Construction Project in Chongqing Municipality

Environmental Impact Report

(Draft for Approval)

Project name	Chongqing Forestry Development Project Funded by EIB Loan for Forestry Sector (Qianjiang Subproject)
Employer (seal)	**Forestry Bureau of Qianjiang District**
Time of preparation	**October 2013**

Issued by Chongqing Environmental Protection Bureau

Instructions

Environmental Impact Report of Construction Project in Chongqing Municipality shall be completed by an entity holding a certificate of environmental impact assessment under authorization of the Employer.

I. Project name - refers to the name of the project when it is approved for initiation.

II. Construction site - refers to the detailed address of the project. For highways, railways, pipe culverts etc., their starting points and ending points shall be given.

III. Industry category – it shall be given according to national standards.

IV. Total investment - refers to the total amount invested in the project.

V. Main environmental protection goal - means that the protection goal, nature, scale, wind direction, and distance from the project boundary shall be provided whenever possible for places within a certain range surrounding the project, such as centralized residential areas, schools, hospitals, historical relics under protection, scenic spots, potable water sources, and ecologically sensitive points.

VI. Current status of environmental quality - refers to the current category and level of environmental quality. Environmental quality standard means standards on environmental quality required by regional planning and functional zones. Executive emission standard refers to emission standards corresponding to environmental quality standards. The standard number and achieved category or level shall be filled in the report form.

VII. Conclusions and suggestions – Analysis conclusions on clean production, emission in compliance with relevant standards and total amount control shall be provided; effectiveness of pollution prevention and control measures shall be determined; the project's impact on environment shall be described and a definite conclusion on environmental feasibility of the project shall be made. In addition, other suggestions on mitigating environmental impact shall be set forth.

VIII. Pre-review comments – Review comments shall be filled by the competent authority of the industry. For projects without such an authority, the column can be left blank.

IX. This report form shall be accompanied with documents for project initiation approval and other administrative management documents related to environmental assessment, geographical location map (indicates the administrative division, river system, sewage outlet locations, and geomorphologic conditions etc.), general layout plan, general layout of drainage pipe network, and monitoring point map. All these documents shall be tidily bound.

X. This report form shall be filled in quadruplicate in a legible manner and submitted to the environmental protection bureau for review.

XI. If there is any significant change to the scale, nature, project site or surrounding environment of the project after the report form is approved, the form shall be modified and submitted to the said authority for approval.

XII. The entity that completed the report shall be responsible for the data, pollution prevention and control measures to be taken, and conclusions given in this report form.

XIII. The pollution prevention and control measures and requirements in the approved environmental impact report shall serve as an important basis for environmental protection

design, construction and completion acceptance of the project.

XIV. The Employer must strictly observe the provisions extracted from environmental protection laws, regulations and rules given in the last page of this report form and go through relevant formalities according to the environmental protection approval procedure for projects.

Table 1 Basic Information

Item	Chongqing Forestry Development Project Funded by EIB Loan for Forestry Sector (Qianjiang Subproject)				
Employer	Forestry Bureau of Qianjiang District, Chongqing Municipality				
Legal representative	Xiao Ping		Contact person	Yang Fang	
Telephone No.	13709491231		Postal code	409008	
Mailing address	No.75, Middle Section, East Xinhua Road, Forestry Bureau of Qianjiang District, Chongqing Municipality				
Construction site	Qianjiang District, Chongqing Municipality				
Approval authority	Environmental Protection Bureau of Qianjiang District, Chongqing Municipality		Filed project code	/	
Project nature	■New project □Reconstruction/expansion □Technical innovation		Industry category	Forestry breeding and planting	
Total investment	14403.33	Environmental protection investment	RMB 5.65 million	Investment ratio	3.92%
Land area covered by the project	/		Total floor area	/	

Annual energy consumption	Coal	/ 10,000 t, with an average sulfur content in coal / %				
	Electricity	/kWh	Oil	/t	Natural gas	/

Water consumption of the project (10,000 tons)	Type	Annual water consumption	Annual consumption of fresh water	Annual consumption of reused water
	Water for production	/	/	/
	Domestic water	/	/	/
	Total	/	/	/

1.1 Project Origin and Background

1.1.1 Project Origin

The global climate change is a hot issue and key consideration of the international environment and development field and ranks first among the top 10 global environmental problems. Global warming has become an indisputable fact. The international community has passed *United Nations Framework Convention on Climate Change* and *Kyoto Protocol* which serve as the basic framework for the international cooperation to cope with the climate change.

Table 1 (Cont.)

As a responsible developing country, China pays much attention to the climate change and set up a national coordination organization for climate change countermeasures. State Forestry Administration formulated *Action Points for China's Forestry Departments in Response to Climate Change During the 12th Five-Year Plan Period* to speed up afforestation, in which it sets out major actions to be taken by forestry supervision authorities, including comprehensively carrying out forest tending and management, strengthening forest resource management, strengthening prevention of forest disaster, cultivating emerging forestry industry, and cultivating healthy and high-quality forest scientifically. Furthermore, it especially emphasizes that prevention and control of major forestry pests such as the pinewood nematode shall be enforced.

In July 2007, based on the EU-China partnership on climate change, the Board of Directors of European Investment Bank (EIB) approved the "China Climate Change Framework Loan" to support China to take actions to reduce emission of greenhouse gas and other pollutants and thus play an positive role in mitigation of global climate change.

In order to further give play to the important role of forestry in coping with the global climate change and introduce foreign capital to promote China's forestry development, the National Development and Reform Commission, and the State Forestry Administration actively organize each province to apply for loans to only be used for forestry projects from European Investment Bank. In consideration of its basic situation and forest situation, Qianjiang District, as one of the trans-provincial destitute areas, decides to apply for loans from European Investment Bank to develop its forestry, with a view to making funds flow in and learning from Europe's advanced forestry management and operation experience, further to enlarge total amount of forest resource, improve forest quality, improve ecological environment, optimize forestry industrial structure, help to relive farmers in the forest area from poverty and become well-off, promote forestry, social and economic sustainable development of Qianjiang District.

According to the environmental administration procedure for projects and relevant national laws and regulations on environmental protection, environmental impact assessment must be done for proposed projects. In accordance with *Regulations on the Administration of Construction Project Environmental Protection*, *Classified Directory for Environmental Protection Administration of Construction Projects*, *Notice on Environmental Impact Assessment Requirements for Construction Projects of Chongqing Municipality* (Y(QJ)HPT[2013] No.017), the environmental impact assessment of this project was

completed in the form of environmental impact report. Engaged by Forestry Bureau of Qianjiang District, Shenzhen Zongxing Environmental Protection Technology Co., Ltd. completed the environmental impact report for this project. Based on the site investigation and data collection, our environmental impact assessment personnel have completed the *Environmental Impact Assessment Report of Chongqing Forestry Development Project Funded by EIB Loan for Forestry Sector (Qianjiang Subproject).*

1.1.2 Necessity of the Project

(1) The Project is Necessary for Implementing Develop-the-west Strategy

Economic environment construction and economic development are key points of West Development strategy, and economic environment protection is the basis and key point for developing and prospering economy of West China and also a major issue to be studied and solved first during developing and constructing West China.

As the only municipality in West China, Chongqing plays an important role in West Development strategy. The State Council issued *Opinions on Promoting Overall Urban and Rural Reformation and Development of Chongqing* (GF [2009] No.3) in January 2009, further clarifying the strategic position of Chongqing and proposing to build Chongqing into an ecological barrier in the upper reaches of the Yangtze River; additionally, the Opinions also proposed to support development of characteristic industry, each poverty alleviation and development key county shall give support to 2 or 3 characteristic industries, to improve self-development capacity of rural poverty-stricken population. State Forestry Administration printed and issued *Opinions on Implementing 'Opinions on Promoting Overall Urban and Rural Reformation and Development of Chongqing'* (LBF [2009] No. 124) in May 2009, proposing " One-hour Economic Circle and Two Wings" modern forestry development strategy to vigorously promote the construction of urban forestry and suburb forestry industrial clusters (i.e. the one-hour economic circle) as well as the construction of ecological green industry corridor in the reservoir area of northeast wing of Chongqing and the construction of bases of famous, characteristic and high-quality forestry industries in southeast wing of Chongqing.

Implementing this project in Qianjiang District, an economic central city in southeast wing of Chongqing, will generate significant demonstration effect, and cater to the needs of implementing West Development strategy.

(2) The Project is Necessary for Implementing Regional Development and Poverty Relief Strategy

The State Council promulgated *Regional Development and Poverty Alleviation Planning for Wuling Mountain Area (2011-2020)* to explore new ways to alleviate poverty of trans-provincial destitute areas and to promote coordinated regional development. The poverty alleviation and development leading group under the State Council held a meeting in Jishou City, Hunan Province on November 15, 2011 to launch pilot work for regional development and poverty alleviation of Wuling Mountain area. Situated on the hinterland of Wuling Mountain, Qianjiang is a national-level poverty-stricken district integrated with the following disadvantages: old revolutionary area, ethnic minority area, border area, mountainous area and poverty-stricken area. It is among a new round of key areas where poverty alleviation and development will be carried out. As respectively stated in documents GF [2009] No. 3 and [2010] No. 36 (issued by Chongqing Municipal Party Committee), "Speed up the construction of Qianjiang-centered poverty-stricken mountainous areas (in southeast of Chongqing) where minorities inhabit" and "speed up constructing Qianjiang into a central city in southeast of Chongqing", indicating that developing Qianjiang is a step of a national strategy. Lots of economic forest will be created in this project, and ecological environment construction is combined with poverty alleviation and achieving prosperity, both of which are in line with the needs of national poverty alleviation strategy.

(3) The Project is Necessary for Promoting Structural Adjustment of Rural Industries and Forestry Industry

China's existing forest area is 2.3 times of the area of cultivated land; to solve issues concerning agriculture, farmer and rural area, the most practical methods are to adjust rural industrial structure, fully exploit potential of forest land, continuously improve unit output rate of forest land, form magnetic effect on employment of farmers and form multiplier effect on increase of farmers' income. Developing forestry is the most practical, direct and feasible way to alleviate employment contradiction and promote increase of income. Additionally, solid fund support for and motive force of development of ecological construction can be available only through vigorously developing forestry industry, building developed forestry industrial system, giving full play to huge economic function of forestry, satisfying the society's and people's demands for forest products, and accumulating abundant wealth and funds. Implementing this project is required to actively promote strategic adjustment of

forestry industrial structure of Qianjiang District. To develop the forestry is the most practicable, direct and feasible way of mitigating the social employment conflict and facilitating income increase. In addition, the ecological construction can have adequate fund guarantee and development impetus only by developing the forestry industry, establishing a developed industrial system, and giving full play to the powerful economic function of forestry so as to meet the demand for forest products of the society and people and accumulate wealth and sufficient funds. This project will actively facilitate the strategic adjustment of the forestry industrial structure of Qianjiang District.

(4) The Project is Necessary for Driving Local Economic Development and Achieve Poverty Overcoming & Income Increase in Project Area

Qianjiang District was included in the trans-provincial destitute areas around Wuling Mountain, becoming one of the first batch of pilot areas for regional development and poverty alleviation in trans-provincial destitute areas. Qianjiang District now has a poverty-stricken population of 55,000 and this project will relieve 8,000 of them from poverty.

The 12th Five-Year Plan for development of industries in Qianjiang District proposed that 6,666.67 ha of actinidia sinensis would be planted within 5 years; at present, however, land planted with actinidia sinensis only covers an area of 2,666.67ha, the yield reaches more than 30,000 tons, with production value of nearly RMB 300 million. Cortex Phellodendri Chinensis and Herba Artemisiae Annuae are Chinese herbal medicines with high medical value; land in Qianjiang District planted with Cortex Phellodendri Chinensis now covers an area of about 800ha, with production value of over RMB 20 million. Local Chinese herbal medicine manufacturers have huge demand for Cortex Phellodendri Chinensis and Herba Artemisiae Annuae, etc., while the production of the two herbal medicines cannot satisfy their demands; as a result, these enterprises have to purchase them in large quantities from other places outside Qianjiang District; therefore, development these herbal medicines will create remarkable economic benefits, and they will surely sell well.

Therefore, this project can meet the urgent needs of poverty alleviation and development of Qianjiang District as well as the urgent needs of exploring new methods to alleviate poverty in trans-provincial destitute areas.

(5) The Project is Necessary for Achieving Goal of the Twelfth Five-Year Plan for Forestry Industry

Forestry development goal of Qianjiang District to be achieved at the end of the 12th Five-Year Plan Period is to strive to increase the forest coverage rate in Qianjiang District to 55% in 2015 and to 58% in 2020. The greening rate of built up sub-area in urban areas shall reach 40%, per capital public green area shall reach 14 square meters, the greening rate of roads and river systems shall be up to over 90%, total output value of forestry shall achieve RMB 1.7 billion, and Qianjiang District will be built into a city with favorable ecological environment and preliminarily complying with the standard for "National Forest City". In order to achieve the goal of the 12th Five-Year Plan for forestry development of Qianjiang District, it is urgently needed to take the following actions: manual afforest non-forestry land, open forest land, bush land and other lands suitable for forestry development, and develop and cultivate multifunctional man-made forest, so as to improve ecological function and bring a variety of benefits.

1.2 Environmental Impact Assessment Concept

(1) Put forward feasible pollution prevention and control measured according to the engineering analysis and impact analysis; evaluate the environmental feasibility of the proposed project based on national and local industrial policies, urban planning, site selection reasonability, pollutant emission in compliance with relevant standards and total amount indictor, etc.

(2) Environment surrounding the proposed project is not sensitive, so the project will have little impact on the regional environment after proper pollution control measures are taken during the construction. The proposed project is a non-polluting project and upon completion it will scarcely pollute the environment. Therefore, its environmental impact is acceptable.

(3) Construction sites of the proposed project are widely distributed in the 12 townships and towns of Qianjiang District. In this assessment, the environmental monitoring data given

in the 2012 environmental quality bulletin of Qianjiang District will be referred to assess the current status of environmental quality of the project area.

(4) The proposed project is a non-polluting project and, upon completion, it will not result in environmental risk as no industrial production flow process will be established, no pollutants will be directly discharged and no hazardous chemicals will be used. Therefore, no chapters on clean production, total amount control and risk measures are set in this assessment.

1.3 Key Points of Assessment

According to characteristics of the proposed project, the eco-environment problems in the construction period, environmental impact in the construction period, and ecological protection measures in the construction period are determined as the key points of assessment.

1.4 Basic Information on the Project

(1) Project name: Chongqing Forestry Development Project Funded by EIB Loan for Forestry Sector (Qianjiang Subproject)

(2) Project sites: This project will mainly be implemented in 12 subdistricts/towns/townships in Qianjiang District, Chongqing Municipality, including Chengdong Subdistrict, Zhengyang Subdistrict, Xiaonanhai Town, Shaba Township, Heixi Town, Echi Town, Shanling Township, Apengjiang Town, Baishi Township, Shijia Town, Wuli Township, and Shihui Town.

(3) Construction Scale and Contents

The total investment of the proposed project is RMB 144.0333 million and the main construction content is new economic forest with an area of 1400ha.

(4) Construction Organization

The qualified seedlings must be purchased for all the seedlings used for the construction period of the proposed project. To facilitate normal operation activities on the afforestation land, it is planned to build afforestation access along the contour line. Regarding the access road, the pavement must be 0.8-1m wide and even without obstacles such as tree stubs and stone blocks. The entrance/exit of access road should be connected to handcart road and vehicle road. The existing roads around the project can be used for construction transportation. There will be 200 construction workers employed in the

construction period of the proposed project and no construction camp will be provided because all of them are farmers from villages nearby. Construction of the proposed project is planting by hand.

(5) Construction Schedule

Based on arrangement of EIB-loaned Forestry Development Project, construction assignment and local supporting fund allocation, it is to adopt the strategy of staged construction and investment and steady progress. Project construction period is 5 years, i.e. 2014-2018. The planning design, public engineering and training shall be arranged in the first year of construction; economic forest afforestation shall be arranged in the first three years; the fourth and fifth year shall be the period for tending of young forest and inspection & acceptance.

(6) Project Fund and Fund Raising

Upon estimation, total investment of the project construction is RMB 144.0333 million which includes the EIB loan for forestry sector and local supporting fund. The EIB loan is RMB 72 million, equivalent to EUR 9 million, accounting for 49.99% of the total investment. The local supporting fund is RMB 72.0333 million, accounting for 50.01%.

(7) Main Economic and Technical Indicators

Refer to Attached Table 1-2 for main economic and technical indicators of the proposed project.

Table 1 (Cont.)

Attached Table 1-2 Main Economic and Technical Indicators

S/N	Item	Unit	Indicator	Remarks
1	**Project construction scale**			
1.1	New economic forest	ha	1400	/
2	**Amount of investment**			
2.1	Direct project cost	RMB 10,000	12240.94	/
2.1.1	Cost of planting work	RMB 10,000	7861.63	/
2.1.2	Cost of auxiliary facilities and works	RMB 10,000	3703.50	/
2.1.3	Afforestation tool	RMB 10,000	92.60	/
2..1.4	Cost of institution support	RMB 10,000	583.20	/
2.2	Project construction cost and other costs	RMB 10,000	1116.08	/
2.3	Reserve fund	RMB 10,000	667.85	/
2.4	Interests during construction period	RMB 10,000	378.46	Converted into RMB
3	**Source of fund**			
3.1	Money borrowed from EIB	RMB 10,000	7200	Converted into RMB
3.2	Money invested by beneficiaries	RMB 10,000	7203.33	/
4	**Economic benefit (estimated)**			
4.1	Benefit calculation period	Year	20	/
4.2	Economic forest output	t	8430	The year when the project put into normal production
4.3	Total production value	RMB 10,000	19320	The year when the project put into normal production
4.4	Construction period	Year	5	/
4.5	Repayment period	Year	25	Including 5 years of construction period
4.6	Annual loan interest rate	%	1.27	/

2 Project construction scheme

2.1 Project layout

2.1.1 Layout basis

(1) Land use planning for the project area.

(2) Forestry planning for the project area.

(3) Class II resource survey data for the project area.

(4) Survey on intentions of farmers in project area

2.1.2 Layout principles

(1) The new afforestation land shall meet the requirements of Clean Development Mechanism (CDM).

(2) Key points are combined with general work to set example for project area.

(3) Project area should be relatively centralized for implementation and management

(4) The project performance subject shall have strong performance capacity.

(5) The Project should be coordinated with other forestry projects and agricultural projects in progress and planned to be implemented.

(6) It should be combined with adjustment of agricultural production structure and planting structure. Based on the features and laws of the distribution of current land resources, make full use of the advantages of local natural conditions and adjust the pure agricultural production mode and planting structure in a reasonable manner to turn the natural advantages into economical advantages and continuously improve the overall functions and comprehensive benefits of the forestry ecological system.

2.1.3 Principles of land selection

(1) The land owner agrees the implementation of the Project.

(2) The project implementing contents shall be consistent with those planned by the local government.

(3) The soil, climate and site conditions in the project area shall be consistent with or close to the conditions required for the items to be implemented.

2.1.4 Layout scheme

According to principles for project layout, the Project will be implemented in 12 subdistricts and townships in Qianjiang District, Chongqing, including Chengdong Subdistrict, Zhengyang Subdistrict, Xiaonanhai Township, Shaba Township, Heixi Town, Echi Town, Shanling Township, Apengjiang Town, Baishi Township, Shijia Town, Wuli Township and Shihui Town. Details of the project layout are shown in Attached Table 1-3.

Table 1 (Cont.)

Attached Table 1-3 Summary of Proposed Project Construction Layout

Qianjiang District	**Subdistrict/Township**	**Name of Village**	Remarks
Total	12 townships	47 villages	12 subdistricts and townships in total
Central Area of Qianjiang District	1 township	2 neighbourhood committees	
	Chengdong Subdistrict	Jinqiao Neighbourhood Committee and Wenhui Neighbourhood Committee	
North Area of Qianjiang District	2 townships	6 villages	
	Xiaonanhai Town	Xinjian Village	
	Shanling Township	Xinglong Village, Shanling Neighbourhood Committee, Linfeng Village, Fengxiang Village and Kuzhu Village	
Southeast Area of Qianjiang District	2 townships	3 villages	
	Zhengyang Subdistrict	Tuanjie Neighbourhood Committee	
	Wuli Township	Ganxi Village and Wuli Village	
West Area of Qianjiang District	4 townships	19 villages	
	Baishi Township	Tianhe Village, Fuxing Village, Zhonghe Village, Fengshan Village, Anshan Village and Jiulong Village	
	Heixi Town	Baihe Neighborhood Committee, Gaige Village, Suwei Village, Guangming Village, Shengdi Neighborhood Committee, Huzhu Village and Xianfeng Village	
	Shihui Town	Zhongyuan Village	
	Shaba Township	Maidong Village, Shiqiao Village, Muliang Village, Xipao Village and Santai Village	
South Area of Qianjiang District	3 townships	17 villages	
	Echi Town	Echi Neighborhood Committee, Shizhu Village, Xuetang Village, Nanxi Village, Fangjia Village and Zhian Village	
	Shijia Town	Qingtang Village, Manaoding Village, Shenba Village and Huoshiya Village	
	Apengjiang Town	Lianghe Neighborhood Committee, Longtian Neighborhood Committee, Gaoqi Neighborhood Committee, Fenshui Village, Shihe Village, Huanglian Village and Qinggang Village	

2.2 Land conditions for project construction

The country where the Project is constructed is abundant with forest resources and land resources suitable for planting of forest, which can fully meet the demand for land resource conditions for project construction. Refer to Attached Table 1-4 for the land resource conditions in the county (municipality).

Table 1 (Cont.)

Attached Table 1-4 List of Land Utilization Resource Conditions Unit: ha

	Statistical Unit	Total Area	Forest Land	Farmland		Difficult-to-use Land	Other Land
				Total Area	With gradient over 25°		
Project Area	Qianjiang District	240200.00	136260.00	49206.67	16400.00	3853.33	50680.00
	Total	101012.00	56098.40	11986.67	3160.00	1446.67	28073.33
Middle Area	Chengdong Subdistrict	5000.00	2200.00	446.67	20.00	6.67	1946.67
Northeast Area	Zhongtang Township	8026.67	4366.67	906.67	286.67	6.67	2053.33
	Xiaonanhai Town	11140.00	8211.67	766.67	253.33	13.33	1966.67
Southeast Area	Mala Town	9100.00	5746.67	1080.00	420.00	6.67	2140.00
	Pengdong Township	3380.00	1993.33	246.67	73.33	20.00	1120.00
	Wuli Township	5000.00	2613.33	593.33	133.33	13.33	1680.00
Northwest Area	Heixi Town	9453.33	4626.67	1553.33	193.33	13.33	3260.00
	Qingxi Town	6900.00	3660.00	1100.00	386.67	113.33	1886.67
	Shanling Town	5400.00	2820.00	940.00	206.67	66.67	1473.33
	Shihui Town	12700.00	7020.00	1153.33	240.00	800.00	3726.67
Southwest Area	Xinhua Township	7192.00	3860.00	1133.33	280.00	6.67	2200.00
	Shijia Town	10400.00	5200.00	1106.67	373.33	33.33	2393.33
	Echi Town	7320.00	3780.07	960.00	293.33	346.67	2226.67

2.3 Seedling design

2.3.1 Demand of seedlings

According to afforestation area of each tree species and average planting density, the demand of nursery stock for the Project is calculated as 19,244,000 plants. Divided as per afforestation year: 6,975,000 plants for 1st year, 8,073,000 plants for 2nd year and 4,197,000

plants for 3rd year. Added with 15% of seedling loss and replanting seedlings, the total quantity is 22,131,000 plants.

2.3.2 Species of seedlings

Qualified and improved seedlings are the key for success of project afforestation. Hence, the species certified or qualified by the state or grown up well in the project area must be selected. Refer to Attached Table 1-5 for the proposed species of seedlings and demand.

Table 1 (Cont.)

Attached Table 1-5 List of Proposed Species of Seedlings and Demand

Species	2014	2015	2016	Total
Juglans regia	4.44	9.99	1.11	15.54
Actinidia chinensis	8.25	24.75	9.90	42.90
Cortex Phellodendri Chinensis	24.22	27.32	14.45	66.00
Herba Artemisiae Annuae	660.60	745.20	394.20	1800.00
Total	697.51	807.26	419.66	1924.44

2.3.3 Supply of seedlings

In Chongqing, there is approx. 25,000ha seedling base with 1.62 billion plants of nursery stock in good quality; therefore, the supply of nursery stock can be guaranteed. Since the species, quality and quantity of seedlings within the economical transportation range in the project area can meet the requirements for project implementation, new construction of nursery will not be considered for the project.

For the use of seedlings, relevant national regulations must be strictly observed to strength supervision and management, and technicians should be selected and dispatched to the seedling base to supervise lifting of seedlings. The standard of fine and improved seedlings should be strictly observed to ensure the seeding quality.

2.4 Forest Protection

2.4.1 Fire Prevention of Forest

(1) Strengthen organizational leadership and establish complete system of forest protection and fire prevention

Fire prevention of forest is an important work for construction of forest industrial base, and fire control awareness of "hidden danger is more dangerous than open fire; prevention is prior to disaster relief; responsibility is very important" must be established to eradicate occurrence of forest fire. Construction items of the Project should be included in local system of forest fire prevention. Fully utilize local forest-protection and fire-prevention facilities and equipment and uniformly arrange forest-protection and fire-prevention tasks under the leadership of the project county/municipal forest fire prevention headquarters. Leaders of each township subprojects should be the primary principals who shall define the

responsibility, authority and interest of forest-protection and fire-prevention personnel, establish joint organization of forest fire prevention with neighboring communities, determine joint-defense region and specify joint-defense system and measures.

(2) Enhance publicity of forest protection and fire prevention

Set permanent forest fire prevention billboard around the base and at traffic thoroughfares; enhance publicity and education towards neighboring residents with broadcast, television and slogan, extensively propagandize knowledge about forest fire prevention and strengthen fire prevention awareness towards neighboring households, so as to protect the construction achievements of the Project.

(3) Planning of forest rangers

According to the data from the employer, 30 forest rangers are needed for the project in total. The forest rangers should carry out strict patrol and inspection for the project area. Any field fire should be prohibited during the forest fire prevention period; any mechanical or field fire that may cause forest fire should be strictly managed.

2.4.2 Guard shed

In order to protect the achievement of afforestation, it is planned to construct a guard shed of 20m^2 in each forest base. The location of such sheds should be generally at the entrance/exit or centre of planted land. Based on the distribution of project implementation plots, there are 14 guard sheds to be constructed.

2.4.2 Prevention and control of forestry pest

Implement the principle of "prevention first, scientific control, governance as per law and health promotion" and establish integrated pest management, prevention and control system according to the occurrence laws of forestry pests.

(1) Implement quarantine of pests and strictly prevent pests being brought in and out along with scion, seed and seedling.

(2) Clean the environment in project area; investigate surrounding environment of forest land before afforestation; control sources of pest and disease; timely conduct nurturing of forest land; pay attention to sanitation of forest land; improve resistance of forest land against pest to reduce occurrence rate of plant diseases and insect pests.

(3) Carry out forecasting and predication and use pesticide (high-efficiency, low-toxicity and small-residue) for chemical prevention in case of serious plant diseases and insect pests to

minimize damage percentage of forest.

See Attached Table 1-6 for control methods of main plant diseases and insect pests.

Table 1 (Cont.)

Attached Table 1-6 List of Control Methods for Main Plant Diseases and Insect Pests

S/N	Name of Plant Diseases/ Insect Pests	Symptom	Control Method
1	Brown speckle disease (Actinidia chinensis)	Mainly reflected as damage to leaves. Near round dark green water stain-like spot on leaf at early stage, rapid expansion under rainy and high-humidity condition, forming big round or irregular spot, center of spot becoming brown at later stage, center vicinity of spot being grey brown or grayish brown and, spot margin being dark brown, many black dots on the spot, leaf crispation and fracture, withering and falling of leaf.	(1) Thoroughly clean orchard in winter, and clean out trimmed branches and fallen leaves which will be buried in soil in combination with fertilization. Turn over 10~15cm topsoil of the orchard to bury sick leaves and scattered germs in soil to prevent infestation. (2) After cleaning orchard, spray plants with 5~6° (baume degree) lime sulphur to kill germs, mites and other small pests on vines. (3) Apply 70% or carbendazim to spray crown at early stage of disease, once every 10~15 days, lasting 3~4 times, to control development and expansion of disease. Spray 1:1:100 Bordeaux mixture in Feb. ~ Aug. to reduce damage on leaves.
2	Grey leaf spot (Actinidia chinensis)	Mainly damage leaves and form grey spots on leaf surface. At early stage, chlorisis brown water stain-like spots on leaf margin or leaf surface; at later stage, continuous expansion of spots in depth along leaf margin, covering partial or most leaf surface. The spot penetrating both leaf surfaces, blade back in black brown, blade surface in dark brown to grey brown; many black dots scattered or densely distributed on spot at later stage.	(1) Strengthen management; increase dressing of potash fertilizer; avoid sole application of nitrogenous fertilizer; enhance premonition. (2) Spray 27% cuproxat suspension concentrate 600 times dilution or 50% gentamycin sulfate injection water soluble powder 1000 times dilution, 50% prochloraz wettable powder 900 times dilution, 25% fenbuconazole SC suspending agent 1000 times dilution and 75% Dacotech (chlorothalonil) wettable powder 600 times dilution.
3	Soft rot disease (Actinidia chinensis)	No appearance difference between infected fruit and healthy fruit at early stage; infected fruit becoming soft and pericarp color turning from olive green to partial brown at later stage; then half or entire fruit becoming dark brown; fruit flesh of starchiness if pressed by hand. Checked by cutting fruit; flesh of lightly infected fruit in olivine to light green brown, while healthy part in peak green. Separation between pericarp and flesh as for seriously infected fruit,	(1) Pick fruits in sunny days; lightly pick and place fruits to avoid mechanical wound; select healthy fruits for storage. (2) Apply pharmaceutical treatment towards fruits to be stored and transported at harvest day, and then put fruits in boxes. Common medicament and concentration: 2, 4-D sodium salt (200mg/kg) and streptomycin sulphate 800 times dilution; dip fruits in medicament for 1min and take out for drying; put individual fruits or small packages of fruits in boxes.

		pasty flesh (except for center of fruit) due to germs, fruit juice in fawn with alcohol acid and putrefactive odor.	
4	Physiological split (Actinidia chinensis)	Split mainly appears on abnormal fruit tissue, such as rusty spot, scab spot and sunburn; infected fruit splits longitudinally on side; split depth is up to 1cm; some splits extend from calyx or peduncle joint to fruit side. In addition, some species may split longitudinally or transversely during storage period.	(1) Plant species that are difficult to appear physiological split. (2) Notice water management, especially in case of dry, wet and excessively changeable weather, and timely carry out watering or topdressing to prevent split of fruit. (3) Spray alar-85 (800~1000mg/kg). (4) Control temperature and humidity of storage cellar within an appropriate range.

Table 1 (Cont.)

Attached Table 1-6 (Cont.) List of Control Methods for Main Plant Diseases and Insect Pests

S/N	Name of Plant Diseases/ Insect Pests	Symptom	Control Method
5	Cerambycidae (Juglans regia)	Cortex of affected part slightly cracks with large amount of dung from wormhole. Cortex cracks in case of serious effect, and insect feeding path is less than that of carpenter moth in xylem. Imago emergence holes are mainly on upper part, forming big round holes. Occurrence generation number of Batocera horsfieldi depends on location and the status of overwintering insect is different. Usually 1 generation in 2 years, crossing 3 years. Imago or larva overwinters in trunk; start activity at the end of April; peak of emergence is in May; reproduction peak is in the end of June. Larva is in faint yellow without foot. Imago is in black brown or russet.	Paint trunk with sodium 4-CPA No. I before winter or spawning period. Use iron wire to clean out bits of wood in wormhole, and directly inject sodium 4-CPA No. I in wormhole with injector and seal the hole with soil. The insecticidal efficacy is good. Take advantage of its phototaxis and play dead habits, and induce imago to crawl down tree by light at night and kill it. Observe tree leaves and twigs in the daytime. If twig is bitten and is in fresh status, imago can be found and killed in vicinity. Conduct regular inspection after spawning; if spawning crevasse is found, knock it with hammer to kill eggs and just-hatched larva. After larva enters into trunk, fecula can be seen as a mark and tip of small iron wire can be made into a hooklet and put into wormhole to kill larva.
6	Culcula panterinaria Bremer et grey (Juglans regia)	A kind of overeating pest. Its larva eats blade or even eats up whole blade, only leaving petiole, which seriously affect tree vigor.	(1) As for area with dense pupas, pupas should be dug out manually in early autumn or early spring in combination with soil preparation and construction weir.(2) Emergence period is from May to Aug. Induce it by black light lamp or fire to kill it.(3) Spray chemicals during hatching period and young larva stage with 25% diflubenzuron suspending agent 5000 times dilution or 5% hexaflumuron missible oil 1500~2000 times dilution.
7	Powdery mildew (Juglans regia)	Cause early falling of leaves or even death of seedling. Cause chlorosis of leaf or yellow spots on leaf at early stage and distortion and shrinking of leaf at later stage. Bud cannot sprout. Disk-type whiting layer appears on blade surface or blade back. Brown or black dots emerge on the whiting layer.	Continue to remove infected leaves and branches which should be burned out; strength management to enhance tree vigor and premunition. Spray 0.2~0.3° (baume degree) lime sulphur at early stage of powdery mildew during July.
8	Brown speckle disease (Juglans regia)	Mainly affect leaves, fruits and shoots, causing falling of leaves and spike top. After being infected, near round and grey-center small brown spots will appear on leaves, on which there are concentric ringlike	Remove infected leaves in combination with trimming of infected branches, which should be deeply buried or burned out. Spray necrotic spots 800 times dilution every 10~15 days in case of slight infection. Spray necrotic spots 500 times dilution every 7~10

		small black dots. Necrotic spots appear upon increase of the spot, and spots on fruit surface are small and hollow. The spot on tender shoot is of oval or irregular shape.	days in case of serious infection. If the situation goes worse, Aolike Sujing 300 times dilution should be used for spraying every 3 days.
9	Rust disease (Cortex Phellodendri Chinensis)	At early stage of the disease, there are yellow green and near round small dots with unconspicuous margin on leaves. At later stage, the blade back has orange-yellow and slightly-raised small blister spot which is uredinium of pathogenic bacteria. After cracking, the blister spot spills out orange-yellow uredospore which cause more spots on leaves until withering of leaves.	Spray sodium paminobenzene sulfonate 400 times dilution or 0.2~0.3º (baume degree) lime sulphur or 50% nirit 200 times dilution once every 7-10 days during period of disease, lasting 2~3 times.
10	Papilio xuthus Linne. (Cortex Phellodendri Chinensis)	Larva damages the leaves during May to Aug.	(1) Brachymeria Westwood and another parasitic wasp have ever been found in pupas of Papilio xuthus Linne; Therefore, pupas are put into yarn cages while manually catching larvae and picking pupas to protect natural enemies of Papilio xuthus Linne. After emergence, parasitic wasps can fly out of the cages to continue parasitism, so as to restrain Papilio xuthus Linne.(2) Spray 90% dipterex 800 times dilution during instar of larva once every 5~7 days, lasting 1~2 times.(3) Spray insecticidal bacteria (bacteria content: 10 billion/g) 300 times dilution after 3rd instar of larva once every 10~15 days, lasting 2~3 times.

Attached Table 1-6 (Cont.) List of Control Method for Main Plant Diseases and Insect Pests

S/N	Name of Plant Diseases/ Insect Pests	Symptom	Control Method
11	Aphid (Sweet Wormwood Herb)	/	Spray chemicals before migratory flight and spread with 20% fenvalerate or imidacloprid per hectare for control of aphid.
12	Stem rot disease (Sweet Wormwood Herb)	/	Apply polysulfide suspending agent for control.

2.5 Establishment of technological supporting system for the Project

2.5.1 Project study

Study activities for the Project are to be carried out on economic forest management & production technology, breeding of actinidia chinensis and juglans regia, as well as cultivation experiment.

2.5.2 Establishment of technology promotion and service system for Project

At present, there are 68 existing organizations engaged on promotion of forestry science and technology, which include 8 municipal organizations, 24 county-level organizations and 36 township-level organizations. Forestry Administration of Qianjiang District establishes Forestation Section, Disease & Pest Prevention and Quarantine Station, Breeding Station and Forestry Science & Technology Promotion Station. Forestry Management Station has been established in every township and village. The Bureau, with a certain technological base, makes use of existing forestry science & technology promotion system and technology strength to provide forestry industry development with technology and service.

In order to comprehensively and effectively implement all items of training and promotion plan, technical training courses will be offered to all project implementation entities. Content of such training courses will include technical essential and scientific achievements & advanced technology. It will also take all measures to facilitate absorption and application of new technology in project.

(1) Training requirements

According to features of technology, it is needed to take both project implementation

requirements and the following three points into consideration, at the time of determining training courses.

① Extract experience and lessons from completed training courses of foreign invested project;

② Get knowledge about forestry farmers' requirements for technical training in accordance with rural household survey of social assessment;

③ Requirements about technical training from multiple and county-level project offices, forestry stations of townships, economic cooperation organizations and forestation entities.

(2) Content of Training

The emphasis of training shall be placed on technical standards and operation regulations of project implementation, as well as advanced practical skills. The specific content shall include:

① Project management which attaches importance on "project implementation management and quality control", "project fund and financial management", as well as "project purchase" etc.

② Selection and production of economic forest strains, which will be conducted in accordance with technical standards and regulations of Chongqing Forestry Development Project Funded by EIB Loan for Forestry Sector. The main references include "selection and cultivation standard of actinidia chinensis strain", "selection and cultivation standard of juglans regia strain", "nursery stock technology and nursery garden management" and other relevant standards and regulations.

③ Economic forest technical training which will be carried out on the basis of afforestation technical regulations and environmental protection regulations of Chongqing Forestry Development Project Funded by EIB Loan for Forestry Sector. The main references include “management of actinidia chinensis”, “management of juglans regia”, “management of cortex phellodendri chinensis”, “management of herba artemisiae annuae”, and “environmental protection, disease and pest control as well as safe application of pesticide”.

(3) Implementation mode of training

For achievements of the key technology of project afforestation and the project management technology, the promotion shall be conducted through opening training courses. It is to provide technical and management personnel will intensive training, so as to improve

their scientific quality and technical skill.

The training course shall be conducted in three different levels: municipal level, district level and beneficiary level:

Municipal level: such training is mainly offered by Municipal Project Office to technical and management personnel of District Project Office. It is aimed at teaching them how to train the technical personnel from township forestry stations, forestation entities and economic cooperation organizations.

District level training: such training is mainly offered by District Project Office to technical personnel from township forestry stations, forestation entities and economic cooperation organizations. It is aimed at teaching them how to provide forestry farmers, forestation constructors and members of economic cooperation organizations with similar training, as well as how to implement project as required.

Beneficiary level: such training is mainly offered by District Project Office to forestation farmers, construction personnel of forestation entities and members of forestry cooperation. It is aimed at teaching them how to implement the project as required.

Content of artificial forest technology training includes "economic forest management", "environmental protection disease and pest control as well as safe application of pesticide", as well as field training.

2.6 Main technical measures for project implementation

The main technical measures of new afforestation for the proposed project are described as follows:

2.6.1 Planting

Planting quality is a major factor that affects survival rate of afforestation; therefore, planting should be conducted strictly according to technical specifications.

(1) Actinidia chinensis

Turn over field soil to depth of 0.5~0.7m; dig 0.6m×1m (depth × diameter) holes for planting stock; sufficiently mix base fertilizer and topsoil for refilling; plant stock in early spring or late autumn; secure nursery stock and pour certain root water. Planting density is row spacing × line spacing = 3×2m or 2×4m (the former for 1650 plant/ ha while the later for 1245 plant/ ha). Frame modes mainly adopted for planting of Actinidia chinensis are: T frame, fence frame, triangular support, greenhouse frame, etc. Flat-top greenhouse frame is mainly

adopted with concrete pile used in key position. In-place frame is 2.8m high, being grid-shaped network frame crossed vertically and horizontally with 10~12# iron wire in spacing of about 0.6m.

(2) Juglans regia

Deeply turn over soil, rake it and dig holes in fixed points. Excavate 1m × 1m (height × width) planting holes on planting points, put q.s. fully decomposed organic fertilizer and mix it with soil, and then plant trees. First, fill half fertilizer-mixed soil in the hole and pile it to make root system uniformly distribute on the pile during planting. Meanwhile, adjust plant location to make each row orderly and aligned and trunk of nursery stock keep straight. Second, pour 10~15kg clear water in the planting hole and then immediately fill the other half of fertilizer-mixed soil in the hole when 1/2 water seeps into soil. Slightly stamp on soil and scatter a thin layer of soil after burying root collar. This method makes root system closely contact with soil in wet environment, in favor of improving survival rate.

(3) Cortex Phellodendri Chinensis

Cortex Phellodendri Chinensis is an intolerant tree species and can be planted in mountainous region and plain, but place with deep soil layer, convenient irrigation and drainage as well as relatively high humus content is preferred. Dig holes on selected field, with spacing of 5×3m, depth of 0.3~0.60m, length and width of 0.8m. Put in sufficient farmyard manure and other base fertilizer with sufficient grinding and leveling. Plant sweet wormwood herb between lines. Dig out seedling with oil and cut out excessive part at lower end of root after falling of leaves in autumn and winner. Plant 1 seedling in each hole. Slightly lift the seedling when half soil is filled to make root stretched and then fill the other half of soil. Compact the soil and pour water.

(4) Herba Artemisiae Annuae

Table 1 (Cont.)

It is planted in Cortex Phellodendri Chinensis forest with strip-shape soil preparation adopted. 2000~2500kg farmyard manure and 20~60kg compound fertilizer are used per mu (=0.0667 ha), which are mixed, scattered on ground and buried in soil with grinding and leveling. Plot width is 1.2m for flat field, 0.8m for sloping field with plot distance of 0.2m and length determined as per terrain. The plot soil should be fine and flat. Drainage ditches should be arranged around the plot. Plant two lines of trees in each plot with planting density of 0.7×0.8m (row spacing × line spacing) for flat field and 0.5×0.6m for sloping field. Seedlings are preferred to be transplanted with soil to ensure survival rate. Strong seedling is selected for transplanting with standard: height of 0.15m, 6-10 leaves, thick stem and short internode.

2.6.2 Field management

Field management is one of the key measures for successful afforestation. It covers earth loosening, weeding, hilling, stump cultivation, removal of sprout and tiller or trimming, replanting, irrigation, elimination of diseased or infected plants, etc.

(1) Actinidia chinensis

Branch shape is determined according to frame mode, and frame faces should be fully utilized to make branches distribute evenly, so as to achieve high yield and high quality. Trimming of Actinidia chinensis includes trimming in winter, trimming in summer and trimming of staminiferous plant. Trimming in winter is conducted from falling of leaf to 1 month prior to sprouting in early spring, including thinning out (main) and cutting back (auxiliary), mainly leaving main bine and bearing shoot, cutting out overcrowding bough, moribund branch, cross branch and insect-plague branch. Conducted from the Mid-May to early July, the trimming in summer mainly includes removal of sprout, pinching, thinning out and binding, so as to timely remove sprouts on trunk and arrange space for branches and tendrils. The trimming of staminiferous plant is conducted in May-June (post-floral season).Leave 3~4 branches for each plant and 4~6 sprouts for each branch, and carry out pinching when shoot is 1m long. Usually start fruit thinning about 7 days after blossom falling, removing diseased or wormy fruit, malformed fruit and outer fruit, only leaving inner fruit, well-formed high-quality fruit and solitary fruit but not dual fruits. Reserve 3~4 bearing branches for long fruit spur, 2~3 for medium fruit spur and 1~2 for short fruit spur, and cut forked branch from base without fruits.

(2) Juglans regia

Table 1 (Cont.)

Timely conduct intertillage, scarification, weeding and fertilization, usually 3 times of weeding and 3 times of topdressing in summer. 1st topdressing is conducted at the end of March to the beginning of April with topdressing amount accounting for 50% of total annual topdressing amount; 2nd topdressing is conducted at the end of May to the beginning of June with topdressing amount accounting for 30% of the total amount; 3rd topdressing is conducted at the end of June to the beginning of July with topdressing amount accounting for 20% of the total amount.

Conduct trunk-pruning after sprouting in the year of field planting and remove all lateral buds blow the pruned height. If such height is not achieved, the trunk-pruning should be conducted in the next year. In case of necrosis of terminal bud, robust lateral bud near to the terminal bud can be selected to grow upward, and the trunk-pruning should be conducted after the bud grows to certain height. After trunk-pruning, the first upright shoot will be reserved as central stem which is commonly not cut back and will be continuously cultivated as central stem with terminal bud sprouting shoot. After growing to cultivation height for second layer of bough, central stem will be cut back to enable sprouting of the second layer of bough. The terminal bud continues to grow. After growing to cultivation height for third layer of bough, central stem will again be cut back to enable sprouting of the third layer of bough. After formation of the third layer of bough, central stem may not be cultivated any more. As for relatively upright species with strong trunk-growing, trunk should be cut at an appropriate height with 1.5~2m reserved. On the contrary, as for weak trunk-growing species, trunk should be cut at a height of approx. 1m under bad site condition.

Trimming is an important technical measure that ensures continuous cultivation and maintains high-yield tree form. Continue to select and cultivate bearing branches and timely cut useless branches on the basis of trimming. Conduct thinning out for overcrowding and withered branches, cutting back or trimming back for weak branches and branches with sparse inner branches to promote sprouting and achieve three-dimensional bearing of fruit.

(3) Cortex Phellodendri Chinensis

Within half month upon field planting, Cortex Phellodendri Chinensis should be frequently watered to keep moist soil, and timely irrigation should also be required in summer to reduce temperature and be beneficial to seedling growth. In summer and autumn of the year

of field planting and the next two years, 2 times of intertillage and weeding should be carried out and only topsoil of the planting hole should be scarified. After crown closure, watering may be properly reduced or stopped, and ponding due to rain water should be timely drained to prevent rotten root. Apply animal manure once before winter with 10 ~ 15kg for each furrow application. The tree grows up in the fourth year. Then, 1 time of intertillage and weeding should be conducted in winter and soil should be scarified to turn weeds (as fertilizer) in soil every 2~3 years.

(4) Herba Artemisiae Annuae

From transplanting of Sweet Wormwood Herb to harvest, 2~3 times of weeding are required with topdressing combined, and 2 times of foliage dressing can be added. First time: carry out shallow weed hoeing after survival of seedling; after that, evenly mix 1000~1500kg thin liquid dung with 10~30kg compound fertilizer per *mu* and then apply the mixture in each hole. Second time: carry out 1 time of intertillage and weeding after row spacing, and use 1000~1500kg liquid dung and 5~15kg compound fertilizer for each *mu* after weeding; spray foliage fertilizer during first branching period and conduct spraying once again after half month, which can largely increase yield and enhance effective constituent of the medicinal material. Pick off 5mm terminal tender shoot when Sweet Wormwood Herb grows to 1m high to promoting growth of lateral branches and increase yield.

2.6.3 Replanting

Because some saplings die from various reasons, replanting should be conducted in winter of the current year or in spring of the next year to ensure even distribution of trees. Replanted sapling should be pre-planted seedling as far as possible, which should be watered after planting, to ensure orderly growth of trees.

2.7 Establishment of project monitoring system

2.7.1 Project monitoring

(1) Management monitoring

① Construction process monitoring

Include forestation, cultivation, breeding, after replacement and construction of management & protection shed.

Table 1 (Cont.)

② Purchase monitoring

Include monitoring on purchase process and purchase procedure and others.

③ Training and technology promotion

Include monitoring on project training and teaching material preparation and others.

④ Fund management

Include finishing rate of EIB loan, arrival rate of supporting fund and qualification rate of cash reimbursement.

(2) Standing forest quality monitoring

Include monitoring on survival rate of forestation, verification rate of area, qualification rate of nursery stock and that of environmental protection measures.

(3) Implementation achievement monitoring

① Monitoring on eco-environment achievement

Monitoring on water impounding and fertilizer retaining: conduct monitoring on rainfall capacity, soil denudation and direct surface runoff and so on. Monitor the effectiveness of water impounding and fertilizer retaining during different period in different forestation model.

Monitoring on disease and pest damage: monitor the variety, incidence rate and hazard rating of disease and pest damage, as well as the change of prevention and treatment times.

As the monitoring on eco-environment achievement has high requirements for the site, instruments and equipment, typical points in different zones will be selected for long-term continuous monitoring.

② Monitoring on social achievement

Such monitoring shall be conducted through sampling statistics survey based statistic methods provided by national statistical department. By random sampling, select 30~50 households respectively inside and outside the project area to compare the expenditures and the incomes of rural households respectively. The survey shall be conducted in unified manner, through direct investigation by the County Project Office or periodic investigation by entrusted personnel from township forestry stations. The Municipal Project Office may conduct verification on survey results anytime.

Employment opportunity to be provided: include monitoring on employment status of surplus rural labor force and women employment status.

Training rate of personnel participated in project: include monitoring on training offered to county and township level technician, farmers, women and national minorities.

Comprehensive capacities of forestry specialized cooperatives: include monitoring on construction of new projects, consummation of number of rural specialized cooperatives, number of specialized cooperatives to be developed and planned, capacity improvement of cooperatives, etc.

2.8 Project organization and management

2.8.1 Project management organizations and responsibilities

1. Municipal project management organization

(1) Project coordination team

At present, Chongqing Municipality has established a primary work team for foreign invested forestry project, which consists of leaders of Development and Reform Commission, Finance Bureau, Forestry Administration and other departments. This project is proposed to establish project coordination team on the basis of existing organizational structure of municipal leading organ for foreign invested forestry. This team is mainly in charge of leading and decision of project, review and approval of project program outline, as well as research, coordination and solution of significant issues during project implementation.

(2) Project Office

Set Project Office in Municipal Forestry Administration. As the implementation and administration agency of municipal project (implementation) coordination team, Project Office reports project progress and significant issues to project coordination team periodically. It is also in charge of coordinating and handling the problems which exist during project implementation. It is responsible for overall implementation of project, which includes overall design review, plan adjustment, quality supervision and inspection & acceptance etc.

① Prepare construction design methods and inspection & acceptance methods etc.

② Be in charge of skill training, technique promotion, monitoring & assessment and other constructions.

③ Be in charge of checking and supervision of collection, implementation and utilization of supporting fund of each level.

④ Be in charge of reception of relevant departments, such as EIB, for project inspection

and instruction.

(3) Project monitoring center

According to established monitoring system, carry out monitoring on implementation of project business plan. Based on monitoring on project management, standing forest quality and implementation achievement, keep an eye on specific developments such as forestation progress and quality, fund utilization effect, environmental impact and implementation result, so as to discover and solve problems immediately. The achievements of monitoring shall be submitted to decision department for making necessary adjustment and arrangement, so as to make sure the overall goal of project can be gained. Meanwhile, conduct social and economic assessment of project implementation on project area and beneficiaries.

(4) Project technical supporting team

Conduct project technical consulting and management consulting; assist project training, and preparation of project implementation plan and annual working program; assist introduction of advanced concept, technique and experience; propose suggestions for defects of project implementation and conduct necessary coordination on restricted technical factors.

2. District-level project management organization

(1) District-level project leading team

Establish district-level leading team for Qianjiang subproject area of Chongqing Forestry Development Project Funded by EIB Loan for Forestry Sector. The team consists of the deputy district head in charge of forestry as the team leader, and major principals of District Development and Reform Commission, Finance Bureau, Forestry Administration and other relevant departments as members. It is responsible for solution and coordination of significant issues which exist during project implementation. Responsibilities of each department are follows:

District Development and Reform Commission: participate in project plan preparation and assist implementation. Provide instruction and supervision for construction fund utilization of foreign loan. Coordinate and supervise project bidding;

District Finance Bureau: be in charge of on-lending of credit funds, implementation of supporting funds, financial supervision, debt management and capital & interest payoff;

District Forestry Administration: be in charge of project overall design, organization and implementation of activities, management methods preparation, annual construction design, project management, project implementation, annual inspection & acceptance and as-built inspection & acceptance;

District Audit Bureau: be in charge of supervision on project fund utilization and annual audit;

District Environmental Protection Bureau: be in charge of environmental technical guidance and supervision during project implementation.

(2) District-level Project Office

Set a district-level leading team project office at District Forestry Administration, consisting of selected personnel from Finance Bureau and Forestry Administration. This office is in charge of overall implementation of project, which includes project construction design, plan adjustment, quality supervision, inspection & acceptance, fund management and cash reimbursement of loan.

① Based on actual condition and requirement of project activities, prepare annual project construction design.

② Be in charge of forest plantation, and management, material purchase, training & promotion, forest reform supporting, monitoring & assessment and other construction items. It shall check on the construction quality of all afforestation entities.

③ Collect funds independently. Manage project fund and control cash reimbursement.

④ Be in charge of preparation of annual financial final cost journal of the county. Cooperate with audit department to carry out annual audit.

⑤ Be in charge of preparation and submission of annual project plan, purchase plan and funds utilization plan. Prepare primary progress report, interim progress report and as-built report etc. Collect and manage files and information about project implementation, and report

to Municipal Project Office in time.

⑥ Be in charge of reception of relevant departments, such as EIB and superior authorities, for project inspection and instruction.

2.8.2 Project management

(1) Engineering management

Engineering management shall be acted on international convention and be in compliance with international rules. Introduce advanced foreign management experience and use modern management methods to make sure the management is scientific, standardized, democratic and institutionalized. Implement national construction procedures in strict manner, Establish engineering management system of "approval to set up project – implement plan – construction design – construction organization – inspection & acceptance – archive documentation". Establish and perfect inspection and acceptance system so as to guarantee quality. Construction organization must operate in strict accordance with relevant technical regulations, specifications, standards and approved design documents. Promote "Three Systems" of project organization responsibility system, bidding system and project supervision system. Construction organization shall perform responsibility of project organization and be responsible for the entire construction course.

(2) Technical management

Municipal Project Office is in charge of technical training, consulting, scientific research and promotion related to project construction. Prepare project program outline and implementation plan. Instruct District Project Office to carry out annual construction design. Organize personnel to conduct technical promotion. Establish data information system. Enhance management of project technical documents. Carry out assessment on project progress and quality. District Project Office, together with forestry technical training center and township project management stations shall form a multi-layered technical management service network, to guarantee construction achievement through implementing process management and identifying position responsibility.

(3) Fund management

Project fund provided by European Investment Bank shall be lent to local government by National Ministry of Finance (local government shall be responsible for repayment).

Implement cash reimbursement system based on financial audit. Implement strict supervision measures. Open bank account for funds of special purpose. The specified fund shall only be used for specified purpose. Implement relevant financial management system in strict manner. Prohibit occupying, diverting, cutting off, falsely increasing or misusing funds for other purpose. Perfect the fund approval and utilization system. Administrative organizations of each level shall be inspected and supervised by superior project management organization or equative financial and audit departments. Carry out annual final cost settlement in time. Cooperation with audit department to conduct audit on time and submit financial settlement and auditing report to superior competent department.

(4) Material management

The Project Offices and implementation organization shall allocate personnel to be in charge of plan, management, storage, transportation, delivery and utilization of materials, utilize and manage project material appropriately and keep it from being sold, burglarized and lost. Except for locally purchased clay fertilizer, nursery stock and building material, vehicles, chemical materials and equipment shall be arranged by Project Office in accordance with national standards, and shall be purchased through public bidding.

(5) Information management

Establish computer management database equipped with necessary information facilities. Conduct monitoring on project construction, progress, forestation quality, funds, forest growth volume and farmer's income along the entire course, with modern information means. Summarize and analyze all information, and report and feedback the result to superior authorities, so as to provide them with scientific reference for project management and macro decision.

(6) Contract and archive management

Table 1 (Cont.)

A contract is a legal document to bind both parties behavior and supervise the performance of liability, right and interest. Loan contract, operation contract, supply contract, work contract and supervision contract etc. are legal documents which guarantee the successful implementation of project. All the contracts shall be written in form admitted by European Investment Bank and be in compliance with national contract law. The contracts shall define the rights and obligations of both parties.

The archive management shall be carried out in three levels of municipality, district and operation organization by specified personnel. Establish and perfect project archive management system. The collection and documentation of files must be correct and without any omission, interruption or false information.

2.8.3 Operation management

Upon investigation and verification of Forestry Administration of Qianjiang District, the major construction is shouldered by companies. Qianjiang District Modern Agriculture Investment Co., Ltd. of Chongqing Municipality implements an area of 400 ha, accounted for 28.57%; Chongqing Kerui Nanhai Pharmaceutical Co., Ltd. implements an area of 1000 ha, accounted for 71.43% of total area. District Forestry Administration must sign the contracts with project implementation entities prior to official commencement of project.

2.9 Safeguard Measures

2.9.1 Enhance construction of institutional organizations

Establish municipal level leading team and project office for EIB-loaned Chongqing Forestry Development Project, which consists of municipal Development and Reform Commission, Finance Bureau, Forestry Administration and other related municipal departments, so as to enhance organizational, financial and technical management of project, as well as achievement inspection and other works. The Government of Qianjiang District will establish a leading team for Qianjiang subproject area of EIB-loaned Chongqing Forestry Development Project. The team consists of deputy district head in charge of forestry as team leader, and major principals of district Development and Reform Commission, Finance Bureau, Forestry Administration and other relevant departments as members. It is responsible for solution and coordination of significant issuers which exist during project implementation. All townships and subdistrict offices involved will establish project implementation teams leaded by heads of township (subdistrict office) and relevant members of forestry stations and

so on. Such teams are responsible for organization and supervision of planned implementation, fund operation, farmer training, environmental supervision, technical promotion and others.

2.9.2 Enhance project management along entire course

(1) Participatory planning to improve design feasibility

Through joint cooperation of project planning entity and project construction entities, based on local site conditions and planting traditions, make analysis on developmental advantages and potential of project area, select afforestation blocks, modes and tree species, etc. jointly to ensure operatability, feasibility and scientificalness of the afforestation schemes.

(2) Carry out scientific construction and guarantee afforestation quality strictly

Implement quality control to planning design, sapling breeding, operational construction, tending, management & protection and any other procedures based on requirements of guidance in advance, examination during course and inspection & acceptance afterwards. Entrust qualified supervision company to supervise the entire construction course in accordance with planned program. Rectify the discovered problems within a defined period, so as to guarantee afforestation quality.

(3) Pay attention to follow-up management and improve forestation achievement

Based on management method of forest cultivation, embark on tending at proper time to ensure forestation achievement in accordance with site conditions such as climate, as well as different tree species and different cultivation orientation. Meanwhile, implement “three level monitoring” system, which means involved counties and districts conduct 100% monitoring and self-inspection; municipal organizations conduct monitoring and sampling inspection; invite European Investment Bank for monitoring and review. Such system is to guarantee all tending measures shall be well performed.

(4) Manage funds strictly to ensure safe operation of loan

Utilization of loan is conducted in cash reimbursement system, which means the funds shall be paid after construction. Open a specified account for European Investment Band loan and conduct unified management and unified utilization; the account shall be kept and checked independently while cash reimbursement from the account shall be conducted independently too; specified funds shall only be used for specified purpose and such utilization shall accept the check and supervision of superior department and the audit of

relevant department. In order to ensure the full-specified amount of supporting fund in place on time, supporting fund is included in financial budget of this level.

(5) Enhance technical support and improve technology content

Technically cooperate with Southwest University, Sichuan Agricultural University, Chongqing Academy of Forestry and Sichuan Academy of Forestry and other academic institutions. Vigorously promote the efficient utilization technology of slope water rock for treatment of rocky desertification that won the Chongqing Municipal Sci-Tech Advancement Second Prize and soil conservation and fertility increase and other practical technologies to improve technological content and achievement of project implementation.

Table 2 Name and Consumption of Main Raw and Auxiliary Materials for the Project

2.1 Consumption of raw and auxiliary materials during the construction period

Refer to Table 2-1 for the statistics of main raw and auxiliary materials for the proposed project during construction period.

Attached Table 2-1 List of Main Raw and Auxiliary Materials for the Proposed Project during Construction Period

S/N	Name	Unit	Quantity
1	Seedlings		
1.1	Juglans regia	10,000 plants	15.54
1.2	Actinidia chinensis	10,000 plants	42.90
1.3	Cortex Phellodendri Chinensis	10,000 plants	66.00
1.4	Herba Artemisiae Annuae	10,000 plants	1800.00
2	Chemical Fertilizer and Pesticide		
2.1	Fertilizers	Ton	32285.52
2.2	Pesticide	Ton	3.99

2.2 Allocation of equipment for the proposed project

Refer to Attached Table 2-2 for the statistics of equipment for the proposed project.

Attached Table 2-2 Statistics of Equipment for the Proposed Project

S/N	Name	Unit	Quantity
1	Afforestation Infrastructure		
3.2	Guard shed	Nr.	14
3.3	Water pipe	km	4.5
3.6	Mobile water pump	Set	210
2	Pest Control Operation Equipment		
4.1	High branch scissors	Pair	100
6.2	Long-range sprayer	Set	10
3	Forest Fire Protection Equipment		
5.1	Fire fighting tools	Set	1
5.2	Motor-driven sprayer	Nr.	65

2.3 Original pollution issues and main environmental issues relevant to the Project

Located in rural areas, the proposed project area has good site conditions, high forest coverage rate, abundant species resources and favorable ecological environment. No industrial and mining enterprises are distributed around the project area, hence it will not be influenced by industrial pollution. However, there is a large rural population, plantation and breeding industries develop rapidly, a great of rural domestic sewage and breeding waste

water is directly discharged without treatment, pesticide and fertilizers are applied in a great quantity and household garbage is randomly stacked, which have certain pollution impacts on local soil, surface water and ground water. In addition, the rapid development of new rural construction, agricultural reclamation and planting as well as occurrence of natural disasters have caused vegetation in the project area destroyed to some extent and decrease in vegetation coverage; the biological diversity was reduced, and meanwhile water and soil loss was caused to some extent. Therefore, the main environmental issues in the project area are: pollution impacts on soil, surface water and ground water, and decrease in vegetation coverage and biological diversity to some extent.

Table 3 Brief Information on Natural and Social Environment at Project Location

3.1 Brief Information on Natural Environment (topography, geomorphology, geology, climate, meteorology, hydrology, etc.):

3.1.1 Geographical location

Qianjiang is a district lies at the edge of southeastern Chongqing Municipality and located on the hinterland of Wuling Mountain. It borders the following counties and cities: Xianfeng County of Hubei Province in the east, Pengshui County in the west, Youyang County in the south, and Lichuan City of Hubei Province in the north. It sits on the intersection of Chongqing Municipality, Hubei, Hunan and Guizhou and is nicknamed "The Throat of Chongqing and Hubei". It is one of the main minority enclaves in Chongqing Municipality. Its geographic coordinates are 108°28′-108°46′ East and 29°04′-29°42′ North. It is 320km away from Chongqing proper. It covers an area of 2,402 km^2, and reaches a maximum width of 45km from east to west, and a maximum length of 90km from south to north.

3.1.2 Topography and Landform

Qianjiang District is in the synclinorium within the folded belt in Eastern Chongqing and Western Hubei, and its topography is controlled by geological splicing and overlapping. Mountains in Qianjiang District stretches from Northeast to Southwest, the direction as that of fracture and fold axis.Huiqian Liangzi (Mountain), Wufu Mountain, Qilingai, Bamian Mountain, Shantanggai and Jiajiao Mountains from east to west are almost parallel, forming landform of mountains alternating with valleys. Most areas are with low and medium mountains; the total land area is constituted by 85% of mountain area, 10% of hilly area and 5% of flatland in valleys and intermontane basins.Mountains in Qianjiang District goes ups and downs, rivers and steams run across this district, and mountains and valleys alternate with each other. Terrain of the northeast is high, while that of the southwest is low; the highest peak of Huiqian Liangzi is with altitude of 1938.5m, while the lowest point, Gumasikou outlet of Heixi river valley is only with altitude of 320m, resulting in relative altitude difference up to 1618.5m; altitude difference between mountains in Qianjiang District is generally 500m~1,000m. Areas with altitude over 1400m account for 4.04% of the area of Qianjiang District, those with altitude between 1,000m and 1,400m account for 17.18%, those with altitude between 500m and 1,000m account for 59.29%, those with altitude between 500m and 700m account for 14.45% and those with altitude bellow 500m account for 5.04%.

3.1.3 Rivers and Hydrology

Qianjiang District is distributed with lots of rivers, and 12 rivers are with drainage basin over 50km^2, and drainage density is 0.42km/km^2.The drainage areas are mainly distributed on Apeng River basin, Yujiang River basin and Zhufo River basin. All rivers in Qianjiang District flow from north to south and finally join Wujiang River; most of small rivers in Qianjiang District originate from mountains with high altitude and are generally featured by sharp riverbed, narrow channel, deeply dissected landform, high fall, many beaches and torrential flow. Hydropower resources in Qianjiang District are rich.

Theoretical reserves of hydropower resources are 166,000 KW, including over 100,000 KW of Apeng River, with nearly 100,000 KW developable. The total water resource in this district is up to 1.583 billion m^3.

3.1.4 Climatic Conditions

Qianjiang District enjoys subtropical humid monsoon climate, with low temperature in spring, long-lasting rain in autumn, strong wind and hail in spring and summer, and prevailing westerly wind in winter. Winter is always dry, and used to suffer from drought in nine years out of ten and from flood in one year out of six.

Mean annual rainfall in Qianjiang is 1,200.3mm, making Qianjiang as a secondary rain belt; however, the rainfall is distributed unevenly, both spatially and temporally. Interannual rainfall changes greatly, reaching about 817mm from May to July, taking up 68.07% of total annual rainfall, and reaching 173.9mm from November to April of the next year, accounting for 14.49% of total annual rainfall. Mean annual temperature in Qianjiang District over the years is 15.4℃, extremely high temperature is 39.5℃ (occurred on August 15, 2006) and extremely low temperature -5.8℃ (occurred in January 1977); the number of mean annual sunshine hours is 1,120.2, and the sunshine rate is 25%; the maximum number of annual sunshine hours is 1,495 (occurred in 1971), and the minimum number is 823.5 (occurred in 1982).

3.1.5 Soil Condition

Soil in Qianjiang District falls into 7 categories, including yellow soil, purple soil, yellow brown soil, limestone soil, alluvial soil and paddy soil, 12 subcategories, 23 genus and 52 species; among them, yellow soil is widely distributed in the district, accounting for more than 80%, limestone soil is mainly distributed in hilly areas with high altitude, and a small amount of alluvial soil is distributed in the valley area of Apeng River.

3.2 Brief Information on Social Environment

3.2.1 Brief Information on Society

Qianjiang has a long history: it was initially established in Danxing District in the 6th year of Jianan reign period of Eastern Hand Dynasty, renamed as Shicheng District in the 5th year of Kaihuang reign period of Sui Dynasty and renamed again as Qianjiang District in the first year of Tianbao reign period of Tang Dynasty. Qianjiang Tujia and Miao Autonomous County was established in 1984. Qianjiang Prefecture was established in Sichuan in 1988, governing 5 autonomous counties, including Shizhu, Pengshui, Qianjiang, Youyang and Xiushan Autonomous Counties. After Chongqing became a municipality directly under the jurisdiction of the central government, Qianjiang Prefecture status was abolished and changed to a development area in 1998, which governs Shizhu, Pengshui, Qianjiang, Youyang and Xiushan Autonomous Counties on behalf of Chongqing City. Qianjiang Development Area and Qianjiang Autonomous County were abolished in 2000 and jointly became Qianjiang District, directly administered by Chongqing Municipality. The district covers an area of 2,402 square kilometers, contains 30 subdistricts towns and townships, and has total population of 512,500. Transportation is convenient and communication is highly-developed in Qianjiang District, National Highway 319 and Qianjiang-Xianfeng Highway meet in this district, Chongqing-Huaihua Railway runs across Qianjiang, Wulilngshan Airport had been put into service in 2010, and Chongqing-Hunan Expressway runs through this district.

Qianjiang is a national-level poverty-stricken district integrated with the following disadvantages: old revolutionary area, ethnic minority area, border area, mountainous area and poverty-stricken area. It is an old revolutionary area approved by the central government. Population of minorities (most of which are of Tujia Nationality and Miao Nationality) accounts for 72.8% of total population of Qianjiang District, which sits on the intersection of Chongqing and Hubei; this district is distributed with lots of mountains, forming a pattern with 70% of mountains, 10% of water and 20% of paddy field. Qianjiang District is among the new round of national poverty alleviation and development key areas, and has 80 municipal-level poverty-stricken villages, accounting for 36% of total administrative villages. In the process of poverty alleviation, Qianjiang, together with other

districts and counties in southeast of Chongqing, created an anti-poverty miracle, earning Qianjiang the reputation described as “just as there is Linyi in the north, there is Qianjiang in the south”, and cultivated “working hard instead of sweating it out” Qianjiang spirit. Qianjiang, as a district under the administration of Chongqing Municipality, is the only district integrated with identities of an old revolutionary area, ethnic minority area, border area, mountainous area and poverty-stricken area, both in Chongqing Municipalityand in China.

Table 3 (Cont.)

3.2.2 Main Technical and Economical Indices

Chongqing Municipality achieved GDP of RMB 1.001113 trillion in 2011, ranking seventh in Mainland China, with growth rate ranking first in China; local fiscal revenue in 2011 reached RMB 290.882 billion, including RMB 148.825 of general budget revenue; annual per capital disposal income of urban residents is RMB 20,250, and that of rural residents is RMB 6,480.

Total output value of Qianjiang District reached RMB 12.919 billion in 2011, ranking eighth in Chongqing Municipality, local fiscal revenue reached RMB 2.285 billion, above-scale industrial added value was up to RMB 5.312 billion, total investment in fixed assets was RMB 12.797 billion, total retail sales of consumer goods was up to RMB 4.407 billion, and per capita income of urban residents and rural residents is RMB 16,007 and RMB 5,452 respectively.

3.2.3 Traffic

Mileage in highway open to traffic in Qianjiang reached 2,326km in 2011, and that of classified highway is 1,955km. Annual volume of freight transportation was 429.22 million tons·km, volume of passenger transport by highway was 672.78 million people·km. Qianjiang District spares no efforts in implementing the strategy for "construction of a large channel", and has put Chongqing-Hunan Expressway and Wulingshan Airport into full operation and basically completed the comprehensive transportation hub. Qianjiang-Ensi Expressway has been commenced, Qianjiang-Zhangjiajie-Changde Railway and the second line of Chongqing-Huaihua Railway have been approved, and construction design of Qianjiang-Liangping Expressway has completed; Chongqing-Qianjiang Intercity Railway, Qianjiang-Bijie-Shaotong Railway, Qianjiang-Ensi Railway, Qianjiang-Zunyi Expressway, Qianjiang-Zhangjiajie Expressway, and Urban Outer Ring Expressway, etc. are incorporated in relevant national or municipal construction planning. Qianjiang Sections of National Highway 319 and Provincial Highway 202 are reconstructed and upgraded, and 1,075km of total rural highways is reconstructed to make traffic smooth in all townships and make highways stretch to each village.

Qianjiang Wulingshan Airport (Class 4C), as one of "One Large Airport and Two Small Airports" in Chongqing, in Qianjiang District had been put into operation in 2010 and is available for Boeing 737 and Airbus 320 series to take off and land. Qianjiang-Chongqing,

Qianjiang-Shanghai and Qianjiang-Kunming round-trip routes have been open. Qianjiang-Guangzhou, Qianjiang-Shenzhen, Qianjiang-Chengdu and Qianjiang-Wuhan air routes will be open. Passenger throughput in 2011 was 21,686 person-time, including 5,383 person-time entering the harbor, 8,147 leaving the harbor and 8,156 passing the harbor.

3.3 Current Status of Land Utilization

Qianjiang District covers a total land area of 240,200 ha, including: 58,901ha of arable land, 146,500 ha of forestry land, 3,853.33 ha of difficult-to-use land, and 30,945.67 ha of other land. Total land area in the project area is 103,303.6 ha, including 16,547.0 ha of arable land, 63,352.2 ha of forestry land (42,935.1 ha of forest land, 545.8 ha of open forest land, 1,380.4 ha of young afforested land, 15,238.1 ha of shrub land, 6.6ha of land for tree nursery, 3,026.2 ha of barren hills and wasteland suitable for afforestation, 220 ha of other forest land) and 23,404.4ha of non-forestry land.

Table 3 (Cont.)

3.4 Overview of Forestry

3.4.1 Overview of Forestry Resource

Total forestry area in Qianjiang District (including the area beside villages, houses, roads and water) is 149,554.86 ha, including 99,455.46 ha of forest land, 1,206.39 ha of open forest land, 1,905.96 ha of young afforested land, 40,304.52 ha of shrub land, 22.81ha of land for tree nursery, 6,310.41 ha of barren hills and wasteland suitable for afforestation, 349.32 ha of other forest land), and 8,842,318m^3 of growing stock of living trees. The forest coverage rate is up to 47.5%. Refer to Attached Table 3 for statistics of tree resources in the project area.

There are 185 orders, 729 genus and 1658 species of vascular plants identified in Qianjiang District, including 36 species of national key protected plants; there are 42 orders, 81 genus and 146 species of arbor, including 2 species of National Grade I protected plants (Ginkgo biloba and Taxus chinensis), 8 species of grade II protected plants, and 10 species of Grade III protected plants.

Rare tree species distributed in the district include Metasequoia glyptostroboides Hu et Cheng, Cryptomeria fortunei, thin-bark Pinus massoniana Lamb., Pinus armandii Franch, Paulownia fortunei (Seem.) Hemsl., Liriodendron chinensis (Hemsl.) Sarg, Cinnamomum camphora, Sassafras tzumu, Toona sinensis. A.Juss., Betula, Eucommia ulmoides Oliv., Cortex Phellodendri Chinensis and Cortex Magnoliae Officinalis, etc.

There are 8 types (33 formations) of plants identified in the district, including temperate coniferous forest (3 formations), warm coniferous forest (5 formations), broadleaved deciduous forest (4 formations), evergreen broad-leaved mingled forest (3 formations), evergreen broad-leaved forest (3 formations), bamboo forest (6 formations), bush wood (5 formations), and meadow (4 formations).

3.4.2 Overview of Forestry Industry

By taking advantage of rich forest resources, Qianjiang District vigorously develop characteristic forestry industry, wood processing industry, forest tourism industry and Chinese medical herb industry; as a result, both forestry benefits and income of forest workers are increased. Twenty-two townships with forestry characteristics are cultivated and planted with red actinidia chinensis, Morus alba Linn and Eucommia ulmoides Oliv., etc., and some leading forestry enterprises are cultivated. Over 2,000 ha of lands are planted with red actinidia chinensis, increasing income of more than 3,000 farmers; a 3,500 ha pharmaceutical industrial base is constructed for processing Chinese medical herbs planted in this district (mainly including Eucommia ulmoides Oliv., Cortex Phellodendri Chinensis, Herba Artemisiae Annuae and Rhizoma Polygoni Cuspidati) by relying on Chongqing Kerui Nanhai Pharmaceutical Co., Ltd., increasing income of more than 4,000 farmers; more than 8,000 ha of Morus alba Linn gardens are constructed, increasing silkworm-raising households to more than 16,000 and achieving over RMB 80 million of output value; Chongqing Silver Elephant Wood Co., Ltd. and Chongqing Xinfeng Plate Co., Ltd. can produce more than 200,000 wood-based plates, which not only effectively solve the problem concerning handling and using of logging residue, bucking residue and processing residue but also create over 200 job opportunities; Qianjiang District also put forth effort to six scenic spots for forest tourism, including National Apengjiang Wetland Park, Xiaonanhai Scenic Spot, Wuling Spirit Mountain, Yangtou Mountain Scenic Spot, Bamian Mountain Scenic Spot and Huiqian Liangzi Scenic Spot; more than 300 rural home inns are developed by virtue of these forest tourism resources, increasing income of each rural home inn by RMB 120,000 on the average, these rural home inns receive more than 500,000 person-time annually, create over 2,000 job opportunities and earn more than RMB 70 million of tourism income.

3.5 Conformity with Policies

(1) Analysis of Conformity with National Industrial Policies

The project to be built is for the construction of the new afforestation project, belongs to projects specified in the Article 34 "carbon sequestration forest projects, tree and grass planting projects and forestry tree seedling projects" of the Article I "Agriculture and Forestry" in the categories encouraged by *Directory Catalogue on Adjustment of Industrial Structure* (version 2011), and is beneficial to promote ecological balance and effectively prevent water and soil loss.Therefore, the project to be built meets the indutrsial policies.

(3) Analysis of Conformity with *12th Five-year Plan for Foresty Development of Qianjiang District*

In the *12th Five-year Plan for Foresty Development of Qianjiang District*, it clearly states that the forest coverage shall reach 52% in 2015, and the forest coverage shall reach 55%, the greening rate of built up sub-area in urban areas shall reach 40%, per capital public green area shall reach 16 square meters, the greening rate of roads and river systems shall be up to over 90%, total output value of forestry shall achieve RMB 1.7 billion, and Qianjiang District will be built into a city with favorable ecological environment and preliminarily complying with the standard for "National Forest City" in 2020. In the project to be built, the area of the economic forest is 1400 ha, so the development goals are the same with those of Qianjiang District.

To sum up, the proposed project is consistent with the requirements of national policies and relevant planning.

Table 4 Status of Environmental Quality

Current status of environmental quality and main environmental issues in the project area (ambient air, surface water, groundwater, acoustic environment, ecological environment, etc.):

Environmental Quality Status and Main Environmental Problems related to Construction Project Location（ambient air, surface water, underground water, acoustic environment, ecological environment, etc.）

1. Environmental Quality Status in the Construction Project Location.

According to principles for project layout, the Project will be implemented in 12 subdistricts and townships in Qianjiang District, Chongqing, including Chengdong Subdistrict, Zhengyang Subdistrict, Xiaonanhai Township, Shaba Township, Heixi Township, Echi Township, Shanling Township, Apengjiang Township, Baishi Township, Shijia Township, Wuli Township and Shihui Township.

(1) Ambient Air Quality

The ambient air quality in Qianjiang District was relatively good in 2012, and good ambient air quality days in the district were more than 345 days all year around, and the rate of good ambient air quality accounts for 94.3%, including 68 days with Grade I (excellent), accounting for 18.6%; 277 days with Grade II (good), accounting for 75.6%; 21 days with Grade III (slightly polluted), accounting for 5.8%.The annual average concentration indexes of So_2, No_2 and PM_{10} was relatively 0.037 mg/m³, 0.019 mg/m³, and 0.082 mg/m³, and the annual average concentration index of No_2 met requirements of Class I standard in *Ambient Air Quality Standard* (GB3095-2012), and the annual average concentration index of So_2 met requirements of Class II standard in *Ambient Air Quality Standard* (GB3095-2012).The annual average concentration index of PM_{10} was 0.17 times more than ClassII standard.

Ambient air quality in Qiangjiang urban has improved to a certain degree in 2012when compared with it in 2011 which embodied in the increase of excellent and good (reach the standard) days and the decrease of concentration of key pollutants in ambient air quality (So_2, No_2 and PM_{10}) according to the analysis of monitoring results.

The primary pollutant of ambient air in Qiangjiang urban in 2012 was PM_{10}, and second to So_2 and No_2.

To sum up, the ambient air quality in the proposed project location is relatively good.

(2) Aquatic environment quality

Among the water bodies of Qiangjiang River, water of each cross section was good in quality in 2012. For example, Xiaonanhai reached Class II water area standards in *Environmental Quality Standards for Surface Water* (GB3838-2002) all the year around; the cross sections of Apeng River and Nanxi River reached Class III water area standard requirements specified in *Environmental Quality Standards for Surface Water* (GB 3838-2002) except for TP and fecal coliforms.

Indexes like pH, dissolved oxygen, permanganate, and ammonia nitrogen, etc. are taken to assess water quality in cross sections in this assessment, and each index is shown in attached table 4-1, and all meet standards in *Environmental Quality Standards for Surface Water* (GB3838-2002), and water quality is relatively good.

Attached Table 4-1 List of Statistics of Each Cross Section Indexes

Table 4 (Cont.)

Names of Cross Section		PH	Permanganate Indexes	DO	NH_3-N
The sea port of Xiaonanhai Village		7.91	1.7	8.0	0.35
The estuary of Apengjiang Town		7.99	2.1	8.0	0.23
Nanxi River		7.94	2.1	7.1	0.31
Standard value	Class II	6-9	≤4	≥6	≤0.5
	Class III		≤6	≥5	≤1.0

(3) Acoustic Environmental Quality

The average equivalent sound level for regional environmental noise in Qianjiang District is 53.2 dB (quality is relatively good) in 2012, which the scope was between 49.2 dB and 58.7 dB, and decreased 0.3 dB when compared with that in 2011; qualified rate of grid noise is 94.9%, and decreased 0.4 dB when compared with that in 2011. Sound source is mainly composed by social life noise.

The average equivalent sound level for urban road traffic noise in Qiangjiang District was 66.0 dB (quality is good) in 2012 which the scope was between 62.8 dB and 68.5 dB, and increased 0.2 dB when compared with that in 2011; the length ratio of aterial traffic which exceeded 70 dB accounted for 6.0%, and decreased 1.1% when compared with that in 2011.

Most of project locations are in rural areas surrounding county district, traffic volume is relatively little, there is no visible noise sources of industry, traffic and life, and residential areas are in scattered state, so acoustic environment is relatively good.

(4) Current Status of Ecological Environment

①Plant Resources

There are 185 orders, 729 genus and 1658 species of vascular plants identified in Qianjiang District, including 36 species of national key protected plants; there are 42 orders, 81 genus and 146 species of arbor, including 2 species of National Grade I protected plants (Ginkgo biloba and Taxus chinensis), 8 species of grade II protected plants, and 10 species of Grade III protected plants.

Rare tree species distributed in the district include Metasequoia glyptostroboides Hu et Cheng, Cryptomeria fortunei, thin-bark Pinus massoniana Lamb., Pinus armandii Franch,

Paulownia fortunei (Seem.) Hemsl., Liriodendron chinensis (Hemsl.) Sarg, Cinnamomum camphora, Sassafras tzumu, Toona sinensis. A.Juss., Betula, Eucommia ulmoides Oliv., Cortex Phellodendri Chinensis and Cortex Magnoliae Officinalis, etc.

There are 8 types (33 formations) of plants identified in the district, including temperate coniferous forest (3 formations), warm coniferous forest (5 formations), broadleaved deciduous forest (4 formations), evergreen broad-leaved mingled forest (3 formations), evergreen broad-leaved forest (3 formations), bamboo forest (6 formations), bush wood (5 formations), and meadow (4 formations).

②Animal Resources

There are 102 species of terrestrial vertebrates in the project area, respectively belonging to Genus 207, Family 76, Order 27, Class 4. There are 22 species of Amphibia, 29 species of Reptilia, 190 species of Aves and 61 species of Mammalias. Most of them are Aves, accounting for 62.9% of total species of vertebrates in the project area.

③Current Situation of Land Use

Qianjiang District covers a total land area of 240,200 ha, including: 58,901 ha of arable land, 146,500 ha of forestry land, 3,853.33 ha of difficult-to-use land, and 30,945.67 ha of other land. Total land area in the project area is 103,303.6 ha, including 16,547.0 ha of arable land, 63,352.2 ha of forestry land (42,935.1 ha of forest land, 545.8 ha of open forest land, 1,380.4 ha of young afforested land, 15,238.1 ha of shrub land, 6.6ha of land for tree nursery, 3,026.2 ha of barren hills and wasteland suitable for afforestation, 220 ha of other forest land) and 23,404.4ha of non-forestry land.

Table 4 (Cont.)

Environmental Protection Target and Protection Class

This project will mainly be implemented in 12 subdistricts and townships in Qianjiang District, Chongqing City, including Chengdong Subdistrict, Zhengyang Stet, Xiaonanhai Town, Shaba Township, Heixi Town, Echi Town, Shanling Township, Apengjiang Town, Baishi Township, Shijia Town, Wuli Township and Shihui Town.A new forestation base of 1400 ha is proposed to be constructed. Implementation of the project can have an obvious improvement effect on local environment, but there are also some potential environmental impact problems.The main protection objects are following aspects: (1) Ecological environment protection objects, mainly including biological diversity, rare animal and plant resources, arable land, water and soil loss, and important ecological sensitive objects like nature reserves, scenic spots and forest parks in the project area; refer to attached table 4-1 for the important ecological sensitive objects in the project area. (2) Surface water environment protection objects, mainly including surface water body likes Wujiang River, Daxi River, and Furong River, focusing on sources of water, sources of drinking water, for consistency with the requirements of the corresponding water environment function zone and water supply safety of drinking water sources; refer to attached table 4-2. (3) Ground water environment protection objects. Since the scope of project location is rarely in rural areas, and drinking water there is mainly comes from underground wells, the ground water in project location needs to meet Class III standard specified in *Quality Standard for Groundwater* (GB/T14848-93).(4) Ambient air and acoustic environmental protection objects. Ambient air quality and acoustic environment quality of the residential areas surrounding the project location should reach Class II standard specified in *Ambient Air Quality Standard* (GB3095-1996) and Class II standard specified in *Environmental Quality Standard for Noise* (GB3096-93).

Table 4 (Cont.)

Attached Table 4-1 Main Protection Objects in the Project Areas

S/N	Name	Main Protected Objects	Reserve Level	Relationship with the project location
1	Xiaonanhai alpine freshwater lake scenic area	Water are, animals and plants	Scenic spot and national ancient earthquake relic	One of the proposed sites of the project (new village of Xiaonanhai Town), about 6km away from Xiaonanhai
2	Shizhong Mountain	/	Scenic spot	Beyond and far away from the proposed scope of land use under the project
3	Giant Buddha in Yangtoushan Mountain	/	Scenic spot	Beyond and far away from the proposed scope of land use under the project
4	Shengui Gorge	Water area, animals and plants	Scenic spot	Beyond and far away from the proposed scope of land use under the project
5	Guandu Gorge	Water area, animals and plants	Scenic spot	Beyond and far away from the proposed scope of land use under the project
6	Shanyang ridge dinosaur fossil location	/	Paleontological fossil resources	Beyond and far away from the proposed scope of land use under the project

Attached Table 4-2 The Summary Table for Drinking Water Source Reserves in the Project Areas

Name	River	Protected River	Location
Xiaonanhai alpine freshwater lake scenic area	/	/	Qianjiang District
Luojiabao Reservoir	Mala River	Mala River Head Water Protection Zone of Xisha River	Qiangjiang District
Laojiaoxi Reservoir	Shikuai River	Shikuai River Head Water Protection Zone	Qiangjiang DIstrict
Chayuan Reservoir	Xiangshu River	Taiji Reserve of Taiji River	Qiangjiang District

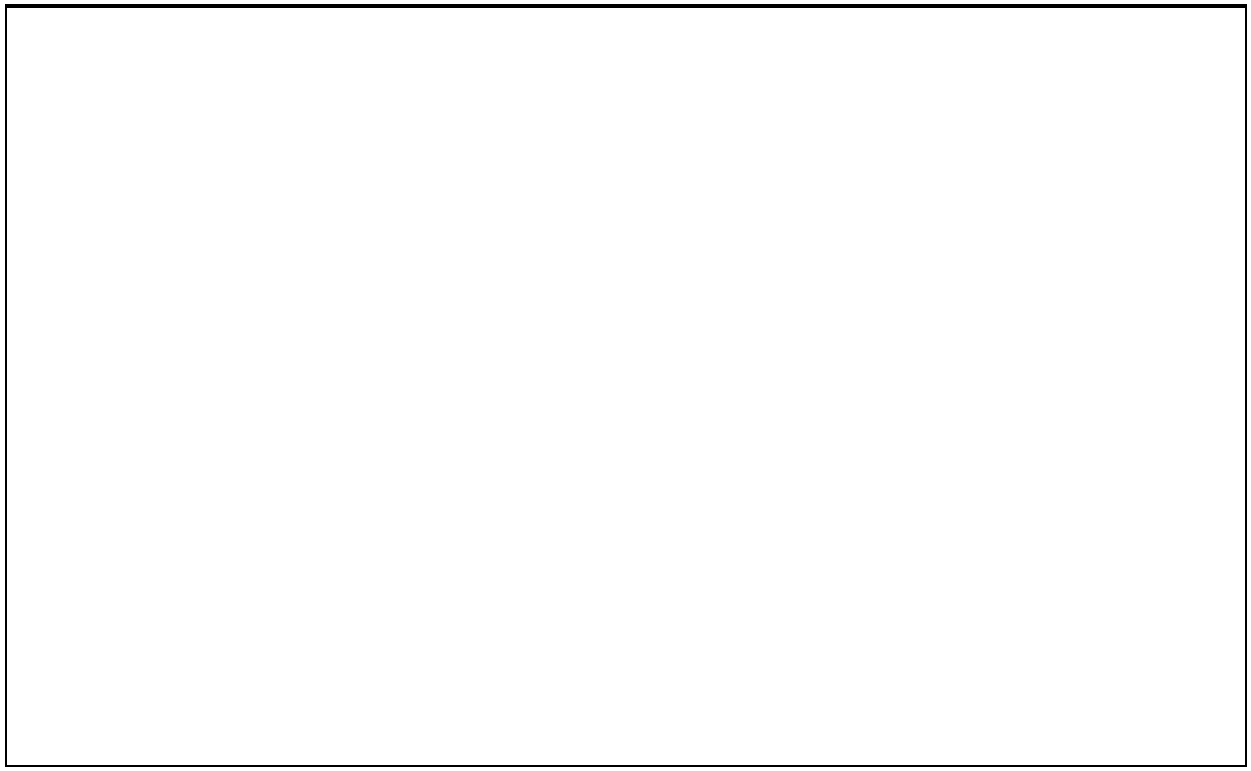

Table 5 Applicable Assessment Standards

Category	Atmosphere	Water	Noise	Others
Current status of environmental quality	Class II standard in *Ambient Air Quality Standard* (GB3095-1996) should be executed.	Class II and Class III surface water body environmental function classification should be executed for water quality.	Class II standard as specified in *Environmental Quality Standard for Noise* (GB3096-2008) should be executed for sound level in daytime and night time.	
Environmental quality standard	Class II standard in *Ambient Air Quality Standard* (GB3095-1996)	Class II and Class III water body environmental function classification standard in *Environmental Quality Standards for Surface Water* (GB3838-2002)	Class II standard in *Environmental Quality Standard for Noise* (GB3096-2008)	

Pollutant emission standard	Class II standard stated in Table 2 of *Integrated Emission Standard of Air Pollutants* (GB16297-1996)	/	*Emission Standard for Ambient Noise of Construction Site* (GB12523-2011) should be executed during construction period.	*Standard for Pollution Control on the Storage and Disposal Site for General Industrial Solid Wastes* (GB18599-2001) should be executed for construction wastes.

Table 5 (Cont.)

5.1 Environmental Quality Standard

Table 5-1: Ambient Air Quality Standard (Unit: mg/m^3)

Description of Pollutant	SO_2	NO_2	TSP
Hourly Value	0.50	0.24	/
Daily Average Value	0.15	0.12	0.30
Annual Average Value	0.06	0.08	0.20

Table 5-2: Environmental Quality Standard for Surface Water (Unit: mg/L)

Controlled Items	PH	COD	NH_3-N	DO	SS
Class II Standard Value	6-9	15	0.5	6	--
Class III Standard Value	6-9	20	1	5	--

Table 5-3: Environmental Quality Standard for Noise (Unit: LeqdB(A))

Category	Daytime	Nighttime
Class II	60	50

5.2 Pollutant Emission Standard

Table 5-4: Integrated Emission Standard of Air Pollutants (Unit: dB(A))

Concentration / Pollutant	Maximum Permissible Emission Concentration (mg/m^3)	Maximum Permissible Emission Rate (kg/h) (Height of Exhaust Stack: 19m)	Monitoring Concentration Limit Of Unorganized Emission	
			Monitoring Point	Concentration (mg/m^3)
Particles	120	3.5	The highest concentration point outside perimeter	1.0

Table 5-5: Emission Standard for Ambient Noise of Construction Site (Unit: dB (A))

Category	Daytime	Nighttime
Ambient Noise at Construction Site	70	55

Table 6 Engineering Analysis

6.1 Brief Description of the Process Flow

Refer to Figure 1 for detailed process flows of the proposed project.

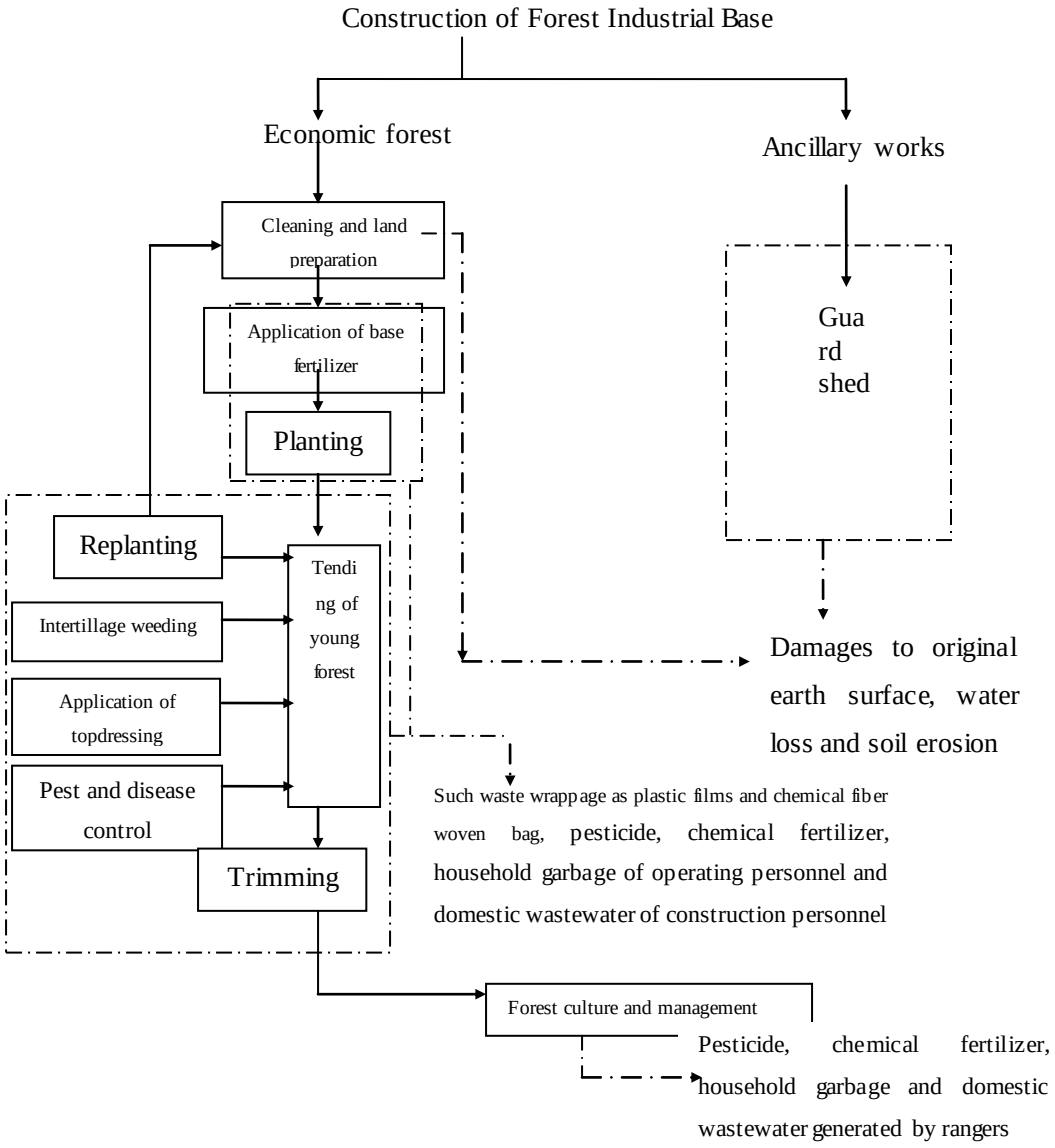

Figure 1: Process Flows of the Proposed Project

Process Flow Description

The content of construction for forest industrial base focuses mainly on the construction of economic forest. In addition, ancillary works (guard shed) shall also be constructed for the prokect.

6.1.1 Economic Forest Works

Cleaning means the cleaning of forest land conducted 3 months prior to afforestation, which mainly includes cleaning the residual wood, wild bush, stumps and others at the

afforestation land, so as to carry out the follow-up construction. Land preparation should be carried out after cleaning, and should adopt the mode of hole cultivation with dimension of hole of 70cm×70cm×60cm (width and depth). Earth covering should be performed about 1 month before planting and the topsoil should be used to fill the planting hole. One water retaining ditch (bamboo joint-like ditch), with bottom of ditch of over 30cm wide and over 30cm deep, should be excavated every 4~5 lines along the contour line, to prevent water loss and soil erosion. Base fertilizer should be applied mainly at the bottom of the hole and should be mixed evenly with the backfill during earth covering. Seedling plantation should be performed after the backfilled earth is settled. Tending and management of young forest mainly include replanting, intertillage & weeding, application of top application of fertilizer and trimming, etc. After the seedling is tended to grow, it should be subject to top application of fertilizer, routine tour and enhancement of management of plant diseases and insect pests during forest culture and management.

In addition, some saplings may die from various reasons, so replanting should be conducted in winter of the current year or in spring of the next year to ensure even distribution of trees. Replanted sapling should be pre-planted seedling as far as possible, which should be watered after planting, to ensure orderly growth of trees.

6.1.2 Ancillary Works

In order to protect the achievement of forestation, it is planned to construct a guard shed of 20m^2 every 100ha. The location of such sheds should be generally at the entrance/exit or center of planted land. Based on the distribution of project implementation plots, there are 14 guard sheds to be constructed.

6.2 Main Sources of Pollution

6.2.1 Pollution-producing Processes and Category of Pollutants during Construction Period

During construction period, the possible impacts of pollution on the project mainly include:

1. Ecological impact and water loss & soil erosion

The proposed project involves 12 township (town) work zones at Qianjiang area. At the beginning of afforestation, cleaning of such items as weeds and bushes should be performed at the afforestation land. Land preparation should be carried out with the mode of hole cultivation before seedling plantation. In addition, replanting, reclamation and deep

excavation should be performed during tending of young forest and low-yield forest. Therefore, it is inevitable to, to some extent, have the destructive effect and cause water loss and soil erosion on the original ground vegetation. In addition, the construction of such ancillary works as access road and guard shed may, to some extent, damage the original ground surface and cause water loss and soil erosion.

2. Loss of pesticide and chemical fertilizer

In the project, chemical fertilizer should be applied during planting. The estimated amount of fertilizer applied is 14528.48 t/a during construction period. According to relevant documents and data, the loss of N and P in the chemical fertilizer is calculated as 1.6% and 0.4% respectively, and it can be predicted that the loss of N and P shall be 232.45t/a and 58.11t/a respectively during construction period.

Pest and disease which may cause withering of trees in a wide area, are the major threats for healthy growth of woods. It may bring severe loss to the country and the organization or personnel who own the forest. For example, such hazards are destructive as Dioryctria splendidella and Dendrolimus to young pinus forest, olethreutid at treetop, sesiidae to man-made Populus tremula forest, batocera horsfieldi to opulus tremula, cunninghamia cerambycidae and Parocneria orienta Chao.

The biological control measures should be taken for forest pest and disease prevention for the proposed project as far as possible. However, it is inevitable to apply pesticides and loss of pesticide may occur. During the construction period, the dosage of pesticides is about 1.8t/a. According to relevant documents and data, the loss of pesticide is calculated as 1% and then the amount of loss of pesticide shall be about 0.18 t/a.

Therefore, excessive application of fertilizer and pesticide (mainly chemical fertilizer) tends to have unfavorable influence on soil and result in eutrophication of water body. However, such influence can be controlled by scientific application of fertilizer.

Refer to Table 6-1 for chemical pesticides used in the proposed project.

Table 6-1 List of Main Chemical Pesticides Used in the Project

Name	Registration Condition	Service Condition	Whether Be the Forbidden Pesticides by EU
70% mancozeb	China	Allowed in China	No
Bordeaux mixture	China	Allowed in China	No
27.1% cuproxat suspension concentrate	China	Allowed in China	No

50% gentamycin sulfate injection water soluble powder	China	Allowed in China	No
50% prochloraz wettable powder	China	Allowed in China	No
25% fenbuconazole SC suspending agent	China	Allowed in China	No
75% chlorothalonil wettable powder	China	Allowed in China	No
lime sulphur	China	Allowed in China	No
Lvheng No.6	China	Allowed in China	No
Complex of maneb and zineb	China	Allowed in China	No

Table 6 (Cont.)

3. Solid waste

Solid waste generated during construction period of the proposed project mainly includes the waste wrappage and the household garbage.

During transport of seedling, plastic film and chemical fiber woven bag should be used for packaging of the seedling with soil to prevent dehydration of the root of the seedling during the transport to the afforestation site; use of the chemical fertilizer may also generate waste film and chemical fiber woven bag; in addition, during the application of pesticide, waste wrappage and container may also be generated, mainly including glass bottle, plastic bottle and aluminum foil bag, etc. It is difficult to degrade the waste wrappage such as plastic films and chemical fiber woven bag which belong to white garbage and they will cause environmental pollution if they are not properly collected for handling. According to *National Hazardous Waste Inventory*, this kind of pesticide waste belongs to hazardous waste, so it should be subject to centralized collection by the forest base builder of each township and town to entrust it to the units with corresponding hazardous waste treatment qualification for proper disposal, or there may be relatively large harm to the environment.

Due to the wide range and large amount of work for the project, a large number of operation personnel should be assigned during afforestation and cultivation, which may result in the production of a certain amount of household garbage during construction period. The project area is located in the rural area and is near the natural villages, and the vast majority of employees are the local farmers who will live their lives in their own homes, so it is unnecessary to arrange centralized construction camps and no new household garbage will be generated. Therefore, implementation of the Project will not bring about the problem of household garbage.

4. Waste water

Due to the wide range and large amount of work for the project, a large number of operation personnel should be assigned during afforestation and cultivation, which may result in the production of a certain amount of domestic wastewater during construction period. The project area is located in the rural area and is near the natural villages, and the vast majority of employees are the local farmers who will live their lives in their own homes, so it is unnecessary to arrange centralized construction camps and no new domestic wastewater will be generated. Therefore, implementation of the Project will not bring about the problem of

domestic wastewater.

5. Waste gas

During construction period, the vehicle used to transport seedling, fertilizer, construction personnel and construction machinery may discharge exhaust and raise dust along the road. However, the discharge, in general, shall be little, which shall have a relatively weak influence on the project area.

Table 6 (Cont.)

6. Noise

Earth excavation should be carried out during construction of the proposed project and the vehicles used mainly include bulldozer, loader and transport vehicle, etc. The sound power level of each noise source ranges between 70 to 90 dB (A), which shall exert large influence on the acoustic environment in the surroundings. Refer to Table 6-2 for analog value of noise source intensity of main equipment in the project.

Table 6-2: List of Noise Source for the Proposed Project during Construction Period

S/N	Noise-producing Equipment	Noise Value [dB (A)]
1	Loader	70
2	Bulldozer	90
3	Lorry	80~90

6.2.2 Pollution-producing Processes and Category of Pollutants during Operation Period

The project belongs to the ecological control one, and mild pollution may caused during operation period, which shall play a role in improvement of the ecological environment after operation. It should be subject to application of fertilizer, routine tour and enhancement of management of plant diseases and insect pests during forest culture and management. During construction period, the possible impacts of pollution on the project mainly include:

1. Impact of application of pesticides for forest pest and disease prevention

It is inevitable to apply pesticide for prevention of plant diseases and inspect pests during forest culture and management. Excessive application of pesticides, especially the one with high toxicity and long residual period, tends to result in environmental pollution. Meanwhile, such waste wrappage and container produced during application of pesticides belong to the hazardous wastes, which may result in damage of environment in case of improper disposal.

During the construction period, the dosage of pesticides is about 2.19t/a. According to relevant documents and data, the loss of pesticide is calculated as 1% and then the amount of loss of pesticide shall be about 0.22 t/a.

2. Impact of application of chemical fertilizer

For fruit-bearing tree forest, each tree should be applied with appropriate amount of fertilizer. Fertilization method: the base fertilizer should be applied by ditching at the periphery of crown and the top dressing should be applied, in general, by digging a shallow

Table 6 (Cont.)

ditch around the crown. The improper fertilization may cause N, P in the compound fertilizer to easily enter the water body nearby with the surface runoff and under serious condition.

The estimated amount of compound fertilizer applied is 17757.04t/a during operation period. The loss of N and P in the chemical fertilizer is calculated as 1.6% and 0.4% respectively, and it can be predicted that the loss of N and P shall be 284.1t/a and 71.03t/a respectively during operation period.

3. Household garbage and domestic wastewater generated by forest ranger

After the completion of construction of forest land, relevant forest ranger shall be assigned. According to the project feasibility study, 40 forest rangers are necessary for the Project but they mainly live their lives in their villages nearby, so only a small amount of toilet wastewater may be produced in the guard shed located at the forest base. It is estimated to generate domestic wastewater of 0.8t/d and household garbage of 0.04t/d in total. Since the Project is scattered in the 14 proposed guard sheds, the domestic wastewater and household garbage of each guard shed in average are 0.057t/d and 3kg/d respectively, and the domestic wastewater can be collected by latrine pit while the household garbage can be collected by the forest rangers themselves. In summary, due to small amount of generation and large range of distribution, with proper collection and handling, the household garbage and domestic wastewater generated by the forest ranger has very slight influence on the environment.

Table 7 Production and Expected Emission Behavior of Main Pollutants in the Proposed Project

Content / Category	Emission Source	Description of Pollutant	Concentration and Amount Produced before Disposal (Unit)	Emission Concentration and Discharge (Unit)
Air Pollutants	Construction period	Fuel exhaust gas of transport vehicle	Small amount	At the construction area, the ambient air quality is good, the discharge of exhaust gas is small, so the influence shall be weak after spreading.
Water Pollutant	Construction period	Pesticide and chemical fertilizer	Loss of pesticide, N and P is 0.18t/a, 232.45 t/a and 58.11 t/a respectively.	
	Operation period	Pesticide, chemical fertilizer and domestic wastewater	Loss of pesticide, N and P is 0.22 t/a, 284.1t/a and 71.03t/a respectively; it is estimated to produce domestic wastewater of 0.8t/d in total, and the domestic wastewater of each guard shed in average is 0.057 t/d for 14 proposed guard sheds in the Project.	
Solid waste	Construction period	Such waste packing material as plastic film and chemical fiber woven bag used during seedling preparation and fertilizer application period, household garbage of operation personnel and waste wrappage and container of pesticide left during application of pesticide. Recyclable material should be recycled as far as possible, and the unrenewable household garbage, plastic film and chemical fiber woven bag should be subject to centralized collection for disposal. Such hazardous wastes as wrappage and container of pesticide should be subject to centralized collection and then be disposed properly by the units with corresponding qualification entrusted.		
	Operation period	It is estimated to produce household garbage of 0.04t/d in total, and the household garbage of each guard shed in average is 3kg/d for the 14 proposed guard sheds in the Project. In addition, such hazardous wastes as wrappage and container of pesticide shall be generated during application of pesticide at each base, and they should be subject to centralized collection and then be disposed properly by the units with corresponding qualification entrusted.		
Noise	Due to little construction noise of this project and far location of its construction site, noise nuisance can be ignored.			

Main ecological impact (additional sheets can be attached when necessary)

Implementation of the project can bring to such positive ecological benefits as water impounding, fertilizer retaining, air purification, carbon sequestration and oxygen release. However, such negative ecological effects as deterioration of original ground vegetation, water loss & soil erosion and reduction of biological diversity may be generated during construction and operation period.

Table 8 Environmental Impact Analysis

8.1 Analysis of Impact on Ecological Environment

Implementation of the Project is in favor of facilitating full use of multiple functions and benefits of the forest land, especially in favor of significant increase of forest land area of the project area and improvement of the regional ecological environment. The project construction is also with positive influences such as water impounding, fertilizer retaining and air purification.

(1) Water Impounding and Fertilizer Retaining

All kinds of trees are with well-developed root system and are in reticular distribution in the soil; according to analogy data, the underground distribution space of root system approximates (or is slightly greater) than the canopy breadth space on the ground; the root system may increase the pore in the soil. Interception of branches and leaves and soil conservation of root system can protect the soil from being eroded by the rain so that prevention of soil loss, preservation of soil fertility, prevention of silt stagnation and sedimentation, reduction of soil collapse and effusion can be achieved. According to recording of relevant data, annual loss of silt per hectare of the closed forest land is 55.05 tons less than that of the non-forest land under the same condition.

(2) Air Purification

All kinds of trees can purify the environment by absorption of dust, absorption of poisonous gas, killing bacteria and reduction of noise.

(3) Influence of Land Utilization

Influence of temporary land occupation: temporary occupation of some lands during the construction of the Project may cause temporary change of utilization modes of these lands, which has temporary influences on the original functions of these lands. All other lands occupied temporarily for the Project can be reinstated so nature of land utilization will not be influenced.

Influence of permanent land occupation: permanent land occupation for the Project is mainly for new afforestation works and sustainable development works of forest ecosystem, etc. Permanent land occupation starts from the construction period and lasts for the whole operation period, so the influence on the land utilization is permanent; however, the permanently occupied land has become the forest land so the influence on the local land utilization is relatively small. In summary, construction of the Project has slight influence

on the local land utilization.

(4) Influence on Animal Community

Construction of the proposed project has a certain influence on the animals in the project area. When the Project is put into operation upon completion, the influence on animal species as a whole in the project area is very slight and the habitat for the wild animals in the project area will be hardly changed. In addition, as time goes on upon completion of the Project, with forming and development of new animal population, the animal community structure will be basically the same as that before the construction.

(5) Influence on Variety of Biocenosis

Cleaning of forest land may cause permanent or temporary interference mainly to the vegetation and the plant resources, which will damage the original vegetation and cause loss of surface soil and nutrient. In particular, if the forest land is cleaned by control burning, almost all the original vegetation may be destroyed, which will cause greater loss of surface soil and nutrient. Meanwhile, improper slope land preparation may cause serious water and soil loss, replanting, reclamation and deep excavation, as well as construction of ancillary works such as access road and guard shed may also cause certain loss of water and soil.

In conclusion, for the purpose of minimizing water and soil loss generated during construction period of the proposed project, it is recommended taking the following measures:

① Training for the construction personnel on studying knowledge related to prevention of water and soil loss should be organized before the construction; strengthen supervision during the construction and timely correct the wrong construction mode;

② It is prohibited to clean the forest land by means of control burning;

③ During new afforestation and tending, soil preparation for afforestation should be focused on hole cultivation instead of full cultivation; planting holes should be arranged in a triangle-shaped manner along the contour line, preserving original vegetation zone with a certain width on the mountain top, mountainside and the foot of the mountain; in addition, the vegetation in the forest land at the dip, slope top, ravine and river bank should not be cleaned by cutting;

④ Belt-shaped reclamation along contour lines should be implemented to minimize water and soil loss;

Table 8 (Cont.)

⑤ The vegetation protection zone with a width of 10m should be reserved between the edge of the afforestation land and the farmland;

⑥ The surface should be covered with deadwood and grass-blade in time upon land preparation to avoid exposed surface soil so as to reduce the possible water and soil loss;

⑦ Construction of ancillary works such as access road and guard shed should conform to the mountain lie and get harmony with the surrounding to avoid large-scale excavation and backfilling so as to minimize the damage to the original earth surface.

(6) Carbon emission

① CO_2 emitted during application of fertilizer

The types and amount of fertilizer applied in the project shall be calculated according to the fertilizer type, nitrogen content, application amount of unit area and the area. The greenhouse gas emission shall be calculated with the following formula:

$$E_{N\_Feretilizer,t}=[(F_{SN,t}+F_{ON,t})*EF_1]*MW_{N2O}*GWP_{N2O}$$

$$F_{SN,t}=\sum M_{SFi,t}*NC_{SFi}*(1-Frac_{GASF})$$

$$F_{ON,t}=\sum M_{OFi,t}*NC_{OFi}*(1-Frac_{GASF})$$

Where, $F_{SN,t}$ – the amount of applied nitrogen fertilizer in year t after volatilization of NH_3 and NOx ($tN.a^{-1}$);

$F_{ON,t}$ – the amount of applied organic fertilizer in year t after volatilization of NH_3 and NOx ($tN.a^{-1}$);

EF_1 - N_2O emission factor in application of nitrogen fertilizer (IPCC default value of 0.01);

MW_{N2O} – molecular weight ratio between N_2O and N of 42/88;

GWP_{N2O} - N_2O global warming potential (IPCC default value of 310);

$M_{SFi,t}$ – the amount of chemical fertilizer applied in year t ($t.a^{-1}$);

$M_{OFi,t}$ – the amount of organic fertilizer applied in year t ($t.a^{-1}$);

NC_{SFi} – Nitrogen content of chemical fertilizer (nitrogen content of compound fertilizer is taken as 20%);

NC_{OFi} – Nitrogen content of organic fertilizer (nitrogen content of organic fertilizer is taken as 2.5%);

$Frac_{GASF}$ – Volatilization ratio of NH_3 and NOx in applied chemical fertilizer (IPCC default value of 0.1);

$Frac_{GASF}$ – Volatilization ratio of NH_3 and NOx in applied organic fertilizer (IPCC default value of 0.2);

The calculation shows that the amount of CO_2 emitted by fertilizer in the boundary during the project period is 79482.6TCO_{2-e}. Refer to Table 8-1 for details.

Table 8-1 Statistics and Investigation of Fertilizer Applied in the Boundary of Project Unit: ha, t, TCO_{2-e}

			Compound Fertilizer		Farmyard Manure		Pesticide	
		Scale (ha)	Application amount per ha (kg)	Annual consumption (t)	Application amount per ha (kg)	Annual consumption (t)	Application amount per ha (kg)	Annual consumption (t)
Model	Juglans regia	140	111	15.54	2220	310.8	13.32	1.86
Mode 2	Actinidia chinensis	260	330	85.8	3300	858	14.85	3.86
Mode 3	Cortex Phelloden dri Chinensis	1000	0	0	1320	1320	9.9	9.9
	Herba Artemisiae Annuae		150	150	1200	1200	18	18
Total	Total	1400		251.34		3688.8		33.63

② CO_2 emitted by transport vehicles

According to the investigation, the transport vehicles are mainly used to allocate and transport the seedlings and fertilizers nearby to the project site (distance of about 30km). calculated by oil consumption of 24L for full load of truck per 100km and that of 20L for no load of truck per 100km, the back-and-forth oil consumption is

(30)/100*24+(30)/100*20=13.2L once. Calculated by CO_2 emission of 2.73kg by 1L diesel oil, the CO_2 emission is 36.04kg for a trip. Based on the application amount of fertilizers and seedlings, about 5900 trips shall be transported and the amount of CO_2 emitted by transport vehicles shall be 212.64T$CO_{2\text{-}e}$.

③ Estimation of net carbon sink of the project

It is referred to as the estimation for the expected net carbon sink in the project (pre-estimation).

The actual carbon sink equals to the variation of project carbon reserve subtracting the increased emission in the boundary, subtracting the variation of baseline carbon reserve, and subtracting the increase (leakage) of emission of greenhouse gas source beyond the boundary.

CProj,t= △CProj,t—GHGE,t—LKt

CProj,t —— Net carbon sink of project in year t (t CO2 - e·a-1);

△CProj, t —— Variation of project carbon reserve (t CO2·a-1);

GHGE,t —— The increased greenhouse gas emission in the boundary of the project (t CO2 - e·a-1);

LKt —— Leakage caused by project activities (t CO2 - e·a-1);

t —— Number of years after commencement of project (t).

8.2 Analysis of Impact on Water Environment

Influence of the proposed project on the water environment is mainly embodied on the influence of domestic wastewater, use of pesticide and chemical fertilizer loss on the water environment.

8.2.1 Loss of Pesticide and Chemical Fertilizer

During construction period and service period of all the proposed projects, pesticide and chemical fertilizer will be used and loss of them may occur, causing influence on the surface water environment; improper fertilization may cause N and P in the compound fertilizer to easily enter the water body nearby along with the surface runoff and eutrophication of water body may be caused under serious condition.

Therefore, effective measures should be taken for control:

(1) Mitigation Measures for Fertilization

① Strengthen training for the forest ranger on the knowledge related to fertilization and

formulate reasonable fertilization plan;

② Advocate to apply organic fertilizer (such as farmyard manure) and apply organic fertilizer after topsoil refill into holes upon land preparation; bury the grass and leaves beside the stump during tending to increase organic fertilizer in the forest land and to reduce quantity of chemical fertilizer;

③ Soil testing for formulated fertilization should be implemented based on the actual condition of the soil in the project site; and reasonable chemical fertilizer type and quantity should be used to avoid excessive fertilization which may cause loss of fertilizer and environmental pollution;

④ Hole fertilization or band fertilization should be employed for application of chemical fertilizer and earth covering must be implemented immediately after the fertilization; top application should be prohibited;

⑤ The chemical fertilizer wrappage should be collected and duly handled to prevent the residual chemical fertilizer on the wrappage entering the water body with the rain which may cause environmental pollution;

⑥ Afforestation land should not be located within the protection zone designated for potable water sources and within 1000km of its upstream.

(2) Mitigation Measures for Application of Pesticide

① Implement quarantine of pests to control import of pests along with seedling from source;

② Clean the environment of forest land in the project area; investigate surrounding environment of forest land before afforestation; control sources of pest and disease; timely conduct nurturing of forest land; pay attention to sanitation of forest land; improve resistance of forest land against pest to reduce occurrence rate of plant diseases and insect pests;

③ Biological control should be employed as the main measure for pest prevention and control to reduce pesticide usage;

④ If medical treatment has to be employed, pesticide of low toxicity, low residual or non-polluted pesticide should be employed such as Bordeaux mixture or carbendazim; and use of pesticide of high toxicity such as DDT is prohibited to mitigate the influence on the environment;

Table 8 (Cont.)

⑤ Upon application of pesticide, attention should be paid to quantity, time and mode of spraying to avoid excessive spraying for one time which may cause waste of pesticide and loss of excessive pesticide which may enter the environment; use of pesticide in rainy season, especially before the downpour should be avoided; in addition, special attention should be paid to mixture of pesticide, cleaning of pesticide container and cleaning site of pesticide container which should be kept away from the potable water source of wild animals and people and livestock;

⑥ Waste wrappage and container generated during application of pesticide must be subject to centralized collection by the forest base builder of each county and city to entrust them to the units with corresponding hazardous waste treatment qualification for proper disposal. Prior to hazard-free treatment, temporary storage of waste wrappage and container for pesticide must meet the requirements in *Standard for Pollution Control on Hazardous Waste Storage* (GB18597-2001);

⑦ The worker and forest worker who should use the insecticide must receive the training on safe management, storage and application of chemical insecticide prior to using, to avoid direct influence on the people or pollution to water source and food;

⑧ Application of pesticide in the breeding season of birds should be avoided as much as possible and the pesticide to be used should be with slight toxicity to the birds.

8.2.2 Domestic Wastewater

Domestic wastewater will be generated by the construction personnel in both construction period and service period of the proposed project.

A certain amount of domestic wastewater will be generated during the construction period and they are mainly from living of the operators. The project area is located in the rural area and is near the natural villages, and the vast majority of employees are the local farmers who will live their lives in their own homes, so it is unnecessary to arrange centralized construction camps and no new domestic wastewater will be generated. Therefore, implementation of the Project will not bring about the problem of domestic wastewater.

Domestic wastewater in the service period is mainly from forest rangers; according to the project feasibility study, 40 forest rangers are necessary for the Project but they mainly live their lives in the villages nearby so only a small amount of toilet wastewater may be generated in the guard shed and it is estimated to generate domestic wastewater of 0.8t/d in total; since the Project is scattered in the 14 guard sheds, the domestic wastewater of each guard shed in average is 0.057t/d and it can be collected by latrine pit. In summary, due to small amount of generation and large range of distribution, with proper collection and handling, the domestic wastewater generated by the forest rangers has very slight influence on the environment.

8.3 Analysis of Impact of Solid Waste

(1) Construction Period

Solid waste generated in the construction period mainly includes household garbage of operating personnel and the waste wrappage.

A certain amount of household garbage will be generated during the construction period and they are mainly from living of the operators. The project area is located in the rural area and is near the natural villages, and the vast majority of employees are the local farmers who will live their lives in their own homes, so it is unnecessary to arrange centralized construction camps and no new household garbage will be generated. Therefore, implementation of the Project will not bring about the problem of household garbage.

During transport of seedling, plastic film and chemical fiber woven bag should be used for packaging of the seedling with soil to prevent dehydration of the root of the seedling during the transport to the afforestation site; use of the chemical fertilizer may also generate waste film and chemical fiber woven bag; in addition, during the application of pesticide, waste wrappage and container may also be generated, mainly including glass bottle, plastic bottle and aluminum foil bag, etc. It is difficult to degrade the waste wrappage such as plastic films and chemical fiber woven bag which belong to white garbage and they will cause environmental pollution if they are not properly collected for handling. According to *National Hazardous Waste Inventory*, this kind of pesticide waste belongs to hazardous waste, so it should be subject to centralized collection by the forest base builder of each township and town to entrust it to the units with corresponding hazardous waste treatment qualification for proper disposal, or there may be relatively large harm to the environment.

In summary, the assessment recommends employing the following mitigation measures for the waste wrappage:

① Collect the film and the chemical fiber woven bag and reuse them for seedling packaging;

② The damaged film and chemical fiber woven bag which cannot be reused should be subject to centralized collection and delivery to local landfill site for disposal;

③ The hazardous waste should be subject to centralized collection by the forest base builder of each township and town to entrust it to the units with corresponding hazardous waste treatment qualification for proper disposal.

(2) Service Period

The solid waste generated during service period of the proposed project is mainly the household garbage generated by the management personnel. Upon completion of forest land construction, forest ranger should be assigned; according to the project feasibility study, 40 forest rangers are necessary for the Project but they mainly live their lives in the villages nearby and the household garbage generated in the guard shed is 0.04t/d; since the Project is scattered in the 14 guard sheds, the household garbage of each guard shed in average is 3kg/d and it can be collected by the forest rangers themselves. In summary, due to small amount of generation and large range of distribution, with proper collection and handling, the household garbage generated by the forest rangers has very slight influence on the environment.

8.4 Analysis of Impact on Acoustic Environment

The noise in the construction period is mainly from the construction machinery. The national building construction technology level and construction equipment are roughly the same, therefore, the data obtained from analogy investigation are employed for noise source intensity of the mechanical equipment in the construction period. The noise source of the mechanical equipment in the construction period may be regarded as point source; so the noise values at different distances from the sound source in the construction period are calculated based on the attenuation mode of point source, with the prediction mode as follows:

$$Lp=LP0-20Log(r/r0)$$

Where: Lp – predicted value of construction noise at the distance of r m from the sound source [dB (A)];

LP0 – referenced sound level at the distance of r0 m from the sound source [dB (A)].

Refer to the attached table 8-1 for noise values of each construction facility at different distances from the sound source.

Attached Table 8-1 List of Noises of Mechanical Equipment for Construction at Different Distances from the Sound Source

S/N	Equipment	Predicted Noise Value (dB)				
		5m	10m	20m	40m	60m
1	Loader	90	84	78	68	58
2	Bulldozer	86	80	74	62	57

According to the above table, it can be noted that noise at the construction site meets the standard limits of ≤75 dB (A) for the daytime and ≤55 dB for the night time specified in *Noise Limit for Construction Site* (GB12523-90) since the noise generated from the equipment is subject to range attenuation, building separation and simple enclosure for attenuation. Therefore, the noise will have no obvious influence on the surroundings.

8.5 Analysis of Impact on Atmospheric Environment

The vehicle for transport of seedling, fertilizer, construction personnel and construction machinery in the construction period will discharge the vehicle exhaust and raise the dust on the road but the total amount of discharge is small.

During transport of soil and stone by the dump truck for the Project, certain amount of

dust and vehicle exhaust will be generated, which has a certain influence on ambient air quality in the construction area, the area on the way and the sensitive area.

The quantity generated depends on the pavement type, weather condition and running speed of the vehicle, etc. According to the measured data in the foreign countries, when the stone transport truck runs with a speed of 4m/s (14.4km/h), the dust capacity in the air along the pavement through which the truck passes is about 10~15mg/m^3. The construction road is simple road and running speed of the truck is < 15km/h, so the amount of the raised dust is < 15mg/m^3.

In summary, proper watering should be implemented for the temporary road for project construction to reduce the dust raised by vehicle running. The influence on the atmospheric environment will stop with the completion of the project construction, with the termination of contamination effect; therefore, the influence in the construction period is relatively small.

8.6 Analysis of Impact on Rocky Desertification

8.6.1 Status quo of rocky desertification

Compared with Guizhou province, the rocky desertification is weak at Qianjiang District, the proposed project site. In Guizhou province, the area of rocky desertification with magnitude above being slight is 35920 square kilometers, accounting for 20.39% of the national territorial area, among which the area of slight rocky desertification is 22733 square kilometers, that of moderate rocky desertification is 10518 square kilometers and that of intensive rocky desertification is 2669 square kilometers.

8.6.2 Impact analysis on timber yield by rocky desertification

Rocky desertification refers to the land degradation phenomenon similar to desertscape on the fragile karst geology foundation resulting from large area of rock exposure caused by vegetation degradation, water loss and soil erosion due to unreasonable human activities. Local land exposure at the rocky desertification area results in the low timber yield at relevant area and it tends to cause torrent, landslide and mud-rock flow. In addition, the underground karst is developed, which results in the frequent occurrence of floods and droughts nearly in successive years. Meanwhile, for the rocky desertification mountain region, the exposure rate of rock is high, the soil is little, the water storage capacity is low and the spillage of rock stratum is strong, which tend to cause water shortage and drought. In addition, the heavy rain will also result in serious water loss and soil erosion.

8.6.3 Treatment measures of rocky desertification

It shall take comprehensive treatment of water loss and soil erosion as the core. Treatment of rocky desertification shall comply with the principle of water and soil conservation and adjust measures to local conditions, stick to the core of comprehensive treatment of water loss and soil erosion, target at increase the sustainable utilization rate of land and water resources to perform the comprehensive treatment by organic integration of treatment of rocky desertification and such ecological works as returning the grain plots to forestry, planting of protection forest, water and soil conservation, drinking water of human and livestock and poverty relief and development. Prevention of rocky desertification shall be subject to perform the combination of measures, set apart hills for forestry, carry out barren hill afforestation, return the grain plots to forestry, transform the production and life mode of the mass and implement the ecomigration. In addition, the preferential and supportive policies shall be developed to encourage enterprise and public institutions, individuals and non-publicly-owned economic organizations to participate in the treatment of rocky desertification. In particular, more attention shall be paid to adjustment of energy structure at the rocky desertification area, acceleration of the pace of rural energy construction and reduction of energy-based consumption of forest resources.

8.7 Analysis of Impact on Social Environment

During project investment, construction and operation which include afforestation, tending, management & protection, harvesting & transportation, a large amount of workers should be employed, most of whom are the rural residents in the project implementation site, therefore, the Project is good for relieving the employment pressure of surplus rural labor force. Meanwhile, implementation of the Project will bring about considerable land rent for the forest workers in the project area and will play an important role in invigorating rural economy, accelerating farmers to cast off poverty to get rich and maintaining social stability. The project construction is in favor of adjusting local industrial structure and boosting the development of crop processing industry, transportation industry, agricultural material industry and other relevant industries; in addition, it will be of relatively strong motivation to the surrounding areas, so as to effectively promote sustained and healthy economic development of the project area and the surrounding areas.

8.8 Influence on Local Biocenosis

All the seedlings necessary for the proposed project are from the local nursery garden. In

Chongqing, the area of the existing seedling base is over 25,000 ha and there are more than 1.62 billion seedlings in the nursery garden of the whole city, with high quality and guaranteed supply of seedlings. The variety, quality and quantity of the seedling within the scope of economical transport in the project area meet the requirements for project implementation, so construction of new nursery garden and long-distance transport of seedlings from other places are not taken into consideration; therefore, the variety of local plant species will not be changed.

8.9 Environmental Protection Measures and Investment

Refer to attached table 8-2 for details of environmental protection measures and investment list for the proposed project.

Attached Table 8-2 List of Environmental Protection Measures and Investment of the Proposed Project

Stage	Item		Contents, Quantity and Scale	Amount of Investment (RMB 10^4)	Remarks
Construction period	Measures for water and soil conservation	Setting of bamboo joint-like ditch	/	70	/
	Solid waste	Collection and handling of plastic film, chemical fiber woven bag and household garbage	/	8	5 years for project implementation
		Upon centralized collection of pesticide wrappage and container, entrust them to the units with corresponding hazardous			

		waste treatment qualification for proper disposal			
Service period	Solid waste	Collection and handling of chemical fertilizer packaging bag and household garbage		12	5 years for project implementation
		Upon centralized collection of pesticide wrappage and container, entrust them to the units with corresponding hazardous waste treatment qualification for proper disposal			

Table 8 (Cont.)

Attached Table 8-2 (Cont.) List of Environmental Protection Measures and Investment of the Proposed Project

Stage	Item		Contents, Quantity and Scale	Amount of Investment (RMB 10^4)	Remarks
Service period	Ecological environment protection measures	Sign of publicity	A few	5	/
		Forest fire prevention facility and fire extinguishing equipment	/	200	Fire prevention
		Forest disease and pest control system	1	150	Ecological management and manual control
		Ecological environment monitoring	/	120	Ecological environment monitoring
Total investment			/	565	/
Proportion in the total investment (%)			/	3.92	/

Table 9 Prevention and Control Measures to be Taken and Expected Treatment Results

Content / Type	Emission Source	Description of Pollutant	Preventive and Control Measures	Expected Treatment Results
Air Pollutant	Construction Period	Fuel exhaust gas of transport vehicle	Choose automobiles whose emission of tail gas meet relevant standards	Discharge in compliance with relevant standards
Water Pollutant	Construction Period	Pesticide and chemical fertilizer	Choose pesticide reasonably, control the dosage of pesticide and chemical fertilizer, pay attention to the time and mode for application	Effective control obtained
	Operation period	Domestic wastewater	Pit toilet collection and forest-shrub	Without emission into surface water body
		Pesticide	Choose pesticide reasonably, control pesticide dosage, pay attention to the time and mode for application	Effective control obtained
Solid waste	Construction Period	Plastic film, chemical fiber woven bag and other waste packing materials	Recycle as much as possible; those cannot be recycled should be collected with domestic garbage	Without discharge to the environment
		Pesticide wrappage	Authorize an organization with corresponding hazardous waste treatment qualification for proper disposal after collection uniformly	Without discharge to the environment
		Domestic garbage	Collected by construction personnel, and send regularly to local waste landfill yard for treatment	Without discharge to the environment
	Operation period	Domestic garbage	Collected mainly by forest ranger, and send regularly to local waste landfill yard for treatment	Without discharge to the environment
		Hazardous solid waste	Authorize an organization with corresponding hazardous waste treatment qualification for proper disposal after collection uniformly	Without discharge to the environment
Noise	Due to little construction noise of this project and far location of its construction site, noise nuisance can be ignored.			

Ecological Protection Measures and Expected Results:

(1) Construction Period

①It is suggested that professional forestry personnel should be organized to carry out specific investigation on the plant resources of afforestation land before clearing of forest land. Random disafforestation is prohibited.

②To prevent serious water loss and soil erosion during construction period, practical water-and-soil conservation measures should be applied by works with selection of proper afforestation lad and low-yield cultivating forest land. Selection of locations whose gradient is more than 25° is not allowed. Soil preparation for afforestation should be focused on hole cultivation instead of full cultivation. Planting holes should be arranged in a triangle-shaped manner along the contour line with reservation of original vegetation zone with certain width on the summit, mountainside and the foot of a mountain; avoid construction during rain spell as much as possible, and take scouring erosion prevention measures; construction of ancillary works such as access road and guard shed should conform to the mountain lie and get harmony with the surrounding as much as possible; avoid large-scale filling and excavation; reduce damage to original surface and vegetations as much as possible; backfill the earthworks (including topsoil) from soil preparation for afforestation as well as excavation of access roads timely for recycling; random stack is not allowed; prepare water-and-soil conservation plan for each base independently before construction with thorough implementation of various water-and-soil conservation measures.

Table 9 (Cont.)

③Choose afforestation land reasonably; afforestation land should not be located within the ecologically sensitive zones or the 2000m surrounding areas, such as natural reserves, scenic spots and forest parks and cannot be located within places under protection or the 100m surrounding areas, such as ecological public-welfare forests and forests for special use.

④Choose a reasonable mode for clearing of forest land; control burning for clearing of forest land is prohibited.

⑤Strengthen publicity and education for animal protection of constructors during construction of the project. Catching and killing wild animals by constructors are prohibited.

⑥Carry out fire prevention during construction period, to avoid forest fire.

⑦Apply manual construction operation as much as possible, to avoid relatively serious surface damage and water loss & soil erosion by mechanical operation.

⑧Shorten operation time as much as possible during soil preparation for afforestation. Cover the excavated soil with film, to avoid severe water loss and soil erosion.

⑨Take strict measures to protect arable land. Afforestation with arable land is prohibited.

(2) Operation Period

①It is recommended to use organic fertilizers (such as farmyard manure); apply some organic fertilizers after topsoil refill into holes during soil preparation; bury grass and leaves etc. beside the stump, to increase organic fertilizers of a forest land and reduce the application amount of chemical fertilizers; use chemical fertilizers reasonably and scientifically; determine the type and amount of the chemical fertilizer to be used as per test results of soil fertility, to prevent pollution of soil, ground water and surface water due to excessive application of chemical fertilizers.

②Strengthen forest fire prevention and control; construct isolation belts for fire prevention in strict accordance with relevant provisions and requirements; carry out prevention and prediction; establish professional prevention and control team with necessary fire-fighting facilities, to ensure fast extinguishing in case of a fire and to minimize fire severity and size; finally, strengthen management and carry out regular patrol, to avoid the occurrence of a fire.

③Implement quarantine of pests to control import of pests along with seedling from source; carry out environmental survey on forest land and surrounding areas before

Table 9 (Cont.)

afforestation; control sources of pest and disease; conduct nurturing of forest land timely; pay attention to sanitation of forest land; improve resistance of forest land against pest to reduce occurrence rate of plant diseases and insect pests.

④Establish an advanced forest pest and disease epidemic forecasting and monitoring system; discover plant diseases and insect pests timely; apply rotating system for prevention of plant diseases and insect pests in combination with biological control, manual catching and high-efficiency, low-toxicity and less-persistent pesticide; medication prevention and control as per the type and age of plant diseases and insect pests; apply high-efficiency, low-toxicity and less-persistent biopesticides as much as possible in case of plant diseases and insect pests, to reduce damage to beneficial organisms and pollution to the environment; pesticides with high toxicity and those prohibited by relevant rules and regulations of China should not be used.

⑤Reasonable intercropping is advocated; plantation can be applied instead of fostering and tending. Planting banks should be reserved during intercropping, to ensure both harvest of crops and growth of forests.

Table 10 Risk Assessment

10.1 Risk Assessment

10.1.1 Identification of Main Risk Factors of Project

Investment efficiency analysis of the Project is based on the real objective environment. The future income of each project will be affected by the change of the external macro-environment and internal micro-environment. The external macro-environment mainly includes changes of national policies, social economy development, social stability, traffic condition, etc. The micro-environment mainly includes material prices, product market situation, management level of operators, natural disasters, etc.

10.1.2 Risk Degree Analysis

(1) National policies: the Project is the forestry development supported by China, so national policies will not bring adverse effects.

(2) Social economy development: our national economy is in the fast and stable development period, so this factor will not bring adverse effects to the Project.

(3) Social stability: the social security in the project implementation area is stable, so this factor will not bring adverse effects to the Project.

(4) Traffic condition: the local traffic condition is good and will not directly affect storage of raw materials and product transportation.

(5) Fluctuation condition of market product price: the fruits produced by the Project are new species of high quality and high market demand. Although the fruit prices have remained high in recent years, a large number of fruits of the Project being sold in the market will still have certain impact on the fruit market in the area. The Chinese herbal medicines produced by the Project are traditional Chinese herbal medicines of high market demand. However, the market prices fluctuate greatly, so the Chinese herbal medicines are of certain market risks. Through enhancing market information monitoring, paying attention to change of market supply and demand, and adopting flexible marketing strategies, the risks brought by price change of Chinese herbal medicines.

(6) Material price: as the material types needed for the Project is only a few, the cost accounts for a small percentage in the total cost, and as the needed material types are of high

marketization, the prices will not fluctuate greatly. Thus, the Project will be affected relatively little by the prices of raw materials.

(7) Material quality: the material quality will directly affect the product output and greatly affect the cost. Thus, the material quality is of high risk.

(8) Labor cost: the Project needs a lot of labor, and increasing of labor cost will cause certain risk to the Project.

(9) Technical level of field management personnel: the technical level of field management personnel will directly affect product output and quality. During construction period of the Project, large-scale personnel will be organized to receive technical training. After being qualified, the personnel will work with certificates, so as to reduce risks.

(10) Management level of operators: the implementation organization of the Project and the employed management personnel have experience of long-term operation management, so they will bring relatively low risk to the Project.

(11) Natural disasters: if forest fires and forest biological hazards are not prevented appropriately, devastating blows will be caused to economic afforestation and the risk is high.

In conclusion, the raw material quality and labor cost will bring relatively high risk to the Project. Refer to Table 10-1 for the risk degree of each factor.

10.1.3 Strategies to Prevent and Reduce Risks

(1) Market risk: although concentrative listing of the project products will have certain impact on the market, in the earlier period of design, the unit price lower than the present market price have been adopted in estimation for the Project, and with economic development and increasing of per capita income of Qianjiang District, the demand of green products will increase by years. Meanwhile, Qianjiang District has actively introduced domestic and international beverage processing enterprises and food processing enterprises, so as to carry out further processing of economic forest products. These enterprises will consume a lot of forest products, so that the market risk of the Project will be reduced. With implementation of the twelfth five-year plan of Qianjiang, Qianjiang will establish a 60,000 m^2 wholesale trade market of Chinese herbal medicine in the southeast of Chongqing, a 100,000 m^2 Wuling Mountain wholesale market of agricultural and sideline products, comprehensive forestry trade market and a large refrigeration storage in the southeast of Chongqing, quality safety

monitoring center of agricultural products and other market circulation systems, so as to promote circulation of market information and to greatly boost the sale of Qianjiang agricultural and forest products.

Table 10-1 Risk Degree Analysis

Risk Factor	Risk Degree
1. National policies	Zero
2. Social economy development	Zero
3. Social stability	Zero
4. Traffic condition	Zero
5. Price fluctuation condition of market products	High
6. Material prices	Medium
7. Material quality	High
8. Labor cost	Medium
9. Technical level of field management personnel	Medium
10. Management level of operators	Medium
11. Natural disasters	High

(2) Strengthen forest operation and improve forest quality, so as to improve the forest capacity to tackle natural disasters. As to forest fires, not only should fire prevention be carried out to focus on control of wild fire, but fire alarm, fire monitoring and fire remedy capacity should also be improved, so as to alleviate the hazard caused to forest resources by forest fires to the fullest. As to forest biological disasters, monitoring and alarm work shall be focused on, so as to realize comprehensive monitoring, accurate prediction and timely forecasting; meanwhile, biological disaster prevention and control level shall be constantly improved and monitoring of prevention and control measures shall be strict, so as to strive to cultivate a healthy forest. At the same time, actively advertize forest insurance knowledge and introduce forest insurance, so as to tackle the possible natural disasters and reduce the loss caused to the Project beneficiaries by natural disasters.

(3) As to material quality, firstly, long-term supply agreement shall be signed with the supplier to reduce quality fluctuation of the materials; secondly, the material quality shall be ensured during material procurement.

(4) As to labor cost, improve the scale degree and intensification degree, enhance science and technology input and enhance technical training, so as to improve labor productivity.

Table 11 Environmental Monitoring and Management Plan

11.1 Environmental management

To ensure successful implementation of this project with the minimum environmental cost, prepare the following environmental management and monitoring plan and each party of this project should be responsible for implementation accordingly. The environmental management and monitoring plan must be an integral part of this project and should be included in the budget of the project financing feasibility study and project implementation plan.

To ensure smooth implementation of environmental management and monitoring plan, and observation of relevant national environmental systems, 1-2 professional officials should be appointed by each project office to take full responsibilities of report and management of environmental impact assessment as well as monitoring the successful implementation of part of the confirmed project activities during each stage of construction period and at least first 5 years of operation period of this project. The county-level project office should arrange 1-2 full-time personnel to be responsible for work concerning environmental protection as per the amount of afforestation. The personnel should be trained, to ensure thorough implementation of all the environmental management and monitoring plan activities on the county/forest farm level of the project. The full-time personnel should also be responsible for reporting relevant environmental events occurred during implementation of the project to the project executive team of the municipal project office and environmental protection bureau of the county. Meanwhile, the full-time personnel should be responsible for data collection and providing technical support to relevant environmental officials. The environmental officials appointed by project offices of various levels (county-level and municipal) should be responsible for preparing environmental-friendly materials and documents related to implementation of this project for review of the World Bank and corresponding environmental protection departments of various levels.

During operation stage, the environmental protection official from project office of each county should coordinate with corresponding project offices to carry out environmental monitoring plan and other work included in the environmental management and monitoring plan. However, the final responsibility to ensure implementation of all the activities confirmed in environmental management and monitoring plan should be taken by the county-level

project office. In addition, the county-level project should ensure successful obtaining of environmental report / data required by municipal project office from county-level project office.

To ensure effective implementation of environmental mitigation measures of this project, environmental management plan is prepared. Refer to Attached Table 11-1 for relevant details.

Attached Table 11-1 Environmental Management Plan Table

Environmental Problems	Mitigation Policies and Control Measures	Actuator	Responsible Organization	Supervision Organization
A. Stage prior to Design / Implementation				
1. Project scheme	1. Optimize project design and plan, to minimize potential negative impact on the environment; 2. The design and plan of this project should avoid impact on the environmentally sensitive zones, such as natural reserves, geological parks, forest parks, wildlife habitats and natural and cultural heritages, etc.; arrange construction schedule reasonably, to reduce land occupation duration; 3. Ensure minimum impact on surface water bodies and portable water sources; 4. Strengthen the monitoring and protection of biodiversity within the project area by the municipal project office; 5. Ensure no obstruct in the migration route and route for foraging / water drinking of wild	District project office and design institute	Municipal project office	Municipal environmental protection bureau

	animals; 6. The county-level project office and relevant departments should provide the subgroup close to natural reserves and / or wildlife habitats with management plan;			

Table 11 (Cont.)

Attached Table 11-1 (Cont.) Environmental Management Plan Table

Environmental Problems	Mitigation Policies and Control Measures	Actuator	Responsible Organization	Supervision Organization
2. Land use	1. Minimize land occupation for design of access way, to avoid acceleration of soil erosion and damage to vegetations. 2. Places considered as historical sites and cultural sites should not be occupied for land use of this project. 3. Sloping fields with gradient more than 25° should not be occupied for land use of this project.	Design institute	District project office	District environmental protection agency
Application of pesticide	1. Inspect the application of all the pesticides within the project area; avoid application of any category-I insecticide classified by the World Health Organization (WHO). 2. Choose alternative pesticide with high efficiency; advocate application of the less-persistent pesticide.	Forest pest and disease control of the district	District project office	District environmental protection agency
B. Implementation Stage				
Soil erosion	1. Soil preparation for afforestation should be focused on hole cultivation instead of full cultivation; planting holes should be arranged in a triangle-shaped manner along the contour line 2. Afforestation on sloping fields should be accomplished at least one month prior to rainy season. 3. Avoid reclamation, hole and/or trench excavation on sloping fields with gradient more than 25° or in rainy season. Cover the lower slope in the excavated area with sandbags and dry straw bags, to reduce water loss and soil erosion. 4. Take measures to maintain and improve the soil structure, soil fertility and organisms; organic fertilizer and green manure are advocated. 5.Use organic fertilizer as per afforestation design with only hole application or furrow application; spreading is prohibited.	Construction team	District and county-level project offices	District environmental protection agency
Plant diseases and insect pests	1. Quarantine on exotic tree species. 2. Reserve original vegetations in valleies. 3. Avoid application of chemical	Design institute	District project office	District environmental protection

	insecticides of great amount. 4. Low-toxicity and less-persistent agents should be applied if it is necessary to use chemical insecticides, such as pesticides, and control its dosage with reasonable application time and mode.			agency
Society	1. Occupation of arable land is prohibited. 2. Establish temporary health and epidemic prevention institutions; strengthen epidemic surveillance, sanitation management and publicity.	District project office and epidemic prevention department	District project office	District environmental protection agency
C. Operation Stage				
1. Animal and plant community	1. Strictly carry out measures related to biodiversity protection as per corresponding national and local rules, regulations and the relevant requirements of this report.	District project office	District project office	District environmental protection agency
2. Plant diseases and insect pests and application of chemicals	1. Strictly carry out proposed management plan for plant diseases and insect pests; improve the application efficiency of pesticide, to minimize the long-term negative impact of pesticide on natural environment. 2. Choose favorable measures for afforestation; improve the resistance against diseases and pests of forest stand. 3. Prefer less-persistent and low-toxicity insecticides. 4. Carry out regular monitoring on severe pest species. 5. Promote comprehensive prevention and control of plant diseases and insect pests; reduce the application of chemicals.	District project office and forest pest and disease control of the county	District project office	District environmental protection agency
3. Soil erosion and soil fertility	1. Protect the vegetations on forest land; take advantage of the plants covering soil. 2. Apply manual weeding; ensure the tending quality of forest stand and the supervision of environmental effect. 3. Apply soil testing and formulated fertilization technology. 4. Apply organic fertilizers as much as possible; spread the application of bacterial manure.	District project office and construction team	District project office	District environmental protection agency

Attached Table 11-1 (Cont.) Environmental Management Plan Table

Environmental Problems	Mitigation Policies and Control Measures	Actuator	Responsible Organization	Supervision Organization
4. Biodiversity	1. Protect the vegetations and dry branches and fallen leaves; protect the original vegetations between tree rows; protect the vegetations on forest edge. 2. Generalize the comprehensive prevention and control of plant diseases and insect pests; strengthen forest health management; reduce the application of chemicals. 3. Control slope rolling of objects.	District project office and construction team	District project office	District environmental protection agency
5. Society	1. Help to address the employment of surplus labor in rural areas. 2. Help the minorities and women with employment. 3. Respect the custom of the minorities.	District project office	District project office	District environmental protection agency
6. Environmental pollution	1. Apply chemical fertilizer and insecticide as less as possible; ensure proper dosage and timing during application. 2. Choose organic fertilizer and green manure. 3. Apply fertilizers in ditches and pits; cover soil layers and deadwoods. 4. Apply low-toxicity insecticide. 5. Recycle and dispose the pesticide bottles and chemical fertilizer wrappage.	District project office	District project office	District environmental protection agency

11.2 Environmental Monitoring Plan

The impact of this project on the environment is mainly the ecological impact, and therefore the monitoring content will be focused on eco-environment achievement monitoring. Refer to Attached Table 11-2 for specific monitoring content and indicators.

Attached Table 11-2 Ecological Environment Monitoring Plan

Monitoring Contents	Monitoring Index	Monitoring Frequency	Monitoring Point	Supervision Organization
Water Impounding and Fertilizer Retaining	Soil water-holding capacity Soil nutrient Soil erosion	For the first, third and fifth year, once a year	Set up one monitoring point for each forest base	District project office
Plant diseases	Type and occurrence rate	Twice a year	Set up two monitoring points for each forest	District project office

and insect pests	Hazard rating		base	
Forest carbon sinks	Relevant data required by carbon reserve variations, gas emissions and leakage from greenhouse inside project boundary	For the first, third and fifth year, once a year	Set up one monitoring point for each forest base	District project office

11.3 List of the Acceptance of the "Three-simultaneousness" Principle

The specific work of environmental protection measures for this works is classified into construction period and operation period as per practical conditions of this project. In addition, specific arrangement for work schedule was made on water quality protection, water and soil conservation, solid waste disposal and eco-environmental protection, etc. of the two stages. Refer to Attached Table 11-3 for details.

Table 11 (Cont.)

Attached Table 11-3 List of the Acceptance of the "Three-simultaneousness" Principle

Stage	Project Description		Schedule	Responsible Party
Construction period	Water quality protection measures	Reasonable application of chemical fertilizers	Implement step by step during afforestation and tending	Contactor
	Measures for water and soil conservation	Clearing and preparation mode of forest land	During clearing and soil preparation	Contactor
		Setting of bamboo joint-like ditch	Carry out during forest land preparation	Contactor
		Conform to the mountain lie and get harmony with the surrounding; avoid large-scale excavation and filling, to reduce the damage to original surface	During construction of access way and guard shed	Contactor
		Vegetation protection of forest land along dip, slope top, ravine and river bank.	During clearing and soil preparation	Contactor
	Solid waste	Collection and handling of plastic film, chemical fiber woven bag and household garbage	During planting and fertilization	Contactor
		Collection and handling of domestic waste	During mobilization of constructors	Contactor
		Upon centralized collection of pesticide wrappage and container, entrust them to the units with corresponding hazardous waste treatment qualification for proper disposal	During application of pesticide	Contactor
	Fuel exhaust gas of transport vehicle	Choose automobiles whose emission of tail gas meet relevant standards	Construction process	Contactor
	Water environmental protection measures	Reasonable application of chemical fertilizers	Afforestation management period	Operator
Operation period	Solid waste	Collection and handling of chemical fertilizer packaging bag and household garbage	Afforestation management period	Operator
		Upon centralized collection of pesticide wrappage and container, entrust them to the units with corresponding hazardous	Afforestation management period	Operator

		waste treatment qualification for proper disposal		
	Ecological environment protection measures	Eco-environmental protection publicity of this project	Afforestation management period	Operator
		Forest fire prevention facility and fire extinguishing equipment	Afforestation management period	Operator
		Forest disease and pest control system	Afforestation management period	Operator
		Ecological environment monitoring	Afforestation management period	Operator

Table 12 Public Participation

I. Purposes of Public Participation

From construction to operation, the Project will bring about certain favorable or unfavorable influences to the surrounding natural environment and social environment, and will directly or indirectly influence the working, daily life, study, rest and entertainment of the public in the region where the Project is located. Through public participation as well as listening and understanding the public's points, opinions and suggestions on the project, the possible omission and negligence in the environmental impact assessment may be remedied; the environmental resources may be more comprehensively understood and utilized to make the project design become better and more reasonable, to make environmental protection measures become more practical and to provide scientific evidences for government departments during decision-making; the environmental awareness of the public may be improved, the public may also be encouraged to take part in environmental protection voluntarily, and more people may understand the meaning of the Project and the environmental problems that may possibly be caused, so that they may support and understand, which will be beneficial to the smooth implementation of the Project.

II. Survey Methods and Respondents of Public Participation

1. Survey methods

The public participation in the environmental impact assessment of the Project is mainly conducted in the ways of random consultation and questionnaire. The project team conducted surveys for the public and organizations from the surrounding area under the influence of the project site on the attitudes, opinions and suggestions relating to the environmental protection of the Project, and the respondents answered questionnaires independently based on their own feelings. The project team then carried out generalization, summarization and analysis for the survey according to the questionnaires and interview transcriptions.

2. Respondents

(1) Public

They mainly consisted of the residents near the proposed project area. During selection of public representatives, the universality and randomness were considered as two key points, region, age structure, cultural structure and occupational composition were also taken into consideration.

(2) Organizations

They mainly consisted of the local government agencies, villagers' committees and enterprises.

III. Survey Results and Analysis of Public Participation

1. Results of survey for organizations

During the survey for the public participation, 14 questionnaires were issued to several organizations including government departments, villagers' committees, enterprises and health centers in the project influence area. Refer to Attached Table 12-1 for the detailed statistics. The comments and suggestions for the survey results are as follows:

Table 12 (Cont.)

(1) Most of the organizations that had been investigated were satisfied with the local environmental quality conditions.

(2) All organizations thought that the site selection of the Project was feasible.

(3) All organizations thought that the implementation of the project would have positive effects on the local forestry planning, and no organization thought that the project would have adverse effects on the local forestry planning.

(4) All organizations agreed with the implementation of the Project.

(5) Most of the organizations thought that the project would have positive effects on the local economy, and no organization thought that the project would have adverse effects on the economy.

(6) Most of the organizations thought that the Project would have little influence on surrounding environment after operation and would not influence atmosphere and surface water, etc.

Attached Table 12-1 List of Organizations Investigated

S/N	Description	Contact	Address
1	Shuguang Specialized Cooperative for Traditional Chinese Medicinal Materials	13996916206	Echi Town, Qianjiang District
2	Medicinal Materials Purchase Center	13896869320	Heixi Town, Qianjiang District
3	Changxin Agricultural Company	15023558555	Qianjiang District
4	Wuguibao Cooperative for Medicinal Materials	13996992093	Apengjiang Town, Qianjiang District
5	Collection Point of Traditional	13609480752	Qianjiang District

	Chinese Medicinal Materials		
6	Specialized Cooperative for Traditional Chinese Medicinal Materials	15683567888	Zhongtang Township, Qianjiang District
7	Futai Specialized Cooperative for Medicinal Materials	15025748366	Heixi Town, Qianjiang District
8	Neighborhood Committee, Jinqiao Community, Chengdong Street, Qianjiang District	13452238466	Qianjiang District
9	Villagers' Committee of Zhongyuan Village, Shihui Town	13638207426	Zhongyuan Village, Shihui Town
10	Xinjian Village, Nanhai Town, Qianjiang District	13594991285	Qianjiang District
11	Villagers' Committee of Fengshan Village, Baishi Township, Qianjiang District	13996990321	Qianjiang District
12	Tuanjie Community, Zhengyang Street, Qianjiang District	13594951369	Qianjiang District
13	Villagers' Committee of Wuli Village, Wuli Township, Qianjiang District	13996955705	Qianjiang District
14	Villagers' Committee of Huoshiya Village, Shijia Town	13594983738	Qianjiang District

In brief, the local government, enterprise and public institutions and social organizations near the project site were willing to support and make contribution to the construction of the Project. Meanwhile, they thought it would be important to protect ecological environment and prevent water loss and soil erosion during the project construction and development process.

Table 12 (Cont.)

2. Results of survey for individuals

The survey for individuals was carried out in the way of issuing questionnaires and the public were well aware of the survey. Different regions, ages, educational levels and jobs were taken into consideration when selecting the representatives of the public. In this survey, 40 questionnaires for individuals were issued and then returned, and the recovery rate was 100%. Refer to Attached Table 12-2 for the detailed list of respondents, and refer to Attached Table 12-3 for the detailed statistics of the survey.

Attached Table 12-2 List of Statistics of Respondents

Name	Gender	Age	Occupation	Educational level	Address	Telephone
Li Jiangqing	Male	/	Farmer	Junior high school	Kuzhu Village, Shanling Township, Qianjiang District, Chongqing City	15923779719
Li Qinghua	Male	/	Farmer	Junior high school	No.6 Group, Kuzhu Village, Shanling Township, Qianjiang District, Chongqing City	13996951842
Wang Chengfeng	Male	47	Farmer	Elementary school	Anshan Village, Baishi Township, Qianjiang District, Chongqing City	13272992219
Jiao Shilian	Male	43	Farmer	Junior high school	Shiqiao Village, Shaba Township, Qianjiang District	18996956798
Cai Guangfeng	Female	50	Farmer	Elementary school	Shiqiao Village, Shaba Township, Qianjiang District, Chongqing City	13896837784
Jin Changshou	Male	49	Farmer	Junior high school	Shengdi Neighborhood Committee, Heixi Town, Qianjiang District, Chongqing City	15823622724
Huang Chaofa	Male	46	Farmer	Elementary school	Shengdi Neighborhood Committee, Heixi Town, Qianjiang District, Chongqing City	15683560129
Wang Zhenjin	Male	/	Farmer	Junior high school	Shengdi Neighborhood Committee, Heixi Town, Qianjiang District, Chongqing City	15310786539
Jian Chunfeng	Female	54	Farmer	Elementary school	Lianghe Neighborhood Committee, Apengjiang Town, Qianjiang District, Chongqing City	13996992093
Dai Anxiang	Female	54	Farmer	Elementary school	Lianghe Neighborhood Committee, Apengjiang Town, Qianjiang District, Chongqing City	13996992093
Wu Wanyuan	Male	/	Farmer	Junior high school	Nanxi Village, Echi Town, Qianjiang District, Chongqing City	13896436747

Ran Guangsheng	Male	/	Farmer	Junior high school	Nanxi Village, Echi Town, Qianjiang District, Chongqing City	15923607461
Li Shengjian	Male	45	Farmer	Elementary school	Qingshan Village, Shihui Town, Qianjiang District, Chongqing City	18723980515
Qin Guangyan	Male	38	Farmer	Junior high school	No.3 Group, Fengshan Village, Baishi Township, Qianjiang District	13896477710
Liu Chunjian	Male	36	Farmer	Junior high school	No.4 Group, Zhengyang Street, Qianjiang District	13594925063
Gong Zhengwei	Male	38	Farmer	Junior high school	No.4 Group, Zhengyang Street, Qianjiang District	13896830199
Gong Jiehua	Male	32	Farmer	Junior high school	No.4 Group, Zhengyang Street, Qianjiang District	13038332188
Zhu Shoulian	Male		Farmer	Junior high school	Huixi Village, Shihui Town, Qianjiang District, Chongqing City	13896836952
Qin Guangchao	Male	38	Farmer	Junior high school	No.3 Group, Fengshan Village, Baishi Township, Qianjiang District	15856017257
Qin Guangyou	Male	52	Farmer	Elementary school	No.3 Group, Fengshan Village, Baishi Township, Qianjiang District	13594915647
Qin Guangyin	Male	60	Farmer	Junior high school	No.3 Group, Fengshan Village, Baishi Township, Qianjiang District	13452245567

Table 12 (Cont.)

Attached Table 12-2 (cont.) List of Statistics of Respondents

Name	Gender	Age	Occupation	Educational level	Address	Telephone
Huang Xingjie	Male	40	Farmer	Junior high school	No.5 Group, Zhongyuan Village, Shihui Town	18716908022
He Zeli	Male	45	Farmer	Junior high school	No.4 Group, Xinjian Village, Nanhai Town, Qianjiang District	13512301295
Zhang Fenglian	Female	42	Farmer	Junior high school	No.4 Group, Xinjian Village, Nanhai Town, Qianjiang District	15923766679
Tang Xingqiong	Female	36	Farmer	Junior high school	No.4 Group, Xinjian Village, Nanhai Town, Qianjiang District	15523695862
Wang Shicui	Female	40	Farmer	Junior high school	No.4 Group, Xinjian Village, Nanhai Town, Qianjiang District	13638218790
He Zuqing	Male	58	Farmer	Junior high school	No.4 Group, Xinjian Village, Nanhai Town, Qianjiang District	15923643504
Li Jinlin	Male	53	Farmer	Junior high school	No.3 Group, Jinqiao Community (east district), Qianjiang District	13594958297
Pang Youjun	Male	59	Farmer	Junior high school	Zhongyuan Village, Shihui Town	13594909441
Huang Youfa	Male	52	Farmer	Junior high school	No.5 Group, Zhongyuan Village, Shihui Town	15025729515
Yang Wendong	Male	46	Farmer	Junior high school	No.5 Group, Zhongyuan Village, Shihui Town	18717076123
Huang Chuansheng	Male	52	Farmer	Junior high school	No.5 Group, Zhongyuan Village, Shihui Town	15123797945
Jin Deping	Male	50	Farmer	Junior high school	No.5 Group, Zhongyuan Village, Shihui Town	13193000617
Li Fangbao	Male	/	/	/	Kuzhu Village, Shanling Township, Qianjiang District, Chongqing City	13008340817
Li Hong	Male	42	Junior high school	Farmer	No.3 Group, Jinqiao Community (east district), Qianjiang District	13896801999
Sun Zhi	Male	46	Farmer	Senior high school	No.2 Group, Jinqiao Community (east district), Qianjiang District	13896858226
An Bangfa	Male	47	Farmer	Junior high school	No.1 Group, Jinqiao Community (east district), Qianjiang District	13996945633
An Bangliang	Male	43	Farmer	Junior high school	No.1 Group, Jinqiao Community (east district), Qianjiang District	13193008809
Wang Kefeng	Male	45	Farmer	Junior high school	No.2 Group, Jinqiao Community (east district), Qianjiang District	13212481011

Sun Zhi	Male	46	Farmer	Senior high school	No.2 Group, Jinqiao Community (east district), Qianjiang District	13896858226

Attached Table 12-3 List of Statistics of Survey Conditions

Statistics of survey conditions:

1. Are you satisfied with the local environmental quality conditions? Satisfied 83% Basically satisfied 17% Not satisfied 0%

2. Do you think the site selection of the Project is feasible? Feasible 100% Basically feasible 0% Not feasible 0%

3. What effects you think the implementation of the Project will have on the forestry planning? Positive effect 100% No effect 0% Adverse effect 0%

4. What is your attitude towards the construction of the Project? Agree 100% Not agree 0% Don't know 0%

5. What effects you think the project will have on local economy? Positive effect 100% No effect 0% Adverse effect 0%

6. What effects you think the project will possibly have on the environment during operation? Exhaust gas 0% Waste water 0% Soil 78% Solid waste 0% Others 22%

7. Other comments or suggestions:

(1) Avoiding ecological environment pollution as far as possible and achieving sustainable development;

(2) Reducing damages to original vegetation as far as possible;

(3) Conducting planting technology training.

To sum up, the personal opinions, suggestions and ideas of respondents were fully and freely expressed in this survey, and the environmental protection awareness of the public was improved. The public showed certain concerns about the influences of the Project on social economy, environmental pollution and ecological damage, and most of the public agreed the Project and actively supported the construction of the Project.

Table 13 Conclusions and Suggestions

I. Conclusions

1. Necessity of Project Construction

The global climate change is a hot issue and key consideration of the international environment and development field and ranks first among the top 10 global environmental problems. Global warming has become an indisputable fact. The international community has passed *United Nations Framework Convention on Climate Change* and *Kyoto Protocol* which serve as the basic framework for the international cooperation to cope with the climate change. As a responsible developing country, China pays much attention to the climate change and set up a national coordination organization for climate change countermeasures. State Forestry Administration formulated *Action Points for China's Forestry Departments in Response to Climate Change During the 12th Five-Year Plan Period* to speed up afforestation, in which it sets out major actions to be taken by forestry supervision authorities, including comprehensively carrying out forest tending and management, strengthening forest resource management, strengthening prevention of forest disaster, cultivating emerging forestry industry, and cultivating healthy and high-quality forest scientifically. Furthermore, it especially emphasizes that prevention and control of major forestry pests such as the pinewood nematode shall be enforced.

2. Main Construction Content of Project

The main construction content includes new economic forest with an area of 1400ha and auxiliary facilities (14 guard sheds).

3. Conformity of Project with Industrial Policies and Related Planning

(1) Analysis of Conformity with National Industrial Policies

The project to be built is for the construction of the new afforestation project, belongs to projects specified in the Article 34 “carbon sequestration forest projects, tree and grass planting projects and forestry tree seedling projects” of the Article I “Agriculture and Forestry” in the categories encouraged by *Directory Catalogue on Adjustment of Industrial Structure* (version 2011), and is beneficial to promote ecological balance and effectively prevent water and soil loss. Therefore, the proposed project meets the industrial policies.

(3) Analysis of Conformity with *12th Five-year Plan for Forestry Development of Qianjiang District*

In the *12th Five-year Plan for Forestry Development of Qianjiang District*, the overall objectives including the forest coverage shall reach 52% in 2015, and the forest coverage

shall reach 55%, the greening rate of built up sub-area in urban areas shall reach 40%, public green area per capital shall reach 16 square meters, the greening rate of roads and river systems shall be up to over 90%, total output value of forestry shall achieve RMB 1.7 billion, and Qianjiang District will be built into a city with favorable ecological environment and preliminarily complying with the standard for "National Forest City", are clearly proposed. The propose project will build an economic forest with an area of1400 ha, so its development objectives are the same with those of Qianjiang District.

To sum up, the proposed project is consistent with the requirements of national policies and relevant planning.

4. Results of Evaluation on Present Environment Quantity Conditions

In the area where the proposed project is located: the air quality indicators meet standards and the present quality conditions of atmospheric environment are good; the indicators of pollutant in surface water areas can meet the requirements and the present quality conditions of surface water environment are good; the environmental noises can meet Class II standards, noise standards are not exceeded, and the noise environmental quality is good.

Table 13 (Cont.)

5. Conclusion of Environmental Impact Assessment

Implementation of the Project may facilitate full use of multiple functions and benefits of the forest land, especially in favor of increase of forest land area of the project area and improvement of the regional ecological environment. The project construction is also with positive influences such as water impounding, fertilizer retaining, air purification, carbon sequestration and oxygen release.

During the project construction process, there are certain adverse effects on the environment. The main influences during the construction period include damages to original earth surface, cutting of vegetation, animals being influenced by construction activities, soil and water pollution caused by improper use of pesticides and chemical fertilizers, and solid waste pollution due to waste packing material (plastic films and chemical fiber woven bags) and waste wrappage and container of pesticides; there will be no centralized construction camps, so the Project will not produce new domestic garbage and waste water; the automobile exhaust generated by transport vehicles of the Project has little influence on the environment. During the operation period, the main adverse effects on the environment include: soil and water pollution caused by improper use of pesticides and chemical fertilizers as well as ecological environmental risks that may possibly caused by plant diseases, insect pests and forest fire. The domestic garbage and waste water produced by forest management personnel is little, so the influence can be ignored.

6. Measures for Environmental Pollution Prevention and Ecological Protection and Effectiveness Analysis for the Measures

(1) Prevention and control for water loss and soil erosion: organize construction personnel to participate in trainings to learn relevant knowledge on preventing water loss and soil erosion before construction; select proper afforestation land and low-yield cultivating forest land, and do not select locations with a gradient greater than 25°; do not use control burning to clean forest land, conduct hole cultivation for soil preparation for afforestation instead of full cultivation, and set bamboo joint-like ditches along contour lines according to requirements; reserve original vegetation belts with a certain width at mountain top, mountainside and foot, and do not cut down the vegetation at steep slopes, slope crests, ravines and river banks; conduct forest reclamation along contour lines; construct access roads and guard sheds depending on mountains and in conformity with

land terrain, do not carry out heavy excavation and backfilling, and use the excavated surface soil for backfilling; apply manual construction and operation as much as possible to avoid serious surface damage and water loss and soil erosion by mechanical operation; shorten operation time as much as possible during afforestation and soil preparation, and cover excavated soil with films to avoid severe water loss and soil erosion; avoid rain spell as much as possible during construction, and take measures to prevent water loss and soil erosion due to rainwater; through the above-mentioned measures, the water loss and soil erosion caused by earth surface damages can be effectively reduced during the construction process.

(2) Ecological protection

Select afforestation land reasonably, and do not select locations with good vegetation distribution and locations under protection and having a sensitive ecology; pay attention to the protection of rare plants during forest land cleaning, organize personnel specialized in forestry to conduct detailed investigation for plant resources of the afforestation land before forest land cleaning, carry out in situ conservation or transplantation protection for rare plants confirmed through investigation and prohibit cutting down trees at will; protect cultivated land strictly and prohibit using cultivated land for afforestation; strength the animal protection publicity and education for construction personnel and prohibit them from hunting wild animals; carry out fire prevention work during construction to avoid forest fire. The animal and plant resources may be effectively protected through putting the above-mentioned measures into practice.

Table 13 (Cont.)

(3) Prevention and control of pesticide residue: clean forest land environment in project area; investigate surrounding environment of forest land before afforestation; control sources of pest and disease; timely conduct nurturing of forest land; pay attention to sanitation of forest land; improve resistance of forest land against pest to reduce occurrence rate of plant diseases and insect pests; for pest control during the construction and operation periods: employ biological control as the main measure and reduce pesticide usage; if chemicals are necessary, use non-polluted pesticides with a low toxicity and residue; upon application of pesticide, pay attention to quantity, time and mode of spraying to avoid excessive spraying for one time which may cause waste of pesticide and loss of excessive pesticide which may enter the environment; avoid use of pesticide in rainy season, especially before the downpour; in addition, pay special attention to mixture of pesticide and cleaning of pesticide container, and do not select potable water sources of wild animals and people and livestock as the cleaning sites of pesticide container; conduct trainings on safe management, storage and application of chemical insecticide for workers and forest workers before they using that. In this way, the adverse environmental impacts that may possibly caused by use of pesticide may be reduced at the maximum degree.

(4) Prevention and control for adverse effects due to use of chemical fertilizers: strengthen training for the forest culture and management personnel on the knowledge related to fertilization and formulate reasonable fertilization plan; advocate to apply organic fertilizer (such as farmyard manure) and apply organic fertilizer upon returning of surface soil to the hole during land preparation; bury the grass and leaves beside the stump during tending to increase organic fertilizer in the forest land and to reduce quantity of chemical fertilizer; carry out soil testing and formulated fertilization according to the actual soil conditions of the project site, use chemical fertilizers (types and quantity) reasonably and avoid overfertilization which will cause fertilizer loss and environmental pollution; collect and duly handle the chemical fertilizer wrappage to prevent the residual chemical fertilizer on the wrappage entering the water body with the rain which may cause environmental pollution. In the premise of taking the above-mentioned measures, the water environment will not be influenced obviously.

(5) Prevention and control of solid waste pollution:

Collect the film and the chemical fiber woven bag and reuse them for seedling

packaging; collect the damaged film and chemical fiber woven bag which cannot be reused in a centralized way and deliver them to local landfill site for disposal; collect and handle domestic garbage produced by forest culture and management personnel during the operation period in a proper way; waste wrappage and container generated during application of pesticide in the construction and operation periods must be subject to centralized collection by the forest base builder of each county and city to entrust them to the units with corresponding hazardous waste treatment qualification for proper disposal. Prior to hazard-free treatment, temporary storage of waste wrappage and container for pesticide must meet the requirements in *Standard for Pollution Control on Hazardous Waste Storage* (GB18597-2001);Through adopting the above-mentioned measures, it can be ensured that no solid waste pollution problem will occur.

(6) Control measures for ecological risks

Strengthen forest fire prevention and control ; construct isolation belts for fire prevention in strict accordance with relevant provisions and requirements; carry out prevention and prediction; establish professional prevention and control team with necessary fire-fighting facilities, to ensure fast extinguishing in case of a fire and to minimize fire severity and size; finally, strengthen management and carry out regular patrol, to avoid the occurrence of a fire. Construct an advanced prediction, forecasting and monitoring system for epidemic situation of pest and disease; discover plant diseases and insect pests timely; use a rotating system for prevention of plant diseases and insect pests in combination with biological control, manual catching and pesticides with high efficiency, low toxicity and short duration; apply medication prevention and control as per the type and age of plant diseases and insect pests; use biopesticides with high efficiency, low toxicity and short duration as much as possible in case of plant diseases and insect pests, to reduce damage to beneficial organisms and pollution to the environment; do not use pesticides with high toxicity and those prohibited by relevant rules and regulations of China.

To sum up, it is considered in the evaluation that the measures required in the report for prevention, treatment and mitigation of environmental impacts are economically and technically feasible.

Table 13 (Cont.)

7. Public Participation

To sum up, the personal opinions, suggestions and ideas of respondents were fully and freely expressed in this survey, and the environmental protection awareness of the public was improved. The public showed certain concerns about the influences of the Project on social economy, environmental pollution and ecological damage, and most of the public agreed the Project and actively supported the construction of the Project.

8. Overall Conclusion of Environmental Impact Assessment

The Project meets national industrial policies as well as 12th Five-year Plan for Forestry Development of Qianjiang District. The implementation of the project is very necessary. The positive effects of the project construction on environment are obvious, but there are also some adverse effects such as vegetation damage, water loss and soil erosion as well as pollution by pesticide and chemical fertilizer, etc., which can be mitigated through adopting effective measures for pollution prevent and treatment and ecological protection. In the area of the proposed project, the present environmental quality is good, and there are no obvious environmental constraints against the project construction. It is considered in the evaluation that, in the premise of timely implementing the measures for pollution prevent and treatment and ecological protection, the project construction is feasible from the angle of environmental protection.

II. Suggestions

1. Put personnel training plans into practice to ensure the project is carried out in a scientific, reasonable and orderly way;

2. Formulate emergency plans for environmental risks, such as emergency plan for forest fire protection;

3. During the project implementation process, respect the residents near the project especially their way of life, properly handle the relationship with the residents, and guarantee charges for services are timely issued.

4. Fore pest control, insist on the principle of prevention first. Realize the sustainable control objectives of low input, high control effect and no pest infestation.

Table 13 (Cont.)

5. Encourage using organic fertilizer, green manure and interplanting nitrogen-fixing plants in forests to guarantee nutrition supply for seedling and accelerate forest establishment speed.

6. Carry out soil monitoring and survey before constructing bases, conduct ambient air quality status monitoring for forest bases near industrial and mining enterprises, and carry out adjustment (such as planting commercial forest) for locations with a high heavy metal content in soil and serious ambient air pollution; conduct soil improvement for alkaline soil which is not suitable for forest, guarantee afforestation benefit of forest bases, and fulfill the requirements for green wood production bases as far as possible.

Extraction from *Environmental Protection Law of the People's Republic of China*

Article 26 Installations for the prevention and control of pollution at a construction project must be designed, built and commissioned together with the principal part of the project. No permission shall be given for a construction project to be commissioned or used, until its installations for the prevention and control of pollution are examined and considered up to the standard by the competent department of environmental protection administration that examined and approved the environmental impact statement.

Article 36 When a construction project is commissioned or put to use in circumstances where facilities for the prevention and control of pollution either have not been completed or fail to meet the requirements specified in state provisions, the competent department of environmental protection administration responsible for the approval of the environmental impact statement on the construction project shall order the suspension of its operations or use.

Extraction from Regulations of Chongqing Municipality on Environmental Protection

Article 17 Environmental protection application and registration system, environmental impact assessment system and the "Three-simultaneousness" system of "environmental protection facilities at a construction project must be designed, built and commissioned together with the principal part of the project" must be executed for construction projects such as new construction, extension, reconstruction, technical transformation and regional development.

Administrative departments in charge of environmental protection at different levels must strictly manage and supervise the environmental protection of construction projects, and take full charge of evaluation and approval of environmental impacts of construction projects, examination of the "three-simultaneousness" system as well as completion acceptance of environmental protection facilities. Administrative departments in charge of environmental protection must not give permission to project approval, construction or commissioning of construction project being unable to meet the environmental protection standards and requirements.

Article 25 For the development and construction of the Three Gorges Reservoir Area, the water resource and vegetation must be protected, and the development strategy of an ecological economic zone must be implemented. For the relocation of towns and enterprises as well as the construction of settlements, environmental protection plans shall be formulated, and the environmental impact assessment system and the "three-simultaneousness" system shall be strictly executed.

Extraction from *Regulations on the Administration of Construction Project Environmental Protection*

Article 25 Whoever starts construction without authorization, without the approval of the construction project environmental impact report, environmental impact statement or environmental impact registration form or without the consent upon re-examination and re-verification of the original examination and approval organ shall be ordered by the competent department of environmental protection administration responsible for the examination and approval of the said construction project environmental impact report, environmental impact statement or environmental impact registration form to stop the construction, restore the original state within the given time period, and may be imposed a fine of less than RMB 100000 Yuan.

Article 26 The matching environmental protection facilities built for the construction project that goes into trial production fail to go into operation simultaneously with the main body project in violation of the provisions of these Regulations shall be ordered by the competent department of environmental protection administration responsible for the examination and approval of the said construction project environmental impact report, environmental impact statement or environmental impact registration form to make a rectification within the given time period; whoever fails to make a rectification on expiry of the given time period shall be ordered to stop the trial production, and may be imposed a fine of less than RMB 50000 Yuan.

Article 27 A construction unit that fails to file an application for acceptance checks on completion of construction of the environmental protection facilities of a construction project having gone into trial production for more than 3 months in violation of the provisions of these Regulations shall be ordered by the competent department of environmental protection administration that examined and approved the said construction project environmental impact report, environmental impact statement or environmental impact registration form to go through the formalities of acceptance checks on completion of the environmental protection facilities within the given time period; whoever fails to complete the said formalities shall be ordered to stop the trial production and may be imposed a fine of less than RMB 50000 Yuan.

Article 28 Where the main body project formally goes into production or is delivered for use without the completion of construction of matching environmental protection facilities required for the construction project, without going through acceptance checks or without passing the acceptance checks in violation of the provisions of these Regulations shall be ordered by the competent department of environmental protection administration that examined and approved the said construction project environmental impact report, environmental impact statement or environmental impact registration form to stop the production or use, and may be imposed a fine of less than RMB 100000 Yuan.