity conservation)
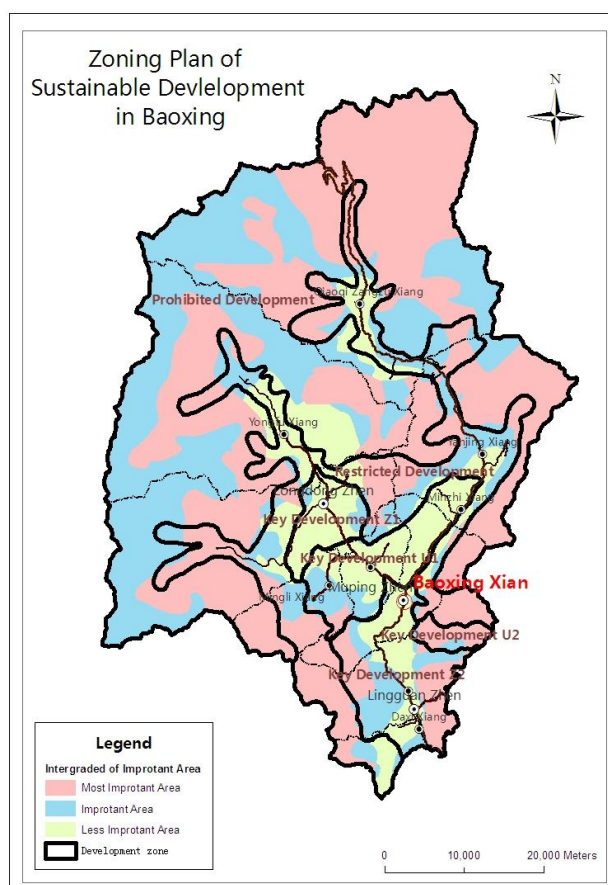
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