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China: From Afforestation to Poverty Alleviation and Natural Forest Management

The World Bank

WORLD BANK OPERATIONS EVALUATION DEPARTMENT

China

From Afforestation to Poverty Alleviation and Natural Forest Management

Evaluation Country Case Study Series

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China

From Afforestation to Poverty Alleviation and Natural Forest Management

Evaluation Country Case Study Series

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Foreword

This case study is one of six evaluations of the implementation of the World Bank's 1991 Forest Strategy. This and the other cases (Brazil, Cameroon, Costa Rica, India, and Indonesia) complement a review of the entire set of lending and nonlending activities of the World Bank Group (IBRD, IDA, IFC, and MIGA) and the Global Environment Facility (GEF) that are pertinent to the Bank Group's implementation of the forest strategy. Together these constitute inputs into a World Bank Operations Evaluation Department (OED) synthesis report entitled *The World Bank's 1991 Forest Strategy and Its Implementation*. This forest strategy evaluation was carried out under the overall direction of Uma Lele.

The purpose of each of the six country studies has been to understand the implementation of the 1991 Forest Strategy in Bank operations and to obtain the views of the various stakeholders in the country about the involvement of the Bank. In doing so, the study team has not only examined the Bank's forest program but also endeavored to place the Bank's activities in the broader context of what the country and other donors have been doing in the forest sector. Therefore, each country study examined the overall development of the country's forest sector. While this naturally includes environmental impacts on forests, such as degradation, biodiversity loss, and deforestation, it also encompasses the economic uses of forests, including the management of forest resources for production, the role of forest development in poverty alleviation, and the impacts of forest research and development.

The evaluation of the Bank's performance in these studies, as always in OED studies, seeks to judge whether the Bank has "done the right things" and "done things right." Here, OED also seeks to judge whether the Bank has lived up to the commitments made in its 1991 Forest Strategy. The case studies do this by examining how the Bank, using the various lending and nonlending instruments at its command, has interacted with the sector's development processes, with other donors, and with the broader government objectives of economic growth, poverty alleviation, and environmental sustainability. Thus, the studies focus on policy in the post-1991 period, but they also recognize that the Bank does not operate in isolation from its historical interactions with a country and its needs. These interactions include the Country Assistance Strategies or their predecessors, Economic and Sector Work, as well as all investments in all sectors and all policy dialogue that is pertinent to the Bank's actions and their outcomes in the forest sector. Together, these activities constitute the Bank's implementation of its forest strategy in a country.

The important questions these country studies address are as follows:

- How have the forces of development effected change in the country's forest sector?
- Did the Bank's 1991 Forest Strategy make a difference to its forest strategy in the country, or was this strategy largely a result of the Bank's historical relationship with the country, the needs articulated by the government, or a combination of both?
- Regardless of how the Bank's forest sector strategy evolved, how consistent was it with the Bank's 1991 Forest Strategy?
- How consistent was the country's own forest policy/strategy with the Bank's 1991 Forest Strategy?
- Was the Bank's overall and forest sector strategy in the country relevant to the country's needs in the forest sector, as identified by the country?
- Were the Bank's overall and forest sector activities effective from the viewpoint of the intentions of its 1991 Forest Strategy?
- Were the Bank's activities efficient?
- Did the Bank's activities achieve policy and institutional development pertinent to forest sector management?
- Are the Bank's impacts likely to be sustainable?

- What impact has the Bank's overall and forest sector strategy for the country had on forest cover and quality, poverty alleviation, and other key issues? What are the prospects for future Bank-country interactions in the forest sector, and for outcomes in the sector?

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Director-General, Operations Evaluation Department: *Mr. Robert Picciotto*
Director, Operations Evaluation Department: *Mr. Gregory Ingram*
Task Manager: *Ms. Uma Lele*

Acknowledgments

This report is a collaborative effort between two country authors, Scott Rozelle and Jikun Huang, and the Operations Evaluation Department (OED) review team under the general direction of Uma Lele. Messrs. Rozelle and Huang conducted desk and field work and wrote the first and second drafts of the report, Arif Husain contributed analysis of the Bank's lending and performance, Aaron Zazueta assessed the forest projects and projects with potential impacts on forests, and William Hurlbut provided editorial input. The report has benefited from comments on earlier drafts by Robert Picciotto and Gregory Ingram of OED; Richard Scobey of the Operational Services Group; Susan Shen, Principle Ecologist, EAP; Juergen Voegle, Principle Agricultural Specialist, EAP; Robert Crooks, Senior Environmental Specialist; and Jin Liu of the World Bank resident mission in China.

Ms. Lele and Mr. Rozelle conducted a mission to China June 7–18, 1999. Qu Shuye, First Director of the Project Management Center (PMC) in the State Forestry Administration (SFA) participated in the mission field visits. Mr. Qu is one of the architects of the successful Bank-China cooperation and has been involved with the Bank work in the forest sector since its inception. Cheng Hong of the SFA's PMC and Jin Liu of the World Bank's resident mission in China accompanied the mission. The mission also included Norman Jones, a former Bank staff member who has been involved in China's forest projects since the mid-1980s. Xiong Sizheng acted as interpreter. The team visited three Bank projects (National Afforestation, Forest Resource Development and Protection,

and Forestry Development in Poor Areas) in four counties (Nanchang, Yongxin, Ninggang, and Sui-chuang) of Jiangxi Province, and held discussions with project beneficiaries that supplemented the field and survey work reported here. The mission's meetings in Beijing included discussions with Wang Zhi Bao, Jiang Xingyong, Jiang Xishan, Qu Guilin, Hong Jusheng, Zhang Zhongmang, Wang Qianjin, Xu Chuande, and Chen Jiawen of the SFA, officials of nine other provinces participating in the various Bank-funded forest projects, and advisors to the SFA including representatives of the Chinese Academy of Forestry and the Forest Economic and Development Institute. Additional discussions were held with the Ministry of Finance, the State Development and Planning Commission, the State Environmental Protection Administration, Justin Hu in the Regional Mission in China, the Food and Agriculture Organization, World Wide Fund for Nature, the Chinese Academy of Sciences, and other academics. The mission also met with Rick Scobey and Suzanne Shen (task managers of the Bank forest/Global Environment Facility projects). The cooperation and assistance of these stakeholders is gratefully acknowledged.

A workshop to discuss this case study was held in Beijing on November 5, 1999. It was hosted jointly by SFA and RMC and was attended by national and provincial officials, beneficiaries of forest projects, academics, NGOs, and representatives of the private sector and donor community. Annex K, in addition to listing the participants, presents the key issues discussed and major implications and recommendations. This revised version reflects as many comments of the Government of China and workshop participants as possible given the limited scope and resources of the study. Four categories of comments and suggestions for improvement were made:

- Refine data and analysis, particularly of the synergy between plantation and natural forests
- Update treatment of environmental and biodiversity work
- Provide more guidance for reconciling poverty alleviation and biodiversity
- Explore the implications of the change in lending terms for the future of Bank-China cooperation.

In general, the workshop participants were highly supportive of the analysis contained in the report.

The report has also benefitted from discussions held during the OED Forest Strategy Review Workshop on January 27–28, 2000, in Washington, D.C., as well as from web-based consultation and an ESSD consultation on the Forest Policy Implementation Review and Strategy in Singapore on May 26–27, 2000.

This report was produced as part of the OEDPK publication series by a team under the direction of Elizabeth Campbell-Pagé (Task Manager). Caroline McEuen (editor), Kathy Strauss and Aichin Lim Jones (graphics and layout), Diana Qualls (editorial assistant), and Juicy Qureishi-Huq (administrative assistant) comprise the publishing team.

Acronyms

ADB	Asian Development Bank
AEPS	Agro-Environmental Protection System
EIA	Environmental Impact Assessment
EPB	Environmental Protection Bureau
EPL	Environmental Protection Law
ERR	Economic rate of return
FAO	Food and Agriculture Organization
FDP	Forestry Development Project
FDPA	Forestry Development in Poor Areas
FHRS	Forest household responsibility system
FRDP	Forest Resource Development and Protection
FRR	Financial rate of return
GDP	Gross domestic product
GEF	Global Environment Facility
GNP	Gross national product
GOC	Government of China
HRS	Household responsibility system
IBRD	International Bank for Reconstruction and Development
ICR	Implementation Completion Report
IDA	International Development Association

IFC	International Finance Corporation
IRR	Internal rate of return
MCI	Multiple cropping index
MIGA	Multilateral Investment Guarantee Agency
MOA	Ministry of Agriculture
MOF	Ministry of Forestry (since May 1998, State Forestry Administration)
MSG	Medium-size grant
MSP	Medium-size project
NAP	National Afforestation Project
NEPA	National Environmental Protection Agency
NGO	Nongovernmental organization
NRMP	Nature Reserves Management Project
OED	Operations Evaluation Department
OP	Operational Policy
PAD	Project Appraisal Document
PAR	Performance Audit Report
PMC	Project Management Center
QAG	Quality Assurance Group
SAR	Staff Appraisal Report
SDPC	State Development and Planning Commission
SEPA	State Environmental Protection Agency
SFA	State Forestry Administration (formerly the Ministry of Forestry)
SFD	Sustainable Forestry Development Project
SOE	State-owned enterprise
UNDP	United Nations Development Program
WCS	Wildlife Conservation Society
WWF	World Wide Fund for Nature

Summary

China's forests and forest consumption are of global significance because of the country's large area and population. China is the biggest borrower of Bank funds generally, and in the forest sector it overshadows all other Bank clients. China has also been one of the best performers in terms of the effectiveness and impact of the Bank's lending operations.

Yet the challenges in the forest sector have increased, and the future of the Bank/China forest program is now uncertain. The government's recent logging ban, while intended to have a strong positive effect on the environment, also has tremendous short- and medium-term social and economic costs. It has already reduced timber supply and will likely affect employment, incomes, and government revenues. The provinces most affected by the ban have called for fiscal transfers from the center to help them deal with the consequences the revenue shortfall. Imports could increase sharply. This is happening at a time when the complexity of projects is increasing and the focus in the forest sector is shifting from production to conservation and biodiversity. As an added burden, the Bank's lending terms are hardening. As China shifts from IDA lending to IBRD, the lending program in the forest sector is coming under pressure at the same time that China's economy has been slowing, and the ability of poor households to borrow for long-term forest investments at commercial interest rates is in question.

The State of China's Forests

Analysis of three sets of forest census data gives considerable reason for optimism about China's forests. Available data suggest that forest cover in China increased 15 percent between 1980 and 1993, and forest volume has recovered sharply in the past decade after a long, steady decline. Much of the newly forested area is covering land that was originally bare wasteland and highly susceptible to erosion. The most recent data suggest that these trends are continuing. The optimism must be guarded, however, since China still faces a number of challenges. Because the rise in forest area has come from an increase in timber plantations, shelterbelts, and commercial plantations, the rise in forest diversity and its associated environmental services has been minimal. Moreover, analysis of China's forest statistics suggests that harvesting practices by forest farms and collectives have limited the contribution of plantation expansion to forest cover increases and may have reduced diversity. During the first 15 years of reform, China has apparently transformed the structure of at least 30 percent of its forest area; on the one hand, forest plantations in some areas have increased; on the other hand, natural and old growth forests in other areas appear to be declining. While such a transformation may increase individual profits and may not greatly affect the ability of the newly forested areas to provide (or eventually provide) environmental services such as erosion control, the transformation does limit other environmental contributions. For example, limited-species forests do not greatly increase the natural forest's diverse flora and habitat for large groups of wildlife, except to the extent that they indirectly reduce pressure on natural forests. These and other adverse environmental impacts also may have indirect effects on the livelihoods of certain groups of forest dwellers in that some non-timber products also are tied to the diversity of natural forests. The 1998 logging ban may slow this trend, but the substantial tradeoffs between environmental and socioeconomic objectives in the short and medium term could make the economic and socioeconomic costs of the ban very high.

The Bank Portfolio in China

With a cumulative total of more than US$1 billion in credits (including projects under preparation), China is the World Bank's largest borrower in the forest sector. Furthermore, forest sector lending to China has been growing for over a decade, while most of the rest of the developing world has seen a decline in such lending. This study goes beyond forest sector lending and examines the entire lending program to China

in all sectors (agriculture, education, environment, transport, electric power and energy, oil and natural gas, social, and urban) to identify projects with potential direct or indirect impacts on forests. Twelve agricultural projects in China have also included forest components as part of watershed management, agricultural diversification, and irrigation development. These components involve a total commitment of US$142 million. The study also examined 47 other projects with potential impacts on forest resources.

The Bank's China program has been mostly driven by demand, and the projects have evolved from relatively simple efforts—forest plantations on state and collective farms—to more complex projects with objectives ranging from poverty alleviation to farmer participation in the production of trees to management of protected areas and biodiversity conservation (some of it involving Global Environment Facility participation). The broader orientation in project design, emphasizing participation, protected areas, and biodiversity in the forest projects, has been particularly noticeable since the mid-1990s. Analysis of the 47 projects with potential impacts on forests found that environmental impact assessment has improved considerably since the 1991 Forest Strategy, but there is room for greater specificity regarding impacts on forests.

The project under preparation at the time this study was being conducted, which also uses Global Environment Facility (GEF) funds, even goes a step further in complexity by addressing the management of protected areas, sustainable management of natural forests, and biodiversity conservation. It also proposes deepening approaches to farmer participation and the economic development component to mitigate the effects of the logging ban on former loggers. The hardening of the lending terms, increasing complexity, and inclusion of environmental and conservation goals have all made it necessary to bring in GEF and bilateral donors to sustain China's interest in this project. Future Bank involvement in China's forest sector therefore is under threat and provides far larger challenges for the government, the Bank, and the donors who are or may be interested in participating in this new endeavor.

Performance of the Bank Projects

The Bank's forest projects have been successful by most measures and have contributed to the successes of China's forest sector. The Bank's assessments have concluded that all of the completed (and reviewed)

projects have returned high economic and financial rates of return, often exceeding appraisal estimates, and past and current projects have almost exclusively earned either satisfactory or highly satisfactory marks from Quality Assurance Group (QAG) and Operations Evaluation Department (OED) evaluations. While the government of China acknowledges the role that physical targets have played in this (i.e., number of seedlings planted and survived and tree growth), it questions the reestimated high rates of return on grounds that long gestation lags make the forecasts of markets and price information speculative. These are unlikely to be highly favorable. Nevertheless, a number of factors have contributed to the success of physical targets being exceeded. Besides, they have been good for poverty alleviation. Most projects, including the early plantation projects, have been in poor areas of the country.

The most important factor within China has been the high priority assigned by the Ministry of Forestry (now the State Forestry Administration) to the forest sector and the high level of project ownership. This extends from the ministry level to the provinces, prefects, counties, and towns, each of which contributes a share of counterpart funds through a "responsibility system" that has profoundly influenced the incentive to make projects work. Even the beneficiary households are expected to contribute their share to this system.

Another major contribution to the success of this program has been made by the continuity in staffing in both China and the Bank. China has carefully selected for Bank projects strong, capable staff with the commitment to ensure the accumulation of learning. Accordingly, the State Forestry Administration (SFA) has considerably increased its capacity in project preparation, monitoring, and evaluation since the start of the Bank program. SFA has also emphasized the continuity of its staff. Moreover, unlike in other countries' forest sector programs, the Bank has had only three task managers since 1989 and has an equally stable set of consultants that it has employed on China's forests. The Bank's responsiveness to China's needs has instilled a high level of trust and confidence with its client and led to high-quality dialogue between the Bank staff and officials from the SFA's Project Management Center.

Future Directions

The future of China's forest lending will depend on the success with which the program can address the remaining constraints:

- The hardening of terms for Bank lending to China carries a high level of risk for the forest program. Officials in China have already

indicated that borrowing more expensive IBRD money will have serious consequences for the innovative responsibility system. Those who currently are able to pay into the system may be less able to do so when the costs are higher. This will almost certainly exclude the poorest beneficiaries from the program. Already there is strong evidence that the number of counties—and poor households—that are interested in participating in the Bank projects dropped considerably once the higher interest rates were announced.

- While this report is able to draw some conclusions about the state of China's forests, the available data are weak in addressing socioeconomic issues. Moreover, although the data are relatively stronger on forest plantation area and growth, the level of aggregation and the limited breadth of the database make it difficult to judge precisely the effect of project loans, management innovations, and forest policies on the forest sector in general, and on Bank forest sector projects in particular.
- Relatively little is known about the diversity of arrangements for the distribution of benefits among households and between project participants and production and marketing units at all levels of the marketing chain.
- Policy reforms, particularly for state-owned enterprises, need to be completed.
- Thus far, the Bank has emphasized production over the complex pricing, marketing, and regulatory framework in the forest sector. Despite an overall liberalization of policies, the state-controlled forest sector is still subject to heavy regulation, quotas, and licensing requirements. The government has emphasized the importance of the Bank staying engaged in the China program during its transition to a more environmentally sensitive and market-oriented policy. It is particularly important, they say, that the Bank assist in the reform of state enterprises and provide concessional funds for the forest sector owing to the global benefits and long-term, risky nature of the program and the fact that costs are being borne by the poor provinces and poor households within them.
- China will need to continue to increase its supply of timber in the future and large tracts of land still await reforestation. The Bank has made a substantial contribution to improvements in the efficiency of China's afforestation programs and contributed to considerable benefits for soil and water conservation and for

carbon sequestration. Thus, there are good reasons to continue World Bank investment in plantations in China, which will help not only to save China's natural forests but also to avert future increased pressure on both domestic and global forest resources.

- While the GEF projects in China have worked very well, some staff of the State Environmental Protection Administration (SEPA) believe that China is not getting a sufficient share of GEF funding. Bank staff charged with administering GEF funds to China say that this is because the government is not submitting proposals that demonstrate global benefits and incremental costs as required by GEF. Officials in China respond that the long-term sustainability of GEF projects is questionable if they do not address national priorities. Actors in China are also often interested in small grants to address biodiversity issues of national priority, but such grants are not possible under the GEF charter.
- The Bank has begun to diversify the participants in its dialogue with China by reaching out to the wider academic community, a broader range of institutions, and nongovernmental organizations working in the forest sector. This diversification needs to be deepened, particularly to address the socioeconomic and environmental challenges that the new logging ban poses and to consult these resources in evaluating current projects and developing future ones.

1

Introduction

China's approach to forest sector development has evolved in the past 20 years from relatively simple projects to a complex strategy. In the 1980s, the country focused on aggressive reforestation and afforestation. Recent efforts, however, exhibit a strategy that embraces a wide range of development goals, including poverty alleviation and biodiversity protection.

The earlier strategy was highly successful when measured by the volume and cover of trees in the country: forested area in China has actually increased. But this may have been accomplished at the expense of the country's natural forests and, initially at least, in the species diversity within its forests. While the government's recent logging ban may help to preserve what remains of China's natural forests, it also will have severe economic consequences, including a potential increase in imports that could intensify pressures on the forests throughout Asia.

The World Bank has made substantial investments in China's forests—more than US$1 billion. These investments, among other things, helped to add more than 3.3 million hectares of high-quality trees to the country's forest stock. But the Bank, due largely to China's reluctance, has had little impact on forest policy.

The changes in the Bank portfolio in the 1990s have been largely consistent with its 1991 Forest Strategy. But given the lack of Bank influence on policy in China, that consistency is likely attributable to the fact that the forest strategy, when it was written (box 1.1), mirrored global thinking and trends in forestry. Also, most of China's forests are

Box 1.1. Bank Forest Strategy: The 1991 Forest Paper and the 1993 Operational Policy Directive

The 99-page World Bank publication *The Forest Sector: A World Bank Policy Paper* was published in September 1991. This paper (henceforth referred to as the 1991 forest paper) represented the initial comprehensive statement of a new direction for the Bank's forest strategy. A two-page Operational Policy directive (OP 4.36, produced in 1993) reflected the policy content of the paper, and a Good Practices summary (GP 4.36) provided operational direction to Bank staff. The 1991 forest paper, the OP, and the GP are together the subject of OED's evaluation.

In today's Bank terminology, the 1991 forest paper sets out a Bank strategy and the OP defines the policy. The 1991 forest paper gave guidance on policy directions, programmatic emphases, and good practice, and it specified principles and conditions for Bank involvement in the forest sectors of its client countries. It was the first instance of significant outside stakeholder participation in the formulation of a Bank sector strategy, and it is this document which the public considers the embodiment of the new direction for the Bank's forest strategy. Both the Bank's Board and civil society were referring to this document, as well as OP 4.36, when they asked OED for an independent evaluation of the Bank's forest policy. Although the Foreword for the 1991 forest paper was signed by then Bank President Barber Conable, the Board was not asked to, nor did it, comprehensively approve the 1991 forest paper. However, it did discuss the paper and endorse specific aspects of it.

The Board-endorsed principles contained in the 1991 forest paper included the ban on financing commercial logging in primary topical forests; incorporation of forest sector issues into the general policy dialogue and country assistance strategy; and promotion of international cooperation, policy and institutional reform, resource expansion, and forest preservation. The endorsed principles also included the statement that "in tropical moist forests the Bank will adopt, and will encourage governments to adopt, a precautionary [sic] policy toward utilization…. Specifically, the Bank Group will not under any circumstance finance commercial logging in primary tropical moist forests. Financing of infrastructural projects … that may lead to loss of tropical moist forests will be subject to rigorous environmental assessment as mandated by the Bank for projects that raise diverse and significant environmental and resettlement issues. A careful assessment of the social issues involved will also be required" (p. 19). The Board also approved a specific section on conditions for Bank involvement.

Both the 1991 forest paper and the OP emphasize that the Bank will not finance commercial logging in primary tropical moist forests, and in addition, the 1993 OP adds that the Bank "does not … finance the purchase of logging equipment for use in primary tropical moist forests" (para. 1a). The OP also states that "in areas where retaining the natural forest cover and the associated soil, water, biodiversity, and carbon sequestration values is the object, the Bank may finance controlled sustained-yield forest management" (para. 1f). The 1991 paper, however, had stressed a lack of agreement on what constitutes sustainable forest management and offered three different definitions of it. However, all definitions of sustainable forest management typically include management of forests for *multiple uses* as distinct from timber production alone, to which logging normally refers. Although this provision in the OP to finance forest management under controlled sustained-yield conditions allows forest management under specific conditions (and the drafters of the OP thought this introduced some flexibility for the Bank), a survey indicates that the staff have not considered the OP to be flexible on this point. The Bank will need a clearer policy if its future lending and non-lending activities are to address issues of improved forest management relative to current logging practices in many countries, which this report argues often tend to be environmentally destructive and socially inequitable. What constitutes "sustainable" forest management will, in all likelihood, remain unresolved and specific to each location.

Based on the larger policy statement, the OP also states that "the Bank distinguishes investment projects that are exclusively environmentally protective … or supportive of small farmers … from all other forestry operations." It goes on to say that projects in the latter category "may be pursued only where broad sectoral reforms are in hand, or where remaining forest cover in the client country is so limited that preserving it in its entirety is the agreed course of action" (para. 1c). The main report for this study finds that the Bank could more usefully and proactively work with stakeholders sympathetic to reforms in borrowing countries in ensuring that reforms are in hand, rather than wait for them to occur before getting engaged in the forest sector.

Box 1.2. The Operations Evaluation Department Review of the 1991 Forest Strategy and Its Implementation

OED's review of the Bank's 1991 Forest Strategy[1] has been undertaken to assess Bank experience in the forest sector—particularly since 1991—to gauge its policy intentions, implementation, and impacts. The review also examines whether the Bank's strategy remains relevant and can embrace a strategy attuned to the current realities of the forest sector. In addition to briefing the Bank's Board of Executive Directors, the review will be used as an input to an ongoing Bank-wide review of its forest sector activities being lead by the Bank's Environmentally and Socially Sustainable Development Network (ESSD).

India was selected as a case study country because it is a large, forest-poor country, and because its lending program was second in size only to that of China.

All of the case studies in this review consist of two parts—the first focusing on the extent and causes of changes in the forest sector, and the second on how the entire set of Bank instruments has interacted with the processes of the changing forest cover, and with what impact.

To the extent possible, the performance of the Bank has been assessed based on outcomes and impacts. Six classes of outcome are considered:

- Improvement in country policies and strategies with direct and indirect impacts on forests
- Institutional development including improvement of the legal framework, a redistribution of roles between the public and private sectors, and participatory approaches to decisionmaking
- Improvements in technologies
- Capacity building and human capital formation
- Improvement in the incentive structure
- Improved information, monitoring, and evaluation systems.

1. The strategy is summarized in Annex B.

in temperate regions and are not directly affected by some of the most restrictive part of the World Bank's Operational Policy on forests.

This Operations Evaluation Department study (box 1.2) finds that while the forest program in China has been highly successful, much remains to be done. Too little is known, for example about the distribution of benefits between households and production and marketing units. The implications of the government of China's recent logging ban require careful analysis. Policy reforms, particularly for state-owned enterprises, must still be completed. Data on what is happening in China's forests is inadequate to support a firm judgment, particularly regarding the country's natural forests. There is almost a complete absence of systematic knowledge about the nation's current stock and future trends of the supply, demand, marketing, and trade for timber and some key non-timber products. Finally, China has graduated from IDA funding

to IBRD lending, a prospect that some people believe will have serious consequences for the most innovative aspect of China's program, a "responsibility system" that has ensured a high level of ownership for the protection of the country's forests. In addition, recent controversies regarding the treatment of indigenous people in Xizang are already increasing risks for the Bank's new style forest sector investments, which have tended to focus on the poorest mountain populations, many of which include ethnic minorities.

PART I: THE STATE OF CHINA'S FORESTS

2

Role of the Forest Sector in China's Economy

The forests of China provide 40 percent of the country's rural energy, almost all of the lumber and panels for the nation's construction sector, and raw material for the pulp and paper industry. The sector also is a vital source of employment and income generation, supplying about 3 percent of the nation's jobs and 4 percent of GNP, although its importance in employment and output has declined gradually during the reform era.

Its importance notwithstanding, the forest resource base in China is small and isolated. Forest cover amounts to only 0.11 hectare per capita, significantly below the world average of 0.77 hectare per capita. Most of the country's natural forest resources are located in relatively remote and poor areas in the northeast and southwest.

Based on its present consumption levels and the future demand implied by the country's rapid economic growth, China's timber needs already outstrip its ability to meet them, and the nation may turn increasingly toward international markets. China is the third-largest user of timber in the world, consuming about 300 million cubic meters (m^3) of wood products annually in recent years. Imports—although small in the 1980s—have grown moderately in the past two decades, while exports have fallen. This trend is of regional and even global importance as devaluation of the currencies in Southeast Asia and China's rising demand for imported logs could lead to a surge of timber products flowing from international markets into China, which could exacerbate deforestation trends in pro-

Box 2.1. Socioeconomic Impact of the Logging Ban

The recent logging ban, imposed to save China's natural forests, potentially has large social and economic costs. China expects to spend US$22 billion in the next 13 years to redeploy nearly 1.2 million jobs to be lost directly and another 1.2 million indirectly as a result of the ban (three provinces, Sichuan, Hunan and Heilongjiang, will incur 80 percent of the loss). Seventy-five percent of the funds to do this will come from the central government and the rest from the provincial and local governments, including US$1.6 billion for forest plantations and nearly US$4 billion for creating alternative conservation-oriented sources of income for the loggers, US$450 million annually for reforestation of waste and barren lands, US$4 billion for social insurance and subsidies to local governments for the loss of fiscal revenues, and US$6 billion in plantations for industrial raw materials, the production of cash crop trees. Domestic banks will finance US$6 billion, with the central and local governments subsidizing these expenditures.

ducing nations. China might have increased the likelihood of this outcome by passing a logging ban in 1998, which will have serious trade implications (box 2.1).

The government of China has reported a drop in production of 18 million m^3 of timber in one year, in part as a result of the logging ban. Without investment in plantations, China will have to import more, thereby increasing the pressures on regional forest resources. Chinese officials have said that they need more investment in plantations as a way of making the logging ban stick, but they are not certain that the plantations can be implemented without subsidies. Indeed, their case for concessional lending for forestry from the Bank is based on the fact that even a poor country like China is committing such large amounts—mostly in the form of government transfers—that the global community also needs to help with grant or near-grant funds to ensure that China protects its biodiversity, nature reserves, and poor people, while minimizing pressures on global forests.

In anticipation of imminent shortages, the government has taken several steps in recent years to expand supply and manage demand. Afforestation efforts have sought to increase forest cover and biomass. Protection forests have been planted across wide areas of fragile lands. On the demand side, the government has implemented a "Wood Conservation and Substitution Policy" that mandates the use of substitutes such as iron and cement in seven industrial and product areas (such as railroads, telecommunications, construction, and boat building). Demand-dampening policies have saved up to 15 million m^3 of timber per year, which largely offsets the production decline of 18 million m^3 resulting from the logging ban. Surprisingly, China's reported imports have not increased as much as might have been expected as a result of the ban.

The forest sector has been subject to moderate policy reform over the past decade and in some subsectors is now fairly liberalized (World Bank sources). The free market covers about 90 percent of all products, and reforms have led to a rapid increase in market prices. Domestic prices are now approximately on par with world prices. Many markets for timber products have arisen in remote rural areas and in regional market towns and thousands of companies now actively trade forest products.

Despite the reforms, a significant part of the high-value timber in the country is still subject to tight regulation. A number of constraints also continue to affect some of the most important forest products. For example, quotas control the harvest of many types of logs. Marketing and transportation permits cause uncertainty about when and if timber can be profitably sold. In addition, numerous taxes and fees on some categories of wood products may have distorted the incentives to producing certain species. In many places, inefficient harvesting and transportation infrastructure greatly reduces the return to forest harvests.

Some of the most important reforms have come in the area of land tenure changes and other institutional changes in the way forests are managed, although there is little systematic, nationwide empirical evidence about the impact such measures have had on forest resource management. China devolved a large measure of control over forests in the 1970s and early 1980s and, following successful decollectivization reforms in the agricultural sector in the early 1980s, forest leaders sought to further devolve control and increase incentives to households and to forest users in the mid-1980s. The reforms did not go as far as those in agriculture in the early stages of implementation, but in the decade or so since then, a number of innovative programs have been launched in an effort to improve investment in forests. The forest sector academic and policymaking communities in China differ sharply regarding the success of this movement.

The other high-profile sector, the state-forest farm system, has evolved more slowly. But recent problems and changes in the way state-owned enterprises are managed have accelerated a new set of changes in China's state-run forest industry. Fiscal and financial support is gradually being removed from many of the chronic money-losing farms. This has led to unemployment and reports that entire communities, frequently in remote corners of the nation, have been impoverished. Some have reported uneconomic and unsustainable mining of remaining old growth forests and younger plantations. The 1998 flood of the Yangtze River

has triggered a new round of restrictions on old growth logging, a move that will have tremendous consequences for state-forest farms and their associated communities.

China also has an extensive wood processing industry, which has expanded with the market liberalization of recent years, though there is concern about its long-run efficiency. Saw mills, processing factories, and plywood mills are scattered throughout China. The country is also the third-largest paper producer in the world (although paper consumption is still only one-tenth to one-twentieth of that of Korea and Japan). Outdated technology, poor management, and lack of high-quality timber products have led to a crisis in the industry in recent years. Quality is notoriously poor in many products, and paper mills are highly polluting.

3

Forest Resource Management

Rigorous studies on China's forests are rare, in part because of the lack of comprehensive, reliable data. Some commentaries claim the unavailability of data has restricted the scope of their study (World Bank 1992; Li et al. 1987; Ross 1988). Others believe that data generated by the country's statistical reporting system are flawed (Smil 1984). There is quite a high degree of confidence in some data—for example, the forest census data on which this section is mostly based. Investigations by the authors during five periods of field work between 1993 and 1995 on the completeness and credibility of forest statistics collected by local forestry production units (villages and forest farms), however, found that, in comparison to information on agriculture (believed to be fairly good, relative to the data generated in most developing countries), forest statistics were generally less complete and of lower quality.[1] The census data used in the first part of this report are described in Annex C.

This report focuses on China's 14 most important forest provinces in four management groups. These 14 provinces account for more than 75 percent of China's total forest land and 88 percent of the harvested timber (ZGNYNJ 1989). Some of the biggest shelterbelt projects (forests planted primarily for their ability to combat soil erosion), and some of the largest forest reserves and recreational areas have been established in these provinces (World Bank 1992; Ghimire 1994).

China has four main forest regions that are managed by one of two regimes. Since the 1950s, two distinct management forms—the state and the collective—have shared control of China's forests (Ross 1988; Sun

1992; Yin 1994). In the 1980s, although the state managed only 20 percent of China's forests, it controlled the vast majority of its high-quality timber reserves. Forest farms, numbering 4,000 and employing over 500,000 people (ZGNYNJ 1987; Yin 1994), execute almost all forest production activities within their assigned geographic jurisdictions and report to local forest bureaus, the lowest level of the State Forestry Administration command hierarchy (Richardson 1990). State forest farm management is most closely associated with forests in China's northeast provinces: Heilongjiang, Jilin, and Inner Mongolia, which contain China's richest timber resources. In 1988, these provinces accounted for approximately 39 percent of China's timber area, 42 percent of its timber volume, and 46 percent of the production from the country's state-owned sector (see table 3.1; QGSLZYTJ 1994: 73; ZGTJNJ 1991: 298). This segment of the forest sector controlled over 91 percent of the forest area in the northeast region (QGSLZYTJ 1994).

Collective management began when 96 percent of the land in rural areas was placed under the jurisdiction of village (brigade) leaders in the mid-1950s (Richardson 1990). During the 1960s and 1970s, however, national grain policy and party ideology discouraged local users from investing in forests, and state forest farms frequently encroached on forests of local collectives and mined their timber resources. But as part of the agricultural reform process, genuine collective management was restored to the forestland that the state did not directly control. On this forestland, leaders or individuals in the villages have responsibility for forest management, although forest users must answer to officials from local forest bureaus.

Most of the major forest areas in the south and north-central parts of China are managed by collectives (table 3.1). In the mid-1980s, the leaders of collectives and farm households belonging to the collectives managed 89 percent of forestry area in southern provinces (QGSLZYTJ 1994) and produced nearly 75 percent of the value of the forest output (ZGLYNJ 1992; ZGTJNJ 1993). This management group's share of timber production has continued to increase in recent years.

The north-central region (not shown in table 3.1), which is also collectively managed, has emerged as a major source of timber in the 1990s. The share of the state sector in total timber output has fallen sharply relative to that of the collective sector since the late 1980s. The north-central forestry region is similar to the southern region, but it is somewhat less well-endowed with natural forest and has only begun to en-

Table 3.1. Forest Cover and Forest Volume in China, Late 1970s to Late 1980s

	Forest cover[b] (%)			Total forest volume (m^3 biilions)		
	1980	1988	Net change	1980	1988	Net change
Northeast State-run Region						
Heilongjiang	33.6	34.4	0.8	1.44	1.32	-0.12
Inner Mongolia	11.9	11.9	0.0	0.82	0.87	0.02
Jilin	32.2	33.0	0.8	0.66	0.71	0.05
Subtotal	19.5	19.8	0.3	2.94	2.89	-0.05
Southern Collective-run Region						
Fujian	37.0	41.2	4.2	0.30	0.26	-0.04
Jiangxi	32.8	35.9	3.1	0.24	0.17	-0.07
Hunan	32.5	31.9	-0.6	0.16	0.14	-0.02
Guangdong [a]	27.7	27.0	-0.7	0.20	0.19	-0.02
Guizhou	13.1	12.6	-0.5	0.13	0.11	-0.02
Subtotal	29.4	30.2	0.8	1.02	0.87	-0.15
Southwest Mixed-management Region						
Yunnan	24.0	24.4	0.4	1.10	1.10	0.00
Sichuan	12.0	19.2	7.2	1.05	1.27	0.22
Subtotal	16.9	21.3	4.4	2.14	2.37	0.23
Total	20.9	22.4	1.5	6.11	6.13	0.02
China	12.0	13.0	1.0	7.98	8.09	0.11

a. Hainan is included with Guangdong.
b. "Forest cover" is measured by total forest area divided by total land area.
Source: QGSLZYTJ, 1983; 1989 (see also table A.1).

courage its collectives to engage in forestry activities on a large scale. The region is dominated by fast-growing timber species, hence the name "north-central fast growth" region.

Two major provinces rich in forests in the southwest, Yunnan and Sichuan, are more difficult to categorize (table 3.1). For analytical purposes, Ross (1988) considers forests in the two provinces as state-run. Timber output from state forest farms in Sichuan and Yunnan ranked fourth and ninth among China's provinces in 1991 (QGSLZYTJ 1991). In contrast, Sun (1992) groups these two provinces with those where collective management is most common. In the mid-1980s, outside of

the five southern provinces, Sichuan and Yunnan together had the largest collective sector in China (ZGTJNJ 1985–93). Forests in Yunnan and Sichuan have characteristics of both management types, with nearly equal division of forest area between the different regimes. Hence, like Yin (1994), this report treats Yunnan and Sichuan as "mixed" management systems.

4

Forest Resource Status and Trends

Forest cover and volume have both grown significantly during the reform era, though their pace in the early reform era (1980 to 1988) and the late era (1988 to 1993) have differed (table 4.1). China's forest cover (the proportion of land covered by forests or commercial orchards) has steadily expanded throughout the reform period, rising almost 15 percent during a 15-year period. The increase in forest cover implies that the area in forests and commercial tree plantations has grown by about 9 million hectares in each period, increasing from 115.3 million hectares in 1980 to 133.7 million hectares in 1993—a total of 18 million hectares.

Forest volume growth has been more variable over time and among regions (table 4.1). In the early reform period, forest volume was nearly stagnant, rising from 7.98 to 8.09 billion cubic meters, an annual percentage increase of only 0.14 percent. In the late reform period, however, the rise in forest volume jumped sharply from 8.09 and 9.09 billion cubic meters. The growth in different regions also varied significantly, with the northeast state-owned and southern collective regions experiencing a fall in forest volume in the early period, a decline that was offset by rapid growth in the southwest and north-central regions. Growth in forest volume occurred in all regions in the late period, led primarily by the turnaround in the southern region.

While the increase in forest cover and volume is of interest from a national resource accounting perspective, these aggregate statistics may mask changes in forest structure and quality. In particular, it may not

Table 4.1. Change in Forest Cover and Forest Volume in China, 1980–93[a]

	Forest cover [b] in % (and % change)			Total forest volume in m^3 billion (and % change)		
	1980	1988	1993	1980	1988	1993
Northeast state-run region	19.5	19.8(+1.5)	20.3(+2.5)	2.94	2.89(-1.7)	3.00(+3.8)
Southern collective-run region	29.4	30.2(+2.7)	35.2(+16.6)	1.12	0.96(-14.3)	1.09(+13.5)
Southwest mixed-managed region	16.9	21.3(+26.0)	22.1(+3.8)	2.15	2.37(+10.2)	2.41(+1.7)
North-Central fast growth region	7.9	10.4(+31.6)	10.8(+3.8)	0.10	0.13(+35.8)	0.13(+3.9)
China	12.0	13.0(+8.3)	13.9(+6.9)	7.98	8.09(+1.4)	9.09(+12.4)
Total covered area (ha millions)	115.3	124.7	133.7			

a. The years 1980, 1988, and 1993 are proxy dates for the three census periods. The "1980" forest census was carried out from 1978 to 1981; the "1988" census was carried out from 1986 to 1989; and the "1993" census was carried out from 1992 to 1994.
b. "Forest cover" is measured by total forest area divided by total land area.
Source: QGSLZYTJ 1983; 1989; 1994 (see also table A.1).

be possible to ascertain the scope of China's afforestation and reforestation effort without more careful disaggregation. Aggregated statistics may hide offsetting trends in various subsectors. It is therefore important to more carefully account for the estimated 18 million hectare net change in forest area and to examine in detail the changes in forest volume.

Timber

Unfortunately, accounting for the 18 million hectare increase in forest area is not a straightforward procedure because of the nature of China's forest data. The published national forest census statistics offer no definitive answers to such questions as: Did newly planted forests replace old ones? We are only given a snapshot of the stock of forest resources in each province, so it is difficult to answer questions such as: Did foresters create new forests in areas that were previously waste or cultivated land? If harvested areas were reforested, were they put back into natural forests or did the post-logging teams plant single-species plantations? Did these new plantations survive? The answers to these questions, therefore, must rely on a mixture of national census data, published statistical sources, and a number of assumptions.

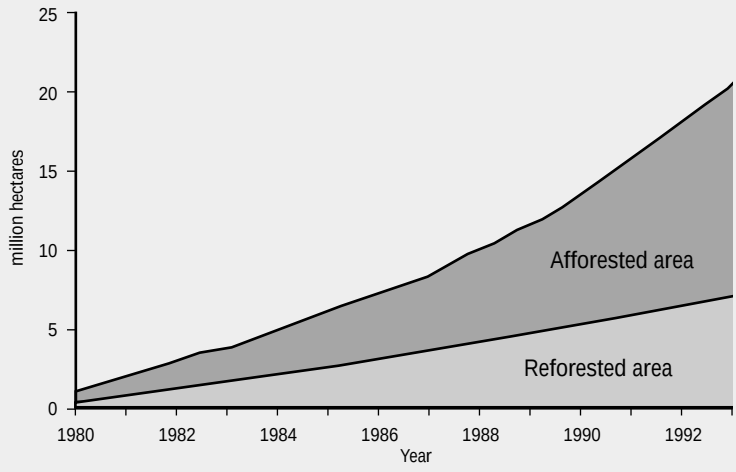
Timber forests have not driven the increase in national forest cover.[2] Although timber area makes up the largest share of national forestlands, it has grown slowly during the reform era. Total area in timber-produc-

ing forests stagnated between 1980 and 1988 (at 80 million hectares). Between 1988 and 1993, however, timber-forested areas resumed growth, rising by about 5 percent.

A steady total timber area, however, does not mean that reform policies, management changes, and other economic forces have not affected timber resources or the nature of timber area. Statistics from State Forestry Administration (SFA) statistical compendia document the rapid rise in newly afforested and reforested "engineered" timber plantations (figure 4.1).[3] From 1980 to 1993, state forest farms and collectives have continuously increased the annual area put into new *afforestation* projects, on average, by about 1.5 million hectares per year. Such large annual increases imply a total rise of 20 million hectares of new forest land from these afforestation efforts, a rise that exceeds the entire *net* increase in forest area (see table A.1). China's forestry system deserves credit for directing one of the largest afforestation campaigns in history (in the developing world).

The dramatic jump in afforestation means that vast areas of forest must have been clear-cut and not replanted. However, those who have been in charge of China's plantation programs should not be blamed for this. According to interviews with foresters in almost every major forest region in China, most plantations are being established on land

Figure 4.1. Cumulative Area of New Afforestation and Reforestation on Engineered Plantations, 1980–93



that is either barren, or at most is home to scrub-covered hills. Most foreign experts who have worked in China on forest issues agree with this assessment. If so, and if most of the engineered afforestation projects are being put into timber-producing species, the fact that total timber area as measured by the census has remained relatively constant would imply that producers in either or both the state-owned and collective forest sectors are logging and not replanting large areas of China's mature plantations (from the 1950s and 60s and before), natural, and/or old growth forests. Such an interpretation, which could have major consequences for the diversity of China's forests, also is consistent with an analysis of changes in China's forest age structure in the early reform era reported in Rozelle et al. (1998). China's miraculous effort to establish vast areas of plantations has more than kept up with harvesting of older timber stands, but diversity is declining in China's forests to the extent that forests being planted have less diverse species composition than those being harvested.

Since 1986, the total amount of newly engineered forest land can be divided into two parts. Fast-growing forests, or species of trees that increase their volume by at least 15 m^3 per year, rose by almost 0.5 million hectares annually (table A.3). According to Yin (1994) and species data in the national forest census, most of these fast-growing forests, which are often used to feed China's growing paper and light industrial manufacturing sector, have been established by producers in the collectively managed forests in the south and north-central provinces. Despite the higher profile of fast-growing forests (which receives a lot of attention from China's forestry community), areas in plantations with traditional timber-producing trees are expanding faster and account for more of the engineered afforestation (table A.3).

The rise in "engineered" *reforested* area also apparently reinforces the sharp structural changes that are occurring in many of China's important forest areas. During the reform era, the average annual area established as high-quality, engineered timber forests on land that had recently been logged rose from about 0.40 million hectares in the early 1980s to more than 0.55 million hectares in the early 1990s, a total increase of seven million hectares. Reforestation of mature plantations helps maintain current forest cover. Yet, if foresters harvest in old growth or natural forests and then replant with single (or even several) species, China's forests would decline in diversity and associated environmental services because plantations typically do not act as repositories for forest plant and wildlife diversity. Of course, these plantations are helping

to meet domestic demand. From this point of view, afforested and reforested plantations take pressures off of remaining natural forests and reduce imports, which takes pressure off of forest resources internationally.

Shelterbelts and Commercial Plantations

The success and magnitude of China's effort to combat erosion and desertification through one of the largest afforestation efforts in history by a developing country is well-documented (World Bank 1992; Richardson 1990; Rozelle et al. 1998). Central leaders have placed great emphasis on high-profile projects, such as Inner Mongolia's "Great Green Wall" and the Upper/Middle Yangtze River Valley Afforestation Campaign (QGSLZYTJ). Indeed, officials interviewed for this study claimed that a large part of the budgetary resources allocated to rural environment and natural resource protection go to afforestation projects. A nearly national representative community survey of 220 villages across China conducted by Rozelle and Huang in 1995 found that the most common use of corvee labor[4] (after maintaining village roads and irrigation canals) is for tree planting.

The support of national leaders and hard work of farmers has made the nation's shelterbelt effort an important contributor to the increase in forest cover. During the reform era (from the early 1980s to the mid-1990s), shelterbelt areas increased by a total of 6.07 million hectares, rising by more than four million hectares in the early reform period while decelerating somewhat during the late period (table A.4). Most of the early increase came from China's major forest regions (all of which showed increases from 1980 to 1988). In the late reform period, however, shelterbelt area actually declined or showed no change in the major regions except the southern collective region (where it rose by 32 percent). The increase in China's shelterbelt areas between 1988 and 1993 shows the change in strategy to expand the scope of environmental protection to those areas outside of the traditional forest provinces.

The expansion of commercial plantations (orchards and other non-timber product tree crops) accounts for one of the most noticeable changes in rural China's forest area today. The area of commercial plantations, consisting of oil bearing trees, fruit and nut orchards, and other cash-producing, non-timber tree species, rose by about 40 percent during the reform era (table A.5). Fruit and nut orchards accounted for nearly 80 percent of the rise, although total orchard area made up only 19 percent of commercial tree plantations in 1980. Orchards expanded by 127 percent between 1980 and 1988 and by 55 percent by 1993.

Accounting for Forest Cover Changes

The trend of China's forest area drawn by census and supplementary statistics, if only even partially accurate, shows the accomplishments and potential environmental implications of China's forest sector. The primary problem is not the destruction of tree cover. Forested area rose by more than two percentage points between the early 1980s and mid-1990s. Rather, the problem can be seen by disaggregating this growth. Table 4.2 provides a stylized accounting of the 18 million hectare net increase in forest area. When combined, the major categories of forests, including engineered timber afforestation efforts, shelterbelts, and commercial plantations grew by 40 percent or more during the reform period. If overall timber area grew only marginally, one way that these figures can be reconciled is if there was 21 million hectares of newly afforested area and loggers clear-cut and did not replace 16 million hectares of old growth or natural timber forests. Eleven of the 18 million hectares of the net increase would then be accounted for by

Table 4.2. Accounting for Changes in Total Forest Areas, 1980–93

Forest types [a]	Subtotal hectares (millions)	Total hectares (millions)
Timber (from QGSLZYTJ 1983, 1989, 1994)		**+5**
Engineered afforested timber forests	+21 [b]	
Clear-cut timberland, non-reforested (calculated)	-16 [b]	
Shelterbelts and commercial plantations		**+11**
Shelterbelts	+6 [a]	
Commercial plantations (including orchards)	+5 [a]	
Other forest types		**+2**
Fuelwood forests, national reserves, other forests (from QGSLZYTJ 1983, 1989, 1994)	+2 [c]	
Total increase in area		**+18**
Other changes affecting forest diversity (but not area)		0
Clear-cutting old growth/natural forests	-7 [b]	
Replanting with single species ("engineered" reforestation area)	+7 [a]	
Clear-cutting old growth/natural forests (no data available)	-? [b]	
Increased non-engineered reforestation (no data available)	+? [a]	

a. Mostly single species.
b. Mostly diverse natural or old growth forests.
c. Part of the increase is in a single-species forest and part is in natural forest; actual increase is 2.6 million hectares.

shelterbelts and commercial plantations. Approximately two million hectares has been added by fuelwood forests, natural reserves, and other special forests. (When examining these figures, China's forest sector officials claim that 16 million may be overstating the problem. It could be that some of the area that is classified as afforested or shelterbelt was actually established on harvested forest land. To the extent that this is true, the area now recorded as reforested is understated and the area that was clear-cut and not reforested should be reduced.)

Regardless of the exact figures, the reconciliation of China's forest statistics (in table 4.2) demonstrates that the nation's forest structure changed sharply in the reform era, and that decreasing diversity and loss of old growth forests unconnected to the reforestation programs may be a serious environmental issue, since according to Ross (1988) there was little reforestation during the socialist era. Given that China's traditional timber sector has in part exploited natural, old growth forests, it is plausible that there has been a sizeable decline in the natural forests of 23 million hectares: 16 million hectares of clear-cut, non-replanted forest and seven million hectares of engineered reforested land (which also often constitutes a switch between natural, mixed forests and single-species forests).

China's Forest Volume

Disaggregating overall forest volume reveals a somewhat different pattern of inter-temporal and regional sectoral development than for forest cover, but it also demonstrates the net increase in resources in the forest sector in the 1980s and 1990s. China's forest volume, as noted earlier, was virtually constant between 1980 and 1988 before jumping sharply between 1988 and 1993, a pattern driven by the northeast and southern regions where volume actually declined in the first period before recovering in the second period (see table A.2). Given the large share of China's forest volume still in timber and that much of the resource is in the traditional major forest regions, it is not surprising that timber forest volume also showed the same down-and-up development trend for both China as a whole and for the northern and southern regions (table 4.3). While the southwest region experienced downward trends in both periods, the constant growth in the small but robust north-central region partially offset this fall. In fact, timber volume fell in every one of the top-10 timber producing provinces, except in Jilin in the early period, while recovering in all but Sichuan in the later period. While the decline in volume is perhaps expected, and typical of the

resource mining that often occurs in rapidly developing countries, the surprising fact is that China's leadership appears to have halted the downward trend.

Besides the rise in forest area, the reversal in the decline of China's forest volume reflects the slowdown in the rate of extraction of timber products throughout the reform period (table 4.3). Timber production in the nation rose only 3 percent between 1988 and 1993, or just 0.6 percent per year, a remarkably slow rate of increase for a rapidly growing economy. Between 1984 and 1993, national roundwood output remained at about 60 million cubic meters per year. While timber has many other uses in China's economy, the constant rate at which this forest product was extracted is certainly contrary to the standard expectation that a rapidly growing economy will push up resource extraction. Richardson (1990), for example, cites a National Forest Products Association study that predicted an extremely rapid increase in China's roundwood consumption during the 1980s and beyond. If true, the stagnation in production of industrial-grade roundwood may in part be explained by strict government limitations on the use of wood in building (Richardson 1990) and by increases in imports of paper and timber raw materials (ZGTJNJ).

Since average timber production did not differ significantly between the first and second census periods, new sources of increasing forest resources and reducing losses must have contributed to the big rise in forest volume. As seen above, the rapid increase in the afforestation projects, especially in fast-growing forests, contributed large volumes

Table 4.3. Timber Resources and Production in China, 1980–93[a]

	Timber forest volume in m^3 millions (and % change)			Timber production in m^3 millions (and % change)		
	1980	1988	1993	1980	1988	1993
Northeast state-run region	2,709	2,581(-4.7)	2,684(+4.0)	0.27	31(+16.5)	.20(-27.2)
Southern collective-run region	1,039	843(-18.8)	929(+10.1)	14	15(+7.8)	.18(+15.7)
Southwest mixed-managed region	1,743	1,411(-19.0)	1,399(-0.9)	6	8(+18.3)	9(+5.1)
North-Central fast growth region	77	86(+11.7)	100(+15.9)	0.70	.80(+8)	6(+790)
China	6,881.86	6,173(-10.3)	6,743(+9.2)	54	62(+16)	64(+3)

a. The years 1980, 1988, and 1993 are proxy dates for the three census periods. The "1980" forest census was carried out from 1978 to 1981; the "1988" census was carried out from 1986 to 1989; and the "1993" census was carried out from 1992 to 1994.
Source: QGSLZYTJ 1983, 1989, 1994. ZGNYNJ 1981, 1989, 1994.

of increasing timber product. In addition to the fast-growing forests, 3.3 million hectares of fast-growth trees had been planted in 12 provinces during 1974–78 (CFFA 1979). These trees require only 15 years to reach usable size, and produce about 15 m^3 of timber volume per year. In addition, there was a particularly steep fall in forest volume in Heilongjiang province due to fires in the late 1980s. However, such numbers still do not account for the disappearance of the timber product from the large areas of natural and old growth forests that were replaced by the rising areas of single-species afforestation, shelterbelt, and commercial forests. A large part of this timber may have gone for traditional timber uses, such as paper pulp, light furniture manufacturing, and construction, and was not counted by the roundwood data collection effort of the state statistical systems. Certainly some of these disappearances could be accounted for by illegal extractions, either for village use or for sales on the black market. There are other reports (e.g., Qiao 1997; Zuo 1995) that suggest that due to the high return to non-timber products there is a propensity for farmers to extract timber products and expand orchards and expand non-timber product plantations. Since the current data set cannot answer some these questions about forest land use, we cannot make strong statements about the success or failure of China's efforts to protect forest volume by limiting production. But if forest volume statistics are near to being correct, there is at least some reason for optimism, whatever the mechanism is for increasing forest resources.

5

Land Degradation and Other Rural Environmental Problems

Beyond forest cover problems, China also faces several other environmental problems, some of which may be related to forests. Rapid economic growth has contributed to increasing pressure on the natural resource base. Most scholars agree that environmental stress and natural resource degradation are primarily functions of inappropriate government policy, lack of appropriate property rights, population growth, and poverty. Increased income, lower fertility rates, and more rational property rights have, according to some scholars, led to improvements in the quality of China's rural environment. Further efforts, coupled with effective regulation, can improve resource sustainability and slow the rate of soil erosion, as well as the degradation of land, forest, and groundwater.

The evidence on the development of China's natural resources in this century is ambiguous—and subject to conflicting interpretations. Time-series data on China's land quality show fertility has risen and fallen during the 20th century and generally has not worsened. Other measures suggest that the land resource is improving—controls have continuously reduced the area suffering from salinity and erosion, forested areas have recovered from losses in the 1980s, and prevention measures have reduced the areas subject to floods (table A.7). Dust storms and "mud rains" in Beijing and other northern cities have diminished in frequency following the introduction of forestry shelterbelts. The Yellow River still transports more sediment than any

other river, but silt trapping has reduced the sediment loads from 1.6 billion tons annually before 1960 to 1.2 billion tons subsequently (World Bank 1993). As shown in Chapter 4, national statistics document the increase in forest cover from 12 to 14 percent (18 million hectares) between 1980 and 1995 and the area of nature reserves has tripled in the past decade.

At the same time—in other sectors and according to other measures—China faces a deteriorating environment. Pastures in northwest China and on the Xizang-Qinghai plateau continue to be overgrazed and converted to cultivated lands, although some of the conversions subsequently revert to grassland. Coastal wetlands are drained for agriculture (primarily rice) or converted for aquaculture. Statistics are difficult to find, but desertification is said to be increasing. Much of the reforested area is monocultured; and the drop in natural and old growth forest may signal a decline in biodiversity, wildlife habitats, and other environmental services provided by natural forests.

Technology's relationship to environmental and natural resource degradation also is ambiguous. Using modern mechanized terracing equipment on the Loess Plateau will lead to declining erosion and increased production, and will initiate a positive cycle of rising incomes and environmental improvement. The development of new cold-tolerant varieties of cereals has encouraged their introduction into marginal areas. In many instances, however, technology improves resource use—new crop varieties that incorporate pest resistance will reduce pesticide use. While heavy applications of chemical fertilizers and pesticides have polluted rural water, this probably has been more a function of inadequate farmer education than of the technology itself.

Interpretations of the impact of environmental degradation on growth conflict. Estimates range from 0 to 15 percent of GDP, but the higher estimates are based on gross assumptions and anecdotes rather than on systematic national data analyses. In 1992, the Research Center of Environment and Development, Chinese Academy of Social Science estimated the impact of environmental pollution and ecological degradation on the economy (1992) at Y200 billion, about 7 percent of GDP, and concluded that agriculture suffered about half those losses. An analysis by Xu (1998) determined that GDP losses from ecological destruction were large but declining between 1985 and 1993. A similar study, also for 1992, concluded that pollution and degradation costs were 4 percent of GDP. A study by Yu and an analysis based on data collected by the Ministry of Agriculture found that ecological

losses declined in provinces where economic growth was more rapid and rose in slower-growth provinces in northwest and southwest China. These findings lend credibility to the theory that growth reduces pollution and degradation. Some scholars find no long-term impact on growth.

The State of China's Rural Environment and Resource Base

Little authoritative information exists on the state of China's rural environment and natural resource base. Several studies have been done on various aspects of degradation and the response of various governmental jurisdictions. However, the evidence is fragmented, anecdotal, and based on data of varying degrees of reliability. These problems frequently leave well-intentioned observers confused and faced with conflicting evidence and unclear policy options. In other countries, the World Bank has begun an Environmental Indicators Program, an effort that tries to make a systematic assessment of the available studies, establish in a country what is and is not known about the environment, and make the results known to interested parties.

Soil Erosion and Desertification

An oft-quoted statistic suggests that China loses some five billion tons of soil (including nonagricultural land) to water erosion annually (how this statistic was derived, or by whom, cannot be determined). When sloping or fragile lands are not protected with groundcover, or are cultivated inappropriately, accelerated surface runoff and soil erosion is inevitable. Some 1.53 million km^2 are classified as more than slightly eroded (NEPA and SPC, undated). The most seriously affected areas are the Loess Plateau, the red soils area south of the Yangtze River, the black soils of the northeast plains, and the grasslands of the northwest. While the primary direct effect of erosion is a decline in soil productivity and crop yields, crop area also declines as erosion worsens, although this has not been captured in available statistics. Also, an area of 1.53 million km^2 is classified as desert (*jiang*). Increasing rates of desertification have been reported, suggesting that the annual rate has reached 2,460 km^2 in the 1990s. While the spread of desert lands may be fast, the reported level of desertification is unproven. If the desert were expanding at the rates suggested, all grasslands would have been lost years ago.

A report by the Research Center for Environment and Development found that of all China's natural resource problems, erosion and desertification had the greatest impact on GDP. Subsequent work (Huang and Rozelle 1995) on the effect of erosion on crop yields determined that impact was small, but statistically significant. Had it not been for erosion, China's grain yields would have grown about 5 percent more between 1983 and 1989. Some erosion is natural, and some is caused by inappropriate agricultural/cultivation practices. The Loess Plateau has been eroding for centuries, exacerbated by inappropriate cultivation practices, but most erosion is likely to be the direct result of either pasture overgrazing, inappropriate conversion to cultivated cropland, removal of vegetative cover through deforestation and clearing of marginal lands. Erosion was most serious during the 1950s and 1960s when large-scale forest and pasture conversion was undertaken to meet grain production targets. In recent years, pastureland conversion has diminished and forest conversion has reversed, but large areas have been severely eroded or degraded by cultivation. Erosion control measures had been implemented on almost 700,000 km^2 through 1996.

Grasslands

Converting grassland into cultivated land, together with overstocking and overgrazing, has also contributed to desertification.[5] Agricultural policy, particularly the goal of increased grain production and self-sufficiency, historically has been a driving force behind grassland conversion and destruction. Although precise data series are unavailable to evaluate the severity of grassland degradation and desertification, Li (1998) reports that 30 million hectares of grasslands have been converted to cultivated land, contributing to soil deterioration and desertification. China's Environmental Action Plan (NEPA and SPC, undated) indicates that in addition to the 1.5 million km^2 of desertified land, that 1.3 million km^2 of farmland in northeast, north, and northwest China were vulnerable to wind erosion.

The conversion of grassland to crop land for annual crops in low rainfall areas such as Inner Mongolia often is highly destabilizing, unless the land can be irrigated. Planting perennial fodder crops would provide year-round vegetative cover to limit erosion and provide livestock fodder to reduce the pressure on the remaining natural grazing land. However, grassland is still being brought under cultivation on a large scale. Cultivated land in Inner Mongolia has expanded by 1.0 million hectares since 1990, but the effectively irrigated area has in-

creased by only 0.3 million hectares. However, lower quality cultivated land also is reverting to grassland; in the late 1980s and early 1990s about 100,000 hectares of the annual decline in cultivated land represented grassland reconversions.

Biodiversity

China contains about 10 percent of the world's plants, mammals, birds, reptiles, and amphibians. The giant panda is the most notable of these (box 5.1). However, over the past few decades, increasing population pressures and development activities have eroded the country's biodiversity resources. The combination of a large population and limited land has led to extensive loss of habitats to agricultural and aquacultural production, logging, fuelwood collection, and livestock grazing. The Chinese Academy of Sciences reports that about 200 plant species are believed to have become extinct and an estimated 5,000 species have become endangered in recent years because of human activity.

The government, in recognition of these problems, has significantly strengthened the policy framework for environmental protection in general (see Chapter 7), and for biodiversity in particular. New environmental protection and wildlife conservation laws put into effect in 1989 facilitated development of a comprehensive system of nature reserves, and rationalized categories of protection for endangered wild-

Box 5.1. Giant Pandas and China's Forests

The bamboo forests of southwestern China are home to an estimated 1,200 endangered giant pandas. Bamboo is critical to panda survival because it is the animal's primary food. The forests, however, are subject to population pressures, destruction by human activities (including logging), and periodic die-offs that severely affect the pandas. In consequence, the World Wide Fund for Nature (WWF) estimates that the bamboo forests have shrunk by about 50 percent since the early 1980s to about 11,000 square kilometers.

In an effort to preserve the dwindling population of pandas, China has established 27 reserve areas totaling 11,011 km^2 and estimated to hold about 800 of the animals. The most important of these are the Wolong and Tangjiahe Reserves in Sichuan and the Foping Reserve and Chongqing Forest Bureau area in Shaanxi, which have provided valuable research on the animal and its habitat. Another 14 reserves, covering an area of 3,302 km^2, have been proposed but have yet to be implemented for financial reasons.

In 1989, with WWF assistance, the State Forestry Administration developed a Giant Panda Management Plan. Among other things, it calls for the restoration of panda habitats damaged or destroyed by human activities. The plan also calls for modifications to forestry practices outside the protected areas that will make timber operations sustainable.

Source: WWF and World Conservation Monitoring Centre.

life. China has also become increasingly visible in international efforts. In 1992, China became party to the Convention on Wetlands of International Importance especially as Waterfowl Habitat (the RAMSAR Convention) and the Convention on Biological Diversity in 1993. These policy changes have been accompanied by increased emphasis on sector planning and management. In 1987, China produced a national strategy for nature conservation. A National Environment Protection Action Plan approved in 1994 includes biodiversity objectives and priorities. The State Commission on Environmental Protection approved a Biodiversity Conservation Action Plan in 1994. The plan reviews the present status of biological diversity and conservation efforts in China and sets out a comprehensive program of requirements for investment, policy reform, and technical assistance to strengthen national biodiversity management and conservation.

As in many other countries, biodiversity protection in China has focused on establishing nature reserves. The amount of protected areas has dramatically expanded over the past 10 years. China's 926 nature reserves total some 77 million hectares—7.6 percent of the country's land area. The State Forestry Administration has jurisdiction over two-thirds of the reserves, and the State Environmental Protection Agency, Ministry of Agriculture, State Oceanography Administration, Chinese Academy of Sciences, and other agencies administer the remainder. Despite the government's strong commitment to biodiversity conservation and substantial recent increase in the areas designated as parks and protected areas, staff levels, management budgets, and training and performance standards have not kept pace with reserve expansion. Few areas are protected or managed effectively, and if current trends continue, biological diversity in many critical reserves will diminish dramatically. The main constraint is fiscal resources, which leaves nature reserves with insufficient funds and staff to effectively perform their protection and management responsibilities. Given the prevailing fiscal constraint, reducing the number and area of nature reserves—and improving the management of the remaining reserves—may improve biodiversity protection. This would necessitate a review of the entire nature reserve system to rationalize public holdings.

6

Policy Reforms in China's State and Collective Forest Regions

The trends observed in the study's state, collective, and mixed forest regions differ both because policies toward each of the management groups have differed and because of differences in the way forest managers and users have responded to these measures—or the lack thereof. The policies of the reform period represented a sharp break from the preceding socialist era and were pursued in search of a more effective way to use the sector's resources. This section of the report summarizes the pre-reform policies and reviews the reforms pursued by policymakers since the early 1980s in both the state and collective sectors.

China's pre-reform forest management system relied on command and control to implement the central government's forest sector plan (Ross 1988) and did not rely on prices to create incentives for producers to allocate products efficiently. Timber producers received low prices, retained little of their profits, and were promoted on the basis of their ability to meet production targets. With few positive incentives and tight financial constraints, forest managers undertook few non-harvesting activities such as replanting. Strict control and poor incentives extended beyond the state forest sector to the collectively managed forests, where production plans were determined by local needs and the state's procurement plan. No extra-plan or over-quota markets existed.

Policymakers identified several objectives of reform that would promote efficient use of the sector's resources. They hoped to create a set of

policies that would (a) shift the emphasis from cutting natural forests to afforestation and replanting, (b) diversify the output of the forest sector, and (c) better use the collective sector and reduce the economy's dependency on the output of state-run forest farms (ZGLYNJ, 1992). In keeping with the spirit of the early reforms in the agricultural sector, there were also efforts to liberalize economic activity in the forest sector by eliminating rules that were stifling initiative and effort. Forest leaders pursued these goals by making a clear division of responsibilities over forests between the collective and state sector, and launched a series of measures in each sector to encourage more efficient resource use.

Reforming the State-Run Sector

Despite reform rhetoric, the basic features of the centrally planned forestry industry—production plans, controlled prices, and fixed wage payments to forest managers and workers (instead of profit-sharing schemes)—remained in place throughout most of the early reform period (ZGLYNJ 1987). State forest farms and their managers remained solidly within the state-owned enterprise bureaucracy. Since top-level forest farms and their managers almost never expected to endure long tenures at any given site, their planning horizons were often quite short. Reform officials did promote a farm manager responsibility system to encourage farm officials to use forests more efficiently, and forest farms were given marginally more latitude for investing excess profits. Even in the early 1990s, forest farm management agreements usually cited completion of the logging plan as the most important of the manager's duties. It is likely, therefore, that forest managers-cum-bureaucrats still focused their efforts primarily on meeting annual production plans.

Despite the large degree of continuity, however, there were two significant changes in the incentives facing state managers. A new accounting system effectively removed one of the main constraints for reforestation (Ross 1988),[6] while a revised price structure more accurately reflected the opportunity cost of timber (Li et al. 1987; Rozelle et al. 1993).

Reforming the Collective Sector

Forest officials executed more radical measures in the collective sector, implementing the "three-fixed" policy, which granted more control over forest resources and more responsibility for its management to individuals and village leaders (ZGLYNJ 1987). The first part of the policy clearly delineated what forest land came under collective control as a way of preventing state forest farm managers from claiming forest

resources, a practice that had previously reduced the collective's incentive to invest in and better manage forest resources in the pre-reform years (DDZGDLY 1985). The second part fixed rights of the individuals to output produced on household forest plots assigned by the village (Richardson 1990; Yin 1994). These first two measures, which policy architects believed would induce more efficient harvesting and planting efforts, were monitored by officials in the forest ministry's local branches, whose actions were prescribed in the third part of the policy. Local forest stations were given ultimate responsibility for forest use by allowing officials to limit the quantity of timber products that could be harvested and marketed by collective managers and individuals. Guidelines also were established requiring afforestation efforts in state and collective land by all rural residents.

The lack of a systematic method for imposing these regulations, the weakness of the enforcement mechanisms, and the history of policy uncertainty in the rural sector, however, created an unpredictable environment for new collective forest managers. Although there is no systematic evidence to support such conjectures, many sources report that collective forest managers (both local leaders and individuals) responded by quickly harvesting trees, legally and quasi-legally, taking the opportunity to exploit a resource that was perceived to be only tenuously and perhaps only temporarily under village control (Li et al. 1987; Smil 1984). The suspicion caused initially by a history of policy uncertainty in the agricultural sector during the reform era (Lardy 1983) was exacerbated by a series of rapid land tenure policy changes aimed at preventing indiscriminate felling and denudation and promoting more efficient forest use (DDZGDLY1985). In some areas private mountain lands were taken away from individuals (Menzies and Peluso 1991). In other areas, tenure forms were reassigned several times in the 1980s (Zuo 1994). Some regional authorities invoked various rules prohibiting or circumscribing use of the forest (Rozelle et al. 1993). Policies governing timber markets were equally unpredictable.[7]

Reforms in the Rest of the Economy

In addition to forest-sector policies that undoubtedly had some impact on China's forest resources, economy-wide reforms also affected forest use. One of the most significant effects of the economic reforms was to spur rapid economic growth—which led to large increases in demand for timber, paper, and other forest products. Projections of income and demand growth taken from Richardson (1990) show one

estimate of the fast rise in the economic pressures on forest resources. The general liberalization of prices also meant that prices were now much freer to respond to increasing demand. The price index of timber rose rapidly in the 1980s as controls were removed, exerting further market-based pressure for increased harvesting (although relative to the price of grain, a competing product in some regions, there is less change).

Fiscal reform may have also created changes that led to increased pressure on natural resources in rural areas. In an attempt to control spiraling expenditures and provide an incentive for local leaders to push ahead development in their local areas, the central leadership hardened budget constraints in all counties and most townships in the mid- to late-1980s (Wong, Heady, and Wu 1995). After a fixed tax remission or set subsidy, expenditures in localities depended completely on their revenue earning. While stimulating growth in some areas, the constant pursuit of budget balancing funds may have lead some leaders in resource-rich areas, and particularly in forested areas, to overexploit their endowments to meet current growth and local management goals (Harkness 1998).

7

Rural Environment Protection Policy

China's environmental strategy in rural areas is based on three main policy tools: direct regulation (Ross 1988); targeting and planning cleanup and rectification campaigns; and reliance on state-mandated technological improvement to reduce the adverse consequences of certain production practices (Wu 1987; Sinkule and Ortolano 1995). While noted in the literature (Qu and Li 1984), in practice little use is made of economic incentives to combat environmental deterioration (Sinkule and Ortolano 1995). To implement these largely administrative-based policies, tough regulations and incentive-compatible institutions are essential (Ross 1988; World Bank 1992). This section describes the major laws and institutions that China and its provinces are using to implement environmental policies.

Laws

China has had laws covering economic and environmental concerns for many years. Since its first national conference on the environment in 1973, environmental leaders have worked continuously at creating a series of laws to protect the environment. In 1979, on a trial basis, China promulgated its first Environmental Protection Law (EPL; Wu 1987). Since then, leaders have expanded the law and made it the legal basis for much of China's resource protection work (Smil 1984, contains a translation of the law).

The EPL is at the apex of a hierarchy of laws covering a broad range of issues (World Bank 1992 contains an exhaustive listing of the impor-

tant ones). The EPL defines the general principles underlying the nation's effort to protect the environment and contains general clauses describing overall goals. But it has few specific regulations. Laws to protect specific parts of China's natural resource base were supposed to be created in subsequent years, and in fact, such laws have proliferated. Rules and regulations address elements in nearly all sectors of rural areas that affect the environment either directly or indirectly.

Some of the most strict laws and regulations issued recently by the State Council, for example, pertain to the protection of China's forests. The comprehensive provisions in these laws address such issues as management practices, property rights, and forest protection, as well as strict limitations on any form of exploitation. Recent rules state that timber-cutting quotas are to be established exclusively under the national plan. In theory, this means that the central authorities determine all logging activity in China's forest areas.

Similar laws have been passed for fisheries and pasture lands (Liu, Findlay and Watson 1992). Many of these are targeted at eliminating problems caused by previous policies, including a number of provisions aimed at encouraging soil and water conservation as well as reclaiming wasteland and water areas. In particular, laws have given high priority to speeding up the conversion of marginal farmland back into more sustainable uses (e.g., for forestry or livestock uses).

Policymakers developed one of the newest set of laws to confront the problem of wastes created by township and village enterprises (NEPA 1992). In particular, state council regulators began to prohibit the discharge of toxic and waste materials from such enterprises in 1990. One of the main measures stipulates that sound environmental controls must precede the establishment of the enterprise. Laws also place the responsibility for protecting local resources and the environment on enterprise owners and managers.

China passed its forestry law in 1984 and modified it most recently in April 1998. Two features of the law are of interest from a comparative international perspective: First, the law acknowledges a high degree of decentralization in the management of the forest sector and yet asserts a high degree of central control over forest land issues and over the disposal of forest products, including permits for cutting and transportation of wood aggregated and approved by the central State Council. Second, the law contains relatively little on the need for management plans to ensure sustainable management of forests. The exception, step-by-step felling that is adopted according to different condi-

tions, is mentioned perhaps because the state is in charge of the management of all forests and has now imposed strict bans on logging natural forests.

- The law states that all forest resources belong to the state, except those owned by collectives. Local governments above county level register and certify all forest trees and forest land owned or used by individuals and affirms the related ownership and use rights. The law protects the rights and user rights to forest, wood, and forest lands.
- Forests are classified into five categories: shelter forests; timber forests; economic forests; fuel forests; and forests of national importance for defense, environmental protection, and research.
- The state provides for the protection of farmers' rights and interests, ensures financial support for long-term investments and limits on cuts, provides for funds from coal and paper wood production, establishes a forest fund and a benefit compensation fund, enables the creation of joint ventures, and provides for voluntary tree planting.
- Under the law, local governments have responsibility for organizing forest protection committees and forest rangers, but the state controls the annual cut of forests—for collectives and individuals the annual cut quotas are to be worked out by the county. All consolidated quotas are submitted to the central State Council for approval after being approved by various local governments. The state draws the annual timber production plan not to exceed the approved annual cut, and the State Council stipulates the range of the timber production plan and the annual cut.
- The law extends the need for cutting permits to all trees other than those scattered around houses and on plots retained by families.
- Everyone obtaining a cutting permit is also required to have a transportation permit.
- Mining and prospective activities are to be approved by local governments.

Institutions

The main organ at the central level for managing the environment and overseeing its implementation is the State Environmental Protection Commission. The executive arm of this state council organization is the State Environmental Protection Agency (SEPA), China's main national environmental protection agency. Below SEPA, in all provin-

cial-level administrative regions, there are environmental protection bureaus (EPBs). Each provincial organization also runs its own network of prefectural and county EPBs.

This national environmental protection system is responsible for all the environmental affairs of China. At the central level, the main task is to work out general principles for each sector's policies and set national standards for environmental quality (Wu 1987). The concrete tasks of enforcement and implementation are left to local agencies (Qu and Li 1984).

SEPA, however, has chosen not to claim jurisdiction over many of China's environmental and natural resource problems (World Bank 1992). Interviews with SEPA officials reveal that its leaders have prioritized the nation's problems, and use its limited budget to address only a subset of them. SEPA leaders admit that they have had to leave implementation of many sector-specific environmental policies to the ministries in charge of the respective systems. In particular, SEPA has decided not to become directly involved with most rural natural resource and environmental problems, though in recent years they have begun to take an interest in reclaiming jurisdiction over the management of some natural resources, such as those in nature reserves.

To carry out these protection tasks, each ministry has established its own environmental management hierarchy. For example, Ministry of Agriculture (MOA) officials have given responsibility for implementing township and village enterprise wastewater control and solid waste disposal policies to its Environmental Protection and Rural Energy Division. The Bureau of Fisheries (in the MOA) has jurisdiction over water resources in most rural freshwater lakes and rivers. State Forestry Administration officials have set up a division of environmental protection and nature conservation to watch over the protection effort in the nation's forests. There are also environmental protection divisions in the State Oceanographic Administration, the State Meteorological Administration, and others.

The implementation path for all measures typically pass through the lower levels of the administrative hierarchies (provinces, counties, townships), creating a three-tiered Agro-Environmental Protection System (AEPS).[8] At the top of the system is the provincial AEPS station, an office that has been set up under the Bureau of Agriculture in the provincial capital. In Wuhan, the provincial capital of Hubei, for example, the station had 15 full-time professionals (in 1990) working in four divisions: Policy and Management; Monitoring; Extension; and Admin-

istration. The tasks of these four divisions are described more fully in Rozelle and Jiang (1993).

In the provincial system, most counties have established AEPS offices. For example, 78 percent of Hubei's 80 counties had created county-level protection stations by the early 1990s. Approximately 300 full-time professionals worked in Hubei's 60 county-level stations. Although, some counties did not set up protection stations, other counties built strong, committed networks to address rural environmental problems. Provincial officials in Hubei have identified 10 to 15 county AEPS offices as "strong and deserving the study of others." These "model" stations have an average staffing level of about 20 professionals. Each AEPS is also divided into four divisions, each with the same responsibilities as their provincial counterparts.

At the lowest rung of the implementation ladder, the township, an agro-environmental specialist typically is in charge of executing environmental rules and regulations. These technicians belong to the agricultural technical stations, which act as the representative offices of the provincial agricultural bureau in nearly every township in China. In Hubei in the early 1990s, there were more than 1,200 so-designated personnel at the township level (located mainly in the 60 counties that have AEPS offices). Their work commonly includes: passing on information of new environmental regulations and policies; enforcing new laws and regulations; and periodically monitoring selected resource bases (e.g., critical water sources, soils, and grain and other agricultural products).

Environmental Policy Implementation Problems in China

The array of new regulations in China is designed to provide policy implementation guidance to leaders in specific sectors. The expanded set of laws also is supposed to give more substance to the EPL. While China's environmental legal framework is impressive in scope, many observers have criticized it. The laws are vague (He 1990; Smil 1984, 1993), and lack mechanisms to facilitate enforcement (World Bank 1992; Ma 1997). The laws in many of the sectors lack coordination (Qu and Li, 1984). Final ordinances do not contain specific standards, fine schedules, or other provisions to facilitate monitoring and enforcement (Sinkule and Ortolano 1995; Ma 1997). Wu (1987) and Qu and Li (1984) conclude that since most of China's environmental laws lack substance, effective environmental control relies on the efforts of those charged with its implementation.

Relying on this type of system to protect China's rural environment, however, means that the effectiveness of the entire rural branch of China's institutional structure is suspect, and many questions remain regarding its long-term efficacy. First, if Hubei is a model province and its implementation network is still as weak as provincial authorities admit, what are other provinces like? The answer, according to interviews with MOA personnel and Hubei provincial officials (who have been consulted by interested officials in other provinces), is that some are satisfactory; others are poor or nearly nonexistent.

Second, how well trained are China's environmental protection professionals? Sinkule and Ortolano (1995), and Ma (1997) find that poor training of environmental officials is one the biggest obstacles to more effective implementation of environmental rules and regulations in the much better funded and more experienced urban and industrial networks. The level of training of their rural, local counterparts is certainly even lower and often inappropriate. In most townships and counties, personnel at the agricultural technical station at most have a background in agronomy or agricultural management. Most have only high school-level technical training. Even if the leadership were fully behind these policies, such a staff would have difficulty organizing and carrying out systematic monitoring and enforcement.

Finally, one of the biggest questions involves the level of commitment of local leaders to seriously addressing environmental concerns. Under the current system, there is no independent watchdog agency. Production-oriented bureaus and agencies have obvious conflicts of interests. And sectoral leaders have an incentive to implement protection efforts less strictly. Such production-protection frictions become more visible closer to the local level, where output and income growth come into the most direct conflict with environmental concerns. Even better laws and a more committed and better-funded and -trained central environmental protection agency most likely could not overcome the weaknesses of the system that breaks down at this phase of the implementation process.

Why would anyone expect local officials to actively push environmental rules and regulations? Local leaders, who have both environmental and production responsibilities, have no incentive to increase the weight of protection goals in their decisionmaking calculus. Indeed, it is difficult to blame local officials, since they face demanding production targets that offer monetary and promotion bonuses when completed and penalties when not (Rozelle 1994). Unlike production targets, there are almost no rewards or punishments explicitly tied to suc-

cess or failure in executing environmental laws. If there is a tradeoff between production and the environment, the rational official can be expected to sacrifice environmental goals, or even make decisions that lead to greater environmental degradation, to meet production targets. Given this system, China's rural environmental protection efforts should be expected to be ineffective, since they have, in effect, put production officials in charge of environmental protection in many cases.

In fact, interviews with local officials (in two different surveys) reveal that the awareness of the most important problems in rural environment is quite low. In a set of interviews with 72 local leaders in Jiangsu and Hubei regarding their goals as local leaders (reported in Rozelle and Boisvert 1994), only two mentioned protection of the community's resource base among their decisionmaking criteria. A survey of participants in an MOA-sponsored conference on sustainable agriculture and rural development found that over half failed to explicitly tie together issues of sustainability and obvious actions needed to protect the county's resource base (e.g., that afforestation may positively affect yields and aquatic output through its impact on reducing erosion, increasing moisture retention, and local climate control).[9] In almost every annual report from 16 model county rural environmental protection chiefs interviewed, "sustainability" was described as a state in which the economy grows rapidly year after year.

Fiscal Environment

The extreme decentralization of China's fiscal system and the inadequate fiscal resources that the reforms have provided for local governments, especially in poor, rural areas, are the most serious constraint to environmental and natural resource protection. The government allocates minimal financial resources to environmental protection and natural resource conservation, and only a small portion of that is directed to the rural environment, primarily for forest protection. While real expenditures for environmental protection increased modestly during the 1990s, relative expenditures declined (table 7.1).

Fiscal constraints have led to inaction and conflicts of interest. Staffing resources are modest, and local bureaus often have only part-time and inadequately trained staff to implement and enforce anti-degradation policies. Localities largely must invest in and staff their own systems. Since one-quarter of the counties have no local SEPA offices, and many have only poorly trained staff members, the answer is obviously that they do not. According to interviews with Hubei officials in the

Table 7.1. National Investment in Environmental Protection, 1991–95

Year	Investments: Current yuan (billion)	Investments: 1990 yuan (billion)	Percentage of: GNP	Percentage of: Budgetary expenditures	Percentage of: Total expenditures [a]
1991	17	19	0.81	5.0	—
1992	21	16	0.75	5.6	—
1993	27	17	0.68	5.8	4.4
1994	31	17	0.63	5.4	4.0
1995	35	19	0.57	5.1	3.8

a, Includes extrabudgetary expenditures.
Sources: China Environmental Yearbook, 1997; and China Statistical Yearbook, 1996.

early 1990s, the worst county offices or the ones without an office are frequently the poorest counties, even though some of their poverty-stricken areas are known to be suffering from serious environmental problems. Of those Hubei counties that do have offices, each unit, on average, has only four full-time staff members. These four people must implement all laws, rules, and regulations in all of the rural subsectors in areas that contain approximately 500,000 rural residents (the average rural population of a county in China).

Within the constrained fiscal atmosphere, local leaders frequently give resource control rights to the agencies responsible for protecting resources, which are then encouraged to use those rights to generate income for staff salaries and other expenses. This can easily induce agency officials to exploit the very resource they are charged with protecting. And, these fiscal limitations and responses can have severe consequences for the rural environment. For example, officials charged with protecting the nature reserves are provided insufficient budgets to implement their responsibilities and often encouraged to use the reserve's assets to generate the required income. Harkness (1998) reports that a nationwide audit by the Ministry of Forestry (now the State Forestry Administration) and the World Wide Fund for Nature (WWF) found that these types of actions had left several nature reserves devoid of biodiversity. The system lacks an independent monitoring or oversight agency to resolve growth and environmental conflicts.

8

Land Tenure and Forests—Evidence from China's Villages

The impact of tenure on investment in forests and the protection of its resources is among the most debated issues in China. The debate focuses on whether the reforms of the 1980s that gave control of forest land in a number of villages to farm households led to positive or negative outcomes for forest management.

While the collective sector has had relatively superior performance in comparison with the state-run sector (see Chapter 5), the mechanism by which such gains were made cannot be clearly uncovered with aggregate data of the type used in previous studies. The collective sector is itself made up of different actors, most particularly, the collective and individual households. To understand the reforms inside the collective sector, especially those measures that bestowed forest land use and income rights on farmers, Huang, Rozelle, and Qiao (1998) undertook a study to review the evolution of forest land tenure reform, examine the impacts of forest land tenure reform on resource use and forest development, and clarify the debate on how forest land tenure reform should proceed in China in the future (see box 8.1). To meet these goals, the study provided empirical information from a unique set of data to examine the institutional changes in China's forest land tenure system and their impacts on land use patterns and forest structure.

Box 8.1. Methodology of the Village Land Tenure Study

To describe the changes in the forest land tenure reform process and to test the above alternative hypotheses on the impacts of forest land reform on the patterns of forest production and land use, Qiao, Huang, and Rozelle conducted an intensive village-level survey in Yunnan province in 1996. A total of 28 villages were randomly drawn from a random selection of seven counties. The survey was conducted plot by plot based on the land tenure status and land use pattern. Information on the land use pattern and the land tenure system in each plot are available for 1995, 1988, the first year the village started the forest household responsibility system (ranging from 1982 to 1986), and 1975 (pre-reform period).

Since issues of household resource allocation across all household income activity choices are inseparable from understanding how incentives in one sector affect investment in that sector, the study also collected information on investments in agriculture and the availability of off-farm jobs. These data were used to control for the productivity and opportunity in the rural economy's other major sectors, farming and off-farm employment. With such information, it was then possible to test hypotheses about the interaction between farm investments, off-farm wage levels, and forest resource management.

General Findings

As discussed in Chapter 5, after the household responsibility system (HRS) reforms were initiated in agriculture in the late 1970s, China started a similar reform of forest land tenure in the early 1980s (FHRS). The reform followed a path similar to that implemented in the agricultural sector—it was gradual and focused primarily on income rights, and only slowly loosened control rights. The reforms to the marketing system and price changes followed in subsequent years. In the regions where the collective owned the forest, the forest land was gradually distributed to farmers through a contract system, called the forest responsibility system. Although there was great geographic heterogeneity, often there was some distribution rule, based on some indicator such as family population and labor.

While the reform had been implemented gradually in the first two years, it was halted and a series of retrenchment policies were adopted nationwide in 1984–85. In the most forested regions, forest land reform was discontinued. In some villages, the village government even took back the land that had been distributed to farmers in the early 1980s. After reaching its historical high of 55 percent in 1983 (table A.8), the share of the forest land allocated to farmers declined to 52 percent by 1988.

Changes in Forest Land Tenure

The data show that in the sample areas there was great differences in the pace and extent of the reforms carried out. Nine out of 28 villages initiated forest land reform in 1982. Village leaders allocated 269 hect-

ares of collectively owned forest land to farmers (including both private plots and responsibility for forest land), accounting for 30 percent of the total forest land of these 9 villages. This initial reform then was rapidly expanded to other villages in the province. The share of collectively managed forest land declined from 94 percent in 1982 to 45 hectares in 1983 (table A.8). After it reached the highest level by 1983, the share of non-collectively run forest land has declined thereafter. These trends in the sample villages are very similar to those observed in at the provincial and national levels.

However, with more careful disaggregation of the data, there is no evidence of a positive linkage between FHRS and forest coverage (or deforestation) in the sample villages. Table A.9 shows that forest area has continued to increase in the sample villages. The data also show that these trends continue over the period when the farmers were accused of launching a widespread tree-cutting campaign.

Population Growth and Changes in Agricultural Production

Besides the impact of the FHRS, the data were also used to examine the linkages between population pressure and deforestation and between agricultural expansion and deforestation. The literature has often assumed that population growth and intensification of agriculture would lead to a decline in forest resources (Otsuka 1997). Population in the villages grew from 5,068 in 1975 to 7,666 in 1995, more than a 50 percent increase during last 20 years with an annual increase of 2.09 percent (table A.10). The rise in the village population certainly put pressure on the local supply of food. As a result, the area of cultivated land in the villages rose from 1,185 hectares to 1,307 hectares (an expansion of about 10 percent) during the past 20 years. Because of the limited resource endowment, the expansion of agricultural land has been generally lower than the population growth. If the productivity gains from the technology change cannot keep up with the rise in food demand, the decline in the per capita cultivated land could put more pressure on the local food supply. In most forest regions, the expansion of agricultural land likely means the decline in the forest land (through either deforestation or reclaiming new land from the waste forest land).

Table A.10 also indicates that the share of irrigated land as a portion of the total cultivated land has declined gradually. The proportion of land irrigated fell from 41 percent in 1975 to 37 percent in 1995. This drop could reflect either deterioration of China's irrigation facilities or an increase in newly expanded agricultural land that is not easily irrigated.

According to many studies (e.g., Otsuka), population pressure and expansion of agricultural land should have a negative impact on forest area and forest cover. Building on these results it is possible to hypothesize that population pressures should negatively affect forest area and that any activity that reduces this pressure should aid the conservation of forest land. A negative relationship between investment in agriculture and forest area might also be expected.

Shifting the Structure of Forest Land Use

Somewhat unexpectedly, although agricultural land increased in the sample villages, the forest did not decline. On average, timber land remained near its early 1980s level throughout the reform period (2,981 ha in 1980 and 2,961 ha in 1996). In fact, closer examination of the data found that unused wasteland was used for most of the agricultural expansion. Wasteland dropped from 16 percent to 10 percent of village land.

But that does not mean the forest did not change. In fact, the structure of the forest changed significantly (table A.11). For example, there was a decline in old growth natural forests, from 28 percent to 25 percent. Plantations, monoculture forests rose sharply, from 39 to 43 percent of forest area. Most significantly, forests producing non-timber products expanded from less than 1 percent in the 1970s to 5.2 percent in 1996, with most of the growth coming since the early 1990s.

Land Tenure and Afforestation

Interestingly, the descriptive data clearly show that afforestation and change in forest use patterns vary significantly by forest tenure type (tables A.12 and A.13). In general, the increase in timber plantations and non-timber product forests have increased fastest on FHRS forest plots and private forest plots. Likewise, afforestation effort is greatest on FHRS and private plots. At the same time, collective plots experienced a sharp fall in timber area. Descriptive statistics show that within the non-state sector (at least in this sample), increases in forest area happen most frequently when individuals have more control and income rights.

Results of Multivariate Analysis

Most importantly, the study finds that the land tenure system influences both land use pattern and the forest structure in China's Southern forest region (Annex H). The signs of the parameters on the forest land

tenure, *PRIVATE*, *CONTACT*, and *ZYEAR* variables have expected signs in nearly every case and about half of the estimated parameters are statistically significant at 5 percent level. First, the positive and statistically significant coefficients on the *PRIVATE* and *CONTRACT* variables in the non-timber product forest equation reflect the expected increase in non-timber product forest if the management of collective-owned forest shifts to a more secured management system, such as in the forms of private plot or contract (and FHRS) system, holding the effect of other variables constant. Second, the forest land tenure reform in the early 1980s also had a significant impact on allocating land to agricultural use. The negative and statistically significant coefficients on the *PRIVATE* and *CONTRACT* variables in the cultivated land equation indicate that the reform on the forest land tenure has been able to reduce the speed of agricultural expansion resulting mainly from the continuing growth in the population and depleting agricultural production conditions, such as deteriorating irrigation systems in the forest region in China.

The positive and significant sign on the irrigation variable in many equations also shows the important linkages between investments in agriculture and forest use. In contrast to some earlier studies, but similar to results found at the national level (see Chapter 1) and results found in other country studies, investment in agriculture may indeed lead to positive benefits for forests. If investments were in the form of increasing irrigated area, the higher productivity of the land may help reduce pressure on marginal lands, allowing farmers to grow more on the current cultivated land base and allowing them the luxury of investing in long-term, but higher-valued plantation and non-timber product forests. Similarly, the sign on the population variable shows the importance of finding outlets for land and people to move out of poor, forested area. In areas where migration was high and populations fell, forest area rose. Accounting for these externalities in cost-benefit analyses when developing projects that promote agricultural intensification and migration-oriented projects may raise the prominence of such projects, which may have a positive influence on China's forests. A similar analysis was carried out to explain forest cover in general (table A.14), and the findings were similar.

PART II: INFLUENCE AND IMPACT OF THE WORLD BANK

9

The Bank Portfolio in China

The World Bank has made a huge investment in the forest sector in China: between 1980 and 1998, the Bank approved US$954 million of forest sector credits for China (table 9.1). Add to that the projects started and those that will begin soon (including GEF grant activity), and the Bank has invested more than US$1 billion in China's forests (table A.15). The volume of this effort is large even for China, the Bank's largest borrower, and demonstrates the emphasis that the Bank has placed on the forest sector.

Portfolio Analysis

The analysis in this section compares the World Bank lending portfolio for China in two eight-year periods, the period before the forest strategy (1984–91) and the period after the strategy (1992–99). This exercise was done for each of the six case studies to discern whether there has been any significant change in the pattern of Bank lending since the forest strategy became effective.

Before 1991, the Bank financed 85 projects with commitments of US$9.9 billion, making China the fifth-largest borrower, with 6.7 percent of the total Bank lending. Thirty percent of these commitments were allocated to 25 projects in the agriculture sector. The transportation sector had 17 projects for approximately 22 percent of the total lending. The industrial sector had eight projects and about 11 percent of the total lending. The three sectors combined accounted for almost two-thirds of the Bank's total lending in this period (see table A.19).

Table 9.1. Agriculture and the Forest Sector in the Bank's China Portfolio, 1993–98

Credit type	Number of credits	Total (US$M)	Percent of total/sector
Total portfolio	200	30,956	100
Agriculture sector	51	8,108	26
Irrigation	16	2,998	37
Agro-industrialization	6	1,390	17
Forestry	6	954	12
Fisheries	3	322	4
Other agriculture	20	2,444	30

Source: World Bank OED database.

After 1991, Bank lending to China increased by 123 percent, to 125 projects with commitments of US$22 billion, making China the largest borrower, with 11.7 percent of the total Bank lending. The commitments to the agriculture sector increased by 79 percent, to 28 projects and US$5.4 billion. Lending to the transportation sector increased by 172 percent, to 27 projects with commitments of US$5.9 billion. Compared to the pre-1991 period, when there were no environment sector projects, the post-1991 period had 13 projects with total commitments of US$1.7 billion. Lending to the energy sector increased by 349 percent, to 16 projects and commitments of US$4.6 billion (see table A.19).

Adjustment operations have been rare in China. A single adjustment loan, with a commitment of US$300 million, was made during the 1984–91 period. None have been made since (see table A.20).

Analysis of the lending by primary program objectives shows that before 1991, 51 percent of the projects concentrated on environmentally sustainable development. Poverty reduction and human resource development were the primary objectives of 19 projects, or 21 percent of the total commitments. Private sector development was the primary goal of only eight projects for 15 percent of the total commitments. Ten projects, 13 percent of the total commitments, had economic management as a main objective (see table A.21).

The trend continued after 1991 with 53 percent of the total projects focusing on environmentally sustainable development. Poverty reduction and human resource development were major objectives of 36 projects, or 22 percent of the total commitments. Economic management was the primary objective of 17 projects and 8 percent of the total commitments (table A.21).

Forest and Forest Component Projects in China

Over the entire 16-year span of the two periods examined, the Bank financed a total of 75 forest projects in the world with total commitments of US$3.4 billion. Before 1991, 41 forest projects with total commitments of US$1.68 billion were financed. These include three forest projects in China for a total commitment of US$404 million, about 4 percent of the overall lending to China. The Bank's forest projects in China as a percentage of total forest projects was 7 percent, reflecting 24 percent of the commitments.

After 1991, the Bank approved three projects for a total commitment of US$550 million, a 36 percent increase in forest lending. However, forest lending constituted less than 3 percent of the overall commitments to China. During the same period, the Bank financed a total of 34 forest projects with commitments of US$1.72 billion, of which China received 32 percent of the commitments and 9 percent of the projects (table A.27).

In addition to the forest projects, there are numerous non-forest projects with forest components. These "forest component projects" are generally in other subsectors of agriculture, environment, and natural resource management.

Before 1991, the Bank financed 32 forest component operations with total project commitments of US$1.94 billion of which US$291 million was for forest-specific activities. China had two such projects with total project commitments of US$152 million and only US$6 million allocated for forest-specific activities.

After 1991, the number of forest component projects substantially increased to 94 projects with total project commitments of US$6.2 billion, of which US$1.79 billion was related to forest activities. This increase is also reflected in the China program, which had 15 component projects with total project commitments of US$2.57 billion, out of which US$305 million was for forest-specific activities (table A.28).

Quality Assurance Group Ratings for China Projects

The Quality Assurance Group (QAG) maintains a database of all active projects that identifies the risk level of the projects. The rating has three levels: actually at risk, potentially at risk, and not at risk. A project's rating is based on current supervision reports, which indicate project performance based on such "flags" as effectiveness delays, compliance with legal covenants, management performance, availability of

counterpart funds, procurement progress, environment/resettlement problems, slow disbursements, history of past problems, risky country, risky subsector, and economic management problems.

As of June 1999, China had 106 active projects with total commitments of US$18.8 billion. Of these, QAG rates 97 projects—92 percent of the total projects and 94 percent of the total commitments—as not at risk (table A.25). Six projects (one project each in the environment; industry; oil and gas; public sector management; population, health, and nutrition, and urban development sectors) with commitments of US$807 million are rated as actual problem projects. Only three projects (in the agriculture; population, health, and nutrition; and social protection sectors) with commitments of US$245 million are rated as potential problem projects. The only significant flags in the overall portfolio are slow disbursements, and procurement progress.

Agriculture Project Ratings

The agriculture sector has 25 active operations with commitments of US$5.0 billion. The performance of the agriculture sector is slightly better than the overall portfolio performance, given that 24 projects are rated as not at risk—96 percent of the projects and 98 percent of the total commitments. Only one is rated as a potential problem project with commitments of US$115 million. The only significant flag is procurement progress.

Forest and Forest Component Project Ratings

All three active forest projects in China with net commitments of US$410 million are rated as not at risk. Further, all 12 active forest component projects with net commitments of US$2.1 billion are also rated as not at risk.

Operations Evaluation Department Ratings for China Projects

OED has evaluated 76 projects in China that exited the portfolio between 1992 and 1998 on their outcome, sustainability, institutional development impact, bank performance (project identification, project appraisal, and project supervision) and borrower performance (project preparation, project implementation, and project compliance). These projects had net commitments of US$7.6 billion (1996 dollars).

The outcome of 67 projects was satisfactory (88 percent of the total projects and 90 percent of the total commitments). Sustainability was rated as likely for 60 projects (79 percent of the projects and 82 percent

of the total commitments). Institutional development impact was considered substantial for 37 projects (49 percent of the projects and 48 percent of the total commitments). The ratings for all OED evaluated projects by sector and subsector are presented in tables A.22–A.24.

Bank performance was rated as satisfactory for 71 projects (93 percent of the projects and 89 percent of the commitments). Project appraisal was satisfactory for 60 projects (79 percent of the projects and 82 percent of commitments). Project supervision was rated satisfactory for 63 projects (83 percent of the projects and 82 percent of the total commitments).

Borrower performance was satisfactory for 66 projects (87 percent of the projects and 90 percent of the total commitments). Project implementation was satisfactory for 60 projects (79 percent of the projects and 82 percent of the total commitments). Finally, project compliance was found satisfactory for 61 projects (80 percent of the projects and total commitments).

Agriculture Sector Operations

The outcome and sustainability ratings for the lending operations in the agriculture sector are slightly above those for the entire portfolio; the institutional development impact ratings are well above the ratings for the portfolio. Nineteen operations with commitments of US$1.2 billion were evaluated in the agriculture sector. The outcome of 18 projects was rated satisfactory (95 percent of the projects and 92 percent of the commitments). The sustainability rating was likely for 16 projects (84 percent of the projects and 75 percent of commitments). The institutional development impact was rated substantial for nine projects (47 percent of the projects and 38 percent of the commitments).

Bank performance on project identification was satisfactory for all 19 projects. Project appraisal was found satisfactory for 15 projects (79 percent of the projects and 68 percent of the commitments). Project supervision was rated satisfactory for 18 projects (95 percent of the projects and 94 percent of commitments). The project identification and supervision ratings in the agriculture sector projects are slightly better than the ratings for the entire portfolio, but project appraisal ratings are comparable.

Borrower performance on project preparation was deemed satisfactory for 14 operations (74 percent of the projects and 56 percent of the commitments). Project implementation was satisfactory for 17 projects (89 percent of the projects and 93 percent of the commitments). Project

compliance was considered satisfactory for 15 projects (79 percent of the projects and 72 percent of the commitments). The project preparation and compliance ratings for the agriculture projects were lower than the ratings for the entire portfolio, but project implementation ratings were higher.

Forest Sector Operations

OED has evaluated 3 forest operations with commitments of US$191 million. The outcome of all of these projects was rated as satisfactory. Sustainability was rated as likely for two projects (67 percent of the projects and 51 percent of the commitments). Institutional development impact was rated as substantial for two of the projects. It is difficult to compare the percentage of forest project ratings with those of the agriculture sector or the overall portfolio since the number of projects in evaluated projects is very small. Bank performance on project identification and project supervision was rated as satisfactory for all 3 projects. Project appraisal was rated as satisfactory for two of the projects. Borrower performance was rated as satisfactory for all three projects.

Operations with Forest Components

OED has evaluated three forest component projects in China with net commitments of US$202 million. The outcome of all of these projects was satisfactory and sustainability was rated as likely. Institutional development impact for two of these projects was rated as substantial. Bank performance in identification and supervision was satisfactory for all three projects, whereas Bank appraisal was satisfactory for two projects. Borrower performance on implementation and compliance was satisfactory for all three projects and project preparation was satisfactory for two of the three projects.

Non-Lending Activities

The Bank has produced two full Country Assistance Strategies (CASs) for China, the first in 1995, the second in 1997. In the first CAS, the forest sector analysis emphasized support to China's sustainable growth efforts, with specific attention to poverty reduction and the equitable distribution of income between urban and rural areas. The more recent CAS gives special attention to poverty alleviation in poor areas and to better utilization of marginal agricultural land through sustainable technologies and practices, including the re-

forestation of denuded upland areas and the preservation of forest reserves and biodiversity.

The Bank has produced 45 economic reports and six agricultural sector reports on China since 1991. None of the sector reports were specific to forests. In all of this work—including a five-part economic report produced for the 1997 annual meetings of the World Bank and International Monetary Fund in Hong Kong—the Bank has emphasized poverty alleviation and the environment. The most recent sector report,[10] which included a small section on natural resource management, was rated among the best pieces of agricultural sector work by the 1999 OED study "Rural Development: From Vision to Action?" Absent any major study of the forest sector, however, the East Asia and Pacific Region of the World Bank considers the present study the most comprehensive recent review of the forest sector and associated Bank operations in China.[11]

The principle reason that the Bank has done no sector work on the forest sector is that the lending program, as will be evident from the discussion that follows, has been largely driven by the needs of the sector as perceived by the Government of China. In view of the Government of China and the Bank officials, forest sector work was a low priority because of the perceived relative health of the forest sector policy framework. Given the limited resources available for economic sector work (ESW) and the need for analytical work on other pressing issues such as rural development, poverty, grain marketing, and agricultural research, the Bank made a decision to let other donors like the FAO and the Ford Foundation take the lead in the forest sector analytical work. However, in some cases there was significant dialogue between the Bank and the Ministry of Forestry. Early drafts of the appraisal report for the Forest Resource Development and Protection project identify several important policy issues. Internal documents show that the Bank wanted studies done on the information available to the private sector so that a more conducive environment for the private sector could be created through improved market intelligence. Government officials, however, resisted and the final appraisal report includes only timid activities and even those were cancelled during the project.

Forest Sector Projects Before 1991

China has approved and implemented or is in the process of implementing six forest sector projects since the early 1980s. Three of those

projects preceded the 1991 forest strategy and three came after. Since the mid-1990s, Bank managers have also helped China apply for one GEF grant and are in the process of negotiating a new loan. Following is a brief description of each project.

Forestry Development Project (FDP, Cr. 1605-CHA)

The first Bank-supported forestry project in China, a credit of US$47.8 million, was approved in June 1985 and closed in December 1991. The objectives of the project were to accelerate afforestation and improve management of existing forests in the provinces of Guangdong, Heilongjiang, and Sichuan. The project was also to support strengthening of four research institutions, 10 extension centers, and several medium-sized wood processing facilities, and related research and extension activities.

The project exceeded all of its physical targets and an OED audit concluded that the project's overall returns—ERR of 38 percent and FRR of 20 percent—were high, although they were below the appraisal estimates of 56 percent and 27 percent, respectively.

Although the project achieved its targets, weaknesses that emerged during implementation affected its overall economic impact. First, the project was not designed to promote technology transfers. It perpetuated traditional afforestation practices and therefore did not optimize yields and returns for the plantation program. Second, the project financed thinning and harvesting in natural forest areas without any provisions for assessment of natural forest resources or the preparation of forest management plans. Consequently, the project financed selective felling in 10,000 ha of indigenous woodlands at the Hongya Forest Farm in Shicha, habitat for the giant pandas. These activities were suspended once the WWF brought it to the attention of the Bank in 1990. Third, wood processing facilities encountered severe difficulties due to the shortage of funds, deficient plant and equipment design standards, and procurement delays, and capacity utilization was low due to inadequately trained staff, inexperienced managers, and a decline in demand for wood products. The wood processing facilities were not successful and raised questions about the government's indirect subsidies, which increased costs and reduced efficiency of the state sector. Fourth, technical assistance for the research institutions encountered implementation problems that slowed research and extension, necessitating two extensions of the project beyond the credit closing date (World Bank sources).

Daxinganling Forest Fire Rehabilitation Project (Cr. 1918-CHA)

This project, approved in June 1988 and closed in March 1994, was an emergency operation in response to massive forest fires in 1987. The project consisted of a credit of US$41.1 million and had three objectives: salvage the wood from trees destroyed by the fires, introduce improved fire detection and control systems, and regenerate the forest.

The salvage operation was highly successful. The sale of burned timber generated yuan 2.6 billion in gross revenues and yuan 880 million in pretax profits, leading to a financial rate of return of over 200 percent. The ERR was also over 200 percent. The fire protection component dramatically reduced the fire losses. The regeneration component, however, was less than satisfactory as newly planted seedlings did not grow as well as expected. Project design had focused on timber salvage and did not systematically address the more complicated technical and economic issues regarding regeneration. This component of the project suffered technology development deficiencies similar to those of the Forestry Development Project (inefficient afforestation methods, low-grade genetic material, and problems with extension services).

The implementation of the first two projects overlapped and had implementation experiences that reinforced several lessons (World Bank sources):

- The importance of new technology development, new species, improved planting material, more efficient silvicultural practices, and lower stocking densities to improve productivity. Particularly important was the need to improve linkages between research and plantation management.
- The need to assess and manage natural forest resources, calling for the development of comprehensive provincial forest management plans
- The importance of assessing the financial viability of the wood processing investments and the importance of deepening the state enterprise reform measures in the wood processing sector, particularly the elimination of subsidies, development of restructuring programs, and plant closings as appropriate
- The need to strengthen ministry-level institutional capacity for economic and financial analysis, particularly in the evaluation of cost-effective afforestation techniques and new factory investments
- The importance of developing detailed environmental management guidelines for project implementation to avoid problems such as excessive reliance on toxic pesticides.

The lessons, knowledge, and trust developed during the two initial projects laid the foundations for the National Afforestation Project.

The National Afforestation Project (Cr. 2145-CHA)

The NAP was approved on March 1990 for US$230 million and closed in December 1997, one year after the date originally planned. An important objective of the project was to expand forest resources by establishing intensively managed forest stands on 985,000 hectares in 16 provinces. NAP was designed to incorporate many of the lessons learned in the previous two projects by seeking to improve the quality of forest plantations through the use of superior planting stock and by disseminating superior techniques of plantation establishment and intensive management; strengthening research and extension programs that support plantation forestry; beginning an accelerated breeding program to increase the productivity of planting stock within two to three years; and creating an organizational and managerial infrastructure to plan, appraise, finance, implement, and evaluate plantation programs.

The project was highly successful. It exceeded its physical objectives and goals for afforestation with an ERR of 23.5 percent and an FRR of 21.7 percent—higher than in the project appraisal report. The area planted was 1,385,000 ha, 40 percent more than planned. It established an efficient administrative system within the provincial and county forestry bureaus, training thousands of extension workers on NAP's silviculture methods and fostering the creation of 4,000 new non-state commercial forestry enterprises.

NAP made several important environmental contributions, one of which was to assist the government in achieving sustainable increases in timber supply. Up to that time, China's growing wood needs were being met by unsustainable cutting of natural areas. The project promoted planting in hilly lands, most of which were highly degraded. These projects produce economic and environmental gains with little or no environmental losses. While poverty alleviation was not a specific objective, the project significantly raised the incomes of 12 million people. Noteworthy is that 72 percent of the project plantations are collective, township, or country shareholding entities (as distinct from state farms). Farmers will get 20 to 80 percent of after-tax wood revenues (NAP ICR 1998). The research component focused on the project-related tree species and developed improved genetic material, although it was not fully disseminated.

Forest Sector Projects Since 1991

Forest Resource Development and Protection Project (Cr. 3557)

The FRDP, approved in 1994, was designed to enhance the productivity of forest sector resources; the efficiency of resources use; and the institutional capacity for sustainable management of plantations, watershed protection forests, and nature reserves. The components of the project are as follows: (1) Intensive Management of Plantations was to establish 620,000 hectares of trees on barren or degraded land in 16 provinces and produce the 2.1 billion seedlings required under the project; (2) Planting Stock Development and Nursery Management was to raise the quality of planting materials through the introduction of improved genetic material and nursery management technologies; (3) Multiple-Use Protection Forest was to establish 280,000 hectares of watershed protection forests in the middle and upper reaches of the Yangtze River; and (4) Research and Technology Transfer was to strengthen the operational focus of research and extension through technical assistance and operating support for 11 priority research programs, demonstration plantations, and extension activities.

This project also includes two innovative components. Nature Reserves Management was meant to enhance biodiversity conservation through support for new management programs in five nature reserves; improved management of natural forest habitats for giant pandas and other endangered species; and development of new training, research, and information management programs. A GEF grant of US$17.8 million was requested to finance this component. The second set of innovations included three policy studies (options to rationalize the market, options to restructure state-owned wood processing factories, and price reforms to complete transition to a market economy) and the development of a new private sector investment promotion agency. The project appraisal report considers and refers to environmental safeguards, and the project includes erosion prevention, integrated pest management, and species diversity in planted forest. A nature reserve component was also originally included, but later was removed and made a separate GEF component.

The Staff Appraisal Report (SAR) does not indicate land tenure or management institutions that will be applied in the plantations and watershed protection, nor does it specify the previous uses of project lands. But, in fact, most of the plantations were put on collective farms. The SAR does mention that its objectives fit the overall Bank sector objectives to reduce deforestation, enhance environmental contributions

of forests, promote afforestation, and encourage economic development. The appraisal report also notes that China satisfies the required conditions for government commitment for sustainable management and conservation-oriented forestry. It identifies two areas of weakness in the regulatory framework: restrictions on prices and international trade. These are addressed by the project-supported policy studies.

Loess Plateau Watershed Rehabilitation Project (Cr. 3222-CHA and Ln. 3377-CHA)

Like the previous project, Loess Plateau was approved in 1994 and designed to incorporate several of the lessons learned during the previous decade regarding plantation development research and extension and watershed management. The project seeks to enhance the planning and monitoring capacities of state institutions. Its primary objective is to increase agricultural production and incomes in the Loess Plateau, in north-central China. Its secondary objective is to reduce sediment inflows to the Yellow River. The project builds on a long-term effort (since 1949) to reduce soil degradation and improve water management in the 430,000 square km of land affected by soil erosion. By July 1992, when the SAR was under preparation, the achievements of the government of China were already quite impressive, 140,000 square km of eroded area had been brought under control with 8 million hectares of forest and more that 2 million hectares of grasslands (*China Daily* July 6, 1992).

The project has two components. One is the construction of land development and erosion control works on 156,000 square km in Inner Mongolia, Shanxi, Shaanxi, and Gansu provinces. These include a plan for afforestation on 270,000 ha and planting of 27,000 ha of fruit trees, the establishment of 155,000 ha of grassland, 5,400 ha of new agricultural land (sediment and river diversion), and 5,000 ha of irrigated lands. Erosion control activities include terracing and construction of dams. The project was also intended to test and disseminate integrated pest management and other environmentally accepted and cost-effective pest and disease control methods.

The second component consists of institutional development programs to support training, technology transfer, and research. Included are enhanced planning, design, and project management and monitoring, and management information systems for provinces, prefectures, and counties. The scale is larger than previous projects. The component finances construction of training centers, vehicles, local and overseas

training, and research. It anticipates training managers, staff, and farmers. The project provides for support to ongoing research to improve regional production (crop protection, forestry seedling, orchard management) and to the introduction of new technologies for erosion control, seedling production, plantation establishment, orchard management, socioeconomic aspects of watershed development, livestock management, and shrub management.

According to the SAR, shrubs and trees were to be planted in waste and unused lands carrying poor-quality grass. These land use changes were meant to preserve land and increase productivity in an environmentally sustainable way. The intention was to increase land under forest and shrubs from 210,000 ha to 510,000 ha. In addition, 110,000 ha of steep slope lands currently in agriculture were to be converted to forests. Improved grasslands were to be managed by farmer groups.

The SAR does not describe the land tenure regimes in the areas affected by the project, but it indicates that the project was designed in consultation with villages that have the rights to cultivate the land being developed. How consultation took place is not mentioned. The environmental impact assessment finds that the project will have wholly beneficial environmental and social impacts. Most of the land seems to be in use or degraded. There is no mention of biodiversity as an important consideration in the area. Nor does the project directly address policy issues.

Forestry Development in Poor Areas (Ln. 4325, Cr. 039)

FDPA was approved in 1998, and its objective is to develop forest resources in poor areas of central and western China on a sustainable and participatory basis to support poverty reduction and forestry development, and to improve environmental management. While it builds on the production-oriented elements of previous projects (plantation, improvement of forestry practices, genetic stock upgrade, and technological research and extension), this project is different in that it is the first Bank-supported forestry project in China to specify the use of participatory techniques from the appraisal phase onward. Plans with local communities were supposed to be designed through Community Forestry Assessments with the technical support of the Ford Foundation and other organizations. The Project Appraisal Document (PAD) also raises policy and institutional reform issues more directly than previous projects. One policy issue refers to the correction of distortions that contribute to inefficiencies in resource use and suboptimal levels of

reforestation. This issue was not linked to specific investment operations, but was supposed to be addressed through nonlending services. This is an important issue raised by the QAG Agricultural Review in 1998 regarding the need to redefine the role of the state in forestry, with less emphasis on direct investment in commercial forestry and more emphasis on regulation and environmental protection (FDPA–PAD, 1998:11). The second policy issue addressed in FDPA is the introduction of new social assessment and community participation approaches into the government afforestation programs (PAD: 3).

The PAD establishes links between the poor, their needs, and the activities that the project will support. The project has three components: (1) Timber Plantation will expand 315,000 ha of plantations on mountain wastelands. This will be the third phase of the improved silvicultural management program initiated under the NAP. The main afforestation entities will be groups of households (36 percent), shareholding cooperative forest farms (36 percent), individual households (19 percent), and village/township collective farms (12 percent). Tree species were selected on the basis of farmer preferences, growth potential, and climatic and ecological sustainability; (2) Economic Forests Crops will establish about 230,000 ha of economic tree crops on mountain wastelands in 12 provinces. Varieties and planting sites were selected on the basis of market demand, climatic factors, and ecological suitability. The main afforestation entities will be individual households (64 percent), groups of households (26 percent), and shareholding cooperative forest farms (10 percent). This investment will be designed to meet short-term income and consumption needs of poor households prior to thinning and harvesting of forest plantations. The project has a small loan component to provide capital to smallholders.; and (3) Technical Support Service supports technical programs for afforestation activities in four areas: planting stock, training and extension, rural infrastructure, and monitoring and evaluation.

The project expects to increase the *per capita* income of two million poor people and one million additional people. The PAD establishes production, beneficiary, and process indicators that will permit measurement of project accomplishments and impacts. The environmental impact assessment identified some possible adverse environmental effects related to pesticide use, earthworks, small blocks of monoculture, and effluent disposal. An environmental management plan was developed to address these issues.

Pending Project

Sustainable Forestry Development Project (SFD)

In response to recent flooding and longer-term economic and environmental problems in China's old-growth natural forests, the proposed US$200 million SFD will have three objectives: improve protection and management of natural forests; develop new forest resources to address China's increasing wood deficit; and support economic development of state enterprises and rural households to redress the social and fiscal impacts of China's logging ban (see box 2.1). The key components of the project will be increased training and support of natural forest management and natural forest biodiversity protection, plantation establishment, retraining and redeployment of unemployed state forest farm workers, and activities (e.g., microcredit programs) to support rural development for farm households affected by the recent logging ban. The project also seeks to develop improved inventory assessment and monitoring; improve training and extension of natural forest management and protection; and prepare policy studies on important issues.

Projects with Forest Sector Components

In addition to the forest sector projects, the Bank financed 13 projects in the period 1992–99 that had significant activities related to trees, tree planting, forest management, or forest protection. Seven projects specified the amounts of funds the Bank provided to finance forest or tree planting. Improvement activities in all of these projects directly affected more than a million hectares (table A.16). Twelve forest sector components were in agricultural sector projects and one was in an employment social sector project. The following analysis is based on an examination of the appraisal reports for the 13 forest sector components (see Annex I).

All 13 projects included *forest expansion and improvement activities* consisting of some new plantings in wastelands and eroded or hillside areas and 551,000 ha of other plantings (162,989 ha of orchard; 354,667 ha of timber, non-timber, and bush forests; and 36,388 ha of economic trees such as bamboo, mulberry, and tea). These activities are frequently associated with agriculture intensification (irrigation or agricultural expansion), usually serving as windbreaks in irrigated agricultural areas, preventing soil erosion in wastelands, and protecting watersheds for dam catchment areas (see table A.16).

Poverty alleviation is also a prominent theme in all 13 projects. Up to 1995, most projects assumed a "trickle down" approach to poverty alleviation. Land tenure and management regimes or rights and responsibilities for trees to be planted during the project were not clear. In most cases, the poor were expected to benefit from increased opportunities, higher incomes, more food availability in the area, and similar effects. Other projects indicated that they intended to increase incomes but did not indicate the mechanisms used. Examples are Second Red Soil (1994), Guangdong (1991), Forest Resource Development (1994), and Songliao Plain (1994). While some tree management was to be carried out by households, the appraisal reports for these and other projects designed up to 1994, such as Tarim Basin I (1991) and Sichuan Agricultural Development (1992), did not specify whether land was owned by state plantations, collectives, provinces, or households.

Since 1994, appraisal reports have identified mechanisms for poverty alleviation that are designed to go beyond "trickle down." More emphasis is placed on prescribing specific instruments, such as long-term contracts between plantations, provinces, and households, and more attention is given to technical assistance to households. As in the forest sector projects, the approach to poverty alleviation increasingly emphasizes farmer participation in planning and implementation, and aims to strengthen farmer organizations, particularly water users' associations. Examples are Yangtze Basin Water Resources (1995), Southwest Poverty Reduction (1995), Shanxi Poverty Alleviation (1996), and Qinba Mountain Poverty Reduction (1997; see table A.16).

Another set of instruments frequently used to address poverty alleviation in forest sector components is *marketing and agroindustrial development*. This has been designed as a means to improve farmer access to markets both in the sale of products and in accessing inputs and services. Eight of the forest sector components directly address marketing issues. The range of issues varies, but frequently includes market studies, fruit processing plants, warehouse construction, and agricultural services such as access to machinery, inputs, and mechanical services. Assistance in marketing and agroindustrial development in China is supposed to have been an important part of a strategy to make markets more efficient by reducing administrative obstacles (such as intervention by policymakers into agricultural prices, building organizational capacities among farmer groups and government agencies, and improving market infrastructure and post-harvest technology).

Forest protection or conservation also frequently occurs in forest sector components after 1994. The appraisal reports for the 12 projects indicate that they do not expect negative impacts on the environment or forests. Tree planting of most projects is expected in degraded agricultural lands, wastelands, eroded lands, or slopes. Only one project, Shanxi Poverty Alleviation (1996), expected to affect endangered species. In compensation, and as a result of the environmental impact assessment, this project included the establishment of a protected area in the Youncheng Prefecture. This is the only forest sector component that directly addresses biodiversity conservation. The SAR does not indicate how many hectares would be protected. Tarim Basin I (1991) and II (1998) seek to preserve and expand a "greenbelt" of 182,000 ha to help arrest desertification and protect an agricultural area under development. This protection will take place by allocating water to replenish the hydrological system that supports the green corridor. The Gansu Hexi Corridor project (1996) seeks to protect 109,080 ha in a dam catchment area; and the Yangtze Basin Water project will plant 6,000 ha of protected forest.

Projects that Impact Forests

The 1991 forest strategy required the Bank to pay close attention to intersectoral interactions and to infrastructure projects, seeking to minimize their negative effects on forests. The strategy indicated that "public investments need to be preceded by much more careful environmental assessments and, where possible, should be directed toward preservation."

To assess the degree to which this has been accomplished in China, this study examined Staff Appraisal Reports (SARs) and Environmental Impact Assessments (EIAs) for 47 projects with the potential to affect forests and biodiversity.[12] Environmental issues, particularly during project appraisal, generally have received more attention since 1991 (box 9.1 summarizes the findings of a study analysis of SARs). In addition, the use of participatory processes in EIAs has increased. The treatment of forest and biodiversity issues in SARs, EIAs, supervision reports, and completion reports is frequently superficial, however, and insufficient to assess, track, or ascertain the impacts projects have on forests. In infrastructure projects, forest and biodiversity issues are sometimes under reported or glossed over. When forest sector issues are addressed it is most often the short-term impacts that are considered (felling of trees, erosion caused by soil movements during construction) or the sustainability of the public

Box 9.1 Treatment of Forests in Staff Appraisal Reports

Of the 47 non-forestry SARs examined,[a] none cite long-term impacts on forests.

- Three say the project is likely to have a positive impact on forests
- Eleven say that the project will affect forests or natural environments
- Eleven say that the project will have no impact on forests
- Twenty-two do not mention forests, trees, ecology, or natural environments
- One indicates no mitigation action (low-impact flooding of 150 ha of forest/bush)
- Three say that an environmental monitoring plan has been developed (but do not specify actions in forest)
- Six specify actions to mitigate impact on forests or trees.

a. Some of the SARs have more than one of the listed characteristics.

works under construction (landslides, changes in hydrological patterns). The long-term effects of large public works on forests have not been properly assessed or reported.

To assess changes in the treatment of environmental issues at entry by Bank projects, this study examined EIA requirements for two periods: before the strategy (1984–91) and after (1992–99). There has been a marked improvement: EIAs were required and conducted prior to project approval for many more projects since 1991. This was particularly true in the lending sectors that affect forests. In the agricultural sector, for example, 25 projects were approved in the 1984–91 period. None required full EIAs, six required partial assessments, 12 were to be decided, and seven did not require EIAs. By contrast, of the 28 agricultural projects approved in the 1992–99 period, seven required a full EIAs, 19 required partial assessments, none were left to be decided, and two did not require EIAs. One factor that influenced this change was the Bank's growing adoption of policies on issues related to the environment.[13]

Because 34 of the 47 SARs either did not mention forests or said that the project was expected to have no impact on forests, the study also looked at a subset of 21 EIAs for project types that are prone to have impacts on forests. The subset consisted of 10 rural highway projects,[14] seven hydroelectric projects and power projects with transmission components in rural areas, two multipurpose projects (electricity/irrigation), one railway project, and one urban housing project (land use conversion). The results of this examination are summarized in box 9.2.

The majority of SARs agreed with their associated EIAs. Those SARs that acknowledged up front the dangers posed to natural forests or reserves were the same ones that included the best mitigation and compensation activities. Four SARs failed to report that their projects ex-

pected to affect forests. This omission was most significant for two highway projects (Second Shanxi Provincial Highway and Second Henan Provincial Highway) that failed to report their proximity to natural forests and ecologically sensitive areas.[15] The EIAs of two other projects (Hubei National Highway 3 and 4) state that their highways will go through sensitive ecosystems and indicate that no endangered species were found 500 meters from the highways and that the highways do not cross natural or protected areas. But it is not clear what type of forests or biological resources exist outside the 500 meters. Finally, no EIA addressed impacts of the improved access to natural forests or any other form of long-term impact on forests.

Box 9.2. Treatment of Forests in Environmental Impact Assessments

Of the 20 EIAs examined[a] and compared with their respective SARs:

- Thirteen EIAs and SARs agreed that the project would have no impact on natural forests or that it would have relatively small impacts on plantations or orchards.
- Three EIAs and SARs agreed that the project would affect forests; each project had sound components to compensate for the loss of forests.
- Four SARs did not indicate that the project would affect forests or would be implemented in the vicinity of natural reserves.
- None of the EIAs addressed the long-term effects of projects on forests.
- Ten EIAs used some form of consultation or participation, although in most cases it is difficult to assess whether the consultation process reached the stakeholders who were most affected and whether it was conducted in ways that actually influenced project design.

a. Some of the EIAs have more than one of the listed characteristics.

This study also examined 11 Implementation Completion Reports (ICRs) to assess how they addressed forest issues and to identify the lessons they draw regarding improvements to the way projects treat forests. The projects examined all started before 1992, but were completed after 1995 and were in sectors likely to have direct impacts on forests (agriculture, power, and transportation). The selected projects (see table A.18) consisted of three highway, two railway, three agriculture, and three power and electricity projects. The findings of this analysis were as follows:

- Two mentioned trees or forests (one was an irrigation project and the other a railway project).
- Two referred to serious environmental problems that affected project implementation and sustainability.
- Two indicated that their impact on the environment was "not excessive" or "more benign" than other alternatives.
- Four did not comment on environmental issues.

Box 9.3. Safeguarding the Environment through Forest Strategy Implementation

Since 1991, Bank projects (particularly large public works projects) are attending more closely to forest and environmental issues that affect the sustainability of the project outcomes. When forest and environmental issues had no direct impact on project outputs, no issues were identified or, when identified, were only briefly described. This was most apparent in power and electricity projects, whose ICRs stated that they did not have "excessive impacts on the environment," but also did not indicate what impacts they did have. As previously noted, projects that disclosed potential threats to forests and ecological resources included the best mitigation or management plans. The supervision and completion reports examined did not consider forest issues in their lessons, nor did they address potential long-term impacts on forests. Supervision reports provide very little information on forests and project impacts on forests. Three specific findings of the review, if addressed, could significantly improve the treatment of forests and biodiversity in Bank projects:

- Appraisal documents and EIAs have been concerned with immediate impact of forests (during construction) and considered too little the potential long-term impacts of projects.
- EIAs focus mainly on existing resources and impacts along a highway, power transmission lines, or railway (500 meter radius surveys were mentioned in several highway EIAs). It is not clear that the EIAs assessed resources and project impacts on life forms in the larger forest areas that the projects cross.
- Reports often seem to avoid or obscure sensitive information regarding forests. For example, information required for decisionmaking regarding forests and biodiversity that was found in EIAs was not always included in SARs. Supervision reports, completion reports, and impact assessments are frequently ambiguous in their references to forests. Documents frequently avoid the word "forests" and instead use words such as "vegetation" or "ecological resources." Some reports are imprecise, stating that there are "many forms of vegetation" along the path of a highway, or vague, noting that "no impacts are expected because environmental plans have been developed" or that the impacts of a completed project were more benign than the impact of alternative projects, but offering no explanation.

- One indicated environmental management was excellent.

The most recent supervision reports (as of June 1999) for 10 highway projects contain no reporting on the treatment of forests, but they also report no serious environmental problems. The reported environmental issues concern delays on environmental monitoring components. Most of the information in the supervision reports refers to project administration and accomplishment of physical targets.

Global Environment Facility Grants to China

The World Bank is one of the implementing agencies for the Global Environment Facility (GEF), a financially independent entity created in 1991. The objective of GEF is to provide funds to assist in the protection of the global environment and to finance regional approaches to multinational problems. GEF has four program areas: biodiversity loss,

climate change, degradation of international waters, and ozone depletion. From 1991 to 1998, GEF invested more that US$2 billion in global environmental projects.

During the period 1992–99, GEF approved five grants to China that were implemented by the Bank. Their total value was US$147.6 million. One of these, the Nature Reserves Management Project (3402), approved in 1995 for US$17.8 million, was designed to go with FRDP (described above). The main objective of NRMP is to enhance biodiversity conservation by developing skills, human resources, and systems for improving protection in China's nature reserves (box 9.4). A large portion of the funding supports pilot nature reserves in five high-profile sites. The project will contribute to improved management of 625,000 ha of natural reserve lands and 100,000 ha of lands surrounding natural reserves. The work includes preparing management plans, increasing field-level protection, and developing programs to work with local communities in and around the reserves. The project also assists in enterprise restructuring of state-owned forest farms near some of the sites. The grant also will support several of China's policy reforms and investment requirements. Implementation started in late 1998 and is to run through 2002.

In general, the Bank prefers that GEF investment projects be attached to its own investments, which helps to mainstream GEF operations in Bank assistance. This approach also offers the best opportunities for minimizing associated administrative costs. Bank staff interviewed for this study pointed out that there are other possible arrangements. For example, GEF investment projects can be linked to investment programs being administered by other entities, including the government of China, and other donors. The Bank has expressed its willingness to help the government identify

Box 9.4. Reserve Management Progresses under GEF Project

The most recent supervision report for Nature Reserves Management indicates that the GEF-financed project is meeting its objectives. The project has introduced planning approaches that are not only more systematic but also more participatory. It has also helped establish methodologies that are relevant to decision making and do not call for a lot of human or financial resources. Nature reserve management has been improved through the development of staff incentive systems and improvements in staff motivation, performance, and knowledge. The community management component of the project has increased awareness and cooperation between reserve staff, local communities, and local governments. The restructuring of the Changqing forestry enterprise has yielded lessons applicable to the National Natural Forest Protection Program. The Shennongjia Biodiversity Landscape Plan has been incorporated into the National Program.

other partners in cases where it is not possible to identify a suitable Bank-financed project. Another possibility is that for certain medium-sized projects that do not link to the Bank lending program, the Bank has no comparative advantage and the UNDP is likely to be the more appropriate implementing agency. However, the Bank would be prepared to discuss implementing a small number of such projects each year (e.g. one or two), particularly where these would develop innovative ideas such as government/NGO partnerships.

The current GEF grant program is well-designed considering the fiscal crisis in many poor areas and the adverse incentives that many nature reserve managers face (see Chapter 7). The GEF funding allows project management to pursue goals that might otherwise go unfunded because of the public-good nature of the tasks.

10

An Evaluation of the Bank's Forest Sector Work in China

The Bank's forest sector projects have generally been successful and have contributed to the successes of China's forest sector. Despite the decline in borrowing activity for the forest sector in many countries during the 1990s, the Bank has run an increasingly large and complex set of forest sector credits. All of the completed (and reviewed) projects have returned adequately high rates of return, and past and current projects have almost exclusively earned either satisfactory or highly satisfactory marks from QAG and OED evaluations.

The projects have helped China's government achieve many of its policy goals. For example, between 1985 and 1998, Bank-sponsored projects planted 3.3 million hectares of new, high-quality plantation forests, shelterbelts, and orchards (table A.16). Bank projects have also helped introduce new technology and management techniques. Such a massive replanting effort and more recent activity in forest protection, nature reserve management, and integrated forest and agricultural development has had a positive impact on the environment.

The most impressive aspect of China's forest sector portfolio is its evolution over time (table A.15). The projects in the 1980s focused on a small set of highly practical, production-oriented forestry activities and dealt mainly with managers of China's state-run forest farms. In the mid-1990s, projects broadened to include collectively run forests and the rural residents in villages that depend on forests for their livelihood. Today, the newest part of the portfolio is attempting to engage

the government on reform issues, extend innovative forest and nature reserve management systems, deepen the involvement of local villagers, especially the poor, and begin to deal with a broad spectrum of development, transition, and environmental issues.

The Bank's project management also has been responsive to arising needs and changes in the government's policy priorities. The credit approved in the aftermath of the Daxinganling fire is the best example, but the responsiveness extends even to the present. The project currently under negotiation will try to take advantage of the policy opportunities created by China's logging ban in old growth forests. The emphasis on forest projects in poorer, more environmentally fragile areas reflects the rising government priorities in poverty alleviation and natural resource management. While one might question why earlier projects paid so little attention to the poor, when China began borrowing money for forest sector development, it had neither permanent national legislation protecting the forests nor an integrated, national poverty alleviation organization.

The reasons for both the success and the increasing sophistication of forest sector projects are difficult to prove and may not be replicable in other countries, but a review of the project documentation and interviews with those who have been involved with and have observed the Bank's forest operations during the past 10 years have identified several underlying success factors. First, the policy dialogue in China is driven primarily by the government and is based on its own priorities, not those of the Bank. This also applies to the forest sector. Thus, the 1991 forest strategy has had less to do with the Bank's interventions in China than have the needs and priorities of the government. Knowledge of the Bank's 1991 forest strategy is very limited in China.

Macroeconomic stability and an expanding economy contribute to the success of most projects in China, including those in forestry. That factor held constant, however, the high quality and low turnover of Bank staff and the project managers on the China side may be the most important factors. Most notably, a few staff members have been involved with the management, appraisal, development, and implementation of all but two of the projects. While these people deserve much of the credit for the successes (and weaknesses) of the projects, the fact that they have been involved in such a large part of the portfolio makes it hard to separate the management effect from the project implementation effect.

The continued success of China's forest sector portfolio also can be traced to several systemic factors. The forest sector's relatively low pro-

file in China has made the Bank's participation important, and the support of the SFA at all jurisdictional levels has been important in project design and in rectifying implementation problems as they have arisen. The progression of projects from relatively simple and unidimensional to increasingly complex has allowed for relatively low-cost learning. Lessons from problems associated with earlier projects were frequently incorporated into subsequent projects.

Despite such success and deserved accolades, the Bank's work in China's forests has had some shortcomings and faces serious challenges in the coming years. At least until recently, Bank attempts to engage policymakers and the wider academic community in systematic dialogue about forest sector policy issues have been limited and, when pursued, ineffective. The handling of lumber processing and marketing issues illustrates the point (box 10.1). While the ineffectiveness of the Bank on policy issues may be due in part to its limited sphere of contact on the forest sector within the large bureaucracy of China, Bank managers believe that the larger reason has been reluctance on the part of officials in China to engage in substantive policy dialogue except at a pace and pattern determined by the government (although the question remains why the government would be more reluctant to discuss forest policy when it is actively engaged in policy dialogue with the Bank over agriculture, poverty, and many other sectors). The authors' investigations for the OED study also found that, outside of the Bank's project management office, relatively few people at the central government level in China are aware of the Bank's forest work, past, present, or planned. This has probably limited the impact of the Bank's work. Moreover, although NGO participation in China also has been limited (in part a function of their closely circumscribed activities in China), NGOs in China generally seemed to be uninformed about the Bank's activities and believe that their opinions have not been heeded.

Almost no sector work is available to assess whether the Bank is working in the right or wrong areas. In consideration of the government's reluctance about Bank involvement in policy analysis and dialogue in the forest sector, Bank staff say they chose to allocate their limited resources for such work to other areas, such as poverty and agriculture, where there was more government demand for Bank involvement. However, the lack of analytical information coupled with the fact that little systematic research has been carried out on China's forest either inside or outside of China, make it hard to understand how Bank sector managers made many of their investment decisions. Interviews with current and

Box 10.1. The Lingering Policy Opportunity in Wood Processing

The Bank identified lumber processing and marketing as critical for the development of the forest sector in the first two projects it financed (FDP and Forest Fire Rehabilitation). The records for the two projects clearly recognize a need to assess the financial viability of the wood processing investments and to encourage deepening of state enterprise reforms in the processing sector, particularly the elimination of subsidies, development of restructuring programs, and closing of plants where appropriate. In a communication on November 4, 1992, a Bank program officer proposed to carry out a study on planning issues in the wood processing sector. This was an appropriate time to raise the matter because the Ministry of Forestry, as part of a national move to reform the industrial public sector,[a] was undertaking a set of market reforms in Fujian province. The intent of the Fujian pilot project was to convert all of the county's government wood processing enterprises into commercial public enterprises. Early on, however, it became evident that it would be difficult to attract private investors to the project.

Bank staff then worked with ministry officials to incorporate a wood processing activity in the next forestry project (Forest Resource Development and Protection). Staff memoranda of this period refer to such issues as the need to improve capacity utilization, which was 50 to 60 percent (SAR draft October 1993) at the time, and to reduce protection of the timber industry (low prices, subsidies, etc.). The project completion report for the Forest Development Project (report no. 12012, June 17, 1993) again identified as one of the issues affecting that project the "inadequate analysis of wood processing investments at the start of the project. Specifically, studies failed to prevent an ongoing shift in demand."

Despite the acknowledged problems and importance of the wood processing industry in the SAR for the Forest Development and Protection Project (p. 6), Bank assistance on the issue was timid: the Bank agreed to finance the development of an Investment Promotion Office in Fujian province to demonstrate the new institutional arrangements to promote private sector investment in forestry (p. 25). But even this intervention was short lived. It was canceled in June 1996 because private investors were moving into the area and the Investment Promotion Office was considered redundant.

The problems of the wood processing industry have come up again recently in discussions surrounding China's 1998 ban on logging in natural forests. The ban will require the relocation and placement of millions of people involved in lumber and lumber processing activities in natural forests. The latest bank project indicates that the Bank will provide technical assistance in market policies for the forest sector. Only time will tell, whether this longstanding matter will be addressed at last.

a. See Broadman, Harry G., "Meeting the Challenge of Chinese Enterprise Reform," World Bank Discussion Papers 283, 1995: p 19, 24-25.

past project managers and past division leaders reveal a low level of demand for systematic information about the performance of the sector and the impact of projects. The Bank will soon have invested more than US$1 billion in China's forest sector, but it has never undertaken a sector review. The depth of the work on forests in the poverty and environment sector reports is quite shallow and uninformative.

Finally, most of the work until recently has been in the state-owned forest sector and at most has dealt with local leaders in projects on collective forest farms, while research shows that the most dynamic sector is based on the investment activities of households, despite the regulatory, credit, land tenure insecurity, and other constraints that they face. The focus on the state sector and work with collectively managed forest farms may have limited the impact that projects have had on poverty, although there has been a tendency to begin to explicitly target the poor areas, but not necessarily the poorest in those areas, unlike in the Bank's Southwest Poverty Project.[16] It is unclear in the most recent project whether sufficient attention is being given to rural households and their role as forest farm workers. Also, although there may be technical grounds for the decisions of Bank project managers, projects have avoided some of the most difficult environmental and other transitional questions. The proposed Sustainable Forestry Development Program would go a long way toward overcoming this criticism.

The rest of this section will seek to amplify and more clearly explain the basis for the preceding observations. To do so, the report will follow the OED framework, examining the relevance, efficacy, efficiency, and sustainability of sector lending and other activities.

Relevance

Because of the special nature of this report, the relevance discussion is in two parts. The first part examines the relevance of the 1991 forest strategy to forest lending in China. The second part examines the relevance of the Bank's forest sector activities in China to the sector's performance.

World Bank's Forest Strategy and China

The 1991 forest strategy has a set of relatively uncontroversial aspects and a number of more contentious aspects. The uncontroversial aspects are:

- Supporting policy and institutional reform
- Preventing of undervaluation of forestry resources

- Targeting poverty reduction
- Recognizing the rights of indigenous people
- Strengthening and integrating agricultural and forest development.

The more controversial aspects are:

- A logging ban and associated issues of sustainable use of forest lands
- The treatment of externalities
- The focus on tropical moist forests
- The focus on 20 countries with threatened moist forests.

One of the main reasons for this global review of the 1991 forest strategy is that the controversial aspects appear to have reduced Bank lending and attention to the forest sector. Meanwhile unsustainable, forest-depleting activity in many of the world's most fragile forests apparently has not slowed.

The most controversial aspects of the Bank's 1991 forest strategy are simply irrelevant for China. Only a minute fraction of the country's forests are tropical, and China is not on the list of 20 countries with threatened moist forests. Forest lending, contrary to the trend elsewhere, has been increasing since 1991. Forest resources, at least in terms of forest cover, have improved during the 1990s. China's current logging ban was a direct result of government policy and the government has turned to the Bank for help in figuring out its impact and to learn how to deal with the consequences. The Bank did not encourage the government to impose the ban.

In fact, in the period since 1992, project staff in the Bank and in China have not felt that their actions were being constrained by the 1991 forest strategy. This may partly explain why the sensitivity that has caused some regional managers to back away from forest sector projects is nonexistent in China.

Nonetheless, the changes in the forest sector's project portfolio during the 1990s have been surprisingly consistent with several of the uncontroversial aspects of the strategy. The removal of agricultural subsidies has never been an issue in China (agriculture has been taxed), so this has been irrelevant. But the recent projects have been more focused on poverty reduction (Loess Plateau and FDPA), institutional reforms (SFD and NMRP), and strengthening of the integration of forests with agriculture and watershed management (many integrated agricultural development projects, FRDP, and Loess Plateau).

It would be difficult to say that cognizance of the Bank's forest strategy had any influence on the movement toward lending projects consis-

tent with the strategy. Of more than 10 people interviewed by the authors in the State Forestry Administration, including those in the Bank's project office, only two had ever heard that there was a Bank Operational Policy on forests. Neither could give any details of the policy. Even the most informed thought it had something to do with making the environment a more important part of the project. No one thought that the policy had affected the composition of China's forest sector credits. Therefore, the shift in lending probably had more to do with China's own policy priority changes and the assimilation in the forest strategy of other trends in the Bank (and developing countries in general), such as a move toward poverty alleviation and a concern for biodiversity.

If several aspects of the 1991 forest strategy had been more fully addressed, however, the portfolio might have been even stronger. For example, engagement in broader policy dialogue, had it been possible, would have been desirable. Such a dialogue might have introduced a more complete valuation of forest project costs and benefits and resulted in a different mix of components. The emphasis in the China program on increasing forest cover has made the current portfolio extremely important to meeting the national reforestation goals. The most recent project negotiations finally seem to have achieved a breakthrough on policy discussions with China, which may lead to increased environmental and sectoral impact of Bank-financed projects.

Special Aspects of Bank's Forest Sector Activity in China

The Bank's forest sector and other lending portfolios in China have mostly (and increasingly) addressed relevant issues and invested in areas that further the nation's development needs—although the emphasis has evolved. Success of the forest sector credits has been most notable in afforestation and the portfolio exhibits increasing concern about the livelihood of the poor in resource-fragile environments. The overall success of the Bank's rural development portfolio may have contributed even more to increasing the quality and sustainability of forest sector activities, since these have been instrumental in increasing the productivity of farm resources and providing opportunities for farmers to move family members off the farm.

Until the logging ban, China had delineated its forest goals primarily in terms of forest cover, which has increased significantly since the early 1980s (see Part I). If the data are accurate, 3.3 million hectares of area established by afforestation efforts supported by Bank projects (those included in table A.15) account for one-sixth of the total increase in

forestry area and more than one-quarter of the rise in shelterbelt and plantation area. This is clearly a major, direct contribution to helping China meet its goals.

One of the problems with giving the Bank credit for this achievement is that the Bank has not been able to document the importance of its activities in the context of the larger supply and demand trends of forest products in China and its role in world markets. Part of the reason for this inability certainly must rest with the lack of sector work in support of the forest program. In short, the Bank knows too little about China's supply, demand, and trade for wood products. Furthermore, there is little solid economic analysis elsewhere.

About all that can be said is that the large improvement and recent stabilization in the forest cover seems to be due to the policies pursued by the government both outside and inside the forest sector, including land tenure shifts, labor market liberalization, poverty policy reform, and the investment strategy that has increased agricultural intensification (almost all of the annual growth in agricultural production—exceeding between 5 percent to 7 percent annually—has come from productivity growth; see Section 7 for more details).[17]

The government of China estimates that demand is around 100 million cubic meters in timber, lumber, paper, and paper pulp products. Even before the logging ban, the country was only producing around 60 to 70 million cubic meters. Imports in the 1990s were around 50 million cubic meters and worth about US$6.4 billion in 1998.

Choosing to increase domestic supply rather than to increase imports, China embarked on an ambitious program to massively enlarge its forest cover, mainly through establishing artificial plantations. Despite continuing deforestation (estimated before the logging ban to be about 500,000 hectares a year), China's forest cover has stabilized. Hence, the rise in the area planted to artificial plantations, shelterbelts, and orchards is driving the increases in forest cover. These plantations will help China meet more of its annual demand for wood and other timber products once their output becomes available.

The development of plantations in China may also have minimized the country's impact on the world's forests. Despite an overall economic growth rate of more than 10 percent annually during the 1980s and 1990s, China has not dramatically increased its forest-related imports. During the height of the growth period in the 1990s, the value of China's imported logs, sawed lumber, and plywood rose by 4 percent per year (between 1993 and 1998—table 10.1).

Table 10.1. Imports of Wood Products, Pulp, and Paper into China, 1993–98

Type	1993	1994	1995	1996	1997	1998	Annual percentage rise 1993/4 –97/8	Annual percentage rise 1995/6 –97/98
Wood products (logs, sawed boards, and plywoods) (US$M)	1,504	1,521	1,439	1,465	1,853	1,807	4	10
							Annual percentage rise between 1997 and 1998	
Wood products (cubic meters)					5,130	5,605		8
Paper pulp (US$M)					924	1,095		16
Paper products (US$M)					3,466	3,511		1
Total trade (US$M)					6,254	6,426		3

Source: For 1993 to 1997: Ministry of Forestry, 1998. Report on 1993 to 1997 Wood Product Imports. For 1998: Statistics from SFA' s Statistics Division.

Why has the Bank pursued a strategy of plantation in China rather than forest regeneration? The reported reasons are:

- Large tracts of land were available for planting, but where regeneration was often impossible.
- Until the imposition of the logging ban, the government did not encourage the Bank to get involved in natural forest management, which entails many complex sociopolitical, environmental, and technological issues.
- The Bank brought stronger expertise to bear in plantation forestry than in natural forest management.
- The Bank considered remaining involved in the sector an important way of being able to influence reforms (including participatory approaches and biodiversity conservation—in contrast to its approach in some other countries, such as Indonesia).

The long-term effects of the logging ban will not be known for some time, but the initial impact on China's domestic market and on international markets shows that the plantation strategy may already be paying dividends. In 1998, the domestic supply of timber had reportedly declined nearly 16 million cubic meters or by 25 percent of the total timber supply—most of it from China's natural forests (table 10.2). Yet in 1998 imports rose only five million cubic feet, which means that the

Table 10.2. Balance Sheet for Forest Product Supply and Demand

Supply/demand sources	1997 (million m^3)	1998, post logging ban (million m^3)
Supply from area affected by logging ban	33	17+ unmonitored
Supply from area not affected by logging ban	30	30+ increase from plantations
Imports		
Logs, lumber	7	8
Plywood	2	2
Other timber products	0.5	0.4
Pulp	14	19
Paper	27	27
Total imports	50.5	56.4
Demand (residual)	114+	114- fall in demand from recession

Source: Statistics provided by State Forestry Administration.

remainder of the demand (which also may have fallen due to China's current recession) was met by increased production from areas not affected by the logging ban, which are mostly plantations. Hence, the relatively small impact of the ban to date is almost totally attributable to increased plantations. It should also be noted that a State Forestry Administration report has found that since 1993, China's imports from Southeast Asia (Malaysia, Indonesia, and Myanmar), while still large, have fallen by nearly 10 percent (through 1997).

The impact of Bank projects may extend beyond the immediate project sites through improved management and new technology. Indeed, one of the main successes noted by the project appraisal reports and implementation reviews is that project sites in China have planted forests of extremely high quality. Site management and planted varieties have led to healthy stands that have a very high probability of surviving and growing to maturity. With China's own expertise in forest breeding and extension, to the extent that new management and technologies are usable by non-project sites, Bank projects may also add to China's forest area in this indirect way.

The shift of focus in Bank lending away from large-scale plantations (from the 1980s to the 1990s) will reduce the direct contribution to forest cover, though it might increase the impact in other areas. The projects funded in the 1990s have markedly lower planting goals (from 600,000 hectares per project to less than 300,000 hectares). However, earlier projects probably had little effect on other national goals, such as poverty alleviation and watershed protection. Most of the early

projects focused on supporting state forest farms and not rural households. Moreover, the included provinces (e.g., Heilongjiang and Guangdong) were not experiencing the severe erosion problems of other provinces (e.g., the northwest provinces and Sichuan).

All three credits approved since 1994 (FRDP, Loess Plateau, and FDPA) have had components for watershed management and erosion control in more environmentally sensitive areas. While little evidence is available,[18] agricultural and other production practices used in the parts of the country where these projects are being carried out are thought to have contributed to erosion (Huang and Rozelle, 1995). The large increase in shelterbelts, expansion of terraces, and newly introduced animal husbandry systems will almost certainly aid in achieving national goals for reducing erosion and eliminating a constraint that is reducing agricultural productivity and reducing the efficiency of water projects. Most of the projects also are at least partially located in the northwest or Sichuan.

These same recent projects may lead to rises in income for rural residents, which can have both positive poverty alleviation effects and indirect positive effects on forest development. Targeting farmer households would provide sources of income in areas where resource endowments and locational disadvantages offer few alternatives to those left in these areas. Terracing, improving watersheds, and providing capital for plantations and orchards will help increase incomes for many, if the projects are carried out effectively.

Recent projects are putting more effort into collecting baseline and subsequent data to analyze the impact of these projects. But the information in periodic reviews to date is insufficient to assess changes in incomes or standards of living of residents. Even if local income figures can be believed, the rural economy in most of China today is sufficiently dynamic that even rising average incomes should not be casually attributed to Bank lending projects. One worry is that the provincial research institutes charged with data collection may not have sufficient expertise to obtain genuine responses or collect relevant information rather than simply meet pro forma requirements for monitoring and evaluation.

The absence of social welfare components in forest sector projects means that these projects cannot directly help the nation meet its education, health, or other social welfare goals. None of the project documentation mentions whether consideration was given to including a component on local schooling, training, or health care. That is not to say the projects do not trigger investment by local government or indi-

viduals in such spending. In fact, a videotape presentation about the Loess Plateau project makes such claims. Unfortunately, there is no systematic evidence of the improvements claimed.

The rest of the Bank's rural development portfolio (that is, lending exclusive of direct investments in the forest sector) is also relevant in its impact on forest cover, watershed management, and rural income goals. Indeed, as seen in Part I of this report, economic activities that increase the productivity of agricultural resources and provide rural residents with off-farm work can be directly associated with improvements in the forest resource base. For example, as reported in an earlier QAG review of the Southwest Poverty Project, the innovative labor transfer program has been instrumental in increasing incomes of both the migrants and their families. There have also been spillovers reported to the rest of the village in terms of non-project participants being able to find off-farm work. To the extent that these off-farm jobs raise the opportunity costs of rural household members and alleviate cash constraints, labor-intensive practices, such as farming marginal uplands, will be curtailed. Similar dynamics should follow in areas that benefit from agricultural investments, such as new irrigation or terracing.

Efficacy

This section summarizes the performance of forest sector projects based on the findings of QAG and OED reviews. Of the six formally approved lending projects, OED has reviewed the three fully implemented projects (FDP, Daxinganling, and NAP) and QAG has reviewed three projects (NAP, FRDP, and Loess Plateau). The NAP is the only project reviewed by both groups. The most recently approved lending project, FDPA, has not been reviewed. To help assess the relative risks and achievements, the forest portfolios (as defined here for each of the different types of reviews) are compared to the rest of the lending in China's agricultural and rural development portfolio—one of the Bank's best performing.

In almost every sense, China's forest portfolio is performing well. The rates of return of the completed projects have ranged between 23.5 and 38 percent (table 10.3). Weighted by the size of the credit, forest projects have returned 25 percent. These rates of return, although held down by the long period before revenues are generated, compare favorably to 22 other projects in "the rest of the portfolio," which averaged 26 percent. Midterm reports for the ongoing projects generally suggest that they will have equally high rates of return.

Table 10.3. Summary of OED Reviews for Forest Sector Credits in China, 1985–98

Project/I.D.	Credit size [a]	Rate of return [b]	Outcome	Sustainability	Institutional development impact
Forest sector					
Forest Development Project (1605-CHA[3430])	47	38	Satisfactory	Uncertain	Modest
Daxinganling Forest Fire Rehabilitation (1918-CHA [3550])	57	n.a.	Satisfactory	Likely	Substantial
National Afforestation Project (2145-CHA [6463])	300	23.5	Satisfactory	Likely	Substantial
Total		25	100% Satisfactory	67% Likely (one project Uncertain)	67% Substantial (one project Modest)
Rest of agricultural sector		26	91% Satisfactory (two projects Unsatisfactory)	82% Likely (four projects Uncertain)	50% Substantial (10 projects Modest; one project Negligible)

a. Millions of US dollars.
b. Weighted average rate of return, with the credit size as the weight.
Source: World Bank OED summary database.

OED's reviews of forest sector projects have found that *all* of the completed projects are "satisfactory" in their outcome (table 10.3) and the projects currently being implemented also appear to be proceeding smoothly. The 100 percent rating on OED-reviewed projects is even higher than the average rating received by the rest of the agricultural sector, where two of the 22 non-forest sector projects received "unsatisfactory" ratings. The projects currently being implemented, in many of the categories, are outperforming the completed projects. For example, in the 1998 project status reports, the FRDP and Loess Plateau projects received satisfactory summary ratings. However, the trend of the ratings for each of the project components and specific aspects are either satisfactory or highly satisfactory and, on average, the ratings have improved since the 1997 project status report.

OED has raised questions about the sustainability and institutional development impacts of FDP. The sustainability rating for the project

was marked down because of doubts about the ability of state forest farms to manage the projects in a way that would maximize returns, and about whether some of the processing firms can survive. The institutional development impact rating doubts the replicability of the projects, given their focus on state farms and their capital intensive, long-term nature. These lower marks made the forest portfolio (67 percent), on average, appear to have greater sustainability problems than the average non-forestry agricultural sector credit (82 percent; table 10.3). Despite the "modest" rating on the institutional development impact category, the average score for forest projects (67 percent) was higher than the rest of the sector (50 percent).

QAG reviews ranked China's forest sector projects even higher in relative terms, in part because the portfolio included projects that were more recent (NAP, FRDP, and Loess Plateau) and did not include FDP (table 10.4). There were no QAG caution flags for forest lending projects, and all forest projects were rated "not at risk." Implementation and development scores were 100 percent "satisfactory." In contrast, at least one project in the agroindustrial, agricultural extension, and irrigation subcategories received one or more caution flags. And while all projects in extension, irrigation, and the rest of the sector received 100 percent "not at risk" and "satisfactory" implementation and development scores, there were projects in the agroindustrial subsector that were considered "at risk" and "unsatisfactory" in implementation.

Formal reviews aside, project managers in the Bank and counterparts admit that there are some "hidden" hazards that eventually could put the projects at risk or undermine their achievements, including foreign exchange risks. Devaluation could of course increase repayments, the ensuing higher domestic prices might also stimulate a supply response from the forest sector, some of the proceeds of which could be saved and invested for repayment. Interviews in the government revealed that risks also are likely to rise in the projects that have lent to the state forest farm sector. Original project terms were conditioned on guarantees by government units. As China has continued to reform, state-owned units, such as forest farms, have received less fiscal support. In some cases, in which non-project resources have deteriorated, premature harvesting may reduce expected returns in revenue, product output, and environmental services. China also needs to diversify post-harvest activities from the current predominance of the state enterprises. The Bank is not convinced that the government of China is committed to such diversification.

Table 10.4. Summary of QAG Reviews for Forest Sector Credits in China, 1985–98

Project/I.D.	Credit size (US$M)	No. of flags	At risk	Implementation score	Development score
Forest sector					
National Afforestation Project (2145-CHA [6463])	300	0	No	Satisfactory	Satisfactory
Forest Resource Development and Protection Project (2623-CHA [3557])	200	0	No	Satisfactory	Satisfactory
Loess Plateau Watershed Management Project (3540)	150	0	No	Satisfactory	Satisfactory
Total		0	100% No	100% Satisfactory	100% Satisfactory
Selected other sectors					
Agroindustrial (four projects)		0	80% No (one At Risk)	80% Satisfactory (one Unsatisfactory)	100% Satisfactory (one Highly Satisfactory)
Agricultural Extension (one project)		2	100% No	100% Satisfactory	100% Satisfactory
Irrigation (eight projects)		4	100% No	100% Satisfactory	100% Satisfactory (one Highly Satisfactory)
Rest of agricultural sector (10 projects)		0	100% No	100% Satisfactory	100% Satisfactory

Source: World Bank QAG summary database.

Efficiency

Despite the strong performance of the forest sector portfolio in China, perhaps the most surprising response to the interviews that were carried out with Bank and counterpart personnel is the pessimistic view voiced by many about the future of lending to China's forest sector. Bank and China officials agreed that the forest portfolio had been successful, but they are also worried about the effect of graduating to IBRD loans. China's forest sector officials willingly expressed doubt about the replicability of prior projects on IBRD terms.

On paper, the cost and returns to Bank forest sector projects appear to be favorable (box 10.2). Returns matched those of the rest of China's successful agricultural portfolio. A cursory review of Bank manager time reveals that forest projects, while not the "cheapest" in terms of personnel effort (one of the main constraints to more lending, many

Box 10.2. Estimating Rates of Return for Forestry Projects

Project monitoring documents indicate that plantation area targets in the NAP and FRDP have been exceeded by around 20 percent. In these same projects, average annual compound yield growth in the completed plantations has been estimated to be nearly 10 percent higher than targeted rates and more than 20 percent higher than traditional plantations. Overall, 3.3 million hectares of plantations have been (or are being) established through five Bank projects. Together they have contributed nearly 10 percent of the reported increase in total area under artificial plantations (approximately 34 million during the 1980s and 1990s). The total contribution to timber biomass and value is far greater than 10 percent, given the extremely high quality of the Bank's forest plantations. Reestimated rates of return on the completed projects have exceeded 20 percent, also exceeding IRRs at appraisal. [a]

These estimated rates of return, however, are the subject of debate between China and the Bank. First, while physical and environmental management aspects of the artificial plantations seem to have been well established, the price projections on which projected revenues are based remain a matter of speculation. Chinese officials argue that investments in trees are long-term and are subject to such risks as fires, pests and diseases, foreign exchange and market risks, and cash flow problems faced by farmers and other plantation units to maintain the level of management needed to achieve the high yields. In short, they assert that external rates of return (around 20 percent in the past, based on price and market projections) may not be as high in the future. They therefore suggest that the rates of return should be interpreted with caution and should not be used to justify hardened lending terms. The forest sector, they argue, should receive special treatment because of the global environmental implications of investments in the sector.

The other side argues that the estimated benefits do not include either the multiplier effects on the quality of the overall management of the Chinese plantations outside the Bank-financed areas (which seem to have been considerable) or the environmental benefits of carbon sequestration—estimated to be 25 percent of China's total annual emissions—improved soil and moisture conservation practices introduced in the management of the plantations, and reduced offsite runoffs, reduced soil erosion and siltation,[b] and possible impacts on the climate.

In addition, proponents also point out other intangible benefits. The production, planting, management, and thinning of the tree growth under the projects have created massive employment and increased incomes, which have been widely distributed in the provinces to millions of households: three Bank forestry projects (FRDP, Loess Plateau, FDPA) provided cash payments for forestry project work to more than one million households (in addition to increasing their forest and orchard area). Projects with forest components in them reached more than 4 million households.

a. The ICRs for two forest sector projects include ERRs. The Forestry Development Project (1985) ICR estimates and ERR of 38 percent, the ICR for the National Afforestation Project (1990) estimates an ERR of 23.5 percent.
b. See for instance, the Environmental Monitoring Evaluation Report, World Bank National Afforestation Project, the World Bank project office, the Chinese Academy of Forestry, April 1997.

would argue), certainly used less than projects such as Grain Sector Adjustment, Southwest Poverty, and all irrigation projects. However, this rosy picture on the cost of forest sector project processing is changing rapidly. Safeguard issues—particularly resettlement and environmental assessment—have begun to acquire a high profile for China with implicit reputational risks.

The direct creation of forest area has spawned many benefits and costs in terms of non-market environmental services and expenses, but these are difficult to value. Recent projects tend to focus on poorer areas with more fragile environments and provide farmers with more choice (grow 18 species rather than four), including horticultural trees and fast-growing plantations (a change that in part has been driven by the requests of farmers. This should reduce the costs and increase the benefits, and marginally improve biodiversity. But until the most recent lending effort, almost all projects have emphasized the development of plantations and orchards. Projects with heavy social forestry or natural forest management components are complicated to run at the scale of Bank projects. This may be one source of pessimism about the future of Bank lending in China.

One of the biggest criticisms officials and other observers in China have about the Bank's current work in China is that Bank projects cannot be replicated by domestic projects. They have been high quality and high return, but they have also been expensive in terms of capital costs and project management time. Without cheap IDA credits, loans are unprofitable—especially, as some argue, with the emerging fiscal and exchange rate risks. The Bank's project management office also points out that Bank review procedures do not count many of the costs of creating, implementing, and monitoring the projects. Local government offices spend considerable time on these efforts, yet their time is not charged against the project. Officials in China agree that Bank project management is effective, but that they could not use these methods if they had to borrow at market interest rate and pay all the costs associated with Bank-type management schemes. One NGO official in Beijing told OED that using current Bank methods it would not be possible to implement complicated community-based social forestry projects cost effectively.

Yet there have been a number of potential spillovers in terms of increased access to technology and forest management. Forestry officials argue that China has learned a lot from projects. Others disagree, noting that little information has moved beyond Bank projects. Critics ar-

gue that capital is the primary binding constraint. But state forestry administration officials and Bank officials alike dismiss the idea that China could have produced high rates of return and high-quality plantations without Bank involvement.

Given the vast changes taking place in the forest sector, not only in China but also globally, the Bank needs to allocate more resources to economic and sector work than it has in the past to ensure that task managers working on forestry and forestry-related projects have a broader and more in-depth view of the sector. Without such knowledge, they cannot have the ongoing commitment needed to continue to meet the continually rising challenges of the coming period of development and transition. And the needs are many: restructuring of land tenure; forest farm transition; rising demand to be met by changing production and trade institutions; the role of forests and plantations as the rural structural transformation occurs; reform of the state enterprises; and the rising need for the environmental services provided by forests. Far too little is known about these issues. The burden appears to be on Bank personnel to argue that the forest sector does not need any additional attention. On the surface, the needs are greater than ever.

Sustainability and Institutional Capacity Building

China's forest sector portfolio has been successful when judged by the performance of most of the components of the lending projects. It has created substantial capacity in the forest departments of the national, provincial, and county levels; trained thousands of workers in improved nursery and technology management; and substantially upgraded plantation technology. Indeed, the "Jones" plantation nurseries,[19] may be the most important single contribution of the Bank toward improved forest technology. The greatest weakness of the portfolio is that it has resulted in too little development of institutions, particularly the research and policy analysis capacity, in China. Such development is necessary to address the nation's continuously changing forest needs. Current Bank managers admit to this shortcoming (though they point out that this is gradually being corrected). The problem has surfaced in many areas, and needs to be addressed in future work.

The establishment of an independent unit within the SFA to manage all Bank projects may have undermined the transfer of new ideas and technologies piloted under Bank projects throughout the SFA system.

Interviews with SFA officials demonstrate how the dominance of one set of officials in the ministry may have limited contact with and flow of ideas into the ministry and its affiliated systems. For example, two officials in the division of afforestation, who were interviewed by the authors, did not know that the Bank had undertaken large plantation projects in China. One official in the SFA's forestry management division did not know any details of the Bank's work, past or present. On the other hand, personnel in the Bank's liaison office could list the number, size, location, and focus of each project that the Bank had undertaken.

The Bank also, until very recently, has not reached out to social scientists in China outside of the forest sector for inclusion in the conceptualization, implementation, or evaluation of its projects. Even some of those working in the sector have not been used to their full potential. These researchers have great experience in working with forests and foresters in both the state and collective forest subsectors. Given the experience in other parts of the rural development division (e.g., poverty, agricultural policy), there is great room for exchange of ideas and experiences.

Part of the weakness may be the lack of Bank sector work on forests in China. Despite lending in excess of US$1 billion; despite having almost no external sources of information on China's forest sector; only one piece of sector work has been funded, and even that was discontinued or postponed. In contrast, 12 projects are listed in the database in the areas of rural development, poverty, and agricultural policy analysis. All blame cannot be laid on the forest sector managers, however. In 1993, a collaborative project (with a major North American research university) was designed to look at tenure and forest resource use in China's forest and to assemble and analyze China's forest census by the China division's forest sector staff. It did not receive enthusiastic support within the Bank at the time (in fact, the research team was urged by top management—not the Bank staff, who completely supported the effort—to address other, "more pressing" needs) and the Bank's research committee did not support the work.

Because of this relative isolation, the Bank's impact on policy and the indirect impact of its technical and managerial innovations have not lived up to potential. Unlike the poverty program, which has been a leader in capacity building and engagement with the officials of the Leading Group, and the agricultural policy program, which has organized and supported some of the most cutting-edge work on China's agriculture, the forest sector has been silent. No Bank representative

has attended any of the four major policy conferences on China's forests over the past six years. The reorganization of the SFA and the struggle over control for nature reserves has been watched from afar. There is no forest sector plan or development strategy. And while the forest sector must be applauded for seeking out opportunities presented by major forestry events (e.g., the Daxinganling fire) and state policy decisions (e.g., the logging ban), in the future it should strive to be more proactive than reactive. China's forest policy can currently most accurately be described as at a critical juncture. There is no better time than the present to step in and begin to engage China in a policy dialogue and to begin to mix with a broader spectrum of officials.

Impact on Poverty

While the early projects were criticized for ignoring poverty, the current project task leaders have taken the previous criticisms seriously and given the forest sector program a poverty alleviation focus. The emphasis on the poor of mountainous rural areas is the first step to ensuring that poor households are being targeted. Unfortunately, it is unclear from project documents if the current strategy to support forest sector projects, watershed development, and plantation expansion is going to have a large effect on poverty and a positive effect on the environment. China's record in the past decade or more has been that the most effective way to increase utilization of the forests has been to increase agricultural productivity, improve access to off-farm jobs, and increase incomes. Under these conditions, farmers have initiated their own forest activities. Yet many of the current project components focus primarily on forest sector investments, which are being supported by the more recent projects.

NGO critics claim that they have expressed their doubts to the Bank's project management during the pre-evaluation trips for the FDPA project and in recent interactions over the current lending package and its ability to lead to long-term poverty alleviation and community development. The Bank has tended to finance projects with nationwide coverage (involving up to 16 provinces) that are administered very effectively by provinces and counties, albeit with national-level coordination. But the Ford Foundation and WWF, believe that community participation and social forestry require a more localized approach for effecting long-term rural development in many of China's poorest, most remote areas. Some of the most ardent supporters of social forestry in these organizations, however, recognize that it is difficult to try to design, monitor, and evaluate com-

munity-based forestry programs at the scale of projects that the Bank is used to administering in China. Many of the activities needed to implement truly community-based programs would add to the already costly forest sector package that the Bank is asking poor farmers and communities to finance. There are three possible solutions: first, the Bank can keep doing what it is doing *if* it can be proved that what it is doing actually helps, or at least does not hurt, the poor. Second, the Bank can experiment with ways to work with communities, though it will have to go outside of China to find models. Finally, if the current approach is not working, the Bank may want to opt to do nothing, or concentrate on integrated agricultural development and other poverty alleviation lending that may indirectly help farmers in poor, resource-scarce areas.

The recognition of the political-economy complexities of forestry reform in poor localities and a willingness to deal with these problems demonstrates a maturing of the forest sector program in the Bank. The lending package currently under negotiation with the SFA is structured to help local governments in poor areas deal with the fiscal shortfalls caused by recent policy pronouncements and actions taken to protect old-growth forests. Amelioration of the fiscal crises confronting poor county and sub-county governments will be key to assisting rural residents, who will otherwise be forced to shoulder increasing taxes for declining social and other public services. Additionally, if local fiscal problems are not addressed, it will be impossible to guarantee that local public agencies charged with the provision of public goods, including protecting nature reserves and forest resources, will not be induced by adverse incentives to exploit the very resources they are supposed to be protecting. Fiscal solutions, unfortunately, are not easy and often can only be addressed by basic reform of the entire regional fiscal system. The Bank's recent rural development strategy for China cites the rural fiscal problem as the number-one challenge facing China's rural development in the early twentieth century. It will affect forestry development if it is not addressed. The Bank could certainly use the input of China's rural policymakers and scholars to help design some parts of this strategy.

Summary Ratings

Based on the analysis in this report and the above evaluation of the World Bank program in China's forest sector, the study team has developed summary ratings for the implementation of the 1991 forest strategy. These ratings are presented in table 10.5.

Table 10.5. Summary Evaluation of the Implementation of the 1991 Forest Strategy in China

	1991–94	1994–99
Strategy Implementation		
Did the Bank forest strategy for the country change from the pre-1991 period?[a]	No	No
Was change attributable to the 1991 Forest Strategy?[a]	No	No
Was the Bank's post-1991 forest strategy for the country responsive to the needs articulated by the country?[a]	Yes	Yes
Consistency of Bank strategy		
Was the Bank strategy consistent with the CAS?[b]	Mostly	Mostly
Did the country have a forest policy consistent with the Bank's policy?[a]	No	Yes
Did the Bank follow the principles of its involvement in the sector?[b]		
Multisectoral Approach	Mostly	Mostly
International Cooperation	Negligibly	Partly
Policy Reform	Partly	Partly
Institutional Reform	Partly	Mostly
Preserving Natural Forests	Partly	Partly
Resource Expansion and Intensification	Predominantly	Predominantly
Were participatory approaches Implemented?[a]	Yes	Yes
Was the 1991 Strategy implemented?[b]	Mostly	Mostly
Nature of Bank Interactions		
The forest sector strategy was implemented through:[b]		
CAS	Partly	Partly
ESW	Negligibly	Negligibly
Policy dialogue	Partly	Partly
Lending to forest sector	Predominantly	Predominantly
Lending to forest-related sectors	Partly	Partly
Forest conditionality in adjustment lending	Not Applicable	Not Applicable
Bank application of safeguards	Mostly	Mostly
Bank Outcomes		
Bank's forest sector strategy from country perspective:[c]		
Relevance	Substantial	Substantial
Efficacy	High	High
Efficiency	High	High
Is the impact of the Bank strategy in the country sustainable?[a]	Yes	Yes
The Bank's Impact		
Did the country improve its forest cover?[a]	Yes	Yes
Did the country improve the way it addresses forest sector issues?[b]	Mostly	Mostly
What degree of impact did the Bank strategy have on the poor?[c]	Substantial	Substantial
Relevance for Future Strategy		
Does the Bank's 1991 Forest Strategy seem relevant from the perspective of the country?[d]	Partly	Partly
Is there government demand for Bank involvement in the forest sector?[a]	Yes	Unclear
Is there demand from NGOs, the private sector, and professionals for Bank[a] involvement in the forest sector?	NGOs: Unclear Private Sector: Unclear Professionals: technical, Yes; social scientists, Unclear	NGOs: Unclear Private Sector: Unclear Professionals: technical, Yes; social scientists, Unclear
How was the country's forest policy embedded in its overall growth and poverty alleviation strategy?[e]	Well	Very Well

a. Ratings choices: Yes, No, Not Applicable, and Unclear.
b. Ratings choices: Predominantly, Mostly, Partly, Negligibly, Not Applicable, and Unclear.
c. Ratings choices: High, Substantial, Modest, Negligible, Adverse, Substantially Adverse, and Unclear.
d. Ratings choices: Substantially, Partly, Negligibly, No, and Unclear.
e. Ratings choices: Very Well, Well, Poorly, Very Poorly, Unclear.

11

Conclusions and Future Directions

China's forest work has been remarkably successful; it is a high point in one of the Bank's highest-quality portfolios. The work has evolved markedly over time, contributing initially to meeting China's forest cover goals, but then gradually addressing complicated issues in China's poor and environmentally fragile regions. The beneficiaries have also changed over time from those in more prosperous state-run and collective forest farms to poor rural households and workers in economically stressed forest regions.

Despite these strengths, work in the future will also face a number of challenges. With graduation from low-interest to commercial-rate loans, there is concern that China's leaders will not want to continue borrowing for forest sector work—especially for loans that address poverty and environmental concerns at a time when the terms of Bank lending are hardening. There are many issues concerning how the Bank should continue and expand its work into the household sector. The activities in the lending package should be closely monitored in order to determine which parts work and which do not. Currently, it is not known who among the poor counties benefits from forest sector projects. A more integrated approach, including projects that increase the productivity of local agricultural resources and offer off-farm job opportunities could enhance forest work. Such an emphasis could increase the poverty alleviation and environmental impact of Bank projects.

For forest projects to succeed Bank staff must find less costly, quicker payback forestry systems for which farmers are willing to borrow at

commercial rates. Issues of land tenure and the security of the investments of participants in an environment where contractual terms are difficult to enforce must be addressed. Land tenure systems in China are complex and often are playing multiple roles (including important social welfare and social security roles), and changes will be difficult to enforce unless they are designed to meet community needs. Managing the exchange rate risk on such long-term, dollar-denominated loans is also of concern. Finally, until China can address the chronic shortcomings of its fiscal system—which systematically underfunds policy-mandated expenditures, leading to over-taxation, investment diversion, and exploitation of the local resource bases (including the forests)—there is little hope that poverty alleviation or environmental management projects can be implemented in a sustainable way.

The Bank's successes have contributed to and even helped amplify China's successes in increasing forest cover. At a time when much of the rest of Asia is experiencing rapid deforestation, China has not only reversed the worst excesses of the 1950s, 1960s, and 1970s, but has made great progress in increasing forest areas. The Bank's projects have contributed 3.3 million hectares of new, high-quality forest land. Interviews with project officials have noted that project offices in some areas have used the lessons learned during project implementation to expand forest area outside of and after the Bank's projects have finished. Working more closely with a broader range of personnel in the SFA and the rest of the forest sector policymaking and academic community will increase the effectiveness and reach of Bank projects.

Although China's success and the Bank's projects have had important environmental and economic benefits, the biggest impact on forests may have come from poverty alleviation progress and economic growth and investment in agricultural intensification. There is evidence that China's forest policy and regulations have actually negatively affected forests. The investment concentration on forest farms and China's early suspicion of households has made less of a direct impact on poverty.

The impressive performance of the Bank-funded forest investments in China has been the result of many factors, some in China and some in the Bank.

Success Factors in China

Within China, the most important factor for success has been the high priority the government has accorded to forest sector development and a high level of project ownership. The sense of ownership

extends from the central level to the provincial, prefectural, county, and township levels, each of which typically contribute a share of the counterpart funds. There is widespread recognition—not only among the officials of the ministries of finance and planning and of the state forest administration but also among provincial and county officials and among farm households—that Bank funds must yield enough return to enable repayment, including bearing foreign exchange risks.

The high level of ownership derives in part from the selection of participating provinces based on their interest in the program as reflected in the provision of budgetary resources and allocation of qualified staff. The counties, townships, and households in turn are selected based on their need (not only whether they are designated poor but also whether they demonstrate a willingness to contribute their own resources and to repay borrowed funds). The Ministry of Finance is known to use draconian measures to enforce payment, including stopping disbursements on all Bank-funded projects to the province in arrears—thus punishing even those counties who are not beneficiaries of the forest project and thus not responsible for the repayment.

The "responsibility system" that the government introduced with the initiation of the Bank-funded projects has profoundly influenced the incentives at all levels for making projects "work." Making all program participants (households, townships, and provincial and national forest administrations) pay their share of the credit with interest encourages beneficiaries at all levels to improve performance. This is in sharp contrast to the previous government practice of allocating resources to forest sector programs with no expectation of repayment and poor project results. This innovation, however, restricts participation by the poorest in the poor counties—particularly given the long gestation lag in realizing returns and the high opportunity cost of the land and labor.

The provision of budgetary resources for Bank-funded programs has been both adequate and timely, although the government's own programs seem to founder on both scores. Provincial officials point out that this limits the multiplier effects of the large investment in managerial and human capital made by the Bank projects.

The State Forestry Administration (SFA) has considerably increased its internal capacity in project preparation, monitoring, and evaluation since the initiation of Bank projects. Despite a relatively advanced stage of fiscal and administrative decentralization, the SFA exercises strong leadership in project preparation, monitoring, evaluation, and oversight as

well as in building the capacity of the provinces in the preparation, implementation, monitoring, and evaluation of Bank projects.

China carefully selects strong, capable staff to manage Bank-financed projects so that successful models can be replicated within the forest administration. The downside of this is that the World Bank Project Management Center (PMC) of the SFA has perhaps tended to keep too much power to itself. It is envied and seen to be isolated within the SFA and therefore may not have had as much influence on the rest of the forest sector as it could have given the experience it has acquired.

Continuity among the staff managing Bank projects has been high at all levels. This has generally ensured accumulated learning and greater impact.

China's forest research system has had a variety of research successes and, with Bank assistance on strengthening the research-extension linkage, was able to convey those results to farmers. The forest research system is in danger of weakening, however, as is the agricultural research system, owing to government zeal for cost recovery, which has tended to move research toward adaptive research and also prevented Bank financing of the research systems.

Success Factors in the Bank

Strong continuity of task managers (only three since 1989 and only one since 1991) has been crucial with equal amount of continuity in the use of external consultants. This has occurred despite healthy differences of opinion between managers and consultants on a variety of matters related to forest sector development.

Projects have evolved from the relatively simple to the more complex, with initial emphasis on simple improvements in technology, control of forest fires, and similar objectives. During this evolution, the use of participatory approaches has increased. The evolutionary trend has also led to a strong emphasis on technology and research-extension links and on improvements in the environmental management and monitoring of plantation programs. Institutional development, including improving management procedures, monitoring and evaluation, and management by results, has likewise received considerable attention. And training has reached every level of the forest management system from the leadership of the SFA to the households and collective and state farm managers who directly benefit from the projects.

The projects have introduced biodiversity conservation and a more diverse set of tree species. Biodiversity conservation has been assisted through mobilizing support from GEF. The GEF program in China is among the more successful ones, although both SFA and SEPA officials say that they are not receiving as much of the GEF resources as they seem to be able to use effectively.

Implications for the Future

Bank forest sector projects in China still have many areas that could be improved and should receive more attention in future projects.

Relatively little is known about the distribution of benefits between the households and the higher order of production/marketing units. Beneficiary participation is relatively new in China. India, Nepal, and Mexico have been using the Joint Forest Management (JFM) or community-participation projects for some time. But even in those countries, the distribution of benefits has not received the attention it deserves. This issue requires focus globally by the Bank.

The impact of the government controls on harvesting quotas and transportation permits on producer incentives has received less attention than the incentives related to production; less attention than it has in India, for instance. This, together with production and market intelligence, will become important as emphasis on participation and private sector investments increases.

The macro issues of international trade vis-à-vis domestic production have also not received attention.

Policy reforms, particularly for state-owned enterprises (SOEs), need to be moved forward. Officials in China claim that the Bank needs to be involved in policy reforms in the forest sector, particularly the issues of post-harvest processing, the reforms of the SOEs, and the role of the private sector. But the Bank staff argue that government has not been willing to take the steps necessary to reform state enterprises, promote private investment, or improve incentives. China, they say, has not faced the issues of unemployment in the SOEs (this has now changed with the government declaration of the logging ban and plans to spend US$22 billion over the next 13 years in support of a variety of programs to "convert loggers into protectors of forests." This debate needs to be resolved. Government officials have expressed an interest in having more private investment of the sort brought into the country by the IFC and private investors and are seeking help from the Bank in fostering an increased private-sector presence in the forest industry.

China's policy of lending to households for tree planting rather than providing outright subsidies has pros and cons that require close examination. The government has indicated that because it proposes to spend massive public funds to improve the environment, mostly in the form of transfers, unless the Bank does the same, there would be severely limited demand for IBRD resources, a message also strongly supported by officials of the nine participating provinces in the project currently under discussion. They doubted the farmers' interest in forestry at the higher interest rates and expressed concern that the new project will not be able to reach the poorest farmers.

Current monitoring and evaluation procedures, while far stronger than most M&E efforts in the Bank, are inadequate for judging the effect of several innovations in current Bank forest sector projects. While farmers, local leaders, and regional administrators now have a better-defined channel through which to express their needs and desires, it is unclear how well the current system is working to find projects that fit the needs of localities and their farm households. The institutional reforms promoted by the most recent projects need close monitoring to ensure that they are in fact occurring. There is still a tendency to define one or more "models" and then try to solicit support from locals to adopt one or more of them. There is less dialogue than some in the social forestry field (e.g., Ford Foundation, WWF) would like to see. Most agree that the current situation is better than before, but wonder if more thought can be given to making community participation even more important. Given the already high costs of implementing Bank projects, however, providing more flexibility might only come at the expense of higher administration costs or less monitoring.

While there is clearly more effort being put into targeting projects at poorer households, there is almost no systematic way of judging how well the projects are getting to the poorest households. The extent to which the projects are helping to alleviate poverty is also unclear, given that the forest sector provides only part of the farmers' income. On one hand, poorer households must welcome the availability of cash payments for work on the local plantations. On the other hand, significant costs do not appear to be accounted for, including the use of land resources that might otherwise be used in household agricultural production, for activities that create more and quicker cash payments and plant crops that have quicker payback periods.

While Bank task managers have actively begun to mobilize donor funds, the task is proving very difficult. There seems to be less donor

interest in China and its forests compared with, for example, the pristine rainforests in Latin America. Donors are keen to maintain their identity and feel that their assistance would not have the political visibility to make it worthwhile to cofinance a Bank project. From the perspective of the government of China, an increase in tied aid is also a problem compared to the international and local competitive procedures used by the Bank.

The GEF projects in China, like other forest sector projects, have worked very well. But some SEPA staff members believe that China is not getting a sufficient share of GEF funding. Bank staff charged with administering GEF funds to China say that this is because the government is submitting proposals that do not meet key criteria for GEF: demonstrable global benefits and incremental costs. Officials in China respond that the sustainability of GEF projects is questionable if they do not address national priorities. Actors in China are also often interested in small grants to address biodiversity issues of national priority, but even assuming such projects could meet all GEF criteria, competing pressures on Bank staff would prevent them from processing large numbers of small requests. The administration of GEF funds is also an issue, at least for SEPA officials, who feel that their agency, not others, should administer future GEF grants.

Officials interviewed for this study clearly indicated that they will not be able to participate in the World Bank-WWF alliance, which is currently under discussion, without grant funds.

The Bank presence in China has been driven more by China's demand for specific projects rather than by a systematic analysis of the country's forest sector policies, strategies, and priority areas for Bank interventions. To date there are no Bank forest sector reports on China, in sharp contrast to the amount of economic and sector work (often of high quality) the Bank has carried out in the agricultural sector and poverty, each of which has had considerable influence on government policies and strategies. Although the Bank has contributed to a substantial increase in the supply of forest products, and indirectly reduced pressure on natural forests (both through its forest sector and agricultural activities), this has not benefited from broad analysis of supply, demand, and trade policies strategy. The authors consider the lack of adequate data to inform government and the Bank on changes in the forest cover and its quality, particularly the composition of natural forests, a significant problem. The Bank staff who reviewed this report, however, suggest that the lack of data is not a critical problem.

The Bank has emphasized production over the pricing, marketing, and regulatory framework in the forest sector—even recognizing that the excessive production of citrus in some provinces has resulted in a requirement that marketing surveys be carried out before permits are granted for logging of trees in various areas to ensure remunerative prices and markets. However, China seems to have a complex system of centrally allocated quotas assigned to various provinces in turn broken down to the lower levels of administration with exceptions to these assigned quotas reportedly made only by the State Development Planning Council (SDPC) in Beijing. Permits are also needed for moving logged timber across county boundaries, leaving scope for taxes and fees imposed by various administrative levels, with some studies showing the total of these amounting to nearly 80 to 90 percent of the value of timber. Hence it is no surprise that when the farmers were given a choice in some of the more recent participatory projects as to the types of trees they would want to plant, they specified 18 species, a majority of them horticultural crops rather than timber trees. A recent survey showed that the reason they want to plant orchards and certain types of paper-pulp plantations is that there is no control on the sale of output of these "economic trees" in contrast to the regulations in logging timber.

China will need to continue to increase its supply of timber in the future and large tracts of land still await reforestation. The Bank has made a substantial contribution to improvements in the efficiency of China's afforestation programs and contributed to considerable benefits for soil and water conservation and for carbon sequestration. Thus there are good reasons to continue World Bank investment in plantations in China, which will help not only to save China's natural forests but also to avert future increased pressure on both domestic and global forest resources. The Sustainable Forestry Development Project that is currently under preparation seeks to further expand afforested area and is a good start toward meeting the future wood needs of China's people.

Annexes

A. Supplemental Tables

Page 100–139 contain 28 supplemental tables of data on forestry and foresty projects in China. Due to formatting constraints, the first of these tables does fit on this page.

Table A.1. Forest Cover and the Volume of Forest and Timber Resources in China from Late 1970s to Late 1980s

	Forest cover (%) [c]			Total forest volume			Mature forest volume [d]				Mature timber forest volume			
	1980	1988	Net change	1980	1988	Net change	1980	1988	Net change	Net change[a]	1980	1988	Net change	Net change[a]
Northeast State-run Region (1)														
Heilongjiang	33.60	34.35	0.75	1,436.63	1,316.87	-119.76	927.02	665.58	-261.44	-208.13	852.12	611.31	-240.81	-203.61
Inner Mongolia	11.90	11.94	0.04	847.78	865.13	17.35	494.35	400.51	-93.84	-52.57	458.78	351.33	-107.44	-87.64
Jilin	32.20	32.99	0.79	656.97	710.35	53.37	369.81	427.23	57.42	-11.35	337.35	352.64	15.29	-35.64
Subtotal	19.49	19.80	0.32	2,941.38	2,892.35	-49.03	1,791.18	1,493.32	-297.85	-272.06	1,648.24	1,315.28	-332.97	-326.86
Southern Collective-run Region (2)														
Fujian	37.00	41.18	4.18	296.38	263.82	-32.56	89.22	48.04	-41.18	-24.76	84.94	40.16	-44.78	-29.99
Jiangxi	32.80	35.94	3.14	236.33	168.50	-67.82	55.56	51.28	-4.27	-67.93	54.10	47.71	-6.39	-72.72
Hunan	32.50	31.88	-0.62	160.21	140.66	-19.55	63.66	49.26	-14.40	-25.91	62.23	43.26	-18.97	-34.76
Guangdong [b]	27.70	27.03	-0.67	203.41	185.74	-17.67	35.13	49.28	14.15	-24.72	34.65	39.07	4.43	-36.66
Guizhou	13.10	12.58	-0.52	126.41	108.01	-18.39	34.72	32.07	-2.65	-21.81	23.36	19.37	-4.00	-17.44
Subtotal	28.16	28.92	0.77	1,022.73	866.74	-155.99	278.29	229.93	-48.35	-165.12	259.28	189.58	-69.70	-191.57
Total, 1 & 2	22.35	22.82	0.47	3,964.11	3,759.09	-205.02	2,069.46	1,723.26	-346.21	-437.18	1,907.52	1,504.86	-402.67	-518.43
Southwest Mixed-managed Region (3)														
Yunnan	24.00	24.38	0.38	1,097.03	1,096.57	-0.46	643.66	713.72	70.06	-42.58	571.70	368.29	-203.41	-352.99
Sichuan	12.00	19.21	7.21	1,048.80	1,273.01	224.20	825.67	1,051.78	226.11	191.54	610.87	555.57	-55.31	-81.89
Subtotal	16.87	21.29	4.42	2,145.84	2,369.58	223.74	1,469.33	1,765.50	296.17	148.97	1,182.57	923.85	-258.72	-434.88
Total, 1-3	20.92	22.42	1.50	6,109.95	6,128.67	18.72	3,538.79	3,488.76	-50.04	-288.21	3,090.10	2,428.71	-661.39	-953.31
China	12.00	12.98	0.98	7,978.37	8,091.49	113.12	4,592.15	4,726.59	134.44	-18.81	3,927.79	3,317.23	-610.56	-1,012.38

a. Includes both middle-aged and matured forest biomass.
b. Hainan is included with Guangdong.
c. "Forest cover" is measured by total forest area divided by total land area.
d. Mature forests is a term used by foresters in China to denote the age and size of a stand, and varies by region and species. See text for more detailed explanation and analysis.
Source: QGSLZYTJ, 1983; 1989.

Table A.2. Forest Cover and the Volume of Forest Resources in China from Late 1980s to 1993 [a]

	Tree cover (percentage) [c]					Total forest volume (million m^3)				
				% change					% change	
	1980	1988	1993	1980 –88	1988 –93	1980	1988	1993	1980 –88	1988 –93
Northeast State-run Region										
Heilongjiang	33.6	34.4	35.6	2.2	3.5	14.4	13.2	13.5	-8.3	2.3
Nei Monggol	11.9	11.9	12.1	0.3	1.7	8.5	8.6	9.0	2.0	3.7
Jilin	32.2	33.0	33.6	2.5	1.9	6.6	7.1	7.6	8.1	6.8
Subtotal	19.5	19.8	20.3	1.6	2.5	29.4	28.9	30.0	-1.7	3.8
Southern Collective-run Region										
Fujian	37.0	41.2	50.6	11.3	22.9	3.0	2.6	3.2	-11.0	21.9
Jiangxi	32.8	35.9	40.4	9.6	12.3	2.4	1.7	1.8	-28.7	7.3
Hunan	32.5	31.9	32.8	-1.9	2.9	1.6	1.4	1.5	-12.2	7.7
Guangdong [b]	27.7	27.0	35.9	-2.4	32.8	2.0	1.9	2.2	-8.7	18.1
Guangxi	22.0	22.0	25.3	0.0	15.2	2.2	2.0	2.1	-7.5	4.7
Subtotal	29.4	30.2	35.2	2.8	16.5	11.2	9.6	10.9	-13.8	12.9
Southwest Mixed-managed Region										
Yunnan	24.0	24.4	24.6	1.6	0.8	11.0	11.0	11.0	0.0	0.8
Sichuan	12.0	19.2	20.4	60.1	6.0	10.5	12.7	13.0	21.4	2.5
Subtotal	16.9	21.3	22.1	26.2	3.6	21.5	23.7	24.1	10.4	1.7
North-Central Fast Growth Region										
Jiangsu	3.2	3.8	4.0	17.5	6.9	0.03	0.07	0.08	113.1	18.2
Anhui	13.0	16.4	16.3	25.8	-0.2	0.55	0.71	0.63	30.9	-12.5
Shandong	5.9	10.5	10.7	77.8	2.0	0.05	0.11	0.15	118.3	42.1
Henan	8.5	9.4	10.5	10.7	11.6	0.32	0.40	0.48	26.8	19.2
Subtotal	7.9	10.4	10.8	30.9	4.1	0.95	1.29	1.34	36.8	3.5
China	12.0	13.0	13.9	8.2	7.2	79.8	80.9	90.9	1.4	12.3
Total covered area (millions ha)	115.3	124.7	133.7							

a. The years 1980, 1988, and 1993 are approximate time periods of the three census periods. In fact, the first forest census (referred to as 1980) was carried out in different provinces from 1978 to 1981; the second census (referred to as 1988) was carried out in 1986 to 1989; and the third census (referred to as 1993) was carried out in 1992 to 1994.
b. Hainan is included with Guangdong.
c. "Forest cover" is measured by total forest area divided by total land area.
Source: QGSLZYTJ, 1983; 1989; 1994.

Table A.3. Estimated Newly Afforested and Reforested Plantation Area Planted to Monospecies Forests, 1980–93 (million ha)

	Afforested area [a]		
Year	Total [b]	Fast growing	Reforested area [c]
1980	0.91	--	0.37
1981	0.93	--	0.37
1982	9.96	--	0.38
1983	1.01	--	0.42
1984	1.09	--	0.48
1985	1.15	--	0.54
1986	1.09	--	0.49
1987	1.23	0.38	0.59
1988	1.66	0.45	0.54
1989	1.63	0.42	0.57
1990	1.91	0.45	0.54
1991	2.26	0.56	0.54
1992	2.53	0.62	0.57
1993	2.28	0.51	0.61
Total	20.74	3.39	7.00

a. Afforested area (or *gongchengzaolin*, "engineered" afforestation) includes two kinds of forest area: one is regular forest area and the other is "fast-growing" (or *shushenglin*) forest area, which has been formally recorded since 1987.
b. Figures for 1980 and 1986 are extrapolated based on the figures for 1987 to 1993.
c. Reforested area (*jidigengxin*) is the area planted on harvested land.
Source: ZGLYNJ (China Forestry Yearbook), 1949–86 (one volume), 1987–93.

Table A.4. Shelterbelt Forest Area and Volume of Selected Regions in China from Late 1970s to Early 1990s [a]

	Shelterbelt forest area (million ha)					Shelterbelt forest volume (million m^3)				
				% change					% change	
	1980	1988	1993	1980 –88	1988 –93	1980	1988	1993	1980 –88	1988 –93
Northeast State-run Region										
Heilongjiang	.47	.45	.40	-6	-10	.42	.29	.28	-32	-3
Nei Monggol	.28	.40	.50	43	26	.12	.21	.23	76	8
Jilin	.89	.82	.75	-8	-8	.70	.63	.79	-10	26
Subtotal	1.64	1.66	1.65	1	0	1.24	1.13	1.30	-9	15
Southern Collective-run Region										
Fujian	.14	.22	.31	60	39	.09	.12	.22	41	78
Jiangxi	.05	.19	.26	276	33	.04	.05	.07	27	35
Hunan	.04	.16	.20	258	22	.02	.09	.10	307	17
Guangdong [b]	.17	.25	.36	46	43	.08	.16	.20	92	24
Guangxi	.59	.67	.86	14	29	.46	.47	.57	1	22
Subtotal	.99	1.50	1.98	50	32	.70	.89	1.17	28	30
Southwest Mixed-managed Region										
Yunnan	.54	1.60	1.80	198	12	.97	2.33	2.57	140	10
Sichuan	2.03	3.38	2.72	67	-20	2.68	5.30	5.37	97	1
Subtotal	2.57	4.98	4.52	94	-9	3.65	7.63	7.94	109	4
North-Central Fast Growth Region										
Jiangsu	.03	.06	.07	115	13	.01	.02	.03	222	23
Anhui	.03	.39	.12	1,450	-70	.00	.19	.04	4,581	-80
Shandong	.47	.47	.44	1	-7	.03	.05	.07	52	50
Henan	.28	.34	.31	23	-8	.13	.15	.16	15	11
Subtotal	.80	1.27	.94	59	-26	.17	41.00	.30	138	-26
China	10.00	14.56	16.07	46	10	8.84	14.00	17.78	58	27

a. The years 1980, 1988, and 1993 are approximate time periods of the three census periods. In fact, the first forest census (referred to as 1980) was carried out in different provinces from 1978 to 1981; the second census (referred to as 1988) was carried out in 1986 to 1989; and the third census (referred to as 1993) was carried out in 1992 to 1994.
b. Hainan is included with Guangdong.
Source: QGSLZYTJ, 1983; 1989; 1994.

Table A.5. Area of Commercial Trees and Orchards in China from 1980 to 1993 [a] (million ha)

	Area of commercial trees					Area of orchards				
				% change					% change	
	1980	1988	1993	1980 –88	1988 –93	1980	1988	1993	1980 –88	1988 –93
Northeast State-run Region										
Heilongjiang	.03	.06	.05	98	-15	.01	.01	.02	0	197
Nei Monggol	.85	.89	.87	5	-3	.02	.03	.04	17	59
Jilin	.05	.04	.04	-13	-2	.02	.02	.02	18	-33
Subtotal	.94	1.00	.96	7	-4	.05	.06	.08	15	35
Southern Collective-run Region										
Fujian	.34	.57	.79	65	40	.04	.20	.44	460	115
Jiangxi	.98	1.10	1.13	12	3	0.00	.04	.05	--	40
Hunan	2.42	2.42	2.27	0	-6	.90	.83	1.79	-7	116
Guangdong [b]	.75	.84	1.32	11	57	.20	.19	.50	-5	163
Guangxi	.71	.80	.99	13	23	.05	.06	.20	30	223
Subtotal	5.20	5.73	6.50	10	13	.37	.57	1.36	54	138
Southwest Mixed-managed Region										
Yunnan	.32	.59	.68	84	15	.05	.09	.14	62	61
Sichuan	.24	.69	.84	191	21	.02	.25	.31	1,188	25
Subtotal	.56	1.28	1.52	130	18	.07	.34	.45	361	34
North-Central Fast Growth Region										
Jiangsu	.11	.15	.16	27	11	.05	.08	.08	70	6
Anhui	.14	.32	.41	125	28	.03	.07	.12	133	89
Shandong	.33	.87	.99	160	14	.17	.73	.86	341	18
Henan	.31	.33	.43	6	31	.10	.10	.17	-3	77
Subtotal	.90	1.67	1.99	84	20	.35	98	123	185	28
China	11.28	13.74	16.10	22	17	1.50	3.41	5.30	127	55

a. The years 1980, 1988, and 1993 are approximate time periods of the three census periods. In fact, the first forest census (referred to as 1980) was carried out in different provinces from 1978 to 1981; the second census (referred to as 1988) was carried out in 1986 to 1989; and the third census (referred to as 1993) was carried out in 1992 to 1994.
b. Hainan is included with Guangdong.
Source: QGSLZYTJ, 1983; 1989; 1994.

Table A.6. Timber Resources and Production in China, 1980–93 [a] (million m³)

	Timber forest volume					Timber production				
				% change					% change	
	1980	1988	1993	1980 –88	1988 –93	1980	1988	1993	1980 –88	1988 –93
Northeast State-run Region										
Heilongjiang	1,341	1,216	1,267	-9.3	4.1	16	19	12	15.6	-34.9
Nei Monggol	797	775	798	-2.8	2.9	.4	6	5	43.4	-14.8
Jilin	571	590	619	3.2	5.0	6	6	5	0.9	-15.8
Subtotal	2,709	2,581	2,684	-4.7	4.0	.27	31	.2	16.5	-27.2
Southern Collective-run Region										
Fujian	284	245	286	-13.7	16.9	4	6	6	45.4	0.5
Jiangxi	229	157	167	-31.5	6.4	3	2	3	-21.5	11.0
Hunan	158	123	135	-21.7	9.6	2	3	3	22.3	12.7
Guangdong [b]	194	162	187	-16.4	14.9	3	2	3	-30.8	38.1
Guangxi	174	156	154	-10.6	-1.4	2	2	3	30.7	37.6
Subtotal	1,039	843	929	-18.8	10.1	14	15	.18	7.8	15.7
Southwest Mixed-managed Region										
Yunnan	976	698	662	-28.5	-5.2	2	3	4	35.0	9.9
Sichuan	767	713	737	-7.0	3.3	4	5	5	8.4	1.6
Subtotal	1,743	1,411	1,399	-19.0	-0.9	6	8	9	18.3	5.1
North-Central Fast Growth Region [c]										
Jiangsu	2	4	5	84.8	15.3	0	.1	.5	--	939
Anhui	54	52	58	-3.6	10.0	.5	.4	2	-10	491
Shandong	2	6	7	238.6	35.4	0	.1	1	119	1,772
Henan	19	24	30	27.5	24.4	.2	.2	2	3	1,031
Subtotal	77	86	100	11.7	15.9	.7	.8	6	8	790
China	6,881.86	6,173.17	6,743.39	-10.3	9.2	54	62	64	16	3

a. The years 1980, 1988, and 1993 are approximate time periods of the three census periods. In fact, the first forest census (referred to as 1980) was carried out in different provinces from 1978 to 1981; the second census (referred to as 1988) was carried out in 1986 to 1989; and the third census (referred to as 1993) was carried out in 1992 to 1994.
b. Hainan is included with Guangdong.
c. For the North-Central Provinces this estimate is based on mean timber production after they attained the new higher level of output, which was in the period 1990–92. For the others it is based on the mean output over the entire period 1988–93.
Source: QGSLZYTJ, 1983; 1989; 1994. ZGNYNJ 1981; 1989; 1994.

Table A.7. Indicators of Rural Environment and Natural Resource Conservation

Year	Water erodible area (million ha)		Salinity area		Flood area		Forest cover (%)
	Total	Controlled	Total	Improved	Total	Improved	
1975	119.6	40.7	7.1	3.9	22.1	16.1	13–14
1980	118.3	41.1	7.1	4.2	23.4	17.8	12
1985	132.0	49.5	7.6	4.8	24.3	18.5	13
1990	136.0	53.0	7.5	5.0	24.4	19.3	14
1995	163.0	66.8	7.6	5.4	24.4	20.1	
1996	182.7	69.3	7.6	5.5	24.6	20.3	n.a.

n.a. Not available.
Source: China's Ministries of Water Resources, Agriculture, and Forestry.

Table A.8. Structure of Forest Land Tenure System in the Sampled Villages, Yunnan Province, China, 1975–95

Year	Share of forest land by tenure system (%)			
	Collective land	Responsibility land	Private plot land	Auction land
1975	99	0	1	0
1982	94	2	4	0
1983	45	43	12	0
1984	46	43	12	0
HRSF year [a]	43	45	12	0
1988	48	40	12	0
1995	45	44	11	1

a. The first year implementing the forest household responsibility (ranging from 1982 to 1986).
Source: Based on a survey conducted by authors in Yunnan province.

Table A.9. Land and Forest Coverage in the Sampled Villages, Yunnan Province, China, 1975–95

Year	Total land area (ha) (1)	Forest area (ha) I[a] (2)	Forest area (ha) II[b] (3)	Forest coverage (%) I[a] (4)=(2)/(1)	Forest coverage (%) II[b] (5)=(3)/(1)
1975	5,867	3,747	3,016	63.9	51.4
HRSF year [c]	5,867	3,796	3,033	64.7	51.7
1988	5,867	3,840	3,075	65.5	52.4
1995	5,867	3,916	3,198	66.7	54.5

a. Including timber, non-timber product forest, bamboo, and fuel wood forest.
b. Excluding fuel wood forest.
c. The first year implementing the forest household responsibility (ranging from 1982 to 1986).
Source: Based on a survey conducted by authors in Yunnan province.

Table A.10. Population Growth, Cultivated Land, and Irrigation in the Sample Villages, Yunnan, China, 1975–95

Year	Population (person)	Cultivated land (ha)	Population density (ha/person) In total land	Population density (ha/person) In cultivated land	Share of cultivated land (%)[a]	Share of irrigated land (%)[b]
1975	5,068	1,185	0.86	4.28	20	41
HRSF year [c]	6,064	1,186	1.03	5.11	20	40
1988	6,742	1,246	1.15	5.41	21	39
1995	7,666	1,307	1.31	5.86	22	37

a. The percentage of cultivated land in the total land.
b. The percentage of irrigated land in the total cultivated land.
c. The first year implementing the forest household responsibility.
Source: Based on a survey conducted by authors in Yunnan province.

Table A.11. The Trend of Forest Land Use in the Sampled Villages, Yunnan, China, 1975–95

		The structure of forest land use (%)						
		Timber forest						
Year	Forest land [a]	Sub-total	Matured	Young	Non-timber product forest	Bamboo forest	Fuel-wood forest	Wasted forest land
1975	4,450 (100)	67.0	28.0	39.0	0.6	0.2	16.4	15.8
HRSF year [b]	4,447 (100)	67.1	27.5	39.6	0.9	0.2	17.2	14.6
1988	4,400 (100)	68.0	25.9	42.0	1.7	0.2	17.4	12.7
1995	4,348 (100)	68.1	25.0	43.1	5.2	0.2	16.5	9.9

a. Land areas are in hectares, the figures in the parentheses are the sum of the shares in the total forest land.
b. The first year implementing forest household responsibility.
Source: Based on a survey conducted by authors in Yunnan province.

Table A.12. Changes in Forest Land Use Patterns by Land Tenure System in the Sampled Villages, Yunnan Province, China

	Total forest land (hectare) [a]					
Land tenure system	Total area	Timber forest	Non-timber product forest	Fuel-wood forest	Wasted forest land	Cultivated area in forest land
Collective land						
1975	1,746	1,181	8	248	310	0
HRSF year [b]	1,746	1,172	1	281	292	0
1988	1,746	1,161	2	301	283	0
1995	1,746	1,116	2	323	306	0
Responsibility land						
HRSF year [b]	1,816	1,375	35	183	222	1
1988	1,816	1,374	34	203	204	1
1995	1,816	1,428	94	212	82	0
Private plot land						
HRSF year [b]	472	166	9	230	54	13
1988	472	204	49	195	24	0
1995	472	206	109	131	26	0

a. The forest land defined in 1975, including forest land that was cultivated to crop production use after 1975.
b. The first year implementing the forest household responsibility
Source: Based on a survey conducted by authors in Yunnan province.

Table A.13. Afforestation by Land Tenure System in the Sampled Villages, Yunnan, China

Land tenure system	Land area (hectare) (1)	Afforestation area (hectare) (2)	Afforestation ratio (%) (3)=(2)/(1)*100
Collective land			
1975–HRSF year[a]	1,746	56	3
HRSF year[a]–1988	1,746	159	9
1988–1995	1,746	51	3
Responsibility land			
HRSF year[a]–1988	1,816	58	3
1988–1995	1,816	152	8
Private plot land			
HRSF year[a]–1988	472	79	17
1988–1995	472	69	15

a. The first year implementing the forest household responsibility.
Source: Based on a survey conducted by authors in Yunnan province.

Table A.14. Estimated Parameters for the Forest Cover Rate

	Forest cover rate		
	(1)	(2)	(3)
Constant	0.457	0.378	0.462
	(3.86)	(2.63)	(3.79)
Private forest plot	0.231	0.197	0.216
	(1.68)	(1.54)	(1.68)
Responsibility forest	0.326	0.336	0.332
	(3.32)	(3.39)	(3.21)
Length of the land tenure (year)	0.001	0.001	0.001
	(0.53)	(0.38)	(0.56)
Population/land area	-1.393	-1.334	-1.422
	(-3.65)	(-3.45)	(-3.42)
Irrigation land (%)	0.354	0.348	0.355
	(2.37)	(2.32)	(2.36)
Slope of arable land	-0.001	-0.001	-0.001
	(-0.32)	(-0.22)	(-0.29)
Distance to town			-0.005
			(-0.18)
Highway dummy		0.079	
		(0.99)	
County dummies	not shown	not shown	not shown

Note: *t*-values are in the parentheses.

Table A.15. Summary of Forest Sector Loans, Their Targets, and Performance in China, 1985–98

Project ID	Project name	Fiscal year	World Bank commitments (US$M)	Scope of work	Target group
3430	Forest Development Project (FDP-I)	1985	47	Plantation, afforestation	State forest farms
3550	Daxinganling Forest Fire Rehabilitation (DXALFire)	1988	57	Timber recovery/ fire prevention	State forest farms
3463	National Afforestation Project (NAP)	1990	300	Plantation, afforestation	State forest farms
3557	Forest Resource Development and Protection Project (FRDPP)	1994	200	Plantation, afforestation, and protection forests	Collective forest farms and state forest farms
3540	Loess Plateau Watershed Management Project	1994	150		Contract to farmers
46952	Forestry Development in Poor Areas (FDPA)	1998	200	Collective plantations and orchards	Collective forest farms and households
Total		1984–99	954		
GEF grant	Nature Reserves Management Project (NRMP)	1995	18		
Proposed IBRD loan	Sustainable Forest Development Project (SFDP)	2000	200		State forest farms and rural households
Grand total			1,172		

Source: World Bank Project Completion and Staff Appraisal Documents.

Table A.16. World Bank Forest Components in China, 1992–99

Project ID	Project name	Fiscal year	Orchards and economic crops (ha)	Forests and tree farms (ha)	Forest protection (ha)	World Bank investment for forest component (US$M)	House-holds reached [a]
3555	Guangdong Agricultural Development Project	1992	14,000	0	[b]	35.9	60,800
3556	Tarim Basin Project	1992	0	18,200	182,000	2.7	200,000
3561	Sichuan Agriculture Development Project	1993	14,000	25,200	[c]	18.3	888,000
3595	Second Red Soils Area Development Project	1994	17,420	9,742	[c]	42.4	67,000
3593	Songliao Plain Agriculture Development Project	1994	20,753	4,700	[c]	18.4	518,000
3639	Southwest Poverty Reduction Project	1995	67,000	19,400	[d]	32.2	343,000
3596	Yangtze Basin Water Resources Project	1995	11,400	32,500	6,000	3.9	200,000
3594	Gunsu Hexi Corridor Project	1996	3,300	5,100	113,130	26.2	200,000
3649	Shanxi Poverty Alleviation Project	1996	69,400	0	[b]	13.4	250,000
3590	Quinba Mountain Poverty Reduction Project	1997	18,500	1,200	[c]	30.6	150,000
49700	Irrigated Agriculture Intensification II Project	1998	0	129,600	[c]	16.6	734,000
46563	Tarim Basin II Project	1998	0	182,000	182,000	5.9	200,000
49665	Anning Valley Agricultural Development Project	1999	7,200	0	[d]	18.2	764,000
56216	Second Loess Plateau Watershed Rehabilitation Project	1999	72,000	181,000	[d]	36.3	277,000
46564	Western Poverty Reduction Project	1999	15,000	20,900	[d]	3.9	277,000
	Totals		329,973	629,542	428,130	304.9	5,128,800

a. Number of households reached was calculated by dividing the population the project expected to reach (4.5 million) by 6.13, the number of rural household members indicated by the Anning Valley project.
b. Will establish a nature reserve but it does not indicate how many hectares will be protected.
c. Will follow Bank's Environmental Guidelines for protection.
d. Anticipates a positive impact on the environment and on forests.
Source: Staff Appraisal Report and Project Appraisal Documents for each project.

Table A.17. Projects That Warrant Assessment for Impact of Forests, 1992–99

Project ID	Project name	Fiscal year	SAR: Treatment of forests	SAR: Mitigation actions	EIA: Natural environment	EIA: Expected impact	EIA: Mitigation/ response	EIA: Participation/ local people issues
34081	Xiaolangdi Multi. II (N)	1997	No mention of forest			Area was of high biological diversity but has been altered for centuries by human populations. Some forest remaining.	Did not find section for mitigation.	No mention of participation. Does have a large resettlement component.
3627	Grain Distribution (N)	1993	No mention of forest					
3563	Animal Feed (N)	1996	No mention of forest					
38988	Heilongjiang ADP (N)	1997	No mention of forest					
3591	State Farms Commerci (N)	1998	No mention of forest					
3562	Xiaolangdi Multipurpose (N)	1994	No mention of forest, but it seems that dam catchment area will be very big. It does mention that much of the area has been affected by human intervention.	No mitigation measures of forests proposed.	It will affect a stand of primary forests.	Area was of high biological diversity but has been altered for centuries by human populations. Some forest remaining. Mentions that some protected areas and zones with endangered bird species habitat.	Did not find section with mitigation actions. There are plans for monitoring.	Did not find participation. Does mention resettlement component.
51888	Guangdong Irrigation Improvement (O)	1999	No mention of forests but project not expected to have a negative environmental impact. It is all modification of existing infrastructures.	EIA has identified mitigation actions mainly having to do with water quality.				

Table A.17. Projects That Warrant Assessment for Impact of Forests, 1992–99 (cont'd)

Project ID	Project name	Fiscal year	SAR: Treatment of forests	SAR: Mitigation actions	EIA: Natural environment	EIA: Expected impact	EIA: Mitigation/ response	EIA: Participation/ local people issues
63123	Yangtze Flood Emergency Rehabilitation (P)	1999	No PAD available, information from Technical Annex. The main objective is to support the rebuilding of damaged infrastructure destroyed by floods.	Likely to have a positive effect on forests. Supports ban on logging in natural areas and to relocate populations away from natural forests.				
36405	Wanjiazhai Water Tra (N)	1997	No mention of forest.		Apparently no forest present in area.			
36947	Sichuan Transmission (N)	1995	Not mentioned directly in summary, will expand network transmission lines by 400 km.	Mitigation plans have been developed for each component and an environmental monitoring plan.	Lines will pass by natural forest habitat of the giant panda, golden monkey and other protected species.	5 km of lines will cross natural forests.	Project designed to have a short transmission line going through forest. Will pass 20 km from bamboo forest habitat of the giant panda.	
3492	Daguangba-Hainan (O)	1992	Region is devoid of tropical forests, reservoir is covered by bush 2–3 meters high. Areas affected by human intervention. Expect a loss of 87 ha of pear trees.	Afforestation activities in 35 percent of the area in the proposed irrigation project. Will be planted with trees to reduce erosion.				
3506	Ertan Hydro (I)	1992	Mentions analysis of dam catchment area land use trends. Expect to relocate 30,000 people.	Mitigation activities will be conducted, not specified in the summary document.	Broad leaf forest present.	The project will inundate at least 1,080 ha of broad leaf forest with biodiversity value.	Protection of 4,600 ha of forest to compensate for loss of entire reservoir.	Consultation took place when people to be relocated were informed of areas and village layouts. Leaders were taken to visit sites and changes were made to original plans.

Table A.17. Projects That Warrant Assessment for Impact of Forests, 1992–99 (cont'd)

Project ID	Project name	Fiscal year	SAR: Treatment of forests	SAR: Mitigation actions	EIA: Natural environment	EIA: Expected impact	EIA: Mitigation/ response	EIA: Participation/ local people issues
3526	Shuikou II (I)	1993	Mentions loss of trees (2066) used by local people only.	Mitigation will take the form of compensation to local people. Does not mention additional tree planting.				
3616	Tianhuanping Hydro (I)	1993	Mentions loss of 150 ha of forest/bush lands.	No mitigation mentioned.				
3507	Ertan Hydro II (I)	1996	Mentions that it will inundate 3,000 ha of forest of which 2,000 ha are regularly harvested for fuel wood and 1,000 is broad leaf evergreen forest.	To compensate the loss will assume management responsibility for a 100 m (vertical elevation) buffer zone above the maximum operational water surface elevation along the entire periphery of the reservoir.				Consultation took place. At a meeting with experts in Beijing, where the project was presented and recommendations were made for change. At the local level there was a seminar with specialists called by the municipal government. All participants agreed with the plan. Subsequently, there was a poll in which apparently 25 persons participated. All were in agreement. The main concern had to do with resettlement of over 1,000 people. Electricity scarcity had been a factor slowing down growth in the region.

Table A.17. Projects That Warrant Assessment for Impact of Forests, 1992–99 (cont'd)

Project ID	Project name	Fiscal year	SAR: Treatment of forests	SAR: Mitigation actions	EIA: Natural environment	EIA: Expected impact	EIA: Mitigation/ response	EIA: Participation/ local people issues
CN-PE-3616	Tianhuangping Hydroelectric Project (O)		Will result in loss of 150 ha of forest and bush.	No mitigation mentioned.	Land in the Shangay region has been cultivated for centuries, altered from its natural state.			
51736	E. China/Jiangsu Pwr. (O)	1998	Mentions that transmission lines will pass mainly though agricultural lands. They require felling 900,000 fruit trees. They will go through a Sheyang Lake with endangered species.	No mitigation measures indicated.	Land is cultivated, trees to be felled are fruit trees.		Lost trees will be recovered and similar habitats developed in resettled areas. The issue is largely resettlement, not forests.	
3641	Yangzhou Thermal Pow. (N)	1994	Not mentioned directly in summary, will expand network transmission lines by 30 km, will require acquisition of 179 ha of farm land and relocation of 4,500 people.	Mitigation and monitoring plan developed. No specifics provided in the document.	According to EIA there are no protected animals or plants in the area. Only domesticated plants and animals.			
3642	Zhejiang Power Development (N)	1995	Not mentioned directly in summary. Will expand network transmission lines by 400 km.	Mitigation plans have been developed for each subcomponent. No specifics provided.	It is an urban area without many forests.	Unlikely to have a significant impact on forests.		The EIA has an account of speeches in congress but not clear what have been the actual steps in consulting local people (did not do exhaustive review).

Table A.17. Projects That Warrant Assessment for Impact of Forests, 1992–99 (cont'd)

Project ID	Project name	Fiscal year	SAR: Treatment of forests	SAR: Mitigation actions	EIA: Natural environment	EIA: Expected impact	EIA: Mitigation/ response	EIA: Participation/ local people issues
3531	Henan (Qingb.) Thermal (O)	1996			EIA indicates that there are some protected areas close by.	The plant will be constructed in an area with low vegetation and previously populated. Same as other service areas. Does not expect direct adverse effect during construction.	In the long term there have been measures taken to ensure that air emissions do not affect protected areas close by.	
3632	Environmental Technical Assistance (P)	1993	No mention of forest but project likely to have a positive impact with biodiversity monitoring component and its ecological research component.	Positive impact likely with its biodiversity monitoring component and ecological research component.				
3597	Taihu Basin Flood Co. (N)	1993	Not mentioned directly in summary, will require acquisition of 1,865 ha permanently and 3,155 temporarily. 33,100 people will be dislocated.	Mitigation and monitoring plan developed. Summary does not provide details.				
3644	Xiaolangdi Resettlement (P)	1994	Mentions no adverse effect of forest. To the contrary, barren lands will revert to forest for timber, fuel and fodder production.	Positive impact expected in the expansion of forest in barren lands, no numbers provided.				

Table A.17. Projects That Warrant Assessment for Impact of Forests, 1992–99 (cont'd)

Project ID	Project name	Fiscal year	SAR: Treatment of forests	SAR: Mitigation actions	EIA: Natural environment	EIA: Expected impact	EIA: Mitigation/ response	EIA: Participation/ local people issues
3577	Cement (N)	1992	No mention of forest. It might have a positive impact if there are surrounding forests and dust is reduced.					
3609	Sichuan Gas Dev. and Conserv. (N)	1994	Not mentioned directly in summary, but it will expand oil wells, rehabilitate other 190 oil wells, and will rehabilitate transmission and distribution system.	Mitigation and monitoring measures have been developed as part of the EIA. Summary provided no specifics.				
3633	Telecommunications (O)	1994	Mentions that it is not expected to have adverse effect. Will include the construction of 6,550 km of high-capacity transmission network.	Mitigation actions will include laying lines on transport and waterway areas; no disruption of virgin land is expected.				
3534	Zhejiang Prov. Transport (N)	1992	No mention of forest		EIA not in the Image Bank. Probably carried out prior to 1991.	EIA not in the Image Bank. Probably carried out prior to 1991.		
3518	Guangdong Prov. Transport (N)	1993	No mention of forest		EIA not in the Image Bank. Probably carried out prior to 1991.	EIA not in the Image Bank. Probably carried out prior to 1991.		
3581	Henan Prov. Transport (N)	1993	No mention of forest		EIA not in the Image Bank. Probably carried out prior to 1991.	EIA not in the Image Bank. Probably carried out prior to 1991.		

Table A.17. Projects That Warrant Assessment for Impact of Forests, 1992–99 (cont' d)

Project ID	Project name	Fiscal year	SAR: Treatment of forests	SAR: Mitigation actions	EIA: Natural environment	EIA: Expected impact	EIA: Mitigation/ response	EIA: Participation/ local people issues
3504	Hebei/Henan National (I)	1994	Mentions that there will be no negative impact on sensitive ecosystems, mentions loss of 1,062 ha of orchards. No mention of long-term effects on forest.	Mitigation actions will address mainly orchards through compensation to relocated population.	Document E 174, 1996: Goes through agricultural area with deciduous trees sparsely located as wind breaks.	No significant impact on natural forests or biodiversity.	Plans for careful soil borrowing, protection of agricultural lands. Propaganda campaigns for good natural resources management.	
3626	Fujian Prov. Highway (I)	1994	Mentions that there will be no negative impact on sensitive ecosystems if "appropriate actions are taken." No mention of long-term effects on forest.	Will follow recommendations of EIA.	There are no natural forests along the highway, but some farm forest.	No major impact on forest expected.		Public consultation took place to ensure that resettlement action reflected needs of population. Participants are local government and affected population. No numbers or methods presented.
3612	Xinjiang Highway I (N)	1995	No mention of forest.		EIA mentions that this is mainly an agricultural area with a few plantations (5,944 ha and 800 ha) and some woodlands. (Reviewed six EIA documents)	Project is unlikely to have a major negative effect on forest. Not many forests around the area.	N/A	Consultation with local government and affected peoples took place. Not clear on the methods used.

Table A.17. Projects That Warrant Assessment for Impact of Forests, 1992–99 (cont'd)

Project ID	Project name	Fiscal year	SAR: Treatment of forests	SAR: Mitigation actions	EIA: Natural environment	EIA: Expected impact	EIA: Mitigation/ response	EIA: Participation/ local people issues
3569	Shanghai-Zhejiang Hi (O)	1996	Mentions that it will not have an impact in ecologically sensitive areas and that appropriate measures will be taken during construction. Does not address mid or long-term impacts on forests.		Area has been transformed to agricultural production. No mention of existing forests. No mention of protected areas or endangered species.	Project is unlikely to have a major negative effect on forests. Not many forests around the area.	N/A	Participation. Several people were visited by the EIA team to get their opinion on the project, the report estimates 50 people, local officials, congressmen, residents. Most liked the idea of the highway. Farmers to be resettled tended not to like the project. They felt it would be difficult to find other jobs. Many people felt it was useless to give an opinion because the decision had been taken.
3652	2nd Shaanxi Prov Highway (O)	1996	Mentions that it will not have an impact in ecologically sensitive areas and that appropriate measures will be taken during construction. Does not address mid or long-term impacts on forests.		According to the EIA the southern part of the Loess plateau (particularly the section of the Tong- Huang Highway) has 87.9 percent of natural forests. There is the Quinling Mountain National wildlife preserve with white leopards, panda, etc. and the Reserve of Hungrin Old Cypress (of the Tong-Whang EIA segment).	The EIA mentions that the road will not pass though preserves and will not affect them. It does not say how far away. But the highway will cut across 55 km of the natural forest. No mention of long-term impact of forest, or if the road will improve access to old stands.	All mitigation is during construction. No real mention of long term issues.	Participation did take place, apparently in the form of social assessment. One-thousand questionnaires were distributed, 726 were returned. Most respondents are in favor of construction and agree on importance of project in terms of "national interest." People expected to be compensated.

Table A.17. Projects That Warrant Assessment for Impact of Forests, 1992–99 (cont'd)

Project ID	Project name	Fiscal year	SAR: Treatment of forests	SAR: Mitigation actions	EIA: Natural environment	EIA: Expected impact	EIA: Mitigation/ response	EIA: Participation/ local people issues
40513	2nd Henan Prov. Highway (I)	1996	Mentions loss of forest during construction. Does not look into possible mid-term and long-term effects of the highway on the forests.	Mitigation measures include afforestation in waste lands, care during construction to prevent erosion and disruption in the ecology and training of workers on ecological issues, i.e. measures against poaching.	Highway goes through a variety of ecosystems, some arid with low vegetation, others are mountains with lush vegetation. In Loess Plateau there are forests. Various volumes of the EIA indicate that there are no endangered species.	In some areas there are no endangered species, but in mountains and some of Loess Plateau there seem to be forests. These forests are altered due to many centuries of human intervention.	Several mitigation actions are proposed to reduce erosion and vegetable cover destruction. No mention of long-term effects on forests.	Consultation took place with residents and NGOs. Residents seem to agree with relocation as long as there is adequate compensation for resettled population. NGOs seem to think road was good for economic growth. Not clear how consultation took place, who participated, etc.
3643	Xinjian Highways II (O)	1997	Mentions that it will not affect ecologically sensitive areas. Area seems to be dry shrubs. Does not address mid- or long-term effects on forest.	Mitigation will include afforestation. No mention of area and will use non-forested areas. Will implement environmental monitoring after completion.	EIA indicates that there are no natural forests by the highway. Only some plantations (5,944 ha).	No impact expected on forests.	N/A	
3654	Hunan/Guang Highway 2/NH2 (O)	1997	Mentions that it will not affect ecologically sensitive areas (wood lands). Does not address mid- or long-term effects on forest.		Area natural vegetation has long been substituted by agriculture and some tree crops such as tea and Chinese fir.	No major impact likely.	N/A	No info. found on consultation project; does include resettlement.

Table A.17. Projects That Warrant Assessment for Impact of Forests, 1992–99 (cont'd)

Project ID	Project name	Fiscal year	SAR: Treatment of forests	SAR: Mitigation actions	EIA: Natural environment	EIA: Expected impact	EIA: Mitigation/ response	EIA: Participation/ local people issues
36949	Nat. Highway 3-Hubei (I)	1998	Mentions impact during construction of road, no mention of mid/long-term impacts.	Mitigation will consist of using forest areas as little as possible for services, and will do afforestation on degraded areas to compensate for fallen trees.	Highway passes by different ecosystems, but along the way most area has been transformed by human interventions. Most forests are pine and Chinese fir.	Mentions that no endangered species were found 500 m from highway and that highway does not go by natural or protected area. No mention of long-term impacts, seems that area already populated.		A process of participation and consultation has taken place in several forms, meeting with different type of stakeholders (NGOs, local GOV and residents); all approve of the project. Some concerns have to do with resettlement and others with environmental issues such as noise, pollution, importance of green belt, etc.
41268	Nat. Highway 4-Hubei (I)	1999		Mitigation will consist of using forest areas as little as possible for services, and will do afforestation on degraded areas to compensate for fallen trees.	Highway passes by different ecosystems, but along the way most area has been transformed by human interventions. Most forest are pine and Chinese fir.	Mentions that no endanger species were found 500 m from highway and that highway does not go by natural or protected area. No mention of long-term impacts, seems that area already populated.		A process of participation and consultations has taken place in several forms, meeting with different type of stakeholders (NGOs, local GOV and residents); all approve of the project. Some concerns have to do with resettlement and others with environmental issues such as noise, pollution, importance of green belt, etc.

Table A.17. Projects That Warrant Assessment for Impact of Forests, 1992–99 (cont'd)

Project ID	Project name	Fiscal year	SAR: Treatment of forests	SAR: Mitigation actions	EIA: Natural environment	EIA: Expected impact	EIA: Mitigation/ response	EIA: Participation/ local people issues
45788	Tri-Provincial Highway (O)	1998	Mentions that area is highly degraded and that project will have no additional impact on forests.					
3486	Railways V (N)	1992	No mention of EIA.					
3570	Railways VI (N)	1993	No mention of EIA.					
3571	Railways VII (N)	1995	No mention of forest, no adverse impacts on environment.		EIA: Area is largely agricultural with some forests and brush in the hills.	EIA indicates that it will affect human populations and vegetation.		
56491	Hebei Earthquake (N)	1998	No mention of impact on forest (will require construction material).					
3473	Zhejian Multicities (N)	1993	No mention in EIA section of forest. But SRA does mention that there will be conversion of forest to urban uses. No mention of numbers.	No mitigation measures for forest are presented.	Area is mainly agricultural paddy rice cultivation. In the hills there are some lumber farms. The EIA does not highlight natural terrestrial environment as an important issue of the plan.			

Table A.17. Projects That Warrant Assessment for Impact of Forests, 1992–99 (cont'd)

Project ID	Project name	Fiscal year	SAR: Treatment of forests	SAR: Mitigation actions	EIA: Natural environment	EIA: Expected impact	EIA: Mitigation/ response	EIA: Participation/ local people issues
3603	Enterprise Housing Social Security (N)	1995	Mentions potential impact on natural areas, does not provide more information.	Mentions that will follow IDA Environmental Guidelines.				
3509	Changchun Water Supply	1993	Mentions that there will be disturbances to forests in the construction of the pipeline. No ha.	Mitigation will include planting of trees and grass to prevent erosion. No has provided.				

(P) 3 are likely to have a positive impact on forest.
(N) 22 do not mention forests, ecology, or natural environment.
3 (3481, 5362, 36947) EIAs indicate that projects will affect "some forest," natural forests, or will go close to reserves.
(O) 11 mention forest and indicate that there will be no impact.
1 EAI (3652) will go by natural forest (55 km) and close to natural reserves
(I) 11 mention that they will affect forests or natural environment.
1 SAR (3526) no mitigation actions indicated (low-impact flooding 150 ha of forest/bush)
3 indicated that an environmental monitoring plan had been developed (did not specify actions in forest)
6 SAR specified specific actions to mitigate impact on forest or trees.
47 projects (1 project [50036] too recent; PAC not in system)
Source: Staff Appraisal Reports, Project Appraisal Documents and EIA for each project.

Table A.18. Selected Implementation Completion Reports of Projects with Likely Impact on Forests

Project	Treatment of forest	Environmental issues
Gansu Prov. Dev. Rep. 16321	No mention	No mention
Northern Irrigation Rep. 179996	Planted 3300 ha of forest belts and 3700 of orchard	
Shanxi Agricultural Dev. Rep. 18127	No mention	No mention
Jiangxi Prov Cr. 1984 Highway	No mention	Roadside drainage problems
Sishuan Prov. Highway Cr. 1917	No mention	EIA misinformed problems with overflows, slides, tunnels
Shandong Prov. Highway Cr. 2025	No mention	Dealt well, rated as best part of project
Third Railway Rep. 15842	No mention	No mention
Inner Mongolia Local Rep. 16808	Tree planting to protect RW, nurseries	Environmental monitoring established
Ertan Hydroelectric Rep. 16583	No mention	Was "more benign on the environment than a thermal power project"
Yatah Hydroelectric Rep. 14773	No mention	Concentrated on resettlement issues. No mention of environment.
Bellungang Thermal Rep. 1417	No mention	Followed Bank's environmental guidelines. Did not have "excessive impacts on the environment"

Source: ICRs for each project.

Table A.19. World Bank Lending to China by Sector, 1984–99

	1984–1991				1992–1999				Comparison by period	
Sector	No. of projects	Commit-ments ($M)	No. of projects (%)	Commit-ments (%)	No. of projects	Commit-ments ($M)	No. of projects (%)	Commit-ments (%)	Change in commit-ments ($M)	Change in commit-ments (%)
Agriculture	25	3,023.7	29.41	30.50	28	5,404	22.40	24.49	2,380.3	79
Education	8	707.0	9.41	7.13	8	815	6.40	3.69	108	15
Electric power and energy	7	1,034.4	8.24	10.43	16	4,647	12.80	21.06	3,312.6	349
Environment					13	1,707	10.40	7.74	1,707	
Finance	5	839.3	5.88	8.47	3	228	2.40	1.03	-611.3	-73
Industry	8	1,075.1	9.41	10.85	3	427.7	2.40	1.94	-647.4	-60
Mining	1	126.0	1.18	1.27					-126	-100
Multi-sector	2	30.0	2.35	0.30					-30	-100
Oil and gas	3	155.3	3.53	1.57	1	255	0.80	1.16	99.7	64
Pop. health and nutrition	3	217.0	3.53	2.19	7	601.6	5.60	2.73	384-6	177
Public sector management	1	20.7	1.18	0.21	5	175	4.00	0.79	154.3	745
Social					3	282.5	2.40	1.28	282.5	
Telecommunications					1	250	0.80	1.13	250	
Transportation	17	2,183.6	20.00	22.03	27	5,939	21.60	26.91	3,755.4	172
Urban development	3	343.4	3.53	3.46	6	988.4	4.80	4.48	645	188
Water supply and sanitation	2	157.8	2.35	1.59	4	346	3.20	1.57	188.2	119
Grand total	85	9,913.3	100.00	100.00	125	22,066.2	100.00	100.00	12,152.9	123

Table A.20. World Bank Lending to China by Lending Instrument, 1984–99

		1984–1991				1992–1999				Comparison by period	
Lending type	Major lending instrument	No. of projects	Commit-ments ($M)	No. of projects (%)	Commit-ments (%)	No. of projects	Commit-ments ($M)	No. of projects (%)	Commit-ments (%)	Change in commit-ments ($M)	Change in commit-ments (%)
Adjustment	Sector adjustment loan	1	300	1.18	3.03					-300	-100
Adjustment total		1	300	1.18	3.03					-300	-100
Investment	Emergengcy Reconstruction loan	1	30	1.18	0.30	2	108.4	1.60	0.49	78.4	261
	Financial Intermediary Loan	10	1,764	11.76	17.79	2	500	1.60	2.27	-1,264	-72
	Learning and Innovation Loan					2	10	1.60	0.05	10	
	Specific Investment Loan	57	6,662.6	67.06	67.21	113	21,127.8	90.40	95.75	14,465.2	217
	Specific Investment & Maintenance	11	1,051	12.94	10.60	1	100	0.80	0.45	-951	-90
	Technical Assistance Loan	5	105.7	5.88	1.07	5	220	4.00	1.00	114.3	108
Investment total		84	9,613.3	98.82	96.97	125	22,066.2	100.00	100.00	12,452.9	130
Grand total		85	9,613.3	100.00	100.00	125	22,066.2	100.00	100.00	12,452.9	123

Table A.21. World Bank Lending to China by Primary Program Objective, 1984–99

	1984–91				1992–99				1984–91–1992–99	
Primary program objective	No. of projects	Commitments (US$M)	No. of projects (%)	Commitments (%)	No. of projects	Commitments (US$M)	No. of projects (%)	Commitments (%)	Change in commitments (US$M)	Change in commitments (%)
Economic management	10	1,245.8	11.76	12.57	17	1,778.7	13.60	8.06	532.9	43
Environmentally sustainable development	43	4,880.8	50.59	49.23	67	14,424.4	53.60	65.37	9,543.6	196
Poverty reduction and human resource development	19	2,070.4	22.35	20.89	36	4,790.1	28.80	21.71	2,719.7	131
Private sector development	8	1,524.3	9.41	15.38	5	1,073	4.00	4.86	-451.3	-30
Gender analysis	2	102	2.35	1.03					-102	-100
Not stated	3	90	3.53	0.91					-90	-100
Grand total	85	9,913.3	100.00	100.00	125	22,066.2	100.00	100.00	12,152.9	123

Table A.22. Bank Performance Ratings for OED Evaluated Projects, 1992–98

	Evaluated projects		Outcome satisfactory			
Sector/Subsector	No. of projects	Net commitments (US$M)	No. of projects	Net commitments (US$M)	No. of projects (%)	Commitments (%)
Agriculture	19	1,244.8	18	1,144.6	95	92
Agricultural credit	2	182.0	2	182.0	100	100
Agriculture adjustment	4	233.1	3	132.9	75	57
Agro-industry and marketing	1	76.0	1	76.0	100	100
Fisheries and aquaculture	1	70.9	1	70.9	100	100
Forestry	3	120.9	3	120.9	100	100
Irrigation and drainage	4	258.2	4	258.2	100	100
Other agriculture	2	207.6	2	207.6	100	100
Perennial crops	1	64.8	1	64.8	100	100
Research	1	31.4	1	31.4	100	100
Education	8	472.6	8	472.6	100	100
Education adjustment	1	60.0	1	60.0	100	100
Higher education	3	193.0	3	193.0	100	100
Other education	1	54.1	1	54.1	100	100
Primary education	1	22.4	1	22.4	100	100
Vocational/teacher training	2	143.0	2	143.0	100	100
Electric power and other energy	10	1,761.3	9	1,761.3	90	100
Distribution and transmission	1	139.1	1	139.1	100	100
Electric power and other energy	1	157.1	1	157.1	100	100
Hydro	3	629.6	3	629.6	100	100
Thermal	5	835.6	4	835.6	80	100
Finance	3	432.3	1	316.0	33	73
Financial sector development	1	115.7				
Other finance	2	316.6	1	316.0	50	100
Industry	9	1,142.2	4	616.7	44	54
Fertilizer and other chemicals	4	453.2	2	171.9	50	38
Industrial restructuring	1	108.3	1	108.3	100	100
Other industry	3	580.2	1	336.6	33	58
Small-scale enterprise	1	0.6				
Mining	1	94.0	1	94.0	100	100
Mining and other extractive	1	94.0	1	94.0	100	100
Oil and gas	1	31.4	1	31.4	100	100
Oil and gas exploration and development	1	31.4	1	31.4	100	100
Population, health, and nutrition	2	167.7	2	167.7	100	100
Basic health	2	167.7	2	167.7	100	100
Public sector management	2	46.9	2	46.9	100	100
Public sector management adjustment	2	46.9	2	46.9	100	100
Transportation	16	1,765.8	16	1,765.8	100	100
Highways	6	581.0	6	581.0	100	100
Ports and waterways	7	482.3	7	482.3	100	100
Railways	3	702.5	3	702.5	100	100
Urban development	3	248.0	3	248.0	100	100
Urban development adjustment	1	30.9	1	30.9	100	100
Urban environment	1	50.5	1	50.5	100	100
Urban management	1	166.5	1	166.5	100	100
Water supply and sanitation	2	179.2	2	179.2	100	100
Rural water supply and sanitation	1	100.4	1	100.4	100	100
Urban water supply	1	78.8	1	78.8	100	100
Grand total	76	7,586.0	67	6,844.1	88	90

Table A.22. Bank Performance Ratings for OED Evaluated Projects, 1992–98 (cont'd)

Sustainability likely				ID impact substantial			
No. of projects	Net commitments (US$M)	No. of projects (%)	Commitments (%)	No. of projects	Net commitments (US$M)	No. of projects (%)	Commitments (%)
16	939.5	84	75	9	471.7	47	38
2	182.0	100	100				
3	132.9	75	57	1	44.9	25	19
1	76.0	100	100				
1	70.9	100	100	1	70.9	100	100
2	61.5	67	51	2	61.5	67	51
4	258.2	100	100	2	136.4	50	53
1	61.9	50	30	1	61.9	50	30
1	64.8	100	100	1	64.8	100	100
1	31.4	100	100	1	31.4	100	100
5	208.2	63	44	3	131.7	38	28
2	80.1	67	41	2	80.1	67	41
1	54.1	100	100				
1	22.4	100	100				
1	51.6	50	36	1	51.6	50	36
9	1,761.3	90	100	9	1,761.3	90	100
1	139.1	100	100	1	139.1	100	100
1	157.1	100	100	1	157.1	100	100
3	629.6	100	100	3	629.6	100	100
4	835.6	80	100	4	835.6	80	100
1	316.0	33	73				
1	316.0	50	100				
3	553.7	33	48	2	269.2	22	24
1	108.9	25	24				
1	108.3	100	100	1	108.3	100	100
1	336.6	33	58	1	161.0	33	28
1	94.0	100	100				
1	94.0	100	100				
1	31.4	100	100	1	31.4	100	100
1	31.4	100	100	1	31.4	100	100
2	167.7	100	100	2	167.7	100	100
2	167.7	100	100	2	167.7	100	100
2	46.9	100	100	2	46.9	100	100
2	46.9	100	100	2	46.9	100	100
16	1,765.8	100	100	8	694.8	50	39
6	581.0	100	100	2	251.1	33	43
7	482.3	100	100	5	286.6	71	59
3	702.5	100	100	1	157.2	33	22
3	248.0	100	100				
1	30.9	100	100				
1	50.5	100	100				
1	166.5	100	100				
1	100.4	50	56	1	100.4	50	56
1	100.4	100	100	1	100.4	100	100
60	6,232.8	79	82	37	3,675.1	49	48

Table A.23. Bank Performance Ratings for OED Evaluated Projects, 1992–98

	Evaluated projects		Identification satisfactory			
Sector/Subsector	No. of projects	Net commitments (US$M)	No. of projects	Net commitments (US$M)	No. of projects (%)	Commitments (%)
Agriculture	19	1,244.8	19	1,244.8	100	100
Agricultural credit	2	182.0	2	182.0	100	100
Agriculture adjustment	4	233.1	4	233.1	100	100
Agro-industry and marketing	1	76.0	1	76.0	100	100
Fisheries and aquaculture	1	70.9	1	70.9	100	100
Forestry	3	120.9	3	120.9	100	100
Irrigation and drainage	4	258.2	4	258.2	100	100
Other agriculture	2	207.6	2	207.6	100	100
Perennial crops	1	64.8	1	64.8	100	100
Research	1	31.4	1	31.4	100	100
Education	8	472.6	8	472.6	100	100
Education adjustment	1	60.0	1	60.0	100	100
Higher education	3	193.0	3	193.0	100	100
Other education	1	54.1	1	54.1	100	100
Primary education	1	22.4	1	22.4	100	100
Vocational/teacher training	2	143.0	2	143.0	100	100
Electric power and other energy	10	1,761.3	10	1,761.3	100	100
Distribution and transmission	1	139.1	1	139.1	100	100
Electric power and other energy	1	157.1	1	157.1	100	100
Hydro	3	629.6	3	629.6	100	100
Thermal	5	835.6	5	835.6	100	100
Finance	3	432.3	1	0.6	33	0
Financial sector development	1	115.7				
Other finance	2	316.6	1	0.6	50	0
Industry	9	1,142.2	6	722.4	67	63
Fertilizer and other chemicals	4	453.2	4	453.2	100	100
Industrial restructuring	1	108.3	1	108.3	100	100
Other industry	3	580.2	1	161.0	33	28
Small-scale enterprise	1	0.6				
Mining	1	94.0	1	94.0	100	100
Mining and other extractive	1	94.0	1	94.0	100	100
Oil and gas	1	31.4	1	31.4	100	100
Oil and gas exploration and development	1	31.4	1	31.4	100	100
Population, health, and nutrition	2	167.7	2	167.7	100	100
Basic health	2	167.7	2	167.7	100	100
Public sector management	2	46.9	2	46.9	100	100
Public sector management adjustment	2	46.9	2	46.9	100	100
Transportation	16	1,765.8	16	1,765.8	100	100
Highways	6	581.0	6	581.0	100	100
Ports and waterways	7	482.3	7	482.3	100	100
Railways	3	702.5	3	702.5	100	100
Urban development	3	248.0	3	248.0	100	100
Urban development adjustment	1	30.9	1	30.9	100	100
Urban environment	1	50.5	1	50.5	100	100
Urban management	1	166.5	1	166.5	100	100
Water supply and sanitation	2	179.2	2	179.2	100	100
Rural water supply and sanitation	1	100.4	1	100.4	100	100
Urban water supply	1	78.8	1	78.8	100	100
Grand Total	76	7,586.0	71	6,734.5	93	89

Table A.23. Bank Performance Ratings for OED Evaluated Projects, 1992–98 (cont'd)

Appraisal satisfactory				Supervision satisfactory			
No. of projects	Net commitments (US$M)	No. of projects (%)	Commitments (%)	No. of projects	Net commitments (US$M)	No. of projects (%)	Commitments (%)
15	846.1	79	68	18	1,168.8	95	94
2	182.0	100	100	2	182.0	100	100
4	233.1	100	100	4	233.1	100	100
1	70.9	100	100	1	70.9	100	100
2	59.4	67	49	3	120.9	100	100
3	142.7	75	55	4	258.2	100	100
1	61.9	50	30	2	207.6	100	100
1	64.8	100	100	1	64.8	100	100
1	31.4	100	100	1	31.4	100	100
5	243.1	63	51	6	299.6	75	63
1	23.6	33	12	2	80.1	67	41
1	54.1	100	100	1	54.1	100	100
1	22.4	100	100	1	22.4	100	100
2	143.0	100	100	2	143.0	100	100
10	1,761.3	100	100	9	1,761.3	90	100
1	139.1	100	100	1	139.1	100	100
1	157.1	100	100	1	157.1	100	100
3	629.6	100	100	3	629.6	100	100
5	835.6	100	100	4	835.6	80	100
1	316.0	33	73	1	115.7	33	27
1	316.0	50	100				
4	714.7	44	63	5	780.7	56	68
1	108.9	25	24	2	253.2	50	56
1	108.3	100	100	1	108.3	100	100
2	497.6	67	86	2	419.2	67	72
1	94.0	100	100	1	94.0	100	100
1	94.0	100	100	1	94.0	100	100
1	31.4	100	100				
1	31.4	100	100				
1	54.8	50	33	2	167.7	100	100
1	54.8	50	33	2	167.7	100	100
2	46.9	100	100	2	46.9	100	100
2	46.9	100	100	2	46.9	100	100
15	1,709.7	94	97	14	1,361.0	88	77
5	524.9	83	90	5	445.8	83	77
7	482.3	100	100	7	482.3	100	100
3	702.5	100	100	2	432.9	67	62
3	248.0	100	100	3	248.0	100	100
1	30.9	100	100	1	30.9	100	100
1	50.5	100	100	1	50.5	100	100
1	166.5	100	100	1	166.5	100	100
2	179.2	100	100	2	179.2	100	100
1	100.4	100	100	1	100.4	100	100
1	78.8	100	100	1	78.8	100	100
60	6,245.1	79	82	63	6,222.8	83	82

Table A.24. Borrower Performance Ratings for OED Evaluated Projects, 1992–98

	Evaluated projects		Preparation satisfactory			
Sector/Subsector	No. of projects	Net commitments (US$M)	No. of projects	Net commitments (US$M)	No. of projects (%)	Commitments (%)
Agriculture	19	1,244.8	14	701.1	74	56
Agricultural credit	2	182.0	175.7	50	42	
Agriculture adjustment	4	233.1	3	132.9	75	57
Agro-industry and marketing	1	76.0				
Fisheries and aquaculture	1	70.9	1	70.9	100	100
Forestry	3	120.9	3	120.9	100	100
Irrigation and drainage	4	258.2	3	142.7	75	55
Other agriculture	2	207.6	1	61.9	50	30
Perennial crops	1	64.8	1	64.8	100	100
Research	1	31.4	1	31.4	100	100
Education	8	472.6	7	142.5	88	87
Education adjustment	1	60.0				
Higher education	3	193.0	3	193.0	100	100
Other education	1	54.1	1	54.1	100	100
Primary education	1	22.4	1	22.4	100	100
Vocational/teacher training	2	143.0	2	143.0	100	100
Electric power and other energy	10	1,761.3	10	1,761.3	100	100
Distribution and transmission	1	139.1	1	139.1	100	100
Electric power and other energy	1	157.1	1	157.1	100	100
Hydro	3	629.6	3	629.6	100	100
Thermal	5	835.6	5	835.6	100	100
Finance	3	432.3	2	431.7	67	100
Financial sector development	1	115.7	1	115.7	100	100
Other finance	2	316.6	1	316.0	50	100
Industry	9	1,142.2	7	1,078.6	78	94
Fertilizer and other chemicals	4	453.2	3	390.2	75	86
Industrial restructuring	1	108.3	1	108.3	100	100
Other industry	3	580.2	3	580.2	100	100
Small-scale enterprise	1	0.6				
Mining	1	94.0	1	94.0	100	100
Mining and other extractive	1	94.0	1	94.0	100	100
Oil and gas	1	31.4	1	31.4	100	100
Oil and gas exploration and development	1	31.4	1	31.4	100	100
Population, health, and nutrition	2	167.7	2	167.7	100	100
Basic health	2	167.7	2	167.7	100	100
Public sector management	2	46.9	2	46.9	100	100
Public sector management adjustment	2	46.9	2	46.9	100	100
Transportation	16	1,765.8	15	1,709.7	94	97
Highways	6	581.0	5	524.9	83	90
Ports and waterways	7	482.3	7	482.3	100	100
Railways	3	702.5	3	702.5	100	100
Urban development	3	248.0	3	248.0	100	100
Urban development adjustment	1	30.9	1	30.9	100	100
Urban environment	1	50.5	1	50.5	100	100
Urban management	1	166.5	1	166.5	100	100
Water supply and sanitation	2	179.2	2	179.2	100	100
Rural water supply and sanitation	1	100.4	1	100.4	100	100
Urban water supply	1	78.8	1	78.8	100	100
Grand total	76	7,586.0	66	6,862.1	87	90

Table A.24. Borrower Performance Ratings for OED Evaluated Projects,1992–98 (cont'd)

Implementation satisfactory				Compliance satisfactory			
No. of projects	Net commitments (US$M)	No. of projects (%)	Commitments (%)	No. of projects	Net commitments (US$M)	No. of projects (%)	Commitments (%)
17	1,162.5	89	93	15	891.4	79	72
2	182.0	100	100	1	75.7	50	42
4	233.1	100	100	3	132.9	75	57
1	70.9	100	100				
3	120.9	100	100	3	120.9	100	100
3	251.9	75	98	4	258.2	100	100
2	207.6	100	100	2	207.6	100	100
1	64.8	100	100	1	64.8	100	100
1	31.4	100	100	1	31.4	100	100
7	412.5	88	87	8	472.6	100	100
				1	60.0	100	100
3	193.0	100	100	3	193.0	100	100
1	54.1	100	100	1	54.1	100	100
1	22.4	100	100	1	22.4	100	100
2	143.0	100	100	2	143.0	100	100
9	1,761.3	90	100	8	1,622.3	80	92
1	139.1	100	100				
1	157.1	100	100	1	157.1	100	100
3	629.6	100	100	3	629.6	100	100
4	835.6	80	100	4	835.6	80	100
				1	115.7	100	100
				1	115.7	100	100
3	553.7	33	48	4	589.7	44	52
1	108.9	25	24	1	144.3	25	32
1	108.3	100	100	1	108.3	100	100
1	336.6	33	58	1	336.6	33	58
				1	0.6	100	100
				1	31.4	100	100
				1	31.4	100	100
2	167.7	100	100	2	167.7	100	100
1	54.8	50	33	2	167.7	100	100
2	46.9	100	100	2	46.9	100	100
2	46.9	100	100	2	46.9	100	100
16	1,765.8	100	100	16	1,765.8	100	100
6	581.0	100	100	6	581.0	100	100
7	482.3	100	100	7	482.3	100	100
3	702.5	100	100	3	702.5	100	100
3	248.0	100	100	3	248.0	100	100
1	30.9	100	100	1	30.9	100	100
1	50.5	100	100	1	50.5	100	100
1	166.5	100	100	1	166.5	100	100
1	100.4	50	56	1	100.4	50	56
1	100.4	100	100	1	100.4	100	100
60	6,218.8	79	82	61	6,051.8	80	80

Table A.25. Quality Assurance Group Projects at Risk Ratings for All Active Projects in China, June 1999

	Active projects		Actual problem projects			
Sector/Subsector	No. of projects	Net commitments (US$M)	No. of projects	Net commitments (US$M)	No. of projects (%)	Commitments (%)
Agriculture	25	4,957				
Agricultural extension	1	115				
Agriculture adjustment	3	730				
Agro-industry and marketing	5	1,115				
Annual crops	1	100				
Fisheries and aquaculture	1	100				
Forestry	3	550				
Irrigation and drainage	9	2,017				
Other agriculture	1	80				
Perennial crops	1	150				
Education	7	685				
Education adjustment	1	70				
Higher education	1	85				
Other education	2	162				
Primary education	2	200				
Secondary education	1	100				
Vocational education, training	1	30				
Electric power and energy	10	3,380				
Distribution and transmission	1	270				
Hydro	3	1,000				
Other power, energy conv.	1	250				
Thermal	5	1,860				
Environment	12	1,555	1	150	8	10
Environment adjustment	2	200	1	150	50	75
Environmental institutions	1	125				
Natural resources management	3	510				
Pollution/waste management	5	610				
Resettlement	1	110				
Finance	3	188				
Financial sector development	2	143				
Other finance	1	45				
Industry	2	267	1	92	50	34
Other industry	2	267	1	92	50	34
Oil and gas	1	255	1	255	100	100
Oil and gas exploration	1	255	1	255	100	100
Population, health, and nutrition	7	595	1	110	14	18
Basic health	1	85				
Targeted health	6	510	1	110	17	22
Public sector management	4	170	1	50	25	29
Institutional development	1	10				
Other public sector management	1	50				
Public financial management	2	110	1	50	50	45
Social protection, etc.	2	278				
Labor markets, employment	2	278				
Telecommunications	1	220				
Telecommunications, informatics	1	220				
Transportation	24	5,179				
Highways	14	3,302				
Other transportation	1	71				
Ports and waterways	2	334				
Railways	2	791				
Transportation adjustment	1	123				
Urban transport	4	558				
Urban development	6	968	1	150	17	15
Other urban development	1	28				
Urban environment	4	610	1	150	25	25
Urban housing	1	330				
Water supply and sanitation	2	116				
Rural water supply/sanitation	1	46				
Water supply/sanitation adjustment	1	70				
Grand total	106	18,813	6	807	6	4

Table A.25. Quality Assurance Group Projects at Risk Ratings for All Active Projects in China, June 1999 (cont'd)

Potential problem projects				Not at risk			
No. of projects	Net commitments (US$M)	No. of projects (%)	Commitments (%)	No. of projects	Net commitments (US$M)	No. of projects (%)	Commitments (%)
1	115	4	2	24	4,842	95	98
1	115	100	100				
				3	730	100	100
				5	1,115	100	100
				1	100	100	100
				1	100	100	100
				3	550	100	100
				9	2,017	100	100
				1	80	100	100
				1	150	100	100
				7	685	100	100
				1	70	100	100
				1	85	100	100
				2	162	100	100
				2	200	100	100
				1	100	100	100
				1	30	100	100
				10	3,380	100	100
				1	270	100	100
				3	1,000	100	100
				1	250	100	100
				5	1,860	100	100
				11	1,405	92	90
				1	50	50	25
				1	125	100	100
				3	510	100	100
				5	610	100	100
				1	110	100	100
				3	188	100	100
				2	143	100	100
				1	45	100	100
				1	175	50	66
				1	175	50	66
1	100	14	17	5	385	71	65
				1	85	100	100
1	100	17	20	4	300	67	59
				3	120	75	71
				1	10	100	100
				1	50	100	100
				1	60	50	55
1	30	50	11	1	248	50	89
1	30	50	11	1	248	50	89
				1	220	100	100
				1	220	100	100
				24	5,179	100	100
				14	3,302	100	100
				1	71	100	100
				2	334	100	100
				2	791	100	100
				1	123	100	100
				4	558	100	100
				5	818	83	85
				1	28	100	100
				3	460	75	75
				1	330	100	100
				2	116	100	100
				1	46	100	100
				1	70	100	100
3	245	3	1	97	17,761	92	94

Table A.26. Quality Assurance Group Risk Ratings Flags by Sector for China

Sector	No. of projects	Effectiveness delays	Compliance with legal covenants	Management performance	Counterpart funds	Procurement progress	Financial performance	Enviro/ resettlement problems	Slow disbursements	History of past problems	Risky country	Risky subsector	Economic management	Golden Rule
Agriculture	25	1	0	2	2	3	1	0	1	2	0	0	0	0
Education	7	0	0	0	0	0	0	0	0	0	0	0	0	0
Electric Power & Engy.	10	4	0	0	0	0	1	0	1	0	0	3	0	0
Environment	12	1	0	0	1	0	3	1	3	0	0	0	0	0
Finance	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Industry	2	0	0	0	0	1	0	1	1	0	0	0	0	0
Oil & Gas	1	0	0	1	0	0	0	0	1	0	0	0	0	0
Popultn, Hlth & Nutn	7	0	0	0	2	3	0	0	3	0	0	0	0	0
Public Sector Mgmt.	4	0	0	0	1	1	0	0	3	0	0	0	0	0
Social protection, etc.	2	0	0	1	0	1	0	0	1	0	0	0	0	0
Telecommunications	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Transportation	24	2	0	0	0	1	0	1	3	0	0	0	0	0
Urban Development	6	1	0	0	0	1	2	0	2	0	0	0	0	0
Water Supply & Santn	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Number of Flags	106	9	0	4	6	11	7	3	19	2	0	3	0	0

Table A.27. World Bank Forest Project Lending by Country, 1984–99

Region/ Country	1984–91 No. of projects	1984–91 Commitments (US$M)	1984–91 No. of projects (%)	1984–91 Commitments (%)	1992–99 No. of projects	1992–99 Commitments (US$M)	1992–99 No. of projects (%)	1992–99 Commitments (%)	1984–91—1992–99 Change in commitments (US$M)	1984–91—1992–99 Change in commitments (%)
AFR	17	425.8	41.5	25.3	3	53.2	8.8	3.1	-372.6	-88
Benin	1	5.4	2.4	0.3					-5.4	-100
Burundi	1	12.8	2.4	0.8					-12.8	-100
C.A.R.	1	19	2.4	1.1					-19	-100
Côte d'Ivoire	2	111.3	4.9	6.6					-111.3	-100
Ethiopia	1	45	2.4	2.7					-4.5	-100
Gabon					1	22.5	2.9	1.3	22.5	
Ghana	1	39.4	2.4	2.3					-39.4	-100
Guinea	1	8	2.4	0.5					-8	-100
Kenya	1	19.9	2.4	1.2					-19.9	-100
Madagascar	1	7	2.4	0.4					-7	-100
Malawi	1	16.7	2.4	1.0					-16.7	-100
Mali	1	6.3	2.4	0.4					-6.3	-100
Nigeria	1	71	2.4	4.2					-71	-100
Rwanda	1	14.1	2.4	0.8					-14.1	-100
Tanzania					1	18.3	2.9	1.1	18.3	
Uganda	1	13	2.4	0.8	1	12.4	2.9	0.7	-0.6	-5
Zambia	1	22.4	2.4	1.3					-22.4	-100
Zimbabwe	1	14.5	2.4	0.9					-14.5	-100
EAP	9	722.7	22.0	43.0	6	577.9	17.6	33.6	-144.8	-20
Cambodia					1	5	2.9	0.3	5	
China	3	404.2	7.3	24.0	3	550	8.8	31.9	145.8	36
Indonesia	2	54	4.9	3.2					-54	-100
Lao, P.D.R.					1	8.7	2.9	0.5	8.7	
Malaysia	2	15.5	4.9	0.9					-15.5	-100
Myanmar	1	25	2.4	1.5					-25	-100
Papua New G.					1	14.2	2.9	0.8	14.2	
Philippines	1	224	2.4	13.3					-224	-100
ECA	1	35	2.4	2.1	5	244.9	14.7	14.2	209.9	600
Albania					1	8	2.9	0.5	8	
Belarus					1	41.9	2.9	2.4	41.9	
Bos.-Herz.					1	7	2.9	0.4	7	
Croatia					1	42	2.9	2.4	42	
Poland					1	146	2.9	8.5	146	
Yugoslavia	1	35	2.4	2.1					-35	-100
LAC	3	102.8	7.3	6.1	5	85.6	14.7	5.0	-17.2	-17
Argentina					2	35.5	5.9	2.1	35.5	
Brazil	1	48.5	2.4	2.9					-48.5	-100
Guyana	1	8.8	2.4	0.5					-8.8	-100
Haiti					1	26.1	2.9	1.5	26.1	
Mexico	1	45.5	2.4	2.7	1	15	2.9	0.9	-30.5	-67
Nicaragua					1	9	2.9	0.5	9	
MENA	2	69	4.9	4.1	4	220.5	11.8	12.8	151.5	220
Algeria					1	25	2.9	1.5	25	
Morocco	1	49	2.4	2.9	1	100	2.9	5.8	51	104
Tunisia	1	20	2.4	1.2	2	95.5	5.9	5.5	75.5	378
SAR	9	326.8	22.0	19.4	11	540.2	32.4	21.4	213.4	65
Bangladesh	1	28	2.4	1.7	1	49.6	2.9	2.9	21.6	77
Bhutan	2	6.6	4.9	0.4	1	5.4	2.9	0.3	-1.2	-18
India	3	223.8	7.3	13.3	8	460.3	23.5	26.7	236.5	106
Nepal	2	48.5	4.9	2.9					-48.5	-100
Pakistan					1	24.9	2.9	1.4	24.9	
Sri Lanka	1	19.9	2.4	1.2					-19.9	-100
Grand total	41	1,682.1	100.0	100.0	34	1,722.3	100.0	100.0	40.2	2

Table A.28. World Bank Investment Operations with Forest Components, 1984–99

	1984–1991						1992–1999					
Region/country	No. of projects	Total commitments ($M)	Forest component commitments ($M)	No. of projects (%)	Total commitments (%)	Forest component commitments (%)	No. of projects	Total commitments ($M)	Forest component commitments ($M)	No. of projects (%)	Total commitments (%)	Forest component commitments ($M)
AFR	16	281.1	90.2	50.0	14.5	31.0	20	718.1	219.0	21.3	11.6	12.2
Benin							1	14.1	14.1	1.1	0.2	0.8
Burkina Faso	1	16.5	16.5	3.1	0.8	5.7						
Burundi	1	10.0	1.0	3.1	0.5	0.3						
C.A.R.	1	8.0	2.7	3.1	0.4	0.9						
Cameroon	1	21.5	0.5	3.1	1.1	0.2						
Chad							1	5.3	3.3	1.1	0.1	0.2
Comoros	1	5.0	0.9	3.1	0.3	0.3						
Eq. Guinea	1	6.0	5.9	3.1	0.3	2.0						
Ethiopia							1	200.0	3.4	1.1	3.2	0.2
Ghana							2	27.4	27.4	2.1	0.4	1.5
Guinea Biss.	1	3.7	0.7	3.1	0.2	0.2						
Kenya							1	60.5	34.7	1.1	1.0	1.9
Madagascar	1	26.0	26.0	3.1	1.3	8.9	2	76.0	13.8	2.1	1.2	0.8
Malawi	1	46.7	9.9	3.1	2.4	3.4	1	12.4	10.2	1.1	0.2	0.6
Mali	1	24.4	2.0	3.1	1.3	0.7	2	40.4	21.5	2.1	0.7	1.2
Mauritania							1	18.0	1.2	1.1	0.3	0.1
Mozambique	1	22.0	3.4	3.1	1.1	1.2	1	30.0	3.5	1.1	0.5	0.2
Niger	2	40.8	4.2	6.3	2.1	1.5						
Nigeria							2	67.5	5.7	2.1	1.1	0.3
Rwanda	1	11.5	2.1	3.1	0.6	0.7						
Senegal							2	52.2	4.2	2.1	0.8	0.2
Somalia	1	19.0	9.8	3.1	1.0	3.4						
Sudan	1	20.0	4.7	3.1	1.0	1.6						
Uganda							2	51.8	13.5	2.1	0.8	0.8
Zimbabwe							1	62.5	62.5	1.1	1.0	3.5
EAP	2	152.0	6.0	6.3	7.8	2.0	29	3,188.8	617	30.9	51.4	34.5
China	2	152.0	6.0	6.3	7.8	2.0	15	2,556.5	304.9	16.0	41.2	17.0
Indonesia							7	298.3	87.7	7.4	4.8	4.9
Lao, P.D.R.							1	20.7	0.4	1.1	0.3	0.0
Malaysia							1	70.0	70.9	1.1	1.1	4.0
Papua New G.							1	27.0	27.0	1.1	0.4	1.5
Vietnam							4	216.3	126.8	4.3	3.5	7.1
ECA	2	220.0	9.6	6.3	11.3	3.3	7	282.4	73.8	7.4	4.5	4.1
Georgia							1	4.4	1.9	1.1	0.1	0.1
Latvia							2	29.0	9.2	2.1	0.5	0.5
Lithuania							1	7.0	0.5	1.1	0.1	0.0
Romania	1	180.0	0.6	3.1	9.3	0.2						
Russia							1	110.0	15.4	1.1	1.8	0.9
Turkey							2	132.0	46.9	2.1	2.1	2.6
Yugoslavia	1	40.0	9.0	3.1	2.1	3.1						

(continued on following page)

Table A.28. World Bank Investment Operations with Forest Components, 1984–99 (cont'd)

	1984–1991						1992–1999					
Region/country	No. of projects	Total commitments ($M)	Forest component commitments ($M)	No. of projects (%)	Total commitments (%)	Forest component commitments (%)	No. of projects	Total commitments ($M)	Forest component commitments ($M)	No. of projects (%)	Total commitments (%)	Forest component commitments ($M)
LAC	5	360.0	151.1	15.6	18.5	51.9	24	1,351.0	547.5	25.5	21.8	30.6
Bolivia							3	47.7	28.1	3.2	0.8	1.6
Brazil	2	180.0	125.3	6.3	9.3	43.1	4	442.0	231.2	4.3	7.1	12.9
Chile	1	75.0	22.2	3.1	3.9	7.6	2	26.5	2.9	2.1	0.4	0.2
Colombia							1	39.0	39.0	1.1	0.6	2.2
Dominican R.							1	3.0	1.2	1.1	0.0	0.1
Ecuador							2	40.0	4.8	2.1	0.6	0.3
Haiti							1	21.5	21.5	1.1	0.3	1.2
Honduras							3	104.8	104.8	3.2	1.7	5.9
Mexico							2	418.0	35.0	2.1	6.7	2.0
Nicaragua							1	30.0	2.2	1.1	0.5	0.1
Panama							1	22.5	6.7	1.1	0.4	0.4
Paraguay							1	50.0	8.0	1.1	0.8	0.4
Peru	1	40.0	2.8	3.1	2.1	1.0	1	51.0	7.1	1.1	0.8	0.4
Uruguay	1	65.0	0.8	3.1	3.3	0.3						
Venezuela							1	55.0	54.9	1.1	0.9	3.1
MENA							7	346.3	113.0	7.4	5.6	6.3
Algeria							1	89.0	89.0	1.1	1.4	5.0
Egypt							1	22.0	7.3	1.1	0.4	0.4
Morocco							3	175.0	7.1	3.2	2.8	0.4
Tunisia							1	27.5	4.8	1.1	0.4	0.3
Yemen							1	32.8	4.8	1.1	0.5	0.3
SAR	7	931.4	34.1	21.9	47.9	11.7	7	322.4	218.9	7.4	5.2	12.2
Bangladesh	1	24.5	4.6	3.1	1.3	1.6	1	53.0	3.1	1.1	0.9	0.2
Bhutan	1	9.0	1.4	3.1	0.5	0.5						
India	3	857.8	16.9	9.4	44.1	5.8	3	196.7	179.0	3.2	3.2	10.0
Nepal	1	19.1	2.6	3.1	1.0	0.9						
Pakistan	1	21.0	8.6	3.1	1.1	3.0	3	72.7	36.8	3.2	1.2	2.1
Grand Total	32	1,944.5	291.0	100.0	100.0	100.0	94	6,209.0	1,789.9	100.0	100.0	100.0

B. The 1991 Forest Strategy

The World Bank Forest Strategy sought to address rapid deforestation, especially of tropical moist forests, and inadequate planting of new trees to meet the rapidly growing demand for wood products. These twin challenges were the consequence of five forces:

- *Externalities* that interfered with the free interplay of market forces with the potential to bring about socially desired outcomes
- Strong *incentives* to cut trees
- Weak *property rights* in many forests and wooded areas
- High private *discount rates* for those encroaching on the forests
- Inappropriate government *policies*, particularly concession arrangements.

The Bank's strategy, therefore, promised to promote the conservation of natural forests and the sustainable development of managed forest resources. The strategy it outlined consisted of policies to alleviate poverty, improve forest zoning and regulation, correct private incentives, and increase public investments. The strategy also proposed reducing demand through investments in research and technology, increasing the supply of essentials through farm forestry, and increasing market efficiency. Government policies and programs, the strategy said, should aim to change the incentives and institutional structures that lead to excessive deforestation and inadequate tree planting and prevent the use of good practices in forest management. Under the strategy, international cooperation and assistance were to ensure that global externalities were internalized locally and that the efforts of governments and international organizations were to be coordinated.

Five principles were elucidated to underpin Bank involvement in the forest sector:

- Adopt a *multisectoral approach* in the design and implementation of forest operations.
- Support *international cooperation* in the formulation and adoption of legal instruments conducive to sustainable forest development and conservation.
- Promote *policy reform and institutional strengthening* by helping governments identify and rectify market and policy failures that encourage deforestation and unsustainable land use.
- Finance operations that lead to socially, environmentally, and economically sustainable *resource expansion and intensification*.
- Support initiatives that *preserve intact forest areas.*

1991 Forest Strategy

Two Challenges

To slow the alarming rate of deforestation, especially in the tropics

To ensure adequate planting of new trees and the management of existing resources to meet the rapidly growing demand for fuelwood and other projects in developing countries

Four Strategies for Forest Development

Protecting the Forests
- Policies to alleviate poverty
- Forest zoning and regulation
- Correcting private incentives
- Public incentives

Policies to Meet Basic Needs for Forest Products and Services
- Reducing demand
- Increasing supply

Strengthening Forest Institutions

Role of International Community
- Technical assistance, research, and institution building
- Financing
- International trade reforms

Five Principles of Policy

Multi-sector approach | **International cooperation** | **Policy/ institutional reform** | **Preserving natural forests** | **Resource expansion**

Source: Derived from "The Forest Sector," a World Bank Policy Paper, 1991.

Fulfilling this commitment required five things of Bank-financed projects:

- Adoption of policies and an institutional framework consistent with sustainability and a participatory approach to the management of natural forests
- Adoption of comprehensive and environmentally sound conservation and development plans based on a clear definition of the roles and the rights of the key stakeholders including local people
- Basing commercial use of forests on adequate social, environmental, and economic assessments
- Making adequate provisions to maintain biodiversity and safeguard the interests of forest dwellers, particularly indigenous peoples
- Establishing adequate enforcement mechanisms.

C. Data

The data used in the first part of this report come from three national forest resource censuses, making them less susceptible to the problems suffered by forest statistics collected by the traditional data-reporting system. The surveys were carried out in the late 1970s (QGSLZYTJ 1983), the mid- to late-1980s (QGSLZYTJ 1989), and the early 1990s (QGSLZYTJ 1994). Coordinated by the Ministry of Forestry (MOF) between 1977 and 1981, 28 provinces undertook comprehensive enumerations of forest resources. Interviews with officials, scholars, and other former participants and observers revealed that great effort went into making the consecutive censuses in the 1980s and 1990s fairly consistent. For example, officials in one province estimated that more than 80 percent of the survey personnel participated in both of the surveys in the 1980s. The survey results do not pass through the governmental hierarchy, avoiding at least one possible source of bias, and are collated and published by the MOF in Beijing.

Relying primarily on direct observation techniques, trained teams of foresters, academics, and officials followed a comprehensive spatial sampling plan. In Yunnan Province, for example, census organizers randomly chose 7,975 plots of 0.08 hectares each throughout the province before the 1980 survey. Of these plots, only about 30 percent contained forests, the remainder covered cultivated land, urban districts, lakes, or other non-forested regions. Permanent inconspicuous markers staked out each census plot, and enumerators visited the exact same plot in each of the time periods. Yunnan forest bureau officials claim that over 95.5 percent of the plots surveyed in the late 1970s were located and resurveyed in 1988.

After receiving rigorous training, enumerators collected area and volume data on each of the sample plots. Information was broken down by age structure, use category, and tree species. The criteria used to collect information on variables such as age were generated by each province to account for region-specific environmental factors, such as soil quality and climate, but were all approved by national MOF coordination teams. Supervisors monitored the work and checked the work of the enumerators for accuracy and consistency. MOF statisticians claim the sampling design produces statistically valid observations at the provincial level.

D. Types of Forests

Since the impact of different policies and management strategies on resource use in each region may depend on the region's forest type, careful attention must be paid to the nature of each region's resources. In China, the main forest types include timber, shelterbelt, fuelwood, and special forests. Timber forest, which includes trees used in making paper, as well as those used for construction and other industrial manufacturing processes, accounts for by far the largest share, about 80 percent during the 1980s. Shelterbelts, which include both those areas developed by conservation-seeking afforestation and reforestation programs and those regions where existing forests are set aside for environmental protection reasons, rose from 10.5 percent in 1980 to nearly 15 percent by the end of the decade. Fuelwood forests, though making up only about 4 percent of the total, are important to rural residents as sources of firewood. Richardson (1990) estimates that fuelwood use in the mid-1980s may be equal to about 75 percent of the figure for planned timber use. Special forest refers to all forest land set aside in national parks, nature reserves, and other special sites.

In addition to the traditional forest types, the national forest census also gives area figures for commercial trees and bamboo. Commercial trees include orchards as well as oil palm and other trees whose products can be harvested without cutting down the tree itself. In 1980, oil trees accounted for more than four times as much area as orchards. But since then, their area has held constant, while that of orchards has risen rapidly. As a result, by the early 1990s the area of orchards had reached 87 percent of that of oil trees. Commercial trees, along with bamboo, are both counted as part of tree cover by the census; rising from 12.7 percent of the total in 1980 to 15 percent in the early 1990s. The area of commercial trees rose slightly faster than bamboo over the 1980s, although bamboo use was also increasing rapidly.

E. Methodology for Analysis of Projects with Impact on Forests

Identification of projects for analysis

SARs for the entire portfolio (125 projects) were examined to identify activities with likely impacts on forests or trees or with possible impacts on the natural environment. Of those examined, 48 projects were selected as likely to have impacts (positive or negative) on forests. The sample included projects that mentioned trees or that carried out activities that required landscape changes in rural areas or that could have indirect impacts on forests or trees. Projects in the forestry sector or with forestry sector components were not included.

Examination of treatment of forests or trees in SARs

SARs of the 48 projects were examined for their references to trees, forests or biodiversity, for expected impacts on forests, and for mitigating actions the project intended to take to reduce negative impacts on trees and forests.

Examination of the EIA practices before and after the 1991 strategy

EIA requirements at entry were examined for two periods, a pre-strategy period (1984–91) and a post-strategy period (1992–99). The aim of this analysis was to determine whether any change had occurred in the way Bank projects treated environmental issues at entry relative to the strategy introduction.

Examination of selected EIAs for their treatment of forests

Given the fact that a large number of SARs (34 out of the 48) did not mention forests or that the project was expected to have no impact on forests, the next step was to look at the EIAs of 21 projects. These projects were selected from among those that are considered prone to forest impacts. The sample comprised 10 rural highway projects, seven hydroelectric projects and power projects with transmission components in rural areas, two multipurpose projects (electricity/irrigation) and one railways and one urban housing (land use conversion).

Examination of 11 Implementation Completion Reports

The aim of this examination was to asses the ways in which ICRs addressed forest issues and to identify the lessons ICRs drew to improve project treatment of forests. The examined projects were all completed after 1995, which allowed sufficient time after strategy effectiveness to see how projects were treating forests. The projects were in sectors most likely to have direct impacts on forests (agriculture, power, and transportation). Eleven out of the 21 ICRs from 1995 to 1998 were examined: three for highway projects, two for railways, three for agriculture, and three for power and electricity. All projects selected started prior to 1992, and closed between 1995 and 1998.

Quality Assurance Group ratings and of selected Project Supervisory Reports

To assess the ongoing projects in China, the study reviewed QAG ratings for 106 active projects active in China.

F. Analysis of Change in the 1980s

In an attempt to shed some additional light on which factors are most important in determining China's forest resources, and to control for the influences that simultaneously affect forests, regression analysis is also used to relate forest cover and volume to a set of determining factors. Dividing factors affecting tree cover into three groups yields a general model in the form:

$$(1) \qquad Y_1 = a + b_1X_1 + b_2X_2 + b_3X_3$$

where Y_1 is the percentage of land in each province covered with trees or the change in these numbers between two census years, X_1 contains a set of dummy variables indicating China's geographic regions, X_2 contains measures of economic factors likely to affect the supply and/or demand for trees as well as indicators of resource availability, and X_3 is a measure of policy differences across provinces that are likely to impact tree harvesting and planting.

To operationalize the estimating equation, the following specifications were used for the various locational, economic, and policy variables. Locational dummy variables were used corresponding to China's traditional regions—North China (*huabei*), Northeast China (*dongbei*), East China (*huadong*), Central China (*huazhong*), South China (*zhongnan*), Southwest China (*xinan*), and Northwest China (*xibei*). Four economic variables were included: wealth and the rising demand for wood (measured by the share of GDP contributed by light industry); rural population density (measured by agricultural population divided by total land area of the province), land quality (measured by the Multiple Cropping Index), and a price variable (measured by the ratio of the grain price index to the timber price index. The two policy variables include a measure of land management strategy (which is the share of forest areas under state management) and a dummy variable for the later period to pick up (among other effects) the change due to policies passed in the early- to mid-1980s. Data for the economic variables all come from published statistical compendiums (e.g., ZGTJNJ 1980 to 1990). Those for forest management strategy are from QGSLZYTJ (1983, 1989). Ordinary least squares and several limited dependent variable estimators were used, with the results being fairly robust across the choice of estimating techniques.

The results of the estimation are fairly strong given the size of the sample (2 x 25 provinces—all except Beijing, Tianjin, Shanghai, Tibet, and Qinghai); the *r*-squares ranged between 0.73 and 0.80 and most of

the coefficients were consistent with apriori expectations (table F.1). While much of the cross sectional variation in provincial tree coverage might be expected to be a result of regional and climatic differences, unsurprisingly, after holding the other factors constant, the northeast area is most strongly related to tree-cover and the northeast and the southwest (China's main areas of old-growth forest) are significantly and positively related to forest biomass. A population density variable (POPDEN), measured as the agricultural population divided by the total area of each province, had a negative and significant sign. Holding other things constant, areas with denser population have been less able to increase their tree cover and volume. In contrast, when there are alternative economic opportunities (GDP) and land resources (MCI) are fairly productive, pressure on forest resources is less. Apparently the reduced pressure on farmers to exploit forests that comes with rising wealth outweighs the possible negative demand-side effects that could also increase as the light industry sector of the economy grows faster. Moreover, the greater

Table F.1. Regression Results Explaining Forest Cover and Forest Volume in China, 1980–98

	Dependent variable	
Independent variables	Forest cover	Forest biomass
Constant	-10.13	-1,433.0
	(0.62)	(0.76)
Tenure (share of forest area under state management)	-3.29	1,489.9
	(0.59)	(2.33)
Wealth (share of GDP from light industry)	46.8	4,165.2
	(3.18)	(2.47)
Rural population density	-519.4	-28,932
	(-3.82)	(1.86)
Land quality (MCI)	0.23	5.83
	(5.63)	(1.24)
Relative price increase, wood/agriculture	-7.97	-404.0
	(0.94)	(0.42)
Policy effect (year dummy: 1998) [a]	-1.18	-85.1
	(0.71)	(0.45)
Regional dummies		
Northeast	27.36	2,271.7
	(9.59)	(6.95)
North	5.61	253.9
	(1.72)	(0.68)
Eastern	0.95	806.8
	(0.17)	(1.24)
Central/South	-1.58	759.4
	(0.32)	(1.36)
Southwest	-3.87	1,745.6
	(0.97)	(3.81)
R-square	0.88	0.73
Observations	50	50

a. In equation explaining changes in forest cover and volume, the policy variable is one for change over 1988–93 and zero for the change over 1980–88.
Equations estimated by ordinary least squares. *T*-ratios in parentheses.

amount of fuel provided by the residue of more than one crop and greater time allocated to farming reduces the importance of forest exploitation by farmers. These findings are consistent with those found by Qiao in a village level study in Yunnan and Fujian. The price variable is not significant.

Holding all these other factors constant, the form of the forest management matters (table F.1, row 2). Somewhat surprisingly, however, unlike in the simple descriptive analysis above, in areas where the collective sector is stronger, forest cover rises. State forest management, suffering from all the usual problems of central planning, despite the accounting changes in the early 1980s, contributed to the fall in forest cover. Moreover, it is apparently not collective management that is creating the fall in forest cover in key forests in some regions of the country, but rather the fact that these areas have faster growing populations and have poorer (or deteriorating) land resources, both of which lead to the falling forest covers observed in China's collective forest sectors. On the other hand, the positive coefficient on the state-owned enterprise sector variable in the forest volume equation may be primarily picking the historic legacy, whereby early planners gave the best forest resources to the state forest farmers to manage. If the time dummy is mostly capturing the implementation of new forestry policies, its insignificance may be evidence of the ineffectiveness of forestry policy, a result that is hardly surprising given the minute resources dedicated to the protection sector and the decision to let the forestry ministry police itself, not the newly developed National Environmental Protection Agency (NEPA).

G. Changes in the 1990s: Economic Forces, Policy, and Other Factors

Assessment of the current state of China's forests and improvements have been even more optimistic in the 1990s. Forest area has increased steadily. The rapid running down of forest reserves that characterized the first period appears not only to have stopped, but to have been significantly reversed between 1988–93. This finding is certainly at odds with such observers as Smil, who expresses doubt about the reliability of afforestation data, and predicts that China's forests will all be gone by the year 2000.

But the previous discussion focused on understanding regional and intertemporal trends in forest area and volume and ignored consideration of why the trends might have occurred. In this section, a simple empirical model is specified to help us explain what factors might have caused the changes in forest area and volume, examining the differential impact of geography and climate, economic factors, and policy, including the prevalence of state-owned and collective management.

Dividing factors affecting tree cover into three groups yields a general model in the form:

$$(1) \qquad Y_1 = a + b_1X_1 + b_2X_2 + b_3X_3$$

where Y_1 is the percentage of land in each province covered with trees (or volume) or the *changes* in these numbers between two census years; X_1 contains a set of dummy variables indicating China's main forest regions (to hold constant geographic and climatic factors);[1] X_2 contains measures of economic factors likely to affect the supply and/or demand for trees, their products, and environmental services, and X_3 is a measure of policy and management differences across provinces that are likely to affect tree harvesting and planting.

Economic Factors Affecting Forest Use

A province's endowment of land and labor will affect the pressure that is put on forest resources. Population density has long been shown to affect forests (Hyde, Amacher, and Magrath 1996). In China, during the period, total population rose steadily. However, densities varied widely across the sample (from 27.6 per square kilometer in the Northeast to 437 in the North Central Provinces) and the pace of increase also differed (e.g., negative in the Northeast, while positive in the other sample regions—table G.1, columns 1 to 4). Differential fertility rates, different age structures of the population, and migration have created these differences among regional densities. Otsuka (1997) found that

land quality had a significant impact on forest area, since farmers with better agricultural resources will be less likely to be forced to exploit its forests. The quality of the land (as measured by the multiple cropping index—MCI) also varies widely across the study area's main regions and over time (table G.2, column 5 to 8).

Changing economic forces should also be expected to affect forest resources. Rapid growth of the output of the light industrial sector is a double-edged sword; it directly increases the demand for timber and other forest products, but it also is correlated with the wealth of an area and off-farm employment opportunities, forces that may take pressure off of local resources. Hence, the expected impact is indeterminate. Like the other independent variables, the share of light industry in the economy varies across the sample regions and over time (table G.2, columns 1 to 4). In the northeast region, the share actually declines between 1980 and 1993. In the other regions, the measure rises, especially in the southern region where the percentage rose from 34.7 to 43.4 percent, an increase of more than 25 percent. The relative price of timber and grain, although difficult to measure, also may affect forest changes. Descriptive statistics are not provided, since this variable is only used in equations included in the appendix. The quality of the data are so suspect that they are included just to show that when included in the analysis the indices do not affect the size or sign of our other variables of interest.

Policy Factors

Government policies also have had strong effects on forests in other developing countries (Hyde, Amacher, and Magrath 1996) and China (Richarson 1990; Rozelle et al. 1998). Huang, Rozelle, and Qiao (1998) comprehensively review the forest sector's changing policy environment during the reform era. Sharp changes have occurred throughout the period. There is a great debate whether forestry policy has helped or hurt forest protection work during the reform era (Richardson 1990; Ross 1988; Rozelle et al. 1998). Because of the difficulty in measuring the policies themselves, after controlling for other geographical and economic factors, a time period dummy is included to capture the effect of policy.

The government's decision on tenure arrangements also have been shown to have important impacts on forest use in other developing countries (Otsuka 1997) and China (Huang, Rozelle, and Qiao 1998; and Rozelle et al. 1998). Even during the reform period, state forests and

Table G.1. Factors Affecting Forest Management and Conservation in China, 1980–93 [a]

	Agricultural population density (person/square km)				Multi-cropping index			
	1980	1988	1993	% change 1980–93	1980	1988	1993	% change 1980–93
Northeastern State-run Regional	29.1	27.1	27.6	-5.1	0.98	0.95	0.98	0.86
Southern Collective-run Region	194	200	209	7.8	2.10	2.12	2.23	6.1
Southwest Mixed-managed Region	126	128	133	5.6	1.70	1.79	1.91	12.7
North-Central Fast-Growth Region	418	420	437	4.6	1.61	1.73	1.74	7.5
China	89	90	94	4.6	1.47	1.51	1.55	5.4

a. The years 1980, 1988, and 1993 are approximate time periods of the three census periods. In fact, the first forest census (referred to as 1980) was carried out in different provinces from 1978 to 1981; the second census (referred to as 1988) was carried out in 1986 to 1989; and the third census (referred to as 1993) was carried out in 1992 to 1994.
Source: ZGNYNJ.

Table G.2. Factors Affecting Forest Management and Conservation in China, 1980–93 [a]

	Share of total value of output from light industry (%)				Share of forest-area managed by state-forest farms (%)		
	1980	1988	1993	% change 1980–93	1988	1993	% change 1980–93
Northeastern State-run Regional	26.5	28.7	25.5	-3.6	91.9	93.2	7.0
Southern Collective-run Region	34.7	39.3	43.4	25.1	13.9	13.1	87.0
Southwest Mixed-managed Region	29.5	31.8	31.7	7.5	43.9	41.8	58.0
North-Central Fast-Growth Region	36.2	38.6	39.7	9.7	13.5	14.7	85.0
China	35.5	37.3	37.9	6.8	51.5	51.9	48.0

a. The years 1980, 1988, and 1993 are approximate time periods of the three census periods. In fact, the first forest census (referred to as 1980) was carried out in different provinces from 1978 to 1981; the second census (referred to as 1988) was carried out in 1986 to 1989; and the third census (referred to as 1993) was carried out in 1992 to 1994.
Source: Cols. 1–3, ZGTJNJ; cols. 5–6, QGSLZYTJ.

their managers remained solidly within the state-owned enterprise bureaucracy. Incentives primarily induce managers to meet annual quantitative production targets. While certain changes were made to encourage more reforestation and to make prices more accurately reflect the

true opportunity cost of timber, the failure to institute stronger incentive policies probably has made state forest farms less committed to striving for efficient operations. In contrast, provinces in south, east, and north central China have given responsibility for most forest land to villages and individuals. If they were given good rights over the land, its forest resources, and the profits from the output of forests, local community leaders and individuals should have had the incentive Two general types of equations are included, one set analyzing the impact on tree cover and the other analyzing forest volume. Some equations for forest area and volume attempt to explain the *level* of tree cover and forest volume; others explain the *changes*. The dependent variables are regressed on a set of geographic, economic, and policy variables and, in general, performed fairly well; most of the coefficient estimates had reasonable signs and levels of significance and the measures of goodness of fit, adjusted R-square statistics, ranged from 0.45 to 0.87 for the forest cover equations and from 0.18 to 0.66 for the volume equations (table G.3, column 1 and 2). Ordinary least square estimators were used, but estimates from tobits were also calculated, with little changes being found in the results (not shown—available from authors on request).

Determinants of Forest Cover and Reforestation

The geographic dummy variables perform mostly as would be expected and are consistent with the descriptive statistics. In the level equations the highly timber-endowed Northeast has a large and statistically significant coefficient, although the sign in the changes equation is negative (table G.3, row 8). The north and eastern regions are somewhat larger than the base region, the northwest, but somewhat surprisingly the central/ south and southwest are nearly the same (rows 9 to 12).

The economic variables in the forest cover level and changes equations are consistent and the impact on forest land use as expected (table G.3, columns 1 and 2). Those living in areas with higher population densities have expanded forest cover less, while holding population per land unit constant, in regions with better land, producers have less reason to encroach into the forest and exploit timber resource and have expanded forest cover (row 2 and 3). The positive sign on the light industry variable means that in regions with greater concentrations and growth of light industry, the employment and wealth effects apparently have triggered the expansion of forest cover (row 4). The positive wealth effect apparently dominates the demand effects. Price, as measured, does

Table G.3. Regression Results Explaining Forest Cover and Forest Volume, Levels and Changes in China, 1980–95

	Dependent variables			
	Tree cover		Forest volume	
Independent variables	Levels	Changes	Levels	Changes
Constant	23.07	--	-1,721.38	--
	(3.54)		(2.39)	
Tenure (share of forest area under state management)	-607.20	-63.59	-44,654	0.30
	(7.69)	(1.62)	(4.97)	(1.03)
Wealth (share of GDP from light industry)	0.22	0.001	2.63	0.00002
	(7.20)	(1.55)	(0.77)	(0.70)
Rural population density	48.26	12.67	4,511.36	0.04
	(4.23)	(3.68)	(3.47)	(1.46)
Land quality (MCI)	-3.19	-2.04	772.38	-0.0095
	(0.92)	(2.70)	(2.01)	(-1.70)
Relative price increase wood/agriculture	-2.27	-1.45	379.52	-0.0012
	(0.91)	(2.15)	(1.34)	(0.24)
Policy effect (year dummy: 1998) [a]	-1.22	--	467.64	--
	(0.50)		(1.68)	
Regional dummies				
Northeast	27.53	-0.06	2,249.66	-0.001
	(12.02)	(1.44)	(8.69)	(0.12)
North	6.76	1.02	360.27	-0.003
	(2.87)	(1.00)	(1.35)	(0.33)
Eastern	6.16	2.42	1,131.64	-0.02
	(1.48)	(1.66)	(2.37)	(1.69)
Central/South	2.42	0.10	818.61	-0.02
	(0.63)	(0.08)	(1.86)	(1.64)
Southwest	-0.99	1.05	1,742.97	-0.007
	(0.31)	(0.80)	(4.94)	(0.75)
R-square	0.86	0.45	0.66	0.18
Observations	75	50	75	50

a. In equation explaining changes in forest cover and volume, the policy variable is one for change over 1988–93 and zero for the change over 1980–88.
Equations estimated by Ordinary Least Squares. *T*-ratios in parentheses.

not matter and its inclusion or exclusion from the forest area models has little impact on the rest of the results (table G.4).

Tenure does matter in China, affecting both the level of forest cover and the changes (table G.3, row 5). Regions with large concentrations of state forest farm-managed forests have lower levels of forests (holding

geographical factors constant) and have experienced sharper declines. This result is an important one for policymakers who frequently have lamented the poor performance of the collective forest sector. Relative to state farm-managed land, collectives have done better in increasing forest area. However, this study cannot determine whether it was the local leaders who caused improvement to forest cover or individuals in the villages (for an analysis of this question, see Huang, Rozelle, and Qiao 1998).

Finally, while the policy dummy is not significant in the levels equations, the negative and significant sign in the changes equation implies that forest policy has not only not reversed the degradation of forest area, but has made the problem worse (table G.3, row 6 and 7). If true, laudatory statements about the achievements of China's forest policies may not be warranted. The positive forest changes observed in China may be more a function of migration, falling fertility, investment in land-saving technologies, and rising wealth than the efficacious implementation of national forest policy by the forestry system. At the very least, the insignificant sign in the levels equations means the neutrality of policy.

Forest Volume

The results of the forest volume equations also performed quite well and were robust to various changes in specification. The estimated coefficients measuring the relationship between forest volume and key structural variables were remarkably consistent with a priori expectations and mostly similar to those in the forest cover equations (table G.3, column 3 and 4). The large, positive and significant coefficient on the tenure variable in the levels equation reflects the initial policy bias of the forest industry that gave state forest farms control of the best timber resources (Rozelle et al. 1998). The signs on the wealth and rural population density variables are the same signs as in the forest cover level equations; wealthier regions without heavy population pressure have positively contributed to the rising levels of forest volume across China and over time. The signs (of the significant variables) and significance of the tenure, wealth, population, and land quality variables also are the same in the changes variable. Changes in tenure from state to collective have contributed to increase forest volume, while change in wealth (like the level of wealth) also positively affects the changes in forest volume.

The only significant and somewhat surprising differences between the forest area and volume equations are in coefficients of the policy variables (table G.3, rows 5 and 6). Policy (assuming this is mostly what is

being captured by the time period dummy variable), especially in the late reform period, appears to have a somewhat significant and positive effect on increasing the level of forest volume. The strong and significant negative effect of policy on forest cover (column 2) disappears in the volume changes equations (column 4). At first such a result seems contradictory. Is the ineffectiveness of policy in conserving forest area offset by its effectiveness in conserving forest volume? More likely, this somewhat ironic effect may actually be the result of the extra policy incentives in China (in addition to the wealth and population trends) in the early reform era that stimulated planting of shelterbelts, fast growing forests, and commercial plantations. The policy-induced increase in forest volume in these areas (shown by these results) may be offsetting the loss of volume associated with the policy-induced forest area loss.

Assessing the Magnitudes of Factors Affecting Forest Area: A Decomposition Exercise

A decomposition analysis, performed to assess the magnitude of the impact of the variables that affect forest area, reveals that a number of factors boost forest area, while at the same time other factors hold expansion back (table G.6). The basic goal of the analysis is to decompose the 15 year rise in forest cover, a total of 1.92 percentage points (bottom row), into its component parts. Each component's contribution to forest cover (column 3) is calculated by multiplying its elasticity with respect to forest cover (column 1) by the change in the level of the component (column 2).

On the positive side, increases in the multicropping index, the share of light industry in the economy, and the shift to collective management led to a 4.46 rise in cover (1.77+1.16+1.53—column 3, rows 2 to 4). The three factors account for 232.3 percent of the change in the forest (92.2+60.4+79.7—column 4), implying that if other factors had not limited the expansion of forest area, cover would have risen by over 4 percentage points more (or by more than 30 million hectares more). The largest contributor, land quality (measured by the MCI), demonstrates the complementarity between agricultural and nonagricultural investments. When government officials improve farmland through investments (or farmers as a result of investment incentives), they also appear to be helping increase forest area. This finding, while fairly novel in the general development and resource literature, is consistent with that of Huang, Rozelle, and Qiao (1998) at the village level (see discussion below). The positive and large impact of tenure

Table G.4. Regression Results Explaining Forest Cover and Forest Volume, Levels and Changes in China, 1980–95–with Relative Prices

	Dependent variables			
	Tree cover		Forest volume	
Independent variables	Levels	Changes	Levels	Changes
Constant	-14.45	--	-1,939.4	--
	(1.66)		(1.87)	
Tenure (share of forest area under state management)	-526.6	-58.56	-46,260	0.32
	(5.92)	(1.42)	(4.38)	(1.06)
Wealth (share of GDP from light industry)	0.22	0.0001	2.62	0.000002
	(7.72)	(0.20)	(0.76)	(0.66)
Rural population density	41.73	13.26	4,636.2	0.04
	(3.60)	(3.61)	(3.37)	(1.45)
Land quality (MCI)	-1.84	-1.40	724.43	-0.007
	(0.52)	(0.94)	(1.72)	(0.62)
Relative price increase wood/agriculture	-8.79	-0.55	241.25	-0.002
	(1.28)	(0.49)	(0.30)	(0.27)
Policy effect (year dummy: 1998) [a]	5.46	-1.01	180.10	0.0005
	(0.89)	(0.91)	(0.25)	(0.06)
Policy effect (year dummy: 1993)	6.78	--	249.12	--
	(1.02)		(0.31)	
Regional dummies				
Northeast	27.15	-0.02	2,258.34	-0.001
	(12.29)	(0.01)	(8.61)	(0.09)
North	5.48	0.99	389.78	-0.003
	(2.27)	(0.96)	(1.36)	(0.34)
Eastern	3.76	2.36	1,172.24	-0.02
	(0.89)	(1.60)	(2.35)	(1.69)
Central/South	0.78	0.15	834.25	-0.01
	(0.21)	(0.12)	(1.87)	(1.60)
Southwest	-1.38	1.21	1,750.01	-0.007
	(0.48)	(0.88)	(4.91)	(0.66)
R-square	0.87	0.45	0.71	0.19
Observations	75	50	75	50

a. In equation explaining changes in forest cover and volume, the policy variable is one for change over 1988–93 and zero for the change over 1980–88.
Equations estimated by Ordinary Least Squares. *T*-ratios in parentheses.

security shows the importance of providing good incentives in forest management, but more work is needed to pinpoint the exact nature of the incentive effect.

The large positive impact of land quality, wealth, and tenure changes, however, are in part offset by the negative influence of rising population

Table G.5. Regression Results Explaining Forest Cover and Forest Volume, Levels and Changes in China, 1980–95–with Relative Prices

	Dependent variables			
	Tree-cover time varying		Tree-cover space varying	
Independent variables	Levels	Changes	Levels	Changes
Constant	23.07	--	-1,721.38	--
	(3.54)		(2.39)	
Rural population density	-607.20	-63.59	-44,654	0.30
	(7.69)	(1.62)	(4.97)	(1.03)
Land quality (MCI)	0.22	0.001	2.63	0.00002
	(7.20)	(1.55)	(0.77)	(0.70)
Share of GDP from light industry	48.26	12.67	4,511.36	0.04
	(4.23)	(3.68)	(3.47)	(1.46)
Tenure (share of forest area under state management)	-3.19	-2.04	772.38	-0.0095
	(0.92)	(2.70)	(2.01)	(-1.70)
Policy effect (year dummy: 1998)[a]	-2.27	-1.45	379.52	-0.0012
	(0.91)	(2.15)	(1.34)	(0.24)
Policy effect (year dummy: 1993)	-1.22	--	467.64	--
	(0.50)		(1.68)	
Regional dummies				
Northeast	27.53	-0.06	2,249.66	-0.001
	(12.02)	(1.44)	(8.69)	(0.12)
North	6.76	1.02	360.27	-0.003
	(2.87)	(1.00)	(1.35)	(0.33)
Eastern	6.16	2.42	1,131.64	-0.02
	(1.48)	(1.66)	(2.37)	(1.69)
Central/South	2.42	0.10	818.61	-0.02
	(0.63)	(0.08)	(1.86)	(1.64)
Southwest	-0.99	1.05	1,742.97	-0.007
	(0.31)	(0.80)	(4.94)	(0.75)
R-square	0.86	0.45	0.66	0.18
Observations	75	50	75	50

a. In equation explaining changes in forest cover and volume, the policy variable is one for change over 1988–93 and zero for the change over 1980–88.
Note: Equations estimated by Ordinary Least Squares. *T*-ratios in parentheses.

densities (-0.28—row 1) and a general policy effect (-1.22—row 5). If the time trend is capturing mostly the effect of policy, the size of the negative impact means that if general policy had just been neutral, the increase in forest cover would have been 60 percent higher. Whereas our analysis can not explain the exact nature of the policy effect, such elements as the

inability to provide rational, consistent policies, irrational quota allocation, and imperfect monitoring of logging activity (and/or corruption) may be responsible for the negative impact.

Somewhat disappointingly, the decomposition leaves a residual over half the size (-1.04) of the change in forest cover. While this may mean that we have missed some important factor, part of the reason for such a large residual may be overstatement of the positive impact of the shift in tenure. Our analysis assumed full state control of all China's forests in 1980. If the assumed change in tenure (48 percent) fell by half (to 24 percent), the residual is only 0.28.

Table G.6. Sources of Growth in Forest Cover, 1980–93

Variable	Coefficient	Changes in levels, 1988–93	Forest cover changes by source: % of land	Forest cover changes by source: %
Rural population density (persons/km^2)	-607.2	4.64	-0.28	-14.6
Land quality (MCI)	0.22	7.9	1.77	92.2
Share of GDP from light industry	48.3	2.4	1.16	60.4
Tenure (share of forest area under state management) (%)	-3.19	-48.2	1.53	79.7
Policy effect (year dummy: 1993)	1		-1.22	-63.5
Sum of predictor variables			2.96	
Residual			-1.04	-54.2
Change in forest cover			1.92	100.0

H. Multivariate Analysis: Village Level Analysis of Tenure and Policy Impacts on Forest Resources

To examine these questions in a more rigorous, multivariate framework, the authors use the following model:

(1) $W_i = f_i(Z, X_1, X_2, X_3)$

where, W is the area share; *i's* index the purposes of land use, $i = 1, 2, 3, ?, n$; and Z is a vector includes the elements reflecting the forest land tenure system. X_1 is a vector or a set of variables representing household and village economic endowments (population density, land quality, and other natural environment); X_2 is the extent of local marketing and commercialization situations; and X_3 represents other local specific variables that influence the land use patterns.

The empirical model is:

(2) $W_{i(t)} = f_i(\text{PRIVATE}_{(t)}, \text{CONTRACT}_{(t)}, \text{ZYEAR}, \text{POPDEN}_{(t)}, \text{IRRI}_{(t-1)}, \text{SLOP}_{(t-1)}, \text{ROAD}_{(t)}, \text{DISTANCE}_{(t)}, \text{COUNTY}_k)$

where t is the index time or year; *PRIVATE* and *CONTRACT* are the shares of private plot forest and contract (responsibility) forest, respec-

Table H.1. Estimated Parameters for the Total Land Use Patterns

	Percent share in total forest land					
Variable	Timber forest	Non-timber product forest	Fuel-wood forest	Barren/ waste land	Culti-vated land	Other used land
Constant	0.179	0.063	0.136	0.187	0.23	0.204
	(1.27)	(1.85)	(2.16)	(1.88)	(2.79)	(2.35)
Forest land tenure:						
Private forest	-0.033	0.104	0.125	-0.039	-0.219	0.062
	(-0.26)	(3.45)	(2.23)	(-0.44)	(-2.96)	(0.79)
Responsibility forest	0.056	0.085	0.194	-0.068	-0.306	0.038
	(0.58)	(3.65)	(4.48)	(-0.99)	(-5.35)	(0.64)
Tenure security of land (year)	0.004	-0.001	-0.002	-0.001	-0.001	0.001
	(1.60)	(-1.05)	(-2.14)	(-0.39)	(-0.70)	(0.49)
Population/land area	-1.396	-0.000	0.062	0.310	0.439	0.586
	(-3.68)	(-0.00)	(0.37)	(1.15)	(1.96)	(2.50)
Irrigation area (%)	0.360	0.021	-0.033	-0.245	-0.205	0.102
	(2.45)	(0.58)	(-0.50)	(-2.36)	(-2.36)	(1.12)
Slope of arable land	0.005	-0.002	-0.003	-0.004	0.006	-0.002
	(1.50)	(-2.72)	(-2.37)	(-1.84)	(3.39)	(-0.77)
Highway dummy	0.092	0.003	-0.016	0.001	0.040	-0.120
	(1.17)	(0.15)	(-0.46)	(0.03)	(0.86)	(-2.48)
County dummies	not shown	not shown	not shown	not shown	not shown	not shown

Note: *t*-values are in parentheses.

tively. *ZYEAR* is time length of contract (responsibility) forest land; *PPODEN* is a ratio of population and cultivated land; *IRRI* and *SLOP* are irrigation level and the slope of cultivated land, representing the quality of land, and are measured by ratio of irrigated to total cultivated land and the weighted average slope of cultivated land using plot by plot slope data; *ROAD* is a dummy variable which equals "1" if there is a road (at least for 4-wheel tractor) passing the village, and equals "0" otherwise; *DISTANCE* is the distance of the village from the nearest county capital; *County* is county dummy variable, $k = 1$ to 6. The estimation of the model is discussed in Qiao et al. 1997.

The results of econometric estimation of land use pattern model, equation (3), are shown in the tables below. Table H.1 shows the estimated parameters for total land use pattern and table H.2 explains the determinants of the forest structure in the sampled survey area. Estimated parameters from the systems of both land use pattern and the forest structure are robust. The signs of most estimated parameters are expected.

Table H.2. Estimated Parameters for the Total Land Use Patterns

	Percent share in total forest land			
Variable	Timber forest	Non-timber product forest	Fuel-wood forest	Barren/ waste land
Constant	0.257	0.127	0.339	0.277
	(1.30)	(2.70)	(2.88)	(1.69)
Forest land tenure:				
Private forest	0.050	0.150	0.022	-0.221
	(0.29)	(3.56)	(0.21)	(-1.51)
Responsibility forest	-0.105	0.137	0.187	-0.219
	(-0.77)	(4.20)	(2.31)	(-1.93)
Tenure security of land (year)	0.006	-0.001	-0.006	0.000
	(1.88)	(-0.72)	(-2.99)	(0.09)
Population/land area	-1.466	0.083	0.589	0.793
	(-2.75)	(0.66)	(1.86)	(1.79)
Irrigation area (%)	0.423	0.018	-0.161	-0.280
	(2.05)	(0.37)	(-1.31)	(-1.63)
Slope of arable land	0.008	-0.004	-0.001	-0.003
	(1.69)	(3.36)	(-0.52)	(-0.70)
Highway dummy	0.085	-0.037	-0.018	-0.030
	(0.78)	(-0.141)	(-0.28)	(-0.33)
County dummies	not shown	not shown	not shown	not shown

Note: *t*-values are in parentheses.

I. Criteria for Selecting Impact Projects

SARs of 125 projects were examined for mention of forests, trees, or possible impacts on the natural environment. Selected projects include those that mention trees or that carried out activities that required landscape changes in rural areas or that could have indirect (positive—such as cattle feed or environmental technical assistance—or negative) impacts on forests or trees. Projects already included in the forestry sector or as sector components were **not included.** These projects are reviewed elsewhere.

Included projects are:

- Agriculture: Irrigation and drainage, agricultural adjustment, agroindustrial projects
- Electric power: Hydroelectric, projects with an electricity transmission component
- Environment: Environmental adjustment (technical assistance), and projects in which SAR mentioned forests or trees
- Industry: one Cement project—as possible positive effect
- Mining: (none in China)
- Oil and Gas
- Transportation: Rural highways, railways, and transportation adjustment
- Urban Development: Urban housing, and water projects that require aqueducts by forested areas.

J. China/World Bank GEF Pipeline Discussions

World Bank Resident Mission in China

The main objective of both parties to the discussions was to strengthen the pipeline of GEF projects in China administered through the World Bank. Specifically, the discussions covered: (a) the current pipeline of possible GEF investments and medium-sized projects (MSPs), (b) the institutional arrangements to identify additional GEF projects in the future, and (c) options for providing financial support for development of GEF proposals.

Current Pipeline

In general, the Bank prefers the development of GEF investment projects attached to World Bank investments with the objective of mainstreaming GEF operations in World Bank assistance. This approach also offers the best opportunities for minimizing associated administrative costs. However, the World Bank team also made it clear that there are other possibilities as well including:

1. GEF investment projects linked to investment programs being administered by other entities including the Government of China itself and other donors such as the Asian Development Bank or bilateral donors. The Bank expressed its willingness to assist the GOC to identify other partners in cases where it is not possible to identify a suitable Bank-financed project.
2. Medium-size projects (MSPs). The team pointed out that in cases where these projects do not link to the Bank lending program, the Bank has no comparative advantage and the UNDP is likely to be the more appropriate partner. However, the Bank would be prepared to discuss a small number of MSPs each year (e.g., one or two), particularly where these would develop innovative ideas such as government/NGO partnerships.

Opportunities for Biodiversity Projects. Based on the discussions on the first day of the workshop and presentations made during the morning of the second day (see Attachment 1), plus consideration of the prospective World Bank investment pipeline for rural development projects, several opportunities are already apparent (italicized comments suggest actions should be taken by MOF/SEPA or the World Bank to pursue these opportunities):

1. Possibilities for Investments through the World Bank Lending Program. Two projects in the current lending program appear to offer potential for development of attached GEF projects:

a) **Uplands Poverty Project (FY 2000). T**his project is likely to cover four provinces, one of which could be Ghuizhou. If Ghuizhou is included it offers definite potential for a GEF project since that province is significant from a biodiversity point of view.

b) **Semi-Arid and Arid Lands Development Project (FY 2000/ 2001).** This project has not yet been identified but, at least in principle, seems to offer potential for a GEF investment focusing on management of ecologically and internationally significant ecosystems in the semiarid zone (e.g. Xinjiang, Gansu, Qinghai).

2. Possibilities for Stand-Alone GEF Projects. There are three possibilities for stand-alone projects, one of which could be associated with a purely Government of China (GOC)-financed program and the two others which might be associated with programs jointly financed by other donors. These are:

a) The GOC has announced a major natural forest protection program along the Yangtze and Yellow Rivers as a result of the recent disastrous floods and pledged major investments over the next five years. This could provide an opportunity to build on the experience of the current GEF project (Nature Reserves Management Project) which has piloted the reform of State Owned Forestry Enterprises. MOF/SEPA will provide the Bank with further details of the Government's forest protection investment program —its scale, scope and target sites—to facilitate further consideration of this option.

b) Yunnan Great River Park. An international NGO (the Nature Conservancy), the United States Government, and private sector partners have been working with the Government of Yunnan on development of the concept of a national park in the headwaters of the Mekong River system. If the Provincial Government and its foreign partners are intending to move forward with an investment program, this also provides a potential GEF opportunity. To proceed further, MOF should identify the stage to which planning has developed, and identify the potential participants and the scope of investments proposed.

c) Biodiversity Conservation and Sustainable Utilization of Natural Resources on Hainan Island. This project concept was presented to the participants and was considered to have good potential for GEF assistance (see Attachment 1). The World Bank is not expected to have a suitable lending program in

Hainan to associate with this concept but it is possible that the Asian Development Bank might have, given the substantial resources it has put into Hainan in recent years for land use planning and related activities. MOF/SEPA will obtain details of the current and planned ADB lending program, discuss with the ADB the possibility of seeking complementary GEF assistance to any future ADB lending, and report to the World Bank on the results of its inquiries. The Bank will also make some informal inquiries.

3. **Medium-Size Project.** A major workshop was recently held in Tibet to discuss ecological issues and considerable work has been done by the regional government, the World Wide Fund for Nature (WWF), and the Wildlife Conservation Society (WCS) with a view to undertaking activities in relation to Qiangtang Grassland Nature Reserve. Given the involvement of NGOs, this could provide a good prospect for an MSP.

Opportunities for Climate Change Projects. There are currently two GEF-supported climate change projects in China: Efficient Industrial Boilers and the Energy Conservation Project. The following possibilities are also in the pipeline:

1. **Renewable Energy Project (FY 1999).** It is already intended that this will have a substantial GEF component.
2. **Air Pollution Control Project (FY 2000).** This project is still being identified, but it is already intended to include a substantial GEF component. Based on the **Clean Coal Technology Concept** presented during the workshop (see Attachment 1), the project might also furnish an opportunity to include work on coal sector regulation or to develop it as an associated MSP.
3. **Energy Conservation II (FY 2000).** This would be a follow-on to the current project and would logically include a GEF component.
4. **Beijing Environment II (FY 2000).** There have been some initial discussions regarding the possibility of a GEF component associated with work on boiler efficiency and coal-to-gas conversion.

In addition to these, there is some possibility of a **District Heating Project (FY 2000 or beyond)** which might also provide a GEF opportunity.

The meeting also discussed the **Energy Efficient Buildings** proposal presented at the workshop. This was considered to have excellent potential as a GEF activity, but the Bank is not active in housing in China

so there is no obvious Bank program association at the present time. Apparently local governments consider World Bank funds to be too expensive for local housing development. Other possibilities include associating it with an urban development project or a district heating project or developing a stand-alone MSP on energy efficient building standards. *Bank staff will follow up these possibilities in Washington to assess the level of interest in pursuing an energy efficient buildings activity.*

The Government also expressed interest in using GEF resources to promote energy technology transfer projects through one or more large scale, low GHG-emitting projects consistent with the GEF's OP 7. Among the options it wishes to consider are advanced fossil fuel gasification, fuel cells, and solar thermal generation. *The Bank will include this option in its forthcoming energy lending program discussions.*

Institutional Arrangements

The approach taken on the Chinese side to develop GEF investment ideas has been to cast the net wide amongst line agencies and institutes to promote investment ideas. This has resulted in preparation of many proposals, but many of them are unsuitable for GEF support for reasons discussed in Attachment 1. In addition, even where there are good project concepts (e.g., energy efficient buildings), there may not be suitable Bank investment programs to attach them to.

The government and the Bank are interested in promoting a more strategic approach that would mirror the procedures followed by the GOC and the Bank in developing the lending pipeline. That is, annual GEF pipeline discussions should be held, at the same time as the lending pipeline discussions, to identify investment opportunities and then use this as a basis for commissioning Chinese experts to develop targeted GEF investment proposals that have a good chance of success.

Regarding **focal points** in the Bank with whom MOF/SEPA and others should communicate directly, it was agreed that the two key people on the Bank side are Mr. Robin Broadfield, the East Asia and Pacific Coordinator within the Bank's Global Environmental Unit, and Mr. Robert Crooks, who is Mr. Broadfield's counterpart within the East Asia and Pacific Environment Unit (headed by Ms. Kristalina Georgieva). Inquiries may be directed either to Mr. Broadfield or Mr. Crooks with copies of communications to Mr. George Plant and Ms. Sun Chongwu at RMC. Mr. Broadfield or Mr. Crooks will then forward communications to the appropriate person.

Financial Support for GEF Program Development

There are two problems on the Chinese side with the financial aspects of GEF program development; (a) MOF/SEPA have limited funds to support the associated administrative costs for program development and quality assurance (e.g. procurement of services of relevant experts to review proposals); and, (b) covering costs associated with developing promising investment ideas from concepts to investment proposals.

The **first problem** affects a large number of countries participating in the GEF program and there has been some prior discussion at the level of the GEF Council about providing some GEF funds to overcome this problem. *One important step MOF could take in this regard is to encourage the Chinese representative on the GEF Council to raise this issue with other council members with a view to placing it on the agenda of the next council meeting for discussion*. The Bank team also undertook to see if any assistance can be provided from Bank resources to assist on this.

The **second problem** is not really a problem for well thought out GEF concepts. GEF provides two types of grants (PDF-A and PDF-B) to finance the costs associated with developing GEF concepts into Bankable proposals. The Bank can assist in procuring these grants for mutually agreed project concepts arising out of the pipeline development activities outlined above.

Attachment: Comments on GEF Project Concept Proposals

A. Introduction

During the course of the World Bank/GEF Training Workshop held in Beijing on September 18 and 19, 1998, a document entitled "The Compiled List of Chinese GEF Project Ideas," compiled by ICD of the Ministry of Finance and FECO of SEPA was provided to the World Bank Team. Five of the proposals were the subject of presentations on the morning of September 19, 1998, after which World Bank team members made comments and suggestions. This attachment summarizes the comments and suggestions made about the five proposals presented (Section B) and also provides additional comments on the other eleven proposals that were not presented (Section C).

B. Comments on Presented Proposals

Project Name: TO OVERCOME THE OBSTACLES OF POPULARIZING THE BUILDING ENERGY EFFICIENCY AND REDUCING CO_2-DISCHARGING VOLUME

1. There is a good fit with OP 5 and is also consistent with the Greenhouse Gas Study.
2. The proposal responds directly to the OP by identifying barriers to use of energy efficient buildings and proposing counter measures.
3. There has been broad-based participation in preparation of the concept, which is an attractive feature for GEF.
4. However, it would be critical to clarify the content and status of the housing market reform program and address two key policy measures: (1) problems due to housing unit ownership; and (2) lack of demand-based fees for thermal energy consumption. These would need to be addressed in any revised project concept.

In summary, this project concept has potential as a GEF project. However, at the moment, the Bank does not have a suitable housing sector investment project to which a GEF proposal like this could be attached. Two possible responses to this are:

1. Wait until a decision is made between the Bank and GOC as to whether the Bank will participate in housing sector reform and, when a suitable lending operation is developed, work further on this concept to be associated with that lending project.
2. Scale the concept down (e.g., to delete the major investment components and focus on development of national and regional energy efficient building standards) and apply for a medium-sized grant (MSG).

Project Name: PROMOTING THE APPLICATION OF CLEAN COAL TECHNOLOGY IN CHINA

1. There is a good fit with OP 5(f), but ongoing and planned clean coal actions need to be fully described to provide the strategic context for proposed GEF assistance.
2. GEF would support the technical aspects. However, the proposal does not address the market and policy barriers preventing wide-spread adoption of clean coal technology. For GEF to accept the proposal, these issues would have to be addressed.
3. The Bank is constrained from investing in the coal industry due to the widespread economic distortions that characterize the sector. Therefore, there could be a problem finding a suitable lending vehicle to associate the GEF investment with. In addition, GEF would probably not support the coal washing investments as the benefits are mainly local rather than global (reductions in ash fallout and acid rain).

4. There could be potential, however, to reduce the scope of work, focus it on analysis of the policy framework, and incorporate it as part of the GEF activities being developed under the Air Pollution Control Project, which is presently being identified.

In summary, the policy analysis activities have potential for inclusion as part of a wider GEF program being developed for the Air Pollution Control Project.

Project Name: PROTECTION AND SUSTAINABLE UTILIZATION OF SEABUCKTHORN RESOURCES IN CHINA

1. The proposal is species-focused rather than ecosystem focused.
2. The species is not rare, endangered, endemic or threatened.
3. It is not clear whether the target areas are globally significant with respect to biodiversity.

In summary, this proposal has very limited potential to be acceptable to GEF.

Project Name: BIODIVERSITY CONSERVATION AND SUSTAINABLE UTILIZATION IN HAINAN PROVINCE

1. Parts of this proposal provide a very good fit with GEF criteria—it follows an ecosystem approach, it is a priority area under the Biodiversity Action Plan, and the ecosystems are of global significance.
2. However, there are some weaknesses that would need to be reviewed. These include: (1) too much focus on Protected Areas Management rather than on a more integrated approach involving local communities; (2) problems involved in the proposal for involuntary resettlement; and (3) a question whether the expanded protected areas would be financially sustainable after the conclusion of the project.
3. The proposal does not focus on addressing the issues responsible for the gradual reduction in the areas of significant ecological systems (land development pressures, population growth, poverty, etc.). These should be addressed more directly in any revised proposal.
4. The Bank does not presently have a lending operation underway or planned in Hainan to which the GEF project could be attached.

In summary, there is potential for a significant GEF investment in Hainan addressing at least some of the issues identified in the proposal. The first problem to address is to find a suitable investment project to which the GEF project could be attached. Since the World Bank has

nothing in prospect in Hainan, it would be worthwhile contacting the Asian Development Bank, which has been working in Hainan, to see whether it has any investments planned. If it does and is interested in a GEF proposal, the World Bank would be pleased to assist the Government and ADB in preparing the proposal for submission to the GEF.

Project Name: BIODIVERSITY CONSERVATION AND SOCIAL SUSTAINABLE DEVELOPMENT IN QINGHAI-TIBET PLATEAU OF CHINA

1. There is definite potential for a GEF project here. The global biodiversity significance is well established, and there is a good link with relevant international conventions (RAMSAR, etc.).
2. However, the proposal needs more work with specific emphasis on the underlying causes of current conservation management problems and identifying interventions (e.g., community-based development, better land management techniques) that might help reduce them. Also, more consideration needs to be given to the institutional arrangements for project implementation to ensure relevant local institutions are involved.

In summary, this is an idea that is worth working on, but several decisions need to be made. If the emphasis is to be on research and studies, this would not be a high priority for the GEF. Alternatively, if an investment project is preferred, more work needs to be done to shift the emphasis from research to activities on the ground that are intended to address the root causes of the management problems in the area. There is already some work being done by the World Wildlife Fund, the Wildlife Conservation Society, and the Tibetan Government on development of a similar idea in Qiangtang. The proponents should get into contact with these organizations to see whether a joint approach could be developed. The World Bank does not have an investment project in Tibet, but there might be potential for this to be developed as an MSP or, alternatively, it could be included in the proposed Arid and Semi-Arid Land Development Project.

Project Name: THE CONSERVATION AND SUSTAINABLE UTILIZATION OF RARE AND THREATENED MEDICINAL PLANTS IN CHINA

This has limited potential as a GEF project since it is species-oriented and it is difficult to identify incremental costs (most of the benefits are local, not global).

In summary, even though this is not a good GEF prospect, it is technically a very good proposal, is likely to be extremely sustainable economically and might have some potential as a conventional World Bank investment project.

C. Comments on Other Proposals

Project Name: DEMONSTRATION FOR DEVELOPMENT AND COMPREHENSIVE UTILIZATION OF GEOTHERMAL ENERGY WITH MEDIUM AND LOW TEMPERATURES

If there are removable barriers to the commercialization of low-medium temperature geothermal technologies in China, the "barrier removal" components of the geothermal projects would be potentially GEF-eligible under OP 6. However, the major share of project costs would be economically justified and therefore not GEF-eligible. In the concept paper, the barriers are not clearly identified. Nor is it clear that they could be surmounted with GEF assistance. More information is therefore required to determine its GEF eligibility. It is also not clear that this project fits with the Bank's energy lending program.

Project Name: POWER TOWER TECHNOLOGY DEVELOPMENT IN CHINA

The GEF has selected the solar parabolic trough as the solar thermal technology to support under OP 7. Given that GEF plans to support only a small number of solar thermal projects, it is unlikely to fund the solar tower technology as well.

Project Name: DEMONSTRATION OF FUEL CELL BUS DEVELOPMENT COMMERCIALIZATION IN CHINA

The technology is potentially eligible for GEF assistance under OP 7 and/or the emerging transport OP. However, despite the existence of an analytical study, the concept paper provides insufficient information on the cost of the technology and economic potential to determine whether the concept is economically sound. A second barrier to Bank/GEF support is the apparent lack of a suitable future Bank lending program association.

Project Name: STUDY OF ENERGY SAVING LAWS AND REGULATIONS IN CHINA

This activity is potentially GEF eligible under OP 5. However, as it is a relatively small-scale technical assistance activity, it is more appropri-

ate to UNDP/GEF than Bank/GEF support and might qualify for expedited processing through the Medium-Sized Grant window.

Project Name: HAZCHEM SPILL EMERGENCY PLANNING AND RESPONSE FOR SIX PORTS IN CHINA

The project would have substantial local and national benefits and is therefore unlikely to be GEF eligible. If any of the planned components were to specifically address transboundary threats, they might qualify for modest GEF cofinancing.

Project Name: PUBLIC EDUCATION AND PROPAGANDA ON BIODIVERSITY CONSERVATION IN CHINA

GEF Biodiversity Enabling Activity grants can fund modest education/awareness work. However, investment projects must adopt an ecosystem-based approach to conservation and emphasize field activities. Education and awareness-focused projects are therefore not GEF eligible.

Project Name: IMPROVING THE ENVIRONMENTAL QUALITY OF GRASSLAND IN XINJIANG

Neither the national nor global significance of the target biodiversity is established. The root causes of land degradation are inappropriate agricultural practices, which are a sustainable development rather than a global environment challenge. In any event, no solutions to these underlying problems are proposed. As presented, the concept is therefore not GEF eligible.

Project Name: CONSTRUCTION OF BIODIVERSITY INFORMATION SYSTEM AND NETWORK IN CHINA

This concept does not fit with the GEF's operational strategy and the GEF has indicated that it is not willing to support national biodiversity information systems. This concept is considered unlikely to be GEF-eligible.

Project Name: BIODIVERSITY PROTECTION AND SUSTAINABLE DEVELOPMENT OF TROPICAL RAINFOREST IN YUNNAN PROVINCE

The region's biodiversity is a national priority and of global significance and therefore activities in this area are potentially eligible for GEF support. However, the proposal does not address the root causes of biodiversity loss, does not involve the local stakeholders, and is too

small to have significant global impact or to fit with the Bank's GEF mandate. It is therefore not GEF eligible. Finally, a lot of the activity duplicates work done under the existing Nature Reserves Management Project, the Dutch- funded Biodiversity and Tropical Forests Conservation Project, and the GTZ-funded Tropical Rainforest Conservation Project.

Project Name: BAIJI DOLPHIN REPRODUCTION AND PROTECTION

The concept does not fit the GEF's Operational Strategy because (a) it is species- rather than ecosystem-focused, and (b) it emphasizes ex-situ, not in-situ conservation. It is therefore not GEF eligible.

K. Report on Case Study Workshop

Beijing, November 5, 1999
Report Prepared by Liu Yonggong and Li Fan

Background

In 1999 the World Bank Operations Evaluation Department (OED) conducted a 1991 Forest Policy Review Case Study in China for assessing impacts and achievements of World Bank financed China forestry development projects. As a part of the policy review case study, a one-day review workshop was carried out in Beijing on November 5, 1999.

According to the agreement between OED and SFA, the workshop was to achieve the following two objectives:

- Reviewing the draft case study report prepared by OED and collecting feedback and comments of participants from different institutions and actors who are directly and indirectly involved in World Bank funded forestry development projects in China
- Jointly identifying possible cooperation areas and forms for the future China-World Bank forestry development projects based on the evaluation results and the bank's new lending terms to China.

Altogether 35 participants representing the World Bank, SFA, the State Development Planning Commission, the Finance Ministry, SEPA, the Chinese Academy of Social Science, provincial World Bank Loan Project Management Offices, the private sectors, WWF, etc., attended the one-day workshop (see participant list).

For facilitating the workshop, two moderators were assigned by the Bank from College of Rural Development (CORD), China Agricultural University. This present report was written by the moderators.

Implementation and main results of the workshop

Opening and introductory session

The opening and introductory session was chaired by Mr. Jiang Xingyong, Director General of World Bank Loan Project Management Center (PMC) of SFA. To open the workshop, Prof. Qu Shuye, Senior Advisor of World Bank Loan Project Leading Group of SFA, Mr. Austin Hu, Deputy Chief of the World Bank resident mission in China gave their welcoming speech to the participants. Mrs. Uma Lele, advisor and task manager of the policy review case study from OED of the World Bank, presented the purpose of the 1991 Forest Policy Review. The pre-

sentation provided background information on the World Bank Forest Policy to the participants and highlighted the objectives of the workshop.

Following the opening speech and OED representative presentation, Mr. Rozelle, one of the OED case study consultants, introduced the main findings and conclusions of the case study report. After the introduction, a commentary speech was made by Mr. Song Shikui, Deputy Director General of PMC.

Introduction of the workshop methods and procedures

In order to give participants an overview of the workshop, two moderators introduced the workshop objectives, methods and discussion regulations and rules. Through the introduction, participants got a clear picture of the workshop procedures and methods applied during the plenary and group discussion.

Reviewing the Policy Review Case Study Report

Copies of the draft case study report prepared by OED had been distributed to all participants prior to the workshop so that participants could give their comments during the plenary review session. The discussion was carried out by use of brainstorming methods in which all participants were invited to write down their concrete comments on the report.

In general, all participants were satisfied with the findings, impact analysis, and conclusions elaborated in the report. At the same time they pointed out issues not sufficiently addressed and presented.

The main outputs and key issues commented on by the participants in this exercise can be summarized as follows:

Positive comments

- The report systematically reflected and summarized the Chinese forestry development strategy and policy.
- The report sufficiently presented the cases of World Bank China forestry development projects, their achievements, impacts and experiences during implementation.
- The report identified and indicated the World Bank's contributions and roles in China's forestry development and natural forestry resource protection.
- The report presented the current resource and environmental challenges faced by Chinese forestry development and analyzed relevant constraints and problems.

Weaknesses that need to be addressed

- Collected data is not sufficient to support the authors' conclusions. Some of the data need to be further verified, checked, and reanalyzed;
- There was insufficient clarification and analysis of the relation between timber forest development and natural forestry protection.
- There was insufficient highlighting of China's forestry development priorities for the future. The report discussed the key issues, but gave few concrete recommendations to improve the current situation, especially under the World Bank's new lending terms.
- GEF natural reserve and biodiversity protection projects are not sufficiently highlighted in the report.
- The establishment of a market system for timber products and trends of commercialization of the timber industry is not sufficiently discussed in the report. Roles of governments, the timber industry, and farmers in the resource forestry resource management are not clearly defined.

Recommendations for revision of the report

From the brainstorming, the following recommendations related to the report are made to the authors and OED:

- Discuss rural environmental protection policy and relevant issues in more detail.
- Discuss possible roles of farmers, timber enterprises and government in forestry resource development under the new lending terms, and discuss the concept of how to strategically incorporate sustainable forestry resource management and commercialization of forestry products in more detail.
- Give concrete recommendations on natural forest and biodiversity protection.
- Recommend how to identify new project areas under the new loan lending conditions.

The results of this step are documented in Annex 3.3 and could be used as a reference in finalizing the OED Case Study Report.

Identifying issues to be further addressed and future cooperation fields

Based on the results of report review, important issues and possible areas of cooperation between China and the World Bank under the new loan lending terms were discussed in the plenum. The following priority fields were identified by the participants:

- World Bank and China forestry cooperation mechanism and conditions after hardening lending terms
- Further cooperation in timber forest development
- Deepening the cooperation in development and protection of biodiversity
- Strengthening poverty alleviation roles of World Bank forest development projects
- Establishing information systems for forestry resource management, monitoring, and forest product marketing
- Strengthening forestry technology development and extension
- Conducting research on the environmental protection functions of forestry projects
- Forestry policy studies and research
- Supporting cooperation with nongovernmental institutions, universities and research institutions on forestry technology development and project preparation.

Following the priority area identification, participants were divided into two work groups to further analyze the current situation, problems, and constraints related to each area and formulate recommendations for different stakeholders, such as governmental organizations, research and service institutions and enterprises, and the World Bank. These recommendations can be used as draft reference points for negotiating the new cooperation forms between the World Bank and the Chinese government (see Annex 3.4).

Workshop Program

9:00 – 9:30 **Inauguration and introduction**

The State Forestry Administration (10 minutes)

Reasons for the importance of this workshop and for its being a working meeting

The World Bank Resident Mission in China (10 minutes)

Operations Evaluation Department's (OED's) special role in the Bank, the Global Forestry Review, and the importance of the country in the overall review

OED Representative (10 minutes)

Purpose of the 1991 Forest Policy Review:
OED is looking for feedback on its assessment of the Bank's involvement in all lending and nonlending

services that have affected China's forest sector, areas where the Bank and China have been successful, areas where there is need for improvement in the future, lessons the Bank and China should learn, and the implications for the Bank's forest activities in China and the Bank's global forest policy.

9:30-10:05 **Plenary: Case study panel**
Review of objectives, agenda, and rules of the workshop
Case study presentation by OED (20 minutes)
Response by Government (15 minutes)

10:05 – 10:20 **Coffee Break**

10:20 - 12: 30 **Plenary session I**
Comments on the draft case study report: What were the most important issues addressed in the OED country case study draft?
What important issues were missed and need to be improved in the report?
In which priority fields should the World Bank and China strengthen cooperation?

12:30: 14:00 Lunch

14:00- 16:00 **Break out groups discussion session**
Two mixed working groups with representation from all affiliations:
Current situation and problems related to the priority fields and recommendations to governments, enterprises and institutions, and the World Bank for future cooperation.

16:00-16:15 **Coffee Break**

16:15- 17:15 **Plenary Session II**
Group reports to plenary (6 minutes each)

17:30- 17:40 **Closing:** Cosponsors (Government, Bank Regional Mission, OED)

Participant list

Name	Position	Institution
Mr. Qu Shuye	General Advisor	World Bank Loan Project Leading Group, SFA
Mr. Huang Guosheng	Project Officer	Resource Department of SFA
Mr. Yan Xun	Director	Department of Wildlife and Forest Protection, SFA
Mr. Jiang Xingyong	Director General	PMC, SFA
Mr. Song Shikui	Deputy Director General	PMC, SFA
Mr. Cheng Hong	Project Officer	PMC, SFA
Mr. Wu Gang	Deputy Director General	International Department, SFA
Mr. Yang Jinlin	Acting Director	International Department, Ministry of Finance
Mr. Wu Xiaosong	Director	Department of Rural Economy, State Development Planning Commission
Ms Zhou Guomei	Project Officer	Foreign Economic Cooperation Office, SEPA
Mr. Chang Zhongnong	Project Officer	Natural Protection Department, SEPA
Mr. Zhu Peixin	Officer	Nature Protection Department, SEPA
Mr. Hu Jialin	Director	Provincial PMO, Jiangxi Forestry Department
Mr. Ling Lin	Director	Provincial PMO, Sichuan Forestry Department
Mr. Zhao Hailin	Director	Provincial PMO, Henan Forestry Department
Mr. Liu Jingmin	Governor	Mabian Township, Weixian, Hebei
Mr. Wang Zhanqiang	Director	Xishuangbanna natural Reserve Administration Bureau, Yunnan
Mr. Fan Shaohui	Secretary General	Chinese Forestry Association
Mr. Jim Harkness	Program Director	World Wildlife Fund
Ms. Wen Yali	Associate Professor	GEF-China Nature Reserve Management Project Office, Beijing Forestry University
Mr. Sun Changjin	Researcher	Chinese Academy of Social Science
Ms. Grace H.Y. Zheng	Representative	American Forest and Paper Association
Mr. Li Daoguang	General Manager	Plantation Timber Products Leshan, Limited
Mr. Luan Shenqiang	Project Coordinator	GTZ, Beijing Office
Mr. Abraham Zhu	Manager	Pacific Millennium
Mr. Liu Yonggong	Vice Dean	College of Rural Development, China Agricultural University
Mr. Li Fan	Lecturer	College of Rural Development, China Agricultural University
Mr. Xu Jintao	Assistant Researcher	Chinese Academy of Agricultural Sciences
Mr. Austin Hu	Deputy Chef	World Bank Resident Mission, China
Mr. Pawan Patil	Resource Economist	World Bank
Ms. Uma Lele	Adviser	OED, World Bank
Mr. Sun Chongwu	Environmental Specialist	World Bank Resident Mission, China
Ms. Susan Shen	Ecologist	World Bank Resident Mission, China
Ms. Liu Jin	Forestry Specialist	World Bank Resident Mission, China
Mr. Scott Rozzele	Consultant	OED, World Bank
Mr. Huang Jikun	Consultant	OED, World Bank

Review of the Case Study Report

Issues/areas	Comments and feedback
1. Positive comments	
Policy Impact Analysis	Most changes on policies (forestry policy in particular) have been described
	Clear and systematic evaluation on the changes of Chinas' forestry policy
	Strongly agree with authors' suggestion that more & better monitoring & evaluation is needed for forest sector projects' impacts on poor & biodiversity
	Clear and detail description on types of WBs' project and their progress and meeting the need of Chinas' political and economic development
	Covered most of the current national forestry policy
	Good analysis to the policy impacts of World Bank' s forestry project on China' s forestry development in the course of China' s political and economic reform
World Bank project achievements and contributions	Convincible and systematically analysis on reasons why WB' s projects can be succeeded in China
	Systematic introduction and evaluation on WB supported afforestation projects in China and analyzed their achievements and impacts
Description of current challenges	The report raised the current challenges on environmental protection that both China and WB will face with
	Besides forestry aspects, the report also touched impacts of other relevant factors
	The report raised the issue on the development of intensive forest management and industrial afforestation
2. Issues to be addressed	
Data availability and policy analysis	Insufficient data to support conclusions, especially with regard to issues of farmers' participation and impact on poor population
	Lack of systematic data collection (basic material in particular) and checking organization of some data in the report before drawing conclusions
	Lack of detail and convincing data and indicators (e.g. ERR, IRR, etc.) on the success of WB projects
	Inaccurate descriptions of rural environmental protection policies, inappropriate description of PMC, which needs to be modified
Concrete recommendations	Insufficient concrete recommendations, solutions for new issues, and proposals on how to improve current situation
	Need to discuss relationships between 1991 policy and China forest loans, if any
	Insufficient highlighting of priorities on development of China' s forestry sector
	Lack of recommendations on how to improve the implementation of following WB projects in China
Terms of lending	Not enough attention to the rates of matching funds and the difficulty existing in project implementation in the poor areas
	No attention to the possibility that the loan hardening might suffocate projects

Review of the Case Study Report (cont' d)

Issues/areas	Comments and feedback
Relation between timber production and natural forest protection	Lack of detailed analysis and description of the relation between afforestation and natural forest protection
	Not enough attention to afforestation from the industrial point of view and based on the current situation in China
	Not enough attention to impacts of commercial-oriented afforestation on China' s forest sector
Project management and GEF projects	Insufficient discussion of follow-up management of implemented forest project
	Too long preparation period of World Bank projects
	Not enough attention to the relation between afforestation and environmental protection
	Success of GEF project in China and the need for continuous GEF projects not highlighted
	Some GEF projects and their impacts on protection zone are omitted
3. Proposals to the case study report	
	Highlight the need for afforestation based on further development and long-term benefits.
	Discuss the possibility of integrating enterprises, individual farmers, and government into loan application after hardening of the loans.
	Discuss rural environmental protection policy and rural environmental issues in the report in more detail.
	Elaborate on recommendation for protecting natural forest and biodiversity.
	Simplify the report components and annex based on the purpose of the report.
	Discuss more how to improve China' s forest sector and the commercialization of forestry.
4. Proposals to World Bank	
	Shorten the financial reporting period of fast-growing forest and economic forest projects.
	World Bank projects should focus more on evaluation of related policies.
	Modify the planting style of fast growing forest in plain areas
	The World Bank should enhance cooperation with Chinese NGOs, universities and research institutes
	After the IDA project has decreased, the World Bank should increase cooperation with the Chinese government on GEF projects
	Further projects should pay more attention to building up an effective information (marketing and resource information in particular) analysis and monitoring mechanism.
	Afforestation projects in poverty areas of China should get more attention from the World Bank.
	World Bank projects should give more support to the establishment of technical support system.

Identified Cooperation Fields and Recommendations

Priority fields	Current situation/problems and constraints	Action recommendations: Government	Action recommendations: Service sectors and enterprises	Action recommendations: World Bank
Further cooperative mechanism after hardening of the loans	7 percent interest is too high No direct economic return of environmental impacts from afforestation projects Effect of other grant and technical assistance projects Effect of economic forest projects	Negotiate project components with the World Bank under the new loan conditions Provide low-interest loans as matching funds in order to soften the hard loan	Strengthen participation of enterprises and farmers in the project to soften the hard loan Involve enterprises in forestry development projects Form government, enterprises and farmers corporation to borrow the hard loans and share the risks	Modify investment priority areas and expand borrowers (e.g., enterprises) Allocate more GEF funds Mobilize more bilateral technical support from other governments Support the commercialization of China's forest sector
Support to establish forestry information system	Lack of completed forestry information system Lack of networked forestry resource information system Lack of forestry and environmental monitoring system Lack of market information system	Improve the current system Steer and coordinate government in setting up the market information system	Solicit participation of information service institutions	Try to find support from other channels Include resource monitoring and other information system components in forthcoming afforestation projects
Forest technology development and extension	Ineffective functioning of existing forestry extension system Lack of recognition of importance of extension by the officers Lack of domestic funds for supporting new technology extension	Strengthen extension of experiences and models of World Bank projects		Allocate relevant budget for training in new established projects

Identified Cooperation Fields and Recommendations (cont'd)

Priority fields	Current situation/problems and constraints	Action recommendations		
		Government	Service sectors and enterprises	World Bank
Strengthen cooperation with universities and research Institutes	High demands on technology in hard loan projects	Provide matching funds for technology research and development	Encourage universities and research institutes to develop applied technologies Strengthen the exchange	Help find other soft financial support
Develop artificial forest	Long development period High demand for commercial timber Some inappropriate current policies (e.g., tax) Lack of funds for developing commercial forests Lack of appropriate technologies for commercial forest products	Adjust forestry policies on taxation and other fee charges Provide low-interest matching funds	Strengthen technological extension for commercial timber products	Integrate hard and soft loans for softening the loan conditions Demonstrate providing loans to private enterprises and farmer households
Development and protection of biodiversity	Inadequate and fixed national budget Low economic return of biodiversity protection projects Insufficient participation of related governmental and nongovernmental organizations	Pay more attention to and support biodiversity protection based on sustainable development Guarantee local matching funds for projects Implement special local policies for farmers in protection areas	Organize publicity and training/extension on biodiversity protection	Develop more GEF projects in China that are separate from hard loans Focus on small GEF projects

Identified Cooperation Fields and Recommendations (cont'd)

Priority fields	Current situation/problems and constraints	Action recommendations		
		Government	Service sectors and enterprises	World Bank
Forest policy research	Lack of personal and financial capacity in policy research Lack of effective information analysis and service system	Cooperative more with World Bank on forestry policy research	Involve universities and other research institutes in policy research Increase farmers' participation in policy research	Support developing forestry policy research
Forestry development and poverty alleviation	Matching funds shortage	More information exchange with the World Bank Combine poverty alleviation and forestry project	Provide more technology, training, and extension to poverty areas	Provide continuous support for forestry development in poverty areas Consider special policies suitable for forestry development in poverty areas
Afforestation projects and environmental protection	Lack of long-term and sufficient baseline information on the relationship between afforestation and environment	Enhance cooperation with the World Bank	Solicit active participation of universities and research institutes	Provide support to related research activities

Endnotes

Chapter 3

1. A complete probe into the quality of forest sector statistics generated by the statistical system is beyond the scope of this study. After looking closely at these information sources during several trips in the mid-1990s, we believe that part of the problem may be that China devotes fewer resources to the collection of forest statistics, and monitoring is insufficient. This neglect may have several causes. First, lower priority is placed on forest products relative to grain and the rest of cropped agriculture. Second, forest products come from areas that are more remote and poorer, making monitoring more difficult. Third, information on half of the sector's output is reported through the agricultural and forest sector reporting system (which is coordinated by the statistical bureau); the other half is collected by the enterprises in the state-owned industrial enterprise sector and reported through a different channel.

Chapter 4

2. The forest categories used by Chinese foresters are described in Annex D.

3. When an area is designated an "engineered" forest, the areas included in these plantation data series are generally those that received careful and intensive planning before planting and care afterwards. They are therefore designated "engineered" forests because they meet national design standards for planting density, spacing, and methods of transplanting and post-planting management.

4. Labor provided to a public authority in lieu of taxes.

Chapter 5

5. Analyses by the Lanzhou Institute of Desertification concluded that 85 percent of desertification was caused by excessive land conversion, overstocking, and denudation; 12 percent, by inappropriate water use and industrial construction; and only 3 percent, by natural dune movement (Jin 1995). This conclusion is supported by Lin Lixian, of Beijing Forestry University.

Chapter 6

6. Until the early 1980s, accounting conventions did not allow forest farms to receive reimbursements for expenses incurred in their reforestation efforts. Maximum deductions were far below the actual costs of reforesting properly (Ross 1988). Expenses were only allowed to be deducted for the first three years, although many tree plantations and reforested areas require inputs of labor and capital for five to 10 years to get the optimal return (Richardson 1990). Also, the deductible cost of growing and managing trees was set at a uniform rate throughout the nation and across species, although actual costs vary greatly (Li et al. 1987).

7. After eliminating procurement quotas in the mid-1980s, timber markets were temporarily closed, monitoring by outside agents increased, and fines were imposed (Li et al. 1987). A year later, policies were partially reversed, and markets were liberalized for substandard timber products, causing some households to harvest forest products prematurely. In a subsequent period, access to all markets was again limited.

Chapter 7

8. The information in this section is based on a case study of Hubei Province. In cases where variations between Hubei institutions and those of the province are known, these differences are highlighted. Considerable regional variation in substance and nomenclature exist.

9. The results are even more surprising since these participants were supposed to be the country officials responsible for overseeing its sustainable agriculture and rural development plan.

Chapter 9

10. Nyberg, Albert and Scott Rozelle, "Rural China: Transition and Development," World Bank, 1999.

11. Richard Scobey email to Uma Lele, et al., 24 July 1999.

12. The methodology is described in Annex E.

13. The EIA Operational Policy (OP) was adopted in 1989, and has been revised and expanded twice. The Bank adopted its *Environmental Assessment Sourcebook* in 1993. Similarly, other OPs on related issues were adopted during the 1990s: resettlement and indigenous people in 1991, forests in 1993, and natural habitats in 1995.

14. The 10 projects include one of the highway projects approved from 1994 to 1999.

15. This was most clear for Second Shanxi Provincial Highway. According to the EIA, the Southern Part of the Loess Plateau (particularly the section of the Tong-Huang Highway) has 87.9 percent of natural forests and two important protected areas near the highway. One is the Quinling Mountain National wildlife preserve, the other is the Reserve of Hungrin Old Cypress (see p. 33-34/58-59 of the Tong-Huang EIA).

Chapter 10

16. Lele, Uma, et al., "QAG Review of East Asia Rural Poverty Reduction Projects," January 12, 1999, memorandum.

17. The government has vowed to reverse further conversion through the new law, which offers farmers incentives to put land—particularly on the steep hills—back into forests, but it is not clear whether this can be implemented.

18. One rigorous study by the Chinese Academy of Science has shown that the projects have reduced erosion significantly.

19. Named for Mr. Norman Jones, a former Bank staff member, whom forest officials credit with the design.

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