Construction Project in Chongqing Municipality

Environmental Impact Report

(Draft for Approval)

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

Issued by Chongqing Environmental Protection Bureau

October 1999

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

Project name	Chongqing Forestry Development Project Funded by EIB Loan for Forestry Sector (Wulong Subproject)				
Employer	Forestry Bureau of Wulong County				
Legal representative	Zheng Shirong		Contact person	Chen Qinghua	
Telephone No.	15923725678		Postal code	408500	
Mailing address	No. 50, West Furong Road, Xiangkou Town, Wulong County				
Construction site	Wulong County of Chongqing Municipality				
Approval authority	Environmental Protection Bureau of Wulong County, Chongqing Municipality		Filed project code	/	
Project nature	■New project □Reconstruction/expansion □Technical innovation		Industry category	Forestry breeding and planting	
Total investment	RMB 336,113,600	Environmental protection investment	RMB 14.85 million	Investment ratio	4.4%
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. 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.

Table 1 (Cont.)

In order to further give play to the important role of forestry in coping with the global climate change, to enhance the fundamental position of forestry in China's Western Development Campaign and to conduct active exploration in utilizing foreign investment to develop afforestation projects, National Development and Reform Commission (NDRC) organized many provinces to apply for the Forestry Development Project Funded by EIB Loan for Forestry Sector and issued Notice on Issuing R*equest by NDRC on Planning of Utilizing Special Framework Loan from EIB for Forestry Sector* (FGWZ [2012] No.396).In light of the actual conditions of Wulong County and its forestry conditions, Wulong County, on the basis of researches, decided to apply for the Forestry Development Project Funded by EIB Loan for Forestry Sector to expand the total quantity of forest resources, promote the forest quality, improve the eco-environment, boost the income of farmers and facilitate the sustainable development of the forestry, society and economy of Wulong County by using the funds and the advanced forestry management and operation experience from Europe.

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(W)HPT[2013] No.015), the environmental impact assessment of this project was completed in the form of environmental impact report. Engaged by Forestry Bureau of Wulong County, 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 (Wulong Subproject).*

1.1.2 Necessity of the Project

(1) It is Necessary for Response to Chinese Government's Policy of Actively Copping with Climate Change and Rehabilitating and Developing Forest Resources

At the 15th APEC meeting in 2007, Hu Jingtao, President of China, set forth Chinese Government's views and suggestions on climate change and promised to improve China's

forest coverage from 18.21% to 20% by 2010, and furthermore proposed to establish the "Asia-Pacific Network for Sustainable Forest Management and Rehabilitation". At the Summit on Climate Change organized by the United Nations in September 2009, President Hu Jintao said that China would make efforts to increase forest carbon sinks and strive for an forest area 40 million ha more and an forest growing stock 1.3 billion cubic meters more than that of 2005 by 2020. Therefore, forestry development is the demand of China to facilitate its sustainable economic and social development and fulfill its international commitments; it is an urgent demand of China's long-term forestry development strategy to accelerate forestry ecological construction and continuously improve the resource environmental carrying capacity.

(2) It is Necessary for Building Ecological Barrier Zone in Upper Reaches of the Yangtze River to Safeguard Ecology of Three-Gorge Reservoir Area and the Middle and Lower Reaches

The Yangtze river runs through 19 provinces/regions/municipalities and the whole river basin covers an area accounting for 18.75% of the territory area of China. The middle and lower reaches of the river is a zone with the best economic and social development in China.

Table 1 (Cont.)

At a very important ecological location, the Yangtze River Basin is a key area for forestry development and ecological construction of China. The ecological condition of the Three-Gorge Reservoir area and the upper reaches of the Yangtze River is directly related to safety of Three-Gorge Reservoir and welfare of the people living in the Yangtze River Basin. However, this area is ecologically vulnerable and the more and more severe land rocky desertification endangers the regional land ecological safety. To build the ecological barrier zone in upper reaches of the Yangtze River to safeguard ecology of Three-Gorge Reservoir area and mitigate water and soil erosion is an urgent and difficult task before us.

Located in the central area of the upper reaches of the Yangtze River, where there are large cities, large rural areas, large reservoir area, large mountain areas and ethnic areas, Chongqing has a very important ecological location and undertakes the significant mission to safeguard the ecological safety of the Three-Gorge Reservoir area and the middle and lower reaches of the Yangtze River. In January 2009, the State Council issued *Opinions on Promoting Overall Urban and Rural Reformation and Development of Chongqing*, which states that Chongqing shall significantly improve its eco-environmental quality and increase

its forestry coverage to 45% by 2020 and build the municipality as the ecological barrier zone for the upper reaches of the Yangtze River. It further defines the strategic position of Chongqing and fully reflects the new and more severe requirement for the forestry construction of Chongqing set by the state. In May 2009, the State Forestry Administration printed and issued *Opinions on Implementing 'Opinions on Promoting Overall Urban and Rural Reformation and Development of Chongqing'*, which requires to make efforts to build Chongqing as the pilot area for overall urban and rural modern forestry reformation and development and the demonstration area for ecology and civilization of upper reaches of the Yangtze River. Located in the southeast of Chongqing and the lower reaches of the Wujiang River which is a major tributary of the Yangtze River, Wulong is a key area for prevention and control of water and soil erosion in Three-Gorge Reservoir area. Under the dissection by the Wujiang River and its tributaries for a long time, a rocky desertification area in a tree shape with the Wujiang River as the trunk was formed. Through this project, lots of ecological forests will be created, which is the urgent demand to mitigate water and soil erosion, prevent the further rocky desertification, build the ecological barrier zone in upper reaches of the Yangtze River, and safeguard the safety of Three-Gorge Reservoir area.

(3) It is Necessary for Accelerating Integrated Rocky Desertification Control in Karst Area

Rock desertification refers to the land degradation similar to desert caused by vegetation degradation, water and soil erosion, and rock exposure in large area due to unreasonable human activities in areas with vulnerable karst geological conditions. With a rocky desertification area of 930,000 ha, Chongqing Municipality is among the 8 areas with the most severe rocky desertification, and it directly affects the ecological safety of the middle and lower reaches of the Yangtze River. Located in a typical karst area where rocky desertification is severe, Wulong County has a rocky desertification area of 41698.8 ha, including the slight rocky desertification area of 20166.5 ha, medium rocky desertification area of 21128.7 ha, high rocky desertification area of 374.9 ha, and potential rocky desertification area of 65391.9 ha. It has been listed as a key country at national level for integrated control of rocky desertification. According to Implementation Plan for Chongqing's Key Integrated Control Counties Involved in Rocky Desertification Integrated Control Project in Karst Areas 2011-2013, the area for rocky desertification control is 4704ha and the rocky desertification area of 36994.8 ha is not included in the control area. Through this project, a

medium rocky desertification area of 1193 ha will be regulated and kept under control.

Table 1 (Cont.)

(4) It is Necessary for learning advanced experience of other countries

European Investment Bank has developed a set of scientific and standard project management methodology on forestry project construction management. It treats the project as an engineering system and follows the management principle of quality first. It also has a complete quality management system and rich experience. However, project management is a weakness of China in implementation of international forestry cooperation projects. We should set up a complete set of strict management system according to the project agreements and implement it carefully. In addition, we should, based on advantages and disadvantages of international cooperation projects, learn and introduce the advanced international project management experience in an innovative manner and gradually explore and develop a set of scientific project management mythology in line with Chinese characteristics.

In forestry operation, developed countries, on the basis of the close to nature theory, lay emphasis on promotion of standing forest quality and make full play to the protection function of forests, and at the same time, they can keep their economic effect of forestry at a high level. We should learn the above experience for reference in the process to change the current situation of forestry operation in China that attention is only paid to quantity but not quality and the protection function is in conflict with economic development function of forests. In forestry project construction management and forestry operation, it is an urgent demand for us to learn advanced experience of other countries.

(5) It is Necessary Accelerating Eco-tourism Development of Wulong County

As one important national tourist attraction characterized by eco-landscape, the only one pilot demonstration area based on a county among the 10 forest tourism pilot demonstration areas of China, one of the top 10 tourist attractions of Chongqing Municipality, and an excellent tourism city of China, Wulong County has rich tourism resources such as Xiannv Mountain National Forest Park (a AAAAA scenic spot), Wulong Karst National Geopark-Giant Doline and Crevice of Tianshengqiao Group (the largest one in Asia), Furongjiang Scenic Spot praised as "underground artistic palace and speleology museum", Baima Mountain praised as "bio-gene bank", Furongjiang Reservoir Area, 1000-li Wujiang River Scenic Gallery, Longshuixia Crevice, and Huangbaidu Drifting Scenic Spot.

Endangered by forestry pests and rocky desertification, it is an urgent demand for Wulong to protect forest resources of its scenic spots. Through this project, the forest ecosystem will be properly rehabilitated and improved and forest scenic spots with distinct seasonal features will be developed. Furthermore, forest scenery will be enriched and at the same time the eco-environment of the project area will be further optimized. In this way, the scenic spot quality will be improved and thus more tourists will be attracted.

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.

Table 1 (Cont.)

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 various townships and towns of Wulong County. In this assessment, the environmental monitoring data given in the 2012 environmental quality bulletin of Wulong County 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, no industrial production flow process will be established, no pollutants will be directly discharged and no hazardous chemicals will be used after completion of the proposed project. 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 (Wulong Subproject)

(2) Project sites: the construction sites of the proposed project are 19 towns/townships of Wulong County of Chongqing Municipality (including Xiangkou Town, Huangying Township, Yangjiao Town, Changba Town, Huolu Town, Pingqiao Town, Baiba Town, Yajiang Town, Wenfu Township, Shiqiao Township, Shuanghe Township, Fenglai Township, Miaoya Township, Tongzi Town, Tiekuang Township, Tudi Township, Jielong Township, Baiyun Township, and Houping Township) along with Xianlvshan Forestry Station and Baimashan Forestry Station.

(3) Construction Scale and Contents

The total investment of the proposed project is RMB 336.1136 million. The main construction content of the proposed project includes the new afforestation works and the works for creating a forest ecological system under sustainable development: the area of the new afforestation works is 6400 ha, including the timber forest with an area of 905 ha and the economic forest with an area of 5495 ha; the works for creating a forest ecological

system under sustainable development includes 133 ha for Jujube witches broom prevention and control, a 15km long isolation belt for biological prevention and control, a 100km long isolation belt for biological fire prevention, and 7 fire towers. Refer to Attached Table 1-1 for details.

The Proposed project adopts the existing roads and no new roads will be laid, which avoid the potential risks of such secondary disasters as destruction of existing vegetation, new water loss and soil erosion, mud-rock flow and landslide due to construction of highway or road.

Table 1 (Cont.)

Attached Table 1-1 Composition of the Proposed Project			
Item	Construction Content		Remarks
Main works	New afforestation with an area of 6400 ha	905 ha timber forest	
		5495 ha economic forest	/
Auxiliary works	Works for creating a forest ecological system under sustainable development	Jujube witches broom prevention and control	133 ha
		Isolation belt for biological prevention and control	15 km
		Isolation belt for biological fire prevention	100 km
		Fire tower	7

(4) Construction Organization

All the seedlings used for the construction period of the proposed project will be purchased from qualified vendors. 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 300 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 (including 2 years of tending period for young forest).

(6) Project Fund and Fund Raising

Upon estimation, total investment in the project construction period is RMB 336.1136 million, including the EIB loan for forestry sector, local supporting fund, and the money invested by the beneficiaries. The EIB loan for forestry sector is RMB 168.00 million, roughly equivalent to EUR 21 million and accounting for 49.98% of the total investment. The local supporting fund is RMB 48.5859 million, accounting for 14.45% of the total. The

money invested by the beneficiaries is RMB 119.5277 million, accounting for 35.57% of the total.

(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 afforestation		ha	6400	
1.1.1	Timber forest		ha	905	
1.1.2	Economic forest		ha	5495	
1.2	**Works for creating a forest ecological system under sustainable development**				
1.2.1	Prevention and control of forestry pest	Jujube witches broom prevention and control	ha	133	
		Isolation belt for biological prevention and control	km	15	
1.2.2	Forest fire control infrastructure	Isolation belt for biological fire prevention	km	100	
		Fire tower	Nr.	7	
2	**Amount of investment**				
2.1	Direct project cost		RMB 10,000	28792.832	
2.1.1	New afforestation cost		RMB 10,000	25073.57	
2.1.2	Auxiliary facilitates construction cost		RMB 10,000	2760.3	
2.1.3	Institution support and project management, monitoring and evaluation cost		RMB 10,000	958.9	
2.2	Other expenses		RMB 10,000	2567.37	
2.3	Reserve fund (contingency cost)			1439.64	
2.4	Interests during construction period		RMB 10,000	811.53	Converted into RMB
3	**Source of fund**				
3.1	Money borrowed from EIB		RMB 10,000	16800	Converted into RMB
3.2	Local supporting fund		RMB 10,000	4858.59	
3.3	Money invested by beneficiaries		RMB 10,000	11952.77	
4	**Economic benefit (estimated)**				
4.1	Benefit calculation period		Year	25	1 operation period of trees for timber

4.2	Timber output	10,000 m^3	107.57	Subtotal
4.3	Economic forest output	10,000 t	38.1	Subtotal
4.4	Total production value	RMB 10,000	609117.05	Subtotal
4.4.1	Timber production value	RMB 10,000	86238.05	Subtotal

Table 1 (Cont.)

Attached Table 1-2 (Cont.) Main Economic and Technical Indicators				
4.4.2	Economic forest production value	RMB 10,000	519639	Subtotal
4.5	Taxes paid	RMB 10,000	8623.8	Subtotal
4.6	Loan interests in construction period	RMB 10,000	811.53	Subtotal
4.7	Construction period	Year	5	
4.8	Repayment period	Year	25	Including 5 years of grace period

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) Overall planning of stony desertification comprehensive treatment for Wulong County.

2.1.2 Layout principles

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

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

(3) It shall be coordinated with other forestry projects and agricultural projects which are in progress or planning, without overlapping and crossing.

(4) 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 comply with the biological and ecological characteristics of various tree species.

2.1.4 Layout scheme

According to the project layout principles, the project will be constructed in 19 townships and 2 state-owned forest farms. The new constructed afforestation project is arranged in 19 townships including Xiangkou Town, Huangying Township, Yangjiao Town, Changba Town, Huolu Town, Pingqiao Town, Baima Town, Yajiang Town, Wenfu Township, Shiqiao Township, Shuanghe Township, Fenglai Township, Miaoya Township, Tongzhi Town, Tiekuang Township, Tudi Township, Jielong Township, Baiyun Township and Houping Township, and Xiannvshan Forest Farm and Baimashan Forest Farm. Forestry pest control operation is distributed in Yangjiao Town, Fenglai Township and Miaoya Township. The construction of forest fire control infrastructure is arranged in Baimashan Forest Farm and Xiannvshan Forest Farm. 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

Area	Township	Item	Implementing Village
Central area	Xiangkou Town	Economic forest	Huangdu Village, Zhongxin Village, Yantang Village, Guangping Village, Yangjia Village, Sanping Village, Zouma Village and Luhong Village
	Huolu Town	Timber forest	Fazi Village and Wanfeng Village
		Economic forest	Fazi Village, Wanfeng Village, Yunfeng Village, Mushui Village, Cheba Village, Xintian Village, Houcao Village, Xujia Village, Mengchongtang Village, Lujia Village, Baofeng Village, Guanqiao Village and Yanfeng Village
	Yangjiao Town	Economic forest	Beiya Village, Chaling Village and Shichuang Village
		Jujube	Eling Village and Yonglong Village

		witches broom prevention	
Southeast area	Wenfu Township	Economic forest	Gaofeng Village, Qishu Village, Tongluo Village, Xinglong Village, Nanmu Village and Xishan Village
	Shiqiao Township	Timber forest	Tianchi Township
		Economic forest	Tianchi Village, Daping Village, Xianglong Village, Bajiao Village, Liuling Village and Jiajiao Village
Northeast area	Shuanghe Township	Economic forest	Xinchun Village and Tielong Village
	Jielong Township	Timber forest	Lianghe Village
		Economic forest	Lianghe Village, Xiaoping Village and Jielong Village
	Tongzi Town	Timber forest	Guantian Village, Xiangshu Village and Shuangfeng Village
		Economic forest	Fanrong Village, Tongzi Village, Guantian Village, Xiangshu Village and Shuangfeng Village
	Tudi Township	Timber forest	Liujing Village
		Economic forest	Tiansheng Village, Xiaoyan Village and Yanhe Village
	Houping Township	Timber forest	Wenfeng Village
		Economic forest	Baishi Village, Wenfeng Village, Shuanglian Village, Baihe Village, Gaoping Village and Zhongling Village
Southwest area	Baima Town	Timber forest	Chepan Village and Baoyan Village
		Economic forest	Yangliu Village and Lingshan Village
	Changba Town	Timber forest	Hongguang Village and Mingzhu Village
		Economic forest	Hongguang Village, Mingzhu Village, Qianjin Village, Dayuan Village, Eguan Village, Jiancun Village, Shengli Village and Chayuan Village
	Baiyun Township	Timber forest	
		Economic forest	Hongyun Village, Hongse Village, Hongxing Village and Lianchi Village
	Tiekuang Township	Economic forest	Xingfu Village
		Timber forest	

	Huangying Village	Economic forest	Huangying Village, Longxing Village, Shuanghe Village and Xinshu Village
		Timber forest	Huangying Village
Northwest area	Yajiang Town	Timber forest	Gaoxing Village, Qingfeng Village, Sanyuan Village and Xianling Village
		Economic forest	Baohe Village, Gaoqing Village, Qingfeng Village, Sanyuan Village, Xianling Village, Songyue Xianling Village, Yangyan Xianling Village and Tanping Xianling Village
	Pingqiao Town	Economic forest	Gaowu Village, Honglong Village, Longyuan Village, Maoping Village, Nanping Village, Wuyang Village and Zhongcun Village
		Timber forest	
	Fenglai Township	Economic forest	Gaolou Village, GaoshouVillage, Linjiang Village, Qinglong Village, Shizi Village, and Songping Village
		Isolation belt for biological control	GaoshouVillage and Gaolou Village
	Miaoya Township	Economic forest	Fengyou Village, Heping Village, Puping Village, Shuangqiao Village and Yuncong Village
		Isolation belt for biological control	Shuangqiao Village
Forest Farm	Xiannvshan Forest Farm	Timber forest	
		Isolation belt for biological control	
		Fire tower	
	Baimashan Forest Farm	Timber forest	
		Economic forest	
		Isolation belt for biological	

		control	
		Fire tower	

Table 1 (Cont.)

2.2 Land conditions for project construction

The county 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.

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°		
Total	174346.67	102260.00	31986.67	9600.00	1093.33	39006.67
Xiangkou Town	27613.33	17340.00	4686.67	1406.67	193.33	5393.33
Jiangkou Town	12913.33	6526.67	2840.00	853.33	66.67	3480.00
Wenfu Township	10500.00	6806.67	1906.67	573.33	0.00	1786.67
Shiqiao Township	6353.33		1993.33	600.00	0.00	4360.00
Xiannvshan Town	18733.33	12466.67	2113.33	633.33	46.67	4106.67
Shuanghe Township	15586.67	10686.67	2120.00	633.33	680.00	2100.00
Huolu Town	17960.00	9400.00	3980.00	1193.33	33.33	4546.67
Yangjiao Town	9386.67	5240.00	2040.00	613.33	60.00	2046.67
Baima Town	16900.00	10753.33	2226.67	666.67	13.33	3906.67
Heshun Town	10313.33	6766.67	1733.33	520.00	0.00	1813.33
Yajiang Town	12073.33	5540.00	3373.33	1013.33	0.00	3160.00
Xiannvshan Forest Farm	7193.33	6620.00	0.00	0.00	0.00	573.33
Miaoya Township	3586.67	2080.00	1413.33	426.67	0.00	93.33
Fenglai Township	5233.33	2033.33	1560.00	466.67	0.00	1640.00

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 10,784,200 plants. Divided as per afforestation year: 5,489,200 seedlings for 1st year, 2,686,000 seedlings for 2nd year and 2,609,000 seedlings for 3rd year. Added with 10%~20% seedling loss and replanting seedlings, the total demand is up to 12,401,800 on the basis of 15% replanting and re-grafting.

2.3.2 Species of seedlings

Table 1 (Cont.)

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.

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

Species	2014	2015	2016
Juglans regia	109.8	116.8	130.8
Cortex Magnoliae Officinalis	42.9	4.6	0
Zhuyao jujube	43.4	10.7	0
Pyrus spp and Citrus maxima	26	30.5	1.9
Bambusoideae	15.7	19.6	22.3
Larix gmelini and Cunninghamia Lanceolata	14.4	47.7	40.3
Vaccinium spp	14.9	0	0
Diospyros kaki and Prunus salicina	37.2	10.5	3.6
Camellia	214.4	0	0
Rhus verniciflua and Cupressus funebris	0	0	47
Chaenomeles lagenaria	7.4	0	0
Aleurites fordii	3.7	0	0
Singapore cedar	2.06	4.1	
Liquidambar formosana Hance	2.06	4.1	0
Schima superba	7.5	10	7.5
Ligustrum lucidum	7.5	10	7.5
Total	548.92	268.6	260.9

Note: Refer to Attachment 3 for statistic table of construction tasks.

2.3.3 Supply of seedlings

The area of the seedling bases in Chongqing is now up to 25000 ha and the number of nursery seedlings is 1.62 billion with good quality, providing guarantee for the supply of seedlings. 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 allocation and transport of seedlings, the allocation and transfer system of the Municipal Forestry Administration 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

Table 1 (Cont.)

(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 the 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, 200 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 112 guard sheds to be constructed.

2.4.3 Forestry pest control operation

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	Pine wilt disease	It enters xylem tissue through the wound of Monochamus alternatus for extra-nutrition and is parasitic in resin canal. It moves with	Set a biotic isolation belt in risk areas to prevent infection of pine wilt diseases and

		mass propagation and gradually pervades throughout the plant, causing damage and death of parenchymal cells and epithelial cells of resin canal, dehydration of plants, transpiration decrease and sharp reduction and stop of resin secretion. The external symptom is that the needlelike leaves turn tawny and even red brown successively and finally the whole plant dies down.	ensure ecological safety of masson pine area in the project area. The biotic isolation belt is 50m wide and 15km long. Trees planted in the belt are of broad-leaf species including Liquidambar formosana Hance and Cedrela toona.
2	Jujube witches broom	(1) flowers turn into leaves, floral organs become degenerated, flower stalk extends, sepal, petal and stamen turn into leaflets and pistil converts into twig.(2) Sprouts emerge abnormally: main buds on annual development branches and kryptoblasts on perennial braches of diseased or infected plants.(3) Laminas get diseases, mesophyll turn yellow, laminas turn hard and crisp, leaf apex edges get dried up and diseased leaves even come off. (4) Fruits get diseases and diseased flowers cannot fruit.(5) Roots get diseases and cortex decays and even the whole plant dies.	Biological control and chemical control methods

2.5 Establishment of Technological Supporting System for the Project

2.5.1 Project study

Study activities for the Project is to be carried out on forest culture and management, breeding of forest seedlings, planting tests and measurement of carbon density.

(1) Breeding technology of forest seedlings: make study on breeding of forest seedlings and planting tests in combination with EIB-funded projects.

(2) Measurement of forest carbon density: measure the carbon density of various forest trees.

2.5.2 Project construction capacity

In order to ensure successful implementation of the Project, various forms of targeted training must be given to the project participants to achieve high-quality and efficient completion of the Project.

(1) Overseas training and investigation

The administrators and organizers of the Project should actively learn the management experience and advanced concepts aboard. 5-6 direct administrators and organizers should be dispatched to the relevant units in Europe through EIB for training and learning to improve their business level and project management ability.

(2) Domestic training

The departments concerned should actively organize the project organizers and technical backbones to the related units and enterprises with rich experience in EIB-funded projects for learning, such as International Network for Bamboo and Rattan (INBAR). The number of personnel for domestic training is suggested to be 20.

Table 1 (Cont.)

(3) Urban training

Relying on the strong technical force of Chongqing Academy of Forestry, the experts from it should be invited to give technical training by stages for all the technicians and related managerial personnel and organizers of townships participating in the Project to improve their technical level and understanding for the Project and achieve successful implementation of the Project. In terms of the involved townships, the number of personnel for this training is 200.

(4) County training

As thousands of households are involved, the Project cannot be implemented without participation of mass people. They must be provided with training as they were given different education and are living under different environment and accordingly have greatly different understandings of the Project. The related experts or personnel who have gone through the upper class of training should be invited to provide training for them on the significance and importance of the Project, etc. Only their active participation is the root guarantee of project implementation. In terms of the project scale and involved townships, the number of personnel for this training is 2000.

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 seasons: Mid-December to mid-March of the ensuing year for the project area with an elevation of below 1000m; late October or late January of the ensuing year to mid-April for the project area with an elevation of above 1000m.

Planting quality is the main factor that influences the survival rate of afforestation. Prior to planting, immerse the root with clean water or dip it with rooting powder aqueous solution (or mud).The planting depth should be determined per the seedling species and

characteristics. Planting essentials of "deep planting, root stretching and solid tamping" should be mastered. For the shallow-root extension species, the seedlings should be kept vertical with roots spread out and deep planted properly (1/3 of seedlings in height should be buried).In addition, soil should be backfilled in layers and compacted. For the species with deep tap roots, the seedlings should be kept vertical with roots spread out and deep planted, and soil should be backfilled in layers and compacted. Upon soil backing, fill the surface soil firstly and then subsoil, and compact them in layers to combine the roots and soil tightly. Upon planting, each subcompartment should select proper sections with good soil conditions to pre-plant 15% seedlings (in different holes) in the forest. The survival rate in the first year should be 85%.

2.6.2 Tending

Tending management is one of the key measures for successful afforestation. Tending of young forest covers earth loosening, weeding, hilling, stump cultivation, removal of sprout and tiller or trimming, replanting, irrigation, elimination of diseased or infected plants, etc. Tending of young forest should be conducted in good time, which is generally conducted continuously for three years, twice in the 1st year and once respectively in the 2nd and 3rd year, until the canopy is closed to form a forest. If no closed canopy, continue tending once in the 4th year. Economic forest should be tended each year with such tending measures as trimming, fertilizing and watering; trimming of economic forest with high technical requirements should be carried out with training and guidance of technicians.

Table 1 (Cont.)

2.6.3 Fertilization

Except earth loosening, weeding and irrigation, young forest should also be subject to rational fertilization to maintain and increase the soil fertility, maintain balanced nutrient intake of forest ecosystem and boost vigorous growth of forest trees. Fertilization measures include sufficient basal dressing during afforestation and topdressing after afforestation. For basal dressing, animal manure is in the majority and meanwhile some nitrogenous fertilizer and phosphate fertilizer can be added. Topdressing can be conducted during growth season or forest hibernation period. The type, quantity and matching ratio of fertilizers should be selected scientifically based on the analysis and test results of soil in different places. Animal manure and cake fertilizers should be preferentially used for fertilization in winter for

economic forest. For topdressing in growth season, some urea and compound fertilizers can be added in combination with tending management, once to twice each year; dig a 15~20cm deep trench 20~30cm away from saplings and extend it outwards year by year; After fertilization, water and cover them with soil.

2.6.4 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.

2.6.5 Management and maintenance

As the saying goes "30% of Planting and 70% of Management", good management and maintenance of forest is the key of successful afforestation. Prior to afforestation, proper management and maintenance measures must be established and qualified forest rangers should be selected. Forest rangers should have strong sense of responsibility, good mass base, deep love for forestry cause and be in good health. Forest rangers should go on duty promptly after afforestation. The area in the charge will be determined based on the management difficulty degree of the afforestation block. Regular inspection system should be carried out and the responsibilities and rights should be defined. The incomes of forest rangers will be directly linked with their management and maintenance quality.

2.7 Establishment of project monitoring system

2.7.1 Project monitoring

(1) Management monitoring

① Construction process monitoring

Include forestation, cultivation, tending, replanting, and construction of operation passage, guard sheds and fire forest belts.

② Purchase monitoring

Table 1 (Cont.)

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, utilization rate of grade-I seedlings and pass percentage 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 forest carbon sink: Measure and monitor the carbon sink in the 19 involved townships. Monitor the indicators of increased volume of total biomass, conversion rate of biomass and yearly fixed carbon dioxide volume, etc.

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 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

Table 1 (Cont.)

(1) A leading team for the construction of the Project funded by EIB-loan for Forestry Sector of Wulong County will be established, with the Deputy County Head in charge of forestry as the team leader and the major principals from the Development and Reform Bureau, Finance Bureau, Forestry Administration and other relevant departments of the county as members. It is responsible for solution and coordination of significant issues which exist during project implementation. A leading team project office will be set at the county Forestry Administration, consisting of selected personnel from Finance Bureau and Forestry Administration. It is responsible for dealing with the issues related to the project implementation and the contact between the national related departments and the European party, as well as direction and inspection of township work. Responsibilities of each department are follows:

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

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

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

County Audit Bureau: be in charge of supervision on project fund utilization and annual audit.

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

(2) All the involved townships (forest farms) will establish project implementation teams leaded by the heads of townships (heads of forest farms) and relevant members of forestry

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

(3) As principal parts for implementation of the Project, the involved townships (forest farms) in the project area are responsible for completion of specific construction tasks.

2.8.2 Project management

(1) Engineering management

The Project will be constructed in strict accordance with the construction procedures and standards, and design should be carried out before construction. Implement the system of constructor responsibility. Meanwhile, strictly carry out the inspection and acceptance system to ensure a working procedure must pass the inspection before entering the next working procedure. For the inspection and acceptance system, the project office of the County Forestry Administration will dispatch a subcompartment to conduct 100% inspection. The area passing the inspection will be used as the qualified reimbursement area after confirmation and signing of the project supervisor. Strictly carry out the related afforestation technical procedures established by the state or municipality, and consider the Project as the national capital construction project for management. During the implementation period, an evaluation team should be established, consisting of the representatives from China and Europe parties and experts, to perform inspection, evaluation and guidance for the whole implementation process of the project. For afforestation production, diversified operation modes will be adopted, including state-owned, collective-owned, individual and joint stock partnership modes. The operation organization should implement the head responsibility system for operation management, promote management contract system for construction and production, and sign contracts with the implementation organization and farmers.

Table 1 (Cont.)

(2) Fund management

Utilization of loan from EIB is conducted in cash reimbursement system, which means the funds shall be paid after construction. Open a special account for EIB 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 and will be transferred to the Employer one year before the construction of the Project.

(3) 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.

(4) 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.

(5) Contract management

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 must define the responsibilities, rights and benefits with clear and accurate clauses, and should be signed in advance in the form admitted by European Investment Bank.

2.9 Safeguard Measures

2.9.1 Enhance construction of institutional organizations

It is planned to establish municipal level leading team and project office for EIB-loaned 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. Wulong County Government will

establish a leading team for EIB-loaned Forestry Development Project, with the Deputy County Head in charge of forestry as the team leader and the major principals from the Development and Reform Bureau, Finance Bureau, Forestry Administration and other relevant departments of the county as members. It is responsible for solution and coordination of significant issues which exist during project implementation. All the involved townships and forest farms will also establish project implementation teams leaded by heads of townships (forest farms) and relevant members of forestry stations (forest farms) and so on. Such teams are responsible for organization and supervision of planned implementation, fund operation, farmer training, environmental supervision, technical promotion and others.

Table 1 (Cont.)

2.9.2 Enhance Project Management along Entire Course

(1) Participatory Planning to Improve Design Feasibility

Upon joint cooperation of project planning entity and project construction entities, conduct analysis on developmental advantages and potential of project area based on local site conditions and planting traditions.

(2) Carry out Scientific Construction and Guarantee Forestation 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 construction 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 stony 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	357.31
1.2	Cortex Magnoliae Officinalis	10,000 plants	47.5
1.3	Zhuyao jujube	10,000 plants	54.1
1.4	Pyrus spp	10,000 plants	34.3
1.5	Citrus maxima	10,000 plants	24.09

1.6	Bambusoideae	10,000 plants	57.6
1.7	Larix gmelini	10,000 plants	37.14
1.8	Cunninghamia lanceolata	10,000 plants	65.18
1.9	Vaccinium spp	10,000 plants	14.9
1.10	Diospyros kaki	10,000 plants	37.19
1.11	Prunus salicina	10,000 plants	14.1
1.12	Camellia	10,000 plants	214.4
1.13	Rhus verniciflua	10,000 plants	40.1
1.14	Cupressus funebris	10,000 plants	6.93
1.15	Chaenomeles lagenaria	10,000 plants	7.4
1.16	Aleurites fordii	10,000 plants	3.7
1.17	Singapore cedar	10,000 plants	6.16
1.18	Liquidambar formosana Hance	10,000 plants	6.16
1.19	Schima superba	10,000 plants	25
1.20	Ligustrum lucidum	10,000 plants	25
2	Chemical Fertilizer and Pesticide		
2.1	Organic fertilizer	Ton	45254.34
2.2	Compound fertilizer	Ton	4294.83
2.3	Pesticide	Ton	11.43

Note: Refer to Table 2-3 for pesticides applied in the project.

2.2 Allocation of equipment for the proposed project

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

Table 2 (Cont.)

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

S/N	Name	Unit	Quantity
1	Afforestation Infrastructure		
3.2	Guard shed	Nr.	112
3.3	Water pipe	km	90.24
3.6	Fire tower	Nr.	7
2	Pest Control Operation Equipment		
4.1	Portable sprayer	Set	50
6.2	Solar pest forecasting light	Set	2

4.3	Long-range sprayer	Set	5
4.4	High branch scissors	Pair	100
4.5	Toolkit for monitoring	Nr.	5
4.6	Trapper	Set	500
3	Forest Fire Protection Equipment		
5.1	High-pressure water pump	Set	12
5.2	Chopper	Pair	142
5.3	Tent	Set	60
5.4	Hydraulic giant	Nr.	90
5.5	Fire shovel	Nr.	90
5.6	Chain saw	Nr.	90
5.7	Power generator	Set	6
5.8	Hand-hold interphone	Set	42
5.9	Pneumatic extinguisher	Set	36
5.1	Forest fire control patrol overalls	Set	120
5.11	GPS navigator	Set	24
5.12	Motorcycle for forest patrol	Set	30
5.13	Vehicles for forest protection and fire control	Set	1
5.14	Telescope	Set	30
5.15	Forest fire control command system	Set	1

Table 2 (Cont.)

Table 2.3 List of Pesticides Applied in the Proposed Project

S/N	Generic Name	Type and Content	Registration Condition	Service Condition	Whether Be the Forbidden Pesticides by EU
1	Sodium 4-CPA	27.5% emulsified concentrate	China	Allowed in China	No
2	Dipterex	90% crystalloid	China	Allowed in China	No
3	Decamethrin	2.5% emulsified concentrate	China	Allowed in China	No
4	Fenvalerate	20% emulsified concentrate	China	Allowed in China	No
5	Beta-cypermethrin	4.5% emulsified concentrate	China	Allowed in China	No
6	Chlopyrifos	40.7% emulsified concentrate	China	Allowed in China	No
7	Imidacloprid	10% wettable powder	China	Allowed in China	No
8	Phoxim	50% emulsified concentrate	China	Allowed in China	No
9	Diflubenzuron	25% suspending agent	China	Allowed in China	No
10	Carbendazol	50% wettable powder	China	Allowed in China	No
11	Chlorothalonil	75% wettable powder	China	Allowed in China	No
12	Mospilan	20% wettable powder	China	Allowed in China	No
13	Pyridaben	15% emulsified concentrate	China	Allowed in China	No
14	Hexythelloazox	5% hexythiazox emulsified concentrate	China	Allowed in China	No

Table 2 (Cont.)

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

Located in a rural area, 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, decrease in vegetation coverage and biological diversity, and meanwhile resulted in water and soil loss 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

Wulong County is locateded in the southeast edge of Chongqing Municipality, the downstream of Wujiang River, and at the junction between Wuling Mountain and Dalou Mountain. Its geographical coordinates are 107° 14′ ~ 108 ° 05′ east longitude and 29°02′~29°40′ north latitude. The east-west distance is 82.7 km and the north-south distance is 75 km, and the total area is 2901.3 km^2.It adjoins Pengshui Tujia and Miao Autonomous County in the east, connects Daozhen Gelao and Miao Autonomous County in Guizhou Province in the south, borders Nanchuan District and Fuling District in the west, connects Fengdu County in the north and it is 128Km away from Chongqing Municipality, and situated in the junction of the “one-hour economic circle and two wings” (Northeast and Southeast of Chongqing) in Chongqing Municipality and it is known as the “Screen between Chongqing Municipality and Guizhou Province”, and a shining pearl in Wujiang River.

3.1.2 Topography and Geomorphology

Wulong County belongs to Dalou Mountain fold belt at the southeastern edge of Chongqing Municipality, where it is dominated by high mountains and deep valleys.The nature feature is summarized as "70% of mountain, 20% of plain and 10% of river".It is high in the northeast and low in the southwest topographically.There are Dongshanjing Mountain, Baima Mountain and Danzi Mountain, crossing the country from north to south in approximately parallel arrangement, to break it up into Tongzi, Mugen, Shuanghe, Tiekuang, and Baiyun highlands. Wujiang River passes through the county at the middle from east to west.Tongzi Mountain and Xiannv Mountain, north of the Wujiang River, belong to Wuling Mountain System, and Baima Mountain and Danzi Mountain, south of the Wujiang River, belong to Dalou Mountain System.The tributaries, Muzong River, Furong River, Changtu River, Qingshui River, Shiliang River, Daxi River flow into Wujiang River from the south and north.The special environment of the whole county is featured by high mountains and lofty hills, vertical and horizontal valleys, underground river criss-crossing and karst caves widely distributed, because of appearance of intersection of deep through valleys formed due to deep corrosion.The Xiannv Mountain is at the highest elevation, with the main peak of Mocao Bay at the elevation of 2033m, and

the river mouth of Daxi River is at the lowest elevation of 160m, and relative height is generally between 700 to 1000m.The whole county is dominated by sloping fields and terraced filds, except for some little and small-sized flatlands in mountains and valleys.

3.1.3 Hydrology

With rivers criss-crossing, Wulong County has abundant water resource.Wujiang River is the only navigable river in Wulong County, which is 80 km long in the county, via 16 towns and townships, and starting from Muzong River in the east and ending at Daxi River in the west.There are more than 50 rivers in the county, and tributaries like Muzong River, Furong River, Changtu River, Qingshui River, Shiliang River and Daxi River all flow into Wujiang River from the south and north, and the total length of the rivers with a flowing distance of more than 50 km is 203.7 km, and the hydroenergy resource reserve reaches 2,400,000 kw, among which the developable resource is 1,900,000 kw, so the county is regarded as an important clear energy base in Chongqing Municipality.Wulong County has 31 reservoirs, including 4 medium-sized and larger reservoirs.

3.1.4 Clamatic Conditions

Wulong County belongs to subtropical monsoon climatic region, and is characterized by sufficient sunlight, warm and humid climate, and clearly-demarcated four seasons.Annual average temperature is 18.5℃, and annual extreme lowest temperature is -3.5℃, and annual extreme highest temperature is 41.7℃, and frost free period is more than 300 days, and annual total sunshine duration is between 1100 hours and 1610 hours.Annual rainfall is between 900mm and 1400mm, and the rainfall from April to August accounts for 70%, annual relative humidity is 78% which is suitable for the growth and reproduction of many kinds of animals and plants.

Table 3 (Cont.)

The main disasters are hailstone, mountain torrents and gale. The rainy season lasts for about 5 months every year in the mountainous areas at an elevation of more than 800m, and fog and rain, little sunlight, low temperature, autumn wind and cold dew make an serious influence on the growth of crops; the areas with an elevation lower than 600m is vunerable to drought. The temperature difference from the top to foot of mountain is about 10℃, and stereo climate is relatively prominent.

3.2 Brief Information on Social Environment

Established in the second year of Tangwude Period of Tang Dynasty (619 A.D.), Wulong County has a history of 1393 years and 13 nationalities like Han, Miao, Tujia and Gelo, etc.Wulong County is 2,901.3 km^2 and has 26 towns and 186 administrative villages under its jurisdiction, and a 412,700 total population. The county seat is located in Xiangkou Town.Wulong County has a rare and excellent landscope, like the grand Dalou Moutain, elegant Wuling scene and peaceful Wujiang Gallery, which is known as the world museum of karst ecosystem.Wulong County is a national major county of poverty relief and development, and it locates within inundation scope of the three gorges reservoir area, and is one of nine districts granted with both gold-lettered signboards of "World Natural Heritage" and "National 5A-level Scenic Spot" in the country.

Wulong County is a poverty-striken mountainous county which is predominated by agriculture, and the county's GDP was RMB 8.658 billion, the local fiscal revenue was RMB 1.14 billion, the total retail sales of social consumer goods was RMB 2.657 billion, per capita disposable income of urban residents was RMB 18,030, Per capita net income of rural residents was RMB 5,792, and tourism income was RMB 5.5 billion in 2011; deposit balance of financial institutions was RMB 8.2 billion, and the loan balance was RMB 9.1 billion at the end of year.

Wulong County develops rapidly, and the development momentum is very strong.Wulong County strongly implements "People is enriched by tourism, county is prospered by industry" strategy, and accelerates the construction of a prosperous county with characteristic economy in the municipality, national ecological county and international tourist destination, and economic society steps into a hypernormal great-leap-forward development fast lane. There is 248,300 employees in the county, including 76,200 urban employees. There are 121,600 employees in the primary industry and 53,100 employees in the secondary industry and 73,600 employees in the tertiary

industry.

Among the total population of the project location, the agricultural population is 233,000, and rural labor force is 172,000, mainly engaged in farming, and surplus labor force is more than 30,000. Abundant labor resources can meet requirements of project construction adequately, and the project construction can also provide surplus labors with a way of becoming rich.

3.3 Current Status of Land Utilization

The total land area of Wulong County is 290,133.33 ha, including 67,666.67 ha of agricultural land area, 192,533.33 ha of forestry land area, 1,380 ha of difficult-to-use Land, and 28,553.33 ha of land for other uses. The steep slope arable land with a gradient greater than 25 degrees is 15,666.67 ha in agricultural land area, and forestation-suitable barren hills is 18,566.67 ha in forestry land area, and vacant lands available for afforestation is 8,333.33 ha. Besides, there are 26,666.67 ha low-efficiency forests to be transformed in the county.

Table 3 (Cont.)

3.4 Overview of Forestry

3.4.1 Overview of Forestry Resource

Wulong county belongs to the subtropical evergreen broad-leaved forest area and has rich plant resources. The forest coverage reached 50% at the end of 2011, and the standing forest stock in the whole county was 7,970,000 m^3.There are more than 200 orders and 1500 species of vascular plants according to the survey, including national first and second class protection plants like Cathaya, Dauikia inuolucrata var.vilmeriniana and Alsophila spinulosa.

The subtropical plants dominate in flora of Wulong county, Fagaceae, Lauraceae, Theaceae, Styracaceae and Aquifoliaceae plants are seen everywhere. The flora in this region has a close relation to the north of Guizhou Province, where Pinus massoniana Lamb and Cunninghamialanceolata (Lamb.) Hook., belonging to the typical middle subtropical coniferous species, are widely distributed, and cupressus funebris, Nandina domestica and Pyracantha fortuneana are distributed in the limestone mountain areas. The climate and soil type in Wulong county are suitable for growth of Cunninghamialanceolata(Lamb.) Hook, Metasequoia glyptostroboides Hu et Cheng, Cortex Magnoliae Officinalis,Toona ciliata, cupressus funebris, Cryptomeria fortunei, Phyllostachys bambusoides f. lacrima-deae, Camellia oleifera Abel, Castanea mollissima, Juglans regia, Cinnamomum camphora (L.) Presl., Pinus massoniana Lamb., Robinia pseudoacacia, Quercus L., Camellia oleifera Abe, Toxicodendron verniciflua (Stokes) F.A.Barkl, Camellia sinensis(L.)O.Kuntze, Liriodendron chinensis (Hemsl.) Sarg, Sassafras tzumu, Schima superba Gardn et Champ, Liqui dambar spp., Albizia julibrissin Durazz, Morus alba L, Vernicia fordii (Hemsl.), Sapium sebiferum(L.) Roxb., cupressus funebris, Eucommia ulmoides Oliv., Flos Lonicerae, Citrus maxima, Pyrus spp, Zizyphus jujuba, Citrus reticulata Blanco. Tree species of timber forest afforestation should be Metasequoia glyptostroboides Hu et Cheng, Cortex Magnoliae Officinalis, Larix gmelinii, cupressus funebris, Toxicodendron verniciflua(Stokes)F.A.Barkl, etc. Tree species of economic forest should be zhuyao jujube, Juglans regia, Vaccinium spp, Camellia sinensis(L.)O.Kuntze, Diospyros kaki, Prunus salicina Lindl., Pyrus spp and Citrus maxima, etc., according to site conditions and suitability of tree species.

Among the forest land, the closed forest land covers 104,666.67 ha, accounting for 54.4%; open forest land covers 1,733.33 ha, accounting for 0.9%; shrubland covers 54,266.67 ha, accounting for 28.2%, including special shrubland of 31,400 ha; young afforested land covers 9,000 ha, accounting for 4.7%; land for tree nursery covers 40 ha;

non-forest land covers 22,533.33 ha, accounting for 11.6%.

3.4.2 Overview of Forestry Industry

Wulong county persists to promote "Zhuyao jujube", "Chinese herbal medicines", and "Bamboo shoots" strategy, and makes efforts to establish a forest industry system based on forest tourism, Zhuyao jujube, Chinese herbal medicines and bamboo shoots, and boosted by seedlings and flowers, economic forests and fruits, breeding under forest, wood processing, etc. The comprehensive production value of forest industry reached RMB 850 million in 2011, and forest industry became an impotant force to promote the economic development of the county and an important pillar for increase of foresters' income.Industrialization of forest parks is boosted strongly, and a total number of tourists received at Fairy Mountain National Forest Park reached 3,600,000, and tourism revenue reached RMB 248,000,000 in 2011, both of which hit a new record.

In terms of base construction, Zhuyao jujube, Chinese herbal medicines and bamboo shoots reached 3,333.33 ha, 5,333.33 ha and 2,000 ha. In terms of market development, the forestry enterprises are supported and developed continuously, and at present, Wulong Yuanda Jujube Industry Limited Liability Company is the leading Zhuyao jujube enterprise, and Chongqing Tiansheng Pharmaceutical Co., Ltd and Linhai pharmaceutical Co., Ltd is the leading Chinese herbal medicines enterprise, and Wulong Huayu Agriculture Co., Ltd. is the leading bamboo shoots enterprise,

Table 3 (Cont.)

and the annual processing output value of forestry enterprises breaks through RMB 300 million. With production-marketing integration, the three main industries has formed strong industrial development vitality and potential. In terms of brand creation, Zhuyao jujube was awarded as an improved variety of forest tree in Chongqing Municipality, and an agricultural product with national geographical indication of the Ministry of Agriculture, and it was awarded as a trademark of national geographical indication by State Administration for Industry & Commerce of the People's Republic of China, and the price of Zhuyao jujube is much higher than any other kinds of jujube in market, and the demand exceeds supply every year, driven by its brand effect.The forestry industry in Wulong County develops strongly, and the largest Cortex Magnoliae Officinalis production base was established in Chongqing Municipality, and the output of fresh jujube was 5000t in 2011, and the annual output of

bamboo shoots is 4200t, which are sold in Sichuan Province, Guangdong Province, Shanghai, Southeast Asia and other countires and regions.

3.5 Conformity with Policies

(1) Analysis of Conformity with National Industrial Policies

The proposed project involves new afforestation works, belonging to the projects specified in the Sub-article 34 "carbon sink forest projects, tree and grass planting projects and forest tree and seedling projects" of the Article I "Agriculture and Forestry" in the encouraged category of *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 is consistent with the indutrsial policies.

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

It is clearly proposed in 12*th Five-year Plan for Foresty Development of Wulong County* that the overall objectives are "by 2015, the forest land area in the county will be over 3 million *mu*, the forest coverage rate will be over 60%, the standing forest stock will be over 10 million m^3 and the forestry production value will reach RMB 1.8 billion". In the proposed project, the area of the new afforestation works is 6400 ha, including the timber forest with an area of 905 ha and the economic forest with an area of 5495 ha, so the development goals are consistent with those of Wulong County.

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

Table 4 Status of Environmental Quality

Current Environmental Quality Status and Main Environmental Problems of the Construction Project Location（ambient air, surface water, ground water, acoustic environment, ecological environment, etc.）

1. Current Environmental Quality Status at the Construction Project Location.

The proposed project is planned to be located at 19 towns and townships of Xiangkou town, Huangying township, Yangjiao town, Changba town, Huolu town, Pingqiao town, Baima town, Yajiang town, Wenfu township, Shiqiao township, Shuanghe township, Fenglai township, Miaoya township, Tongzhi town, Tiekuang township, Tudi township, Jielong township, Baiyun township, Houping township, and Xiannvshan Forest Farm, and Baimashan Forest Farm in Wulong county. The environmental quality status at the project location is as follows according to environmental quality report of Wulong county in 2011.

(1) Ambient Air Quality

Air pollution integrated index of Wulong county was 2.92 in 2011, 3.3% lower than that in 2010 (P=3.01 in 2010). The load ratios of the main pollutants of SO_2, NO_2 and PM_{10} in air are consistent, which are all 24%; the load ratio of dust is 28% which is slightly higher than the other three factors. In general, the four pollution factors' contribution to the pollution is equivalent.

Ambient air quality in Wulong county was good in 2011, the average concentration of SO_2, NO_2, PM_{10}, and dust were 0.042mg/m^3, 0.028mg/m^3, and 2.59 t/km^2•month, and all the indexes reached the Class II standard as specified in *Ambient Air Quality Standard* (GB 3095-1996) and the dust reference standard.

The precipitation pH value range was 3.68-6.77, the detection rate of acid rain was 75%, and the average pH value of precipitation was 4.52 in Wulong county in 2011. The range of variation in acid rain frequency was not big, the acid rain frequency was 55%~80%., and the average pH value of precipitation was 4.2~5.10.

To sum up, the regional ambient air quality at the proposed project location is good.

(2) Aquatic environment quality

Among the water bodies of Wulong county, water of Furong River in the cross section at Jiangkou town was good in quality in 2011, and it reached Class II water area standard requirements specified in *Environmental Quality Standards for Surface Water* （GB

3838-2002) all the year around; the pollutants in the cross section of Wujiang River at Luoying and Baima, and of Daxi River at Pingqiao town and Yajiang town reached Class III water area standard requirements specified in *Environmental Quality Standards for Surface Water*（GB 3838-2002) except for TP and fecal coliforms.

Cross section water quality was evaluated based on 9 indexes: pH, dissolved oxygen, permanganate index, biochemical oxygen demand, ammonia nitrogen, total mercury, total lead, oil type, and volatile phenol. The integrated pollution indexes of the cross section of Wujiang River at Luoying and Baima, and of Daxi River at Pingqiao town and Yajiang town and of Furong River at Jiangkou town were 0.20, 0.21, 0.22, 0.23, and 0.24 respectively, and the water quality classification were I, I, II, II, and I respectively, and water quality was good in 2011.

Twenty-one indexes in the table 1 of *Environmental Quality Standards for Surface Water* (GB 3838-2002) were taken for cross section water quality evaluation, except for water temperature, total nitrogen, and fecal coliforms, and the water quality classification of cross section of Wujiang River at Luoying and Baima, and of Daxi River at Hepingqiao town and Yajiang town and of Furong River at Jiangkou town were Inferior V, Inferior V, Inferior V, V and II respectively in 2011, and the major contamination index in Wujiang River and Daxi River was total phosphorus.

Concentration of total phosphor in the cross section of Wujiang River at Luoying and Baima were 0.566 and 0.516 mg/L, and both of them were inferior V, and cross section over-standard rates were 88.6% and 72.0%, and exceeding multiples were 1.83 and 1.62; concentration of total phosphor in the cross section of Daxi River at Pingqiao town and Yajiang town were 0.439 mg/L and 0.316 mg/L which belong to inferior V and V, and cross section over-standard rates were 46.3% and 5.3%, exceeding multiples were 1.20 and 0.58 in 2011.

To sum up, the surface water quality in Wulong county was good in 2011.

(3) Current status of acoustic environmental quality

The average equivalent sound level Leq of the regional environmental noise in urban district of Wulong county was 55.2 Db in 2011, which is same to that in 2010. Seeing from area and population distribution status which were exposed to different equivalent sound levels, noise lower than 55 Db accounted for 58.65%, and most of the towns and townships reached Class II standard of the regional acoustic environmental quality. The average of road traffic noise in the urban district of Wulong county was 67.8 Db, and the average traffic volume was 711 vehicles per hour, and the traffic noise environment was good in 2011.

Most of the project sites are rural areas surrounding urban district of the county, where traffic volume is relatively little, there is no obvious noise sources of industry, traffic and life, and the residential buildings are distributed sporadically, so acoustic environment quality is relatively good.

(4) Current Status of Ecological Environment

① Plant Resources

Wulong county belongs to the subtropical evergreen broad-leaved forest area and has rich plant resources. The forest coverage reached 50% at the end of 2011, and the standing forest stock in the whole county was 7,970,000 m^3.

There are more than 200 orders and 1500 species of vascular plants according to the survey, including national first and second class protection plants like Cathaya, Dauikia inuolucrata var.vilmeriniana and Alsophila spinulosa.

The subtropical plants dominate in flora of Wulong county, Fagaceae, Lauraceae, Theaceae, Styracaceae and Aquifoliaceae plants are seen everywhere. TThe flora in this region has a close relation to the north of Guizhou Province, where Pinus massoniana Lamb and Cunninghamialanceolata(Lamb.)Hook., belonging to the typical middle subtropical coniferous species, are widely distributed, and cupressus funebris, Nandina domestica and Pyracantha fortuneana are distributed in the limestone mountain areas. The climate and soil type in Wulong county are suitable for growth of Cunninghamialanceolata(Lamb.)Hook, Metasequoia glyptostroboides Hu et Cheng, Cortex Magnoliae Officinalis,Toona ciliata, cupressus funebris, Cryptomeria fortunei, Phyllostachys bambusoides f. lacrima-deae, Camellia oleifera Abel, Castanea mollissima, Juglans regia, Cinnamomum camphora (L.)

Presl., Pinus massoniana Lamb., Robinia pseudoacacia, Quercus L., Camellia oleifera Abe, Toxicodendron verniciflua(Stokes)F.A.Barkl, Camellia sinensis(L.)O.Kuntze, Liriodendron chinensis (Hemsl.) Sarg, Sassafras tzumu, Schima superba Gardn et Champ, Liqui dambar spp., Albizia julibrissin Durazz, Morus alba L, Vernicia fordii(Hemsl.),Sapium sebiferum(L.) Roxb., cupressus funebris, Eucommia ulmoides Oliv., Flos Lonicerae, Citrus maxima, Pyrus spp, Zizyphus jujuba, Citrus reticulata Blanco. Tree species of timber forest afforestation should be Metasequoia glyptostroboides Hu et Cheng, Cortex Magnoliae Officinalis, Larix gmelinii, cupressus funebris, Toxicodendron verniciflua(Stokes)F.A.Barkl, etc. Tree species of economic forest should be zhuyao jujube, Juglans regia, Vaccinium spp, Camellia sinensis(L.)O.Kuntze, Diospyros kaki, Prunus salicina Lindl., Pyrus spp and Citrus maxima, etc., according to site conditions and suitability of tree species.② Animal Resources

The main wild animals in Wulong county include 34 species of mammals in 12 families of 4 orders; 16 species of reptiles in 2 families of 2 orders; 6 species of amphibians in 3 families of 2 orders; 25 species of birds in 16 orders; 34 species of fishes in 8 families of 7 orders. There are totally 181 species of wild animals, including the rare animals under national Class I, II, and III protection, such as tiger, clouded leopard, leopard, golden cat, zibet, lesser panda, Guizhou golden monkey, slow loris, macaque, elaphodus cephalophus, antelope, syrmaticus, silver pheasant, lady amherst pheasant.

The proposed project sites are mainly barren hills, forest lands, etc. The animal resources in the proposed project sites are relatively little and animals such as rats, great tits are common, because vegetation are artificial vegetation mostly and in a spare distribution, and human activities are relatively frequent; it is difficult to found the rare wild animals under protection.

③ Current status of land utilization

The total land area of Wulong County is 290133.33 ha, including 67666.67 ha of agricultural land area, 192533.33 ha of forestry land area, 1380 ha of difficult-to-use Land, and 28553.33 ha of land for other uses. The steep slope arable land with a gradient greater than 25 degrees is 15666.67 ha in agricultural land area, and forestation-suitable barren hills is 18566.67 ha in forestry land area, and vacant lands available for afforestation is 8333.33 ha. Besides, there are 26666.67 ha low-efficiency forests need to be transformed in the county.

Environmental Protection Objects and Protection Classes:

The proposed project is the Wulong Subproject of Chongqing Forestry Development Project Funded by EIB Loan for Forestry Sector, involving 19 towns and townships of Xiangkou town, Huangying township, Yangjiao town, Changba town, Huolu town, Pingqiao town, Baima town, Yajiang town, Wenfu township, Shiqiao township, Shuanghe township, Fenglai township, Miaoya township, Tongzhi town, Tiekuang township, Tudi township, Jielong township, Baiyun township, Houping township, and Xiannvshan Forest Farm, and Baimashan Forest Farm. A new forestation base of 6400 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 project location is mainly 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).

Attached Table 4-1 Main Protection Objects at Project Location

S/N	Description	Main Protection Objects	Reserve Level	Relationship with the project location
1	Xiannvshan Forest Park	Rare animals and plants	National	The proposed construction site (Xiannvshan Forest Farm) is located on the Xiannv Mountain in the northwest of the county
2	Furong River Scenic Area	/	/	Beyond and far away from the proposed scope of land use under the project
3	Baimashan Natural Reserve	Rare animals and plants	/	The proposed construction site (Baimashan Forest Farm) is located on the Baima Mountain in the south central county

Attached Table 4-2 Summary Table for Drinking Water Source Reserves of Project Location

Description	River	Protected River Reach	Location
Wulong County Municipal Waterworks Co., Ltd.	Wujiang River	The ipsilateral water area with the stream centre line as the boundary in the upper reaches of 1000m and lower reaches of 100m; The ipsilateral water area with the stream centre line as the boundary in the upper reaches of 1000m to 2000m and lower reaches of 100m to 200m.	Wulong County
Zhongxinmiao Reservoir	Reservoir	The fan area of 1000m in radius and with the water intake as center of the circle.	Wulong County

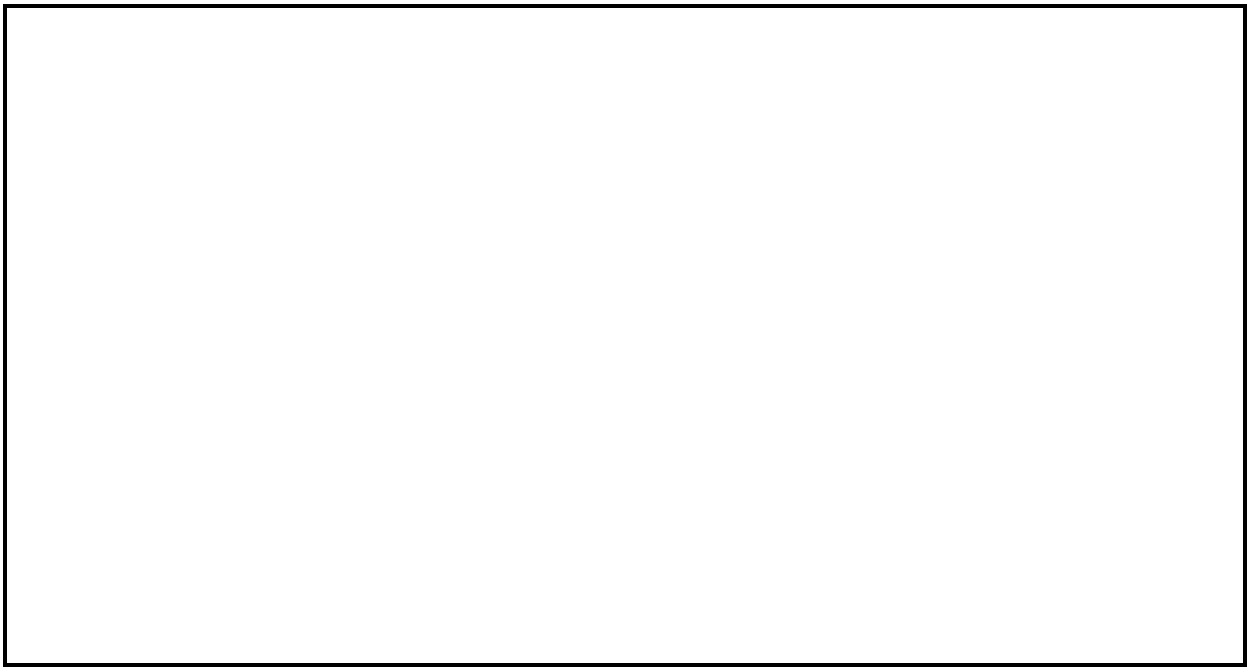

Table 5 Applicable Assessment Standards

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 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	Total Phosphorus	SS
Class II Standard Value	6-9	15	0.5	0.1	--
Class III Standard Value	6-9	20	1	0.2	--

Table 5-3: Environmental Quality Standard for Noise (Unit: Leq dB(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

6.1 Brief Description of the Process Flow

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

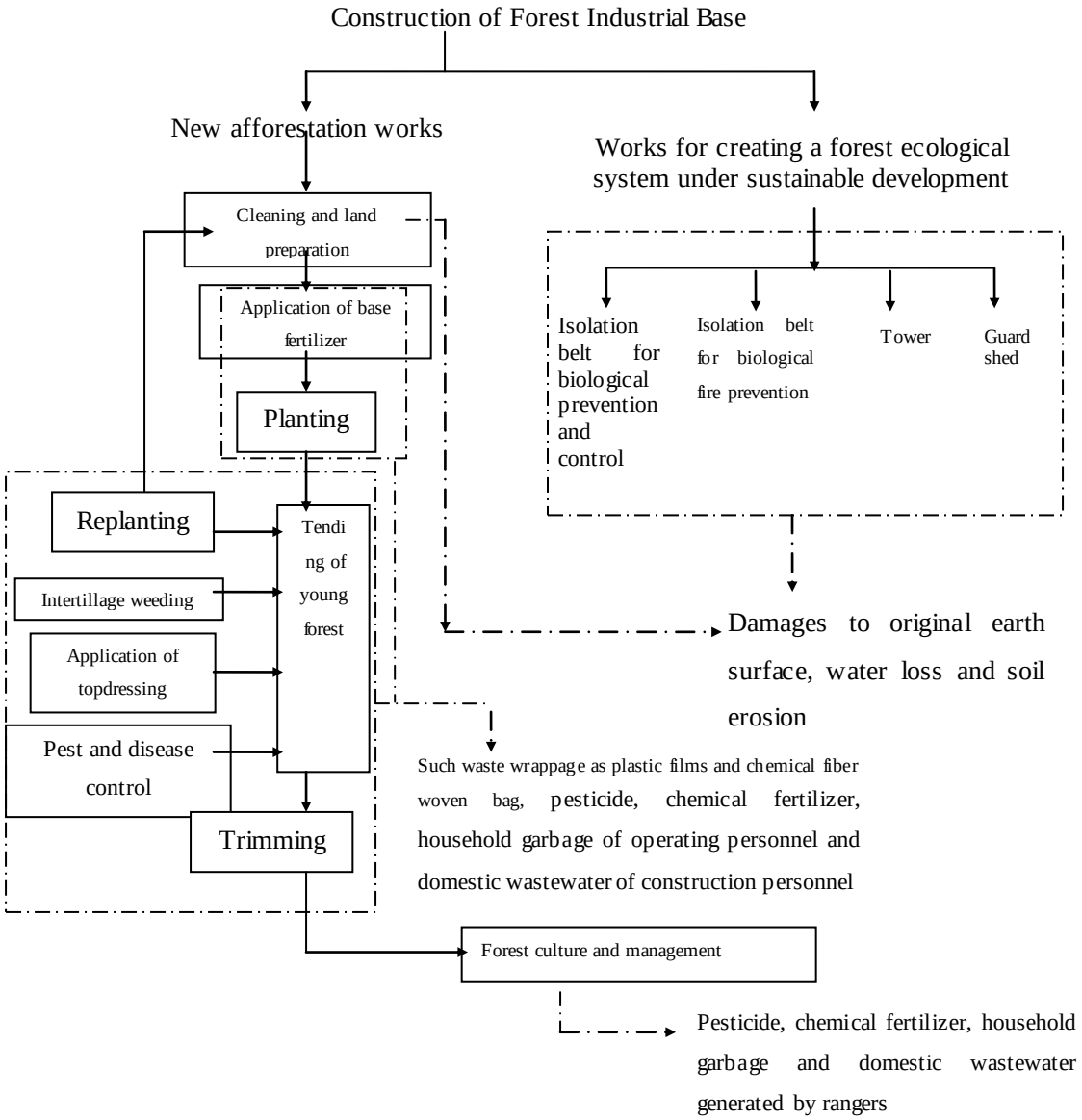

Figure 1: Process Flows of the Proposed Project

Process Flow Description

The content of construction for forest industrial base includes the new afforestation works and the works for creating a forest ecological system under sustainable development.

6.1.1 New Afforestation 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 Works for Creating a Forest Ecological System Under Sustainable Development

The works for creating a forest ecological system under sustainable development includes 133 ha for Jujube witches broom prevention and cure, a 15km long isolation belt for biological prevention and control, a 100km long isolation belt for biological fire prevention and 7 fire towers.

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 19 township (town) work zones at Wulong County. 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 tending of the new afforested forest and the young forest. The estimated amount of compound fertilizer applied is 3006.38 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 48.4t/a and 12.02t/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 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 0.08t/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.

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 6-1 for analog value of noise source intensity of main equipment in the project.

Table 6-1: 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 3.41t/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 0.0341t/a.

2. Impact of application of chemical fertilizer

For fruit-bearing tree forest, each tree should be applied with organic fertilizer of 25~50kg in winter and compound fertilizer mainly comprising N and P of 0.5~1kg in spring

and summer. 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 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 1288.45t/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 20.61t/a and 5.15t/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, 200 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 1t/d and household garbage of 0.09t/d in total. Since the Project is scattered in the 112 proposed guard sheds, the domestic wastewater and household garbage of each guard shed in average are 0.009t/d and 0.08kg/t 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 0.08t/a, 48.4 t/a and 12.02 t/a respectively.	
	Operation period	Pesticide, chemical fertilizer and domestic wastewater	Loss of pesticide, N and P is 0.341t/a, 20.61t/a and 5.15t/a respectively; it is estimated to produce domestic wastewater of 1t/d in total, and the domestic wastewater of each guard shed in average is 0.009t/d for 112 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 0.9t/d in total, and the household garbage of each guard shed in average is 0.08kg/d for the 112 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.

(2) 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.

(3) 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.

(4) 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.

Table 8 (Cont.)

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;

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);

According to the statistical table of the project, the amount of farm manure (night soil of human and livestock) is 45244.3t and that of compound fertilizer is 4294.8t during construction period, the amount of farm manure is 251208.6t and that of compound fertilizer is 12154.5t during operation period. In total, the amount of farm manure applied is 296452.9t and the compound fertilizer is 16447.3t.

The calculation shows that the amount of CO_2 emitted by fertilizer in the boundary during the project period is 13153TCO_{2-e}.

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, provided the distance is 30km for transport of seedlings and compound fertilizer. 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 for transport of seedlings and compound fertilizers and the back-and-forth oil consumption is (5)/100*24+(5)/100*20=2.2L once for transport of. Calculated by CO_2 emission of 2.73kg by 1L diesel oil, the CO_2 emission is 36.04kg for transport of seedlings and compound fertilizers once and that is 6.0kg for transport of farm manure once. Based on the application amount of fertilizers and seedlings, about 1450 trips shall be transported for seedlings and fertilizers and the amount of CO_2 emitted shall be 52.3t, and about 14820 trips shall be transported for farm manure and the amount of CO_2 emitted shall be 88.9t. In total, the amount of CO_2 emitted by transport vehicles shall be 141. 2TCO_{2-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).

According to the 8th survey data of forest resources in Chongqing Municipality, with reference to relevant document literatures and with combination of the estimation model related to biomass, the formula in power function model is chosen under the postulated conditions:

$$W=a(D^2H)^b$$

Where, W—biomass, D—diameter ay breast height, H—tree height, a and b are coefficients.

In the project, all the economic forests are subject to dwarf plants with average height of 3m; the average height of tea plant is 1; the average height of blueberry is 0.5m and the biomass is 236712t in total, containing carbon content of 111255t (carbon coefficient of 0.47), equivalent to CO_2 of 407935t CO_2–e after transformation. According to calculation, within the calculation period of 25 years, the variation of carbon reserve is 407935t CO_2–e, the increased greenhouse gas emission (mainly the carbon emission due to application of fertilizer) in the boundary of project is 13153t CO_2 – e, and the leakage caused by project activities (mainly carbon emission caused by transport vehicles) is 141. 2t CO_2 –e, then:

CProj, t= △CProj, t—GHGE, t—LKt

The net carbon sink of the project is 394640.8t CO_2 - e·a-1.

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;

Table 8 (Cont.)

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;

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.

Table 8 (Cont.)

Domestic wastewater in the service period is mainly from the forest rangers; according to the project feasibility study, 200 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 1t/d in total; since the Project is scattered in the 112 guard sheds, the domestic wastewater of each guard shed in average is 0.009t/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.

Table 8 (Cont.)

Upon completion of forest land construction, forest ranger should be assigned; according to the project feasibility study, 200 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 0.09t/d; since the Project is scattered in the 112 guard sheds, the household garbage of each guard shed in average is 0.08kg/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 Sit*e (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.

Table 8 (Cont.)

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

Located in a typical karst area where rocky desertification is severe, Wulong County has a rocky desertification area of 41698.8 ha, including the slight rocky desertification area of 20166.5 ha, medium rocky desertification area of 21128.7 ha, high rocky desertification area of 374.9 ha and potential rocky desertification area of 65391.9 ha. It has been listed as a key country at national level for integrated control of rocky desertification. Compared with Guizhou province, the rocky desertification is weak at Wulong County of 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 1,200 ha and there are more than 410 million seedlings in the nursery garden of the whole city, with high quality. 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	/	220	/
	Solid waste	Collection and handling of plastic film, chemical fiber woven bag and household garbage	/	25	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		30	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	10	/
		Forest fire prevention facility and fire extinguishing equipment	/	500	Fire prevention
		Forest disease and pest control system	1	300	Ecological management and manual control
		Ecological environment monitoring	/	400	Ecological environment monitoring
Total investment			/	1485	/
Proportion in the total investment (%)			/	4.4	/

Table 8 (Cont.)

8.10 Forest certification

In order to improve the management level of forest management organization, promote the sustainable management of forest, stabilize the market share of enterprise products, create the market access conditions to enter into the new market, reduce the investment risk, promote the participation of stakeholders, acquire more financial and technical support, it will be an irresistible trend to implement the sustainable forest certification. Relevant requirements of sustainable forest certification shall be implemented simultaneously during each phase of project operation.

(1) Establish the forest certification management office to be responsible for learning and propaganda of policies, regulations and standards related to forest certification.

(2) Estimation layout of forest certification: upfront cost for management, data, propaganda and training related to forest certification is estimated in management cost, data cost, propaganda cost and training cost of the project. Cost required for forest certification is paid in the monitoring and certification estimation of the project.

(3) Personnel training: training for relevant requirements of forest certification shall be performed at municipality, county and town levels and the training objects include the technical personnel and management personnel participated in the project and farmers and workers participated in implementation of the project.

(4) Pre-management of forest certification: the project implementation must meet the requirements for forest certification and the management personnel and technical personnel of the project must be in strict accordance with relevant requirements and standards during implementation of project to make project planning, design, implementation (including selection of afforestation land, soil preparation mode, quality of seedlings, fertilizer, safety of pesticide, planting technology, quality of management and protection) and management meet relevant requirements of forest certification.

(5) Forest certification: Perform forest certification declaration to companies or specialized cooperatives with mature conditions to realize the sustainable development of forest resources and acquire the maximum benefits of forest resources.

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

Contents / 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.

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 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.

Table 9 (Cont.)

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

Relevant identification and judgment are made centering on the potential risk factors to influence the realization of expected objectives of the project, the main risk factors include technology, operation management and policy change, etc.

10.1.1 Technical risk

Afforestation management technology at the project area is the important factor to influence the yield and carbon sink. Improper fast-growing and high yield technology, operation and management technology, such as insufficient input of water and fertilizer and insufficient attention and input of stumping technology and pest control technology and misoperation will have a direct influence on the yield and revenue of the current year and future.

Countermeasures: the first is to ensure the input of science and technology support at the project area annually and take the intensive operation measures to manage the forest; the second is to allocate a certain number of technical management personnel, carry out regular and timely training for direct production and operation technical personnel, summarize and apply the technical experience in construction of forest projects for years at the project area, take the measure of prevention first for forest pest and disease damage, enhance the pre-disaster control and minimize the potential loss; the third is to mobilize positively the forces of such departments as forest prevention, protection, supervision and inspection department of the project to input the service assurance work at the project area.

10.1.2 Management risk

The economic indicators of the project are the average ones measured and calculated according to the normal production and operation and the existing management mode and experience. The project, involved in 19 townships and 2 state-owned forest farms, having great difference in natural and geological conditions and having the risk of fire and unlawful felling of tree, shall be allocated with experienced management personnel and sufficient management and protection teams for management. The deficient capacity and level of relevant personnel, oversight at a link and improper management may have influence on the project yield and revenue.

Countermeasures: Perform comprehensive investigation, understanding and management of risk assessment at the project area, predict the potential unfavorable factors and areas,

perform major prevention and control for major area and key link, strengthen management of tracking and monitoring, implement the responsibility system or target system at the tenure, establish efficient operation and management mechanism and reduce the management risk.

10.1.3 Policy risk

The main policy risk of the project: One is related to cutting management of timbers. There are ecological forest and fast-growing forest in the project area. The fast-growing and high-yield forest is for operation and application in China, so as to meet the requirements for industrial raw materials and the revenue of local people. The cutting quota management for such forest will be more and more loosened. With the implementation of scientific outlook on development and the construction of socialism new countryside, and the conduction of the three system construction related to forest industry, the policy risk related to timber cutting is extremely low. The other is the organic integration of construction of economic forest and that of natural forest protection project, the project to return the grain plots to forestry and protection forest project to realize the integration of economic benefit and industrial development. In addition, it shall make forest competent department at all levels cultivate and support the leading enterprises related to construction of economic forest, give relevant preferential policies related to revenue, tax and finance and improve the industrialized operation level.

Table 10 (Cont.)

10.1.4 Investment and repayment risk

Necessary fund input is the important factor for normal implemetaiton of project. As for fund injection, the county govermnet makes a commitment to provide all the rest fund besides the load from European Investment Bank and guarantees to repay the fund during the period of repayment. The source of local supporting fund and repayment fund is the imput of county-level finance. The beneficiary supporting fund is mainly the fund converted by the input labor. The project adopts the participation-type design, and the positivity of beneficiaries are high to participate, so the labor input are guranteed reliably. Therefore, there is no investment and repayment risk basically.

10.1.5 Natural disaster risk

Natural disaster may result in heavy loss of the project, so forest management shall be strengthened and forest quality shall be improved to enhance the capacity of forest to cope

with the natural disaster. The disaster easily to be taken place shall be subject to deep study and critical prevention and control. For forest fire, not only prevention of fire shall be conducted to make great effort to control the field combustion source, but also early warning and monitoring of fire shall be made. In addition, fire fighting capacity shall be improved to minimize the danger of forest fire to the forest resources. For forest biohazard, monitoring and early warning shall be carried out to realize overall monitoring, precise prediction and timely forecasted and improve the scientificity, precision and timeliness of monitoring and forecasting. In addition, the prevention and control level of biohazard especially the biological prevention and control and nuisanceless control technology, shall be improved continuously. The prevention and control measures shall be monitored strictly to ensure the ecological safety and forest food safety and make great effort to cultivate the sound forest. Publicize positively the forest insurance knowledge, introduce the forest insurance, confront the potential natural disaster and reduce the loss of project beneficiaries due to natural disaster.

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;	County-level project office and design institute	Municipal project office	Municipal environmental protection bureau

	5. Ensure no obstruct in the migration route and route for foraging / water drinking of wild 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	Municipal project office	Municipal environmental protection bureau
3. 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 county	Municipal project office	Municipal environmental protection bureau
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	Construction team	Municipal and county-level project offices	Environmental protection bureau of the county

	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.			
Plant diseases and insect pests	1. Quarantine on exotic tree species. 2. Reserve original vegetations in valleys. 3. Avoid application of chemical 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.	Design institute	Municipal project office	Environmental protection bureau of the county
Society	1. Occupation of arable land is prohibited. 2. Establish temporary health and epidemic prevention institutions; strengthen epidemic surveillance, sanitation management and publicity.	County-level project office and epidemic prevention department	Municipal project office	Environmental protection bureau of the county
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.	County-level project office	Municipal project office	Environmental protection bureau of the county
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	County-level project office and forest pest and disease control of the county	Municipal project office	Environmental protection bureau of the county

	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.			
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.	County-level project office and construction team	Municipal project office	Environmental protection bureau of the county

Table 11 (Cont.)

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. . Control slope rolling of objects.	County-level project office and construction team	Municipal project office	Environmental protection bureau of the county
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.	County-level project office	Municipal project office	Environmental protection bureau of the county

6. Environmental pollution	1. Apply chemical fertilizer and insecticide as less as possible; ensure proper dosage at proper time of 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.	County-level project office	Municipal project office	Environmental protection bureau of the county

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	County-level project office
Plant diseases and insect pests	Type and occurrence rate Hazard rating	Twice a year	Set up two monitoring points for each forest base	County-level project office
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	County-level 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 10-3 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	Afforestation management period	Operator

		the units with corresponding hazardous 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 pest and disease 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, 20 questionnaires were issued to several organizations including government departments, villagers' committees, enterprises and health centers in the project influence area. Refer to Attached Table 11-1 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	Baiyun Township Government	77757009	Baiyun Township, Wulong County
2	Villagers' Committee of Yangliu Village, Baima Town	13896748858	Yangliu Village, Baima Town, Wulong County
3	Villagers' Committee of Lingshan Village, Baima Town	13594590875	Lingshan Village, Baima Town, Wulong County
4	Villagers' Committee of Shuanghe Village	13896681528	Villagers' Committee of Shuanghe Village, Wulong County
5	Villagers' Committee of Longxing Village	13983309836	Longxing Village, Wulong County
6	Cheba Village, Huolu Town	13658408466	Huolu Town, Wulong County
7	Epidemic Prevention Station for Animals	15826212123	Wulong County
8	Health Center of Jielong Township	13896678451	Jielong Township, Wulong County
9	Rural Commercial Bank of Jielong Township	13648491380	Jielong Township, Wulong County
10	Villagers' Committee of Puping Village, Miaoya Township, Wulong County	13996780504	Puping Village, Miaoya Township, Wulong County
11	Villagers' Committee of Xiangshu Village, Tongzi Town	13658477868	Xiangshu Village, Tongzi Town, Wulong County
12	Neighborhood Committee of Tongxin Community, Tongzi Town	15025679055	Tongxin Community, Tongzi Town
13	Villagers' Committee of Eguan Village, Changba Town	13896621623	Eguan Village, Changba Town, Wulong County

14	Villagers' Committee of Hongguang Village, Changba Town	13996899770	Hongguang Village, Changba Town, Wulong County
15	Villagers' Committee of Yonglong Village, Yangjiao Town	13996713086	Yonglong Village, Yangjiao Town, Wulong County
16	Villagers' Committee of Shuangheyuan Village, Yajiang Town	13658483545	Shuangheyuan Village, Yajiang Town, Wulong County
17	Villagers' Committee of Zhongxing Village, Xiangkou Town	13896746377	Zhongxing Village, Xiangkou Town, Wulong County
18	Villagers' Committee of Xinglong Village, Wenfu Township	15826297611	Xinglong Village, Wenfu Township, Wulong County
19	Villagers' Committee of Tiansheng Village	13896503871	Tiansheng Village, Wulong County
20	Villagers' Committee of Liuling Village, Shiqiao Township	13594556445	Liuling Village, Shiqiao Township, Wulong County

Table 12 (Cont.)

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.

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
Rang Shiwei	Male	45	Grain farmer	Junior high school	Dongyacunkou Group, Hongse Village, Baiyun Township	18996883888
Rang Xinghua	Male	40	Grain farmer	Senior high school	Fazi Village, Huolu Town	13068358595
Wang Jianyun	Male	45	Grain farmer	Junior high school	Yanfeng Village, Huolu Town	13996726479
Rang Yiquan	Male	48	Grain farmer	Senior high school	Cheba Village, Huolu Town	15025688298
Dai Yuanhai	Male	48	Village cadre	Junior high school	Shuanghe Village, Huangying Township, Wulong County	15803629789

Huang Jikui	Male	50	Village cadre	Junior high school	Huangying Village, Huangying Township, Wulong County	15213688251
Li Tianfa	Male	36	Village cadre	Junior high school	Longxing Village, Huangying Township, Wulong County	13509463289
Long Guoquan	Male	45	Worker	College	No.60, Jinghua Street, Tongzi Town	15923715428
Zhang Yonggao	Male	46	Worker	College	No.48, Jinghua Street, Tongzi Town	18623386122
Li Deguo	Male	45	Grain farmer	Junior high school	Xiangzhangshu Group, Xiangshu Village, Tongzi Town	18996873666
Wu Qionglan	Female	40	Grain farmer	Senior high school	Xiangzhangshu Group, Xiangshu Village, Tongzi Town	18996873666
Wang Shulan	Female	43	Grain farmer	Technical secondary school	Tongzi Middle School, Tongzi Town	15923675155
Yuan Guangrong	Male	48	Grain farmer	Junior high school	Huaqiuwan Group, Xianglong Village, Shiqiao Township	15213720497
Liu Tingwu	Male	48	Grain farmer	Senior high school	Zhuanfang Group, Daping Village, Shiqiao Township	15978998058
Chen Binghong	Male	45	Grain farmer	College	Tiankan Group, Pingsheng Village, Pingqiao Town	13983318227
Tang Wen	Male	59	59	Junior high school	Renjiabao Group, Nanping Village, Pingqiao Town	13996849711
Yang Yunquan	Male	50	Grain farmer	Junior high school	Lishuping Group, Zhongcun Village, Pingqiao Town	13996866014
Zhang Zhongyuan	Male	43	Grain farmer	Senior high school	Baihe Group, Lingshan Village, Baima Town	15123620455
Chen Guangbin	Male	42	Grain farmer	Senior high school	Quanyan Villagers' Group, Chepan Village	15826297077
Dai Yuanjiang	Male	49	Grain farmer	Senior high school	Yangliu Village, Baima Town	13896748858

Table 12 (Cont.)

Attached Table 12-2 (continued) List of Statistics of Respondents

Name	Gender	Age	Occupation	Educational level	Address	Telephone
Xia Feng	Male	4 7	Grain farmer	College	Gaokanzi Community, Hongguang Village, Changba Town	13996899770
Ren Zhonglian	Male	46	Grain farmer	Senior high school	Zhulinwan Community, Chayuan Village, Changba Town	13658464789
Li	Male	45	Grain	Senior high	Shiba Community, Eguan	15023923506

Qingguo			farmer	school	Village, Changba Town	
He Jianglian	Male	/	Village cadre	/	Tianwan Village, Yangjiao Town	15310134288
Jiang Hongbo	Male	/	Village cadre	/	Yonglong Village, Yangjiao Town	13983587047
Xie Huaipu	Male	/	Village cadre	/	Miaoling Village, Yangjiao Town	18996789222
Que Zhenghe	Male	52	Grain farmer	Senior high school	Shuijingwan Community, Sanyuan Village, Yajiang Town	13923651183
Sheng Chengwu	Male	45	Grain farmer	Junior high school	Dingjiawan Community, Yangyan Village, Yajiang Town	15923715436
Xia Feng	Male	4 7	Grain farmer	College	Gaokanzi Community, Hongguang Village, Changba Town	13996899770
Ren Zhonglian	Male	46	Grain farmer	Senior high school	Zhulinwan Community, Chayuan Village, Changba Town	13658464789
Du Xinggang	Male	51	Village cadre	Junior high school	Zouma Group, Zouma Village, Xiangkou Town	15023923506
Yang Yonglun	Male	45	Grain farmer	Junior high school	Shilangan Group, Pengchi Village, Baiyun Township	15310134288
Luo Chengbo	Male	38	Village cadre	Junior high school	Daijiaba Group, Guangping Village, Xiangkou Town	13983587047
Shao Huabin	Male	42	Grain farmer	Senior high school	Banpo Group, Xinglong Village, Wenfu Township	18996789222
Xiong Congsheng	Male	43	Grain farmer	Junior high school	Luoboya Group, Xinglong Village, Wenfu Township	15826272391
He Zhijun	Male	50	Grain farmer	Junior high school	Niubangyan Group, Wenfu Township	13923651183
He Kelong	Male	43	Village cadre	Technical secondary school	Guanghui Group, Yanhe Village, Tudi Township	15923715436
Zhang Liyi	Male	39	Village cadre	College	Sihe Group, Tianshang Village, Tudi Township	15823661699
Dou Jingu	Male	35	Grain farmer	Technical secondary school	Xujiawan Group, Xiaoyan Village, Tudi Township	15826278977
Luo Mingquan	Male	40	Grain farmer	Technical secondary school	No.1 Communitiy, Xinchun Village, Shuanghe Township, Wulong County	13658450219

Table 12 (Cont.)

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 80% Basically satisfied 20% 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 85% Solid waste 0% Others 15%
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) For selection of sprout varieties, conducting trial planting then expanding planting areas; (4) 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

In order to further give play to the important role of forestry in coping with the global climate change, to enhance the fundamental position of forestry in West Development and to conduct active exploration in utilizing foreign investment to develop afforestation projects, NDRC organized many provinces to apply for the Forestry Development Project Funded by EIB Loan for Forestry Sector and issued *Notice on Issuing Request by NDRC on Planning of Utilizing Special Framework Loan from EIB for Forestry Sector* (FGWZ [2012] No.396).Considering the actual situation in Wulong County and the forestry conditions here, County Party Committee and County Government of Wulong County decided to apply for the Forestry Development Project Funded by EIB Loan for Forestry Sector after researches, to expand the total quantity of forest resources, increase the forest quality, improve the ecological environment, boost the income of farmers and promote the sustainable development of the forestry, society and economy of Wulong County with the help of the funds and by using the advanced forestry management and operation experience from Europe.

2. Main Construction Content of Project

The main construction content of the proposed project includes the new afforestation works and the works for creating a forest ecological system under sustainable development: the area of the new afforestation works is 6400 ha, including the timber forest with an area of 905ha and the economic forest with an area of 5495ha; the works for creating a forest ecological system under sustainable development includes 133 ha for Jujube witches broom prevention and control, a 15km long isolation belt for biological prevention and control, a 100km long isolation belt for biological fire prevention and 7 fire towers.

3. Conformity of Project with Industrial Policies and Related Planning

(1) Analysis of Conformity with National Industrial Policies

The proposed project is for the construction of the new afforestation works, belongs to works specified in the Article 34 “carbon sequestration forest projects, tree and grass planting works and forestry tree seedling works” 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 loss and soil erosion. Therefore, the proposed project meets the industrial policies.

(3) Analysis of Conformity with 12th Five-year Plan for Forestry Development of Wulong County

It is clearly proposed in 12th Five-year Plan for Forestry Development of Wulong County that the overall objectives are "by 2015, the forest land area in the county will be over 3 million mu, the forest coverage rate will be over 60%, the standing tree accumulation will be over 10 million m^3 and the forestry production value will reach RMB 1.8 billion". In the proposed project, the area of the new afforestation is 6400 ha, including the timber forest with an area of 905ha and the economic forest with an area of 5495ha, so the development goals are the same with those of Wulong County.

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;

Table 13 (Cont.)

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.

(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; (抢沟) 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.

Table 13 (Cont.)

(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.

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 Wulong County. 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 12 (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 timber 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.