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POLICY PERSPECTIVE

A New Opportunity to Recover Native Forests in China

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Abstract

Despite unprecedented efforts at reforestation in recent decades, China's native forests continue to be displaced by plantations. Collective forest land (CFL)—land owned by rural households/communities—accounts for 60% of China's total forest land and harbors nearly half of its remaining native forests. However, China's existing policy structure for native forests suffers from considerable deficiencies with regard to CFL, most notably because policies provide no mechanism for restoring native forests on CFL. Rectifying these deficiencies requires that China's management approach toward CFL forests recognize the value of forests, especially native forests, for things other than tree crop production. In particular, policies must account for biodiversity in assessing the ecological conditions and values of forests and must provide incentives to protect and restore native forests. An opportunity has arisen to incentivize native forest recovery on CFL through the newly announced "mechanism of compensation for ecological protection" (MCEP), introduced in May 2016 and on track to become China's umbrella policy for ecosystem protection. Currently, however, MCEP does not explicitly target CFL, and it contains no incentives for restoring native forests. Adding these elements to MCEP could herald a renaissance for China's diminishing native forests and associated biodiversity. The Chinese government should not let this opportunity slip away.

The imperative of recovering China's native forests

China has undertaken remarkable reforestation efforts over the past two to three decades (Figure 1; Dai *et al.* 2013). For the first ~25 years after the People's Republic of China was founded in 1949, state forest policies were focused on resource extraction and gave little consideration to forest conservation (Harkness 1998; Dai *et al.* 2013). This, together with widespread agricultural expansion, led to massive forest loss across China (Richardson 1990). The mid to late 1970s marked the birth of China's protected areas network, the introduction of reforestation programs and, importantly, a heretofore nonexistent regulatory framework on logging (Harkness 1998; Dai *et al.* 2013). Massive floods across much of China in 1998, attributed to unchecked deforestation, marked an important turning point in China's forest policy, whereby forests' critical ecological values came to the forefront of policy attention (Dai *et al.* 2013). A system of nationwide and regional programs aimed at forest conservation and reforestation was swiftly initiated (Chapter 1 in Yin 2009) on an unprecedented scale. Government statistics subsequently reported rapid increases in China's forest cover starting from the late 1990s (Figure 1), although alternative assessments indicated that the increases were not as significant (Ahrends *et al.* 2017) or may even have been negative (China Nature Watch 2017). Regardless of

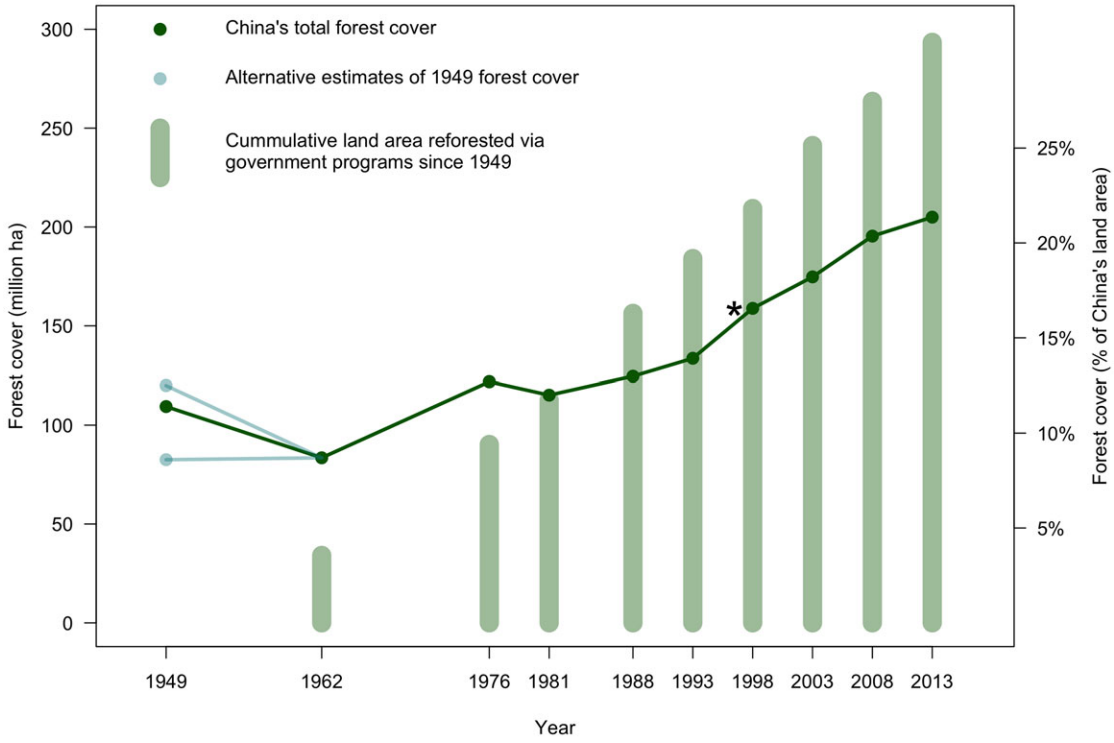

Figure 1 Trends of China's forest cover, based on government statistics, since the People's Republic of China was founded in 1949. Data on total forest cover are from the National Forest Inventory (since 1976), which has taken place approximately every 5 years since 1976, and from He *et al.* 2007 (prior to 1976). Data on forest cover established via reforestation programs since 1949 are from the China Forestry Yearbook 2012. *Indicates the year (1998) when the threshold canopy closure for forest definition was lowered from 30% to 20%. Note that alternative assessments indicate that recent increases in China's forest cover are not as significant as government statistics suggest (Ahrends *et al.* 2017) or may even have been negative (China Nature Watch 2017).

the extent of increase, however, China's forests created via reforestation programs are overwhelmingly monocultures or compositionally simple forests (Xu 2011; Zhai *et al.* 2014; Hua *et al.* 2016).

Consequently, while the increase in forest cover has generated major environmental and social benefits for China (Ouyang *et al.* 2016), it has failed to restore the country's native forests (Xu 2011), which have suffered severe destruction since 1949 (Richardson 1990). Crucially, it has also disguised China's continued loss of native forests (Li *et al.* 2007; Feng 2009; Greenpeace East Asia 2013-2015; Zhai *et al.* 2014; Ahrends *et al.* 2017; China Nature Watch 2017; Figure 2). Yet, the ecological values of native forests cannot be overemphasized, particularly in comparison to monocultures and other compositionally simple forests, and especially with respect to biodiversity conservation (Bremer & Farley 2010; Gibson *et al.* 2011; Hua *et al.* 2016 [as an example from China]). Notably, a recent study found that biodiversity was the only one out of six ecological metrics that had deteriorated amid China's massive reforestation efforts (Ouyang *et al.* 2016). Given that the Chinese government considers ecosystem protection to be one of its guiding visions (State Council 2016-2017), recovering (i.e., protecting and restoring) native forests is critically important, now more than ever.

China's current policy context regarding native forests

China's policy for native forests currently consists of five main components. The first to be implemented was the state-owned protected areas network, which protects ~15% of China's terrestrial surface, including some of the best remaining native forests (Harkness 1998; SFA-1 1998-2014). The second is the Natural Forest Protection Program (NFPP; "天然林保护工程"), which was instituted after the 1998 floods and aims to recover native forests in 18 out of mainland China's 31 provinces (Chapter 1 in Yin 2009; SFA-4 2011). NFPP also inspired several provinces to enact their own programs for native

Figure 2 Native forests on CFL cleared to make way for monoculture plantations in Ya'an, Sichuan Province in 2015.
Photo credit: Greenpeace East Asia.

forest protection, e.g., in Sichuan, Yunnan, and Xinjiang Provinces (Miao & West 2004). The third is a suite of payment-for-ecosystem-service funds (known in China as "compensation funds for ecological benefits"; "生态效益补偿基金") that were tested in 2001 in select provinces and implemented nationwide in 2004, with the aim of protecting noncommercial forests—on state-owned as well as collective-owned land—not covered under NFPP (MOF 2004). (In China, forest lands are classified as either commercial [serving production functions; "商品林地/商品林"] or noncommercial [serving ecological functions; "公益林地/公益林"], and as either state-owned ["国有林地/国有林"] or collective-owned [i.e., owned by rural households/communities; "集体林地/集体林"]; Miao & West 2004; Dai *et al.* 2013). While these compensation funds did not specifically target native forests, there is some evidence that they protected existing native forests at least in some cases (e.g., Li *et al.* 2003). The fourth, representing a bold expansion of NFPP and to be implemented over time, is a sweeping ban on the commercial logging of all of China's native forests. This policy was instituted in 2015 following President Xi Jinping's announcement that China must, over time, protect all its native forests (SFA-6 & -7 2015). Currently, the commercial logging ban is in place for state-owned native forests only ("国有天然林"); it is planned to be extended onto all collective-owned native forests ("集体天然林") by the end of 2017 (SFA-7 2015b). The fifth and the newest is the Ecological Protection Redline ("生态保护红线") policy initiated in 2017 to protect zones of "bottom-line" ecological importance (State Council 2016-2017). Again, this policy does not specifically target native forests, and it has yet to be operationalized from the current guideline stage (State Council 2016-2017). Therefore, despite its theoretical relevance to protecting existing native forests, whether and how it does so is yet to be seen.

Against this policy background, the opportunities and challenges facing the recovery of China's native forests are particularly prominent for the country's vast collective forest land (CFL, "集体林地"; SFA-1 1998-2014; Miao & West 2004). On the one hand, CFL is central to the future of China's native forests. According to government statistics, CFL harbors nearly half (47.9%) of China's remaining native forest cover, and it accounts for 60% of China's total forest land and >76% of new forest cover established between 2002 and 2013 (SFA-1 1998-2014). In addition, as rural depopulation frees up land from agriculture (Liu *et al.* 2010), CFL should continue to be China's main land source for restoring native forests, as suggested by historical precedents from countries that have gone through similar forest transitions (Rudel *et al.* 2005). On the other hand, China's existing policy structure for native forests—as explained above—is notably deficient when it comes to CFL. Apart from NFPP in the subset of provinces, it has historically neglected the protection of native forests on CFL (Xu & Melick 2007; SFA-4 2011), and the CFL part of the commercial logging ban has yet to be formulated. Moreover, when extended to CFL, the logging ban will face considerable challenges related to meeting rural livelihood needs, particularly with regard to commercial CFL. Most importantly, even if all existing policies can be effectively implemented, they can at best cover only the *protection* of existing native forests on CFL, but will still fall strikingly short of providing a *restoration* mechanism for native forests on CFL. Specifically, while there are various incentives for reforestation on CFL, none makes the distinction between native forests and other less-biodiverse types of forests (e.g., the Grain-for-Green Program, a nationwide program that primarily incentivizes rural households to reforest sloped cropland; Yin 2009; Hua *et al.* 2016), resulting in a de facto disincentive to restore native forests over compositionally simple and/or production forests. Considering the extensive historical destruction of native forests on CFL (Richardson 1990; Harkness 1998), the absence of a restoration mechanism in China's current policy structure for native forests points to a major missed opportunity.

Barriers to recovering native forests on CFL

Rectifying existing policy deficiencies concerning native forests on CFL necessitates overcoming two major philosophical barriers with regard to China's forest management. First, CFL forests, particularly commercial CFL forests, tend to be viewed primarily as serving production purposes, resulting in the neglect of their potential ecological functions such as soil and water retention and biodiversity conservation (Miao & West 2004; Xu & Melick 2007); this attitude explains the neglect of CFL in China's current policies concerning native forests. Embodying this production focus, the explicit goal of facilitating production was an important factor in the formulation of China's existing CFL tenure system in 2008 (SFA-2 2008; SFA-5 2013). Moreover, the government has been actively promoting the production-oriented "circulation" of CFL ("林权流转," whereby rural households lease out their CFL holdings to enterprises seeking to establish production bases; Zhai *et al.* 2014), by formulating guidelines and sponsoring a growing network of circulation trading centers across the country (Bosi Data 2014). The existence of a large, active CFL circulation market undoubtedly promotes the production use of CFL, although at least in theory, policies are in place to ban the production-oriented circulation of forests identified as serving key ecological functions (SFA-8 2016).

Second, China's approach to assessing the ecological conditions of CFL forests does not explicitly account for biodiversity, but instead relies on a simple metric of forest cover (e.g., SFA-1 1998-2014) or, at best, a small number of ecosystem services and functions other than biodiversity (e.g., soil retention, carbon sequestration; Yin 2009). This narrow focus stems from a tendency to view biodiversity conservation as largely the responsibility of protected areas (Harkness 1998), causing policy-makers to overlook the biodiversity value of forests outside protected areas. Unfortunately, biodiversity loss is probably more severe than what has been assumed from changes in forest cover or other ecosystem services and functions (Ouyang *et al.* 2016; also see Bremer & Farley 2010 and Liao *et al.* 2010 for two meta-analyses comparing plantations against native forests regarding, respectively, biodiversity and ecosystem functions). The narrow focus thus grossly blurs the ecological distinction between native forests and other less-biodiverse types of forests on CFL; it also results in severe underestimation of the ecological costs of native forest loss on CFL. In sum, the success of any change in China's policy to facilitate the recovery of native forests on CFL hinges on explicitly recognizing the ecological value of CFL and making biodiversity a key metric in assessing the ecological conditions of CFL forests.

Policy deficiencies aside, implementing native forest recovery efforts also entails overcoming a number of operational barriers that have impeded the three broad pathways to native forest recovery—protection of existing forests, passive restoration via natural regeneration, and active restoration via artificial planting (Lamb *et al.* 2005)—for China's CFL to varying extents. For one thing, allocating land to native forests as opposed to alternative land uses may carry opportunity costs for CFL households. Because farmers usually plant trees to earn income (Frayer *et al.* 2014), possible opportunity costs associated with opting for native forests ought to be properly compensated for to remove disincentives to landowners to protect or restore native forests. Second, and particularly concerning the active restoration pathway, native forest restoration usually involves nontrivial economic costs (Lamb *et al.* 2005), as well as technical knowledge (e.g., planting the right mix of trees at the right place), materials (crucially, seeds and seedlings), and other steps considerably more sophisticated than that involved in re-establishing monocultures or other compositionally simple forests (Elliott *et al.* 2013). Financial and technical resources must be made accessible to CFL owner households to enable them to restore native forests rather than compositionally simple forests.

A policy mechanism to enable the recovery of native forests on CFL

Fortunately, a policy that is in development and on track to become China's umbrella policy for ecosystem protection could provide a promising opportunity to incentivize the recovery of China's native forests on CFL—but only if it is properly designed. In part a descendant of the previously discussed payment-for-ecosystem-services funds, the Mechanism of Compensation for Ecological Protection (MCEP, "生态保护补偿机制") was introduced by the central government in May 2016 as a policy concept (State Council 2016-2017). The development of its details is currently under way, and is at the center of China's environmental policy-making (State Council 2016-2017). MCEP stipulates that ecosystems should be protected on the basis of their ecological values and services, with funding provided by the beneficiaries of those services (State Council 2016-2017). At least in theory, it streamlines the legal basis and funding mechanisms for the protection of ecosystems across the country, including, significantly, those outside protected areas, and has the potential to serve as a powerful policy backbone for recovering native forests on CFL. Nevertheless, current

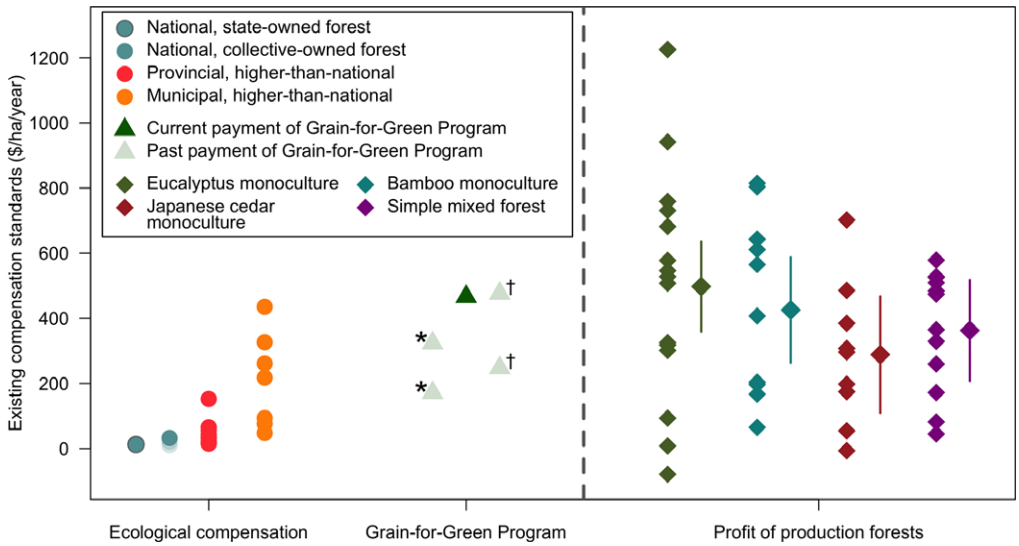

Figure 3 Compilation of existing compensation standards for forests in China as of March 2017 (in USD), in comparison with profits from production forests in 2015 as reported in a field study in Sichuan Province.
Standards under the "compensation funds for ecological benefits" are represented in short by "ecological compensation." Note that most compensation standards, past and present, fall below the profits that can be earned from extractive forest production, thereby penalizing landowners who wish to protect or restore native forests. Corresponding symbols in faded colors represent past standards (2001 onward for standards under ecological compensation; 1999 onward for standards under the Grain-for-Green Program). For ecological compensation standards at the provincial and municipal levels, only those higher than their respective national standards are displayed; data displayed came from an extensive Web search covering every Mainland province (SFA-9 2017). For the Grain-for-Green Program, * and † indicate past standards for the Yellow River Basin and Yangtze River Basin, respectively (NDRC 2014). Profits of four types of production forests in 2015 estimated by a field study in Sichuan Province are provided to illustrate the potential opportunity costs of native forests; each diamond represents one household interviewed (Hua *et al.* 2016).

policy document of the MCEP indicates that it suffers from the same pitfalls that have plagued China's previous forest policies: (1) it does not explicitly target CFL, thus at best all but leaves out the vast areas of commercial CFL and (2) its compensation scheme is based on land function—i.e., it targets the blanket category of noncommercial forest—rather than forests' ecological conditions (SFA-3 2009; State Council 2016-2017), thus fails to create an incentive, and at worst creates a disincentive, for the protection and restoration of native forests. Thus, despite its enormous potential, MCEP currently falls short of benefiting native forest recovery on CFL, in ways similar to China's other existing policies.

Our preceding analysis on the barriers to recovering native forests on CFL provides clear guidance as to how MCEP can rectify its current pitfalls and be operationalized to achieve its potential regarding native forests on CFL. In terms of rectifying policy pitfall, MCEP should formally recognize the ecological functions of CFL forests, including commercial CFL forests, beyond just timber production and tree crops, and enable households that own CFL to receive payments for nonextractive ecological values and services. In addition, MCEP should explicitly account for biodiversity when assessing the ecological conditions, values, and services of CFL forests (and other ecosystems in general). In terms of operationalizing the policy, MCEP should design a compensation scheme to adequately anticipate and cover the opportunity costs borne by CFL owner households of allocating land to native forests as opposed to alternative land uses. This task requires securing adequate compensation funds at the level of the MCEP (including from the central government) and, crucially, determining socially equitable, effective, and efficient compensation standards. Compensation standards should be informed by the economics of household decision-making with respect to land use (e.g., profits from alternative land uses, Hua *et al.* 2016; willingness to accept, Wossink & Swinton 2007); they should reflect the "additionality" values and services of native forest protection or restoration against alternative land uses (Engel *et al.* 2008); and they must be tailored to the specific geographical, biophysical, and socioeconomic contexts of the region. For native forests arising from active restoration, compensation standards should also account for restoration costs. In Figure 3, we have compiled, to the best of our knowledge, the different compensation standards currently used in China (SFA-9 2017), including those under the "compensation funds

for ecological benefits" mentioned above (MOF 2004) and under the Grain-for-Green Program (Yin 2009). We have also compiled in the same figure the profits of alternative land uses, as reported in a field study (Hua *et al.* 2016) that illustrates the opportunity costs of allocating land to native forests versus extractive uses (Figure 3). Importantly, this compilation highlights the fact that apart from a few local programs, existing compensation standards in China are far too low to promote the protection or restoration of native forests. Delivering adequate compensation will be crucial for MCEP to facilitate native forest recovery on CFL; it can also free up rural households for alternative, nonfarm/forestry means of income, in turn providing new economic opportunities and benefiting rural livelihood. Another aspect of operationalizing MCEP is to provide the technical resources needed for the active restoration of native forests, including technical guidance, seed and seedling supply, and field support. Instead of continuing the simplistic approach of re-establishing monocultures or compositionally simple mixed forests, reforestation under MCEP should mobilize traditional ecological knowledge in combination with modern forestry insights regarding different forest ecosystems in China to inform its design of species mix and restoration protocols (e.g., Stone 2009; Meng *et al.* 2011; Elliott *et al.* 2013; Lu *et al.* 2016). Following these protocols, MCEP should accordingly diversify and expand the supply of native seedlings, particularly those of endemic or endangered species (Wade *et al.* 2017), from partner nurseries, instead of continuing to focus on a tiny number of commercial (often nonnative) tree species.

Finally, in the context of recovering native forests on CFL, MCEP needs to overcome a further operational challenge not discussed above: its implementation must be based on a realistic, evidence-based assessment scheme that evaluates each forest's full range of ecological services and benefits, that monitors their continued delivery, including biodiversity conservation, and that evaluates the economics associated with these services and benefits. Such a scheme will again entail technical expertise, guidance, and support, and is almost certain to be more demanding than current programs. However, published guidelines (e.g., Seppelt *et al.* 2012) and experience from similar schemes in other countries (e.g., DEFRA 2013) can provide useful guidance for MCEP as it tackles this challenge.

Concluding Remarks

China has much to gain from recovering native forests. Aside from the fact that native forests provide critical ecological functions (Liao *et al.* 2010), their recovery on China's vast CFL has the potential to connect isolated protected areas, to provide "stepping stones" of habitat for species moving in response to climate change, to allow for the recovery of old-growth forests (which are imperiled across China and have been virtually wiped out on CFL), and ultimately, to help restore degraded ecosystems on a landscape scale (Xu & Melick 2007), a prospect that lies at the center of China's ecological vision (State Council 2016-2017).

To reap these potential benefits requires a policy instrument that duly recognizes and rewards the ecological functions of CFL and the ecological benefits of native forests relative to compositionally simple forests, particularly with regard to biodiversity conservation. China's nascent MCEP provides a promising vessel in which to construct such a policy instrument, particularly considering that its details are now being developed and thus amenable to incorporating input. Nonetheless, the design and implementation of MCEP to achieve the recovery of native forests on CFL based on socially equitable, effective, and efficient compensation entails nontrivial challenges. Recent decisions made at the highest levels of government signify a major shift in China's attitude toward native forest protection (SFA-6 & -7 2015; State Council 2016-2017); it is high time for native forest restoration to also receive due policy attention. As China continues to experience rural depopulation, freeing up land for forest conservation and reforestation, a historic opportunity has emerged to recover native forests on CFL. China must not let this opportunity slip away.

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