

## Paradoxes and Challenges for China's Forests in the Reform Era

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**Abstract:** China's relatively recent dramatic increase in forest area has been hailed domestically and globally as one of the world's few environmental success stories, but significant problems remain in China's reforestation efforts. We describe the challenges that China still faces if it is to meet its laudable – but sometimes contradictory – goals for its forest sector: improving rural livelihoods, sustaining and restoring ecosystem services, and increasing output of the forest-product-dependent manufacturing and construction sectors. We do so while pointing out the unintended consequences of implementing these policy goals: overstatement of the quantity and quality of the forest recovery, domestic human and ecological costs of the reforestation, and externalization of China's continually growing demand for timber and forest products in the form of increased imports from vulnerable forests in other parts of the world.

### *Introduction*

In 2011, the State Forestry Administration (SFA) reported that at the end of 2009, 20.36 percent of China's land area was forested, up from an estimated 5-8 percent in 1950, and that another 4 percent would be forested by 2020.<sup>1</sup> This increase in forest area has been hailed domestically and globally as one of the world's few environmental success stories,<sup>2</sup> in contrast to both

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<sup>1</sup> State Forestry Administration 2011.

<sup>2</sup> Liu et al. 2008.

deforestation in other countries and China's own dismal record on many other environmental issues. There is no doubt that more of China is now forested than in 1950 or 1990, and that the massive process of deforestation that characterized much of recent Chinese history from the Qing through the Cultural Revolution has now been halted or reversed. But significant problems remain. While not wishing to deny the indubitable progress of China's reforestation efforts, in this article we describe the challenges that China still faces if it is to meet its laudable – but sometimes contradictory – goals for its forest sector: improving rural livelihoods, sustaining and restoring ecosystem services, and increasing output of the forest-product-dependent manufacturing and construction sectors. We do so while pointing out the unintended consequences of implementing these policy goals: overstatement of the quantity and quality of the forest recovery, domestic human and ecological costs of the reforestation, and externalization of China's continually growing demand for timber and forest products in the form of increased imports from vulnerable forests in Russia, Southeast Asia, and Africa.

### ***Roots of the crisis: forestry in the Maoist period***

When the PRC was founded, China had already experienced centuries of deforestation, which accelerated in the Qing and Republic; one estimate places forest cover at 26% in 1700 and only 9% in 1937.<sup>3</sup> But policies in the Maoist period did little to address this lack of forests. Forestry between 1949 and 1978 was marked by rapid resource exploitation and depletion, with little concern for regeneration or active management. Between 1953 and 1958, all forestland was removed from private ownership and placed into either state-owned or collective forests.<sup>4</sup> Most wood production for construction, mining, and transport came from state-managed forest farms,

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<sup>3</sup> Ling 1983.

<sup>4</sup> Richardson 1966. Beginning in 1960, collective forest management, like that of agricultural lands, was devolved from the commune and brigade to the production team. Office of Rural Forest Reform, State Forestry Administration 2010.

while collective forests supplied fuelwood and construction needs for local communities.<sup>5</sup>

Investment in regeneration was low.

Still, during the 1950s, the government recognized that China's forests were historically depleted and inadequate, and called for the afforestation of nearly 100 million hectares (mmha) (approximately ten percent of China's total land area), focusing on creating protected areas and planting fast-growing species of high economic value.<sup>6</sup> However, these early efforts at afforestation are now generally regarded as having been ineffectual, with high rates of mortality, due to a lack of technical expertise, poor selection of sites and species, and an inadequate definition of responsibility that led to neglect in the maintenance and protection of young forests.<sup>7</sup>

If the afforestation programs of the initial years of the PRC were ineffective, the policies of the Great Leap Forward period were disastrous for forests. It is estimated that between 20 and 30 mmha were deforested between 1958 and 1962, constituting the loss of about a quarter of China's forested areas.<sup>8</sup> Modest recovery after 1962 still left China's forested area at a historic minimum (see Table 1).

Table 1. Forested area and standing biomass in China, 1949-2008.<sup>9</sup>

| Year | Forested Area [mmha]; (percent of total area) | Change from - previous period (%) | Standing biomass (billion m <sup>3</sup> ) | Change from previous period (%) |
|------|---|-----------------------------------|--|---------------------------------|
| 1949 | 109.01 (11.4%)                                |                                   | --   |                                 |
| 1962 | 80-113 (8.1-                                  | -26.6% to                         |  |                                 |

<sup>5</sup> Ross 1980.

<sup>6</sup> Food and Agricultural Organization 1982.

<sup>7</sup> Food and Agricultural Organization 1982.

<sup>8</sup> He et al. 2008.

<sup>9</sup> Data before the 1970s are unreliable and controversial. See He et al. 2008; Démurger and Yang 2007; Dikötter 2010; Dai et al. 2011; He et al. 2011. The large increase in forest coverage between the fourth and fifth inventories (1989-93 to 1994-97) partly reflects a change in the definition of forested area from minimum 30% to 20% canopy cover.

|           |                 |        |       |        |
|-----------|-----------------|--------|-------|--------|
|           | 11.6%)          | +3.9%  |       |        |
| 1973-76   | 121.86 (12.7%)  |        | 8.66  |        |
| 1977-81   | 115.28 (12.0%)  | -5.3%  | 9.03  | +4.2%  |
| 1984-88   | 124.65 (12.98%) | +8.1%  | 9.14  | +1.2%  |
| 1989-93   | 133.70 (13.92%) | +7.2%  | 10.14 | +10.9% |
| 1994-98   | 158.94 (16.55%) | +18.8% | 11.27 | +11.1% |
| 1999-2003 | 174.91 (18.21%) | +10.0% | 12.46 | +10.5% |
| 2004-2008 | 195.45 (20.36%) | +11.7% | 13.72 | +10.1% |

*Undoing (some of) the damage: a brief history of forest policy and practice during the early reform era*

China began the Reform Era with a severely deforested landscape (12-13 percent coverage, much of which was low quality), a confused system of tenure rights and obligations, and the ambition to grow all sectors of its economy. From 1978 to 1998, although some attention was given to afforestation, environmental policies changed little from those of the Maoist era. While environmental problems were recognized and environmental protection was made a goal of state policy, China's leaders repeatedly stressed that environmental policy should not impede economic expansion.<sup>10</sup> For the forest sector, this meant continued emphasis on maximum short-term productivity.<sup>11</sup>

*The Collective Sector.* Forest tenure reforms have not been as consistently successful as those in the agricultural sector, and have thus followed even more of a "trial and error"<sup>12</sup> process.<sup>13</sup> The first collective forest reform was the Resolution on Issues Concerning Forest Protection and Development, also known as the "Three Fixes Reforms (*sanding gaige* 三定改

<sup>10</sup> Jahiel 1998; Ross 1998.

<sup>11</sup> Economy 2004.

<sup>12</sup> Qian and Xu 1993.

<sup>13</sup> Yin et al. 2003.

革),” issued in 1981.<sup>14</sup> This reform led to three new forms of management: family plots (*ziliushan* 自留山), often deforested areas turned over to households for replanting; responsibility hills (*zerenshan* 责任山), where families shared management responsibilities and split the income from timber sales between the collective and individual households; and collectively managed forests (*tongguanshan* 同管山), where all management decisions remained in the hands of the production team. While management and resource ownership shifted, land ownership itself was retained by the collective.

Although one important goal of the early reforms was to improve tenure security for rural households and collectives,<sup>15</sup> results were mixed.<sup>16</sup> A combination of competing interests for land usage and previous reversals in tenure policies during the Mao period had already led to a lack of confidence in resource ownership rights,<sup>17</sup> possibly leading some farmers to harvest trees rapidly.<sup>18</sup> This initial period of reform witnessed widespread illegal cutting,<sup>19</sup> and a ten percent reduction in forest coverage in southern collective forests.<sup>20</sup> The high rates of harvest during this time also led to changes in stocking, species composition, and fragmentation of forests.<sup>21</sup> In response, the government quickly reversed course, suspending household tenure reforms in 1985.<sup>22</sup>

*The State Sector.* Reforms in the state-owned forest bureaus began simultaneously with those in other state-owned enterprises, although it was not until 1989 that this sector was

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<sup>14</sup> State Council 1981.

<sup>15</sup> State Council 1981.

<sup>16</sup> Démurger et al. 2009.

<sup>17</sup> Liu 2001.

<sup>18</sup> Harkness 1998.

<sup>19</sup> Song et al. 1997.

<sup>20</sup> Liu 2001.

<sup>21</sup> Liu and Edmunds 2003.

<sup>22</sup> Xu 2008; Song et al. 1997.

formally decentralized into separate, albeit still connected, units.<sup>23</sup> Silvicultural management was further decentralized by splitting up some of the large forest farms and contracting out to collectives, which sometimes further contracted out to households or groups of households.<sup>24</sup>

Initial reforms in the state sector led to accelerated cutting of many forests, particularly in the Southwest,<sup>25</sup> during the 1980s and early-1990s. Local governments in poor and remote areas experiencing a local version of the “resource curse”<sup>26</sup> were faced with increased needs for revenue to fund development, while simultaneously losing central and provincial subsidies. As a result, they depleted their resources by selectively harvesting large-diameter trees and experienced a consequent loss of forested area,<sup>27</sup> a trend that continued until the southwestern logging ban of 1998.

*Forest Protection and Reforestation.* Although the primary emphasis in the early reform period was on economic growth, the government also introduced new programs aimed at the protection and restoration of forests and biodiversity. In 1978, the Three North Forest Protection Project was launched, attempting to use afforestation to combat desertification in the north and northwest. The 1995 Forestry Action Plan for China’s Agenda 21 emphasized three objectives: a) ensuring sustainable forestry and increasing overall forest coverage and volume; b) modernizing forestry as an industry and raising productivity and efficiency; and c) revamping the management system and improving education and public awareness. The development of the entire forest sector since then has largely conformed to these guidelines.

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<sup>23</sup> Zhang 2000.

<sup>24</sup> Zhang 2000.

<sup>25</sup> Sichuan forest coverage has been reported to have dropped from 28% “in the 1970s” to 14% “in the 1980s,” see Economy 2004; and forest coverage in the “Upper Reaches of the Yangtze” was reported to have dropped from 30-40% in the 1950s to 10% in 1998, see Stockholm Environmental Institute 2002. These figures may be exaggerated, but there is no doubt that there was extensive cutting in the Southwest in the 1980s and 1990s.

<sup>26</sup> Sachs and Warner 2001.

<sup>27</sup> Albers et al. 1998.

*Results.* The first National Forest Inventory (NFI) in 1973-1976 estimated that forest cover stood at 121.9 mmha, or nearly 13 percent of total land area.<sup>28</sup> Stepped-up cutting led to a decrease of about 6 mmha by the second NFI of 1977-81, particularly in the southwest, but overall forest coverage subsequently increased steadily through the fifth NFI in the mid-90s (see Table 1, above), mainly attributable to large-scale reforestation efforts and the creation of forest plantations.<sup>29</sup>

### ***The State of the Forests, 1998-2011***

*The shock of 1998 and the turn toward reforestation.* In the summer of 1998, devastating floods struck Hubei, Hunan, and Jiangxi.<sup>30</sup> The floods were quickly blamed on the extensive deforestation of the *upper* Yangtze watershed from the 1950s to the 1990s. As a result three crucial policies were implemented, including an almost-total ban on commercial logging in the Southwest and two national-scale programs: the Natural Forest Protection Program (*tianranlin baohu gongcheng* 天然林保护工程) and the Returning Farmland to Forest Program (*tuigeng huanlin gongcheng* 退耕还林工程).<sup>31</sup>

These forest-focused programs are part of a more general trend toward concern for environmental protection and restoration adopted since 1998, including a spate of environmental-protection laws,<sup>32</sup> elevating the State Environmental Protection Agency to the status of a

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<sup>28</sup> Démurger et al. 2009.

<sup>29</sup> Stone 2009; Albers et al. 1998.

<sup>30</sup> See Schmidt et al. 2011. for recent research casting doubt on upstream deforestation as the cause of the 1998 mid-Yangtze floods.

<sup>31</sup> CCP Central Committee and State Council 1998. The *tuigeng huanlin* program has a variety of English nicknames, including Grain-for-Green and the Sloping Land Conversion Program. We choose to use the literal translation here, since it better portrays the intent and nature of the program.

<sup>32</sup> Ferris and Zhang 2005.

Ministry in 2008, promotion of “sustainable development” as a national slogan,<sup>33</sup> and recent investment in alternative energy.<sup>34</sup> These all reflect the trend on the part of the state to try to balance the goals of economic growth and environmental protection. However, China’s environmental record has been decidedly mixed. The forest sector, though doing somewhat better than, for example, water resources or air quality, has also had a mixed record, demonstrating the diverse and perhaps contradictory goals now adopted for forestry: improving rural livelihoods, protecting and enhancing ecosystem services, and growing the forest-sector economy.

These diverse goals may conflict at some levels, but they all depend on the quantitative and qualitative recovery of forests. Realizing this, the government in 1998 made a radical change in its investment strategies in the forestry sector. As figure 1 shows, the investment strategy of the 1950s through the 1970s reflected the general goals of economic development and national construction, in which forest resources were used for short-term gains without much thought to long-term sustainability; investment favored industry over silviculture<sup>35</sup>

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<sup>33</sup> Cann et al. 2005, 3-34; Li 2005; Tilt 2010.

<sup>34</sup> Chinafaqs.org. 2011.

<sup>35</sup> Silvicultural practices vary globally, but here we mean a potential combination of planting, thinning *and* harvesting activities. Silviculture can be distinguished from purely afforestation programs, which may include no planned thinning or harvesting activities.



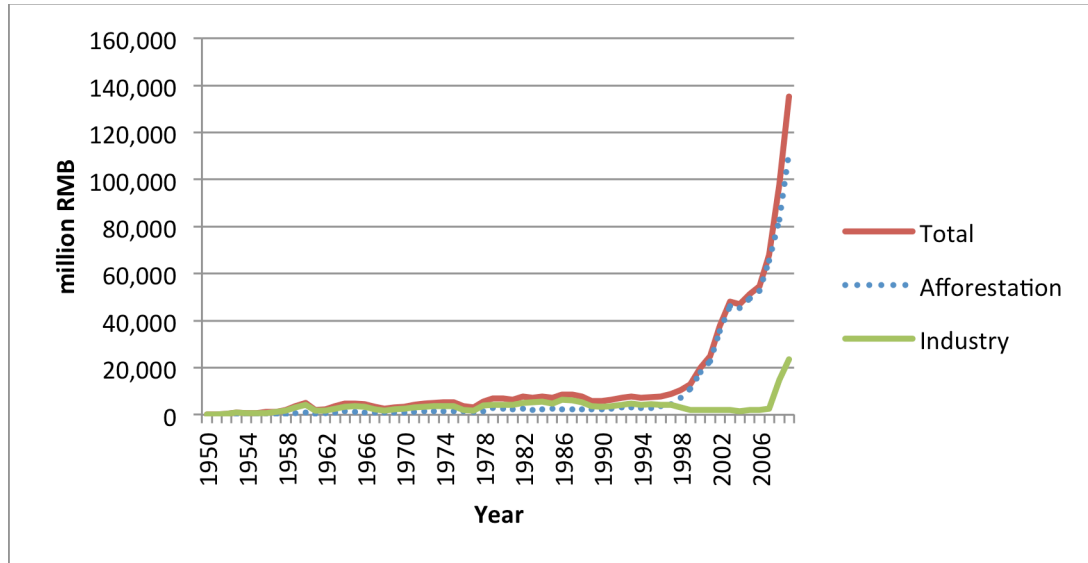


Figure 1. Total real investment in China's forest sector, in million RMB, 1950-2009

Source: State Forestry Administration, *Zhongguo linye tongji nianjian (China forestry statistical yearbook)*. (Beijing: China Forestry Publishing House, 2010).

and afforestation by a ratio of 2:1. After the 1998 shock, expenditures shifted dramatically to afforestation and silviculture, and expenditures in this sector came to dominate industry by 9:1. Only since 2008, perhaps with the confidence that silviculture and afforestation have been put on a stable basis, has industry again risen from 3 percent of total investment in the forest sector in 2006 to 17 percent in 2009.

*China's Forest Stocks, 1998-2011*. The Seventh NFI (2004-2008) reported a 12 percent overall increase in forest coverage over the previous inventory (Table 2).<sup>36</sup> Total forestland increased by 20 mmha to 195 mmha, and further growth has increased forest cover to an estimated 21 percent

<sup>36</sup> State Forestry Administration 2010.

of total land area in 2010. The government's goal is to increase national forest cover to 26 percent by 2025.<sup>37</sup>

Table 2. Forest area by region (mmha), and as percentage of total land

|           | Forest area (mmha) |           |            | As % of total land |           |           |
|-----------|--------------------|-----------|------------|--------------------|-----------|-----------|
|           | 1999-2003          | 2004-2008 | % increase | Total area         | 1999-2003 | 2004-2008 |
| North     | 26.35              | 30.67     | 16%        | 151.86             | 17%       | 20%       |
| Northeast | 32.51              | 36.15     | 11%        | 79.18              | 41%       | 46%       |
| Northwest | 18.12              | 22.79     | 26%        | 304.42             | 6%        | 7%        |
| Eastern   | 28.66              | 30.53     | 7%         | 80.86              | 35%       | 38%       |
| Central   | 36.03              | 41.66     | 16%        | 101.60             | 35%       | 41%       |
| Southwest | 50.18              | 57.84     | 15%        | 232.77             | 22%       | 25%       |
| National  | 174.91             | 195.45    | 12%        | 950.69             | 18%       | 21%       |

Source: State Forestry Administration, *Zhongguo linye tongji nianjian (China forestry statistical yearbook)*. (Beijing: China Forestry Publishing House, 2005 - 2010).

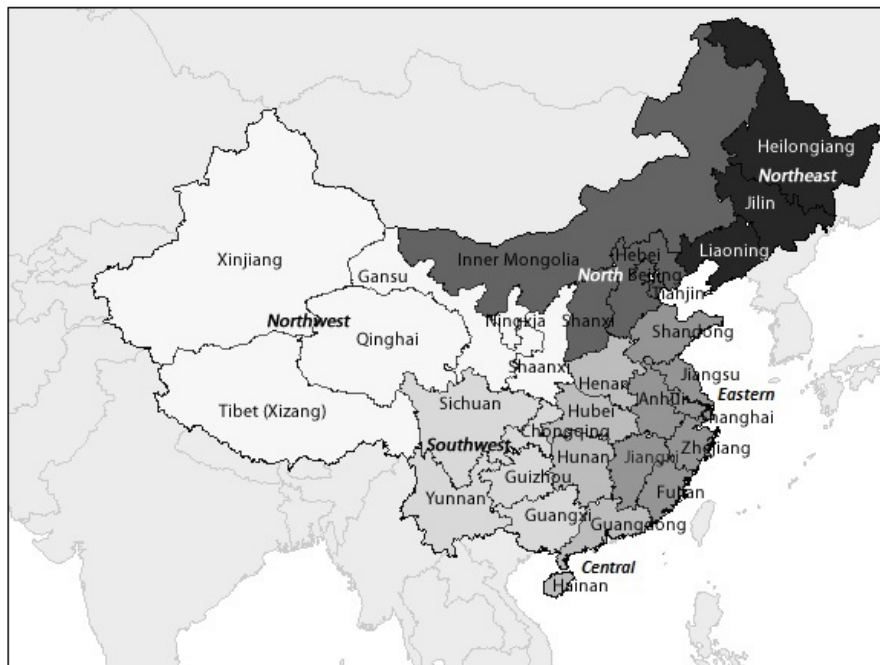


Figure 2. Geographic Regions for Forest Statistics

<sup>37</sup> Wang et al. 2008.

Inner Mongolia, Yunnan, Heilongjiang, and Sichuan have the largest areas of forest. Much of the total increase in inventory occurred in Guangxi, Yunnan, Inner Mongolia, Sichuan and Gansu. The northwest region, which has the lowest overall coverage, experienced the greatest percentage increase, rising by 26 percent. The central and southwest regions continue to account for half the country's forest coverage, with the northeast and the north regions accounting for another 34 percent.<sup>38</sup>

### *Ecosystems recovery and the challenges of forest quality*

Afforestation schemes have contributed significantly to the reported increase in forest cover since the 1980s, recovering an average of approximately 5 mmha per year. Particularly since 1998, government subsidies and loans from multilateral institutions have facilitated the establishment of large-scale, fast-growing plantations through two kinds of programs: regional shelterbelts and nationwide recovery schemes. Although both have been reported as wildly successful in overall quantitative terms, the quality of the forests and the ecosystem services they provide is often questionable. There are very few close-to-mature forests remaining, and young- and middle-aged forests have lower density and productivity than older forests.<sup>39</sup> This is, of course, an inevitable result of previous deforestation; one cannot plant mature forests, and newly-planted forests will have less biomass than those they replaced.

*Shelter Forests.* Probably the best known shelterbelt is the Three North Protective Forest project (*sanbei baohulin gongcheng* 三北保护林工程), colloquially called the Great Green Wall (*liuse wanli changcheng* 绿色万里长城), which was initiated in 1978 and is planned to be

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<sup>38</sup> Forestland is now defined as land with at least 20% canopy cover. Fruit trees and cash orchards began to be included in the mid-1980s, followed by a reduction in canopy cover requirements, and later by the inclusion of shrubs.

<sup>39</sup> Yin 1998.

completed by 2050. Intended to combat desertification and soil loss, as well as reduce the impact of dust storms that plague north China, it covers parts of 13 provincial level units and 551 county-level units in the northeast, north, and northwest, and is scheduled to reforest over 30 mmha, or about three percent of China's total land area.<sup>40</sup> In addition, the Taihang Mountain Afforestation Project (*taihangshan fulin gongcheng* 太行山复林工程) has also covered more than 20 mmha in a specific effort to reduce sandstorms. However, desertification has continued to advance in the northern regions despite the afforestation programs, leading to questions about the structure, quality and diversity of the trees planted in such programs. Survival rates of GGW plantations have been estimated to be as low as 15 percent. Some scholars have raised the possibility that poorly planned afforestation efforts, including planting any trees at all in areas that have long been grasslands or shrublands, have led to negative balances in soil moisture, thus potentially exacerbating the very desertification problems that such policies were intended to combat.<sup>41</sup> The very partial success of these programs seems to reflect a general tendency in China to solve ecological problems through large-scale, uniform megaprojects often poorly adapted to local conditions.

*National-Scale Reforestation Programs: The NFPP and RFFP.* The Natural Forest Protection Program (NFPP), introduced in 1998 and implemented starting in 2000,<sup>42</sup> called for reducing annual timber harvests in natural forests from 32 mmm<sup>3</sup> to 12 mmm<sup>3</sup>, conservation of nearly 90 mmha of forest, and afforestation and revegetation of 31 mmha.<sup>43</sup> Specific measures included logging bans in the upper reaches of the Yangtze and Yellow Rivers, reducing logging in state-owned forests, engaging in reforestation and improved silvicultural treatments, and subsequently

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<sup>40</sup> Cao 2008.

<sup>41</sup> Cao 2008; Rozelle et al. 2003; Luoma 2012; Cao et al. 2011; Wang et al. 2010.

<sup>42</sup> State Forestry Administration N.D.

<sup>43</sup> Cao et al. 2010.

providing alternative employment opportunities for state forest workers.<sup>44</sup> The NFPP covers 18 provinces and autonomous regions, focusing mainly on the upper Yangtze and Yellow River watersheds, as well as state-owned forests in the northeast and Hainan.

The Returning Farmland to Forest Policy (RFFP) was piloted in Sichuan, Shaanxi, and Gansu beginning in 1999, and implemented more widely the following year as part of the Develop the West Campaign. The RFFP was designed to reduce runoff and soil erosion and increase forest coverage by converting former crop growing areas on sloping lands into forest lands.<sup>45</sup> The RFFP has been held up as the world's largest program of payment for ecosystem services, and claims poverty alleviation as a key component.<sup>46</sup> This program provides farmers with saplings to plant, along with grain and cash subsidies to replace income from foregone agricultural activities. A secondary goal is to shift farmers into less-intensive agricultural activities (such as livestock breeding) and off-farm employment.<sup>47</sup> As of 2010, the RFFP had enrolled more than 21 mmha.<sup>48</sup> By the end of the program, it will have affected the landholdings of an estimated 40-60 million households across 25 provinces.<sup>49</sup>

Both programs have ostensibly met their ecological targets for harvest reductions and resource protection.<sup>50</sup> It is unclear what the effect on the long-term timber supply will be: although up to 75 percent of the land is slated to be planted as production forests,<sup>51</sup> the survival of the trees and shrubs planted has been called into question.<sup>52</sup> According to one estimate, only 22.9 percent of the 268 mmha of forests planted under the NFPP and RFFP have been retained;

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<sup>44</sup> Miao and West 2004.

<sup>45</sup> State Council. 2002; Xu et al. 2010; Bennett 2008.

<sup>46</sup> Li et al. 2011.

<sup>47</sup> Xu et al. 2004.

<sup>48</sup> State Forestry Administration 2010.

<sup>49</sup> Xu et al. 2010.

<sup>50</sup> Xu et al. 2006.

<sup>51</sup> Bennett 2008.

<sup>52</sup> Trac et al. 2007. Weyerhaeuser et al. 2005.

in terms of environmental protection objectives, this implies a waste of approximately 75 percent of the 244B RMB spent on major reforestation projects between 1998 and 2005. Afforested areas are often overestimated because the SFA is in charge of both reforestation *and* assessment of success.<sup>53</sup> Not surprisingly, access to better technical support has been suggested as a means of increasing survival rates and reducing program costs.<sup>54</sup>

*Challenges.* China has doubtless made serious efforts to reverse the centuries-long trend of deforestation and to mitigate the ecological effects of more recent development policies. In many ways, China has turned the corner; more of the country is forested than at any time since the early Qing. But the general tendency to implement reforestation and forest protection in a top-down manner, often without due consideration of the suitability of particular programs and particular species in specific places, has meant that much of the noble effort at reforestation has been unsuccessful, and much of the funding for such programs has been wasted. Even in areas where programs have shown success, forests will not grow back immediately; the ultimate success of the reforestation effort will demand both improved methods and patience. In the meantime, as we show below, China will need to depend on foreign imports to feed much of its forest-products industry, putting stress on forests in countries that may not yet have the capacity to manage their forests with even the care and expertise shown in China.

### ***Rural livelihoods and the challenges of poverty and environmental justice***

*Tenure Reforms.* Particularly since 2003, there has been a concerted effort aimed at individualizing collective forests and securing tenure rights. Further reforms were introduced in 2008 with the Comprehensive Collective Forests Reform (*jiti linqun zhidu gaige* 集体林权制度

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<sup>53</sup> Meng 2001.

<sup>54</sup> Bennett et al. 2011. For a comparative assessment of the RFFP in three sites in Sichuan, see Trac et al. 2007.

改革).<sup>55</sup> Although confirming collective ownership, this policy established individual rural households as the dominant holders of effective rights, allowing them to lease or transfer their plots to other farmers or to corporate contractors. It established the contract period as 70 years, with the right to extend.<sup>56</sup> It also called for the clear demarcation between public benefit forests (*gongyi lin* 公益林),<sup>57</sup> to be managed for the ecosystem services they perform, and commodity forests (*shangpin lin* 商品林), to be leased to private contractors and managed for revenue generation.

Few studies have yet examined the impacts of either the 2003 or 2008 reforms. The primary intent of the 2003 reforms was to increase timber harvests in provinces where de-collectivization is occurring, increase the share of forestry in household income, and increase afforestation efforts by farmers.<sup>58</sup> Currently, particularly in the southern region, collective forests are largely made up of plantations and production forests, as well as fruit and cash crop orchards.<sup>59</sup> Effective implementation of reforms will help enhance the productive use of these lands, particularly in the context of improving rural livelihoods. The SFA implemented the 2008 reforms after pilot projects in Jiangxi and Fujian, which quickly increased farmers' incomes. In general, these programs were most successful in areas near forest product industries that would buy their products.<sup>60</sup>

For most rural residents across the country, forestry does not contribute substantively to farm income. In forest-dependent communities, the story differs. National statistics do not

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<sup>55</sup> CCP Central Committee and State Council 2008.

<sup>56</sup> There are unconfirmed reports that some contracts have been signed with a period of less than 70 years.

<sup>57</sup> Also translated as "Ecological Reserve Forests."

<sup>58</sup> Xu 2008.

<sup>59</sup> Wang et al. 2004.

<sup>60</sup> Harrell interview, State Forestry Administration, Bureau of Village Forestry Reform and Development (Guojia linyeju nongcun linye gaige fazhansi), November 6, 2009.

provide data on these farmers' incomes, but a survey of forest farmers in Fujian showed that forestry contributed as much as 16 percent to their overall income; in Jiangxi, it contributed almost 13 percent.<sup>61</sup> Some studies report that up to as much as 70-80 percent of income in forest-dependent communities can come from forest-related activities.<sup>62</sup> Yet rural residents in forest-dependent communities continue to be among the country's poorest.<sup>63</sup> Their poverty often stems from their geographical remoteness, which affects opportunities for economic development. Liu and Yin found that increased productivity in rural households and the contribution of forestry to livelihood improvements were offset by increases in production input costs.<sup>64</sup> Consequently, already-impoverished areas have additional disadvantages in economic development.

Viewing rural livelihood improvement solely through the lens of increasing cash incomes ignores the many rural people who rely on a mixture of cash and subsistence farming or agroforestry.<sup>65</sup> In many upland forest-dependent communities, households depend on forest resources for fuelwood, building materials and non-timber forest products (NTFPs). However, peripheral people in China, particularly ethnic minorities, have long been viewed as "uncivilized", and those practicing shifting cultivation in upland areas as the most primitive.<sup>66</sup> After 1949, the resources these peripheral people depended on, and had managed through traditional ecological practices, were placed under state or collective management and treated as free goods to be extracted and exploited as the state saw fit.<sup>67</sup> Resource policies were further intended to both "civilize" peripheral people (which often meant settling them down in fixed villages and encouraging them to follow Han Chinese farming practices), and direct their

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<sup>61</sup> Xu 2008.

<sup>62</sup> Ruiz Pérez et al. 2004.

<sup>63</sup> Miao and West 2004.

<sup>64</sup> Liu and Yin 2004.

<sup>65</sup> Flower 2009.

<sup>66</sup> Sturgeon 2005, 27-29.

<sup>67</sup> Harkness 1998.



production efforts toward state goals.<sup>68</sup> To the present day, many such communities are allowed to manage their collectively held forest resources only under strict guidelines that assign township and county governments micromanagement authority over cutting decisions.<sup>69</sup> Under the 2008 reforms however, such communities have been encouraged to put their collective forest lands out to bid. In our own experience in Liangshan Yi Autonomous Prefecture, Sichuan, this results in a one-time “sale” (as local people term it) to an unknown outside speculator; households receive a lump-sum payment and are unclear about what authority the speculators assume over the forest; in the meantime, households continue to gather firewood and cut timber for construction.<sup>70</sup>

*Effects of Reforestation Programs.* The major conservation programs have been plagued by several problems related to rural livelihoods. First, the central government provided 80 percent of the funding for the NFPP’s implementation, leaving the remainder to come from already hard-pressed local governments. Although the program is not targeted exclusively at collective forests, forest-owning collectives are required to participate, and landowners are not compensated for economic losses stemming from the reduction in available harvest.<sup>71</sup> As employment among forest-dependent communities has shrunk, it is estimated that rural income will have shrunk by 3-7 billion RMB, pushing many back into poverty.<sup>72</sup>

In some regions the programs may be overcompensating landowners for retiring their lands, making the programs cost-inefficient.<sup>73</sup> In others, there have been large shortfalls in payment delivery and/or landowners have suffered losses amounting to half or more of their

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<sup>68</sup> Sturgeon 2008, 52-53.

<sup>69</sup> Urgenson et al. 2010; Trac 2010, 9-13.

<sup>70</sup> Harrell field notes, August 2008, November 2009, August 2010, September 2011.

<sup>71</sup> Miao and West 2004.

<sup>72</sup> Xu et al. 2003, Yu et al. 2003.

<sup>73</sup> Uchida et al. 2005.

income.<sup>74</sup> Many rural people have seen their traditional access rights significantly restricted,<sup>75</sup> not just in terms of their agricultural practices, but also NTFP and firewood collection and livestock grazing. In a few communities, eco-tourism industries have sprung up to replace forestry activities, creating a limited number of new economic opportunities.<sup>76</sup> In general though, these programs are not creating short- or long-term economic opportunities and have a fixed period within which they will continue to provide payments.

*Ongoing challenges.* The relationship between tenure reform, rural incomes, and forest ecological health is not a simple one, and the regime has not always dealt with this complexity in an ideal manner. Most obviously, implementation of reforms has not always provided secure tenure; rights have been granted, revoked, and changed too often, despite the fact that success depends on tenure certainty and limited market distortions. This is perhaps the inevitable result of “crossing the river by feeling the stones,” but it has led in some cases to overexploitation of timber resources in the short run, without replanting, and thus to decline in forest cover and quality.<sup>77</sup> Programs that provide payments for environmental services, such as the RFFP, have been widely celebrated as successful in stabilizing incentives and thus promoting forest conservation and improving rural livelihoods; however, many of these programs are subsidized by the central government, and will not continue indefinitely. Both the NFPP and the RFFP also suffer from a top-down approach that leaves little apparent room for flexibility in local choices.<sup>78</sup> State directives control even the species permitted to be planted and areas required to enroll, regardless of the ecological suitability.<sup>79</sup> The top-down approach to the NFPP has left many

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<sup>74</sup> Bennett 2008.

<sup>75</sup> Xu and Melick 2007.

<sup>76</sup> Xu et al. 2006.

<sup>77</sup> Yin and Newman 1997.

<sup>78</sup> Xu et al. 2006; Bennett 2008; Trac et al. 2007; Urgenson et al. 2010.

<sup>79</sup> Uchida et al. 2005; Uchida et al. 2007.

landowners feeling a lack of decision-making autonomy, and the durability of the program's conservation effects is questionable: landowners may be inclined to start farming their lands again after the subsidies end. There is evidence that agroforestry practices, and intercropping in particular, may contribute significantly to overall agricultural productivity while simultaneously providing environmental services.<sup>80</sup> Ensuring that landowners have the right to individually determine and engage in mixed practices might enable win-win situations where livelihoods and the environment are improved.<sup>81</sup>

There is also an assumption that privatization is universally superior to communal management in promoting long-term care of forests, because it will “liberate the productive forces of the farm household.”<sup>82</sup> The 2008 forest tenure reforms were implemented on the basis of this assumption, and indeed there is evidence that privatization, when carried out in such a way that it provides stable tenure, provides incentives for sustainable management. At the same time, examples of privatization of grassland and forest resources in other parts of China have shown that privatizing certain areas and letting others remain under collective management can promote severely unequal access to resources and consequent overuse of the collective areas.<sup>83</sup> As long as there are communities that depend on forest resources for subsistence, policies will need to take account of equity of access and methods of managing common-pool resources, rather than simply embracing private rights as a panacea.<sup>84</sup>

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<sup>80</sup> Yin and Hyde 2000

<sup>81</sup> Hyde et al. 1996.

<sup>82</sup> CCP Central Committee 2008, section 1, paragraph 1.

<sup>83</sup> Williams 1996; Harris 2009.

<sup>84</sup> The experience of pulp and paper manufacturer Stora Enso, which was reportedly sold use rights transferred by Hepu County officials and intermediaries in Guangxi Province without obtaining the required consent of households (Li and Nielsen 2010), further demonstrates how households continue to be deprived of their property rights even after privatization rights were affirmed through the 2008 law.

Without improved access to economic opportunities and tenure security, conservation policies could impede, not improve, rural livelihoods in forest-dependent communities. In addition, it is quite possible that without the right property institutions, even the ecological goals of these programs will be impossible to achieve. Authorities may soon find themselves at a crossroads, having to decide between the goals of ecological sustainability and increased cash income for rural households.

***Development of the forest products sector and the challenges of sustainable production***

*Expansion of production.* In addition to ecosystem services and rural livelihoods, China's forests are also managed as a source of income and raw materials for construction and manufacturing industries. Domestic production of logs is controlled by quotas set by the central government, intended to limit harvest to volumes at or below annual incremental growth, and logs are consumed or processed domestically. While the government has a stated goal of increasing domestic production, and has in fact increased the timber quota over the last two five-year planning cycles, actual annual growth in log production in recent years has been inconsistent. From 2000 to 2009, total harvest of logs increased from 44 mmm<sup>3</sup> to 71 mmm<sup>3</sup> (figure 3).

However, these official statistics ignore above-quota production, which may be close to

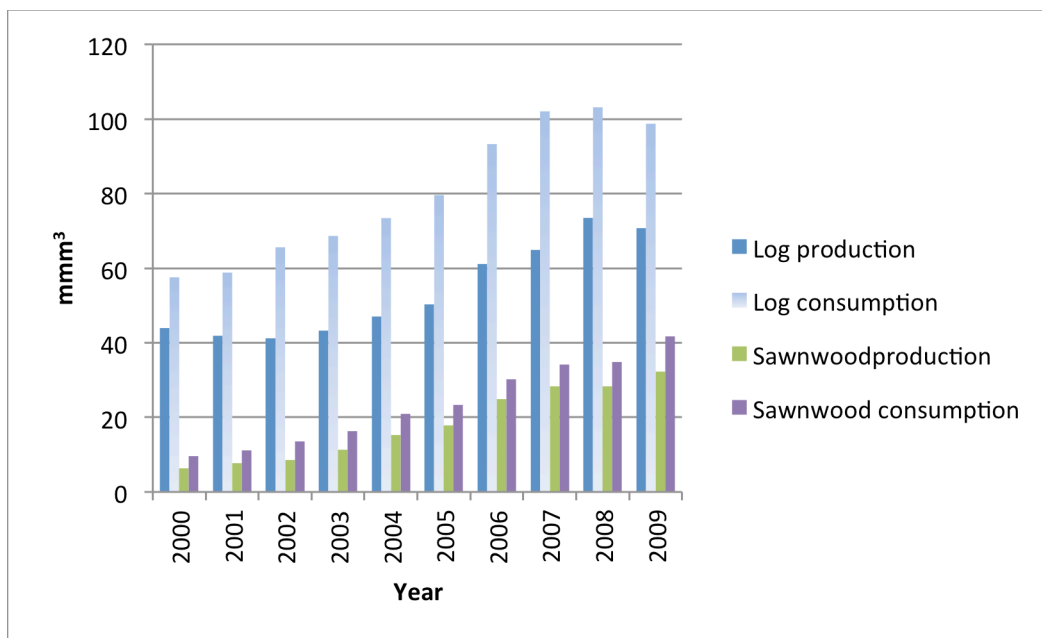


Figure 3. Officially reported log and sawnwood production and consumption 2000-2009

Source: State Forestry Administration, *Zhongguo linye tongji nianji (China forestry statistical yearbook)*. (Beijing: China Forestry Publishing House, 2001-2010).

double the reported production volume: the SFA estimated that above-quota log production had averaged 75.5 mmm<sup>3</sup> per year from 1998-2003.<sup>85</sup> Given the more than 19 percent annual growth rate in sawnwood and panel production in China in the last decade, it seems improbable that total log consumption did not also grow apace. Our own assessment, based on China's officially reported wood product production, is that log consumption is, at minimum, 30% higher than officially reported.<sup>86</sup>

Semi-finished and finished goods are much less likely to be underreported than are timber resources. While China's log production has recently grown somewhat, its production of semi-finished (e.g., sawnwood, panels, etc.) and finished (e.g. furniture) wood products has grown rapidly during the same period. This growth has been fueled primarily by demand from

<sup>85</sup> Démurger et al. 2009.

<sup>86</sup> Robbins 2011, pp. 116-130.

wood product markets (including those abroad) and the domestic construction sector. The raw materials needed to feed this growing demand have increasingly been supplied by imports from other countries.

*Ongoing challenges.* It is widely recognized that the domestic resource base is extremely constrained and will be for the foreseeable future. Natural forests, although recovering, were previously drawn down, and the 12th Five-Year Plan calls for reduced harvests from these forests. Plantations will increasingly provide the harvestable resources needed to meet harvest quotas. The annual allowable cut, quotas, permits, high taxes, and other restrictions have been used to constrain supply. However, demand has grown dramatically in recent years, and while it is currently closely linked to the export industry, it is likely to become increasingly linked to domestic demand, particularly as China's middle class expands and housing resources become more available. Grossly underestimating the volume of wood needed to maintain – let alone increase – production will create incentives for continued misreporting of resource use and will inhibit the ability to improve product quality. An increasing reliance on imports to fuel its export-oriented wood products industry (discussed below) has meant that many of these timber products come from countries with lower costs and poorly enforced environmental standards.

### ***International repercussions and the challenges of (literally) externalizing costs***

Although domestic production of logs has increased modestly, China is increasingly reliant on roundwood imports to fuel the growth of semi-finished and finished wood products. According to official Chinese statistics, total consumption of logs, by volume, grew at an average annual rate of 7.6% between 2000 and 2008, before declining by 4.2% in 2009. Between 2005 and 2009, the average annual reported contribution of imports to this consumption was 33 percent.

The consumption of these materials fuels the production of both China's manufactured exports and goods consumed domestically. The growth in consumption has led China to become the world's largest importer of tropical logs, and to account for nearly a third of global imports of coniferous and about a tenth of non-coniferous, non-tropical logs (table 4).

Table 4. China's global imports of logs as a percentage of world log imports, 2003-2009

|             | 2003  | 2004  | 2005  | 2006  | 2007  | 2008  | 2009  |
|-------------|-------|-------|-------|-------|-------|-------|-------|
| C Quantity  | 20.3% | 20.9% | 22.3% | 23.9% | 27.4% | 26.8% | 31.5% |
| NC Quantity | 10.2% | 9.4%  | 14.5% | 14.1% | 17.5% | 13.7% | 8.7%  |
| T Quantity  | 56.9% | 57.3% | 54.6% | 55.7% | 57.3% | 55.8% | 77.9% |
| C Value     | 18.8% | 19.3% | 21.7% | 24.1% | 27.5% | 37.8% | 37.7% |
| NC Value    | 16.3% | 11.0% | 22.1% | 25.2% | 28.4% | 27.1% | 13.5% |
| T Value     | 53.1% | 53.8% | 47.2% | 49.8% | 51.3% | 80.0% | 88.0% |

C = Coniferous; NC = Non-coniferous, non-tropical; T = Tropical

Source: Food and Agricultural Organization (FAO). 2011. FAOSTAT.

The increased extraction of primary materials from developing and transitioning economies has led to concerns about the long-term sustainability of resources in those countries and over the equity in the gains from trade.<sup>87</sup> Many of China's primary non-coniferous (hardwood) and coniferous (softwood) source countries have been labeled as exporting suspicious logs. These countries include Russia, Malaysia, Papua New Guinea, Gabon, and the Solomon Islands.<sup>88</sup> The largest single source for both coniferous and non-coniferous logs is Russia (figure 4). In 2008, Russia supplied 75 percent of coniferous logs and 44 percent of non-

<sup>87</sup> Zhu et al. 2004

<sup>88</sup> Lawson and MacFaul 2010.

coniferous logs imported by China. Other primary sources of coniferous logs include New Zealand, the US and Canada.

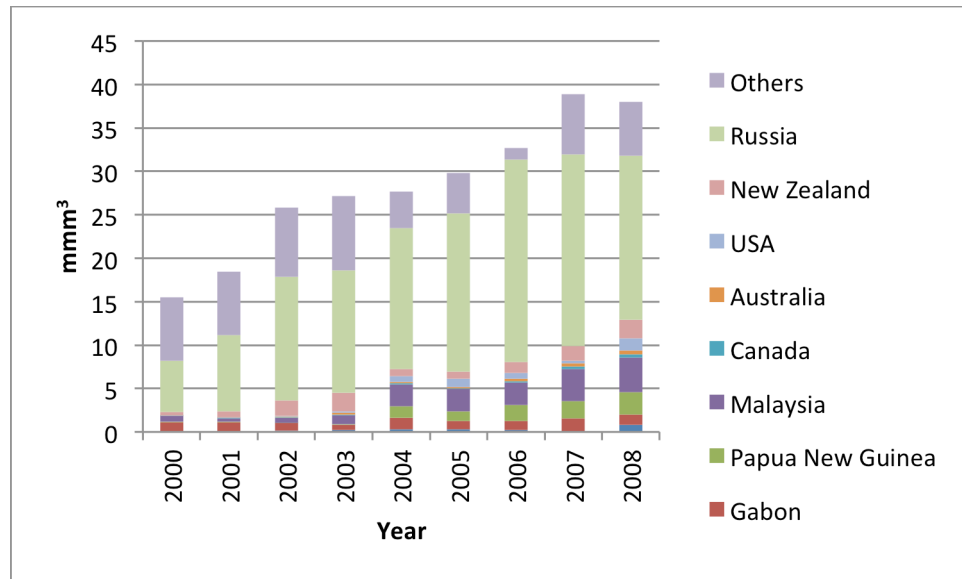


Figure 4. Log imports by source 2000-2008  
*Source:* Food and Agricultural Organization (FAO). 2011. FAOSTAT.

The largest source of tropical logs in 2008 was Malaysia, supplying 48% of China’s tropical logs. There is wide concern that Malaysia serves not only as a source of logs, but also as an intermediate for logs exported illegally from Indonesia, which ranked very low in terms of its own exports to China. According to the FAO, other primary sources included Papua New Guinea, Gabon, and to a lesser extent, Congo, Myanmar, Cameroon, and Equatorial Guinea.<sup>89</sup>

Although China’s own domestic resource base is severely constrained by both natural factors and policy instruments, as described earlier, the government’s forestry development plan has called for continued expansion of its forest-based industries, planning an annual 12 percent

<sup>89</sup> Estimates for China’s imports of tropical roundwood from the International Tropical Trade Organization (ITTO) vary from those of the FAO. The ITTO reports Guyana, Togo and the Central African Republic as exporting larger quantities than Equatorial Guinea and Myanmar.



growth in wood product production.<sup>90</sup> This indicates a strong commitment by the government to affirm China's role as an exporter and will likely require continued high levels of imports. There is widespread concern that, at current prices, China's continued high level of log imports will result in the drawdown of forest resources in countries that have less-stringent or poorly implemented environmental policies, and that may be eager to develop their natural resource-based industries.<sup>91</sup>

China has responded to some of the criticisms by signing bilateral agreements with countries such as Myanmar and Indonesia to help prevent illegal imports and by increasing outreach and training programs in its trading countries. The EU's Forest Law Enforcement, Governance and Trade (FLEGT) program and Voluntary Partnership Agreements and the US's Lacey Act Amendment provide policy frameworks intended to prevent the import of illegally harvested wood and wood products into the EU and the US. As an intermediary between material-source and product-destination countries, Chinese importers and manufacturers are learning how to navigate these rules. Non-policy mechanisms, such as product and chain-of-custody certification, are also being implemented to control the supply chain of illegal and unsustainable wood products. However, although the number of chain-of-custody certificates has grown in recent years, few enterprises actually use any certified wood in their production.<sup>92</sup>

*Ongoing challenges.* China is now the world's largest producer and exporter of forest products.<sup>93</sup> The government's stated goal of continuing to expand its forest products industries while conserving its own domestic resource base will mean that questions of legality and sustainability will not disappear anytime soon. If China's domestic log production continues to

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<sup>90</sup> State Forestry Administration 2009.

<sup>91</sup> Zhu et al. 2004, 30-47.

<sup>92</sup> Lawson and MacFaul 2010.

<sup>93</sup> State Forestry Administration 2009.

be assigned by quota, then it will continue to rely on imports to fuel its growth in wood product production and it will face increasingly high prices for timber imports. This would be particularly true for tropical logs, where the number of exporting countries is fairly limited. There may be new opportunities for trade between China and regions from which it does not currently import significant quantities, such as Brazil, but there are a limited number of sources of tropical wood and many of these countries are actively trying to limit deforestation. China is a major driver of demand for the trade in tropical and coniferous logs. Without a significant increase in domestic production of both coniferous and non-coniferous logs, it will continue to be reliant on imports to fuel its growth in product production. In the coniferous sector, Russia, North America and New Zealand are likely to be the most important sources of increased imports. In the non-coniferous sector, there is greater concern about where China will draw its imports from. Even if it is able to increase non-coniferous log production, it will be unable to produce large volumes of tropical logs. Although it currently serves largely as an intermediary between resource-rich developing countries that supply its raw wood resources and income-rich consuming countries to which it exports wood products, China will be expected to play an increasing role in ensuring the use of well-managed and legally harvested timber materials, not just at home but abroad as well.

### ***Conclusion***

There is no doubt that China has made enormous strides in its efforts to improve rural livelihoods, protect its forest ecology and grow its forest-based industries. Yet the results are, in many ways, mixed, and the efforts have undoubtedly had negative, yet often overlooked, unintended consequences. The problems for state-controlled forests are in a sense more straightforward; they primarily involve balancing the imperatives of enterprise profitability and

domestic timber demand with those of forest ecological health. The situation in collectively-owned forests, whether they are managed as commons or by individual leasing mechanisms, is more complex. Forest-dependent communities continue to be among China's poorest, and their economic development continues to lag far behind the coastal and urban regions. The state has pushed land tenure reform to try to provide income at the same time that it ensures reforestation and high-quality forests, and these two aims have not always been compatible.

When we examine recent forest history at a national scale, we see a generally bright picture: forest coverage has increased, which is a good thing. But gains may be overstated even at the national scale unless the ongoing problems of illegal logging and forest quality within China are acknowledged and addressed. And at more local scales, many of the policies directed at increasing forest coverage have dubious long-term sustainable benefits for rural households and questionable ecological outcomes. The forest industry has expanded rapidly in the last fifteen years or so, but it has become reliant on imports, often from countries with highly suspicious flows and poor environmental records of their own. The government has clearly stated its intent to expand, not limit, the forest-processing industry. If resources abroad become more expensive, there will likely be a push to open up designated conservation areas to greater timber production domestically.

The triple goals of ecological sustainability, rural livelihoods, and increased production are all laudable ones; it remains to be seen how well China can balance them against one another. As a major producer, consumer, importer, and exporter of wood and wood products, China is now expected to participate and demonstrate leadership in industry development and efficient resource use and trade, as well as in forest resource conservation and sustainable use.

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