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Managing hillside landscapes as national forest: lessons learned from the Beijing Western Hills

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ABSTRACT

The question of how to sustainably manage hillside landscapes as national forests is a global concern, yet strategies for effective policy action remain to be discussed, especially in China where reforestation and nationalisation of barren mountains have ended up causing even more problems. While the existing studies of Chinese national forests mainly focus on general overviews of national policies that omit nuanced and empirically rich information, this paper presents instead a deep case study of the Beijing Western Hills in which occurred the first synthesis of hillside forest management instruments that now form Chinese public policy. The findings suggest that state intervention is indispensable to hillside forest management, but it may become financially unsustainable without private sector involvement. A transition to collaborative governance is necessary to broaden and diversify the range of revenues for and from hillside forests, and it should happen step-by-step so that those newly included in decision-making can get better prepared.

Introduction

In the early twenty-first century, 23% of the global forests occur on slopes, covering over one-fourth of the global total mountain area (Kapos, Rhind, Edwards, Price, & Ravilious, 2000). These hillside forests are important to both highland and lowland populations, providing diverse ecosystem services ranging from provisioning and regulating to supporting and cultural (Morran & Price, 2011). It should be noted that 76% of such lands are publicly owned or managed, the validity and efficacy of state intervention in hillside forest management is thus a global concern (FAO, 2016). Historically, the nationalisation of mountains arose as a response to widespread deforestation which ensued from population growth to meet the demands for timber, fuel, and paper products (Eckholm, 1975; Elvin, 2004; Williams, 2006). As deforestation caused serious environmental damage, various policy instruments emerged to conserve remaining forests in protected areas, use reduced impact logging, and reforest the land that had been previously cleared (Lamb, 2011). Many of such efforts in the nineteenth and twentieth centuries were characterised by centrally administered and top-down management (Agrawal, Chhatre, & Hardin, 2008; White & Martin, 2002).

In recent decades, this pattern of governance has been increasingly criticised as unsustainable. Scholars claimed that state intervention is characterised by a discrimination against the rights of local communities, a lack of long-term financial incentives for the private sector to consider hillside forests as economically productive assets for development, and a limited management capacity of governments.

KEYWORDS

Hillside landscape; national forest; private sector involvement; collaborative governance; modern

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to ensure effectiveness due to corruption and logging concessions (Braun, 2002; Dorji, Webb, & Shivakoti, 2006; Rangan, 2000). In some parts of the world where governments recognise their limited capacity to manage public forests effectively, decentralisation policy actions have been taken, but results are not always satisfactory (Nguyen et al., 2014; Pagdee, Y.-s., & Daugherty, 2006; Poudel, 2012). Although the transition from top-down centralisation to collaborative governance appears to gain momentum worldwide, integrated strategies for effective policy action remain to be discussed.

This problem is evident in contemporary China where the number of state-owned forest farms—mostly created on previously barren hillsides—reached 4855 by the end of 2010 (State Forestry Administration [SFA], 2013). Issued by the Chinese Government in 2015, the Plan for Reforming State-owned Forest Farms explicitly claimed that top priority should be given to the protection of forest ecosystem services (SFA, 2015). The plan specified that state-owned forest farms must be fully funded by the central government and stopped from running businesses. But meanwhile three other measures were articulated to invite more stakeholders in the private sector to participate in forest management: (1) purchasing forest tending services from the market; (2) attracting private capital to forest tourist development; and (3) encouraging non-governmental organisations and volunteers to get involved in forest management. These measures indicate that collaborative governance does not yet exist in many Chinese hillside forest landscapes, the role of state intervention remains a critical issue that deserves discussion. This raises several questions: why was state intervention introduced to Chinese hillside landscapes in the first place? Why has it ended up excluding other stakeholders from mountain forest management? How can collaborative governance be achieved in the future? Answering these questions is critical for assessing the validity of the current reform policies.

Given that the above questions are in the form of ‘why’ and ‘how’, this study employs a historical case study method most appropriate for gaining a deep and holistic knowledge (Yin, 2013). The literature on Chinese forestry policies is rapidly growing, but most of the existing studies are overviews of national forestry policies that omit nuanced and empirically rich information (Jiang, Zhang, & Wei, 2016). Case studies do exist, but few approach national forests from a hillside perspective (Chen, 2008; Li, 2013; Wei et al., 2015; Xu & Hyde, 2003; Yang, Huang, & Mei, 2014; Yin, 1997; Zhang, 2001). Instead of examining a series of cases to determine the scope, we focus on one single site, that is, the Beijing Western Hills. This site has been selected because it was where the first state forest farm of the Republic of China (1912–1949) was established, and also because it was the first barren mountain to be reforested and then inscribed as national forest park in the People’s Republic of China (1949–present). Ever since 1913, the Western Hills has been serving as the testing ground for state intervention in hillside forest management regardless of regime change, new approaches to hillside reforestation tested here later became the guiding systems throughout the country. With its development spanning the entire history of state-driven mountain forestry in modern China, the Beijing Western Hills provides information to get unparalleled insights into Chinese sustainable mountain development. By examining such a representative case, this study opens the way for general theorising and distilling arguments suitable for application to other cases.

**Methods**

**Study area**

Located at a distance of 20 km from the Forbidden City, the Western Hills (116.09–116.3E, 39.92–40.01N) are the nearest rugged terrain to urban Beijing, spanning an area of 8400 ha (Figure 1). As an extension of the Taihang Mountain range, this area has an elevation ranging from 100 to 823 m, and its slopes are between 15 and 30°. The parental materials include mainly hard sandstone (70%), the coarse-grained and dry soils formed from which are not favourable for growing plants (Beijing Forestry Survey Team [BFST], 1956). The soil formation is also affected by a continental climate that features an average temperature ranging from –4.1 °C in winter to 25.7 °C in summer, as well as an annual precipitation of 680 mm in which July and Autumn account for 70%.
Today the Western Hills are predominantly blanketed with forests, 5949 ha of which are managed by the Western Hills Experimental Forest Farm (WHEFF), and the rest are enclosed in a few historic and modern parks scattered on lower slopes adjacent to the urban area. On the periphery of the forest cover are a few rural and semi-rural settlements, most of which are located in the transition zone between mountains and flatlands. High-altitude villages are limited in number and only seen in the western portion of the Western Hills. Urban road networks have extended along foothills and up into major valleys and peaks, making most of the area accessible from the city.

**Data collection and analysis**

Due to the potential for researcher bias in the use of historical case study method, we strived to improve the validity of this study through data triangulation, collecting and comparing multiple sources of data.
evidence to determine the causes of various outcomes (Christensen, Johnson, & Turner, 2011). The historical trajectory of state intervention in the Western Hills was reconstructed from the primary source documents created by nine groups of stakeholders with firsthand knowledge, including early Western travellers, foresters, newspaper reporters, local government agencies, educational institutions, and design firms (Table 1). Some documents were retrieved from online databases, some were photocopied from local archives and libraries, others were purchased from commercial publishers or private owners. We also conducted field research to facilitate and enrich textual analysis, taking photos of two forest areas then open to the public, three historic sites, one botanical garden, and some rural settlements adjacent to the national forest.

No single source could cover the entire time span of the period under question, but the above sources together provided a relatively coherent narrative. This study merged piecemeal information around three empirically overlapping but analytically separate dimensions. The first dimension addressed the ways in which state intervention in mountain forestry was legitimised, with information from WHEFF, the Beijing Municipal Government, the Government of the Republic of China, the Sino-French University, and the early Western travellers. These same sources also served as the basis for examining the second dimension concerning technical and social challenges of hillside reforestation. The last dimension was about the post-forestation management, based on information from WHEFF, the Beijing Municipal Institute of City Planning & Design (BMICPD, 2006), the Beijing First Intermediate People’s Court (BFIIPC), the Haidian District People’s Court (HDPC), and local newspapers. Maps contained in these sources were georeferenced so that relevant features could be extracted as thematic layers and overlaid with digital elevation model to reveal the relationship between topography and forest.

Findings

Legitimising hillside reforestation

Early Western travel notes and photos tell the condition of the Western Hills in the beginning of the twentieth century. In the photos taken by the German architect and historian Ernst Boerschmann (1873–1949) in 1902–1903, no tree existed at the east foot of the Western Hills beyond Buddhist and

Table 1. Primary source documents reviewed.

<table>
<thead>
<tr>
<th>Author</th>
<th>Type</th>
<th>Period</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Western Hills Forest farm and related forest service employees</td>
<td>Journal article, Book section, Agency report</td>
<td>1980–present, 1950s, 1949–1990</td>
</tr>
<tr>
<td>4</td>
<td>Sino-French University</td>
<td>Institutional record</td>
<td>1912–1949</td>
</tr>
<tr>
<td>5</td>
<td>Beijing Municipal Institute of City Planning &amp; Design</td>
<td>Master plan</td>
<td>2006</td>
</tr>
<tr>
<td>6</td>
<td>Beijing First Intermediate People’s Court</td>
<td>Court record</td>
<td>2009</td>
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<td>7</td>
<td>Haidian District People’s Court</td>
<td>Court record</td>
<td>2008</td>
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<tr>
<td>8</td>
<td>Early Western travellers</td>
<td>Travel note</td>
<td>1912–1936</td>
</tr>
<tr>
<td>9</td>
<td>Local newspaper reporters</td>
<td>News article</td>
<td>2016</td>
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royal properties (Boerschmann, 1923). In the photos taken by the Finnish-born Swedish art historian Osvald Sirén (1879–1966) in the 1920s, even hills enclosed within royal palace gardens, such as the Yuquanshan Hill, were severely deforested (Sirén, 1926). As witnessed by the German photographer Hedda Morrison (1908–1991) in the years from 1933 to 1946, this phenomenon was widespread in mountainous areas rising from the very outskirts of the imperial capital, where anything combustible was collected by poor peasants for fuel (Morrison, 1985).

This condition coincided with the rise of state intervention. The Ministry of Agriculture and Commerce established a two-hectare forest farm on the north-eastern slopes in 1913, claiming that this initiative was to test reforestation techniques transferrable to barren mountains nationwide that suffered from river flooding and timber shortage (Chen, 1983). After the KMT government moved the national capital from Beijing to Nanjing in 1928, the forest farm continued to be managed by the central authority, although no longer receiving enough funds for expansion (Wu, 1998). During the period of 1928 to 1937, the newly established Beijing Municipal Government also got involved in the reforestation of a few scenic and historic foothills, with tourism as its primary goal (Summer Palace Administration Office [SPAO], 1935). In its plan for reforesting the Wanshoushan Hill and the Yuquanshan Hill, upper slopes would be covered with drought-tolerant, fast-growing, and evergreen coniferous trees to enhance scenery, while lower hillsides would be planted with fruit trees to attract tourists. The Second World War did not interrupt such efforts, as the Japanese occupying forces designated the Western Hills as one of their reforestation districts in North China for the purpose of providing military construction materials and also preventing communism from spreading into rural areas where people suffered from poverty engendered by mountain flooding (Hou, 2010).

It was not until the years 1955–1958 that the Chinese Communist government, with its capital in Beijing, eventually succeeded in greening the entire Western Hills. This project was legitimised by the need for providing urban population with recreation grounds, as well as the need for controlling wind-blown sand hazards to facilitate industrial development (Fang, 2008). All the reforested slopes have since then been administrated by a single government agency, that is, WHEFF (1985). This largely excluded the private sector from mountain forest management, particularly the Sino-French University whose reforestation work began in the 1910s and covered 70 ha of the north-western slopes (Beijing Institute of Technology [BIT], 1997).

Technical and social challenges of hillside reforestation

Hillside reforestation involves technical issues ranging from seed collection to seedling nursing and transplanting. When establishing the first forest farm in the Western Hills, the Ministry of Agriculture and Commerce had to purchase seeds from foreign countries like Germany, or to collect seeds from the Changbai Mountains in north-east China (Chen, 1983; Yu, 2003). These seeds had to be first cultivated to usable size in lowlands and then transplanted up hills, otherwise they would die from spring and fall drought, summer run-off, and winter frigidity (BIT, 1997). Seedlings had to be quickly transplanted to prevent desiccation, before which soil of barren hillsides must be replaced (SPAO, 1935). Moreover, irrigation should be provided at least three times for newly transplanted seedlings. This highly labour-intensive process was costly, for example, the percentage of labour costs in the total budget of the 1935 municipal reforestation project was as high as 33%.

To ease the financial burden of hillside reforestation, different governments tried a variety of ways to encourage private stakeholders to participate in tree planting. The National Forest Law of 1914 authorised private individuals or groups to benefit from greening public barren hillsides without paying rent and tax, and it also granted funds to those producing timber for international trade, ship making, and road construction (Chen, 1983). During the Second World War, the Japanese occupying forces provided free seeds and seedlings to Chinese peasants in hope of accelerating reforestation in the Western Hills (North China Reforestation Association [N CRA], 1944). After taking over the Japanese work in the Western Hills at the end of the war, the KMT government urged local private schools and temples to green half of the area planned to be reforested, allowing private nurseries to get seeds from
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In the years from 1950 to 1953, the Communist government provided local peasants with free seedlings and technical instructions, promising that they could share out a year-end bonus through labour (WHEFF, 1985). Despite these efforts, local people often turned negative attitudes towards state-driven reforestation projects. This problem was manifested in the work during the years from 1950 to 1953. Few peasants of the time were motivated because they worried that hillside reforestation was too technically challenging, and that the Western Hills would be sealed after reforestation (WHEFF, 1985). Due to such attitudes, the first half of the twentieth century saw limited progress in reforesting the Western Hills. As reported by the BFST in 1956, only 9% of the hillsides were covered with forests, and they were mostly found within the state-owned forest farm as well as a few Buddhist temples and palace gardens (BFST, 1956). The rest of the hillsides were subject to grazing (44%), farming (4%), and fruit planting (19%) by which 80% of 48 596 residents made a living. Hillside lands usually became no longer arable after three years of farming and, in steep gullies where farming and grazing were performed, landslides occurred frequently.

With the lessons learned from the previous failures, the Communist government eventually adopted a four-step strategy that led to the final success. The steps included: (1) closing off the entire rugged terrain to farming and grazing, with existing crops converted to fruit trees and livestock confined within a few farms; (2) selecting tree species tolerant of dry and calcareous saline soil, as well as those with nitrogen-rich or bright red fallen leaves; (3) transplanting a mixture of conifer (30%), broad-leafed (47%) and shrubs (23%) in the rainy season; and (4) cultivating seedlings through tilling, weeding, pruning, and pest control (BFST, 1956). The workers for implementation were mainly drawn from the public sector: 370 000 soldiers completed 76% of the total amount of transplanting work, and employees from 26 government agencies and public universities did unpaid regular maintenance (WHEFF, 1985). Upon the completion of the work, the percentage of forest cover in the Western Hills increased to 76% (Figure 2).

However, the heavy reliance on volunteer support soon proved difficult to sustain because even the most devoted volunteers experienced a lack of motivation after performing tough hillside work for long. To provide incentives, the government allocated an area of 72 ha at the east foot of the Western Hills in 1959 for volunteers to grow their own vegetables and fruits as well as to raise livestock. Finally, a group of full-time forest workers were employed to establish WHEFF in 1962, the main portion of the Western Hills (5949 ha) has been under public management since then (WHEFF, 1985).

Figure 2. The Western Hills before and after the reforestation work of 1955–1958. Source: Map by author, adapted from WHEFF (1985).
Expanding financing channels for hillside forest management

During the years from 1962 to 1979, WHEFF shifted its focus from forest maintenance to economic production (WHEFF, 1985). A variety of productive tree species were added to the forest previously dominated by non-productive ones, including 35 ha of nut trees (e.g. walnut and chestnut) and 52 ha of fruit trees (e.g. apple, peach, and pear, apricot and jujube). The pursuit of economic profit from the Western Hills culminated in the Cultural Revolution of 1967–1976, during which many slopes were converted to terraced beds for planting crops. These production-oriented changes to hillside forests had two negative consequences: (1) WHEFF had to make extra investment in pumping stations and reservoirs to secure hillside irrigation, as fruit and nut trees were generally not drought tolerant; and (2) the existing non-productive forests no longer received adequate maintenance, Chinese pine and oriental arborvitae ended up being significantly smaller than their counterparts due to the lack of timely intermediate cuttings (WHEFF, 1985). In the context of China’s deteriorating planned economy, such composite of agriculture and forestry was intended to improve forest workers’ poor working and living conditions.

After the national reform and opening up of 1978, the efforts to expand financing channels went beyond agroforestry. WHEFF began to run manufacturing businesses, such as that of woodwork, ice cream, and handicraft, the profits from which were used to improve forest workers’ dormitories, shower facilities, and work clothes, as well as to give field work allowance and year-end bonus (WHEFF, 1985). WHEFF also converted its pest control technologies, such as natural enemy, insect virus, and micro-organism, into commercial products (Wu & Xu, 2015). Increasingly being at the top of the development agenda, tourism has been promoted through forest park development (WHEFF, 2009a, 2009b). Such development started in the 130-hectare Baiwangshan area that was opened to the public in 1992, which not only provided recreational facilities for hiking, geocaching, rock-climbing, and zip-lining, but also celebrated state-driven reforestation achievements in inscribed steles, decorative walls, and memorial halls (Liu, 2002). Also in 1992 WHEFF became the first state-owned forest farm to be authorised by the SFA to create a national forest park (SFA, 1992). The administration required that a comprehensive landscape master plan be made prior to development so as to avoid damaging natural, scenic, and cultural resources, and that social capital be introduced to park construction and management.

The development of the Western Hills National Forest Park turned out to be difficult. In 2000, WHEFF invited the Beijing New China International Industry & Commerce Economic Development Co., Ltd. (BNCICED) to co-establish a limited liability company. Holding a 70% stake, BNCICED would be responsible for constructing infrastructure facilities and compensating WHEFF for annual forest maintenance (HDPC, 2008). Their landscape development plan divided the reforested hillsides into five scenic areas, with intensive development confined to lower slopes (Figure 3). However, the SFA suspended the approval of this master plan, claiming that Beijing must make a regional national forest tourism plan first, otherwise tourism development might exceed forest carrying capacity, and state assets might be sold at too low a price. This suspension soon broke up the partnership: BNCICED refused to pay the forest maintenance fee, and in turn WHEFF asked for dissolution of the company. The lawsuit went up and down the appeals ladder until the BFIPC approved the dissolution in 2009 (BFIPC, 2009).

As a result, mass construction became impossible, WHEFF had to instead take a piecemeal approach. By far, limited resources have been used to develop the 739-hectare Changhua scenic area nearest to urban Beijing (Zhou, Dong, & Zhao, 2010). Opened in 2011, this area is designed according to picturesque principles widely seen in contemporary Chinese urban parks, and its centrepiece is a flower creek running down the slopes, through four ornamental plant gardens, and eventually into a rock waterfall pond behind the entrance plaza (He, 2012) (Figure 4). The remaining forests are protected and accessible only through a few motor roads and stepped trails, dotted by overlooks and pavilions in traditional Chinese styles. After a half-century of efforts to expand financing channels, the private sector involvement in the forest management of the Western Hills remains limited, the government is still playing the leading role.
Discussion

We have seen how the barren slopes of the Western Hills were reforested, nationalised, and designated as a pleasure ground in the twentieth and twenty-first centuries. In these processes of landscape change, environmental safety, economic production, and tourist recreation converged as the sources of legitimacy for state intervention in hillside landscape forestry. This was not a singular case, as mountain deforestation and its resultant flooding and timber shortage occurred across the country in the early twentieth century (Deng, 1984; Hou, 2010; National Meteorological Center [NMC], 1981; Sherfesee, 1915; Yin, 1997; Yin & Wu, 2005). A group of progressive reformers thus began to propose a rational top-down land use reform based on land suitability, with forestry as the most suitable and lucrative land use for rugged terrains (Chen, 1983; Sun, 1920). Because of Beijing's status in the national politics, the work in the Western Hills was seen as an agent in the propaganda of hillside reforestation and an inspiration to similar projects nationwide.

This new type of government expansion gradually excluded private individuals and groups from hillside forest management. Why did the private sector fail to play a significant role? A primary reason lies in the fact that hillside reforestation was financially expensive, technically challenging and labour-intensive, making private stakeholders more than often incapable of undertaking such projects. Private stakeholders were unwilling to participate in state-driven projects also because governments tend to put constraints on economic and recreational uses of hillside forests. For public agencies, such uses pose potential threat to mountain ecosystems and the non-commercial nature of state assets, as seen in times of economic hardship when local people had the impetus to make a quick profit, as well as in a market economy where tourism development sought to commercialise hillside forests. Besides, the volunteer support failed to sustain due to a lack of motivation.

Figure 3. Zoning types and scenic areas of the Western Hills National Forest Park, as planned in 2006. Source: Map by author, adapted BMICPD (2006).
However, without the support from the private sector, state intervention itself is likely to become unsustainable. The case of the Western Hills shows that mountain forestry placed too heavy a financial burden on the government who then had to expand financing channels through agroforestry, manufacturing, and tourism. The current reform measures of purchasing services from the market, introducing social capital into forest tourism and encouraging NGOs and volunteers to get involved were clearly intended to solve such problems. Nonetheless, it is questionable whether these measures can really foster collaboration between public and private partners, because the protection of forest ecosystem services means putting constraints on development. In fact, management rights to be devolved from the government are quite limited. When there is a low expectation for future profit, the private stakeholders may turn negative attitude towards the reform proposals. If this happens, it will be difficult for the government to keep its promise to fully fund state-owned forest farms, especially when the national economy goes down.

What transferable insights can be distilled from the case of the Western Hills? Above and beyond its local particularities, this case study indicates that ecological protection should not be overemphasised to the degree that economic development is suppressed too much, although it should be a top priority in the management of unstable grounds. To attract private individuals and groups into the management of national forests, it is necessary to achieve a balance between protection and development to broaden the range of revenues from forests, and more rights need to be handed over from the government to the private partners. But such transition should not happen in a radical and rapid way, otherwise it may cause forest degradation due to limited preparation and guidance to local stakeholders, as seen in Indonesia, Russia, and East Europe (White & Martin, 2002). The handover of more rights does not necessarily mean the absence of state intervention, especially in developing countries where the general living conditions are to be improved and community organisations are not yet strong enough. There is no best model of collaborative governance that will solve problems everywhere, policy actions must be made according to changing local, national, and global conditions.

Figure 4. The artificial rock waterfall in the Changhua scenic area, the Western Hills, June 2012. Source: Photo by author.
Conclusions

Hillside forest management challenges vary widely between regions, and solutions needed are not one-size-fits-all. The coordination arrangement of the public–private relationship is a critical issue for many national forests around the world, and there are distinct benefits in undertaking a more comprehensive survey of various forms of state intervention in different parts of the globe. The case of the Western Hills shows that hillsides pose unique technical problems for reforestation because of their topographical and soil constraints, designating such land as a national forest requires mobilising labour and capital both during and after reforestation. The difficulty of hillside forest management often exceeds the capability of private stakeholder groups. State intervention, although more effective in overcoming such difficulties, tends to exclude other players and previous land uses and in turn makes itself financially unsustainable in the long run. For hillside areas that have already been managed as national forests, the transition to cooperative governance had better take a gradual approach so that those newly involved can get better prepared.

Disclosure statement

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