

Initial Environmental Examination (DRAFT)

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People's Republic of China: Yangtze River Green Ecological Corridor Comprehensive Agriculture Development Project

Prepared by the State Office for Comprehensive Agricultural Development for the Asian
Development Bank.

CURRENCY EQUIVALENTS

(as of 24 September 2018)

Currency unit	–	yuan (CNY)
CNY1.00	=	\$0.1458
\$1.00	=	CNY6.8568

ABBREVIATIONS

ADB	–	Asian Development Bank
BFA	–	balanced fertilizer application
CAD	–	comprehensive agricultural development
EIA	–	environmental impact assessment
EMP	–	environmental management plan
EPB	–	environmental protection bureau at county level
EMS	–	environmental monitoring station
FSR	–	feasibility study report
IEE	–	initial environmental examination
IPM	–	integrated pest management
MEP	–	Ministry of Environmental Protection
NPMO	–	National project management office
NPS	–	non-point source pollution
PMO		project management office
POCAD	–	Provincial Office for Comprehensive Agricultural Development
PRC	–	People's Republic of China
SOCAD	–	State Office for Comprehensive Agricultural Development
SPS	–	Safeguard Policy Statement
TA	–	technical assistance
YREB	–	Yangtze River Economic Belt

WEIGHTS AND MEASURES

kg/ha	–	kilogram per hectare
km ²	–	square kilometer
m ³	–	cubic meter
mm	–	millimeter
<i>mu</i>	–	unit of land area equal to 1/15 ha or 667 m ²

NOTE

In this report, "\$" refers to United States dollars.

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国家农业综合开发办公室

承诺函

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单位	签字	日期
国家农业综合开发办公室，财政部	卢黄敏	2017.11.23

国家农业综合开发办公室

ENDORSEMENT LETTER

The People's Republic of China (PRC), through the Ministry of Finance, applied for a loan from the Asian Development Bank (ADB) to conduct Yangtze River Green Ecological Corridor Comprehensive Agriculture Development Project (hereinafter, the "Project") in Yunnan Province, Sichuan Province, Guizhou Province, Hubei Province, Hunan Province and Chongqing Municipality (at provincial level). Therefore, the implementation of the project should be in accordance with the Safeguard Policy Statement (2009) of ADB.

An final draft Initial Environmental Examination (IEE) and Environmental Management Plan (EMP) have been prepared and fully comply with the laws and regulations of the PRC and the safeguard requirements of ADB.

The State Office for Comprehensive Agriculture Development (SOCAD), six Provincial Offices for Comprehensive Agriculture Development (POCADs), hereby acknowledge the contents of final draft IEE and EMP, and will supervise all relevant local governments to implement the draft IEE and EMP in a timely manner. In case any public comments are received during the public review period, which affect the content of the IEE and/or EMP, or for any questions has on the draft documents, the SOCAD, POCADs and ADB will review these together to agree on actions to be taken. It is committed by the SOCAD, on behalf of POCADs that the progress and performance of the EMP implementation will be monitored and reported to ADB regularly as required. There is no objection to these draft documents being posted on the ADB public website, following ADB's standard procedures.



Agency	Signature	Date
SOCAD, MOF	卡贵敏	2017. 11. 23

EXECUTIVE SUMMARY

1. This report summarizes the results on the environmental assessment of this Yangtze River Green Ecological Corridor Agriculture Development Project. The project has been classified by the Asian Development Bank (ADB) as category B for which an initial environmental examination (IEE) is required. This IEE is prepared in accordance with the requirements of ADB's Safeguard Policy Statement (2009),¹ and complements the domestic environmental impact assessment (EIA) report that meets the requirements of the EIA Law (2016) and relevant regulations of the People's Republic of China (PRC).²

2. Under the PRC's environmental laws and regulations, and in consideration of the project nature, a comprehensive environmental assessment covering the six project provinces has been developed. The domestic EIA has been completed by a qualified local institute using methodologies and standards consistent with relevant guidelines established by the PRC's Ministry of Environmental Protection (MEP).³ The approving authority for the domestic EIA report is the MEP. The project preparatory technical assistance consultants closely worked with the domestic EIA team on field visit, data collection, quantification, and qualification of environmental benefits and potential pollution and risks, in the preparation of the domestic EIA. The domestic EIA report was submitted on 10 November 2017 for approval by MEP. In identifying and assessing the potential environmental impacts during operation, experiences and lessons from previous World Bank and ADB projects were reviewed with the project management office staff; for instance, those from the Sichuan and Yunnan provinces. Comparative analysis highlights that this project itself, as an environmental project, will generate more ecological and environmental benefits; and the adverse environmental impacts will be negligible.

3. The IEE concludes that the project will generate multiple environmental benefits. The major anticipated environmental benefits will include (i) reduced use of agrochemicals, including fertilizers and pesticides; (ii) improvement on water use efficiency by installment and construction of infrastructures, as the project is abundant with water resources; (iii) reduced soil erosion and nutrient loss; (iv) recycling of crop straw and animal wastes; (v) recovery of plastic mulch; and (vi) building climate resilience. They will contribute to the mitigation of nonpoint source pollution for the water bodies and improvement of ecosystem quality in the project region.

4. Project activities will not be carried out in environmentally or socially sensitive areas. With the implementation of mitigation measures, the potential environmental impacts of construction activities are anticipated to be minor, temporary, and localized, considering the vast area and small scale of the engineering works.

5. A consolidated environmental management plan has been developed. The environmental management plan includes, among other things, a detailed description of the potential environmental impacts and mitigation measures, environmental monitoring program, public consultation program, reporting and supervision, feedback and adjustment mechanism, and institutional responsibilities. It is carefully designed to fit into the PRC's existing environmental management system. It has been concluded that, with mitigation measures and agreed monitoring arrangements, the residual impacts will be insignificant.

¹ ADB's Safeguard Policy Statement (2009) is available both in English and Chinese language (<http://www.adb.org/Documents/Policies/Safeguards/Safeguard-Policy-Statement-June2009.pdf> and <http://www.adb.org/Documents/Translations/Chinese/Safeguard-Policy-Statement-cn.pdf>)

² Government of the People's Republic of China. 2016. *EIA Law of the People's Republic of China*. Beijing: People's Congress.

³ China Agriculture University EIA Center with a class A certificate issued by the PRC's Ministry of Environmental Protection.

I. INTRODUCTION

1. Background

1. The Government of the People's Republic of China (PRC), through its Ministry of Finance, applied for a \$300 million loan from the Asian Development Bank (ADB) to implement the Yangtze River Green Ecological Corridor Comprehensive Agriculture Development Project in the Chongqing Municipality; and the provinces of Guizhou, Hubei, Hunan, Sichuan, and Yunnan. The project will implement the strategic plan of the Central Committee of the Communist Party of China and the State Council to improve the modern agricultural development and promote the circular agriculture and low-carbon economy development in the Yangtze River Basin.

2. Yangtze River is the PRC's longest river, and the world's third longest river; and the Yangtze River Basin is also the basin with the largest population, the largest number of towns, and the most complete industries in the world. The Yangtze River Economic Belt accounted for more than 40% of the nation's population and the gross domestic product (GDP); and is the economically centralized area, with a high growth vitality for the country. Since the 18th National Congress of the Communist Party of China, the construction and development of the Yangtze River Economic Belt (YREB) has risen to a national strategy.

3. In September 2014, the State Council promulgated the Guidelines on Promoting the Development of the Yangtze River Economic Belt along the Golden Waterway (Guofa [2014] No. 39), in which the Yangtze River Economic Zone was listed in the "Demonstration Zone of Ecological Civilization Construction"; and the Yangtze River Economic Zone development strategy was officially launched. Among all the measures listed, the green ecological corridor construction has become a key task, with the specific activities which aim to (i) strengthen the Yangtze River Basin's ecological environment supervision and comprehensive management; (ii) protect and improve the ecological service functions; (iii) protect and use well the agricultural resources in the Yangtze River Basin; (iv) promote the development of green, circular, and low-carbon economy in the region; (v) lead the construction of national ecological civilization; and finally, (vi) completely build a well-off society and achieve the nation's bright prospect on the road to revival. Relying on the Yangtze River waterway and building the Yangtze River Economic Belt is one of the three major national development strategies. The effective protection of the ecological environment is not only needed to support the YREB with comprehensive economic power and the inner river economy with global impacts; but also the inevitable demand for maintaining regional ecological security, and updating the level of ecological civilization construction.

4. At the 12th meeting of the Leading Group for Financial and Economic Affairs of the Central Committee of the Communist Party of China on 26 January 2016, it was emphasized to promote the development of the YREB with the advanced concepts of ecological priority and green development, and the protection of ecological environment should always be highly ranked. In the discussion meeting of promoting the Yangtze River Economic Development, President Xi Jinping highlighted that the Yangtze River has a unique ecological system and is an important ecological treasure. From now on and within a long period of time, recovering the ecological environment of the Yangtze River is at an overwhelming position; and great protection should be implemented with all resources, and there will be no large-scale development activities. The implementation of the major ecological restoration project is a priority with the key activities of forest construction, soil and water erosion control and management of rocky desertification in karst area, the *Grain for Green* Program, rivers and lakes and wetland ecological protection and water source conservation, and others. Promotion of the development of the Yangtze River

Economic Belt must be implemented from the long-term interests of the nation, so that clean and green environment may produce huge ecological, economic, and social benefits.

5. **National thirteenth five-year plan.** Sustainable development and eco-environmental protection has been firstly set as one of the priority theory guiding the social and economic development in the PRC. The National Thirteenth Five-Year Plan Guidelines (2016–2020) issued on 17 March 2016 by the government particularly put forward the five key concepts of development, i.e., innovation, coordination, green, open-up, and sharing. Environmental planning and protection actions are particularly requested to be taken in the YREB, as one of the largest and intensive economic region in the PRC. In line with this National Thirteenth Five-Year Plan, the Ecological Environment Protection Planning for the Yangtze River Economic Belt (“*Planning*”) was developed and issued by the three ministries of the Ministry of Environment Protection (MEP), the National Development and Reform Commission, and the Ministry of Water Resources on 17 July 2017. Rural environmental protection infrastructure construction; comprehensive management of river, channel, pond, and dam in rural area; nonpoint source (NPS) pollution control; and soil and water erosion had been specifically proposed to recover and improve the ecological and environmental quality of the YREB.

6. **Control of nonpoint source pollution.** The agriculture of middle and upper Yangtze River Basin is dominated by double crops, but two and half crops are also common in many parts of those provinces. Major crops are rice, maize, vegetables, and fruits, together with winter crops such as canola, wheat, potato, and so on. Citrus is an important fruit growing across the region; but there are also various other fruits growing in various parts of the region such as apple, pear, grapes, peaches, kiwi fruits, dates, and so on. Fruit production areas are expanding in recent years because the profit is fairly low for traditional grain productions. Those new fruit or other cash crops are often growing in previously unproductive hills or slopes because there is insufficient land for such fruit and/or cash crop expansions. Agricultural intensification during the past 3 decades (from 1980s to 2010s) has relied mainly on high fertilizer and pesticide input for crop, fruit, and/or vegetable that are sensitive to nutrient and pests. This has greatly increase the agricultural production in the region, in which the provinces of Hunan, Hubei, and Sichuan and the Chongqing Municipality are relatively more intensified; while Guizhou and Yunnan provinces are less. As the project region is more of hilly and mountainous area with sub-tropical climate (600–1,500 millimeters [mm] of precipitation and hot weather), the run-off and leaching of nitrogen, phosphorus, and other agrochemicals (pesticides) significantly increase; although this increase has been much alleviated by the *Grain for Green* Program since 1990s.¹

7. From 2015 to 2020, the planning aims to (i) increase the forest covering rate from 41.3% to 43%; and (ii) reduce discharged chemical oxygen demand, (dissociated form of) ammonia ($\text{NH}_4^+\text{-N}$), and total phosphorus by 11.4%, 11.8%, and 10%, respectively, in the YREB. By 2020, 0.1 million square kilometers (km^2) of land under soil and water erosion control will be increased; and 75% of the national water monitoring station will achieve Grade III of the Environmental Quality Standard of Surface Water. On 17 February 2015, the Ministry of Agriculture also issued two action plans of zero growth of chemical fertilizer and pesticide application. These two action plans were implemented to promote ecological civilization and environmental protection by agricultural practices, including but not limited to the balanced fertilizer application (BFA), the integrated pest management (IPM), and combined usage of chemical fertilizer with organic

¹ Ma, et al. 2012. Diversity and effect of diffuse source pollution load caused by land use change in the upper reach of Yangtze River Basin, China, *Journal of Agro-Environment Science*, 31(4): 791–797; Wang, et al. 2011. Estimating nonpoint source pollutant loads for the large-scale basin of the Yangtze River in China, *Environmental Earth Sciences*, 63(5): 1079–1092; and Ongley, et al. 2010. Current status of agricultural and rural nonpoint source pollution assessment in China, 158(5): 1159–1168.

fertilizer. These regulations, plans, and policies highlighted the priority of ecological environment protection by various means in the YREB.

2. Selection of Project Provinces and Counties

8. Within each project province, cities and/or counties were selected for participation in the project. Based on the national feasibility study report (FSR), the criteria used for selecting the project districts were that (i) the project areas should be in the Yangtze River Basin (including its tributaries) and will have large impact on ecological environmental quality of the Yangtze River. The selected area should have serious problems of soil and water erosion; NPS pollution; and degradation of river, lake, and wetlands; (ii) the proposed project will not be implemented in an environmentally sensitive area and include any activities with critical negative environmental impacts; (iii) the project area is with a large contiguous area of land that is suitable for activities implementation. The area has some basis of agricultural development but lacks basic infrastructure. The technical extension system is in place but needs to be improved; (iv) there is a good demonstration effect of project construction. There will be clear and sound economic, social, and environmental benefits associated with the implementation of the project; (v) the project activities should be sustainable. With the introduction and utilization of various measures, soil erosion and NPS pollution should be reduced; and the region should be adopted to a changing climate; (vi) the CAD organizations at all levels have already been established and have experience in project management; and (vii) government at the provincial, prefecture and/or municipal, and city and/or county levels and farmers are enthusiastic about the project; have an urgent need for a CAD project; and can assure the local counterpart's financial contributions.

9. Out of the seven criteria for the selection of project counties, three are environmental considerations. This ensured the incorporation of environmental considerations at the early stages of project preparation and design for maximization of environmental benefits, and the avoidance and minimization of adverse environmental impacts.

3. Lessons Learned from Previous ADB and World Bank Projects

10. In recent years, ADB and the World Bank financed numerous agricultural development projects in the PRC. For ADB, these include (i) Henan Ecological Agriculture and Productivity Improvement Project (2007–2014); (ii) Dryland Sustainable Agriculture Development Project (2008–2014); (iii) Ningxia Integrated Ecosystem and Agricultural Development Project (2008–2014); and (iv) Shanxi Integrated Agriculture Development Project (2009–2015). In the past decade, the World Bank has financed a series of CAD projects in the PRC. They include (i) Irrigated Agriculture Intensification Project I (1991–1995); (ii) Irrigated Agriculture Intensification Project II (1998–2005); (iii) Guanzhong Irrigation Improvement Project (1998–2003); (iv) Anning Valley Agricultural Development Project (1999–2006); (v) PRC Water-Saving Irrigation Project (2001–2005); (vi) Jiangxi Integrated Agricultural Mechanization Project (2004–2010); (vii) Irrigated Agriculture Intensification Project III (2005–2010); and (viii) Agricultural Technology Transfer Project (2005–2011).

11. The review of related projects has enabled the study to focus on critical environmental issues of concern. These critical environmental issues of concern were identified early in the project preparation process based on previous ADB and World Bank project experiences; and in partnership between the central, provincial, and local government officials; the local design and environmental impact assessment (EIA) experts; the ADB officers and specialists; the project preparatory technical assistance (TA) consultants; and the community representatives. They

have been closely examined by ADB, the project preparatory TA consultants, and the local environmental specialists.

12. For the ADB- and World Bank-financed CAD projects in the PRC, the identified positive impacts include (i) improving the water use efficiency by installment of efficient water transportation facilities in the project region, where water resources from precipitation is abundant (600–1,500 mm per year); but as geography of the region is mostly hilly and mountainous (>80%), the key issue is to increase water available for agricultural use. This is the prominent difference with other ADB or World Bank projects in plain regions, such as in the northern and eastern PRC where precipitation is 400–700 mm per year; (ii) reducing soil erosion; (iii) reducing the use of agrochemicals via promoting the BFA, the integrated water resources management, and the IPM among the users; and (iv) raising the income and social well-being of the beneficiary farmers.

13. The identified adverse environmental impacts include (i) potential dust, soil, noise, solid, and water pollutants discharged or emitted during construction; and (ii) noise, solid, and water pollutants during operation. The experiences from the previous projects indicate that with the implementation of mitigation measures, the adverse impacts can be minimized to an insignificant level.

II. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

1. Legal Framework

14. The environmental management system in the PRC consists of a well-defined hierarchy of regulatory, administrative, and technical institutions. At the national level, the People's Congress has the authority to issue national environmental laws; the State Council promulgates the national environmental regulations; and MEP issues the environmental guidelines. The provincial and local governments can also issue provincial and local environmental regulations and guidelines in accordance with the national laws and regulations. In addition, the local ordinances, national and local environmental standards, and national and local five-year environmental protection plans form important parts of the legal framework.

15. The major laws that established the PRC's legal and administrative framework for environmental and natural resources management include, among others, the EIA Law (2016), the Flood Prevention Law (2016), the Soil and Water Conservation Law (2011), the Water Pollution Prevention and Control Law (2008), the Solid Waste Pollution Prevention and Control Law (2005), the Forest Law (2005), the Land Administration Law (2004), the Water Law (2002), the Air Pollution Prevention and Control Law (2000), the Prevention and Control of Environmental Noise Pollution (1997), and the Environmental Protection Law (1989). The major regulations pertaining to the EIA of this project entail the Regulation on EIA of Plans and Programs (2009), the Regulation on Environmental Protection of Construction Projects (1998), and the Regulation of Nature Reserves (1994), and the Regulation on Protection of Terrestrial Wild Fauna (1992).

16. The implementation of laws and regulations is supported by a series of management and technical guidelines. The major management and technical guidelines applicable to this project are provided in **Table 1**.

Table 1: Applicable Environmental Guidelines

Name	Code/Year
Implementation Regulation of Law of Soil and Water Conservation of the PRC	2011
Guideline on Jurisdictional Authorities for Approval of EIAs of Construction Projects	2009
Guideline of River Management of the PRC	January 8, 2011
Ecological Functional Planning of the PRC	2015
Functional Planning of Important River and Lake of the PRC (2011–2030)	2011
Guideline on EIA Classification of Construction Projects	2015
Guideline on Environmental Information Disclosure	December 11, 2015
Ecological Environment Protection Planning for Yangtze River Economic Belt	July 17, 2017
Regulation on Public Participation in Environmental Protection	July 13, 2015
Technical Guideline for EIA: General principle	HJ 2.1-2016
Technical Guideline for EIA: Surface Water	HJ/T 2.3-93
Technical Guideline on EIA: Atmospheric Environment	HJ2.2-2008
Technical Guideline on EIA: Acoustic Environment	HJ2.4-2009
Technical Guideline on Ecological Impact Assessment	HJ19-2011
Technical Guideline on Control of Pollution from Agricultural Solid Waste	HJ588-2010
Suggestion on Promotion of Cleaner Production in Agriculture by the Ministry of Agriculture	2011
Action Plan of Zero Growth of Pesticide Application by 2020	February 2015
Action Plan of Zero Growth of Chemical Fertilizer Application by 2020	February 2015

Sources: Ministry of Agriculture, Ministry of Environmental Protection, and State Office for Comprehensive Agricultural Development.

2. Institutional Framework

17. In the PRC, the enforcement of environmental laws and regulations rests with the environmental protection authorities within each level of the government. At the national level, MEP is the regulatory, enforcement, and supervision authority. Each province has an environmental protection department. The environmental management authorities at the city and county levels are the environmental protection bureaus (EPBs). These authorities are supported by the environmental monitoring stations and the environmental protection research institutes.

18. Environmental monitoring network has been constructed from 1990s and now has been well in place. After 2010s, the government invested hugely on the update and quality control of these monitoring systems. There is an environmental monitoring station each at the national, provincial, and municipal levels. The national and provincial environmental monitoring stations are responsible for, among other things, setting up and supervising the implementation of environmental monitoring standards and protocols; and compiling and publishing environmental quality statistics at the national and provincial levels. The regular monitoring of ambient environmental quality and the compliance monitoring of pollution sources rest with the municipal (prefecture) and county (or county-status city) environmental monitoring stations. In addition, five regional environmental inspection and supervision centers (covering several provinces and/or autonomous regions) were set up across the country in 2008, with the responsibility of overseeing environmental law enforcement; investigating serious pollution cases; and mediating cross-regional environmental disputes. In recent years, environmental monitoring services provided by the third party is being encouraged to be purchased by the government.² Several provinces in this project also considered to purchase this environmental monitoring service during the construction and operation of the project activities.

² MEP. 2015. *Guidelines on Promoting the Socialization of Environmental Monitoring Services*. No. 20. Beijing.

3. Applicable Environmental Standards

19. The environmental standard system that supports the implementation of the environmental protection laws and regulations in the PRC can be classified into two categories by function—ambient environmental quality standards, and pollutant emission and/or discharge standards. The applicable standards are summarized in **Appendix 2**. The standards meet or exceed internal guidelines and best practices and are considered adequate for the project.

4. Environmental Assessment Methodology

20. **Field visits.** Field visits during 8–17 May and 24 July–5 August 2017 were undertaken, and the environmental consultant have visited the representative villages and activities planned in the six project provinces. At the inception meeting in Chongqing, the environmental consultant reported the key findings obtained from the field visits and from the FSR review to the State Office for CAD (SOCAD), the Provincial Offices for CAD (POCADs), and the FSR design institutes. The findings are more suggestions on the improvement of activities and sites selection within the project, and they are being incorporated in the provincial FSR revision. During the midterm meeting in September 2017 in Beijing, the initial environmental examination (IEE) and draft environmental management plan (EMP) were discussed with the project management office (PMO) staffs from each project province. During the loan fact-finding mission in November 2017 in Guiyang, the environmental consultant reported the IEE and the EMP; and discussed intensively and finalized with SOCAD and the POCADs.

21. **Quantification of environmental benefits.** Since April 2017, the consultant worked with the domestic EIA team on collecting the baseline data of fertilization, pesticide application and irrigation, and other applicable data of important farming operations from the project counties; and collected the optimized fertilization, the IPM and water irrigation guidelines, handbooks, etc., from the county, provincial, and national agricultural and water conservation departments. These data are for the quantification of the mitigation potentiality of chemical fertilizer and pesticide usage in the project regions. By comparing the scenarios of before-the-project (baseline data) and after-the-project (balanced fertilization, IPM, and improved irrigation scheme, etc.), the changes of agrochemicals (fertilizer, pesticides) and water inputs were calculated. The data obtained until now had been shared with the consultants of water resources and climate change who worked on water resources balance and calculation of the change of greenhouse gas (GHG) emission before and after the project, which is a key benefit of the project. The consultants had drafted the IEE which systematically analysed the main environmental benefits and potential environmental risks of the project activities.

5. Domestic Approval Process

22. Entrusted by SOCAD, the EIA Center of the China Agricultural University developed the domestic EIA report. From April to October 2017, the EIA team visited 28 project counties and met with the PMO staff, village leaders, and potential beneficiary farmers; and discussed on the project sites, project activities, and current environmental quality. Relevant documents, including the FSR, environmental quality report, environmental laws and/or regulations, and applicable environmental standards and/or regulations for the project sites, have been collected. Public consultations have also been implemented to collect the comments and/or suggestions to the project. The EIA report (**Supplementary Appendix B**) was finished and submitted in the beginning of November 2017 to MEP for approval. On 12–14 December 2017, MEP organized the approval meeting for the domestic EIA report; and it is expected that the domestic EIA report will be approved by the end of January 2018.

III. DESCRIPTION OF THE PROJECT

1. Project Impact and Outcome

23. The overall impact of the project will be aligned with environmental protection, rehabilitation, and management of the Yangtze River improved. The outcome of the project will be sustainability and modernity of agricultural production systems in participating project watersheds increased.

24. The proposed project covers a total of 47 counties and county-status cities and districts in five provinces and one municipality: Guizhou, Hubei, Hunan, Sichuan, Yunnan, and Chongqing (**Table 2**; see location maps in **Figure 1**).³ The six project provinces have been selected based on geographical diversity, crop production, and agricultural source pollution, so that the success from the project can be disseminated to other provinces of similar conditions. The six project provinces are all in upper and middle reaches of Yangtze River, with similar climate and geographical conditions and social environment. The implementation and management of the project will be harmonized, and the experiences gained can be easily extended to and shared among the project regions.

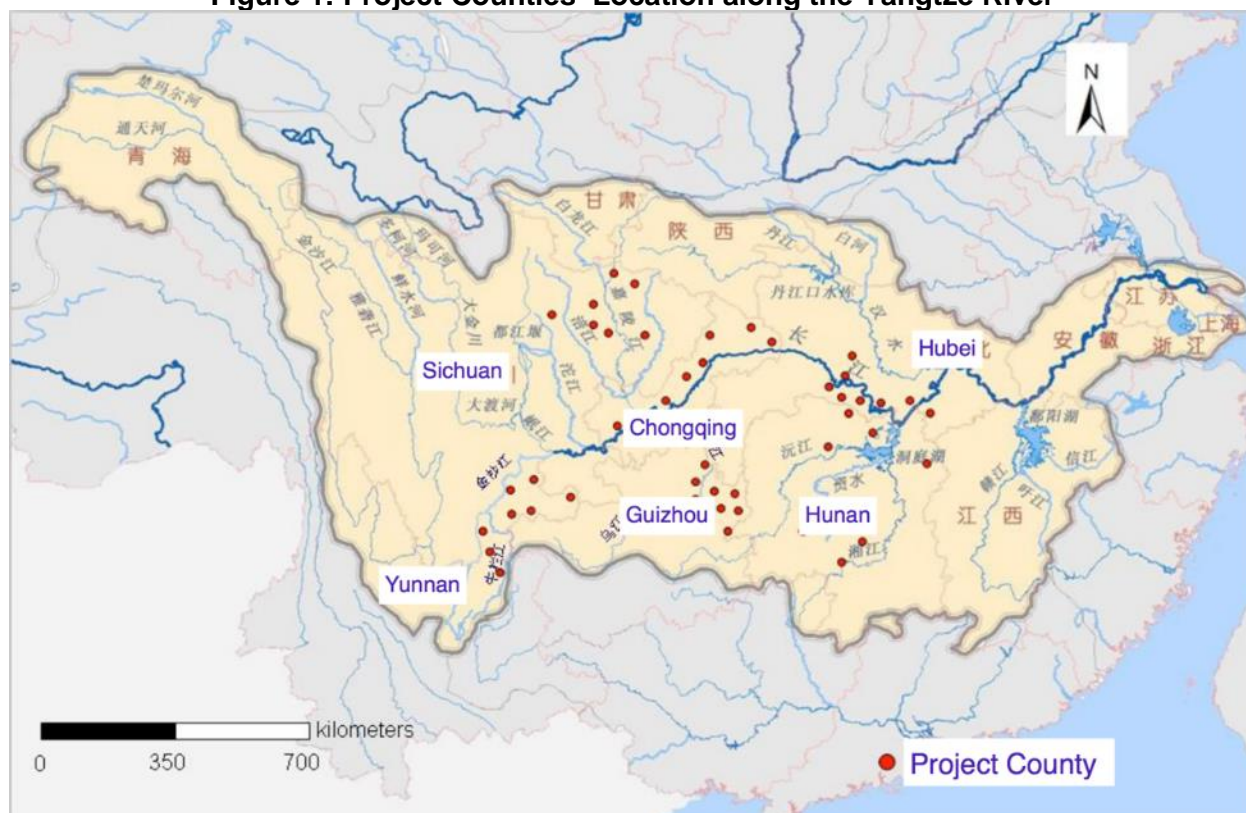
Table 2: Project Provinces and Counties

Project Province	County, City, or District
Chongqing (8)	Fuling, Jiangjin, Kaizhou, Wanzhou, Wulong, Wushan, Wuxi, and Zhongxian
Guizhou (8)	Bijiang, Dejiang, Jiangkou, Sinan, Songtao, Yanhe, Yinjiang, and Yuping
Hubei (8)	Chibi, Dangyang, Gongan, Honghu, Shishou, Songzi, Yidu, and Zhijiang
Hunan (8)	Dongkou, Hengnan, Lengshuitan, Li, Nan, Pingjiang, Shuangfeng, and Taoyuan
Sichuan (7)	Anzhou, Jiange, Nanbu, Wangcang, Yanting, Yingshan, and Zhaohua
Yunnan (8)	Huize, Qiaojia, Weixin, Xuanwei, Yanjin, Yiliang, Yongshan, and Zhaoyang

Source: National feasibility study report.

³ For this IEE report, Chongqing Municipality is referred to as a province.

Figure 1: Project Counties' Location along the Yangtze River



Source: Domestic environmental impact assessment report.

2. Project Outputs

25. The project has three outputs. Detailed descriptions of the project activities by province are presented in **Appendix 2**.

26. **Output 1: Modernized farming systems constructed.** The output will address the current outdated and inefficient production systems, focusing on upgrading the production systems to be more efficient, productive, and clean. The output includes (i) construction of 1,326 kilometers (km) of irrigation and drainage infrastructure, servicing 32,900 hectares (ha) of farmland; 1,610 km of farm access and tractor roads; and 3,535 water storage ponds for irrigation, and affiliated water-saving irrigation systems and equipment; (ii) supporting the uptake of sustainable and locally appropriate climate-resilient land and crop management practices such as 159 ecological farming sites, 8,104 ha of land levelling, returning straw residue to 3,287 ha of farmland, and 2,320 ha of conservation tillage; and (iii) providing equipment and materials to implement sustainable and modern farming practices with 23 sets of farm machinery, 80 ha of greenhouses, and 12,000 square meters (m²) of citrus distribution center.

27. **Output 2: Waste and environmental management systems strengthened.** Output 2 will address livestock and cropping waste management issues that contribute to agriculture-related NPS pollution. It will improve environmental quality through soil and water conservation practices. This output includes (i) applying and promoting waste management systems for cropping (plastic film, and fertilizer and pesticide container collection for recycling); (ii) establishing waste management systems through the construction of livestock waste biogas plants (21,400 cubic meters [m³]), village waste management units (20,308 m³), and organic fertilizer processing

plants (400 m³); (iii) promoting organic fertilizer application to farmland, and balanced fertilizer application for optimizing crop nutrient requirements (25,193 ha); (iv) promoting watershed protection and erosion control through reforestation or afforestation of ecological forests and forest shelter belts (11,000 ha), planting economic trees with high-yielding and climate-resilient tree and crop varieties (23,425 ha), and sloping land protection (2,652 ha); and (v) providing 31 sets of equipment for watershed pollution monitoring, and 25,193 sets of integrated pest management materials and equipment.

28. **Output 3: Institutional, technical, and management capacity and coordination strengthened.** The output will address the issue of insufficient sector and institutional capacity and coordination to enable a more unified development pathway. This output includes (i) raise awareness, and promote new technology and improved agricultural extension services for farmers and farmer organizations; (ii) enhance environmental protection through organizational capacity building, research projects, and policy studies, such as eco-compensation in cooperation with the Ministry for Environmental Protection and the China Council for International Cooperation on Environment and Development; and new technology for modern farming, such as irrigation technologies; (iii) supporting the collaboration across ministries; and (iv) promoting trans-provincial cooperation and coordination mechanism.⁴

IV. DESCRIPTION OF THE ENVIRONMENT

1. General Description

29. The six project provinces (Chongqing, Guizhou, Hubei, Hunan, Sichuan, and Yunnan) and 47 project counties are all along the Yangtze River main stream or tributary catchments (**Figure 1**) and located in the 1st (lowest) and 2nd (medium height) ladder of the PRC's landform. Among which, Hubei and Hunan are in the 1st ladder with a relatively gently terrain and landscapes with plains, low-hills, rivers and lakes; Chongqing, Guizhou, Sichuan, and Yunnan belong to the 2nd ladder; and the corresponding geomorphic conditions are hills, low mountain, medium height mountains and plateau with an increasing altitude (see **Table 3**).

⁴ The China Council for International Cooperation on Environment and Development is a non-profit international advisory body composed of high-level Chinese and international figures and well-known experts in the field of environment and development that undertake policy and applied research.

Table 3: Topographic and Geographic Conditions

Province	Topographic Conditions
Hubei	The eight project counties are located along the Yangtze River, with a low altitude, in the plain and low hills between the Three Gorges exit and Wuhan City.
Hunan	Among the eight project counties and/or districts, four are located around the Dongting Lake with the topography of shallow hills and plain; and the other four project counties are in the upper reaches of the hilly terrain of the Xiangjiang River (a tributary of the Yangtze River) with an increasing altitude.
Chongqing	The eight project counties and/or districts are located within the Three Gorges reservoir canyon, mainly with hilly landscape and sporadically distributed alluvial flatland. From low to high altitude, geographic unit gradually changes from flat to hills and to mountains.
Sichuan	The seven project counties and/or districts are in the upper and middle reaches of the Jialing River (a tributary of the Yangtze River) from north to south with the topography of the Qinba Mountain, the Chuanshan Hill, and eroded flatland of the Fujiang River at a decreasing altitude. Serious soil and water erosion mainly occur in the northern part and nonpoint source pollution in the southern part of the project counties in Sichuan Province.
Guizhou	The eight project counties and/or districts are in the hinterland of the Wuling Mountain and the source of the Yuanjiang River—the second largest river of Dongting Lake. The geographic conditions are in the slope terrain from the Yunnan–Guizhou Plateau down to the Xiangxi Hill, with a decreasing altitude from northwest to southeast. The landforms in the project counties are mainly hilly and mountainous areas, distributed with karst topography, hills, and the rugged depressions which varied greatly in altitude.
Yunnan	The eight project counties are in the upper reaches of the Jinsha River Basin, a branch of the Yangtze River. The region belongs to transition terrain from the Yunnan Plateau down to the hilly area of Sichuan Province with the medium and low eroded hills and mountains.

Source: Domestic environmental impact assessment report.

30. **Climatic and soil conditions.** As the project region covered the area with length of about 1,500 km, climate and hydrology in the region varied greatly. The climate in Hubei and Hunan provinces was subtropical humid monsoon climate with the characteristics of hot summer and warm winter, synchronization of sunny and hot season, long period of frost-free, adequate precipitation, mainly humid and overcast, and 600–1,500 mm of precipitation per year in most areas. This climate conditions meet the requirement of two or three cropping per year. Most project regions are rich in water systems with adequate water resources. However, as geography is dominated with hills and mountains, key water issue is to transport these abundant water resources to the farmland and/or artificial forest. Main soils in the region are yellow brown soil, yellow soil, and red soil with a pH<7. Soil in the valley and flatland are paddy soils.

31. Chongqing Municipality and Sichuan Province belong to subtropical southwest monsoon and mountainous north subtropical humid climate with four distinct seasons. Winter is warm and dry, with much cloud and fog; spring is dry; summer has much storms which often bring the flood; and the temperature in autumn decreases rapidly, with long period of overcast and light precipitation. Purple soil and yellow soil are the two soils with the largest area. The soils are easily degraded and physically weathered, but chemical weathering is slow. Controlled by the mother materials, the soil is rich in mineral nutrients; and low in soil organic matter (average <1.2%), with less developed soil layers. The soil also has a lower layer, low water-holding capacity, and low resistance to erosion; hence, soil and water erosion in the region is serious.

32. Guizhou and Yunnan provinces are in the transition area from subtropical humid monsoon climate to southwest mountainous climate. The climate is distinct with frequent monsoons, significant vertical differences of the weather conditions. Heat resources is rich, and there is appropriate amount of sunlight. The precipitation gradually decreased from east to west. Most regions are warm and humid. The weather in different altitudes of are quite different. Except for a high precipitation in Jinshajiang River valley, other region is rich in precipitation; but as karst geology is rich in the region, there is low surface runoff, and available water resources are limited. The soil are mainly yellow soil and calcareous soil developed from carbonates, with medium level of soil fertility but shallow soil layers. There are also sporadic regions of rocky desertification in these two provinces.

33. **Current environmental quality.** All 18 national surface water monitoring sites (Chongqing, 1; Guizhou, 4; Hubei, 3; Hunan, 4; Sichuan, 2; and Yunnan, 4) meet Class II or III of the Surface Water Standards (GB/T3838-2002), (**Table 4**). As only ambient air monitoring sites in urban areas are available, the data of ambient air were collected from local environmental monitoring stations; and found that the air quality in all these sites can meet the limits of Class II defined in GB3095-2012 of Table 1.3 of Appendix 1. The project activities are all located in rural areas of the six project provinces; and as expected, the air quality should meet the limits of Class I or II, which is good or relatively good.

Table 4: Water Quality of National Surface Water Monitoring Sites in the Project Region

Province	River or Lake	Site	pH	COD _{Cr}	COD _{Mn}	BOD ₅	NH ₄ -N
Hubei	Songzixi River	1,500 m downstream of Songzi wastewater discharge, Songzixi River	7.80	12.00–15.00	1.40–1.60	1.50–2.60	0.52–0.90
	Yangtze River Class III	Shishou	7.90 6.00–9.00	16.00–17.40 20.00	1.58–1.67 6.00	2.80–3.20 4.00	0.25–0.40 1.00
	Yangtze River	1,000 m downstream of Songzi Lingang Industrial wastewater discharge, Songzi	7.70–7.80	6.71–6.82	2.35–2.41	---	0.20–0.23
Hunan	Class II		6.00–9.00	15.00	4.00	3.00	0.50
	Xiangjiang River	1,000 m downstream of 2nd Hengshan water collection site	7.50–7.60	13.40–13.70	1.81–1.86	1.10–1.50	0.42–0.43
	Leishui River	Dahetan	8.00	---	1.20	---	n.d.
	Shibahe River	Jinjiling	7.90	17.00	---	---	0.22
	Class III		6.00–9.00	20.00	6.00	4.00	1.00
Chongqing	Huangjindong reservoir	---	6.45	n.d.	1.30	2.40	0.07
	Class II		6.00–9.00	15.00	4.00	3.00	0.50
	Wujiang River	Wanmu	7.76	---	1.35	---	0.17
	Class III		6.00–9.00	20.00	6.00	4.00	1.00
Sichuan	Jialingjiang River	Shejian Town	7.97	---	3.60	2.70	0.11
	Zitongjiang River	Dafosi, Tianxian Town	8.01	---	4.60	3.00	0.10
Guizhou	Class III		6.00–9.00	20.00	6.00	4.00	1.00
	Songtao River	200 m upstream of Baiyantang bridge	7.90	18.00–18.20	---	3.41–3.61	0.86–0.88
	Hanhezi River	Yonghechujing	7.80	3.20	---	1.90	0.72
	Xiushui River	Qianfeng bridge	7.40	3.80	---	1.70	0.19
	Class III		6.00–9.00	20.00	6.00	4.00	1.00
	Jinjiang River	500 m upstream of Woman and Children Hospital of Bijinag River	---	10.97	1.63	1.63	0.05
	Class II		6.00–9.00	15.00	4.00	3.00	0.50

Province	River or Lake	Site	pH	COD _{Cr}	COD _{Mn}	BOD ₅	NH ₄ -N
Yunnan	Xiaojiang River	Qiaojiaxian	8.40–8.50	2.30–2.69	---	1.60–1.72	0.21–0.24
	Jinshajiang River	1,400 m downstream of Huanglongtan	8.10–8.30	11.00–13.00	n.d.	1.10–2.60	0.05–0.08
	Baishuijiang River	1,000 m downstream of Baishui River and Youfanggou	6.40	10.00	---	0.30–0.40	0.08–0.10
	Daoliuhe River	50 m downstream of Wanjiatong bridge	7.90–8.10	6.00	---	1.90–3.40	0.09–0.13
	Class III		6.00–9.00	20.00	6.00	4.00	1.00

BOD₅ = 5-day biological oxygen demand, COD_{Cr} = chemical oxygen demand of chromium, COD_{Mn} = chemical oxygen demand of manganese, m = meter, n.d. = no data, NH₄-N = dissociated form of ammonia, pH = potential of hydrogen; a numeric scale used to specify the acidity or basicity of an aqueous solution.

Sources: Provided by the Provincial Environmental Protection Department and listed in the domestic environmental impact assessment report.

34. **Ecological function planning.** In November 2015, MEP and the Chinese Academy of Science issued the *National Ecological Function Planning* (2015 updated); and determined the ecological functional zones for all the geographic region in the PRC. Based on the natural properties and its determining service function, ecological service is divided into three types, i.e., ecological adjustment (EA), product supply (PS), and providing of human habitat (PH). For these three ecological services, nine categories of ecological function are further classified, i.e., EA: water source conservation (WC), protection of biodiversity (PB), soil and erosion control (SC), wind prevention and sand fixation (WS), and flood adjustment (FA); PS: agricultural product (AP) and forest product (FP); and PH: metropolis (ME) and important city and town (IC). In line with these zoning and planning, the territory of the PRC is divided into 242 ecological function zones. The main ecological function zone for all 47 project counties and/or districts are listed **Appendix 3**. From the overview, it can be seen that soil and water erosion control; water source conservation; and agricultural and/or forest production are the main ecological functions in the project counties.

2. Ecological and Environmental Concerns

35. **Soil and water erosion.** Except the project counties near Dongting Lake (Li, Nan, Pingjiang, and Taoyuan), most of the project villages are in the hills and mountains with medium to high slope. The proportion of sloping farmland in total farmland is high, and with medium to high soil erosion. Among the six project provinces, the land in Chongqing Municipality and Sichuan Province has a higher level of erosion, accounting for 37.3% of local land, with the erosion rate of 3,393 tons/km²/year. The land under soil and water erosion in the seven project counties in Sichuan Province covers the area of 6,009 km², i.e., 42% of total land area in the region. The land under medium and high erosion covers the area of 1,968 km², with 62% of total eroded land. Total erosion quantity in the project region is 19.7 million tons with the erosion rate of 3,275 tons/km²/year. In Tongren City of Guizhou Province, land under rocky desertification accounts 7.9% of total land with the area of 13,900 km². In the region, there is an expansion of 508 km² of land affected by rocky desertification annually. The detailed soil and water erosion for the six project provinces is listed in **Table 5**.

Table 5: Soil and Water Erosion in the Six Project Provinces

Province	Soil and Water Erosion Level	Proportion of Provincial Land Area (%)	Level of Soil and Water Erosion Control for the Project Counties
Hubei	Light	9.97	All the project counties are provincial control regions.
	Medium	6.63	
	High	1.71	
	Extreme high	0.62	
Hunan	Light	12.00	Dongkong and Hengnan are national control regions. Li, Nan, Pingjiang, and Taoyuan are provincial control regions.
	Medium	4.40	
	High	0.60	
	Extreme high	0.40	
Chongqing	Light	13.10	All project counties are national control regions.
	Medium	12.20	
	High	6.80	
	Extreme high	4.00	
Sichuan	Light	9.90	Nanbu is a provincial control region. Anting, Jiange, Wangcang Yanting, Yingshan, Zhaohua are national control regions.
	Medium	7.40	
	High	1.00	
	Extreme high	1.40	
Guizhou	Light	1.60	Jiangkou, Sinan, Yanhe, and Yinjiang are national control regions; and Bijiang, Songtao, Yinjiang, and Yuping are provincial control regions.
	Medium	9.30	
	High	3.40	
	Extreme high	3.00	
Yunnan	Light	11.50	All project counties are national control regions.
	Medium	8.90	
	High	4.10	
	Extreme high	2.70	

Source: Domestic environmental impact assessment report.

36. **Nonpoint source pollution.** Agriculture in the provinces of Hunan, Hubei, and Sichuan; and in Chongqing Municipality is rather intensified by high input of fertilizer and pesticide with about 30% of utilization efficiency. The recovering rate of agricultural plastic film is less than 80%. The nutrients and pesticide lost via runoff and leaching finally went into water bodies; and brought serious water pollution, and also negative pressure to biodiversity. Current fertilizer and pesticide application is listed in **Table 6**.

37. **Agricultural waste and rural garbage utilization and recycling.** In the six project provinces, agricultural waste of crop straw and animal manure has been recycled and utilized at a rather low level. In Hunan Province, only 30% of crop straw is reused; and others have been discarded. Sichuan is a large-scale animal production province, and annual animal manure is 95 million tons. The discarded agricultural waste was either burned or decomposed in the farmland or water bodies which seriously pollutes the air, soil, and water. With the improvement of rural livelihood, rural waste water and garbage gradually increases. However, the waste disposal and treatment facilities are not or less in place which cannot meet the requirement of waste treatment in the rural area.

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

1. Potential Environmental Benefits

38. **General.** Ecological and environmental benefits will be generated by the project activities in the project region. The major anticipated ecological environmental benefits will include (i) reduction of chemical fertilizer application, (ii) reduction of chemical pesticide application, (iii) increase of water use efficiency, (iv) reduction of soil erosion and nutrient loss, (v) pollution treatment and recycling of crop straw and animal wastes within agricultural system, (vi) recovery of plastic mulch, and (vii) increased climate resilience. These benefits will help to reduce the NPS pollution from the agriculture sector; increase agricultural resources utilization efficiency; improve the ambient air, soil, and water quality and living conditions; and improve ecosystem vitality and service in the Yangtze River Basin.

39. **Estimated reduced use of fertilizers.** The project will also include the adoption of the BFA in the project provinces.⁸ Other good farming management, for instance, paddy farmed mixed with small lobster also significantly reduced the chemical fertilizer and pesticides usage (**Figure 2**). The BFA is one of the key technologies promoted by the Ministry of Agriculture, which involves four major steps: (i) measuring the nutrient contents of the soil; (ii) determining the nutrient requirements of the planted crops; (iii) determining the nutrient needs; and (iv) applying fertilizers in accordance with the needs (see a sample BFA handbook for farmer use in Chongqing, **Figure 3**). The BFA will generate many benefits, including (i) increasing the output by 5%–25% for grain crops and 10%–30% for vegetable crops; (ii) improving the quality of agricultural products; (iii) reducing plant disease and pest infections by strengthening plant health; (iv) reducing the amount of fertilizer use and associated costs; and (v) reducing environmental pollution. The analysis⁹ found the provinces of Hubei and Hunan, and Chongqing Municipality—three highly intensified agricultural provinces—have a higher space of fertilizer reduction, i.e., 20%–30% for nitrogen; and 17%–29% for diphosphorus pentoxide (P_2O_5), (kilogram per hectare [kg/ha]); while the other three provinces of Guizhou, Sichuan, and Yunnan have a lower reduction potentiality, i.e., 10%–21% for nitrogen and 13%–25% for P_2O_5 (kg/ha), (**Table 5**). For the whole six project provinces, nitrogen, P_2O_5 , and potassium oxide (K_2O) were reduced by the project at the level of 23%, 23%, and 13%, respectively; totally, 3,991 tons of nitrogen, 1,716 tons of P_2O_5 , and 834 tons of K_2O per year were saved; or 16% (nitrogen), 18% (P_2O_5), and 8% (K_2O) of reduction compared with before the project. The detailed fertilizer reduction of each project county is listed in **Appendix 4**. Change of fertilizer application was due to (i) optimized fertilization scheme, which is based on targeted yield and corresponding nutrients demand; soil nutrient status determined by soil testing; and (ii) change of crop types: in many provinces, maize cropland was changed to cash fruit (orange, citrus, etc.); and the fertilization amount and types were also changed.

⁸ Also referred to optimized fertilization or formula fertilization program which has same technical requirements as the BFA in the PRC.

⁹ The analysis was based on (i) an intensive interview with agricultural technicians from each project county; (ii) collection of baseline fertilizer and pesticide application, and the optimized fertilization scheme for main crops from the project county; (iii) research literature, provincial and national crop optimized fertilization scheme; and (iv) the expertise of the consultant and the domestic EIA team.

Figure 2: Paddy Farmed with Small Lobster with Minimum Pesticide Input in Hubei

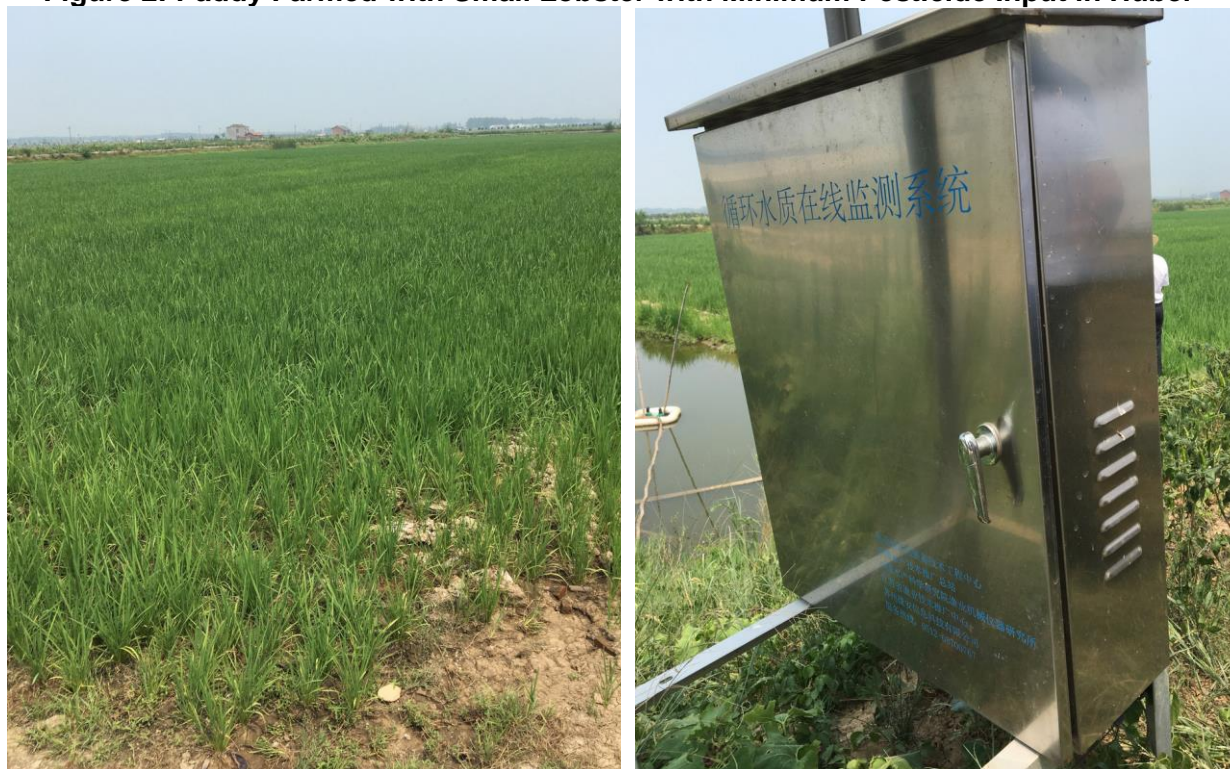


Figure 3: Balance Fertilizer Application Chart Distributed to Farmers in Chongqing

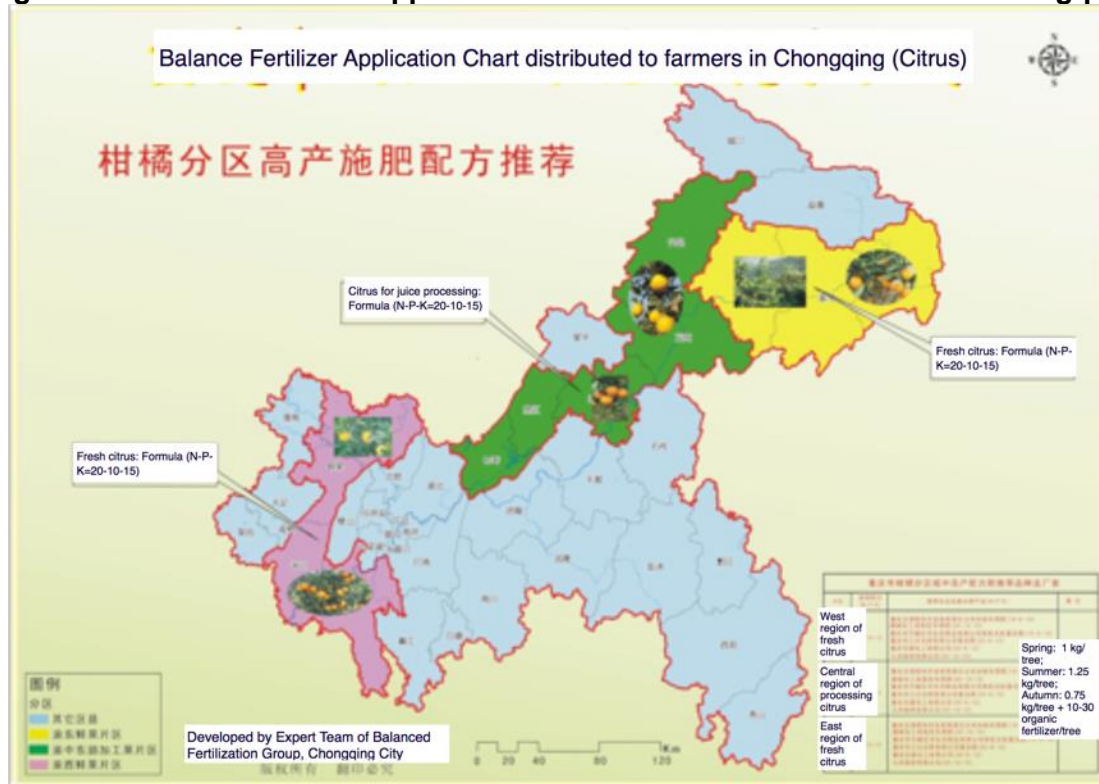


Table 6: Change of Fertilizer Application Rate (kilogram/hectare) and Quantity (ton/year) in the Project

		Hubei	Hunan	Chongqing	Sichuan	Guizhou	Yunnan	Total
Rate								
N	Before	237	405	386	426	243	258	322
	After	190	284	280	376	218	203	248
	Change	-20%	-30%	-28%	-12%	-10%	-21%	-23%
P ₂ O ₅	Before	119	176	208	229	111	90	142
	After	99	128	148	172	97	74	110
	Change	-17%	-27%	-29%	-25%	-13%	-18%	-23%
K ₂ O	Before	128	204	304	258	126	86	164
	After	107	175	235	220	119	86	144
	Change	-16%	-14%	-23%	-15%	-5%	-1%	-13%
Quantity								
N	Before	2,037	7,642	2,965	1,830	1,071	5,710	21,253
	After	1,635	6,404	2,147	1,612	960	4,503	17,262
	Change	-20%	-16%	-28%	-12%	-10%	-21%	-16%
P ₂ O ₅	Before	1,019	3,315	1,596	983	490	1,993	9,396
	After	851	2,896	1,133	740	426	1,634	7,680
	Change	-17%	-13%	-29%	-25%	-13%	-18%	-18%
K ₂ O	Before	1,096	3,859	2,336	1,109	554	1,896	10,850
	After	917	3,952	1,802	946	524	1,875	10,016
	Change	-16%	2%	-23%	-15%	-5%	-1%	-8%

Source: Domestic environmental impact assessment report.

40. **Estimated reduced use of pesticides.** One of the major activity in the NPS pollution control was to reduce the use of chemical pesticides by various means. These activities will reduce the pollution of groundwater and surface water, air, and soil by chemical pesticides; and improve the local ecosystem quality. The food safety will also be significantly improved by these reduced chemical pesticide residuals in crop, vegetable, and fruits produced. With the introduction of the IPM and comprehensive control measures (biological pesticide, black light trap, etc.; **Figure 2**), total chemical pesticide application was reduced by about 17% (66.5 tons/year), or the pesticide application rate was decreased from 5.82 to 4.55 kg/ha at a reduction level of 22% (**Table 7**).¹⁰ In the six project provinces, Hubei, Hunan, and Sichuan provinces are agricultural-developed regions with higher pesticide rate than the other three project provinces of Chongqing, Guizhou, and Yunnan; hence, the reduction is also higher. The detailed change of pesticide application at before and after the project for each project county and province was listed in **Appendix 5**.

¹⁰ The analysis was based on (i) an intensive interview with agricultural technicians from each project county; (ii) collection of baseline fertilizer and pesticide application for main crops from project county; (iii) research literature, provincial and national standards for non-pollution agricultural products (无公害食品行业标准, 种植业部分) issued by the Ministry of Agriculture; and (iv) the expertise of the consultant and domestic EIA team.

Table 7: Change of Chemical Pesticide Application Rate (kilogram/hectare) and Quantity (ton/year) in the Project

	Hubei	Hunan	Chongqing	Sichuan	Guizhou	Yunnan	Total
Rate							
Before	6.63	8.40	7.03	5.84	4.14	3.12	5.82
After	4.76	5.95	5.66	4.76	3.48	2.68	4.55
Change	-25%	-29%	-19%	-18%	-16%	-14%	-22%
Quantity							
Before	57.80	158.70	54.00	25.10	18.20	70.10	383.90
After	43.50	134.50	43.50	20.40	15.30	60.20	317.40
Change	-25%	-15%	-19%	-18%	-16%	-14%	-17%

Sources: Domestic environmental impact assessment report.

41. **Estimated reduction of water use.** Irrigation water will be collected mainly from surface water (rivers, lakes, and reservoirs) bodies as these six project provinces are rich in surface water resources. Water use efficiency will be increased by installment of improved channel, intercepting drain and pond (**Figure 4**), sprinkler and drip irrigation facilities, and riverbank ecological revetment slope protection works (**Figure 5**). Because of farmland use change, for instance, from annual crop to perennial fruit or soil conservation forest, irrigation rate will also be reduced. For the six project provinces, amount of water used for irrigation will not be changed (only 0.02% increased) due to the project; and this water increase only accounts for 0.06% of current water resources available (**Table 8** and **Appendix 6**). Among the six project provinces, water use change will occur mainly in three provinces of Chongqing (+15.5%), Hunan (9.5%), Sichuan (+4.6%), Hubei (-5.6%), Guizhou (-14.8%), and Yunnan (-16.1%), respectively. Notably, (i) Hubei: except Dangyang, all other seven counties decrease its water use for irrigation due to the project, mainly by water saving from improved irrigation and water transportation facilities; (ii) Hunan: all counties increase water use mainly due to the introduction of new fruit planting (no water irrigation for abandoned or other use of land before the project); (iii) Chongqing: all counties increase water use, but the highest among the six project provinces. Similar to Hunan Province, most of water increase is from new fruit planting (no water irrigation for grain crops before the project); (iv) Sichuan: all counties increase water use. Although there is new fruit planting, as water irrigation is water-saving model and the irrigation quota is small (30–50 cubic meters [m^3]/ mu /year), the increase of total water resources is small (3.9% for whole province); (v) Guizhou: decrease in water use for all the eight counties. Water is saved mainly due to the water-saving technology and improved water transportation facilities; and (vi) Yunnan: similar to Guizhou Province, water is saved mainly due to the water-saving technology and improved water transportation facilities.

Figure 4: Current Field Lake Waiting for Bank Improvement



Figure 5: Riverbank Ecological Revetment Slope Protection Works

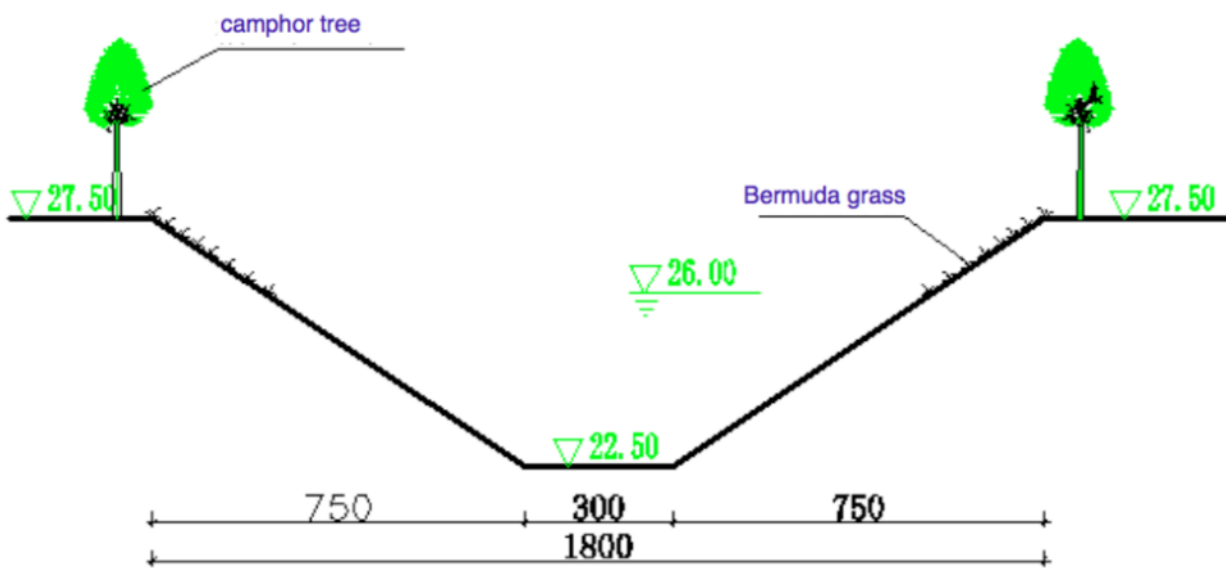


Table 8: Estimated Water Resources Balance for the Six Project Provinces

Project Province	Current Available Water ($\times 10^4$ m ³)	Water Used for Irrigation Before the Project ($\times 10^4$ m ³)	Water Used for Irrigation After the Project ($\times 10^4$ m ³)	Change of Water Used for Irrigation Due to the Project	Proportion of Water Use Change in Available Water
Hubei	5,810	3,498	3,302	-5.6%	-3.4%
Hunan	29,096	11,250	12,323	+9.5%	+3.7%
Chongqing	1,839	1,443	1,666	+15.5%	+12.1%
Sichuan	9,654	8,214	8,592	+4.6%	+3.9%
Guizhou	6,455	3,769	3,211	-14.8%	-8.6%
Yunnan	41,840	5,324	4,463	-16.1%	-2.1%
Total	94,694	33,499	33,557	+0.2%	+0.06%

m³ = cubic meter.

Source: Domestic environmental impact assessment report.

42. **Reduction of soil erosion and soil nutrients loss.** Measures will be undertaken to reduce the soil erosion loss and improve soil quality, including (i) change of slope land to terracing land (**Figure 6**); (ii) planting of economic forest (mainly fruits) and ecological forest (also referred to as soil and erosion control forest in FSR); (iii) conservative tillage, for instance in Sichuan Province; and (iv) introducing the riverbank and slope protection facilities. For these four types of measures (project activities), soil erosion reduction parameters were listed from in **Table 9**. Among these measures, planting of ecological economic forest will convert the original rain-feeding crops; for instance, maize, to orange, citrus, kiwi, plum, apple, cherry, and tea. The land use conversion will significantly decrease the intensities of tillage, chemical fertilization, and disturbance to the soil; and this will contribute to the soil erosion reduction. Totally, the soil erosion of 731,408 tons/year in the six project provinces (**Table 10**) will be mitigated. Detailed information for each project county is listed in **Appendix 7**. As the soil erosion is reduced, leaching of nitrogen and phosphorus nutrients stored in the soil will also be reduced; and this will also have a positive impact on the environment. Besides the soil erosion reduction, one of the promising activities of the project is the construction of silt trap at the end of the discharge system. These facilities will settle the silts from the discharged water; and seasonally, farmers will collect the silts; and reuse in the farmland as fertilizers.

Figure 6: Comparison of Original Slope Land and Terraced Slope Land in Chongqing

Original slope land

Slope land to terracing land

Table 9: Soil Erosion Mitigation Parameters

Project Activities	Mitigation (%)	References
Slope to terrace	71.1	Precipitation, erosion and sand transportation characteristics in Sichuan terrain
Economic forest	84.7	Benefits of grain for green engineerings in Zigui of Sanxia
Conservative tillage	22.5	Soil erosion reduction benefits in different slopes of Jialiangjiang catchment
Ecological forest	84.7	Benefits of grain for green engineerings in Zigui of Sanxia
Riverbank protection and slope protection	73.8	Precipitation, erosion, and sand transportation characteristics in Sichuan terrain

Source: Domestic environmental impact assessment report.

Table 10: Reduction of Soil Erosion in the Six Provinces (ton/year)

Project Activities	Hubei	Hunan	Chongqing	Sichuan	Guizhou	Yunnan	Total
Slope to terrace	7,226	0	21,622	32,599	647	8,277	63,145
Economic forest	4,782	28,196	144,418	44,716	15,855	76,156	309,340
Conservative tillage	0	0	0	12,210	0	0	12,210
Ecological forest	912	28,196	3,454	135,229	0	157,137	324,016
Riverbank protection and slope protection	4,822	1468	0	1,595	1,892	0	4,719
Total	17,742	57,859	169,494	226,349	18,394	241,570	731,408

Source: Domestic environmental impact assessment report.

43. **Pollution treatment and recycling of crop straw and animal wastes.** The project will construct and implement one wetland (21 hectares), 19 set biogas tanks, 72 set septic tanks, 10,154 set anaerobic purification tanks, 210 straw fermentation tanks, 303 set pesticide container storage tanks, and 4 organic fertilizer processing plants. The wetland, biogas tanks, septic tanks, and anaerobic purification tanks will be used for the treatment of living wastewater from rural households. Straw fermentation and organic fertilizer processing plant will help to collect straw and animal manure; and then processed into quality organic fertilizers, which is high demand for the vegetable and fruit production. Farmers in rural area of the PRC always believe that grains, vegetables, and fruits have good flavor and taste if planted with organic fertilizers instead on only chemical fertilizer. This “concept and/or awareness” actually promote the recycling of crop residues and animal manure within cropping-animal production system.

44. **Recovery of plastic mulch.** In the project, plastic mulch recovery will be implemented in 416 hectares of farmland in Sichuan Province, with a negative environmental impact in the region.

45. **Control of schistosome disease spreading.** In the six project provinces, the Nan and Taoyan counties in Hunan Province and the Anzhou County in Sichuan Province are the counties with schistosome diseases designated by the government. Marshland of long-term hot, humid, and dark conditions are the prerequisite for the survival and spreading of schistosome. The project will not dig new ditch or channel, but will improve the riverbank by ecological revetment slope protection works. This will lower the occurrence and spreading of schistosome in the project region.

46. **Building climate resilience.** All the project interventions will help build resilience to climate change. As crop straw and organic fertilizers will be increased, chemical fertilizer will be decreased; and ecological forest and cash fruit will be expanded in the project. Soil organic carbon sequestered by the project measures will increase; and this will contribute to reduce of direct and indirect GHG emission and soil resistance to extreme weather conditions. Improved water management with upgraded irrigation capacity and drainage systems in the project area will be able to better resist drought and floods. Introduction of the IPM and the biological pesticide will enable farmers to better respond to the new pests that may emerge as a result of global climate change. Training and institutional strengthening programs will increase the awareness of local farmers and agricultural agencies on climate change impacts and adaptation.

2. Potential Adverse Environmental Impacts and Mitigation Measures

47. **Impacts during construction.** Most of the project activities under this project will be small-scale interventions in existing farming areas, including land levelling, building of irrigation and drainage ditches, building of rural road, dredging and, construction wetland, biogas tank, septic tank, anaerobic purification, straw fermentation tank, pesticide container storage tank, organic fertilizer processing plant, seeding nurseries, workshops, and administrative buildings. The works are small, and relatively simple and scattered in the vast areas across the six project provinces. They are undertaken in already developed farmland areas or wasteland (for instance, fruit planting in Hunan Province), and the construction period will be short (generally within half year). The civil works will be carried out by local farmers and extension service officers. During the civil work construction, there is only limited water (mainly with sand and silt) for washing of equipment facilities; and there will not be wastewater discharged. Dust discharge from civil work will have limited and short-term impacts on local environment because comparative analysis indicates that total suspended particles within 50 meters downwind of construction sites will be within 0.4–1.2 milligrams/m³, with very few occasions that the total suspended particles contents are higher than the 2nd grade of ambient air quality standard (GB3095-1996). Noise from construction and transportation facilities will be within the range of 80–90 dB(A), and also at intermittent with very short durations. Similarly, as these sites are far away from residential, hospital, or schools, the impacts of noise on environment is negligible. The earth and soil from road building, ditch drainage, and all other construction activities will be reused in nearby farmland. On-site engineers will be assigned the responsibilities of supervising construction activities with respect to earth and vegetation removal, and disposal of spoils and garbage for compliance with relevant national and local environmental protection laws, regulations, standards, and good practices. It is therefore anticipated that impacts of solid waste, noise, and wastewater will be very short term and negligible. This judgment is supported by experience under similar ADB and World Bank projects, which utilized similar activities and approaches.

48. **Water resources availability.** As improved water transportation facilities (channel, intercepting drain, silt trap, grit chamber, small water storage works) and high-efficiency irrigation equipment (sprinkler, drip irrigation) will be constructed and installed, water use efficiency will be increased. Due to the conversion of annual crop to perennial fruit production (except in Hunan Province, where from abandoned land to fruit production and soil conservation forest), irrigation water use will be increased only in Chongqing Municipality, and in Hunan and Sichuan provinces. The increased water accounts about 3.7%–12.1% of local available water resources. Hence, the project will only cause minor significant problems of water resources depletion.

49. **Water impoundments.** The project will involve the development and improvement of 3,615 small water storage structures. These small water storage structures all are under 50,000 m³, and they are not reservoirs but “ponds.”¹¹ No reservoirs or barrages will be built under the project, and there is no associated environmental risk.

50. **Pollution prevention and public health.** No manufacturing or processing activities will be involved in the project. The possible sources of pollution during operation will be related to the transport, storage, handling, and use of agrochemicals such as fertilizers, pesticides, herbicides, and seed treatment chemicals.

51. To prevent, reduce, or control the potential contamination of soils, groundwater, or surface water resources caused by accidental spills during transfer, mixing, and storage, agrochemicals will be stored and handled in a manner consistent with the recommendations for hazardous materials management presented in the World Bank Group Environmental, Health, and Safety Guidelines.¹² It is also worth mentioning that farmers training will be provided under the project. Although the contents of training are not yet defined, the safe transport, storage, handling, and use of toxic agrochemicals; and the safe disposal of containers will be included in the training program.

52. **Protected areas and protected species.** During the domestic EIA development, all the 47 project counties have been visited and for the project counties which are located within or near the protected area, natural reserves and water source collection area, the project activities and the sites have been identified and been removed or replaced by activities in other applicable regions. No project activities are in any of the protected areas. No impacts on the protected areas are anticipated. Biological surveys, as part of the domestic EIA, did not reveal any protected species.

53. **Physical and cultural resources.** Surveys of cultural resources have been conducted under the domestic EIA study. No physical, historical, or cultural relic sites have been discovered in the project area. If an important site is unearthed during construction, work will be stopped immediately; and the matter will promptly be referred to the county, municipal, provincial, or state-level agencies for evaluation and a decision regarding appropriate actions.

54. **Cumulative impacts.** Potential cumulative impacts related to water usage has been assessed in detail. It was concluded that water usage will remain within the regional and local water allocations. No other significant cumulative impacts were identified during project preparation that directly relates to the proposed project.

55. **Induced impacts.** Potential induced impacts have been estimated, notably those impact related to growth and other effects related to induced changes to the pattern of future land use, additional road network, population density, or growth rate. During construction, the induced (adverse) impacts are considered insignificant. Civil works are all small; and will not require significant movements, people, or workers. Most of the civil works will be done locally with relative local contractors.

¹¹ According to the domestic definition in the PRC, a water impoundment with a normal storage capacity below 100,000 m³ is called a “pond”; it is called a “small reservoir” if the normal storage capacity is below 10 million m³. The International Commission on Large Dams (ICOLD) defines large dams as having a height of more than 15 m and a storage capacity of 3 million m³.

¹² World Bank. 2007. *Environmental, Health, and Safety Guidelines*. Washington, D.C.

56. During the operational stage of the project, it is expected that more work and livelihood opportunities are generated; and will reduce the outflow of people from the rural areas. This is exactly the overall objective of the project to promote economic growth in the central and upper parts of the YREB. As such, the induced impacts are considered positive, and will benefit the local population.

3. Climate Risk Vulnerability

57. **Summary of climate risk screening and assessment.** Preliminary climate risk screening, conducted through literature review, indicated that the Yangtze River Basin has been warming at a faster rate than the global average for more than a decade, with the consequences being already apparent from the source to the estuary, including land degradation, drying wetlands, longer droughts, frequent and intense rainstorms, flooding, declining crop yields, and sea level rise. The Yangtze River Basin is affected by climate change in multiple ways; but most notably at local level, through the intensification of extreme events leading to floods, droughts, and soil erosion. The impact of climate change on agricultural industries of the region will be significant and profound, with declining water resources and rising temperatures potentially affecting crop production and limiting performance of project outputs (e.g., sustainable farming practices, reforestation activities, irrigation infrastructure, etc.).

58. Hence, the ‘Medium-High’ risk rating of the project, which triggered a requirement for a detailed climate change assessment for the project according to ADB’s climate change risk management framework. Climate change risks were therefore further assessed for all project subcomponents based on the most recently completed phase of the Coupled Model Inter-comparison Project, 2010–2014 (CMIP5) climate modelling outputs for 2050 (2041–2060) under the RCP4.5 and RCP8.5 climate change scenarios.¹³ For the sake of climate risk and vulnerability assessment, project participating counties were grouped into six climatic regions based on river basins and geographic locations.

59. It is projected that the annual mean temperature will increase by 2°C for the Yunnan project region and by above 2°C for all other river basins under the RCP4.5 climate change scenario.¹⁴ Under the high climate change scenario (RCP8.5), temperatures are projected to increase by 2.5°C for the Yunnan project region; whilst other regions are also projected to increase by 2.6°C–2.7°C. Annual total precipitation is also projected to increase by 2%, 2%, 3%, 3%, 4%, and 4% under RCP4.5 scenario and for 0%, 3%, 2%, 3%, 3%, and 1% under RCP8.5 scenario for the project regions of Yunnan, Sichuan, Guizhou, Chongqing, Hubei, and Hunan, respectively. Temperature increase is consistent over months and seasons. Change in monthly distributions or seasonal patterns of projected precipitation and temperature across all project regions was not projected.

¹³ CMIP is a framework and the analog of the Atmospheric Model Inter-comparison Project (AMIP) for global coupled ocean-atmosphere general circulation models (GCMs).

¹⁴ Representative concentration pathways (RCPs) are four GHG concentration (not emissions) trajectories adopted by the Intergovernmental Panel on Climate Change for its fifth assessment report in 2014. The four RCPs—RCP2.6, RCP4.5, RCP6.0, and RCP8.5—are named after a possible range of radiative forcing values in the year 2100 relative to pre-industrial values (+2.6, +4.5, +6.0, and +8.5 W/square meter, respectively). The RCPs are consistent with a wide range of possible changes in future anthropogenic (i.e., human) GHG emissions, and aim to represent their atmospheric concentrations. RCP2.6 assumes that global annual GHG emissions (measured in carbon dioxide-equivalents) peak between 2010–2020, with emissions declining substantially thereafter. Emissions in RCP4.5 peak around 2040, then decline. In RCP6.0, emissions peak around 2080, then decline. In RCP8.5, emissions continue to rise throughout the 21st century.

60. Rising temperature are projected to cause higher potential evaporation and water demands from crops. It is estimated that water demands from crops will increase to 2% and 4% in 2050 under RCP4.5 and RCP8.5 climate change scenarios, respectively.

61. Projected increase in precipitation will result in increased water flow in rivers; and hence, more available water resources, including more recharges to groundwater. It is estimated that total water resources will increase slightly in 2050 under RCP4.5 and RCP8.5 climate change scenarios, offsetting water demand increases in 2050.

62. There is an observed trend in more severe storms in the last few decades. The CMIP5 climate models are projecting that precipitation is likely to have fewer but more intensive rainfall events in 2050, although changes in monthly totals are not significant. Under the RCP4.5 scenario, projected maximum 24-hour rainfalls at 10-year return interval (which is the standard used for designing infrastructure in the project preliminary design) will increase for 24%, 31%, 33%, 13%, 36%, and 14% for project regions of Yunnan, Sichuan, Chongqing, Hubei, Guizhou, and Hunan, respectively. Further details are provided in the supplementary document on climate change assessment.¹⁵

63. **Climate risk screening.** Risk screening for each major project subcomponents is presented in the following:

- (i) **Farmland improvement and infrastructure improvement.** Building retain walls for terrace lands for either crops or orchard trees; field roads, small irrigation canals, drainage ditches, water collection ponds, and various efficient irrigation facilities, such as pump, pipelines, drip irrigation and sprinkler, etc. The major climate risk to those proposed farmland infrastructure is increased floods or runoff caused by extreme storms or rainfalls, potentially followed by landslides.
- (ii) **Economic ecological forest development.** Developing fruit and/or other tree crops in project regions for both economic and environmental purpose on the gentle slopes (13,189.06 hectares new development and upgrading of 10,968.95 hectares of existing tree crops). The projected temperature rises will be favorable to growing oil tea trees (*Camellia oleifera* Abel.) as it prefers warm conditions. It may be expanded further north from Hunan to other areas. For citrus trees, there may be both negative and positive impacts. The projected temperature rises will reduce the chances of trees suffering harm from early spring low temperature. However, higher temperature may also reduce the fruit quality because of fast fruit development that may lead to earlier maturity; lower acidity levels; and probably less sugar content, which is similar to growing citrus in more tropical climates. Rising temperature may also change the geographic suitability of other fruits that are normally growing in temperate climate. Climate risks for ecological tree planting are mainly erosions caused by severe storm or intensive rainfall events before those trees are well established.
- (iii) **Chemical application reduction.** Reducing their needs through solar insect killing lamps, substituting with organic fertilizer application, and rationalizing fertilization with soil tests. The fertilizer application time and formula may have to be adjusted to adapt to changes caused by climate change in cropping systems. Pest control plans may also face new challenges from change frequency and severity of pest and diseases under changed climate conditions.

¹⁵ Climate Change Assessment (accessible from the list of linked documents in Appendix 2 of the report and recommendation of the President).

- (iv) **Agricultural waste management.** Include various livestock waste processing measures, crop straw processing for fertilizer, and collection of residual plastic films from the field, etc. Climate change impacts include (i) the extreme rainfall events, which may cause floods to collection pipelines and treatment units and/or plants that will result in waste spill over facilities and pollution; (ii) storm water may also swamp the wastewater collection pipelines and treatment facilities if they are not collected by separate pipelines; and (iii) elevated temperatures and heatwaves may affect the biological processes if wastewater treatment plants adopt biological methods.

64. **Climate Risk Management Response within the Project.** Risk screening and adaptation measures for each major project subcomponents are presented in the following:

- (i) **Farmland improvement and infrastructure development.** Building retain walls for terrace lands for either crops or orchard trees; field roads, small irrigation canals, drainage ditches, water collection ponds, and various efficient irrigation facilities such as pump, pipelines, drip irrigation and sprinkler, etc. are intrinsically adaptation measures. For example, irrigation drainage canals check dams, sand sinking pits, and water tanks will help cope with flash floods in the hilly and/or mountainous valleys, caused by extreme storms or rainfalls, and potential landslides. It is recommended that during the detailed design stage, the maximum 24-hour rainfall for a 10-year recurrence period is increased as per projected climate scenario described above.
- (ii) **Economic ecological forest development.** The projected temperature rises will be favorable to growing oil tea trees (for example, *Camellia oleifera* Abel.) as these prefer warm conditions and may be expanded further north from Hunan Province to other areas. For citrus trees, there may be both negative and positive impacts: the projected temperature rises will reduce the chances of trees suffering harm from early spring low temperature. However, higher temperature may also reduce the fruit quality because of fast fruit development that may lead to earlier maturity, lower acidity levels, and probably less sugar content. It is recommended that priority is given to those tree species that are currently successfully grown locally, but with longer growing periods and heat resistance capacity. The improved irrigation and water-saving measures will ensure use of water more efficiently and adapting to increased evapotranspiration caused by raising temperatures. The improved disease and pest management control measures will protect against pest and disease frequency and cycles potentially altered by climate change.
- (iii) **Chemical application reduction.** Reducing their needs through solar insect killing lamps, substituting with organic fertilizer application, and rationalizing fertilization with soil tests. The fertilizer application time and formula may have to be adjusted to adapt to changes caused by climate change in cropping systems. These would have to be evaluated on a case-by-case during project implementation.

65. Climate responsiveness must be embedded in the implementation of the project to account for climate change impacts across the six provinces and 47 counties and the many different agencies and communities involved. Ideally, the Central Project Management Office (PMO) (formerly SOCAD), the executing agency; or the Provincial PMOs (formerly POCADs), the implementing agencies, should be supported by technical personnel with climate change expertise in implementing the project.

66. **Climate mitigation within the project.** Many of the project subcomponents will contribute to climate mitigation while addressing adaptation issues. This is the case for the revegetation subcomponents of the project, i.e., establishment of economic ecological forest, ecological protection forest belt, river protection belt, and ecological grass belt, which will contribute to the GHG emission reduction by sequestering over 480,000 tons of carbon dioxide equivalent per year (net of emissions due to electricity use associated with construction and operation activities). Additional climate mitigation gains, estimates as over 27,000 tons of carbon dioxide equivalent will come from improved fertilization practices, which will reduce nitrous oxide (N₂O) emissions, and from biogas recovery subcomponents, which will capture methane (CH₄) emissions.

4. Social Dimensions

67. **Involuntary resettlement and economic replacement.** The project was classified by ADB as category C on involuntary resettlement according to ADB's Safeguard Policy Statement (SPS, 2009). The project will not involve involuntary land acquisition and resettlement impacts. Of an estimated total 1,400,622 *mu* land area under the project, 1,348,905 *mu* belongs to beneficiary farmers' own land where agricultural activities will be undertaken; and it does not require any land use rights transfer (LURT). The construction of farming facilities, such as irrigation network or farm access roads will be located on existing rights of way, or on the beneficiary villages' unutilized land areas; and the beneficiary villages have confirmed to provide 5,379 *mu* land for such facilities. The plantation activities will be undertaken in land leased obtaining land use rights; and 45,938 *mu* of mostly unutilized slope land has been leased by cooperatives. In addition, 400 *mu* existing state-owned land will be used for bridge and embankment upgrading.

68. The due diligence review has been conducted for the LURT contracts or agreements ensure that these are voluntary, transparent, fair, and beneficial to farmers. In addition, the LURT framework has been prepared providing guidance for future contracts that may be needed during project implementation. Consultations have been undertaken with local people, village committees and farmer cooperatives during project preparation, and they will be further consulted during project implementation. The project-specific grievance redress mechanism has been established and incorporated into the LURT framework. The project will engage an external social monitoring agency to verify and monitor the LURT agreements and submit semiannual social monitoring reports to ADB during project implementation.

69. No other impacts on livelihoods have been identified during the environmental assessment. The project will improve the income and sustainability of livelihoods of about 2 million rural people in about 790 villages in the project area by providing better irrigation and drainage infrastructure and agricultural support services. Most of the 47 project counties are grain and fruit production areas, and 19 of which are classified as national and 23 as provincial key counties for poverty reduction. The project activities will also increase the farmer's income by activities, including production of low chemical residual fruit and vegetable with a price premium, etc.

70. **Indigenous peoples.** The project was classified by ADB as category B on indigenous peoples according to the SPS (2009). Guizhou Province's project area has 44.19% ethnic minority beneficiaries and 27 ethnic minority villages; and Yunnan Province's project area has 4.6% ethnic minority beneficiaries and 4 ethnic minority villages.¹⁶ The ethnic minority communities are expected to benefit from the project without significant adverse impacts. An ethnic minority

¹⁶ Project areas in other project provinces either do not have or have a very small percentage of scattered ethnic minority population: Sichuan (0.250%), Hubei (0.310%), Hunan (0.017%) and Chongqing (0.000%).

development plan (EMDP) has been prepared for the project in consultation with local stakeholders, including ethnic minorities in accordance with the SPS. The EMDP includes adequate measures to ensure that ethnic minorities can participate and benefit from project activities, and adverse impacts to them are avoided or mitigated. The EMDP has been disclosed publicly and posted on the ADB website. The ethnic minorities are equal beneficiaries, and no negative ethnic impacts are expected. Detailed results can be found in the ethnic minority plans prepared for the project.

71. **Poverty and social.** The project is in counties designated as national or provincial poverty counties or less-developed counties eligible for the central government's support for the middle and western provinces in the PRC. They have low levels of industrialization and economic growth, which is largely reliant on agricultural and traditional services. Of the 47 project counties, 31 are national and/or provincial poverty counties. The poverty ratio in the direct project areas is much higher in Yunnan (21%) and Guizhou (15%), followed by Sichuan (6%), Hunan (5%), Hubei (3%) and Chongqing (4%). The major causes of poverty are (i) lack of high-quality farmland; (ii) poor agricultural facilities, and limited farm products; (iii) lack of income-generating opportunities; and (iv) lack of human and social capital.

72. The project's poverty reduction impacts and socioeconomic benefits will be significant. Many farmers will engage in developing high-quality farmland, implementing sustainable and modern farming practices, waste and environmental management, voluntary land leasing, employment opportunities, and human capacity building. The poor and rural farmers will directly benefit these. It is estimated that a total of 1.787 million residents in the project areas will benefit from the project, including 284,881 in Yunnan, 178,895 in Sichuan, 145,541 in Guizhou, 155,028 in Hubei, and 856,785 in Hunan, and 165,882 in Chongqing. Significant portions of the beneficiaries include the poor (7.96%) and ethnic minorities (4.39%). In addition, the project will 25,078 full-time and 45,883 part-time employment opportunities for local residents, including the poor, ethnic minorities, and women.

73. Developing sustainable modern farming system and rural waste and environmental management will result in increased income and improved living standards among the project beneficiaries, including the poor, women, and ethnic minorities. The project will invest in agricultural facilities and equipment, creating opportunities for new modern farming practices. Farmers will be able to grow high-value crops (vegetables, fruits, tea oils, herb medicines) after project construction and skill training. Local residents will also earn income from employment and other income-generating opportunities during project construction.

74. Through the improved long-term agricultural productivity as well as environmental protection and rehabilitation, the 47 counties can attract more investment and businesses; and generate additional employment and income-generating opportunities for the poor and local residents.

75. A social development action plan and has been developed to ensure farmer's rights, interests, and participation while maximizing project benefits to them.

VI. ANALYSIS OF ALTERNATIVES

76. The selection of project provinces and project counties in each province have taken into consideration the local circumstances, including environmental and social factors such as water availability and potential for replication. Alternative designs for project interventions have been examined during the feasibility study phase.

77. Alternatives to the project (i.e., the without-project scenario) and project alternatives (i.e., alternative designs) have been examined. As compared to the without-project scenario, it is estimated that at least 3,991 tons of nitrogen, 1,716 tons of P_2O_5 , 834 tons of K_2O , and 66.5 tons of pesticide per year will be decreased; and this is expected to generate substantial environmental benefits, and decrease farmer's production costs. One significant positive environmental impact of the project is the decrease of soil erosion by 731,408 tons/year due to the slope to terrace, conversion of grain crop to fruit, conservative tillage, and ecological forest planting. Although there is large expansion of fruit production, there will be only 0.58 million m^3 of water per year increase for irrigation because of water-saving technology implementation, and the improvement of water transportation efficiency.

VII. INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION

78. Preparation for the project has been led by SOCAD () within the Ministry of Finance (now transferred to Ministry of Agriculture and Rural Affairs) and its supporting provincial counterparts from each province. Experts and staffs from relevant line agencies, such as agriculture bureaus, water resource bureaus, and the EPBs; as well as universities and technical institutions, have been mobilized and involved in detailed preparation discussions.

79. The primary project beneficiaries will be farmers living and working in the project area. During project preparation, extensive consultations with local farmers have been carried out by the county and city PMOs and the design institutes. Further consultations have also been conducted by the EIA institute. Consultations have visited 28 project counties and will continue during project implementation through the monitoring and supervision activities, where direct feedback from stakeholder groups will be encouraged and documented. The feedback from the beneficiaries confirms that project will provide mainly environmental benefits for the areas. The participants generally requested strong supervision and monitoring of the project implementation to avoid potential impacts and pollution from the construction activities. The public comments and suggestions have been incorporated into the formulation of environmental mitigation measures. Besides, the environmental specialist also visited all the representative project counties in Guizhou and Chongqing with domestic EIA team in May 2017; and visited other typical project counties in Hunan, Hubei, and Sichuan in July 2017. The findings from the visits and meetings with local farmers, company representatives, staff from the PMOs and the EPBs, and other relevant institutions all expressed their welcome to the project activities, which they are quite aware of and believe will improve productivity, infrastructure, and local ecological and environmental quality.

80. Besides the above field visit, meeting, and other regular communications, public consultation has also been implemented by posting the project environmental impacts on the website of each local county and/or city PMO in March and July 2017 (with 10 days of duration) in accordance with the Interim Guideline on Public Participation in EIA (2016).¹⁷ The draft EIA report has also been disclosed on the website of the respective finance bureaus in October 2017 to solicit further public comments. About 30 workshops were organized and were attended by 320 participants. The findings from the environmental assessment were presented and discussed. Moreover, 1,198 questionnaires were distributed in the project area; and all were returned. In total, 99.7% of the public supported the project; and there was no objection. Most of the comments and/or opinions received are that the project is suggested to be implemented as soon as possible to improve local agricultural productivity with improved environmental quality. Most public believed

¹⁷ MEP. 2015. *Interim Guideline on Public Participation in EIA*. Beijing.

that negative environmental impacts of the project are negligible, considering of the scope, size, and duration of the project activities.

Figure 7: Public Consultation Activities



湖北省Hubei



湖南省Hunan



重庆市Chongqing



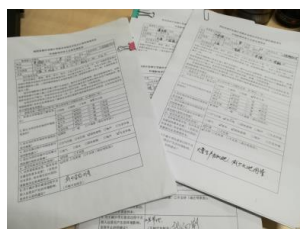
四川省Sichuan



贵州省Guizhou



云南省Yunan



调查问卷Questionnaire



Disclosure of EIA reports in counties of Guizhou and Yunnan



环评报告全文及公参说明公示Disclosure of EIA report



贵州省Guizhou



重庆市Chongqing



云南省Yunnan



湖南省Hunan



湖北省Hubei



四川省Sichuan

VIII. GRIEVANCE REDRESS PROCEDURE

81. Public participation, consultation, and information disclosure undertaken as part of the local EIA process; assessment and development of draft resettlement plans; and consultations undertaken by the project consultants have discussed and addressed major community concerns. Continued public participation and consultation has been emphasised as a key component of successful project implementation. Resulting from this public participation and safeguard assessment during the initial stages of the project, major issues of grievance are not expected. However, unforeseen issues may occur. To settle such issues effectively, an effective and transparent channel for lodging complaints and grievances has been discussed and will be established, in parallel with the mechanism developed under the resettlement planning process. The project's grievance redress mechanism is included in the EMP (**Supplementary Appendix A**).

IX. ENVIRONMENTAL MANAGEMENT PLAN

82. **Introduction.** This IEE contains a consolidated project EMP, summarizing potential environmental impacts and mitigation measures, environmental monitoring program, public consultation program, reporting and supervision, feedback and adjustment mechanism, and institutional responsibilities (**Supplementary Appendix A**). The objective of establishing an EMP is to propose appropriate mitigation measures and establish the institutional arrangements to monitor and ensure compliance with the PRC's environmental regulations, ADB's SPS, and the project documents. Such institutional mechanisms will seek to ensure continuous improvement of environmental protection activities during preconstruction, construction, and operation to prevent, reduce, or mitigate adverse impacts. The EMP draws on the domestic EIA report, and the TA discussions and agreements with the relevant government agencies.

83. **Important features of the environmental management plan.** The overall and provincial EMPs have the following features:

- (i) Identifying environmental issues involved in the project, based on which the objectives and contents of environmental management are decided, making the EMP targeted and applicable;
- (ii) Emphasizing analysis, evaluation, and application of environmental monitoring data and/or results;
- (iii) Emphasizing water-saving irrigation, BFA, IPM, and NPS pollution as priorities of environmental management in the project area;
- (iv) Emphasizing soil erosion mitigation as a priority of environmental management in the project area;
- (v) Clarifying environmental management agencies, their respective responsibilities, and costs and sources of funding for the EMP implementation; and
- (vi) Making necessary adjustments to the items, parameters, venue, and frequency of environmental monitoring program.

84. Following the current model for construction management of physical projects in the PRC, the environmental protection measures to be implemented by the construction contractor are summarized and incorporated into the contract in the form of "rules for environmental protection of construction", with its implementation being supervised by the on-site engineer entrusted by the county or city PMO.

85. **Compliance monitoring.** The EMP includes an environmental monitoring program describing the scope of monitoring, environmental media, monitoring parameters, the time and frequency of monitoring, and implementing and supervising agencies. During construction, the implementing agencies will conduct internal environmental monitoring and inspections to ensure that environmental mitigation measures are properly implemented. Inspections or audits will mainly cover construction activities, but these will also review the affected environment. During operation, the implementing agencies will be responsible for internal monitoring and reporting to the NPMO. External monitoring and inspection will be conducted by local environmental monitoring centers under the local environmental protection bureaus. They will be responsible to undertake regular and random environmental monitoring and inspection activities before, during, and after construction as well as in the event of emergencies.

86. Environmental monitoring, including environmental benefits monitoring, will be incorporated in the project performance monitoring system. The monitoring results will be used to evaluate (i) the extent and severity of environmental impacts compared with the predicted impacts, (ii) performance of the environmental protection measures or compliance with related rules and regulations, (iii) impact trends, and (iv) the overall effectiveness of the EMP. The effectiveness of the mitigation measures and monitoring plans will be evaluated through a feedback reporting system.

87. **Project readiness.** The ADB team will also monitor the project readiness, and ensure that all critical actions are completed prior to the physical implementation of the project. These notably include (i) the approval of the domestic EIA report, in accordance with the domestic legislation; and (ii) the engagement of the project implementation consultant, including an environmental safeguard expert.

X. CONCLUSION AND RECOMMENDATION

88. The project is expected to generate multiple significant environmental benefits. The major anticipated environmental benefits include (i) decrease in the chemical fertilizer and pesticide application rate and total quantity, and contribution to the control of the NPS pollution in the project region; (ii) reduction in soil erosion and improvement in soil quality; (iii) recycling of agricultural waste and its reuse as fertilizer resources; and promotion of green agricultural development; (iv) improvement of water use efficiency; and (v) increase in climate resilience. They will contribute to the (i) improvement of the Yangtze River's ecological environmental quality, (ii) development of sustainable agriculture, and (iii) income generation for farmers.

89. A consolidated project EMP has been developed. The EMP includes, among other things, a detailed description of the potential environmental impacts and mitigation measures, environmental monitoring program, public consultation program, reporting and supervision, feedback and adjustment mechanism, and institutional responsibilities. It is carefully designed to fit into the PRC's existing environmental management system. It has been concluded that, with mitigation measures and agreed monitoring arrangements, the residual impacts will be insignificant.

APPENDIX 1: SUMMARY OF PROJECT ACTIVITIES

Province	County	Name of Subproject	Summary of Key Components	Total Estimated Costs (×10 ⁴ RMB)	Existing Water for Irrigation (×10 ⁴ m ³ per year)	Anticipated Water for Irrigation (×10 ⁴ m ³ per year)	Estimated Fertilizer Application after Project (ton per year)	Concluding Comments
Hubei	Shishou	Irrigation and drainage ditches; rural roads; pipe installation; new pond establishment; land levelling; conservation tillage; greenhouse; IPM control; scientific application of pesticides and fertilizers; institutional coordination strengthened and capacity building.	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA	2,868	234	217	382	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Gongan	Irrigation and drainage ditches; newly established irrigation and drainage station; rural roads; sprinkler irrigation; rehabilitation of dam pond; land levelling; greenhouse; IPM control; scientific application of pesticides and fertilizers; institutional coordination strengthened and capacity building.	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA;	3,619	814	767	601	Highly intensive agriculture, high NPS and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Honghu	Irrigation and drainage ditches; rural roads; sprinkler irrigation; new pond establishment, and rehabilitation of dam pond; farming machinery; small wetlands; sewage collection pipe network; sewage collection pipe network; pollutant discharge warning monitoring station; IPM control; scientific application of pesticides and fertilizers; organic fertilizer processing plant; riverbank ecological revetment slope protection work; institutional coordination strengthened and capacity building.	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	3,438	540	507	565	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.

Province	County	Name of Subproject	Summary of Key Components	Total Estimated Costs (×10 ⁴ RMB)	Existing Water for Irrigation (×10 ⁴ m ³ per year)	Anticipated Water for Irrigation (×10 ⁴ m ³ per year)	Estimated Fertilizer Application after Project (ton per year)	Concluding Comments
	Songzi	Newly established irrigation and drainage station; hardened road; sprinkler irrigation; new pond establishment; dredging, irrigation, and drainage ditches; IPM control; organic fertilizer processing plant; newly establishment of water and soil conservation forest plantation; riverbank ecological revetment slope protection work; institutional coordination strengthened and capacity building.	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	900	303	279	420	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Dangyang	Irrigation and drainage ditches; newly established irrigation and drainage station; rural roads; micro-irrigation (including drip irrigation); new pond establishment; greenhouse; IPM control; scientific application of pesticides and fertilizers; newly establishment of water and soil conservation; terrace-slope to ladder; newly established economic forest; Institutional coordination strengthened and capacity building.	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion and nutrients loss.	3,965	292	295	261	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Yidu	Irrigation and drainage ditches; hardened road; sprinkler irrigation; new pond establishment; dredging, irrigation, and drainage ditches; storage facilities; IPM control; scientific application of pesticides and fertilizers; riverbank ecological revetment slope protection work; newly established economic forest; Institutional coordination strengthened and capacity building.	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion and nutrients loss.	2,538	586	555	480	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Zhijiang	Irrigation and drainage ditches; hardened road; newly established irrigation and drainage station; rural roads; sprinkler irrigation; new pond establishment; micro-irrigation	Improvement of agricultural facilities on water use and land productivity increase; decrease	2,472	292	295	264	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant

Province	County	Name of Subproject	Summary of Key Components	Total Estimated Costs (×10 ⁴ RMB)	Existing Water for Irrigation (×10 ⁴ m ³ per year)	Anticipated Water for Irrigation (×10 ⁴ m ³ per year)	Estimated Fertilizer Application after Project (ton per year)	Concluding Comments
		(including drip irrigation); new pond establishment; straw treatment; IPM control; scientific application of pesticides and fertilizers; newly establishment of water and soil conservation forest plantation; terrace-slope to ladder project; newly established economic forest; Institutional coordination strengthened and capacity building.	of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.					but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Chibi	Irrigation and drainage ditches; hardened road; rural roads; new pond establishment; dredging, irrigation, and drainage ditches; straw treatment; ecological breeding demonstration base (rice-aquaculture industry); IPM control; institutional coordination strengthened and capacity building.	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	4,934	522	492	430	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
Hunan	Nan	Dredging, irrigation, and drainage ditches; straw treatment; ecological demonstration base; greenhouse; pollutant collection tank; safety livestock and poultry manure disposal; IPM (pest control); scientific application of pesticides and fertilizers; riverbank ecological revetment slope protection works; Institutional coordination strengthened and capacity building	Decrease of NPS by bio-pesticides, IPM and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	700	1,333	1,383	820	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Li	Irrigation and drainage ditches; erosion control weir; rural roads; straw treatment; IPM (pest control); ecological protection belt (water and soil conservation forest plantation); ecological economic forest;	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-	1,234	917	1,017	1,027	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation

Province	County	Name of Subproject	Summary of Key Components	Total Estimated Costs (×10 ⁴ RMB)	Existing Water for Irrigation (×10 ⁴ m ³ per year)	Anticipated Water for Irrigation (×10 ⁴ m ³ per year)	Estimated Fertilizer Application after Project (ton per year)	Concluding Comments
		institutional coordination strengthened and capacity building	pesticides, IPM; decrease of soil erosion, nutrients loss, and recycling wastes.					and irrigation facilities not developed; institutional capacity needs to be improved.
	Taoyuan	Irrigation and drainage ditches; rural roads; small water storage works; small constructed wetlands; IPM (pest control); scientific application of pesticides and fertilizers; sewage treatment station; riverbank ecological revetment slope protection works; river green belt; ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	2,127	1,069	1,117	576	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Pingjiang	Irrigation and drainage ditches; erosion control weir; small water storage works; pollutant collection tank; sewage collection pipe network; safety livestock and poultry manure disposal; IPM (pest control); ecological protection belt (water and soil conservation forest plantation); ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM; decrease of soil erosion and nutrients loss.	935	1,429	1,514	1,412	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Dongkou	Irrigation and drainage ditches; small water storage works; pollutant collection tank; IPM (pest control); scientific application of pesticides and fertilizers; ecological protection belt (water and soil conservation forest plantation); ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use; decrease of NPS by bio-pesticides, IPM; decrease of soil erosion, nutrients loss, and recycling wastes.	1,403	1,063	1,181	2,601	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.

Province	County	Name of Subproject	Summary of Key Components	Total Estimated Costs (×10 ⁴ RMB)	Existing Water for Irrigation (×10 ⁴ m ³ per year)	Anticipated Water for Irrigation (×10 ⁴ m ³ per year)	Estimated Fertilizer Application after Project (ton per year)	Concluding Comments
	Hengnan	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; low pressure pipeline engineering; small water storage works; small constructed wetlands; pollutant collection tank; sewage collection pipe network; small watershed comprehensive benefit monitoring point; IPM (pest control); sewage treatment station; organic fertilizer processing plant; ecological protection belt (water and soil conservation forest plantation); river green belt; ecological grass protection; ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides and IPM; decrease of soil erosion, nutrients loss, and recycling wastes.	299	2,987	3,327	2,051	improved. Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Shuangfeng	Irrigation and drainage ditches; rural roads; low-pressure pipeline engineering; micro irrigation (including drip irrigation); small water storage works; dredging, irrigation, and drainage ditches; small constructed wetlands; pollutant collection tank; IPM (pest control); sewage treatment station; ecological protection belt (water and soil conservation forest plantation); riverbank ecological revetment slope protection works; river green belt; ecological grass protection; ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM; decrease of soil erosion, nutrients loss, and recycling wastes.	288	1,158	1,299	1,201	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Lengshuitan	Irrigation and drainage ditches; rural roads; small water storage works; pollutant collection tank; IPM (pest control); ecological protection belt (water and soil conservation forest plantation); ecological economic	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-	2,099	1,296	1,486	3,563	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation

Province	County	Name of Subproject	Summary of Key Components	Total Estimated Costs (×10 ⁴ RMB)	Existing Water for Irrigation (×10 ⁴ m ³ per year)	Anticipated Water for Irrigation (×10 ⁴ m ³ per year)	Estimated Fertilizer Application after Project (ton per year)	Concluding Comments
		forest; institutional coordination strengthened and capacity building	pesticides, IPM; decrease of soil erosion and nutrients loss.					and irrigation facilities not developed; institutional capacity needs to be improved.
Chongqing	Wanzhou	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; low-pressure pipeline engineering; sprinkler irrigation; small water storage works; IPM (pest control); scientific application of pesticides and fertilizers; terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	2,219	102	126	364	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Fuling	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; low-pressure pipeline engineering; sprinkler irrigation; small water storage works; ecological demonstration base; IPM (pest control); scientific application of pesticides and fertilizers; ecological protection belt (water and soil conservation forest plantation); ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	1,992	189	196	581	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Jiangjin	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; low-pressure pipeline engineering; sprinkler irrigation; small water storage works; ecological demonstration base; IPM (pest control); scientific application of	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of	3,436	180	213	715	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not

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		pesticides and fertilizers; ecological protection belt (water and soil conservation forest plantation); terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	soil erosion, nutrients loss, and recycling wastes.					developed; institutional capacity needs to be improved.
	Kaizhou	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; low-pressure pipeline engineering; sprinkler irrigation; small water storage works; IPM (pest control); scientific application of pesticides and fertilizers; terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	2,252	179	196	703	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Wulong	Irrigation and drainage ditches; rural roads; low-pressure pipeline engineering; small water storage works; ecological demonstration base; greenhouse; IPM (pest control); scientific application of pesticides and fertilizers; ecological protection belt (water and soil conservation forest plantation); ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	2184	162	200	560	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Zhonxian	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; low-pressure pipeline engineering; sprinkler irrigation; small water storage works; ecological demonstration base; IPM (pest control); scientific application of pesticides and fertilizers; terrace-slope to ladder project; ecological economic forest; institutional	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	4,412	280	322	1,108	

Province	County	Name of Subproject	Summary of Key Components	Total Estimated Costs (×10 ⁴ RMB)	Existing Water for Irrigation (×10 ⁴ m ³ per year)	Anticipated Water for Irrigation (×10 ⁴ m ³ per year)	Estimated Fertilizer Application after Project (ton per year)	Concluding Comments
		coordination strengthened and capacity building						
	Wushan	Irrigation and drainage ditches; rural roads; low-pressure pipeline engineering; sprinkler irrigation; small water storage works; ecological demonstration base; small watershed comprehensive benefit monitoring point; IPM (pest control); scientific application of pesticides and fertilizers; sewage treatment station; ecological protection belt (water and soil conservation forest plantation); terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	1,294	168	210	512	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Wuxi	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; low-pressure pipeline engineering; small water storage works; IPM (pest control); scientific application of pesticides and fertilizers; terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	2,195	182	203	540	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
Sichuan	Zhaohua	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; small water storage works; dredging, irrigation, and drainage ditches; engineering signs; conservation tillage; straw treatment; ecological demonstration base; greenhouse; IPM (pest control); scientific application of pesticides and fertilizers; ecological protection belt (water and soil	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	1,982	481	529	253	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be

Province	County	Name of Subproject	Summary of Key Components	Total Estimated Costs (×10 ⁴ RMB)	Existing Water for Irrigation (×10 ⁴ m ³ per year)	Anticipated Water for Irrigation (×10 ⁴ m ³ per year)	Estimated Fertilizer Application after Project (ton per year)	Concluding Comments
		conservation forest plantation); terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building						improved.
	Wangcang	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; small water storage works; dredging, irrigation, and drainage ditches; engineering signs; conservation tillage; straw treatment; IPM (pest control); scientific application of pesticides and fertilizers; mulching film collection for recycling; ecological protection belt (water and soil conservation forest plantation); terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	2,503	1,148	1,180	441	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Jiange	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; small water storage works; dredging, irrigation, and drainage ditches; conservation tillage; straw treatment; IPM (pest control); scientific application of pesticides and fertilizers; mulching film collection for recycling; ecological protection belt (water and soil conservation forest plantation); terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	3,477	665	725	855	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Yingshan	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; small water storage works; dredging, irrigation, and drainage ditches;	Improvement of agricultural facilities on water use and land productivity increase; decrease	2,398	538	603	367	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant

Province	County	Name of Subproject	Summary of Key Components	Total Estimated Costs (×10 ⁴ RMB)	Existing Water for Irrigation (×10 ⁴ m ³ per year)	Anticipated Water for Irrigation (×10 ⁴ m ³ per year)	Estimated Fertilizer Application after Project (ton per year)	Concluding Comments
		engineering signs; conservation tillage; straw treatment; IPM (pest control); scientific application of pesticides and fertilizers; mulching film collection for recycling; ecological protection belt (water and soil conservation forest plantation); terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.					but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Nanbu	Irrigation and drainage ditches; rural roads; small water storage works; dredging, irrigation, and drainage ditches; engineering signs; conservation tillage; straw treatment; IPM (pest control); scientific application of pesticides and fertilizers; mulching film collection for recycling; ecological protection belt (water and soil conservation forest plantation); terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	3,371	1,040	1,120	467	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Yanting	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; micro-irrigation (including drip irrigation); small water storage works; dredging, irrigation, and drainage ditches; engineering signs; conservation tillage; straw treatment; IPM (pest control); scientific application of pesticides and fertilizers; mulching film collection for recycling; ecological protection belt (water and soil conservation forest plantation); terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	2,427	610	668	476	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.

Province	County	Name of Subproject	Summary of Key Components	Total Estimated Costs (×10 ⁴ RMB)	Existing Water for Irrigation (×10 ⁴ m ³ per year)	Anticipated Water for Irrigation (×10 ⁴ m ³ per year)	Estimated Fertilizer Application after Project (ton per year)	Concluding Comments
	Anzhou	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; micro-irrigation (including drip irrigation); small water storage works; dredging, irrigation, and drainage ditches; engineering signs; conservation tillage; straw treatment; IPM (pest control); scientific application of pesticides and fertilizers; mulching film collection for recycling; ecological protection belt (water and soil conservation forest plantation); terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	1,562	3,732	3,767	440	Highly intensive agriculture, high NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
Guizhou	Yuping	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; low-pressure pipeline engineering; sprinkler irrigation; small water storage works; conservation tillage; greenhouse; pollutant collection tank; IPM (pest control); scientific application of pesticides and fertilizers; riverbank ecological revetment slope protection works; ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	3,130	440	367	345	Medium-intensive agriculture, medium NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Jiangkou	Irrigation and drainage ditches; erosion control weir; electromechanical irrigation and drainage pumping station; rural roads; low-pressure pipeline engineering; sprinkler irrigation; small water storage works; pollutant discharge warning monitoring station; small watershed comprehensive benefit monitoring point; scientific	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, BFA; decrease of soil erosion, nutrients loss, and recycling	2,839	359	281	58	Medium-intensive agriculture, medium NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity

Province	County	Name of Subproject	Summary of Key Components	Total Estimated Costs (×10 ⁴ RMB)	Existing Water for Irrigation (×10 ⁴ m ³ per year)	Anticipated Water for Irrigation (×10 ⁴ m ³ per year)	Estimated Fertilizer Application after Project (ton per year)	Concluding Comments
		application of pesticides and fertilizers; riverbank ecological revetment slope protection works; terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	wastes.					needs to be improved.
	Songtao	Irrigation and drainage ditches; erosion control weir; rural roads; low-pressure pipeline engineering; sprinkler irrigation; micro-irrigation (including drip irrigation); small water storage works; pollutant collection tank; sewage collection pipe network; scientific application of pesticides and fertilizers; sewage treatment station; riverbank ecological revetment slope protection works; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	2,969	425	434	324	Medium-intensive agriculture, medium NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Bijiang	Irrigation and drainage ditches; erosion control weir; electromechanical irrigation and drainage pumping station; rural roads; small water storage works; pollutant collection tank; pollutant discharge warning monitoring station; scientific application of pesticides and fertilizers; riverbank ecological revetment slope protection works; river green belt; ecological grass protection; terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	2,734	508	477	150	Medium-intensive agriculture, medium NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Dejiang	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; low-pressure pipeline engineering; micro-irrigation (including	Improvement of agricultural facilities on water use and land productivity increase; decrease	3,109	320	253	254	Medium-intensive agriculture, medium NPS, and low waste recycling; water resources abundant

Province	County	Name of Subproject	Summary of Key Components	Total Estimated Costs (×10 ⁴ RMB)	Existing Water for Irrigation (×10 ⁴ m ³ per year)	Anticipated Water for Irrigation (×10 ⁴ m ³ per year)	Estimated Fertilizer Application after Project (ton per year)	Concluding Comments
		drip irrigation); small water storage works; scientific application of pesticides and fertilizers; riverbank ecological revetment slope protection works; ecological economic forest; institutional coordination strengthened and capacity building	of NPS by bio-pesticides, BFA; decrease of soil erosion, nutrients loss, and recycling wastes.					but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Yinjiang	Irrigation and drainage ditches; rural roads; low-pressure pipeline engineering; small water storage works; pollutant collection tank; scientific application of pesticides and fertilizers; ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	3,544	616	548	254	Medium-intensive agriculture, medium NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Yanhe	Irrigation and drainage ditches; erosion control weir; electromechanical irrigation and drainage pumping station; rural roads; small water storage works; pollutant discharge warning monitoring station; scientific application of pesticides and fertilizers; riverbank ecological revetment slope protection works; river green belt; ecological grass protection; terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	3,743	570	487	351	Medium-intensive agriculture, medium NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Sinan	Irrigation and drainage ditches; rural roads; small water storage works; pollutant discharge warning monitoring station; scientific application of pesticides and fertilizers; ecological economic forest; ecological economic forest; institutional coordination strengthened	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, BFA; decrease of soil	4,070	431	365	173	Medium-intensive agriculture, medium NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not

Province	County	Name of Subproject	Summary of Key Components	Total Estimated Costs (×10 ⁴ RMB)	Existing Water for Irrigation (×10 ⁴ m ³ per year)	Anticipated Water for Irrigation (×10 ⁴ m ³ per year)	Estimated Fertilizer Application after Project (ton per year)	Concluding Comments
		and capacity building	erosion, nutrients loss, and recycling wastes.					developed; institutional capacity needs to be improved.
Yunnan	Xuanwei	Irrigation and drainage ditches; rural roads; low-pressure pipeline engineering; mall water storage works; agricultural machinery; pollutant collection tank; IPM (pest control); scientific application of pesticides and fertilizers; ecological protection belt (water and soil conservation forest plantation); ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	3,947	794	681	931	Medium-intensive agriculture, medium NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Huize	Irrigation and drainage ditches; erosion control weir; rural roads; straw treatment; pollutant collection tank; ecological demonstration base; greenhouse; scientific application of pesticides and fertilizers; ecological protection belt (water and soil conservation forest plantation); ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	3,849	520	333	486	Medium-intensive agriculture, medium NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Zhaoyang	Irrigation and drainage ditches; ecological control weir; rural roads; straw treatment; ecological demonstration base; pollutant collection tank; scientific application of pesticides and fertilizers; ecological protection belt (water and soil conservation forest plantation); ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	3,523	490	539	1,030	Medium-intensive agriculture, medium NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.

Province	County	Name of Subproject	Summary of Key Components	Total Estimated Costs (×10 ⁴ RMB)	Existing Water for Irrigation (×10 ⁴ m ³ per year)	Anticipated Water for Irrigation (×10 ⁴ m ³ per year)	Estimated Fertilizer Application after Project (ton per year)	Concluding Comments
	Qiaojia	Irrigation and drainage ditches; ecological control weir; low-pressure pipeline engineering; small water storage works; straw treatment; IPM; scientific application of pesticides and fertilizers; ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion and nutrients loss.	2,762	801	640	1,559	Medium-intensive agriculture, medium NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Yongshan	Irrigation and drainage ditches; rural roads; low-pressure pipeline engineering; small water storage works; IPM (pest control); scientific application of pesticides and fertilizers; ecological protection belt (water and soil conservation forest plantation); terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	2,248	507	341	1,021	Medium-intensive agriculture, medium NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Yanjin	Irrigation and drainage ditches; rural roads; low-pressure pipeline engineering; small water storage works; IPM (pest control); scientific application of pesticides and fertilizers; ecological protection belt (water and soil conservation forest plantation); institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.	3,361	274	233	238	Medium-intensive agriculture, medium NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Weixin	Irrigation and drainage ditches; rural roads; small water storage works; IPM (pest control); scientific application of pesticides and fertilizers; ecological protection belt (water and soil	Improvement of agricultural facilities on water use and land productivity increase; decrease	4,411	926	787	930	Medium-intensive agriculture, medium NPS, and low waste recycling; water resources abundant

Province	County	Name of Subproject	Summary of Key Components	Total Estimated Costs (×10 ⁴ RMB)	Existing Water for Irrigation (×10 ⁴ m ³ per year)	Anticipated Water for Irrigation (×10 ⁴ m ³ per year)	Estimated Fertilizer Application after Project (ton per year)	Concluding Comments
		conservation forest plantation); terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion, nutrients loss, and recycling wastes.					but transportation and irrigation facilities not developed; institutional capacity needs to be improved.
	Yiliang	Irrigation and drainage ditches; rural roads; low-pressure pipeline engineering; sprinkler irrigation; small water storage works; straw treatment; IPM (pest control); scientific application of pesticides and fertilizers; ecological protection belt (water and soil conservation forest plantation); ecological economic forest; institutional coordination strengthened and capacity building	Improvement of agricultural facilities on water use and land productivity increase; decrease of NPS by bio-pesticides, IPM, and BFA; decrease of soil erosion and nutrients loss.	3,739	1013	909	1,819	Medium-intensive agriculture, medium NPS, and low waste recycling; water resources abundant but transportation and irrigation facilities not developed; institutional capacity needs to be improved.

BFA = balanced fertilizer application; IPM = integrated pest management, NPS = nonpoint source; RMB = Renminbi (Chinese currency).

Source: Domestic environmental impact assessment report.

APPENDIX 2: APPLICABLE NATIONAL ENVIRONMENTAL STANDARDS

1. **Surface water standards.** The applicable classes of the surface water standards (GB 3838-2002) of the People's Republic of China (PRC) for this project are provided in *Table A2.1*. The limits for applicable parameters are listed in *Table A2.2*.

Table A2.1: Applicable Surface Water Standards

Project Province	Surface Water Bodies	Class
Hubei	Yangtze River: (Luoshan Town–Xintankou Town), Yuyang River, Manao River	II
	Jiaozi River, Songzixi River (Zhenggongdu–Yangjiadang), Nanhaixin River, Zhang River (Baxia–Herong Town)	III
Hunan	Huangjindong reservoir	II
	Tuo River (Biandanhe–Sanxianhu Dianpaizhan), Liao River (Wuyang Village–Shili Village, Gaosha Town), Xiang River (Shizitou of Guiyang Town–2,000 meters upstream of Yang Village, Songyang Town), Lei River (Yaotian Town–1,000 meters upstream of Henyankuang), Lianshui (Shantangchong–Ruxiang Town)	III
	Changjiang River, Maxi River, Ouyanghai irrigation area (Changping Town and Zheqiao Town, Leiyang City–Linghu Town, Zhuhui District), Dacun River	IV
Chongqing	Sunxi River	II
	Quxi River (Fuling he), Wu River (Gonghe Village–Daxikou, Yajiang Town), Xiaoxi River (Wushan part)	III
Sichuan	Jialing River (Huoyantan–Zhaozhua), Jiangexi River, Xiaoshui River, Zitong River, Ganhezi, Xiushui River	III
Guizhou	Wu River (Sinan–Yanhe), Jinjiang River (Chenshui, Yangtuo power station–Misha Village, Guogongping Town), Liuchi River (Jiancha–Tongkou)	II
	Longjiang River (Yixihe River mouth–Longjiang River mouth), Houzigou reservoir, Songtao River (Lengshuixi–Zhaishi), Wawu River (Tangjiantian–Yangtuo Town), Ongkeng reservoir	III
Yunnan	Xiaojiang River (–Niulanjiang River mouth), Kazhu River, Sayu River (Yudong reservoir–Shiziba), Jinshajiang River (inlet–shuifu outlet), Baishui River (–Hengjing River mouth), Daoliuhe River	III

Sources: Provided by the Provincial Environmental Protection Department and listed in the domestic environmental impact assessment report.

Table A2.2: Applicable Parameters and Limits of Applicable Surface Water Standards

Parameters		II	III	IV
pH			6.0–9.0	
COD ≤	mg/L	15.0	20.0	30.0
BOD ₅ ≤	mg/L	3.0	4.0	6.0
Permanganate index ≤	mg/L	4.0	6.0	10.0
NH ₃ -N ≤	mg/L	0.5	1.0	1.5

BOD₅ = 5-day biological oxygen demand, COD = chemical oxygen demand, mg/L = milligram per liter, NH₃-N = dissociated form of ammonia, pH = potential of hydrogen; a numeric scale used to specify the acidity or basicity of an aqueous solution.

Sources: Provided by the Provincial Environmental Protection Department and listed in the domestic environmental impact assessment report.

2. **Air quality standards.** The class II of the PRC's ambient air quality standards (GB 3095-2012) is applicable for ambient air quality in the project areas. The class II standards are listed in Table A2.3.

Table A2.3: Air Quality Standards

Parameter	Limit (milligram/cubic meter)	
	Timeframe	Class II Standard
PM ₁₀	Annual average	0.070
	Daily average	0.150
PM _{2.5}	Annual average	0.035
	Daily average	0.075
SO ₂	Annual average	0.060
	Daily average	0.150
	Hourly average	0.500
NO ₂	Annual average	0.040
	Daily average	0.080
	Hourly average	0.200

Sources: Provided by the Provincial Environmental Protection Department and listed in the domestic environmental impact assessment report.

3. **Environmental quality standard for noise.** The class I (Daytime: 55 dB(A); Nighttime: 45 dB(A)) of the PRC's environmental quality standard for noise (GB 2096-2008) is applicable for the noise quality control in the project areas, i.e., rural area.

4. **Standards for air pollutant's emission.** During the project construction, the dust emitted should meet the limit of 1.0 milligram/cubic meter regulated by the PRC's Integrated Emission Standards of Air Pollutants (GB16297-1996 or DB50/418-2016 only for Chongqing). The odor emitted during the river trenching and organic fertilizer processing in the Li County should meet the limits of Class II regulated in GB 14554-93 in *Table 2.4*.

Table A2.4: Standards for Air Pollutants Emission

Pollutants	Limit
NH ₃	milligram/cubic meter 1.50
H ₂ S	milligram/cubic meter 0.06
Odor	20.00

Sources: Provided by the Provincial Environmental Protection Department and listed in the domestic environmental impact assessment report.

5. **Standards for noise emission.** During the project construction, the noise emission should meet the limit of 70 (daytime) and 55 dB(A) (nighttime) set by the PRC's Emission Standard of Environment Noise for Boundary of Construction Site (GB12523-2011). During the project operation, the applicable limits for noise emission is 55 (daytime) and 45 dB(A) (nighttime) regulated by GB 12348-2008.

APPENDIX 3: ECOLOGICAL FUNCTION OF ALL PROJECT COUNTIES AND DISTRICTS

Province	County or District	Ecological Service ^a	Ecological Function ^b	Code	Ecological Function Zone
Hubei	Shishou	EA	FA	I-05-01	Flood adjustment of lake wetland in Jiangnan plain
	Gongan	EA	FA	I-05-01	Flood adjustment of lake wetland in Jiangnan plain
		PS	AP	II-01-19	Agricultural production in Jiangnan plain
	Honghu	EA	FA	I-05-03	Flood adjustment of Honghu–Huanggang wetland
		PS	AP	II-01-19	Agricultural production in Jiangnan plain
	Songzi	EA	FA	I-05-01	Flood adjustment of lake wetland in Jiangnan plain
		EA	PB	I-02-13	Biodiversity protection in southwest of Hubei
		PS	AP	II-01-19	Agricultural production in Jiangnan plain
	Dangyang	EA	WC	I-01-30	Water source conservation in mountainous region of southwest Hubei
		PS	AP	II-01-19	Agricultural production in Jiangnan plain
	Yidu	EA	PB	I-02-13	Biodiversity protection in southwest of Hubei
		EA	SC	I-03-07	Soil and water erosion control in the Three Gorges dam
		PS	AP	II-01-19	Agricultural production in Jiangnan plain
	Zhijiang	EA	FA	I-05-01	Flood adjustment of lake wetland in Jiangnan plain
		PS	AP	II-01-19	Agricultural production in Jiangnan plain
	Chibi	EA	FA	I-05-03	Flood adjustment of Honghu–Huanggang wetland
		PS	AP	II-01-20	Agricultural production in southeast hilly region of Hubei
Hunan	Nan	EA	FA	I-05-02	Biodiversity protection and flood adjustment of Dongting lake
		PS	AP	II-01-22	Agricultural production in hilly area of central Hunan
	Li	EA	PB	I-02-14	Biodiversity protection in Wuling mountainous region
		PS	AP	II-01-22	Agricultural production in hilly area of central Hunan
	Taoyuan	EA	PB	I-02-14	Biodiversity protection in Wuling mountainous region
		EA	PB	I-02-16	Biodiversity protection and soil and water erosion control in Xuefeng mountain
		PS	AP	II-01-22	Agricultural production in hilly area of central Hunan
	Pingjiang	EA	WC	I-01-11	Water source conservation in Mufu mountainous region
	Dongkou	EA	PB	I-02-16	Biodiversity protection and soil and water erosion control in Xuefeng mountain
		PS	AP	II-01-22	Agricultural production in hilly area of central Hunan
	Hengnan	PS	AP	II-01-22	Agricultural production in hilly area of central Hunan
	Shuangfeng	EA	AP	II-01-22	Agricultural production in hilly area of central Hunan

Province	County or District	Ecological Service ^a	Ecological Function ^b	Code	Ecological Function Zone
Chongqing	Lengshuitan	EA	WC	I-01-19	Biodiversity protection and water source conservation in Dupangling–Mengzheling
	Wanzhou	PS	AP	II-01-22	Agricultural production in hilly area of central Hunan
		EA	SC	I-03-07	Soil and water erosion control in the Three Gorges dam
		EA	SC	I-03-08	Soil and water erosion control in mountainous region of southeast Chongqing
	Fuling	EA	SC	I-03-07	Soil and water erosion control in the Three Gorges dam
	Jiangjin	EA	WC	I-01-28	Biodiversity protection and water source conservation in Daloushan mountainous region
	Kaizhou	PS	AP	II-01-30	Agricultural production in Sichuan basin
		PH	IC	III-02-16	Urban residential region of Chongqing
		EA	SC	I-03-07	Soil and water erosion control in the Three Gorges dam
		EA	SC	I-03-07	Soil and water erosion control in the Three Gorges dam
		EA	SC	I-03-08	Soil and water erosion control in the mountainous region of southeast Chongqing
		EA	SC	I-03-09	Soil and water erosion control in central mountainous region of north Guizhou
	Zhonxian	EA	SC	I-03-07	Soil and water erosion control in the Three Gorges dam
	Wushan	PS	FP	II-02-05	Agricultural production in hilly area of east Sichuan
		EA	SC	I-03-07	Soil and water erosion control in the Three Gorges dam
	Wuxi	EA	WC	I-01-29	Water source conservation in Micangshan–Dabashan
		EA	SC	I-03-07	Soil and water erosion control in the Three Gorges dam
Sichuan	Zhaohua	PS	AP	II-01-30	Agricultural production in Sichuan basin
		PS	FP	II-02-05	Forest product supply in hilly area of east Sichuan
	Wangcang	EA	WC	I-01-29	Water source conservation in Micangshan–Dabashan
		PS	FP	II-02-05	Forest product supply in hilly area of east Sichuan
	Jiange	PS	AP	II-01-30	Agricultural production in Sichuan basin
		PS	FP	II-02-05	Forest product supply in hilly area of east Sichuan
	Yingshan	PS	AP	II-01-30	Agricultural production in Sichuan basin
		PS	FP	II-02-05	Forest product supply in hilly area of east Sichuan
	Manbu	PS	AP	II-01-30	Agricultural production in Sichuan basin
	Yanting	PS	AP	II-01-30	Agricultural production in Sichuan basin
	Anzhou	EA	WC	I-01-28	Biodiversity protection and water source conservation in Daloushan mountainous region

Province	County or District	Ecological Service ^a	Ecological Function ^b	Code	Ecological Function Zone
Guizhou	Yuping	PS	AP	II-01-30	Agricultural production in Sichuan basin
		PH	IC	III-02-17	Urban residential region of Chengdu
		EA	WC	I-01-27	Water source conservation in medium and low mountainous region of east Guizhou
	Jiangkou	EA	WC	I-01-27	Water source conservation in medium and low mountainous region of east Guizhou
		EA	PB	I-02-15	Biodiversity protection and soil and water erosion control in southeast Chongqing- northeast Guizhou
	Songtao	EA	WC	I-01-27	Water source conservation in medium and low mountainous region of east Guizhou
		EA	PB	I-02-15	Biodiversity protection and soil and water erosion control in southeast Chongqing- northeast Guizhou
	Bijiang	EA	WC	I-01-27	Water source conservation in medium and low mountainous region of east Guizhou
	Dejiang	EA	SC	I-03-08	Soil and water erosion control in mountainous region of southeast Chongqing
		EA	SC	I-03-09	Soil and water erosion control in mountainous region of north Guizhou
	Yinjiang	EA	SC	I-03-10	Soil and water erosion control in Karst region of central Guizhou
		EA	PB	I-02-15	Biodiversity protection and soil and water erosion control in southeast Chongqing- northeast Guizhou
		EA	SC	I-03-08	Soil and water erosion control in mountainous region of east Chongqing
	Yanhe	EA	SC	I-03-08	Soil and water erosion control in mountainous region of east Chongqing
	Sinan	EA	PB	I-02-15	Biodiversity protection and soil and water erosion control in southeast Chongqing- northeast Guizhou
		EA	SC	I-03-08	Soil and water erosion control in mountainous region of southeast Chongqing
Yunnan	Xuanwei	EA	SC	I-03-10	Soil and water erosion control in karst region of central Guizhou
		EA	SC	I-03-13	Soil and water erosion control in mountainous region of Wumengshan
	Zhaoyang	EA	SC	I-03-13	Soil and water erosion control in mountainous region of Wumengshan
		EA	SC	I-03-14	Soil and water erosion control in dry and hot valley of Sichuan-Yunnan

Province	County or District	Ecological Service ^a	Ecological Function ^b	Code	Ecological Function Zone
	Qiaojia	EA	SC	I-03-13	Soil and water erosion control in mountainous region of Wumengshan
		EA	SC	I-03-14	Soil and water erosion control in dry and hot valley of Sichuan-Yunnan
	Yongshan	EA	SC	I-03-14	Soil and water erosion control in dry and hot valley of Sichuan-Yunnan
	Yanjing	EA	SC	I-03-13	Soil and water erosion control in mountainous region of Wumengshan
		EA	SC	I-03-14	Soil and water erosion control in dry and hot valley of Sichuan-Yunnan
	Weixin	EA	SC	I-03-13	Soil and water erosion control in mountainous region of Wumengshan
	Yiliang	EA	SC	I-03-13	Soil and water erosion control in mountainous region of Wumengshan
		EA	SC	I-03-14	Soil and water erosion control in dry and hot valley of Sichuan-Yunnan

EIA = environmental impact assessment, EPD = Environmental Protection Department.

^a Ecological services: EA = ecological adjustment, PH = provision of human habitat, PS = product supply.

^b Ecological functions: AP = agricultural product, FA = flood adjustment, FP = forest product, IC = important city and town, PB = protection of biodiversity; SC = soil and water erosion control; WC = water source conservation.

Sources: Provided by the Provincial Environmental Protection Department and listed in the domestic environmental impact assessment report.

APPENDIX 4: FERTILIZER APPLICATION BEFORE AND AFTER THE PROJECT

Table A4.1: Fertilizer Application Before and After the Project in Hubei

Project Counties		Fertilizer Application Rate (kg/ha)				Total Fertilizer Quantity (t/a)			
		N	P ₂ O ₅	K ₂ O	Sum	N	P ₂ O ₅	K ₂ O	Sum
Shishou	Before	206	113	124	442	209	115	126	450
	After	150	105	120	375	153	107	122	382
	Change	-27%	-7%	-3%	-15%	-27%	-7%	-3%	-15%
Gongan	Before	251	113	124	487	357	161	177	694
	After	197	105	120	422	280	150	171	601
	Change	-22%	-7%	-3%	-23%	-22%	-7%	-3%	-23%
Honghu	Before	195	84	95	373	368	158	179	704
	After	158	67	75	299	297	126	141	565
	Change	-19%	-20%	-21%	-20%	-19%	-20%	-21%	-20%
Songzi	Before	240	109	113	463	266	121	126	513
	After	188	90	100	379	209	100	111	420
	Change	-22%	-17%	-12%	-18%	-22%	-17%	-12%	-18%
Dangyang	Before	440	119	117	675	195	53	52	299
	After	399	88	101	588	177	39	45	261
	Change	-9%	-26%	-13%	-13%	-9%	-26%	-13%	-13%
Yidu	Before	300	225	225	750	240	180	180	600
	After	255	180	165	600	204	144	132	480
	Change	-15%	-20%	-27%	-20%	-15%	-20%	-27%	-20%
Zhijiang	Before	243	160	168	572	141	93	98	332
	After	198	128	129	455	115	74	75	264
	Change	-18%	-20%	-24%	-20%	-18%	-20%	-24%	-20%
Chibi	Before	195	105	120	420	260	140	160	560
	After	150	83	90	323	200	110	120	430
	Change	-23%	-21%	-25%	-23%	-23%	-21%	-25%	-23%
HUBEI	Before	237	118	128	480	2,037	1,019	1,096	4,152
	After	190	98	107	396	1,635	851	917	3,402
	Change	-20%	-17%	-16%	-18%	-20%	-17%	-16%	-18%

EIA = environmental impact assessment, kg/ha = kilogram per hectare, K₂O = potassium oxide, N = nitrogen, P₂O₅ = diphosphorus pentoxide, t/a = ton per annum.

Source: Domestic EIA report.

Table A4.2: Fertilizer Application Before and After the Project in Hunan

		Fertilizer Application Rate (kg/ha)				Total Fertilizer Quantity (t/a)			
		N	P ₂ O ₅	K ₂ O	Sum	N	P ₂ O ₅	K ₂ O	Sum
Nan	Before	414	180	210	804	552	240	280	1,072
	After	300	135	180	615	400	180	240	820
	Change	-28%	-25%	-14%	-24%	-28%	-25%	-14%	-24%
Li	Before	414	180	210	804	552	240	280	1,072
	After	296	138	195	629	484	226	318	1,027
	Change	-28%	-23%	-7%	-22%	-12%	-6%	14%	-4%
Taoyuan	Before	356	152	174	682	379	162	186	727
	After	270	118	152	540	288	126	162	576
	Change	-24%	-22%	-13%	-21%	-24%	-22%	-13%	-21%
Pingjiang	Before	368	158	182	709	915	393	453	1,760
	After	274	121	157	553	701	310	402	1,412
	Change	-26%	-23%	-14%	-22%	-23%	-21%	-11%	-20%
Dongkou	Before	414	180	210	804	1,518	660	770	2,948
	After	282	128	172	582	1,260	571	770	2,601
	Change	-32%	-29%	-18%	-28%	-17%	-13%	0%	-12%
Hengnan	Before	414	180	210	804	1,214	528	616	2,358
	After	267	120	155	541	1,010	454	587	2,051
	Change	-36%	-33%	-26%	-33%	-17%	-14%	-5%	-13%
Shuangfeng	Before	414	180	210	804	635	276	322	1,233
	After	294	138	195	627	563	264	374	1,201
	Change	-29%	-23%	-7%	-22%	-11%	-4%	16%	-3%
Lengshuitan	Before	414	180	210	804	1,877	816	952	3,645
	After	292	132	189	612	1,700	766	1,098	3,563
	Change	-29%	-27%	-10%	-24%	-9%	-6%	15%	-2%
HUNAN	Before	405	176	204	785	7,642	3,315	3,859	14,815
	After	284	128	175	587	6,404	2,896	3,952	13,252
	Change	-30%	-27%	-14%	-25%	-16%	-13%	2%	-11%

EIA = environmental impact assessment, kg/ha = kilogram per hectare, K₂O = potassium oxide, N = nitrogen, P₂O₅ = diphosphorus pentoxide, t/a = ton per annum.

Source: Domestic EIA report.

Table A4.3: Fertilizer Application Before and After the Project in Chongqing

		Fertilizer Application Rate (kg/ha)				Total Fertilizer Quantity (t/a)			
		N	P ₂ O ₅	K ₂ O	Sum	N	P ₂ O ₅	K ₂ O	Sum
Wanzhou	Before	456	239	345	1,040	246	129	186	562
	After	299	150	225	674	162	81	122	364
	Change	-34%	-37%	-35%	-35%	-34%	-37%	-35%	-35%
Fuling	Before	398	208	301	906	331	173	251	755
	After	324	144	229	697	270	120	191	581
	Change	-19%	-31%	-24%	-23%	-19%	-31%	-24%	-23%
Jiangjin	Before	402	210	304	916	402	210	304	916
	After	318	159	238	715	318	159	238	715
	Change	-21%	-24%	-22%	-22%	-21%	-24%	-22%	-22%
Kaizhou	Before	403	210	306	919	376	196	285	858
	After	325	169	260	753	303	158	242	703
	Change	-19%	-20%	-15%	-18%	-19%	-20%	-15%	-18%
Wulong	Before	388	205	311	904	362	191	290	844
	After	225	135	240	600	210	126	224	560
	Change	-42%	-34%	-23%	-34%	-42%	-34%	-23%	-34%
Zhoangxian	Before	399	209	302	911	613	320	464	1,396
	After	321	161	241	723	492	246	369	1,108
	Change	-20%	-23%	-20%	-21%	-20%	-23%	-20%	-21%
Wushan	Before	368	201	300	869	343	188	280	811
	After	209	125	214	549	195	117	200	512
	Change	-43%	-38%	-29%	-37%	-43%	-38%	-29%	-37%
Wuxi	Before	301	196	284	781	291	189	275	755
	After	204	131	223	559	198	127	216	540
	Change	-32%	-33%	-21%	-28%	-32%	-33%	-21%	-28%
CHONGQING	Before	386	208	304	899	2,965	1,596	2,336	6,897
	After	280	148	235	662	2,147	1,133	1,802	5,082
	Change	-28%	-29%	-23%	-26%	-28%	-29%	-23%	-26%

EIA = environmental impact assessment, kg/ha = kilogram per hectare, K₂O = potassium oxide, N = nitrogen, P₂O₅ = diphosphorus pentoxide, t/a = ton per annum.

Source: Domestic EIA report.

Table A4.4: Fertilizer Application Before and After the Project in Sichuan

Project Counties		Fertilizer Application Rate (kg/ha)				Total Fertilizer Quantity (t/a)			
		N	P ₂ O ₅	K ₂ O	Sum	N	P ₂ O ₅	K ₂ O	Sum
Zhaohua	Before	448	235	271	954	148	78	89	315
	After	387	169	212	768	128	56	70	253
	Change	-14%	-28%	-22%	-19%	-14%	-28%	-22%	-19%
Wangcang	Before	397	226	258	881	255	145	166	565
	After	338	151	199	688	217	97	127	441
	Change	-15%	-33%	-23%	-22%	-15%	-33%	-23%	-22%
Jiange	Before	443	233	258	934	514	270	299	1083
	After	369	166	202	737	428	192	235	855
	Change	-17%	-29%	-22%	-21%	-17%	-29%	-22%	-21%
Yingshan	Before	443	234	261	938	211	111	124	446
	After	374	177	221	771	178	84	105	367
	Change	-16%	-25%	-15%	-18%	-16%	-25%	-15%	-18%
Nanbu	Before	405	229	260	894	230	130	148	509
	After	379	183	259	821	216	104	147	467
	Change	-6%	-20%	0%	-8%	-6%	-20%	0%	-8%
Yanting	Before	407	209	241	856	245	126	145	515
	After	380	182	228	790	229	110	137	476
	Change	-6%	-13%	-5%	-8%	-6%	-13%	-5%	-8%
Anzhou	Before	442	241	268	951	228	124	138	490
	After	421	190	242	853	217	98	125	440
	Change	-5%	-21%	-10%	-10%	-5%	-21%	-10%	-10%
SICHUAN	Before	426	229	258	914	1,830	983	1,109	3922
	After	376	172	220	768	1,612	740	946	3298
	Change	-12%	-25%	-15%	-16%	-12%	-25%	-15%	-16%

EIA = environmental impact assessment, kg/ha = kilogram per hectare, K₂O = potassium oxide, N = nitrogen, P₂O₅ = diphosphorus pentoxide, t/a = ton per annum.

Source: Domestic EIA report.

Table A4.5: Fertilizer Application Before and After the Project in Guizhou

Project Counties		Fertilizer Application Rate (kg/ha)				Total Fertilizer Quantity (t/a)			
		N	P ₂ O ₅	K ₂ O	Sum	N	P ₂ O ₅	K ₂ O	Sum
Yuping	Before	269	116	133	518	199	86	98	384
	After	240	103	123	466	178	76	91	345
	Change	-11%	-12%	-7%	-10%	-11%	-12%	-7%	-10%
Jiangkou	Before	230	128	132	490	28	16	16	60
	After	228	93	151	471	28	11	18	58
	Change	-1%	-28%	15%	-4%	-1%	-28%	15%	-4%
Songtao	Before	240	111	127	478	180	83	96	359
	After	214	97	119	431	161	73	90	324
	Change	-11%	-12%	-6%	-10%	-11%	-12%	-6%	-10%
Bijiang	Before	223	114	140	478	77	39	48	164
	After	205	98	136	439	70	33	47	150
	Change	-8%	-14%	-3%	-8%	-8%	-14%	-3%	-8%
Dejiang	Before	225	101	110	436	146	66	71	284
	After	200	87	104	391	130	57	68	254
	Change	-11%	-14%	-5%	-10%	-11%	-14%	-5%	-10%
Yinjiang	Before	225	101	110	436	146	66	71	284
	After	200	87	104	391	130	57	68	254
	Change	-11%	-14%	-5%	-10%	-11%	-14%	-5%	-10%
Yanhe	Before	268	117	133	517	202	88	100	389
	After	240	103	123	466	180	78	93	351
	Change	-10%	-12%	-7%	-10%	-10%	-12%	-7%	-10%
Sinan	Before	239	118	138	495	92	45	53	191
	After	215	106	128	450	83	41	49	173
	Change	-10%	-10%	-7%	-9%	-10%	-10%	-7%	-9%
GUIZHOU	Before	243	111	126	481	1,071	490	554	2,114
	After	218	97	119	434	960	426	524	1,910
	Change	-10%	-13%	-5%	-10%	-10%	-13%	-5%	-10%

EIA = environmental impact assessment, kg/ha = kilogram per hectare, K₂O = potassium oxide, N = nitrogen, P₂O₅ = diphosphorus pentoxide, t/a = ton per annum.

Source: Domestic EIA report.

Table A4.6: Fertilizer Application Before and After the Project in Yunnan

Project Counties		Fertilizer Application Rate (kg/ha)				Total Fertilizer Quantity (t/a)			
		N	P ₂ O ₅	K ₂ O	Sum	N	P ₂ O ₅	K ₂ O	Sum
Xuanwei	Before	318	115	130	563	593	215	243	1,051
	After	281	100	118	499	524	186	221	931
	Change	-12%	-13%	-9%	-11%	-12%	-13%	-9%	-11%
Huize	Before	109	57	42	208	259	135	100	493
	After	102	52	51	205	242	124	121	486
	Change	-7%	-8%	21%	-1%	-7%	-8%	21%	-1%
Zhaoyang	Before	236	85	88	410	701	252	262	1,215
	After	190	72	84	347	565	214	250	1,030
	Change	-19%	-15%	-4%	-15%	-19%	-15%	-4%	-15%
Qiaojia	Before	308	106	86	500	1,108	382	310	1,801
	After	235	87	110	433	848	313	397	1,559
	Change	-23%	-18%	28%	-13%	-23%	-18%	28%	-13%
Yongshan	Before	297	105	116	518	708	252	277	1,237
	After	223	89	115	427	533	213	275	1,021
	Change	-25%	-16%	-1%	-17%	-25%	-16%	-1%	-17%
Yanjin	Before	258	83	64	404	172	55	43	270
	After	228	68	61	356	152	45	41	238
	Change	-12%	-18%	-5%	-12%	-12%	-18%	-5%	-12%
Weixin	Before	206	68	64	337	798	264	247	1,309
	After	162	45	33	239	629	173	128	930
	Change	-21%	-34%	-48%	-29%	-21%	-34%	-48%	-29%
Yiliang	Before	310	99	94	503	1,371	439	414	2,224
	After	229	83	100	412	1,011	366	442	1,819
	Change	-26%	-17%	7%	-18%	-26%	-17%	7%	-18%
YUNNAN	Before	258	90	86	433	5,710	1,993	1,896	9,599
	After	203	74	85	362	4,503	1,634	1,875	8,013
	Change	-21%	-18%	-1%	-17%	-21%	-18%	-1%	-17%

EIA = environmental impact assessment, kg/ha = kilogram per hectare, K₂O = potassium oxide, N = nitrogen, P₂O₅ = diphosphorus pentoxide, t/a = ton per annum.

Source: Domestic EIA report.

APPENDIX 5: CHEMICAL PESTICIDE APPLICATION BEFORE AND AFTER THE PROJECT

Table A5.1: Chemical Pesticide Application Before and After the Project in Hubei

Project Counties	Pesticide Application Rate (kg/ha)			Total Pesticide Quantity (t/a)		
	Before	After	Change	Before	After	Change
Shishou	8.75	6.56	-25%	8.9	6.7	-25%
Gongan	8.75	6.13	-30%	12.5	8.7	-30%
Honghu	1.36	0.97	-29%	2.6	1.8	-29%
Songzi	6.51	5.84	-10%	7.2	6.5	-10%
Dangyang	6.56	6.03	-8%	2.9	2.7	-8%
Yidu	8.75	6.74	-23%	7.0	5.4	-23%
Zhijiang	8.75	5.98	-32%	5.1	3.6	-30%
Chibi	8.75	6.13	-30%	11.7	8.2	-30%
HUBEI	6.33	4.76	-25%	57.8	43.5	-25%

EIA = environmental impact assessment, kg/ha = kilogram per hectare, t/a = ton per annum.
Source: Domestic EIA report.

Table A5.2: Chemical Pesticide Application Before and After the Project in Hunan

Project Counties	Pesticide Application Rate (kg/ha)			Total Pesticide Quantity (t/a)		
	Before	After	Change	Before	After	Change
Nan	8.25	6.77	-18%	11.0	9.0	-18%
Li	8.25	5.76	-30%	11.0	9.4	-15%
Taoyuan	7.13	5.49	-23%	7.6	5.9	-23%
Pingjiang	7.78	5.62	-28%	19.3	14.4	-26%
Dongkou	9.00	6.06	-33%	33.0	27.1	-18%
Hengnan	9.25	6.29	-32%	27.1	23.8	-12%
Shuangfeng	8.00	5.44	-32%	12.3	10.4	-15%
Lengshuitan	8.25	5.92	-28%	37.4	34.5	-8%
HUNAN	8.40	5.95	-29%	158.7	134.5	-15%

EIA = environmental impact assessment, kg/ha = kilogram per hectare, t/a = ton per annum.
Source: Domestic EIA report.

Table A5.3: Chemical Pesticide Application Before and After the Project in Chongqing

Project Counties	Pesticide Application Rate (kg/ha)			Total Pesticide Quantity (t/a)		
	Before	After	Change	Before	After	Change
Wanzhou	7.81	6.53	-16%	4.2	3.5	-16%
Fuling	7.20	6.00	-17%	6.0	5.0	-17%
Jiangjin	7.15	6.00	-16%	7.1	6.0	-16%
Kaizhou	7.39	5.70	-23%	6.9	5.3	-23%
Wulong	6.71	5.53	-18%	6.3	5.2	-18%
Zhongxian	7.18	6.00	-16%	11.0	9.2	-16%
Wushan	6.79	4.88	-28%	6.3	4.6	-28%
Wuxia	6.29	4.88	-23%	6.1	4.7	-23%
CHONGQING	7.03	5.66	-19%	54.0	43.5	-19%

EIA = environmental impact assessment, kg/ha = kilogram per hectare, t/a = ton per annum.
Source: Domestic EIA report.

Table A5.4: Chemical Pesticide Application Before and After the Project in Sichuan

Project Counties	Pesticide Application Rate (kg/ha)			Total Pesticide Quantity (t/a)		
	Before	After	Change	Before	After	Change
Zhaohua	5.91	5.05	-15%	1.9	1.7	-15%
Wangcang	5.88	5.00	-15%	3.8	3.2	-15%
Jiange	5.91	4.72	-20%	6.9	5.5	-20%
Yingshan	5.89	4.46	-24%	2.8	2.1	-24%
Nanbu	5.71	5.01	-12%	3.2	2.8	-12%
Yanting	5.62	4.21	-25%	3.4	2.5	-25%
Anzhou	5.95	5.04	-15%	3.1	2.6	-15%
SICHUAN	5.84	4.76	-18%	25.1	20.4	-18%

EIA = environmental impact assessment, kg/ha = kilogram per hectare, t/a = ton per annum.
Source: Domestic EIA report.

Table A5.5: Chemical Pesticide Application Before and After the Project in Guizhou

Project Counties	Pesticide Application Rate (kg/ha)			Total Pesticide Quantity (t/a)		
	Before	After	Change	Before	After	Change
Yuping	4.59	3.66	-20%	3.4	2.7	-20%
Jiangkou	4.29	1.93	-55%	0.5	0.2	-55%
Songtao	4.06	3.55	-12%	3.1	2.7	-12%
Bijiang	3.51	3.07	-13%	1.2	1.1	-13%
Dejiang	4.00	3.56	-11%	2.6	2.3	-11%
Yinjiang	3.48	2.89	-17%	2.3	1.9	-17%
Yanhe	4.73	4.04	-14%	3.6	3.0	-14%
Sinan	4.13	3.60	-13%	1.6	1.4	-13%
GUIZHOU	4.14	3.48	-16%	18.2	15.3	-16%

EIA = environmental impact assessment, kg/ha = kilogram per hectare, t/a = ton per annum.
Source: Domestic EIA report.

Table A5.6: Chemical Pesticide Application Before and After the Project in Yunnan

Project Counties	Pesticide Application Rate (kg/ha)			Total Pesticide Quantity (t/a)		
	Before	After	Change	Before	After	Change
Xuanwei	3.10	2.71	-13%	5.8	5.1	-13%
Huize	2.03	1.82	-11%	4.8	4.3	-11%
Zhaoyang	3.00	2.53	-16%	8.9	7.5	-16%
Qiaojia	4.04	3.51	-13%	14.6	12.7	-13%
Yongshan	3.77	3.23	-14%	9.0	7.7	-14%
Yanjin	4.38	3.83	-13%	2.9	2.6	-13%
Weixin	1.87	1.72	-8%	7.3	6.7	-8%
Yiliang	3.83	3.12	-19%	16.9	13.8	-19%
YUNNAN	3.12	2.68	-14%	70.1	60.2	-14%

EIA = environmental impact assessment, kg/ha = kilogram per hectare, t/a = ton per annum.
Source: Domestic EIA report.

APPENDIX 6: WATER RESOURCES ANALYSIS

Table A6.1: Water Resources Analysis in Hubei

	Dangyang	Yidu	Zhijiang	Gongan	Shishou	Songzi	Honghu	Chibi	Total/Ave.
Available water resources (10 ⁴ m ³ /a)	512	892	419	1,187	486	521	995	798	5,810
Water used for irrigation BEFORE project (10 ⁴ m ³ /a)	292	586	208	814	234	303	540	522	3,498
Water used for irrigation AFTER project (10 ⁴ m ³ /a)	295	555	190	767	217	279	507	492	3,302
Change of Water used for irrigation due to project (%)	1.3	-5.4	-8.3	-5.9	-7.2	-7.9	-6.1	-5.7	-5.6%
Proportion of water use change in current available water (%)	0.7	-3.5	-4.1	-4.0	-3.4	-4.6	-3.3	-3.7	-3.4

Ave. = average, EIA = environmental impact assessment, m³/a = cubic meter per annum.

Source: Domestic EIA report.

Table A6.2: Water Resources Analysis in Hunan

	Shuangfeng	Li	Hengnan	Taoyuan	Pingjiang	Dongkou	Nan	Lengshuitan	Total/Ave.
Available water resources (10 ⁴ m ³ /a)	1,535	1,187	5,318	4,341	6,104	2,641	2,913	5,057	29,096
Water used for irrigation BEFORE project (10 ⁴ m ³ /a)	1,158	917	2,987	1,069	1,429	1,063	1,333	1,296	11,250
Water used for irrigation AFTER project (10 ⁴ m ³ /a)	1,299	1,017	3,327	1,117	1,514	1,181	1,383	1,486	12,323
Change of Water used for irrigation due to project (%)	+12.2	+10.9	+11.4	+4.5	+6.0	+11.2	+3.8	+14.6	9.5
Proportion of water use change in current available water (%)	+9.2	+8.4	+6.4	+1.1	+1.4	+4.5	+1.7	+3.8	+3.7

Ave. = average, EIA = environmental impact assessment, m³/a = cubic meter per annum.

Source: Domestic EIA report.

Table A6.3: Water Resources Analysis in Chongqing

	Wanzhou	Fuling	Jiangjin	Kaizhou	Wulong	Zhongxian	Wushan	Wuxi	Total/Ave.
Available water resources (10 ⁴ m ³ /a)	140	216	236	215	220	358	234	220	1839
Water used for irrigation before project (10 ⁴ m ³ /a)	102	189	180	179	162	280	168	182	1,443
Water used for irrigation after project (10 ⁴ m ³ /a)	126	196	213	196	200	322	210	203	1,666
Change of Water used for irrigation due to project (%)	-23.3	+3.7	+18.0	+9.4	+23.3	+14.9	+25.0	+11.5	+15.4
Proportion of water use change in current available water (%)	+17.0	+3.2	+13.8	+7.8	+17.2	+11.6	+17.9	+9.5	+12.1

Ave. = average, EIA = environmental impact assessment, m³/a = cubic meter per annum.

Source: Domestic EIA report.

Table A6.4: Water Resources Analysis in Sichuan

	Anzhou	Yanting	Zhaohua	Jiange	Wangcang	Nanbu	Yingshan	Total/Ave.
Available water resources (10 ⁴ m ³ /a)	3,903	786	584	855	1,430	1,320	776	9,654
Water used for irrigation before project (10 ⁴ m ³ /a)	3,732	610	481	665	1,148	1,040	538	8,214
Water used for irrigation after project (10 ⁴ m ³ /a)	3,767	668	529	725	1,180	1,120	603	8,592
Change of Water used for irrigation due to project (%)	+0.9	+9.5	+10.0	+9.0	+2.8	+7.7	+12.1	+4.6
Proportion of water use change in current available water (%)	+0.9	+7.4	+8.2	+7.0	+2.2	+6.1	+8.4	+3.9

Ave. = average, EIA = environmental impact assessment, m³/a = cubic meter per annum.

Source: Domestic EIA report.

Table A6.5: Water Resources Analysis in Guizhou

	Bijiang	Jiangkou	Sinan	Songtao	Yanhe	Yinjiang	Yuping	Dejiang	Total/Ave.
Available water resources (10 ⁴ m ³ /a)	1,185	477	1,041	619	954	685	645	849	6,455
Water used for irrigation before project (10 ⁴ m ³ /a)	508	359	431	524	570	616	440	320	3,769
Water used for irrigation after project (10 ⁴ m ³ /a)	477	281	365	434	487	548	367	253	3,211
Change of Water used for irrigation due to project (%)	-6.3	-21.7	-15.3	-17.2	-14.6	-11.0	-16.7	-21.0	-14.8
Proportion of water use change in current available water (%)	-2.7	-16.3	-6.3	-14.6	-8.8	-9.9	-11.4	-7.9	-8.6

Ave. = average, EIA = environmental impact assessment, m³/a = cubic meter per annum.

Source: Domestic EIA report.

Table A6.6: Water Resources Analysis in Yunnan

	Xuanwei	Huize	Zhaoyang	Yanjin	Weixin	Yongshan	Qiaojia	Yiliang	Total/Ave.
Available water resources (10 ⁴ m ³ /a)	1,911	9,192	9,514	371	4,352	7,616	4,896	3,989	1,911
Water used for irrigation BEFORE project (10 ⁴ m ³ /a)	794	520	490	274	926	507	801	1,013	794
Water used for irrigation AFTER project (10 ⁴ m ³ /a)	681	333	539	233	787	341	640	909	681
Change of Water used for irrigation due to project (%)	-14.2	-36.1	10.1	-15.0	-15.0	-32.7	-20.1	-10.2	-14.2
Proportion of water use change in current available water (%)	-5.9	-2.0	0.5	-11.1	-3.2	-2.2	-3.3	-2.6	-5.9

Ave. = average, EIA = environmental impact assessment, m³/a = cubic meter per annum.

Source: Domestic EIA report.

APPENDIX 7: REDUCTION OF SOIL EROSION BY THE PROJECT

Appendix 7.1: Reduction of Soil Erosion by the Project in Hubei

Project Activities	Chibi	Dangyang	Gongan	Honghu	Shishou	Songzi	Yidu	Zhijiang	HUBEI
Slope to terrace	0	795	0	0	0	0	0	6,431	7,226
Economic forest	0	187	0	0	0	0	3,445	1,151	4,782
Ecological forest	0	0	0	0	0	912	0	0	912
Riverbank revetment and slope protection	0	0	0	1,217	0	3,430	175	0	4,822
Total	0	982	0	1,217	0	4,342	3,620	7,582	17,742

Source: Domestic environmental impact assessment report.

Appendix 7.2: Reduction of Soil Erosion by the Project in Hunan

Project Activities	Nan	Li	Pingjiang	Taoyuan	Dongkou	Hengnan	Shuangfeng	Lengshuitan	HUNAN
Slope to terrace	0	0	0	0	0	0	0	0	0
Economic forest	0	8,131	1,953	0	21,857	23,257	10,400	24,466	90,064
Ecological forest	0	0	9,521	0	10,263	589	6,012	1,811	28,196
Riverbank revetment And slope protection	426	509	0	62	0	0	472	0	1,468
Total	426	8,640	11,474	62	32,120	23,846	16,883	26,277	119,728

Source: Domestic environmental impact assessment report.

Appendix 7.3: Reduction of Soil Erosion by the Project in Chongqing

Project Activities	Fuling	Wushan	Wanzhou	Kaizhou	Wuxi	Zhongxian	Wulong	Jiangjin	CHONGQING
Slope to terrace	0	2,410	477	286	1,432	3,190	0	13,827	21,622
Economic forest	14,214	18,953	16,110	13,646	10,424	28,239	22,743	20,089	144,418
Ecological forest	205	114	0	17	0	1,895	1166	57	3,454
Riverbank revetment And slope protection	0	0	0	0	0	0	0	0	0
Total	14,419	21,477	16,587	13,949	11,856	33,324	23,909	33,973	169,494

Source: Domestic environmental impact assessment report.

Appendix 7.4: Reduction of Soil Erosion by the Project in Sichuan

Project Activities	Wangcang	Jiange	Zhaohua	Yingshan	Nanbu	Yanting	Anzhou	SICHUAN
Slope to terrace	6,683	7,451	3,656	3,097	3,563	4,122	4,028	32,599
Economic forest	7,850	11,456	3,107	5,548	7,406	5,104	4,244	44,716
Conservative tillage	1,621	2454	811	1,555	1,304	2,749	1,717	12,210
Ecological forest	33,481	46,796	11,456	15,700	20,361	6,297	1,137	135,229
Riverbank protection and slope protection	0	145	0	0	967	242	242	1,595
Total	49,636	68,303	19,030	25,900	33,601	1,8513	11,368	226,349

Source: Domestic environmental impact assessment report.

Appendix 7.5: Reduction of Soil Erosion by the Project in Guizhou

Project Activities	Bijiang	Jiangkou	Sinan	Taoyuan	Yanhe	Yinjiang	Yuping	Dejiang	GUIZHOU
Slope to terrace	0	647	0	0	0	0	0	0	647
Economic forest	2,627	3,240	2,992	0	0	3,207	1,338	2,452	15,855
Ecological forest	0	0	0	0	0	0	0	0	0
Riverbank revetment and slope protection	254	153	112	203	610	0	280	280	1,892
Total	2,881	4,039	3,103	203	610	3,207	1,618	2,731	18,394

Source: Domestic environmental impact assessment report.

Appendix 7.6: Reduction of Soil Erosion by the Project in Yunnan

Project Activities	Xuanwei	Huize	Zhaoyang	Yanjin	Weixin	Yongshan	Qiaojia	Yiliang	YUNNAN
Slope to terrace	0	0	2,586	0	3,621	2,069	0	0	8,277
Economic forest	1,794	26,897	15,822	0	0	10,337	14,565	6,741	76,156
Ecological forest	22,595	2,054	12,735	67,785	13,557	34,509	0	3,903	157,137
Riverbank protection and slope protection	0	0	0	0	0	0	0	0	0
Total	24,388	28,951	31,144	67,785	17,178	46,915	14,565	10,644	241,570

Source: Domestic environmental impact assessment report.

APPENDIX 8: SUMMARY OF POTENTIAL ENVIRONMENTAL IMPACTS AND RISKS

Province	County	Name of Subproject	Output and Subcomponent	Total Estimated Costs (×10 ⁴ RMB)	Short Description of Subproject	Description of Potential Impacts and Risks	Concluding Comments
Hubei	Shishou	Irrigation and drainage ditches; rural roads; pipe installation; new pond establishment; land levelling; conservation tillage; greenhouse; IPM control; scientific application of pesticides and fertilizers; Institutional coordination strengthened and capacity building.	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	2,868	In highly intensive farming region. Overall ecological agricultural construction, including soil and water conservation, green and circular agriculture, and NPS control.	Short-term and limited region of land disturbances, and this may slightly increase soil erosion within short duration during construction. Limited and short duration of dust, air, pollutants, and noise pollution during construction. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved, and water use reduced; medium reduction of agrochemicals and contribution to the NPS mitigation.
	Gongan	Irrigation and drainage ditches; newly established irrigation and drainage station; rural roads; sprinkler irrigation; rehabilitation of dam pond; land levelling; greenhouse; IPM control; scientific application of pesticides and fertilizers; institutional coordination strengthened and capacity building.	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	3,619	In highly intensive farming region. Overall agro-ecological construction project, including soil and water conservation, green and circular agriculture, and NPS control.	Short-term and limited region of land disturbances, and this may slightly increase soil erosion within short duration during construction. Limited and short duration of dust, air pollutants, and noise pollution during construction. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved, and water use reduced; medium reduction of agrochemicals and contribution to the NPS mitigation.
	Honghu	Irrigation and drainage ditches; rural roads; sprinkler irrigation; new pond establishment and rehabilitation of dam pond; farming machinery; small wetlands; sewage collection pipe network; pollutant discharge warming monitoring station; IPM control; scientific application of pesticides and fertilizers; organic fertilizer	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	3,438	In highly intensive farming region. Overall agro-ecological construction project, including soil and water conservation, green and circular agriculture, and NPS control.	Short-term and limited region of land disturbances, and this may slightly increase soil erosion within short duration during construction. Limited and short duration of dust, air pollutants, and noise pollution during	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved, and water use reduced; medium reduction of

Province	County	Name of Subproject	Output and Subcomponent	Total Estimated Costs (×10 ⁴ RMB)	Short Description of Subproject	Description of Potential Impacts and Risks	Concluding Comments
		processing plant; riverbank ecological revetment slope protection work; institutional coordination strengthened and capacity building.				construction. Pesticides storage and disposal.	agrochemicals and contribution to the NPS mitigation.
	Songzi	Newly established irrigation and drainage station; hardened road; sprinkler irrigation; new pond establishment; dredging, irrigation, and drainage ditches; IPM control; organic fertilizer processing plant; newly establishment of water and soil conservation forest plantation; riverbank ecological revetment slope protection work; institutional coordination strengthened and capacity building.	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	900	In highly intensive farming region. Overall agro-ecological construction project, including soil and water conservation, green and circular agriculture, and NPS control.	Short-term and limited region of land disturbances, and this may slightly increase soil erosion within short duration during construction. Limited and short duration of dust, air pollutants, and noise pollution during construction. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved, and water use reduced; medium reduction of agrochemicals and contribution to the NPS mitigation.
	Dangyang	Irrigation and drainage ditches; newly established irrigation and drainage station; rural roads; micro-irrigation (including drip irrigation); new pond establishment; greenhouse; IPM control; scientific application of pesticides and fertilizers; newly establishment of water and soil conservation; terrace-slope to ladder; newly established economic forest; institutional coordination strengthened and capacity building.	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	3,965	In intensive farming region. Green and ecological agricultural project.	Short-term and limited region of land disturbances, and this may slightly increase soil erosion within short duration during construction. Limited and short duration of dust, air pollutants, and noise pollution during construction. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved, and water use no change; medium reduction of agrochemicals and contribution to the NPS mitigation.
	Yidu	Irrigation and drainage ditches; hardened road; sprinkler irrigation; new pond establishment; dredging, irrigation, and drainage ditches; storage facilities; IPM control; scientific application of pesticides and fertilizers; riverbank ecological revetment slope protection work;	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience;	2,538	In intensive farming region. Green and ecological agricultural project.	Short-term and limited region of land disturbances, and this may slightly increase soil erosion within short duration during construction. Limited and short	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use

Province	County	Name of Subproject	Output and Subcomponent	Total Estimated Costs (×10 ⁴ RMB)	Short Description of Subproject	Description of Potential Impacts and Risks	Concluding Comments
		newly established economic forest; institutional coordination strengthened and capacity building.	institutional and farmers capacity building.			duration of dust, air pollutants and noise pollution during construction. Pesticides storage and disposal.	efficiency improved, and water use reduced; medium reduction of agrochemicals and contribution to the NPS mitigation.
	Zhijiang	Irrigation and drainage ditches; hardened road; newly established irrigation and drainage station; rural roads; sprinkler irrigation; new pond establishment; micro-irrigation (including drip irrigation); new pond establishment; straw treatment; IPM control; scientific application of pesticides and fertilizers; newly establishment of water and soil conservation forest plantation; terrace-slope to ladder project; newly established economic forest; institutional coordination strengthened and capacity building.	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	2,472	In intensive farming region. Soil and water conservation and green and circular agricultural project.	Short-term and limited region of land disturbances, and this may slightly increase soil erosion within short duration during construction. Limited and short duration of dust, air pollutants, and noise pollution during construction. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved, and water use reduced; medium reduction of agrochemicals and contribution to the NPS mitigation.
	Chibi	Irrigation and drainage ditches; hardened road; rural roads; new pond establishment; dredging, irrigation, and drainage ditches; straw treatment; ecological breeding demonstration base (rice-aquaculture industry); IPM control; institutional coordination strengthened and capacity building.	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	4,934	In intensive farming region. Green and ecological agricultural project and NPS control project.	Short-term and limited region of land disturbances, and this may slightly increase soil erosion within short duration during construction. Limited and short duration of dust, air pollutants, and noise pollution during construction. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved, and water use reduced; medium reduction of agrochemicals and contribution to the NPS mitigation.
Hunan	Nan	Dredging, irrigation and drainage ditches; straw treatment; ecological demonstration base; greenhouse; pollutant collection tank; safety livestock and poultry manure disposal; IPM (pest	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture;	700	In intensively farmed region, to build ecological protection system; implement rural pollution reduction activities;	Soil disturbance, dust, noise, air pollutants, and wastewater discharge within small regions (<50	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in

Province	County	Name of Subproject	Output and Subcomponent	Total Estimated Costs (×10 ⁴ RMB)	Short Description of Subproject	Description of Potential Impacts and Risks	Concluding Comments
		control); scientific application of pesticides and fertilizers; riverbank ecological revetment slope protection works; institutional coordination strengthened and capacity building	increase climate resilience; institutional and farmers capacity building.		and recycle agricultural wastes.	square meters [m ²] for each site) within short period (<3 months) during construction. Pesticides storage and disposal.	environmental sensitive regions; water use efficiency improved and minor water use increase; medium reduction of agrochemicals and contribution to the NPS mitigation.
	Li	Irrigation and drainage ditches; erosion control weir; rural roads; straw treatment; IPM (pest control); ecological protection belt (water and soil conservation forest plantation); ecological economic forest; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	1,234	In intensively farmed region, to build ecological protection system; implement rural pollution reduction activities; and recycle agricultural wastes.	Soil disturbance, dust, noise, air pollutants, and wastewater discharge within small regions (<50 m ² for each site) within short period (<3 months) during construction. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and minor water use increase; medium reduction of agrochemicals and contribution to the NPS mitigation.
	Taoyuan	Irrigation and drainage ditches; rural roads; small water storage works; small constructed wetlands; IPM (pest control); scientific application of pesticides and fertilizers; sewage treatment station; riverbank ecological revetment slope protection works; river green belt; ecological economic forest; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	2,127	In intensively farmed region, to build ecological protection system; implement rural pollution reduction activities; and recycle agricultural wastes.	Soil disturbance, dust, noise, air pollutants, and wastewater discharge within small regions (<50 m ² for each site) within short period (<3 months) during construction. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and minor water use increase; medium reduction of agrochemicals and contribution to the NPS mitigation.
	Pingjiang	Irrigation and drainage ditches; erosion control weir; small water storage works; pollutant collection	Increase of land productivity; increase of water use	935	In intensively farmed region, to build ecological protection	Soil disturbance, dust, noise, air pollutants, and	Projects activities have significant environmental benefits

Province	County	Name of Subproject	Output and Subcomponent	Total Estimated Costs (×10 ⁴ RMB)	Short Description of Subproject	Description of Potential Impacts and Risks	Concluding Comments
		tank; sewage collection pipe network; safety livestock and poultry manure disposal; IPM (pest control); ecological protection belt (water and soil conservation forest plantation); ecological economic forest; institutional coordination strengthened and capacity building	efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.		system; implement rural pollution reduction activities; and recycle agricultural wastes.	wastewater discharge within small regions (<50 m ² for each site) within short period (<3 months) during construction. Pesticides storage and disposal.	and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and minor water use increase; medium reduction of agrochemicals and contribution to the NPS mitigation.
	Dongkou	Irrigation and drainage ditches; small water storage works; pollutant collection tank; IPM (pest control); scientific application of pesticides and fertilizers; ecological protection belt (water and soil conservation forest plantation); ecological economic forest; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	1,403	In intensively farmed region, to build ecological protection system; implement rural pollution reduction activities; and recycle agricultural wastes.	Soil disturbance, dust, noise, air pollutants, and wastewater discharge within small regions (<50 m ² for each site) within short period (<3 months) during construction. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and minor water use increase; medium reduction of agrochemicals and contribution to the NPS mitigation.
	Hengnan	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; low-pressure pipeline engineering; small water storage works; small constructed wetlands; pollutant collection tank; sewage collection pipe network; small watershed comprehensive benefit monitoring point; IPM (pest control); sewage treatment station; organic fertilizer processing plant; ecological protection belt (water and soil conservation forest plantation); river green belt; ecological grass protection;	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	299	In intensively farmed region, to build ecological protection system; implement rural pollution reduction activities; and recycle agricultural wastes.	Soil disturbance, dust, noise, air pollutants, and wastewater discharge within small regions (<50 m ² for each site) within short period (<3 months) during construction. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and minor water use increase; medium reduction of agrochemicals and contribution to the NPS mitigation.

Province	County	Name of Subproject	Output and Subcomponent	Total Estimated Costs (×10 ⁴ RMB)	Short Description of Subproject	Description of Potential Impacts and Risks	Concluding Comments
		ecological economic forest; institutional coordination strengthened and capacity building					
	Shuangfeng	Irrigation and drainage ditches; rural roads; low-pressure pipeline engineering; micro-irrigation (including drip irrigation); small water storage works; dredging, irrigation, and drainage ditches; small constructed wetlands; pollutant collection tank; IPM (pest control); sewage treatment station; ecological protection belt (water and soil conservation forest plantation); riverbank ecological revegetation slope protection works; river green belt; ecological grass protection; ecological economic forest; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	288	In intensively farmed region, to build ecological protection system; implement rural pollution reduction activities; and recycle agricultural wastes.	Soil disturbance, dust, noise, air pollutants, and wastewater discharge within small regions (<50 m ² for each site) within short period (<3 months) during construction. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and minor water use increase; medium reduction of agrochemicals and contribution to the NPS mitigation.
	Lengshuitan	Irrigation and drainage ditches; rural roads; small water storage works; pollutant collection tank; IPM (pest control); ecological protection belt (water and soil conservation forest plantation); ecological economic forest; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	2,099	In intensively farmed region, to build ecological protection system; implement rural pollution reduction activities; and recycle agricultural wastes.	Soil disturbance, dust, noise, air pollutants, and wastewater discharge within small regions (<50 m ² for each site) within short period (<3 months) during construction. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and minor water use increase; medium reduction of agrochemicals and contribution to the NPS mitigation.
Chongqing	Wanzhou	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; low-pressure pipeline engineering; sprinkler irrigation; small water storage works; IPM (pest control); scientific application	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate	2,219	In region of intensively managed agriculture, to undertake soil and water conservation engineering, green and circular	Soil disturbance, dust, noise, air pollutants, and wastewater discharge within small regions (<50 m ² for each site)	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive

Province	County	Name of Subproject	Output and Subcomponent	Total Estimated Costs (×10 ⁴ RMB)	Short Description of Subproject	Description of Potential Impacts and Risks	Concluding Comments
		of pesticides and fertilizers; terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	resilience; institutional and farmers capacity building.		agriculture; and improve institutional capacity.	within short period (<3 months) during construction. Pesticides storage and disposal.	regions; water use efficiency improved and acceptable water use increase; medium reduction of agrochemicals and contribution to the NPS mitigation.
	Fuling	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; low-pressure pipeline engineering; sprinkler irrigation; small water storage works; ecological demonstration base; IPM (pest control); scientific application of pesticides and fertilizers; ecological protection belt (water and soil conservation forest plantation); ecological economic forest; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	1,992			Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and minor water use increase; medium reduction of agrochemicals and contribution to the NPS mitigation.
	Jiangjin	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; low-pressure pipeline engineering; sprinkler irrigation; small water storage works; ecological demonstration base; IPM (pest control); scientific application of pesticides and fertilizers; ecological protection belt (water and soil conservation forest plantation); terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	3,436	In region of intensively managed agriculture, to undertake soil and water conservation engineering, green and circular agriculture; and improve institutional capacity.	Soil disturbance; dust, noise, air pollutants; and wastewater discharge within small regions (<50 m ² for each site) within short period (<3 months) during construction. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and acceptable water use increase; medium reduction of agrochemicals and contribution to the NPS mitigation.
	Kaizhou	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; low-pressure pipeline	Increase of land productivity; increase of water use efficiency; mitigation	2,252	In region of intensively managed agriculture, to undertake soil and	Soil disturbance, dust, noise, air pollutants, and wastewater	Projects activities have significant environmental benefits and negligible adverse

Province	County	Name of Subproject	Output and Subcomponent	Total Estimated Costs (×10 ⁴ RMB)	Short Description of Subproject	Description of Potential Impacts and Risks	Concluding Comments
		engineering; sprinkler irrigation; small water storage works; IPM (pest control); scientific application of pesticides and fertilizers; terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.		water conservation engineering, green and circular agriculture; and improve institutional capacity.	discharge within small regions (<50 m ² for each site) within short period (<3 months) during construction. Pesticides storage and disposal.	environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and acceptable water use increase; medium reduction of agrochemicals and contribution to the NPS mitigation.
	Wulong	Irrigation and drainage ditches; rural roads; low-pressure pipeline engineering; small water storage works; ecological demonstration base; greenhouse; IPM (pest control); scientific application of pesticides and fertilizers; ecological protection belt (water and soil conservation forest plantation); ecological economic forest; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	2,184	In region of intensively managed agriculture, to undertake soil and water conservation engineering, green and circular agriculture; and improve institutional capacity.	Soil disturbance, dust, noise, air pollutants, and wastewater discharge within small regions (<50 m ² for each site) within short period (<3 months) during construction. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and acceptable water use increase; medium reduction of agrochemicals and contribution to the NPS mitigation.
	Zhonxian	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; low-pressure pipeline engineering; sprinkler irrigation; small water storage works; ecological demonstration base; IPM (pest control); scientific application of pesticides and fertilizers; terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	4,412			Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and acceptable water use increase; medium reduction of agrochemicals and contribution to the NPS mitigation.

Province	County	Name of Subproject	Output and Subcomponent	Total Estimated Costs (×10 ⁴ RMB)	Short Description of Subproject	Description of Potential Impacts and Risks	Concluding Comments
	Wushan	Irrigation and drainage ditches; rural roads; low-pressure pipeline engineering; sprinkler irrigation; small water storage works; ecological demonstration base; small watershed comprehensive benefit monitoring point; IPM (pest control); scientific application of pesticides and fertilizers; sewage treatment station; ecological protection belt (water and soil conservation forest plantation); terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	1,294	In region of intensively managed agriculture, to undertake soil and water conservation engineering, green and circular agriculture; and improve institutional capacity.	Soil disturbance, dust, noise, air pollutants, and wastewater discharge within small regions (<50 m ² for each site) within short period (<3 months) during construction. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and acceptable water use increase; medium reduction of agrochemicals and contribution to the NPS mitigation.
	Wuxi	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; low-pressure pipeline engineering; small water storage works; IPM (pest control); scientific application of pesticides and fertilizers; terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	2,195	In region of intensive managed agriculture, to undertake soil and water conservation engineering, green and circular agriculture; and improve institutional capacity.	Soil disturbance, dust, noise, air pollutants, and wastewater discharge within small regions (<50 m ² for each site) within short period (<3 months) during construction. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and acceptable water use increase; medium reduction of agrochemicals and contribution to the NPS mitigation.
Sichuan	Zhaohua	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; small water storage works; dredging, irrigation, and drainage ditches; engineering signs; conservation tillage; straw treatment; ecological demonstration base; greenhouse; IPM (pest control); scientific application of pesticides and fertilizers; ecological protection belt	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	1,982	In region of intensive lymanaged agriculture, to undertake soil and water conservation engineering, green and circular agriculture; and improve institutional capacity.	Soil disturbance, dust, noise, air pollutants, and wastewater discharge within small regions (<50 m ² for each site) within short period (<3 months) during construction. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and acceptable water use increase; medium reduction of

Province	County	Name of Subproject	Output and Subcomponent	Total Estimated Costs (×10 ⁴ RMB)	Short Description of Subproject	Description of Potential Impacts and Risks	Concluding Comments
		(water and soil conservation forest plantation); terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building					agrochemicals and contribution to the NPS mitigation.
	Wangcang	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; small water storage works; dredging, irrigation, and drainage ditches; engineering signs; conservation tillage; straw treatment; IPM (pest control); scientific application of pesticides and fertilizers; mulching film collection for recycling; ecological protection belt (water and soil conservation forest plantation); terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	2,503	In region of intensively managed agriculture, to undertake soil and water conservation engineering, green and circular agriculture; and improve institutional capacity.	Soil disturbance, dust, noise, air pollutants, and wastewater discharge within small regions (<50 m ² for each site) within short period (<3 months) during construction. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and minor water use increase; medium reduction of agrochemicals and contribution to the NPS mitigation.
	Jiange	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; small water storage works; dredging, irrigation, and drainage ditches; conservation tillage; straw treatment; IPM (pest control); scientific application of pesticides and fertilizers; mulching film collection for recycling; ecological protection belt (water and soil conservation forest plantation); terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	3,477	In region of intensive managed agriculture, to undertake soil and water conservation engineering, green and circular agriculture; and improve institutional capacity.	Soil disturbance, dust, noise, air pollutants, and wastewater discharge within small regions (<50 m ² for each site) within short period (<3 months) during construction. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and acceptable water use increase; medium reduction of agrochemicals and contribution to the NPS mitigation.
	Yingshan	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; small water storage works;	Increase of land productivity; increase of water use efficiency; mitigation	2,398	In region of intensively managed agriculture, to undertake soil and	Soil disturbance, dust, noise, air pollutants, and wastewater	Projects activities have significant environmental benefits and negligible adverse

Province	County	Name of Subproject	Output and Subcomponent	Total Estimated Costs (×10 ⁴ RMB)	Short Description of Subproject	Description of Potential Impacts and Risks	Concluding Comments
		dredging, irrigation, and drainage ditches; engineering signs; conservation tillage; straw treatment; IPM (pest control); scientific application of pesticides and fertilizers; mulching film collection for recycling; ecological protection belt (water and soil conservation forest plantation); terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.		water conservation engineering, green and circular agriculture; and improve institutional capacity.	discharge within small regions (<50 m ² for each site) within short period (<3 months) during construction. Pesticides storage and disposal.	environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and acceptable water use increase; medium reduction of agrochemicals and contribution to the NPS mitigation.
	Manbu	Irrigation and drainage ditches; rural roads; small water storage works; dredging, irrigation, and drainage ditches; engineering signs; conservation tillage; Straw treatment; IPM (pest control); scientific application of pesticides and fertilizers; mulching film collection for recycling; ecological protection belt (water and soil conservation forest plantation); terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	3,371	In region of intensively managed agriculture, to undertake soil and water conservation engineering, green and circular agriculture; and improve institutional capacity.	Soil disturbance, dust, noise, air pollutants, and wastewater discharge within small regions (<50 m ² for each site) within short period (<3 months) during construction. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and acceptable water use increase; medium reduction of agrochemicals and contribution to the NPS mitigation.
	Yanting	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; micro-irrigation (including drip irrigation); small water storage works; dredging, irrigation, and drainage ditches; engineering signs; conservation tillage; straw treatment; IPM (pest control); scientific application of pesticides and fertilizers; mulching film collection for recycling; ecological protection belt (water and soil conservation forest plantation); terrace-slope to ladder project;	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	2,427	In region of intensive managed agriculture, to undertake soil and water conservation engineering, green and circular agriculture and improve institutional capacity.	Soil disturbance, dust, noise, air pollutants, and wastewater discharge within small regions (<50 m ² for each site) within short period (<3 months) during construction. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and acceptable water use increase; medium reduction of agrochemicals and contribution to the NPS mitigation.

Province	County	Name of Subproject	Output and Subcomponent	Total Estimated Costs (×10 ⁴ RMB)	Short Description of Subproject	Description of Potential Impacts and Risks	Concluding Comments
		ecological economic forest; institutional coordination strengthened and capacity building					
	Anzhou	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; micro-irrigation (including drip irrigation); small water storage works; dredging, irrigation, and drainage ditches; engineering signs; conservation tillage; straw treatment; IPM (pest control); scientific application of pesticides and fertilizers; mulching film collection for recycling; ecological protection belt (water and soil conservation forest plantation); terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	1,562	In region of intensively managed agriculture, to undertake soil and water conservation engineering, green and circular agriculture; and improve institutional capacity.	Soil disturbance, dust, noise, air pollutants, and wastewater discharge within small regions (<50 m ² for each site) within short period (<3 months) during construction. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and minor water use increase; medium reduction of agrochemicals and contribution to the NPS mitigation.
Guizhou	Yuping	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; low-pressure pipeline engineering; sprinkler irrigation; small water storage works; conservation tillage; greenhouse; pollutant collection tank; IPM (pest control); scientific application of pesticides and fertilizers; riverbank ecological revetment slope protection works; ecological economic forest; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	3,130	In karst region with abundant water resources and limited land, to implement soil and water conservation activities, water bodies and ecological protection, and green and circular project.	The increased soil and water erosion, noise, air and water pollutants, and solid waste discharge during construction; but these impacts/risks will be within limited duration and area. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and water use decrease; slight reduction of agrochemicals and contribution to the NPS mitigation.
	Jiangkou	Irrigation and drainage ditches; erosion control weir; electromechanical irrigation and drainage pumping station; rural roads; low-pressure pipeline engineering; sprinkler irrigation;	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture;	2,839	In karst region with abundant water resources and limited land, to implement soil and water conservation	The increased soil and water erosion, noise, air and water pollutants, and solid waste discharge during construction;	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in

Province	County	Name of Subproject	Output and Subcomponent	Total Estimated Costs (×10 ⁴ RMB)	Short Description of Subproject	Description of Potential Impacts and Risks	Concluding Comments
		small water storage works; pollutant discharge warning monitoring station; small watershed comprehensive benefit monitoring point; scientific application of pesticides and fertilizers; riverbank ecological revetment slope protection works; terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	increase climate resilience; institutional and farmers capacity building.		activities, water bodies and ecological protection, and green and circular project.	but these impacts/risks will be within limited duration and area. Pesticides storage and disposal.	environmental sensitive regions; water use efficiency improved and water use decrease; slight reduction of agrochemicals and contribution to the NPS mitigation.
	Songtao	Irrigation and drainage ditches; erosion control weir; rural roads; low-pressure pipeline engineering; sprinkler irrigation; micro-irrigation (including drip irrigation); small water storage works; pollutant collection tank; sewage collection pipe network; scientific application of pesticides and fertilizers; sewage treatment station; riverbank ecological revetment slope protection works; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	2,969	In karst region with abundant water resources and limited land, to implement soil and water conservation activities, water bodies and ecological protection, and green and circular project.	The increased soil and water erosion, noise, air and water pollutants, and solid waste discharge during construction; but these impacts/risks will be within limited duration and area. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and water use decrease; slight reduction of agrochemicals and contribution to the NPS mitigation.
	Bijiang	Irrigation and drainage ditches; erosion control weir; electromechanical irrigation and drainage pumping station; rural roads; small water storage works; pollutant collection tank; pollutant discharge warning monitoring station; scientific application of pesticides and fertilizers; riverbank ecological revetment slope protection works; river green belt; ecological grass protection; terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	2,734	In karst region with abundant water resources and limited land, to implement soil and water conservation activities, water bodies and ecological protection, and green and circular project.	The increased soil and water erosion, noise, air and water pollutants, and solid waste discharge during construction; but these impacts/risks will be within limited duration and area. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and water use decrease; slight reduction of agrochemicals and contribution to the NPS mitigation.

Province	County	Name of Subproject	Output and Subcomponent	Total Estimated Costs (×10 ⁴ RMB)	Short Description of Subproject	Description of Potential Impacts and Risks	Concluding Comments
	Dejiang	Irrigation and drainage ditches; electromechanical irrigation and drainage pumping station; rural roads; low-pressure pipeline engineering; micro-irrigation (including drip irrigation); small water storage works; scientific application of pesticides and fertilizers; riverbank ecological revetment slope protection works; ecological economic forest; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	3,109	In karst region with abundant water resources and limited land, to implement soil and water conservation activities, water bodies and ecological protection, and green and circular project.	The increased soil and water erosion, noise, air and water pollutants, and solid waste discharge during construction; but these impacts and/or risks will be within limited duration and area. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and water use decrease; slight reduction of agrochemicals and contribution to the NPS mitigation.
	Yinjiang	Irrigation and drainage ditches; rural roads; low-pressure pipeline engineering; small water storage works; pollutant collection tank; scientific application of pesticides and fertilizers; ecological economic forest; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	3,544	In karst region with abundant water resources and limited land, to implement soil and water conservation activities, water bodies and ecological protection, and green and circular project.	The increased soil and water erosion, noise, air and water pollutants, and solid waste discharge during construction; but these impacts/risks will be within limited duration and area. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and water use decrease; slight reduction of agrochemicals and contribution to the NPS mitigation.
	Yanhe	Irrigation and drainage ditches; erosion control weir; electromechanical irrigation and drainage pumping station; rural roads; small water storage works; pollutant discharge warning monitoring station; scientific application of pesticides and fertilizers; riverbank ecological revetment slope protection works; river green belt; ecological grass protection; terrace-slope to ladder project; ecological economic	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	3,743	In karst region with abundant water resources and limited land, to implement soil and water conservation activities, water bodies and ecological protection, and green and circular project.	The increased soil and water erosion, noise, air and water pollutants, and solid waste discharge during construction; but these impacts and/or risks will be within limited duration and area. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and water use decrease; slight reduction of agrochemicals and

Province	County	Name of Subproject	Output and Subcomponent	Total Estimated Costs (×10 ⁴ RMB)	Short Description of Subproject	Description of Potential Impacts and Risks	Concluding Comments
		forest; institutional coordination strengthened and capacity building					contribution to the NPS mitigation.
	Sinan	Irrigation and drainage ditches; rural roads; small water storage works; pollutant discharge warning monitoring station; scientific application of pesticides and fertilizers; ecological economic forest; ecological economic forest; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	4,070	In karst region with abundant water resources and limited land, to implement soil and water conservation activities, water bodies and ecological protection, and green and circular project.	The increased soil and water erosion, noise, air and water pollutants, and solid waste discharge during construction; but these impacts/risks will be within limited duration and area. Pesticides storage and disposal.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and water use decrease; slight reduction of agrochemicals and contribution to the NPS mitigation.
Yunnan	Xuanwei	Irrigation and drainage ditches; rural roads; low-pressure pipeline engineering; small water storage works; agricultural machinery; pollutant collection tank; IPM (pest control); scientific application of pesticides and fertilizers; ecological protection belt (water and soil conservation forest plantation); ecological economic forest; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	3,947	In the upstream of Yangtze River, agriculture is rather extensively managed with high level of soil and water erosion to build soil and water conservation facilities; increase water and agrochemical use efficiency, and recycling of agro-wastes; and build institutional capacity.	Increase soil erosion, noise, air and water pollutants, and solid waste discharge during construction; but the impacts are within short period in limited region.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and water use decrease; slight reduction of agrochemicals and contribution to the NPS mitigation.
	Huize	Irrigation and drainage ditches; erosion control weir; rural roads; straw treatment; pollutant collection tank; ecological demonstration base; greenhouse; scientific application of pesticides and fertilizers; ecological protection belt (water and soil conservation forest plantation); ecological economic forest;	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity	3,849	In the upstream of Yangtze River, agriculture is rather extensively managed with high level of soil and water erosion to build soil and water conservation facilities; increase water and	Increase soil erosion, noise, air and water pollutants, solid waste discharge during construction; but the impacts are within short period in limited region.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and water use

Province	County	Name of Subproject	Output and Subcomponent	Total Estimated Costs (×10 ⁴ RMB)	Short Description of Subproject	Description of Potential Impacts and Risks	Concluding Comments
		institutional coordination strengthened and capacity building	building.		agrochemical use efficiency, and recycling of agro-wastes; and build institutional capacity.		decrease; slight reduction of agrochemicals and contribution to the NPS mitigation.
	Zhaoyang	Irrigation and drainage ditches; erosion control weir; rural roads; straw treatment; pollutant collection tank; ecological demonstration base; greenhouse; scientific application of pesticides and fertilizers; ecological protection belt (water and soil conservation forest plantation); ecological economic forest; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	3,523	In the upstream of Yangtze River, agriculture is rather extensively managed with high level of soil and water erosion to build soil and water conservation facilities; increase water and agrochemical use efficiency, and recycling of agro-wastes; and build institutional capacity.	Increase soil erosion, noise, air and water pollutants, and solid waste discharge during construction; but the impacts are within short period in limited region.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and water use decrease; slight reduction of agrochemicals and contribution to the NPS mitigation.
	Qiaojia	Irrigation and drainage ditches; ecological control weir; rural roads; straw treatment; ecological demonstration base; pollutant collection tank; scientific application of pesticides and fertilizers; ecological protection belt (water and soil conservation forest plantation); ecological economic forest; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	2,248	In the upstream of Yangtze River, agriculture is rather extensively managed with high level of soil and water erosion to build soil and water conservation facilities; increase water and agrochemical use efficiency, and recycling of agro-wastes; and build institutional capacity.	Increase soil erosion, noise, air and water pollutants, and solid waste discharge during construction; but the impacts are within short period in limited region.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and acceptable water use increase; slight reduction of agrochemicals and contribution to the NPS mitigation.
	Yongshan	Irrigation and drainage ditches; ecological control weir; low-pressure pipeline engineering; small water storage works; straw treatment; IPM; scientific application of pesticides and fertilizers; ecological economic	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate	2,762	In the upstream of Yangtze River, agriculture is rather extensively managed with high level of soil and water erosion to build soil and water	Increase soil erosion, noise, air and water pollutants, and solid waste discharge during construction; but the impacts are within	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive

Province	County	Name of Subproject	Output and Subcomponent	Total Estimated Costs (×10 ⁴ RMB)	Short Description of Subproject	Description of Potential Impacts and Risks	Concluding Comments
		forest; institutional coordination strengthened and capacity building	resilience; institutional and farmers capacity building.		conservation facilities; increase water and agrochemical use efficiency, and recycling of agro-wastes; and build institutional capacity.	short period in limited region.	regions; water use efficiency improved and water use decrease; slight reduction of agrochemicals and contribution to the NPS mitigation.
	Yanjing	Irrigation and drainage ditches; rural roads; low-pressure pipeline engineering; small water storage works; IPM (pest control); scientific application of pesticides and fertilizers; ecological protection belt (water and soil conservation forest plantation); terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	3,361	In the upstream of Yangtze River, agriculture is rather extensively managed with high level of soil and water erosion to build soil and water conservation facilities; increase water and agrochemical use efficiency, and recycling of agro-wastes; and build institutional capacity.	Increase soil erosion, noise, air and water pollutants, and solid waste discharge during construction; but the impacts are within short period in limited region.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and water use decrease; slight reduction of agrochemicals and contribution to the NPS mitigation.
	Weixin	Irrigation and drainage ditches; rural roads; low-pressure pipeline engineering; small water storage works; IPM (pest control); scientific application of pesticides and fertilizers; ecological protection belt (water and soil conservation forest plantation); institutional coordination strengthened and capacity building	Increase of land productivity; increase of water use efficiency; mitigation of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.	4,411	In the upstream of Yangtze River, agriculture is rather extensively managed with high level of soil and water erosion to build soil and water conservation facilities; increase water and agrochemical use efficiency, and recycling of agro-wastes; and build institutional capacity.	Increase soil erosion, noise, air and water pollutants, and solid waste discharge during construction; but the impacts are within short period in limited region.	Projects activities have significant environmental benefits and negligible adverse environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and water use decrease; slight reduction of agrochemicals and contribution to the NPS mitigation.
	Yiliang	Irrigation and drainage ditches; rural roads; small water storage works; IPM (pest control); scientific application of pesticides and	Increase of land productivity; increase of water use efficiency; mitigation	3,739	In the upstream of Yangtze River, agriculture is rather extensively managed	Increase soil erosion, noise, air and water pollutants, and solid waste	Projects activities have significant environmental benefits and negligible adverse

Province	County	Name of Subproject	Output and Subcomponent	Total Estimated Costs (×10 ⁴ RMB)	Short Description of Subproject	Description of Potential Impacts and Risks	Concluding Comments
		fertilizers; ecological protection belt (water and soil conservation forest plantation); terrace-slope to ladder project; ecological economic forest; institutional coordination strengthened and capacity building	of NPS; recycling of wastes in agriculture; increase climate resilience; institutional and farmers capacity building.		with high level of soil and water erosion to build soil and water conservation facilities; increase water and agrochemical use efficiency, and recycling of agro-wastes; and build institutional capacity.	discharge during construction; but the impacts are within short period in limited region.	environmental impacts; project sites not in environmental sensitive regions; water use efficiency improved and water use decrease; slight reduction of agrochemicals and contribution to the NPS mitigation.

BFA = balanced fertilizer application; IPM = integrated pest management, NPS = nonpoint source; RMB = Renminbi (Chinese currency).
Source: Domestic environmental impact assessment report.

Supplementary Appendix A: Project Environmental Management Plan**Supplementary Appendix B: Domestic Environmental Impact Assessment
(Chinese Language)**