China/GEF Project

Project No.: P110661

China: Sustainable Management and Biodiversity Conservation in the Lake Aibi Basin

Environmental Impact Assessment Report

China·Xinjiang

Bortala Lake Aibi Basin Sustainable Management and Biodiversity Conservation PMO

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Contents

1 Introduction

1.1 Background

1.1.1 Geographic Position

The project region Lake Aibi Basin is located in the northwest Bortala Prefecture of Xinjiang Uygur Autonomous Region (XUAR) in China, as is shown in Figure 1.1-1.

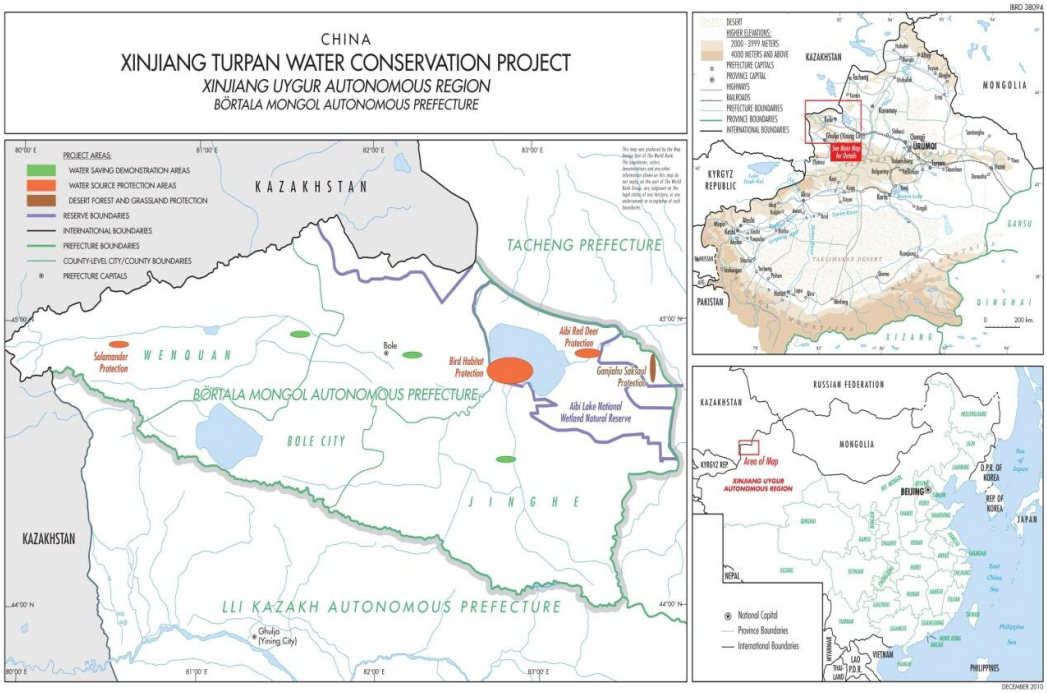


Fig.1.1-1 Project Region - Lake Aibi Basin

1.1.2 Contents of Project

The project will support Water resource assessment and optimized allocation, sustainable land management, biodiversity conservation and local livelihood enhancement and technical support and project management. The contents of each component included in Table 1.1-1. The project will mainly support technical assistance on studies and planning, and some limited engineering construction. The engineering construction activities are associated with water saving for agricultural irrigation and the biodiversity conservation. The basic construction situations of this project that concerns construction can be seen in table 1.1-2.

Table 1.1-1 Overal Project Description

Component	Objective	Details
Water Resource Assessment and Optimized Allocation	To understand water resource supply and demand in Bortala Prefecture and use this to optimize water allocation.	⌘ Water consumption balance for the entire Lake Aibi Basin ⌘ Analysis of real water savings in Bortala Prefecture ⌘ Implementation of pilot programs ⌘ Development of Dynamic Monitoring system supported by RS-based ET measuring technology and carrying out monitoring activities ⌘ Training and Capacity Building
Sustainable Land Management	To increase the area of sustainable land management practices implemented in Bortala Prefecture	⌘ Forest Resources Management ⌘ Sustainable Grassland Management ⌘ Training and capacity building

Biodiversity Conservation and Local Livelihoods Enhancement	⌘ protect habitat and species of Lake Aibi NWR; ⌘ monitor and research key species to allow for adaptive and well informed management; ⌘ support nature reserve management, through staff capacity building and participative development of a management plan, and build a local and regional constituency of support for the reserve.	⌘ Habitat Protection ⌘ Key Species Monitoring and Research ⌘ Nature Reserve Management Support and Awareness Raising ⌘ Livelihood Enhancement
Project Management and Support Services	Capacity building	⌘ Technical Support ⌘ Monitoring and Evaluation; and ⌘ Project Management, would finance consultant services, training, office equipment and incremental operating costs to provide effective technical support and efficient project management.

Table 1.1-2 Construction/Pilot Activities

Component	Type	Location	Scale
Water Resource Assessment and Optimized Allocation	Water-saving irrigation	Jinghe County	⌘ 830mu cotton or corn land through drip irrigation (pressured groundwater)
		Bole City	⌘ 3000mu cotton or corn land through drip irrigation(pressured surface water) ⌘ 2000mu water consumption monitoring
		Wenquan County	⌘ 200mu: returning farmland to grassland
Sustainable Land Managemetn	Forest restoration pilots at forest farms	Santai Forest Far, Bole City	⌘ 12738mu
		River valley, Wenquan County	⌘ 16361mu
		Bole City	⌘ 11024mu
		Huashan Desert, Jinghe County	⌘ 12600mu
Biodiversity Conservation	Birds monitoring and habitat improvement research	Jinghe County	Set a 22 times 3km ranges Infrared video monitoring points in Bortala river mouth and Jinghe river mouth respectively, and each monitoring point set 2~3 18 times 150m range sub Infrared video monitoring points

	The Lake Aibi red deer protection and monitoring	Jinghe County	Set a 22 times 3km ranges Infrared video monitoring points in Kekebasto, Sangdekumu and Daxinan respectively, and each monitoring point set 2~3 18 times 150m range sub Infrared video monitoring points

1.1.3 Project Objectives

1.1.3.1 The overall objective of the project

The overall objectives of the project to strengthen integrated planning and implementation of natural resource management of watersheds and mainstreaming of biodiversity values in Lake Abi Basin. The project will strengthen sustainable management of watersheds to ensure a better balance between available supply and consumption and increase environmental flows to Lake Aibi while strengthening management of Lake Aibi National Westland Reserve. The project will contribute to an overarching goald of reducing wind erosion from the dry bed of Lake Aibi that suspends small-sized salt dust particles in the upper atmosphere and to protect the aquatic and saline-steppe environment of Lake Aibi-the largest terminal salt lake in the region.

To achieve the project development objective the project will use water resource assessments to inform optimized allocation of water for consumptive uses (Component 1) and demonstrate sustainable management of watershed systems (Component 2) to ensure increase environmental flows to Lake Aibi. These two components address the major cause of threats to sustainable biodiversity conservation in Lake Aibi. The project will also strengthen management of Lake Aibi National Wetland Reserve, in particular conserving aquatic habitats (Component 3) to conserve globally significant biodiversity and their supporting ecosystems.

1.1.3.2The specific objectives of the project

(1) Establish coordination mechanisms and management model of multi-sectoral, multi-level, cross-regional, stakeholder participation, and achieve multi-sectoral collaboration of environmental management and collaborative multi-channel project objectives□(2) Significantly improve reserve capacity building of Bortala, strengthen natural grassland and biodiversity protection□(3)Complete restructuring of agriculture and animal husbandry in suitable location of the project area□(4)Enhance citizen environmental protection awareness of project area□(5)Train a talent team of environmental protection and ecological construction in arid area from management to technology and from research to technology application.

1.1.4 Benefits of Project Implementation

1.1.4.1 Ecological benefits

Lake Aibi is located in Bortala Mongolian Autonomous Prefecture of western Xinjiang and in flora intermediate zone of Central Asia to Mongolian, with a variety of different ecological gradients. The ecosystem types is complex and various, including glaciers, meadows, forest, desert, farmland and wetland ecosystems. This area is rare biodiversity enrichment region of the central Eurasian Continent, and is also an important habitat and breeding-place of migrating birds. Lake Aibi Basin is a collection and distribution points which has as high as 60 percent inland desert species. It is also species and gene pool with highly biodiversity conservation value in western China, global arid region and extremely arid region, and contains special and irreplaceable biodiversity resource. Lake Aibi basin not only has some endangered species and endemic species, but also is a passage meeting point of Eurasian Continent migratory birds and an important habitat and breeding spot of migratory birds. Biodiversity protection of Lake Aibi is important for social economic development of Bortala and Xinjiang. It will also pass this importance to each country in the Central Asian by Eurasian Continental Bridge (railway from Lianyungang in China to Amsterdam in Holland).

Through sustainable management and biodiversity conservation of Lake Aibi Basin, the project to enhance and promote the comprehensive prevention of regional land degradation, to optimize policy support and management capacity of water resources allocation, to reduce the ecological impact of land degradation on local, regional West China and neighboring countries, and to integrate biodiversity conservation into natural resource management. And it aims to, through carrying out project activities in key ecological areas, achieve the goal of protecting global importance species, many ecosystem protection threatened in West China, and biodiversity.

1.1.4.2 Social benefits

The project will attract a wide range of stakeholders, and these stakeholders will also be the beneficiaries. Ministry of Finance will guide the GEF project grants to support the sustainable development of Xinjiang, and

promote local capacity building in Xinjiang. State Environmental Protection Administration and State Forestry Administration formulating biodiversity conservation and land degradation prevention and control planning and action program will be implemented with greater intensity.Xinjiang Uygur Autonomous Region, Bortala Prefecture People's Government and its departments, including Development and Reform Commission, Finance, Forestry, Water Conservancy, Agriculture, Animal Husbandry, Environmental Protection, Land Resources, Tourism and other sectors. In aspects of biodiversity conservation, land degradation and socio-economic integrated development, inter sectoral coordination has been strengthened. Use of funds of international cooperation in environmental protection and socio-economic integrated development has been demonstrated.

Long-term research achievement of Institutions and local business support system can be transformed, including the Xinjiang Branch of Chinese Academy of Forestry, Xinjiang Branch of Chinese Academy of Sciences and forestry, environmental protection, water conservancy and agriculture sector. The effect of technical support of local authorities is played, and the capacity is strengthened.The public can participate through community and individual, and combine the biodiversity conservation and socio-economic integrated development. Public awareness biodiversity conservation will be improved, and public participation initiative will be strengthened.

1.1.5 Relevant World Bank Projects

China: Sustainable Management and Biodiversity Conservation in the Lake Aibi Basin project (Project No.: P110661; hereinafter called Lake Aibi Project) is a preselected project with 4 years implementation period under China-GEF Biodiversity Partnership Framework (CBPF) and China GEF Land Degradation Prevention Partnership Framework, which is establishing between China and GEF. The total expense budget is $12,180,000. GEF grant $2,980,000, Supporting funds $9,200,000.

1.1.6 Project Organization Structure

Xinjiang Uygur Autonomous Region People's Government and Bortala Prefecture People's Government set the leader in charge of agricultural population (Vice-Chairman, Deputy Governor) as group leader, and the Coordination Leading group is comprising of forestry, water source management, agriculture, livestock, finance, planning. They are responsible for discussing, coordinating and solving the main problem during roject preparation and implementation period at autonomous region level and autonomous prefecture level. The framework of the project organization is shown in Figure 1.1-2.

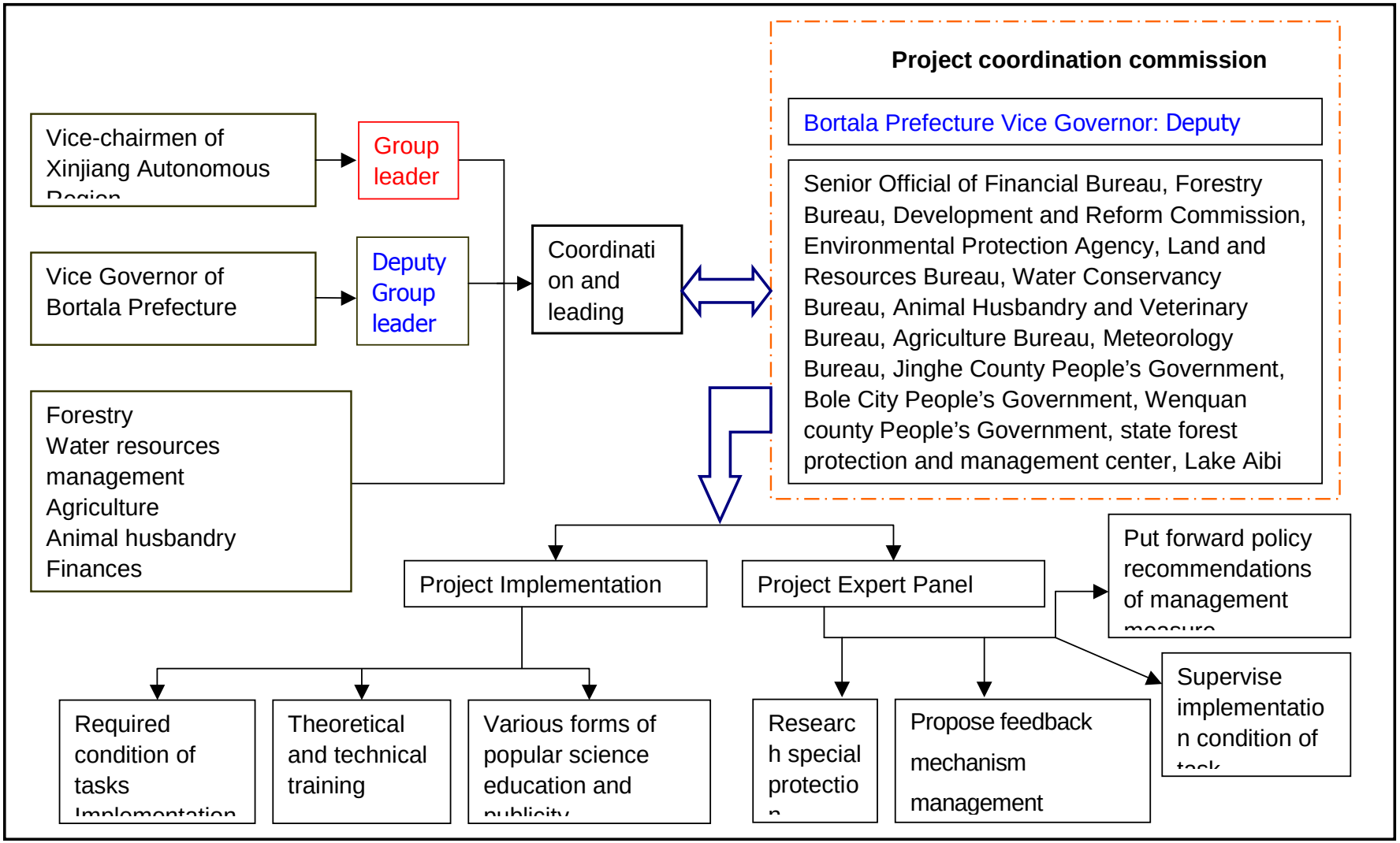


Fig. 1.1-2 Frame diagram of the project

According to the departments involved in project activities, Bortala people's government establishes coordination and lead agencies of *China: Sustainable Management and Biodiversity Conservation in the Lake Aibi Basin*, headed by the Deputy Governor. The members are comprised of Prefecture Finance Bureau, Forestry Bureau, Development and Reform Commission, Environmental Protection Agency, Land and Resources Bureau, Water Conservancy Bureau, Animal Husbandry and Veterinary Bureau, Agriculture Bureau, Meteorology Bureau, Jinghe County People's Government, Bole City People's Government, Wenquan county People's Government, Prefecture Natural Forest Protection and Lake Aibi National Natural Reserve Management Center. They research and formulate project management approach and policy recommendations, organize and coordinate participants units complete their undertaking task respectively in Bortala project area, and implement project funds use plan and management.

According to the approved project activities implementation plan, they should timely monitor the progress of project activities, sum up and inform good experiences to project activities implementation departments, and urge all departments to complete project activities content according to implementing plan on schedule. They also should review and analyze project progress reports, and apply the learned lessons into project activities.

1.2 Environmental Assessment Report Preparation

1.2.1 The Purpose and Principles of Environmental Assessment

The project will include mainly technical assistances on development of studies and planning, and limited civil works. According to the provisions of *Environmental Impact Assessment Law of the PRC*, *Construction Project Environmental Protection Management Regulations*, *Notification on strengthening management of construction project Environmental Impact Assessment financed by international financial organizations*, requirements of the World Bank Safeguard Policies, and the domestic and the World Bank's environmental impact assessment procedures, the project environmental assessment will provide assessment on both the plans and engineering works. Therefore, the EA will:

- Identify and analyze the compatibility of the project activities with Xinjiang Autonomous Region and Bortala Prefecture socio-economic development plans, water resource plans and relevant ecological and relevant ecological and environmental policies, plans and strategies.
- Adequately addressing the environmental issues associated with the project plans, studies and activities. Identifying, screening and scoping the potential social and environmental benefits and negative impacts. Assessing the impacts and developing avoidance, mitigation and compensation measures to formulate an implementable Environmental Management Plan.
- In response to the facts that the potential area of influence (Lake Aibi Basin) is large and the project is located in ethnic minorities areas, public involvement will be carried out thoroughly during environmental assessment process, taking into account the interests of various stakeholders. This shall an important basis for developing mitigation measures.
- Developing principles and guidelines for project activities that will be defined during project implementation.

1.2.2 EA Category and Levels

In accordance with World Bank OP4.01 and environmental screening results, the project is categorized as B for EIA purpose. According to the nature of project activities and Chinese EIA law and regualtions, the EIA is classified as Planning EIA. While, for those pilot or construction related activities, the assessment levels are determined in accordance with relevant Chinese technical guidelines (Table 1.2-1). The following technical guidelines were adopted for environmental assessment.

(1) HJ/T2.2-2008 Technical guidelines for environmental impact assessment of atmospheric environment.

(2) HJ/T2.3-93 Technical guidelines for environmental impact assessment of surface water environment.

(3) HJ/T2.4-2009 Technical guidelines for environmental impact assessment of acoustical environment.

(4) HJ/T19-1997 Technical Guidelines for Environmental Impact Assessment of non-pollution ecological impact.

Environmental Impact Assessment level of each sub-project is shown in Table 1.2-1.

Tab. 1.2-1 Environmental impact assessment level of the sub-project

Location	Subproject	atmospheric environment	surface water environment	acoustical environment	ecology
Jinghe county	Water-saving irrigation in Jinghe County	Third class	Third class	Third class	Third class
	Brids monitoring and habitat improvement research				
	The Lake Aibi red deer protection and monitoring				
	Lake Aibi Birch protection and population restoration				
	Training and publicity				
Bole City	Water-saving irrigation in Bole City				
	Training and publicity				
	Organization and management of project				
	Natural forest and grassland protection and cultivation				
Wenquan County	Water-saving irrigation in Wenquan County				
	Ranodon sibiricus saving and protection				
	Training and publicity				

As can be seen from Table 1.2-1, as a single environmental element, the atmospheric environment, surface water environment, acoustic environment and ecological environment, according to subproject characteristics and impact identification, in accordance with the domestic provisions of technical guidelines, the single environmental element evaluation work rate is identified as third grade. Moreover, as a whole, because the broader geographical coverage but less project type, the adverse environmental impacts may be smaller. Therefore, comprehensive report on environmental assessment of the project overall identified Project as B class

1.2.3. Environmental Impact Assessment Report Preparation

The GEF Program Executive Offices of Bortala Mongol Autonomous Prefecture entrust Xinjiang Institute of ecology and geography Chinese academy of sciences with the environment impact assessment report of this program.

After accept the commission, the project expert team collected and studied the relevant information and carried out field surveys, based on which an *Terms of Reference for Environmental Impact Assessment of Sustainable Management and Biodiversity Conservation in Lake Aibi Basin, the Environmental Impact Assessment Report of Sustainable Management and Biodiversity Conservation in Lake Aibi Basin are prepared.*

1.2.4 EA Documents

According to domestic Environmental Impact Assessment Technical Guidelines and the World Bank safeguards policy, this report comprehensively analyzes and assesses this project. The project environmental assessment reports include the Environmental Impact Assessment (EIA) report, and Environmental Management Plan (EMP).

The two documents address environmental impacts, mitigation measures, environmental monitoring plans, institutional arrangements, capacity development and training, and cost estimates, etc.

1.3 Assessment Approach

1. Consider the Lake Aibi Basin as an integral body for assessment of project influence, using regional environmental assessment approach

to study and assess the impacts of relevant plans, studies and activities on the Lake Aibi basin.

2. Scoping and assess environmental and social issues on the basis of relevant safeguard policies including Environmental Assessment, Natural Habitats, Forests, Involuntary Resettlement, Indigenous Peoples, Physical Cultural Resources, etc.
3. Taking into account and incorporating the World Bank comments on the project, environmental and social safeguards documents as appropriate.
4. Strengthen the collection and analysis of basic data, and objectively and scientifically carry out the work of existing environmental setting and base line investigation and evaluation.
5. Using mathematical model, simulation analysis, ecological mechanism analysis and landscape ecology, and other evaluation methods and techniques to analyze and predict the positive and negative, direct and indirect environment impacts during project construction and operation. Put forward feasible mitigation measures towards adverse environmental impact, and pay full attention to operability of environmental management plan (EMP).
6. Carry out alternative scheme comparison in terms of zero project, different designs, and different scenarios.
7. Public participation is using the way of questionnaires, public meetings, and expert advice to investigate the opinion of affected public management department and other organizations. Information disclosure is using the way of posting notices, newspapers and website information.
8. From the view of environmental protection, make a conclusion on the project feasibility, provide scientific basis for environmental management and project designation.

1.4 Assessment scope, time and conservation objectives

1.4.1 Environmental Assessment Range

The principle and requirements of the project environmental impact assessment scope determination are as follows:

(1) In accordance with the requirements of environmental impact assessment Technical Guidelines, based on assessment level, regard the subproject evaluation scope as the basic evaluation scope of the project cumulative impact assessment.

(2) If there are environmental protection objectives (sensitive points) or the World Bank safeguards policy concerns object closing to the assessment scope, then bring it into the evaluation range.

(3)Towards elements and items (with certain historical material culture resources) that directly relate to this project or have potential impact, are also included in scope of the evaluation.

(4) Atmospheric Environment: It is according to the requirement of 5.4.1 and 5.4.2 of HJ/T2.2 -2008 *Technical Guidelines for Environmental Impact Assessment of Atmospheric Environment*. Regard the furthest extent of project atmospheric pollutants emissions as project atmospheric environment impact assessment scope, and the diameter or side length of evaluation scope should not be less than 5km.

(5) Surface Water Environment: It is according to the relevant requirements of 6.1 of HJ/T2.3-93 *Technical Guidelines for Environmental Impact Assessment of Surface Water Environment*. Due to the amount of wastewater discharged from the project is less than 5000m^3 /d, so the investigation radius should be less than 1km.

(6) Groundwater Environment: Due to the absence of appropriate technical guidelines for groundwater and the project has little effect on groundwater, groundwater evaluation scope is reference to *HJ/T2.3-93 Technical Guidelines for Environmental Impact Assessment of Surface Water Environment*.

(7) Acoustical Environment: It is according to the relevant requirements in 6.1 of the *HJ/T2 [1] .4-2009 Technical Guidelines for Environmental Impact Assessment Acoustical Environment.* Taking construction projects noise impact into account, determine the range of acoustical environment impact assessment is 200m outside of construction projects border.

(8) Ecology: It is according to the relevant requirements in 4.2 of *HJ/T19-1997 Technical guidelines for environmental impact assessment of non-*

pollution ecological impact. Because the project has little bad effect on ecology, and the evaluation level is 3, the evaluation range is 1 ~ 2km.

According to the project characteristics and related guidance requirements, the scope of environmental assessment and cumulative impacts assessment of various types subprojects is shown in Table 1.4-1.

Table 1.4-1(a) Cumulative Impacts Assessment Scope

Environmental Factors	Assessment Scope
Ecology	Focus on the Lake Aibi and Ganjiahu Reserve and extend to the entire Lake Aibi Basin
Water	Lake Aibi, Jinghe River, Bortala River
Social Economic	Three counties and one city of Bortala Prefecture

Table 1.4-1(b) Environmental assessment range of various construction projects

No.	Subproject category		Environmental elements and basic evaluation scope					
			Atmospheric Environment	Surface water	Ground water	Acoustical Environment	Ecology	Society
1	Water-saving irrigation	Water-saving irrigation in Bole City	2.5km around the project area	1km downstream from the channel	1km downstream of groundwater flow	/	1km around the project area	Project area and surrounding area
		Water-saving irrigation in Jinghe County	2.5km around the project area	1km downstream from the channel	1km downstream of groundwater flow	/	1km around the project area	
		Water-saving irrigation in Wenquan County	2.5km around the project area	1km downstream from the channel	1km downstream of groundwater flow	/	1km around the project area	
2	Sustainable land management	Natural forest and grass land protection and cultivation	/	/	/	/	1km around the project area	
3	Biodiversity protection	Brids monitoring and habitat improvement research	2.5km around the project area	1km downstream from river mouth	/	100-200m outside the construction boundary	1km around the project area	
		The Lake Aibi red deer protection and monitoring	/	500m outside around the drinking water points	/	100-200m outside the construction boundary	1km around the project area	
		Lake Aibi Birch protection and population restoration	/	1km downstream from river mouth	/	/	1km around the project area	
		Ranodon sibiricus saving and protection	/	/	/	/	1km around the project area	
3	Training and publicity	Training	/		/	/	/	
		publicity	/	/	/	/	/	
4	Organization and management of project		/	/	/	/	/	

Note: (1) According to HJ/T2.3-93 *Technical Guidelines for Environmental Impact Assessment of Surface Water Environment*

(2) According to HJ/T2.2 -2008 *Technical Guidelines for Environmental Impact Assessment of Atmospheric Environment*

(3) According to HJ/T2 [1] .4-2009 *Technical Guidelines for Environmental Impact Assessment Acoustical Environment*

(4) According to HJ/T19-1997 *Technical guidelines for environmental impact assessment of non-pollution ecological impact*

1.4.2 Environmental Assessment Period

The environmental assessment comprehensive report mainly analyzes and assesses the project implementation and operational stages.

1.4.3 Environmental Protection Objectives

1.4.3.1 Protection targets of each environmental factor

According to domestic laws, regulations and policies of environmental impact assessment and the World Bank safeguards polices, environmental assessment concerned environmental protection objectives of the project are as follows:

(1) Water environmental protection objectives

According to *China's Xinjiang Water Environmental Function Division*,

- Lake Aibi is Ⅴ water body. The part of Jinghe from the intersection of Jinghe and Dongdujingguole to Jinghe hydrological station is Ⅰ category water, and planning dominant function is nature conservation.
- The part of Jinghe from Jinghe hydrological station to Jinghe Bridge (312 national road) is □category water, and planning dominant function is drinking water source.
- The part of Jinghe from Jinghe Bridge (312 national road) to Lake Aibi is Ⅲcategory water, and planning dominant function is scenery and recreation water use.
- The part of Bortala river from the intersection of Daheyanzi and Bortala river to Lake Aibi is Ⅲcategory water, and planning dominant function is scenery and recreation water use.
- The part of Bortala river from Qiyi reservoir to Tuosenhaxia Third Team is □ category water, and planning dominant function is scenery and recreation water use.

Conservation Objectives: Protect river water quality involved in construction, make water quality is not worse than the water quality status.

(2)Ecological protection objectives

- The biodiversity and integrity in the region, in particular in the nature reserves. Protection of surface vegetation and aquatic habitats

- Optimize water resource management to increase environmental flows into Lake Aibi.
- Strictly limit construction disturbance area. In accordance with the defined work area for construction, reduce damage and disturbance to vegetation by construction activities, and prevent the water soil erosion from excavation and waste stack.

(3) Ambient air and acoustic environmental protection objectives

The main objectives of ambient air and acoustic environmental protection are temporary production and living areas, and the residents, schools and other sensitive targets 200m outside of each Construction work area.

(4) Social environment protection objectives

- The livelihood and development of local people, particularly ethnic minorities
- Hygiene and sanitation conditions pertinent to engineering works
- Physical cultural resources in the project area

1.5 Environmental Scoping and Screening

1.5.1 Environmental Impact Factors Identification

The major environmental issues at the Lake Aibi Basin that were identified are the current use of water for irrigation and the impact that has on natural flows into Lake Aibi, the present status of natural grasslands in the Lake Aibi Basin and adequacy of natural resources (water and soils) for the production of artificial pastures and improved natural grasslands to ensure an environmentally and socially sustainable development project. During implementation and operation phase, as long as the project enforces water management plans or the number of animals within natural grasslands can be controlled within their carrying capacity, it is unlikely that project implementation will have any negative environmental impacts in the long term.

It is anticipated that the project through optimized water resource allocation and scale-up of water-saving irrigation, conservation of forests and grassland will increase the environmental flows in Lake Aibi in long term. The development of irrigated fodder and forage crops (artificial pastures) should reduce the pressure on natural grasslands, allowing for the rehabilitation of the presently degraded and/or overgrazed grasslands. Conservation of steppe

vegetation, aquatic habitats, and significant species will contribute to the biodiversity and integrity of the region.

Possible negative environmental impact could come from any limitations in availability of irrigation water to sustain livelihoods of irrigation farmers, or herders relying on forests or pastures within project counties. In order to mitigate such negative impacts, the project will, in line with the water resources planning of the region, make sure that the available water resources are sufficient for sustainable implementation. In addition, the project will encourage alternative, less water demanding, irrigation scheduling and management methods as well as alternative irrigated crops that require less water per unit of productivity. The project will involve some engineering construction activities that have the potential to cause negative impacts during construction stage, as analyzed in below. The potential negative environment impacts identified in the EIA during implementation and operational phase of the project are of temporary nature and limited in magnitude. These are briefly analyzed in below.

⌘ Water-saving Irrigation Activity:

(1) Impact on water environment

Wastewater of construction period includes production wastewater and domestic wastewater. Major pollutant of production wastewater is suspended solids. Major pollutant of domestic wastewater is organic pollutants. If not handled properly, it will affect water quality when discharged into near water bodies.

(2) Impact on ambient air

After the project starts, construction machinery, construction workers increase. Exhaust gas from fuel-powered machinery and generated by construction production and dust and particulates generated by road transportation will affect the atmospheric environment of construction area.

(3) Impact on acoustical environment

Noise source in construction can be divided into a continuous steady-state noise source and noise flow source. The above source will have an impact on the acoustic environment. The construction of such projects has no resident

distribution within the 1.5km surrounding area, so the main target affected by noise is construction personnel.

(4) Impact of solid waste

Solid wastes in construction period mainly are spoil, production and living garbage. The spoil are mainly from excavation of diversion gate and sand basin, and its impact are mainly on landscape and water and soil erosion caused by the inappropriate spoil piling. Domestic garbage from worker camp may pose health and environmental concerns.

(5) Impact on ecology

Land occupation and vegetation resulted from construction, of not properly managed, will exacerbate soil erosion and cause other ecological impacts.

(6)Impact on the social environment

In construction period, as construction workers are concentrated and liquidity is relatively large, it is easy to provide conditions for disease transmission and dissemination. However, during the construction period, local economic will benefit from it thanks to increased commercial activities.

⌘ Natural Reserve Conservation Activities

(1) Impact on water environment

Wastewater of construction period includes production wastewater and domestic wastewater. Major pollutant of production wastewater is suspended solids. Major pollutant of domestic wastewater is organic pollutants. If not handled properly, it will affect water quality when discharged into near water bodies.

(2)Impact on ambient air

After the project starts, construction machinery, construction workers increase. Exhaust gas from fuel-powered machinery and generated by construction production and dust and particulates generated by road transportation will affect the atmospheric environment of construction area.

(3) Impact on acoustical environment

Noise source in construction can be divided into a continuous steady-state noise source and noise flow source. The above source will have an impact on the acoustic environment. Construction areas of this kind of project are located in Natural Reserve, and the main target affected by noise is wildlife in

Natural Reserves and construction workers. Construction period should avoid the breeding period of wild animals.

(4) Impact of solid waste

Solid wastes in construction period mainly are spoil, production and living garbage. The spoil are mainly from excavation of diversion gate and sand basin, and its impact are mainly on landscape and water and soil erosion caused by the inappropriate spoil piling.

Living area during construction will generate a lot of domestic garbage, which is a place with propagation of fly, mosquito, and disease-causing bacteria, and rats. It is also an important infectious disease transmission source. Improper waste disposal will endanger human health, and will also seriously pollute and affect the landscape environment of construction area.

(5) Impact on ecology

Land occupation and vegetation resulted from construction, of not properly managed, will exacerbate soil erosion and cause other ecological impacts.

(6)Impact on the social environment

In construction period, as construction workers are concentrated and liquidity is relatively large, it is easy to provide conditions for disease transmission and dissemination. However, during the construction period, local economic will benefit from it thanks to increased commercial activities.

⌘ Capacity building

Management system project include training and publicity. This subproject is mainly institution building and training, belonging to policy-based project, and has less impact on the environment. In the aspect of training and publicity, it is recommended to use recycled paper to reduce its impact on the environment.

⌘ Sustainable land management project

Such project involves 360 acres of mountain water resources conservation forest management and protection (Bole Santai forest farm, Jinghe forest farm, Harituge forestry center and Haxia Forest farm). There are 52600 mu forest cultivation and management demonstration area, and respectively select 4 domonstration points (namely: Santai Forestry Centre Mountain Natural Forest with the type of mountain land (12738Mu), Hot-spring County valley secondary forest with the type of bottom land forest (16361 Mu), Bole

Gobi secondary forest with the type of wilderness (11024 Mu) and Jinghe County Huashan desert secondary forest with the type of desert (12600 Mu) as the foundation. It also involves 38500 mu grassland demonstration areas. The environmental impact mainly related to forest and grassland cultivation demonstration point construction, such as artificial reseeding, logging, wood cutting and grazing prohibition, and planting signs..

1.5.1.2 Environmental impact identification in operation period

The project belongs to the category of non-polluting projects. The project itself does not produce pollutants in operation period.

The results of sub-project environmental impact factors identified are shown in table 1.5-1 and table 1.5-1.

Tab. 1.5-1 Project Environmental Assessment Screening Matrix

Receptor / Activities	Environmental Factors														
	Natural Environment				Ecologial Environment				Socio-Economic						
	Ambient air	Water	Acoustic	Landscape	Soil	Habitats and NR	Key Species	Carrying Capacity	Livelihoods	Local Economy	Employmebnt	Public Aareness	Cultural Relics	Tourism	Ethnic Minority
Water Resource Assessment and Optimized Allocation															
Water consumption balance and water saving	+	+		+	+	+	+	+	+/-	+		+			
Water-saving irrigation demonstration (costruction)	-	-	-	-	-				-	+	+		-		
Sustainable Land Management															
Forests conservation and restoration demonstration	+	+	+	+	+	+	+	+	+/-	+	+	+		+	
Grassland conservation	+	+	+	+	+	+	+	+	+/-	+	+	+		+	
Biodiversity Conservation and Livelihoods Enhancement															
Natuarl habitats conservation	+	+	+	+	+	+	+	+	+/-	+	+	+	+/-	+	+/-

Monitoring facilities construction	-	-	-	-	-					+	+				
NR management support												+			
Livelihoods enhancement									+	+	+	+			+

Note： “+” indicates benefits；“-” indicates impacts, “+/-” indicates both benefits and impacts.

2. Policies Regulations and Administrative Management Framework

2.1 Environmental Policies and Regulations Document

2.1.1 Overview

By comprehensive analysis of project type, size, location, environmental sensitivity, and the characteristics and size of the potential environmental impact, the mainly basis and related policies, laws, regulations and standards of the project are as follows:

(1) Environmental Protection Laws and Regulations

(2) Pollution Control Technology and Policy

(3) Socio-Economic Development and Environmental Protection Plans And Programs

(4) Urban Master Planning

(5) Environmental Impact Assessment Technology Guidelines

(6) Environmental Quality Standards

(7) Pollutant Emission Control Standards

(8) World Bank Safeguard Policies

(9) Relevant international treaties

The policies, laws, regulations and standards mentioned above constitute the policy, laws and regulations document framework of the project environmental assessment work.

In addition, the EIA will regard feasibility study report, approval documents of government department and the related document mentioned above as basis of environment evaluation.

A summary of relevant legal frameworks are presented in below.

(1) Project implementation and EIA follow the relevant international conventions

Convention on Biological Diversity (entered into force in December 1993): The fourteenth term related to environmental assessment. The requirements of each contracting party are as follows: (a) Adopt appropriate procedures, require environmental impact assessment on proposed projects which may have significant adverse impacts on biological diversity, to avoid or minimize

such effects, and allow for public participation in such procedures. (b) Appropriate arrangements to ensure that the environmental consequences of programs and policies which may have serious adverse effects on biodiversity are given properly consideration.

International Convention on Wetlands (set in Ramsar, February 2nd, 1971, amended by the Protocol in March 12th, 1982): Wetland Definition is that Wetland means natural or artificial, temporary or long time swampland, moor, peatland or water areas, with static or flowing freshwater, brackish or salt water, including not more than 6m deep waters at low tide.

(2) National laws and regulations

(I) the Environmental Protection Act (December 1989): in particular, terms of section 14 (compilation of environmental impact report), Article 17 (protection of natural ecosystems), 20 clause (a reasonable application of chemical fertilizers and pesticides), biological biodiversity conservation and wetland protection.

(ii) Environmental Impact Assessment Law (October 2002): The first clause (the definition of environmental impact assessment), the tenth terms (the content of environmental impact report of special planning), 16th terms (environmental impact assessment classification management) and the twenty-first terms (public participation).

(iii) Environmental protection regulations of construction project (State Council Decree No. 253 in 1998): Particularly Article 7th (project category), Article 8th (the content of environmental impact assessment report), Section 9th (the relationship between Environmental Impact Assessment and feasibility designation), Article 10th (submitted environmental impact assessment report to the environmental protection department for examination and approval).

(iv) List of category management of Environmental Impact Assessment of Construction projects (National Environmental Protection Ministry Decree No. 2 in 2008): The third terms (environmental sensitive areas), 7th provisions (inter-trade and complex construction projects).

(v) Notification on strengthening management of construction project Environmental Impact Assessment financed by international financial organizations (National Environmental Protection Agency, June 21st, 1993): Article 7th I (the project must comply with the laws, regulations and standards),

II (must comply with the People's Republic of environmental approval process), III (type of development projects), VI (project design and environmental impact assessment procedures sync of the PRC and international organizations), VII (public participation), VIII (voluntary resettlement), IX (Environmental Impact Assessment Report submitted procedures), XIII (Class A certificate EIA agency for the preparation of environmental impact assessment report), and Annex A, B, C (annotated outline format of environmental impact assessment tasks, environmental impact assessment reports and environmental impact assessment summary report format).

(vi) Environmental impact assessment Technical guidelines non-polluted ecological impact (HJ/T19-1997, State Environmental Protection Administration): The first item 1(Scope of Application), 4th clause 1 (evaluation classification), 2 (range of ecological impact assessment).

(3) Local regulations and planning

(i) Xinjiang Biodiversity Conservation Planning: planned key areas and priority projects of Xinjiang biodiversity conservation, included biodiversity conservation of Lake Aibi region.

(ii) Xinjiang Natural Reserve Protection Planning: Planned key areas and priority projects of Xinjiang Natural Reserve, included Natural Reserve in Lake Aibi region.

(iii) Xinjiang Ecological Functional Zoning (Xinjiang Uygur Autonomous Region Environmental Protection Agency, September, 2003): The project area is ecology sub-regions of desert shrubs and oasis agriculture in Western Junggar Basin belonging to Junggar Basin temperate desert and the oasis ecosystem functional area, including the Lake Aibi wetland biodiversity protection and desertification control ecological function areas, Jinghe to Bortala valley oasis agricultural ecological function areas, and Wenquan county Ranodon sibiricus habitat and Xiaerxili biodiversity conservation ecological functional area.

(iv) Eleventh Five-Year Plan of Bortala Mongol Autonomous Prefecture Forestry Development (No. 19 (2007) of People's Government of Bortala Mongol Autonomous Prefecture): The Lake Aibi Regional Ecosystem

Comprehensive Treatment Project was listed into important projects of ecology protection and environment improvement.

(4) World Bank Safeguard Policies

The project involves seven safeguard policies of the World Bank, including:

- environmental assessment,
- natural habitats,
- indigenous peoples,
- involuntary resettlement,
- forests, and
- dam safety.

In addition, the project also applies to the Bank's information disclosure policy.

2.1.2 Environmental Protection Laws and Regulations

(1) Environmental Protection Law (December 26th, 1989)

(2) Environmental Impact Assessment Law of the PRC (October 28th, 2002)

(3) PRC Water Pollution Prevention Law and the Implementing Rules (February 28th, 2008)

(4) PRC Air Pollution Prevention Law (April 29th, 2000)

(5) PRC Environmental Noise Pollution Prevention Law (October 29th, 1996)

(6) PRC Solid Waste Pollution Prevention Law (April 1st, 2005)

(7) PRC Water Law (August 29th, 2002)

(8) PRC Soil and Water Conservation Law (June 29th, 1991)

(9) PRC Wild Animal Protection Law (August 28th, 2004)

(10) PRC Fisheries Law (October 31st, 2000)

(11) Cultural Relics Protection Law (December 29th, 2007)

(12) PRC Flood Control Law (August 29th, 1997)

(13) PRC Land Administration Law (August 28th, 2004)

(14) PRC Grassland Law (December 28th, 2002)

(15) PRC Communicable Disease Prevention Act (August 28th, 2004)

(16) PRC Radioactive Pollution Control Act (June 28th, 2003)

2.1.3 Environmental Protection Regulations, Departmental Rules and Protection List

(1) Regulations for the Implementation of PRC Soil and Water Conservation Law (August 1st, 1993)

(2) PRC Wild Plants Protection Regulations (September 30th, 1996)

(3) PRC Nature Reserves Regulations (October 9th, 1994)

(4) PRC River Management Regulations (June 10th, 1988)

(5) Construction Project Environmental Protection Management Regulations (November 29th, 1998)

(6) National Environmental Protection Outline (April 10th, 2001)

(7) Eleventh Five-Year Plan on National Ecological Protection (ED [2006] No.158)

(8) Drinking Water Source Protection Area Pollution Prevention Regulations (July, 1989)

(9) Interim Measures for Public Participation in Environmental Impact Assessment (ED [2006] No.28)

(10) Notification on Strengthening Management of Construction Project Environmental Impact Assessment Financed by International Financial Organizations (four ministries, EM [1993] No.324)

(11) Notification on Strengthening Environmental Protection Work of Hydropower Construction (ED [2005] No.13)

(12) Views on Strengthening Environmental Protection Management of Construction Project in Western Development (ED [2001] No.4)

(13) Views on Strengthening Environmental Protection Supervision of Resource Development (ED [2004] No.24)

(14) Views on Strengthening Environmental Management of Natural Resource Development Project (National Environmental Protection Agency, December 1994)

(15) Letter about Printing and Distributing *Environmental Impact Assessment Technical Guide of River Course Ecological Water Use, Low-Temperature Water, and Fish Pass Facilities in Water Conservancy and Hydropower Construction (Trial)* (EIA letter [2006] No.4)

(16) Letter about Printing and Distributing meeting *Summary of Water Environment and Aquatic Ecosystems Protection Technical Policy Seminar* (Central Office [2006] 11)

(17) Notice on Strengthening Environmental Impact Assessment Manage and Prevent Environmental Risk (ED [2005] No. 152)

(18) List of Environmental Impact Assessment Sort Management of Construction Projects (State Environmental Protection Administration in October 2008)

(19) China's National Reserve List (2004)

(20) List of National Key Protected Wild Animals (National Forestry Bureau 7th Decree Amendment, February 2003)

(21) National Key Protected Wild Plants (The First Batch) Amendment (January 2008).

2.1.4 List and Regulations of Local Environmental Protection

(1) Xinjiang Uygur Autonomous Region Environmental Protection Ordinance (July 1996)

(2) Xinjiang Uygur Autonomous Region Implementation Regulation of *Republic of China Wildlife Protection Act*

Xinjiang Uygur Autonomous Region Wild Animals Protection Ordinance (Revised in December 2004)

(3) Xinjiang Uygur Autonomous Region Wild Plants Protection Ordinance (September 2006)

(4) Xinjiang Uygur Autonomous Region Plains Natural Forest Protection Ordinance (December 2008)

(5) Announcement on Dividing Key Prevention and Protection Regions, Key Supervision Regions, and Key Control Regions of Water and Soil Erosion in Xinjiang by Xinjiang Uygur Autonomous Region People's Government (October 2000)

(6) Water Environment Functional Division of Xinjiang, China

(7) Xinjiang Ecological Function Zoning

(8) Reserve List of Xinjiang Uygur Autonomous Region (2003)

(9) List of Xinjiang Uygur Autonomous Region Key Protected Wild Animals (XFAP [2000] No.201)

(10) Notice on releasing list of Xinjiang Uygur Autonomous Region protection aquatic wildlife (September 2004, [2004] No. 67 of the People's Government of Xinjiang Uygur Autonomous Region);

(11) List of Xinjiang Uygur Autonomous Region key protected wild plants (first batch) (Office of People's Government of Xinjiang Uygur Autonomous Region, August 27, 2007, [2007] No.175)

2.1.5 Social and Economic Development and Environmental Protection Planning

(1) Planning for biodiversity conservation in Xinjiang

(2) Xinjiang Nature Reserve Planning

(3) Xinjiang Ecological function zoning (Xinjiang Uygur Autonomous Region Environmental Protection Agency, September 2003)

(4) Forestry Development Eleventh Five-Year Plan of Bortala Mongol Autonomous Prefecture (Bortala GD [2007] No. 19)

2.1.6 Environmental Impact Assessment Technology Guidelines and Specifications

(1) HJ/T2.1-93 Technical Guidelines for Environmental Impact Assessment of General Principles

(2) HJ/T2.2-2008 Technical Guidelines for Environmental Impact Assessment of Atmospheric Environment

(3) HJ/T2.3-93 Technical Guidelines for Environmental Impact Assessment of Surface Water

(4) HJ/T2.4-2009 Technical Guidance for Environmental Impact Assessment of Acoustic Environment

(5) HJ/T19-1997 Technical Guidance for Environmental Impact Assessment of Non-Polluted Ecology

(6) HJ/T88-2003 Technical Guidelines for Environmental Impact Assessment of Water Resources and Hydropower Engineering

(7) HJ/T169-2004 Environmental Risk Assessment Technical Guidelines of Construction Project

(8) HJ/T192-2006 Ecological Condition Assessment Technical Specifications (For Trial Implementation)

(9) GB/T16453.1 ~ 6-1996 Soil and Water Conservation Comprehensive Control Technical Specifications

(10) GB/T50433-2008 Development and Construction Projects Soil and Water Conservation Technical Specifications

2.1.7 Environmental Quality Standards

(1) GB3838-2002 Surface Water Quality Standards (see Table 2.1-1)

Table 2.1-1 Surface Water Quality Standards (2002)

No.	Items	□	□	□	□	□
1	Water temperature□□□	Man-made water temperature changes should be limited: weekly max. Average temperature rise □1; weekly max. Average temperature drop □2.				
2	P H value (Dimensionless)	6□9				
3	Dissolved oxygen □	Saturation factor 90%□or 7.5□	6	5	3	2
4	Potassium permanganate□	2	4	6	10	15
5	Chemical oxygen demand□COD□□	15	15	20	30	40
6	BOD_5 □	3	3	4	6	10
7	NH_3-N □	0.015	0.5	1.0	1.5	2.0
8	Total phosphorus □P□□	0.02 (lakes, reservoirs 0.01)	0.1 (lakes, reservoirs 0.025)	0.2 (lakes, reservoirs 0.05)	0.3 (lakes, reservoirs 0.1)	0.4 (lakes, reservoirs 0.2)
9	Total nitrogen □lakes, reservoirs□N□□	0.2	0.5	1.0	1.5	2.0
10	Cu□	0.01	1.0	1.0	1.0	1.0
11	Zn□	0.05	1.0	1.0	2.0	2.0
12	Fluoride □F□□	1.0	1.0	1.0	1.5	1.5
13	Se □	0.01	0.01	0.01	0.02	0.02
14	As □	0.05	0.05	0.05	0.1	0.1
15	Hg □	0.00005	0.00005	0.0001	0.001	0.001
16	Cd □	0.001	0.005	0.005	0.005	0.01
17	Cr□sexivalent□□	0.01	0.05	0.05	0.05	0.1
18	Pb □	0.01	0.01	0.05	0.05	0.1
19	Cyanide □	0.005	0.05	0.2	0.2	0.2
20	Volatile phenol□	0.002	0.002	0.005	0.01	0.1
21	Petroleum □	0.05	0.05	0.05	0.5	1.0
22	Anionic surfactant □	0.2	0.2	0.2	0.3	0.3
23	Sulfide □	0.05	0.1	0.2	0.5	1.0
24	Fecal coliform □pcs/L□□	200	2000	10000	20000	40000

(2) GB3095-1996 Ambient Air Quality Standard (see Table 2.1-2)

Table 2.1-2 Ambient Air Quality Standard concentration limits of various pollutants

Pollutant	Time	Concentration limits			units
		Grade I	Grade II	Grade III	
SO2	annual mean	0.02	0.06	0.10	mg/m^3
	daily mean	0.05	0.15	0.25	
	1 hour mean	0.15	0.50	0.70	
TSP	annual mean	0.08	0.20	0.30	
	daily mean	0.12	0.30	0.50	
PM_{10}	annual mean	0.04	0.10	0.15	
	daily mean	0.05	0.15	0.25	
NO_x	annual mean	0.05	0.05	0.10	
	daily mean	0.10	0.10	0.15	
	1 hour mean	0.15	0.15	0.30	
NO_2	annual mean	0.04	0.04	0.80	
	daily mean	0.08	0.08	0.12	
	1 hour mean	0.12	0.12	0.24	
CO	daily mean	4.00	4.00	6.00	
	1 hour mean	10.00	10.00	20.00	
O_3	1 hour mean	0.12	0.16	0.20	
Pb	Seasonal mean	1.50			μg/m^3
	annual mean	1.00			
B[a]P	daily mean	0.01			
F	daily mean	7□			
	1 hour mean	20□			
	Monthly mean	1.8□	3.0□		μg/□dm^3·d□
	Plant growing season mean	1.2□	2.0□		

Note: □ is adequate for urban areas; □ is adequate for pastoral areas and the pastoral area-based semi-pastoral area, sericulture area; □ is suitable for agriculture and forestry areas.

(3)GB15618-1995 Soil Environmental Quality Standards (see Table 2.1-3).

Table 2.1-3 Soil environmental quality standard value unit: mg / kg

Item	Grade				
	Grade I	Grade II			Grade III
pH	Natural background	<6.5	6.5~7.5	>7.5	>6.5
Cd □	0.20	0.30	0.30	0.60	1.0
Hg □	0.15	0.30	0.50	1.0	1.5
As (paddy field) □	15	30	25	20	30
As (dry land)□	15	40	30	25	40
Cu (Farmland) □	35	50	100	100	400
Cu (orchard)□	—	150	200	200	400
Pb□	35	250	300	350	500
Cr (paddy field) □	90	250	300	350	400
Cr(dry land)□	90	150	200	250	300
Zn□	100	200	250	300	500
Ni□	40	40	50	60	200
BHC□	0.05	0.50			1.0
DDT□	0.05	0.50			1.0

Note: □ Heavy metals (Cr mainly Cr^{3+}) and As calculate according to element, and is adequate to the soil, of which cation exchange capacity is greater than 5cmol(+)/kg. If □5cmol (+) / kg, the standard value is half of the numerical value in the table.

□ BHC is total amount of four isomers. DDT is total amount of four derivatives.

□ Towards soil environmental quality standards of paddy field and dry land rotation land, As use the value of paddy fields, and Cr use the value of dry land.

(4) GB3096-2008 standards for acoustic environmental quality (see Table 2.1-4).

Table 2.1-4 Acoustic Environmental Quality Standard Unit: dB

Categories of Acoustic environment functional area		Time	
		diurnal	nighttime
Class 0		50	40
Class 1		55	45
Class 2		60	50
Class 3		65	55
Class 4	Class 4a	70	55
	Class 4b	70	60

(5) GB5084-2005 Irrigation Water Quality Standards (see Table 2.1-5).

Table 2.1-5 Irrigation Water Quality Standard Value of the Basic Control Items

NO.	Item Category	Crop category	
		□□	□□
1	BOD_5□mg/L□	100	40^a□15^b
2	COD□mg/L□	200	100^a□60^b
3	SS□mg/L□	100	60^a□15^b
4	Anionics□mg/L□	8	5
5	Water Temperature□□□	35	
6	pH	5.5□8.5	
7	Total Salt□mg/L□	1000a□□□□□□□□□2000b□□□□□□□	
8	Chloride□mg/L□	350	
9	Sulphide□mg/L□	1	
10	Total mercury (mg/L□	0.001	
11	Cd□mg/L□	0.01	
12	Total arsenic□mg/L□	0.1	0.05
13	Cr^{6+}□mg/L□	0.1	
14	Pb□mg/L□	0.2	
15	Fecal coliform□/100mL□	4000	2000^a □1000^b
16	The number of Ascaris eggs□/L□	2	2^a □1^b

Note: a: processing, cooking and peeling vegetables. b: raw vegetables, fruits and herbal fruit. c: in the region that have some water drainage facilities, and

can ensure drainage and groundwater flow at certain degree, or region that has a certain freshwater resources to flush salt in soil, the total salt index of agriculture irrigation water can be relaxed.

(6) GB/T14848-93 Groundwater Quality Standards (see Table 2.1-6)

Table 2.1-6 Classification Index of Ground Water Quality

No	Item	Class-□	Class-□	Class-□	Class-□	Class-□
1	Color	□5	□5	□15	□25	>25
2	Smell	Nil	Nil	Nil	Nil	Yes
3	Turbidness	□3	□3	□3	□10	>10
4	Visible particle	Nil	Nil	Nil	Nil	Yes
5	pH		6.5 - 8.5		5.5 - 6.5，8.5 - 9	<5.5，>9
6	Total hardness ($CzCO_3$) (mg/L)	□150	□300	□450	□550	>550
7	Dissolved solid (mg/L)	□300	□500	□1000	□2000	>2000
8	Sulfate (mg/L)	□50	□150	□250	□350	>350
9	Chloride (mg/L)	□50	□150	□250	□350	>350
10	Fe (mg/L)	□0.1	□0.2	□0.3	□1.5	>1.5
11	Mn (mg/L)	□0.05	□0.05	□0.1	□1.0	>1.0
12	Cu (mg/L)	□0.01	□0.05	□1.0	□1.5	>1.5
13	Zn (mg/L)	□0.05	□0.5	□1.0	□5.0	>5.0
14	Mo (mg/L)	□0.001	□0.01	□0.1	□0.5	>0.5
15	Co (mg/L)	□0.005	□0.05	□0.05	□1.0	>1.0
16	Volatile phenol (phenyl hydrate) (mg/L)	□0.001	□0.001	□0.002	□0.01	>0.01

17	Anionic synthetic detergent (mg/L)	Non detected	□0.1	□0.3	□0.3	>0.3
18	permanganate index (mg/L)	□1.0	□2.0	□3.0	□10	>10
19	Nitrate (N)(mg/L)	□2.0	□5.0	□20	□30	>30
20	Nitrite (N)(mg/L)	□0.001	□0.01	□0.02	□0.1	>0.1
21	NH4 (mg/L)	□0.02	□0.02	□0.2	□0.5	>0.5
22	Fluoride (mg/L)	□1.0	□1.0	□1.0	□2.0	>2.0
23	iodide (mg/L)	□0.1	□0.1	□0.2	□1.0	>1.0
24	Cyanide (mg/L)	□0.001	□0.01	□0.05	□0.1	>0.1
25	Hg (mg/L)	□0.00005	□0.0005	□0.001	□0.001	>0.001
26	As (mg/L)	□0.005	□0.01	□0.05	□0.05	>0.05
27	Se (mg/L)	□0.01	□0.01	□0.01	□0.1	>0.1
28	Cd (mg/L)	□0.0001	□0.001	□0.01	□0.01	>0.01
29	Cr6+ (mg/L)	□0.005	□0.01	□0.05	□0.1	>0.1
30	Pb (mg/L)	□0.005	□0.01	□0.05	□0.1	>0.1
31	Be (mg/L)	□0.00002	□0.0001	□0.0002	□0.001	>0.001
32	Ba (mg/L)	□0.01	□0.1	□1.0	□4.0	>4.0
33	Ni (mg/L)	□0.005	□0.05	□0.05	□0.1	>0.1
34	DDT(μg/L)	Non detected	□0.005	□1.0	□1.0	>1.0
35	BHC (μg/L)	□0.005	□0.05	□5.0	□5.0	>5.0
36	Colon bacillus (pcs/L)	□3.0	□3.0	□3.0	□100	>100
37	Bacterium (pcs/L)	□100	□100	□100	□1000	>1000

38	σ-radioactivity (Bq/L)	□0.1	□0.1	□0.1	>0.1	>0.1
39	β-radioactivity(Bq/L)	□0.1	□1.0	□1.0	>1.0	>1.0

(7) The Grade Five Class Eight of *Survey Outline and Technical Regulations of Grass Resources in National Key Pasture* is as follows:

Grade 1 pastures: Excellent pasture is more than 60%

Grade 2 pastures: Good pasture is more than 60%, excellent pasture and medium pasture account for 40%.

Grade 3 pastures: Medium pasture is more than 60%, good and low pasture account for 40 %.

Grade 4 pastures: Low pasture is more than 60%, medium and inferior pasture accounts for 40%

Grade 5 pastures: Inferior Pasture is more than 60%.

Class use over ground part fresh grass weight to show, and is divided into eight classes:

Class 1 pasture: 800kg fresh grass per mu

Class 2 pasture: 600 ~ 800kg fresh grass per mu

Class 3 pasture: 400 ~ 600kg fresh grass per mu

Class 4 pasture: 300 ~ 400kg fresh grass per mu

Class 5 pasture: 200 ~ 300kg fresh grass per mu

Class 6 pasture: 100 ~ 200kg fresh grass per mu

Class 7 pasture: 50 ~ 100kg fresh grass per mu

Class 8 pasture: 50kg fresh grass per mu

Environmental quality standards and assessment factors used in sub-project environmental impact assessment is shown in Table 2.1-7.

Table 2.1-7 Environmental quality standards and assessment factors used in sub-project environmental impact assessment

NO.	Types	Project Name	Standards	Class	Assessment factors
1	Water-saving irrigation project	Water-saving irrigation in Bole City	(1) GB3838-2002 Surface Water Quality Standards	Grade II	PH, COD_{Mn} ,NH_3-N, Total phosphorus, Hg, Cu, Cd, Fe, Pb, Zn, F, As, Cr^{6+}, CYN, Volatile phenol, anionics
			(2) GB5084-2005 Irrigation Water Quality Standards	/	Water temperature, PH, BOD_5, COD, SS, anionics, salt content, chloride, sulphide, total mercury, Cd, Total arsenic, Cr^{6+}, Pb, Fecal coliform, The number of Ascaris eggs
			(3) GB3095-1996 Ambient Air Quality Standard	Class 2	TSP
			(4) GB3096-2008 standards for acoustic environmental quality	Grade 1	Equivalent sound level
		Water-saving irrigation in Jinghe County	Idem	Idem	Idem
		Water-saving irrigation in Wenquan County	Idem	Idem	Idem
2	Biodiversity protection project	Brids monitoring and habitat improvement research	(1) GB3838-2002 Surface Water Quality Standards	Grade□	PH, COD_{Mn} ,NH_3-N, Total phosphorus, Hg, Cu, Cd, Fe, Pb, Zn, F, As, Cr^{6+}, CYN, Volatile phenol, anionics

			(2) GB3095-1996 Ambient Air Quality Standard	Class one	TSP
			(3) GB3096-2008 standards for acoustic environmental quality	Grade 1	Equivalent sound level
		The Lake Aibi red deer protection and monitoring	Idem	Idem	Idem
		Lake Aibi Birch protection and population restoration	Idem	Idem	Idem
		Ranodon sibiricus saving and protection	Idem	Grade□	Idem
				Class 1	
				Grade 1	
3	Training and publicity	Training	/	/	/
		publicity	/	/	/
4	Organization and management of project	Multi-sectoral coordination mechanisms establishment	/	/	/

2.1.8 Pollutant emissions control standards

(1) Water pollution

According to the results of *Chinese Xinjiang water function division*, each subproject area involve Grade □ water area regulated by *Surface Water Environmental Quality Standard* (GB3838-2002), new sewage outfall is forbidden. Thereby production waste water and domestic Sewage cannot be discharged into the river, and should be comprehensively utilized after treatment and meeting standards (Wastewater Integrated Discharge Standard is shown in Table 2.1-8). The water used for construction after treatment carry out construction water use standards, and the water used for irrigation carry out Irrigation Water Quality Standard(GB5084-2005).

Table 2.1-8 Wastewater Integrated Discharge Standards

Pollutant	Standard and Class	Items	Standard value	
			unit	value
Wastewater	Integrated Wastewater Discharge Standards□GB8978–1996□Class1	pH	—	6□9
		SS	mg/L	70
		BOD_5	mg/L	20
		Petroleum	mg/L	10
		NH_3-N	mg/L	15
		Anionics	mg/L	5.0
		Animal and plant oil	mg/L	10

(2) Air pollutants

Implement fugitive emission monitored concentration limits of new sources of air pollutants in *Air Pollutants Integrated Emission Standard* (GB16297-1996) (see Table 2.1-9)

Table 2.1-9 Air Pollutant Discharge Standards

Item	Standard value(mg/m^3)
Particulate matter	1.0

(3) Noise Pollution

Construction noise: implement noise limits in various stages of *Construction Site Noise Limits* (GB12523-90) (see Table 2.1-10).

Table 2.1-10 Noise Emission Standards

Construction Site Noise Limits (GB12523-90)		
Construction stage	Diurnal	Nighttime
Earth-rock	75	55
Piling	85	Prohibit construction
Structure	70	55
Fitment	65	55

2.1.9 The World Bank Safeguard Policies

The World Bank has ten safeguards Operational policies in the aspect of society and environment. According to the nature of the project construction, project layout and the scope and on-site investigation determined by EIA, the project possible touched on policies were screened. The result is shown in Table 2.1-11.

Table 2.1-11 Screening of the project touched safeguards policies of the World Bank

NO.	Operational Policy Number	Name	Whether touched or not	Screen Reason
(1)	OP 4.01	Environmental Assessment	Yes	According to the constructive nature, content, World Bank Environmental Policies and potential impact of this project, the World Bank identified the project as Class B EIA projects. EIA/EMP prepared
(2)	OP 4.04	Natural Habitats	Yes	The project involves biodiversity conservation and nature reserves.
(3)	OP 4.09	Pest Management	No	The project will involve pest control for some 4,000mu farmland irrigation and forest conservation. But no significant land use pattern change, purchase or use of pesticides are expected. The policy is not triggered
(4)	OP 4.10	Indigenous Peoples	Yes	Project area is multi-national accumulation area. Project implementation will have some impact to local minority.
(5)	OP 4.11	Physical Cultural Resources	No	Cultural relics found in the Slamander Reserve. However, no civil works will take place. The policy is not triggered. Chance-find policy will apply
(6)	OP 4.12	Involuntary	No	

		Resettlement		
(7)	OP 4.36	Forests	Yes	The project will involve conservation of some 900,000 natural forests and pilot cultivation demonstration in 52,600mu forests farms. The policy is triggered. A Forest Guideline is prepared
(8)	OP 4.37	Safety of Dams	Yes	There are 9 dams exists in the project area. The policy is triggered.
(9)	OP 7.50	Projects on International Waterways	No	None sub-project is on international watercourses. The policy is not triggered.
(10)	OP 7.60	Projects on dissentient Region	No	None sub-project is on territorial dispute region. The policy is not triggered.

2.1.10 Project Related Documents

(1) Environmental Evaluation Outline of Lake Aibi Sustainable Management and Biodiversity Conservation Project

(2) Project Feasibility Study Report

(3) Project Minorities Development Plan

(4) Project Social Assessment Report

(5) Project the Dam Safety Report

(6) Aibi Lake Wetland Nature Reserve Master Plan

2.2 Environmental Management Organization and Responsibilities

China Central People's Government and the provinces (municipalities and autonomous regions), city (prefecture) and county (district) people's governments have established environmental management agencies according to law, and fulfill the corresponding environmental management responsibilities. Environmental management agencies that related to the project are Xinjiang Uygur Autonomous Region Forestry Department, Xinjiang Uygur Autonomous Region Environmental Protection Department, Xinjiang Uygur Autonomous Region Water Resources Department, Bortala Prefecture Water Conservancy Bureau, Lake Aibi Natural Reserve, Ganjiahu Haloxylon ammodendron Natural Reserve, Xinjiang North Salamander Natural Reserve, Bortala Environmental Protection Agency, Environmental Protection Bureau and Water Conservancy Bureau of each county and city.

(1) Xinjiang Uygur Autonomous Region Environmental Protection Agency

Xinjiang Uygur Autonomous Region Environmental Protection Agency is responsible for regional environmental protection administration and administrative law enforcement work, and the main responsibilities include: implement national environmental protection policies, laws, regulations, administrative rules and standards; draft regional environmental protection regulations, administrative regulations, and supervise their implementation; commissioned by the autonomous regional people's government, develop environmental impact assessment on major economic and technical policies, development planning and major economic development plans of the whole

region; develop environmental planning, organize preparation of environmental features divisions and regional, watershed pollution control plans and ecological conservation planning, and supervise their implementation; involve in developing environmental protection industry policies and development planning; responsible for the supervision and management of natural ecology protection work and the environmental protection supervision and management of construction projects; organize, develop and supervise the implementation of pollutant sources limited time treatment planning; develop the regional total pollutant discharge control program, be responsible for pollutant emissions declaration and registration and pollutant discharging license management, and organize to carry out supervision work of sewage charges levied; be responsible for environmental supervision and environmental protection administration inspection; Organize compliance activities of environmental protection international treaty in the region; be responsible for international economic and technological cooperation and exchange activities in the aspect of environmental protection; Deal with the foreign environmental protection affairs commissioned by autonomous regional people's government.

Natural Ecology Department under Xinjiang Uygur Autonomous Region Environmental Protection Agency is specializing responsible for environmental impact assessment administration of non-polluted ecological impact project.

(2) Xinjiang Uygur Autonomous Region Water Resources Department

Xinjiang Uygur Autonomous Region Water Resources Department is responsible for water administration and administrative law enforcement work, and its main responsibilities include: organize and study out Xinjiang water conservancy, hydroelectric power and aquatic product development strategy, medium-term and long-term water development planning, and medium-term and long-term water supply and demand planning of the whole Xinjiang, cross prefecture city and corps designation water use. be responsible for organizing the preparation of basin integrated planning, professional planning; organize, compile and approve key water conservancy and hydropower project pre-planning, and be responsible for organizing the review of project proposal, feasibility study report, preliminary design of water projects in

Xinjiang; Be responsible for the supervision and inspection of water conservancy construction project planning and implementation and completion of funding; organize, review and approve funds use scheme of flood and drought control charges, water conservancy construction fund, and the water regulatory fees; study and put forward water prices, taxes, regulation fees and credit advice; be responsible for organizing and guiding the protection of water resources and water environment, organize water quality monitoring of water area, analyze dynamic monitoring of groundwater; organize the division of water function zoning, control sewage discharging into water district, examine and verify water capacity loading pollutant capacity, and put forward opinion of limiting total pollutants quantity and supervise the implementation; Be responsible for reservoir, power station and dam safety supervision and management; develop Xinjiang soil and water conservation policies, regulations, preparation of soil and water conservation planning and annual implementation plan, and organize the implementation; Organize and guide the comprehensive treatment work of Xinjiang Soil and Water Conservation, be responsible for organizing the preparation, construction and management work of small basin and area Soil and Water Conservation comprehensive treatment project; organize Xinjiang soil and water erosion dynamic monitoring and periodic announcements; organize the compilation of Soil and Water Conservation programming , approval, testing and acceptance check of construction project; be responsible for law enforcement supervision of Soil and Water Conservation Act and relevant laws and regulations.

(3) Environmental Protection Agency of Bortala

Bortala Environmental Protection Agency is responsible for the environmental protection administration and administrative law enforcement work of this area, the main responsibilities include: implement national environmental protection policies, laws, regulations, administrative rules and standards; draft the regional environmental protection laws, administrative regulations, and supervise their implementation; commissioned by the district administrative office, carry out environmental impact assessment of local major economic and technical policies, development planning and major economic development plans; develop environmental protection planning, organize and compile basin pollution control and ecological conservation

planning, and supervise their implementation; be responsible for the supervision and management of ecological protection work and the environmental protection supervision and management of construction projects in Management Area; organize, develop and supervise pollutant sources limited time treatment planning; formulate total pollutant discharge control program of this region, be responsible for the contamination emissions declaring, registration and pollutant discharging license management, and organize to carry out supervision work of sewage charges levied; be responsible for environmental supervision and environmental protection administration inspection; be responsible for international economic and technological cooperation and exchange activities in the aspect of environmental protection; deal with the foreign environmental protection affairs commissioned by Administrative Office of the region.

Environmental assessment management section (or the Pollution Control Section, Supervision and Management Section, Natural Ecology Section) under Bortala Environmental Protection Agency is responsible for the administration of environmental impact assessment, and its main responsibilities include: be responsible for unified supervision and management of environmental impact assessment and The Three-simultaneity System implementation within the region; implement national and regional laws, regulations, rules and policies that related to environmental impact assessment and the Three-simultaneity System; formulate and implement local laws, regulations, policies of environmental impact assessment and the Three-simultaneity System, and supervise the implementation; guide and supervise approval of construction projects environmental impact assessment; be responsible for administrative licensing of construction projects environmental impact assessment documents within the region EPA intra vires; be responsible for construction projects trial production (running), administrative licensing guidance of project environmental protection final acceptance of construction within the region intra vires.

(4)Bortala Water Conservancy Bureau

Organize and study out Bortala Prefecture water conservancy, hydroelectric power and aquatic product development strategy, medium-term and long-term

water development planning; be responsible for organizing the preparation of basin integrated planning, professional planning; Be responsible for the supervision and inspection of water conservancy construction project planning and implementation and completion of funding; organize, review and approve funds use scheme of flood and drought control charges, water conservancy construction fund, and the water regulatory fees; be responsible for organizing and guiding the protection of water resources and water environment, organize water quality monitoring of water area, analyze dynamic monitoring of groundwater; organize the division of water function zoning, control sewage discharging into water district, examine and verify water capacity loading pollutant capacity, and put forward opinion of limiting total pollutants quantity and supervise the implementation; Be responsible for reservoir, power station and dam safety supervision and management of this region; organize and implement Xinjiang soil and water conservation policies, regulations, preparation of soil and water conservation planning and annual implementation plan.

Water and Soil Conservation Section under Bortala Water Conservancy Bureau is responsible for organizing the implementation of regional soil and water conservation project planning, review, declare work, and inspect and supervise soil and water conservation of the whole district.

(5) The county and city Environmental Protection Bureau

Environmental Protection Bureau of subproject located county (city) is in charge of environmental protection administration and administrative law enforcement work of this county (city), and its main responsibilities include: implement national environmental protection policies, laws, regulations, administrative rules and standards; develop the county (city) environmental protection plans and supervise their implementation; be responsible for the supervision and management of ecological environment protection area and the environmental protection supervision and management of construction projects; be responsible for the supervision and management of ecological protection work and the environmental protection supervision and management of construction projects in management Area; organize, develop and supervise pollutant sources limited time treatment planning; formulate total pollutant discharge control program of the county (city), be responsible

for the contamination emissions declaring, registration and pollutant discharging license management, and organize to carry out supervision work of sewage charges levied; be responsible for environmental supervision and environmental protection administration inspection.

(6) The city and county Water Conservancy Bureau

Water Conservancy Bureau of subproject located county (city) is in charge of water administration and administrative law enforcement work of this county (city). Soil and water conservation agency is under city and county Water Resources Bureau, and the agency's main responsibilities are as follows:

 develop the county (city) water conservation planning and annual implementation plan and organize the implementation; Organize and guide the county (city) Soil and Water Conservation comprehensive treatment Work; organize the county (city) soil erosion monitoring and periodic announcements; organize project construction Soil and Water Conservation program compilation and implementation; guide the county (city) Urban Soil and Water Conservation Work; soil and water erosion monitoring: soil and water erosion surveys, soil and water erosion monitoring reports, soil and water erosion data providing, soil and water erosion integrated control and benefit investigation analysis, and soil and water conservation system construction and management; Soil and Water Conservation publicity and staff training.

National environmental management administrative framework (the relevant parts of the project) is shown in Figure 2.2-1.

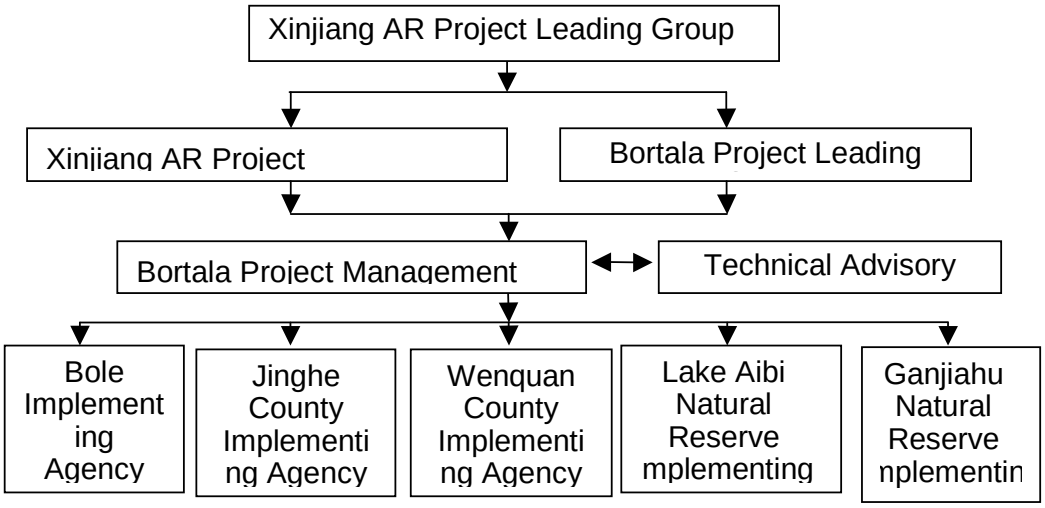


Figure 2.2-1 Administrative framework for national environmental management

3. Project Description

3.1 Name and composition of the project

China: Sustainable Management and Biodiversity Conservation in the Lake Aibi Basin are mainly composed of subprojects shown in Table 3.1-1.

Table 3.1-1 the basic component of the project

Project Activity	Total USD (Ten-thousand)	Funds provided(Ten-thousand)				% in Total project amount
		GEF Grant		Project Allocation		
		USD	RMB	USD	RMB	
1. Water resource assessment and Optimized Allocation	***159.47***	***90.55***	***588.58***	***68.92***	***448.00***	***13.09***
1.1 Water consumption balance for the entire Lake Aibi Basin	44.60	40.29	261.88	4.31	28.00	
1.2 Analysis of real water savings in Bortala Prefecture	4.62	4.62	30.00	0.00	0.00	
1.3 Implementation of pilot programs	86.31	21.69	141.00	64.62	420.00	
1.4 Development of Dynamic Monitoring system supported by RS-based ET measuring technology and carrying out monitoring activities	8.71	8.71	56.60	0.00	0.00	
1.5 Training and Capacity Building	15.25	15.25	99.10	0.00	0.00	
2. Sustainable Land Management	***408.67***	***34.13***	***221.86***	***374.54***	***2434.50***	***33.55***
2.1 Forest Resource Management	271.52	24.44	158.86	247.08	1606.00	
2.2 Grassland sustainable management	130.82	3.35	21.80	127.46	828.50	
2.3 Training and capacity building	6.34	6.34	41.20	-		
3. Biodiversity Conservation and Local Livelihods Enhancement	***540.95***	***122.87***	***798.63***	***418.08***	***2717.55***	***44.42***
3.1 Habitat Protection	392.19	2.65	17.25	389.54	2532.00	
3.2 Key Species Monitoring and Research	92.00	85.96	558.74	6.04	39.25	
3.3 Nature Reserve Management Support and Awareness Raising*	56.76	34.25	222.64	22.51	146.30	
4. Technical support and project management	***108.83***	***50.08***	***325.55***	***58.74***	***381.82***	***8.94***
4.1 Technical support	27.73	27.73	180.25	0.00	0.00	
4.2 Monitoring and evaluation	17.81	8.43	54.80	9.38	60.98	
4.3 Project management	63.28	13.92	90.50	49.36	320.84	
Total	1218	298	1935	920	5982	100

Source: Regional Project Office, September 27, 2010. * under this item RMB1.51 million/US0.23 millio will be allocated to livehoolds enhancement activities

3.2 Subproject owners

Each subproject owners are shown in Table 3.2-1.

Table3.2-1 subproject owners

No.	City (County) Reserve	Name of subproject	Owners
1	Bortala prefecture	Optimize water resource distribution	Project implementation unit of Bole City, Wenquan County and Jinghe County
2	Bortala prefecture	Sustainable Land Management	Bortala prefecture Project Office
3	Wenquan County, Jinghe County	Biodiversity Protection Management and Restoration of Lake Aibi National Wetland Natural Reserve	Management Committee of Lake Aibi, Lake Ganjiahu and Ranodon sibiricus
4	Bortala prefecture	Technical support and project management	Project Office of Bortala prefecture

3.3 Project Description

3.3.1 Water resource assessment and optimized allocation

3.3.1.1 Investigation & Evaluation on Water Resource of Project Area

Accordance with the field survey on industrial & domestic water of Lake Aibi watershed (all water system unit whose concentration centre is Lake Aibi, Lake Aibi basin, Fig 3.3-1) and remote sensing data of different resolutions, carry out water consumption analysis, finding out the water consumption structure of different water usages (including domestic, industrial, agricultural and ecological usages) analysis of whole Lake Aibi watershed based on total evapotranspiration, and then work out the water consumption spatial distribution & temporal change of different land covers and land usage, finding out the water consumption structure of different water usages (including domestic, industrial, agricultural and ecological usages). Making use of years of hydrometries, meteorological observations, groundwater observation data, early water resource evaluation documents and field survey, estimate the surface water resource, groundwater resource, total water resource and water

quality of Lake Aibi watershed, and analyze the water consumption balance of spatial unit (Lake Aibi watershed, sub-watershed and counties & cities), making clear the water consumption target (Object ET) of sustainable development for Lake Aibi watershed, sub-watershed and counties & cities. Based on the water consumption target (Object ET) value allowable ensured by elements like precipitation, economic development and ecological requirements of Lake Aibi watershed, estimate Boultara State, especially the water-saving potential of agricultural area and water-saving irrigation demonstration plots and the water-saving potential of different water-usage types.

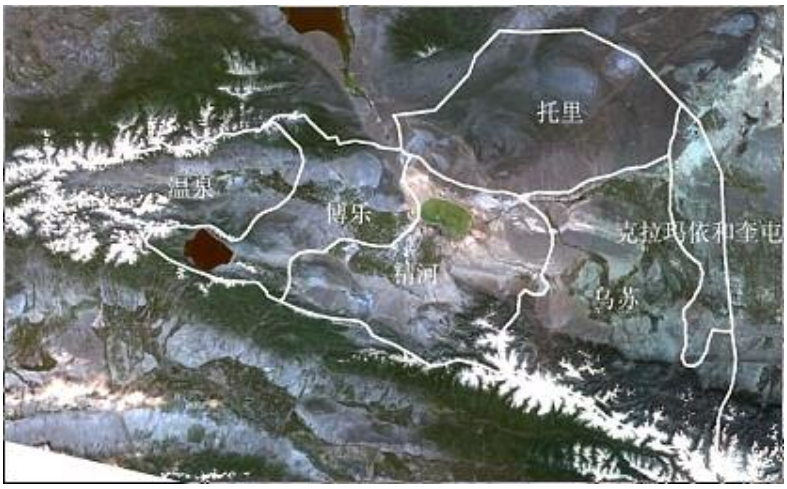


Fig 3.3-1 Distribution Sketch Map of Lake Aibi Watershed (Basin)

(1) Analysis on water consumption distribution of Lake Aibi watershed: by applying the monitor on evapo-transpiration capacity based on remote sensing technique and investigation of domestic & industrial water consumption of watershed unit, together with the spatial water resource evaluation of one whole unit, the project group analyzes the water consumption structure and find out the water consumption spatial distribution & temporal change of different land covers and land usage and the water consumption structure of different water usages (including domestic, industrial, agricultural and ecological usages);

(2)Water resource evaluation on Lake Aibi watershed□Mainly based on hydrometries, meteorological observations, groundwater observation data, early water resource evaluation documents and field survey, estimate the surface water resource, groundwater resource, total water resource and water quality of Lake Aibi watershed respectively , including the estimation of

drainage precipitation, surface runoff, quantity of subarea surface water resources, spatio-temporal distribution of surface water resources, water surface evaporation and available quantity of surface water resources; and the estimation of the supply quantity, drainage quantity, produced quantity and spatio-temporal distribution feature of groundwater (key region of no relief) and the influence of social & economic activities on groundwater resources; and the calculation of watershed unit hydrated transformation, establishing the balance relationship between precipitation and constituent like surface runoff, subsurface runoff, potential water evaporation, surface evapotranspire, etc; and also the calculation of total water resources and available quantity of water resources. Estimate the chemical property, contaminated condition and development trend of surface & subsurface water on the basis of the index properties like PH value, mineralization and total hardness.

(3)Water consumption balance analysis on Lake Aibi watershed: analyze the difference and internal reasons between actual water consumption and target water consumption of watershed, sub-watershed and counties & cities, and confirm the target water consumption (Object ET) of the sustainable development for Lake Aibi watershed, sub-watershed and counties & cities, and put forward the possible approaches to realize target water consumption and main measures to add the water supply quantity to Lake Aibi;

(4)Estimation on water-saving potential of Bortala State: According to the water consumption target (Object ET) value allowable ensured by elements like precipitation, economic development and ecological requirements of Lake Aibi watershed, confirm the target water consumption (Object ET) of the sustainable development for Lake Aibi watershed, sub-watershed and counties & cities, and calculate the water consumption needed to be reduced and the ratio of controllable water consumption to reach target water consumption. By distributing the Object ET into each area/ industry stepwise, and transforms into the maximum available quantity of surface water and groundwater in each area; at the same time, put forward depletion requirement for certain water quality, finding out controllable water consumption and estimating the water-saving potential of unit space in Lake Aibi watershed;

(5)Evaluation of water-saving effect based on ET water consumption balance: Regarding 2006-2010 as base year, calculate rural water productivity, analyzing the spatial difference of them; study the water-saving efficiency and maximum water-saving potential of different water-saving measures and the factors to affect water-saving measures; analyze the total water consumption of cultivated land, total water consumption of important crops and the area of high-efficiency water-saving land; analyze the relationship between crop water consumption and biomass (output), estimating the difference between crop water productivity and global advanced level; based on the data of land usage and crop structure, analyze the water consumption differences between different crops and the influence of crop structure adjustment on water consumption; analyze the recruitment of water consumption after the natural meadow to be reclaimed into artificial pasture.

3.3.1.2 Demonstration on Water Consumption Monitoring Analysis of Multi-type Irrigation Mode

Select representative irrigation plot in Bortala to carry out irrigation demonstration of water control. Based on the suitable irrigation system design and simulation, change the EF quantum of different crops into the collocation proposal of irrigation draught quantity of water users at different times. The demonstration includes: groundwater pressuring drip-irrigation, surface water pressuring drip-irrigation, surface channel irrigation and grain for green irrigation / micro-jet irrigation. According to the monitor of actual measurement on soil moisture movement, develop computational model of irrigation draught quantity under different irrigation models, and carry out the estimation on different water-saving irrigation measures, designing collocation proposal of water for water users according to EF water consumption balance.

Table 3.3-1 The engineering properties of water-saving irrigation project

City (County)	Specific Location	Size (Mu)	Crop Type	Remarks
Bole City	Five team, Wutubulage Village, Wutubulage Town	3000	Cotton or corn	Pressure surface waters
	Wulansumu Village, Dalete Town	2000	The same as that of local	Monitoring of water consumption
Jinghe	The 7th groundwater	830	Cotton or	Pressure

County	irrigation well experimental point of Bortala prefecture water Irrigation Experiment Station		corn	underground water
Wenquan County	Ranching Team, Taxiu Village	200	Alfalfa	Return farmland to grasslands
Total		6030		

Water-saving irrigation demonstration project will be implemented in three counties within the 6030 mu. After implementation of the project, the status changed from the conventional irrigation to drip irrigation. The specific locations of the project area are shown in Figure 3.3-1.

(1)Field observation: Set down field observation proposal based on centralized important model of farming irrigation, and study & demonstrate the water-saving irrigation operational plan based on water consumption control. Conduct observation on crop growing, irrigation frequency, irrigation water volume, soil humidity, soil temperature, evapo-transpiration volume and crop output (biomass) at demonstration point, and then work out water consumption of block field, moisture productivity of crop and irrigation benefits based on the observation data, which will be used to demarcate model. Apply field observation to actually measure the evapo-transpiration volume under different irrigation conditions, and work out evapo-transpiration volume under different irrigation conditions according to the course of soil moisture change, depth of root system's sop up, growth & output of crop observed by field observation. Simultaneously, apply Time Interval Single-value Average Crop Coefficient recommended by FAO to work out the water requirement of crop, comparing with observed value, and confirm the computational parameter to verify the computational model, and then compare the water-saving effect of different irrigation models.

(2)Computational model for irrigation draught quantity of different irrigation models: By monitoring the information of soil moisture and crop moisture, study the upper/lower limit of soil moisture suitable for crop growth under different irrigation conditions, and observe the depth of crop root system's sop up at different growth stages, and then to confirm the suitable guideposts of crops with different irrigation models. Establish the computer model for irrigation system, and then use field observation documents to rate and testify

the model, then on this basis, simulate different irrigation system proposals and select the best one. Based on the quantity of different crops' water consumption quantum transforming into irrigation draught and the current growth stage of crops, work out the water requirement of crop and water supply quantity at current period, instruct farmers to arrange irrigation thereafter.

(3)Water consumption management of rural water-user association: design collocation proposal of water for water users according to EF water consumption balance, and work out water requirement according to water consumption target, and then control & train rural water-user association to carry out water consumption management based on water-supply target. In accordance with approved water consumption guideposts and water requirement quantum (m3/Mu) for different kinds of crops due to water consumption balance, work out the total water requirement of WUA. Distribute corresponding water requirement to soil contracting operator/water users in accordance with the agricultural acreage and crop type of each local water users, which can create advantages for water right management based n ET water consumption balance.

3.3.1.3 Development of Dynamic Monitoring System for Water Consumption Structure

Based on the principles of practicability, universality, openness, advancement, property to be used easily, standardization, security and sharing and requirement analysis, the project group carries out detained detailed design of system function, including: data analysis, analysis on information flow and traffic flow, functional partitioning, interface design, connector design, performance adjustment & calculation and test plan, etc. Establish the dynamic observation & analysis system (which will be pretreated by remote sensing data and estimated by remote sensing ET) on the water consumption structure of Lake Aibi watershed. Analyze the water consumption balance, water consumption structure, water-saving effect and water-saving potential developments, and fulfill the tracking observation of water consumption course of tested zone to realize the observation and monitoring of water consumption structure in Lake Aibi watershed.

(1)Data acquisition & processing: Make Lake Aibi watershed as the boundary, the project group should gain the essential data, weather data and remote sensing data needed by the ET Estimation, and do some standardized processing to get the surface parameter and climate parameter needed by ET processing.

(2)ET calculation: The calculation of ET is the estimation of territorial evapotranspiration based on ET-Watch, making use of surface parameter of remote sensing invertsion together with climate parameter and essential data. It is to provide high-resolution evapotranspiration results of different times, and the time frequencies are ten days, one month, one quarter and one year.

(3)Analysis on water consumption structure: On the basis of data analysis, bring the analysis functional modules□namely: water consumption balance, water consumption structure, water-saving effect, water-saving potential analysis and the tracking monitoring on water consumption course of tested are□in the system, realizing the tract of water user's water consumption course.

3.3.2 Sustainable Land Management

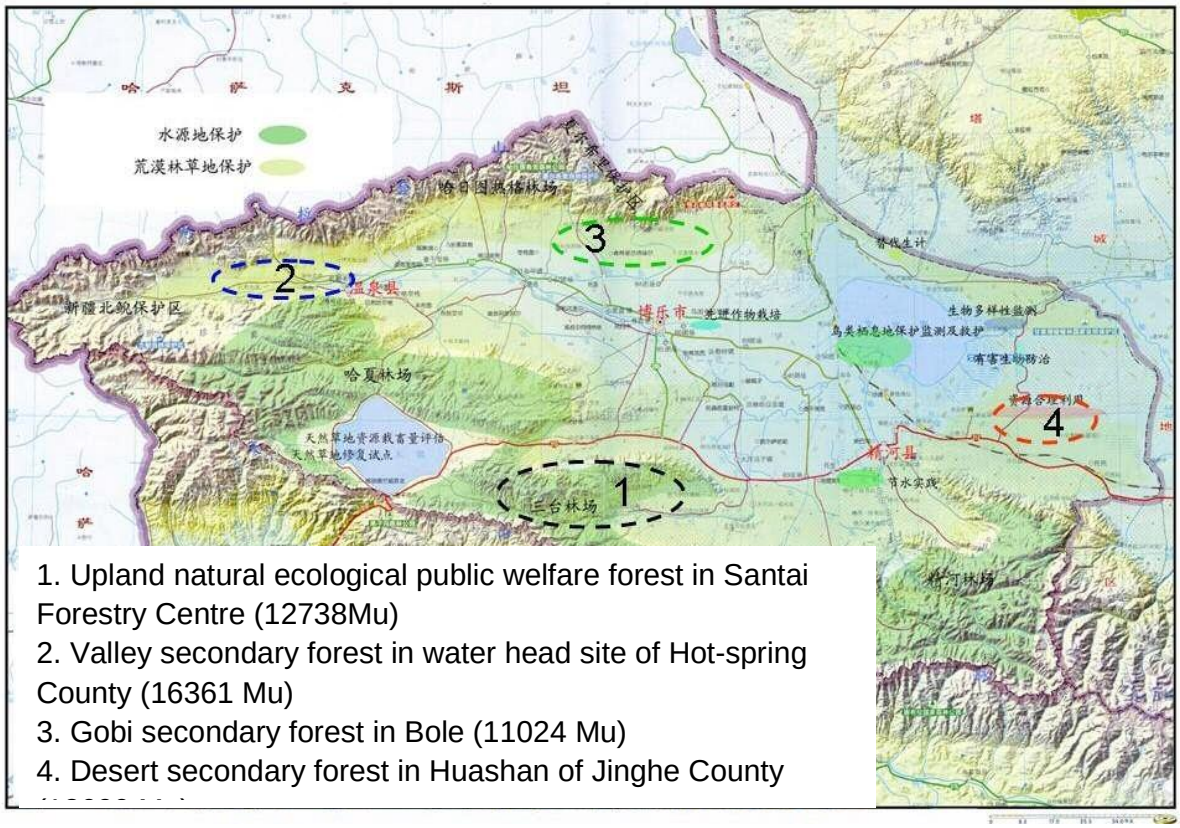
3.3.2.1 The Protection on Natural Forest Resource in Water Source Area

There distributes large area of mountain forest recourses in Tianshan Mountain and Alataw Mountains which are in Bortala Project Area, and the mountain forest resources are the most important generating & converse area of water resources in Lake Aibi watershed, which is of significance for the biodiversity protection in Lake Aibi. Those forest resources are dominated by Santai Forest Centre, Jinghe Forest Centre, Haritrege Forest Centre and Haesha Forrest Centre which are all in Bortala.

In the implementation period of project, each management & protection organization should confirm management & protection responsibility according to the activity frequency of man and beast, the extent of convenient communication and management & protection difficulty. Stop the cut of natural forest resource in water-head site, and strengthen the forest protection and fireproofing, preventing the vandalism on wildlife.

3.3.2.2 Natural Forest Protection Cultivation Demonstration

The demonstration area of forest cultivation management in the project duration is 54,600 Mu, respectively select 4 domonstration points (namely: Santai Forestry Centre Mountain Natural Forest with the type of mountain land (12738Mu), Hot-spring County valley secondary forest with the type of bottom land forest (16361 Mu), Bole Gobi secondary forest with the type of wilderness (11024 Mu) and Jinghe County Huashan desert secondary forest with the type of desert (12600 Mu) as the foundation (See: Chart 3.3-2), roundly carry out closed cultivation and protection, applying closed forest and/or artificial reinforcement planting and after-culture measures in key areas. By applying measures like fence isolation, monitoring prevention and cure on insect pest, forest-fire prevention and artificial after-culture, and also making use of current technology high-efficiency management, improve the forest canopy density and the condition of wildlife, upgrading the value of ecological service.



1. Upland natural ecological public welfare forest in Santai Forestry Centre (12738Mu)
2. Valley secondary forest in water head site of Hot-spring County (16361 Mu)
3. Gobi secondary forest in Bole (11024 Mu)
4. Desert secondary forest in Huashan of Jinghe County

Fig 3.3-2 Distribution of Natural Forest Protection Demonstration Area

Natural Forest Protection Demonstration Area mainly applies the following measures:

Closed cultivation isolation: Apply closed cultivation for the forest zone with obvious degenerated ecological function but high biodiversity values, strictly prohibiting cutting, grazing or any other man-made derangement and sabotage activities, and coordinate the conflicts happened in grass and forest interlaced area, realizing positive grazing management model.

Artificial after-culture: Regarding the sparse forest area whose natural plant cover don't have enough self-reproductive capacity and seedling's distribution is uneven, select optimum local dominant species suitable for hydrothermal season to apply the auxiliary method of artificially after-culture, helping the area renewed naturally and the increase of its species;

Monitoring prevention and cure on insect pest and forest-fire prevention: as the poor habitat, there will be more withered defoliation from plants. Closed cultivation forest land usually has higher risk of insect pest and fire, and its ability against insect pest and recovery ability after disaster is weak. Protect the security of plant cover in closed cultivation area by location monitoring and high frequency patrolling monitoring in high risk season.

3.3.2.3 Forest Resource Monitoring

The man-made intervention cannot be avoided when rehabilitate degenerated land. Sufficient man-made intervention can improve the productivity of land, but if the man-made intervention is excess, land quality maybe cannot form natural stability. Based on the observation on land management effect, make sure that the management reaches the expectant objective firstly, and prevent excess man-made intervention and resource-wasting. Sustainable land management is to keep the natural stability and continuous improvement of soil quality. Management ability development: improve the hardware conditions of observation and the collection, record, storage and transferring of data on the basis of existing facilities; change the function, task, operation target of production primary agencies (forest centers) and speedup the training on the knowledge of natural forest protection management and relevant professional knowledge; and promote the forest-grazing coordination system development, legally prevent man-made sabotage, improving the management effect of natural forest protection and cultivation.

Protection cultivation management observation: observe the conservation of water and soil, water resources conservation, cover degree of plan and

biodiversity change in closed cultivation area, and analyze the effect of forest cultivation based on the collected observation data, realizing the usage of forest cultivation demonstration.

3.3.2.4 Demonstration on Typical Natural Desert Grassland Sustainable Production Management

Based on the results of grassland resource investigation which is carried by Bortala and Xinjiang agricultural University, select several typical natural desert grassland or desert forest & grass land with higher biodiversity value to carry out the regulatory mode of land utilization and renewing management system test management, which is to ensure the grassland biodiversity protection, ecological system sustainable management mode and production mode suitable for the natural conditions of Bortala, and carry out the ecological recovery reclamation activities on degenerated grassland ecological system in this drainage area, which is to realize the aim to effectively protect grassland biodiversity resource and to manage sustainably grassland ecological system. The activity includes:

Sustainable management demonstration on typical natural desert grassland: Based on the desert grasslands with high biodiversity value, which is selected according to “Bortala Grassland Resource Chart” written by Xinjiang Agricultural University, establish demonstration area of 30,000 Mu: 10,000 Mu of which is used to apply delimiting block for rotational grazing; 10,000 Mu is as the effective grazing demonstration; and the left 10,000 Mu is enclosed to forbid grazing. Realize the ecological recovery of degenerated desert grassland by reclamation activities (namely: building fence for stable breeding, delimiting block for rotational grazing, grassland upgrading or regeneration) and to form the renewing management mode and production mode for degenerated desert grassland biodiversity. The total investment is CNY□ 1,484,800.00, which is mainly used for the enclosure construction and service, and this sum of amount will all be undertaken by Bortala Grassland Project and allocated for GEF.

Artificial desert rangeland construction demonstration: Construct succedaneous forage grass base with area of 8500 Mu which uses artificial clove and/or ryegrass for the grazing of herdsmen in the place nearby desert are with high biodiversity value, and the artificial base can provide hay for

livestock to live trough the winter and early spring. Apply high-efficiency water-saving technology to plant high-producing forage grass and to analyze the optimization of water and soil resource benefits; adopt controlled grazing method to delay the time of livestock's returning to natural desert rangeland in Spring, which can help the perennial herbage to resuscitate fully and the ephemeral plant to complete life cycle. The total investment is CNY□ 6,800, 000.00, which is fully undertaken by Bortala Grassland project and is used as the allocation funds of GEF Project.

The sustainable management regulation and capacity building for the natural desert grassland in Bortala: Observe the sustainable management of natural forest desert forest grassland and the progress and effect of artificial grassland demonstration establishment, and set up 18 monitoring points, regularly collect data. According to the monitoring data, differentiation pattern & feature of natural conditions and spatial change of grassland resource in Bortala and the rules of technical measure or model to renew grassland ecology, draft grassland sustainable management regulations for different areas of Bortala, carry out the construction of technical platform including information, communication and network, and also do the training of technical management and information upgrading and wide regulation propaganda and explain. It is planned to apply GEF USD $ 49,600.00, amounting to CNY□ 322,000.00.

3.3.2.5 Technical Support and Capacity building on Sustainable Land Management

Regarding the technical support in the aspects of sustainable land management, carry out training and improvement for essential executors who undertake project task under the support of expert consulting group and global famous experts will, and train for project managers in the aspect of knowledge, concept and regulation, starting capacity building to implement the whole proposal of project task and to realize the expectant objective.

a) Expert guiding and technique popularization: Regarding the special protection task for special part, it must have the site guide from experts, preventing the secondary sabotage caused by unsuitable operation;

b) Technical training: including application and observation speculative knowledge on integrated ecological system, sustainable management skill,

natural forest management and biodiversity protection, water resource distribution and optimization, water-saving technology, analysis and observation, natural reserve management, wetland protection and rehabilitation, land management and water-saving irrigation, ecological tour, etc.

c) Management training: including project task and method, project law and regulation, purchase management, financial management, medium term adjustment skill, project observation and estimation skill, project evaluation and investigation, project demonstration and propaganda, popularizing system, finish acceptance inspection skill.

3.3.3 Biodiversity Conservation and Livelihoods Enhancement

By the protection, rehabilitation and observation on Lake Aibi wetland, Ganjiahu haloxylon forest and the species and habitat of Spring ranodon sibiricus, obviously improve the conditions of Lake Aibi wetland and renew the integrality of eco-landscape, adding endangered rare biotic population and enriching the biodiversity; study the local endangered rare species and some dominant species to put forward the technology, technical system and mode for artificial species amplification or artificial auxiliary species amplification; adopt alternative livelihood measures of peasants and herdsmen in the protection area to solve the conflicts between local domestic production & life and the development of protected area; based on the actual management system construction and implementation of each protected area, realize the improvement of management level, institutionalization of protection activity for protected area and the ordered participation of the public and local residents.

Be directed against the serious ecological problems like habitat degeneration and biodiversity sharp decline in Lake Aibi wetland, focus on the ecological protection, observation and rehabilitation on natural reserves, such as: Lake Aibi Wetland National Natural Reserve, Ganjiahu Haloxylon Forest National Natural Reserve, Ranodon Sibiricus Natural Reserve, etc. Based on original construction and management project of protection area in the State and municipality, the project carries out the rehabilitation of saline ecosystems around Lake Aibi and natural oasis ecosystem of fresh water humid marginal area in protected area and the water surface recovery of lake area with salt

dust caused by the weathering soil degeneration. By the introduction, digestion and application of advanced technical approach, improve the protection technical level and improve the ability of management staff in protection area to execute integrated management regulation and plan, boosting the public, especially the public positivity to join the implementation of protection plan, which can effectively restrain the trend of habitat deterioration and quicken the ecological recovery in Lake Aibi area, ensuring the valid of rare valuable species protection.

3.3.3.1 Management and Protection on Desert Forest Resource

There distributes 2,100,000 Mu desert forest whose main species are diversiform-leaved poplar, halxylon ammondendron and Chinese tamarisk in Lake Aibi Wetland Natural Reserve, and it is the intensive distribution area for various rare endangered species, thus, it is crucial for biodiversity protection to protect those desert forests. In project area, reinforce the publicity and teaching of forest laws and regulations and forest protection policies, prevent deforestation to farm, illegally occupy forest land, denudation, preventing illegal hunting and illegal picking of wild plants.

200 Staff will be employed to undertake the task f management and protection during the project duration, and their duties are: carry out the publicity and education of Forest Resource Protection laws, regulations and policies for local and surrounding residents; prevent the insect pest of forests; prevent deforestation to farm, illegally occupy forest land, denudation; and prevent illegal hunting and illegal picking of wild plants. Regarding the details, please see Annex Nine, Annex Ten and Annex Eleven.

3.3.3.2 Biodiversity Protection Observation and Typical Species Protect Analysis

Make Lake Aibi Wetland National Natural Reserve and Ganjiahu Haloxylon Forest National Natural Reserve to be the project activity region (See: Fig 3.3-3). According to the problems of habitat deterioration and biodiversity change in protection area, the sub-project mainly carry out the protection observation on the time-space distribution of animal, population characteristics, habitat risk and the eco-physiology and growing environment of typical rare endemic plants, and advocate the protection of key biology habitat in protection area based on the observation result and protect the natural conditions for key

protection biology breeding & habitat by the observation of protection area facility and the prohibit of man-made sabotage and disturbance.

Carry out the protection analysis of rare endangered plants & animals including red deer and Lake Aibi birch in Lake Aibi Wetland National Natural Reserve and Ganjiahu Haloxylon Forest National Natural Reserve and also the protection analysis on the ranodon sibiricus kessler in Ranodon Sibiricus Kessler Natural Reserve. Select representative species from national key protected 23 kinds of wild plants and 60 kinds of wild animals to be analyzed firstly, finding out their biological characteristics, ecological characteristics and habitat conditions, which can help to provide reliable detailed technical data for the effective protection and rapid population amplification of endemic rare endangered species and is of significant help to improve the technical development level and scientific research capacity of protection area project and to train technician group.

a). Observation on typical rare endemic species—Lake Aibi red deer, and its habitat: There is a kind of red deer in Lake Aibi Wetland National Natural Reserve and Ganjiahu Haloxylon Forest National Natural Reserve. Accordance with the DNA detection result on red deer sample (male) from Lake Aibi Wetland National Natural Reserve, they are firmly believed to be new subspecies of red deer --- Lake Aibi cervus elaphusebinuricus, whose affiliation lies in between South Asian and East Asian red deer subspecies. The zoology group of “Lake Aibi Integrated Technical Observation” initially estimates that the population of that kind of red deer population is less than 70. Obviously, it is urgent and necessary to make sure whether that population is new subspecies or not. If they are new subspecies, the protection is more urgent; if not, they will be included in the species in Appendix II of Endangered Wildlife International Trade Convention, and we should protect their stable population scale in Lake Aibi wetland, avoiding their disappear, which is still very important. The main contents of this activity are the cognizance of new subspecies, population quantity, main food resource, life habit, reproductive characteristics, home range, and activity law and habitat investigation study. Carry out the automatic tracking monitoring on the habitat of red deer to find out their population quantity, main food resource, life habit, reproductive characteristics, home range and activity law.

At the same time, investigate the data of wild plant resource, water resource distribution, water resource quantity and water quality on the habitat of red deer together with ground investigation to provide accurate technical data for the throw-in of rescue forage, the planning and construction of protection facility and scientific research.

b). Analysis on Lake Aibi birch and Highland Plans: The wetland in Lake Aibi Natural Reserve distributes rare Lake Aibi birch. Lake Aibi Birch (Bortala microphylla Bunge var. ebinurica C. Y.Yang et W. H. Li var. nov.) distinguish from other betula plants for its unique habitat, it has the property to be un-siccolabile, salt-tolerant & alkali-proof and heat-resisting, it distributes in dry salt desert with altitude lower than 200m, and its morphological characteristics distinguish from others birches. At present, the population of that tree species is only 322, which is in extremely endangered condition, urgently needing protection and salvage. The analysis includes closed protection (150 hm2), habitat observation (water, soil, air and relationship between species in the same community, etc.), and artificial propagation test and so on. It is very important to explain why this species appears in salt wetland with altitude of 200m for the acquaintanceship of the environmental adaptation and evolvement of biology.

c). Carry out manual observation on birds in the wetland around Lake Aibi, which is centralized from April to September every year: many groups synchronously investigate and observe the species, quantity, distribution characteristics and population change of wetland avifauna, finding out the environmental features of habitat and breeding ground for different birds, especially the effect of avifauna habitat and breeding after manual extension of wetland at Jinghe River outfall and the environmental effect of wetland weeds integrated utilization, so that scientific evidence can be provided for the recovery mode and planning & construction of wetland ecology. The detailed working proposal is shown in attachment.

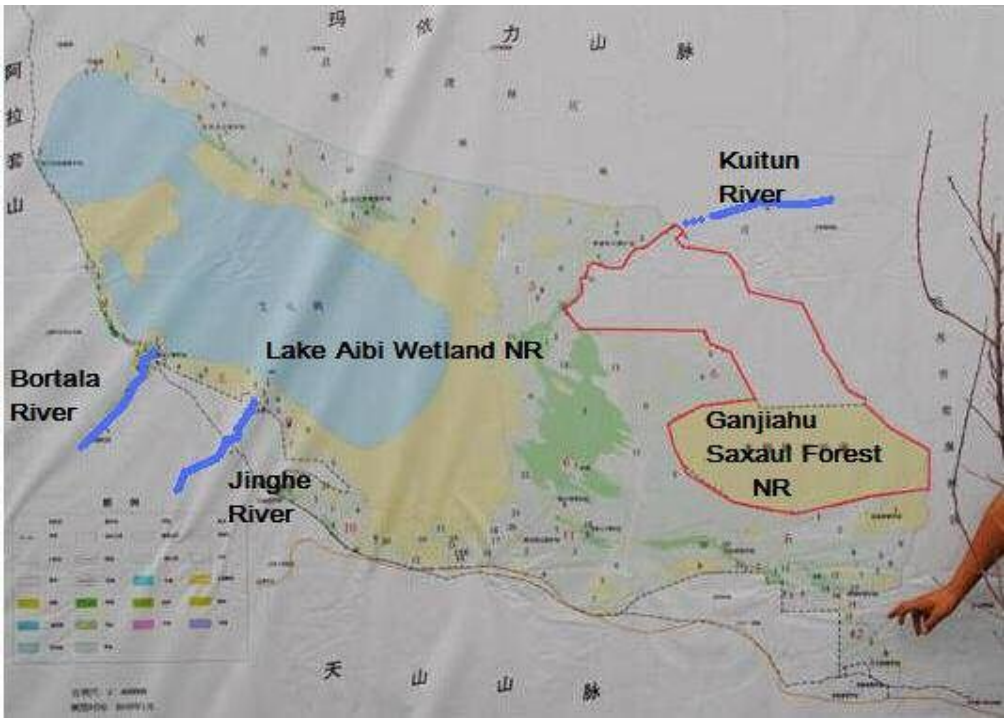


Fig 3.3-3: Lake Aibi Wetland National Natural Reserve and Ganjiahu Haloxylon Forest National Natural Reserve

d). Protection of Salamander: Salamander **(***Ranodon sibiricus Kessler, 1866*) is part of Ranodon, Hynobiidae, Caudate, Amphibia. They are relic species survival to this day from Late Carboniferous Epoch (300 million years ago), and they are the only am phibian with tail in Xinjiang. The present habitat for ranodon sibiricus Kessler only distributes in the upstream source zone of Bortala River which locates Hot-spring County in Bortala. The quantity of this population is just a little more than2600, in the condition of extremely endangered, and this population is included in Global Natural Resource Protection Association Species Protection Directory as “Easy to be endangered” in 1996, and included in China Endangered Animal Pink Book in 1998, but be included in China Species Red Directory in 2004 and the endangered grade is “Extremely Endangered”. The analysis includes fence isolation protection, habitat observation and transmission protection test, etc. Expend the population scale and habitat space of ranodon sibiricus Kessler by analysis and protection.

3.3.3.3 Biodiversity Protection Management

Extend the public wide participation in range and deepen the public wide participation in content by adopting administrative action, including: popular science education, field and un-field training, placard propaganda, media propaganda and so on; make the activities on each protected area biodiversity protection management be ordered steadily advanced with the help of the implementation of system construction and measure plan against concrete object and matter, improving the achievement of administrative management.

a). Training on management information and technique: includes field (Lake Aibi Protection Area) avifauna management training, un-filed (out the area, in China, in foreign countries) avifauna management training, un-filed (out the area, in China, in foreign countries) ecosystem management training, field (Lake Aibi Protection Area and Ganjiahu Protection Area) ecosystem management training, investigation technique training on the special plant & animal and habitat of protection area, long-term incorporation (in China, in foreign countries)deeper training on natural resource protection management and observation activity, and so on. The aim is to rapidly improve the operation information, professional technique and policy executing ability of protection area staff.

b). Management measure and plan constitution for protection area and protect project: Constitute implementation detailed rules and plan with high operability for each protection area and each protection project according to national relevant laws & regulations and relevant policy of Xinjiang autonomous region, including the policies related with assumed detailed activity content and starting plan for community participation in the two protection area, action regulation of staff & public in protection area, public participation guide and the resource utilization of protection area. The relevant policies are constituted or wrote based on the protection area existing concrete information and knowledge provided by protection area staff. The aim is to make system construction be an important part of capacity building.

c). Alternative breading measures for herdsmen: Fully make the conditions like renewable resource around protection area and in buffering land, protection area management and project required animal labor (for example: house and camel) as the prompting factors to stop grazing; analyze

the level of sustainable cistanche salsa herborization, then apply licensing system based on study result; carry out patrol and execute the regulation that allows qualified herdsmen to herborize under supervision plan, precluding all illegal herborization. At the same time, train sustainable methods and quantity control ways for license possessors. Protection area authority carries out patrol and observation on herborization quantity together with license possessors, which can improve the positivity of herdsmen to stop grazing in protection area.

d). Guide decision-making from expert consulting group: Biodiversity protection is an undertaking with powerful system scientificity, professional theory and professional technicality, while the general training just is of basic & primary infotainment and relevant technical issues. Each protection activity of protection area has the guide of famous scientists and experts including multi-aspect natural science and economic sociology, which is the foundation to make sure the activity be effective and safe. Due to the protection activity will include the research to unknown natural more or less, and the activity itself means interference and influence, it is very crucial to rightly operate the plan and grasp the degree. Thus, it is necessary to invite several fixed or unfixed experts (scientists) to guide the decision in the whole implementation progress of project based on the project plan.

e). Propaganda in local area or bigger area: Use placard, slogan nameplate, publications and traditional & modern media to widely propagate project background, project content and project activity progress, spreading the understand & cognition of the public to gain the society-wide positive support and earnestly participation.

3.3.3. 4 Livelihood Enhancement

a) Demarcation, using boundary posts and signs, and protection against livestock grazing of an area dedicated to grass collection (for pan feeding domestic animals) in the 24km2 area inside the NWR Experimental Zone where Kekebasto community is allowed to graze animals

b) Priority hiring of Kekebasto herders to be NWR staff, whether seasonal or long term work, in patrolling, monitoring and other NWR activities, as an incentive to engage in reserve management and to reduce reliance on grazing livestock in the reserve (years one through four)

c) Training of Kekebasto community members to be able to undertake employment with the NWR

d) Training (likely off-site in larger towns) of Kekebasto community members in specific skills (ie vocational training) to assist in employment opportunities to develop livelihoods and reduce reliance on grazing livestock in the reserve (years one and two)

e) Training on-site of Kekebasto community members in skills to assist in employment opportunities to develop livelihoods and reduce reliance on grazing livestock in the reserve (years one to three)

f) Establishment, staffing and provision of supplies of a basic clinic for the Kekebasto community, inside existing infrastructure at the NWR Headquarters, to improve livelihood conditions, using entirely counterpart funds

3.3.4 Technical Support and Project Management

Realize the improvement on management capacity building of Lake Aibi project (Project No: P110661) by adopting multiform management training, the consulting service guide from GEF experts and financial support for equipment upgrading, meeting the management requirement for the continuous development and improvement of technology and the timely consulting service on the relevant information and technique of each project activity. Apply advanced technical methods and quantized or clear targets to accurately tracking observe & estimate the project progress and project activity effect, providing analysis evidence for the project management to timely find successful experience or negative problems; make use of coordinated institutional framework and positive management attitude to guarantee that each activity of GEF Lake Aibi Project can successfully reach the prospective targets.

In accordance with the activity content, range and form requirement of Lake Aibi project, carry out comprehensive capacity building from the aspect of technical measures, work platform and personnel policy level, and support fully the activity of project technical experts, forming the project management model with expert support; apply overall target to observe and estimate each

activity of project at higher starting point, the content of observation and estimation includes the progress of project activity and the environmental benefit and social-economic benefits after activity implementation, timely forming the experience to solve land degeneration and to protect biodiversity and the model which can be promoted widely. Under the overall supervision of initial project evaluation group, apply the management model concretely implemented by Municipality GEF Leading Group, Expert Consulting Group & Project Office, State GEF Leading Group & Office. Apply active management method to carry forward the project detailed content to go with a swing and gain prospective achievement by perfecting framework construction.

3.3.4.1 Capacity building

The capacity building of project management mainly includes:

a) Management Training: this action includes: speed-up the accurate comprehension of project managers on project task and management mode, introduce the relevant laws, regulations, procurement management regulations, financial management regulations, medium-term adjustment skills, project monitoring evaluation skills, project evaluation and instigation, project demonstration and publication, project achievement duplication & popularization system, completion report skills, etc.

b) Technical Training: including: For project managers, carry out short intensive training on watershed unit integrated ecosystem management (IEM) theory, sustainable management skills, basic knowledge of natural forest management and biodiversity protection, the knowledge about arid zone water resources distribution and optimization, water-saving technologies, analysis and observation skills, natural reserve management, wetland protection and ecosystem maintenance, land management and water-saving irrigation and ecotourism, etc.

3.3.4.2 Project Management

According to the requirement of project action, establish two-stage management agencies of autonomous region level and autonomous prefecture level respectively. There is the participation of county leaders in autonomous regional agencies. The Organization-relation and Workflow Diagram are shown in Chart 8. Project management activities include the organization establishment and operation of project leading groups, project

management offices, supportive expert groups and project implementation units in the levels of autonomous region, autonomous prefecture, and county/natural reserve; provide training on capacity building for project staff to realize the effective project management and successful project execution; and carry out activity to promote the public understanding, including project achievement display and exhibition, the compilation of printings and the record of science documentary, and the publication and distribution of project documents.

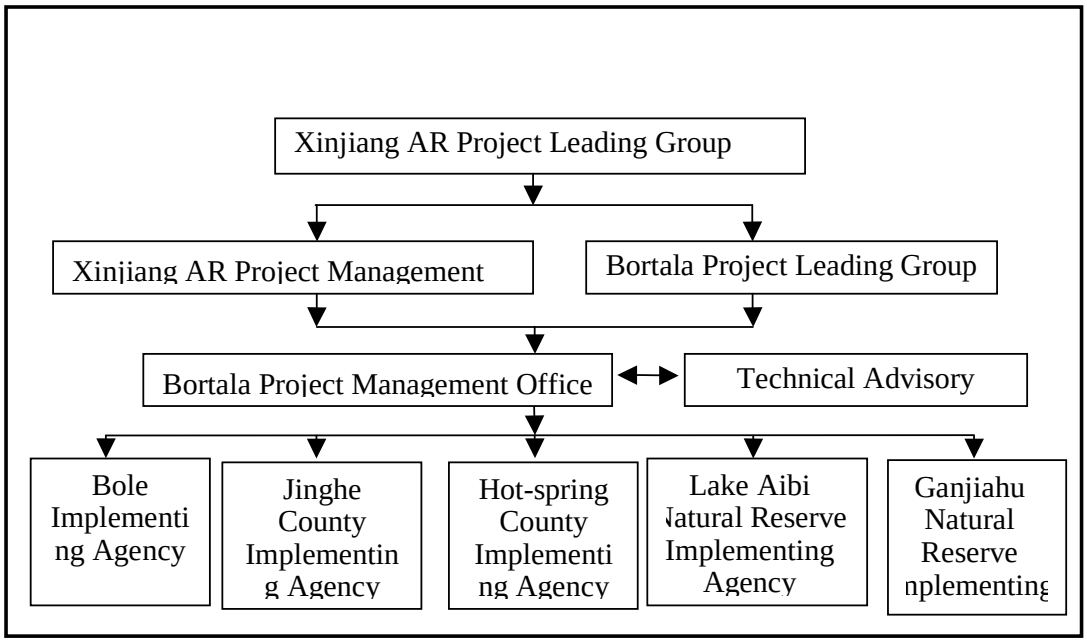


Figure 8 Project Management Organization-relation and Workflow Diagram

Carry out real-time estimation on the progress and plan implementation effect and influence of the project activity by building & implementing Observation & Estimation System. The project management will support the effective observation and estimation on the changes brought by the project. The Observation & Estimation System includes: (a) Project progress observation; (b) Purchase and financial management observation based on the Contract; (c) Environmental and social insurance observation; and (d) Project activity effect observation based on the target frame of project. In the duration of project implementation, the Project Office Observation Workgroup will check the data collected by Natural Resource Observation System constructed

under the support of project implementation workgroup and the project, and will also bring the checked data into the Half-year Progress Report of the whole project. The State Project Office will overall undertake the construction and implementation of Observation & Estimation System, and the project progress observation will be carry out by Municipality Project Office, State Project Office and project exploiting entities in the form of establishing Half-year Progress Report. While, the observation of environmental, social and project influence will be carried out by a self-governed observation unit selected by State Project Office.

3.4 Project land occupation and Countermeasures

3.4.1 Project land occupation

This project is a project of biodiversity protection, and the involving construction is less. In this project, water-saving irrigation subproject is only change the irrigation way, and not involving land occupation. In biodiversity protection subproject and sustainable land management subproject, natural forest protection and cultivation demonstration, birds' observation and the habitation improvement research, Lake Aibi red deer protection and monitoring, including observation-tower construction, will occupy a small amount of land(Part of them are the original area). Other research and monitoring subproject, and management system construction subproject are research, and publicity, training and project operation management, does not involve specific construction. The EIA report prepared in accordance with the feasibility report. Due to the feasibility study did not give a specific area of each construction project, the report only presents the relevant requirements on environmental protection.

3.4.2 Statistics of Tangible Impacts of Land Occupation and Countermeasures

（1）Statistics of tangible impacts of land occupation

□Immigration

Kekebasto is the only herder settlements in Lake Aibi Natural reserve, located in the buffer zone of Lake Aibi Natural reserve. Due to income-generating activities, the area that the herders can achieve is about 24 square

kilometers. The main activities of household income are grazing, fishing and digging herbal medicine. Now it has formed a Livestock point with 51 families, and the region is in Jinghe administrative area. After the establishment of protected areas, the region is classified as buffer zones of protected areas and adjacent to the core area. From the view of household register, people in Kekebasto region are attached to Tuoli County of Tacheng, but they are living in Boertala, especially in buffer area of Lake Aibi Natural Wetland Reserve.

According to Bortala and Tacheng Conference Memoire on Herder Arrangement Issues of Kekebasto and Herder Dispute Issues of Aqikesu Wetland in Lake Aibi Natural Wetland Reserve, towards the herders of Kekebasito, the two sides reached the following consensus: upholding people oriented, gradually improve the production and living condition of herders. Respecting herders' desire, those who want to live here by grazing can stay. Towards those who want to move and place, the two prefectures Bortala and Tacheng will solve the problem of resettlement by thematically reporting to the government of autonomous region, declaring herders' settlement project and transferring employment.

cultural relic

Cultural relic situation: petrogram and ancient tombs was found in Ranodon sibiricus Natural Reserve. It should strengthen the protection of cultural relics of the project area when carrying out related activities, avoiding affecting the cultural relics. The original plan is to set up additional water diversion project and take artificial rainfall measures. However, after technical and economic demonstration and environmental assessment, it suggests that using original habitat enclosure instead of original plan (Fence measures are also abolished), which has little effect on cultural relics of reserve.

Disposal method: in situ conservation.

3.5 Layout of each subproject construction road

Water-saving irrigation subprojects: Various fields surrounding the project area have tractor road, so this subproject doesn't need to construct new road.

The natural reserve subproject only includes building observation station and construction is using existing roads.

3.6 Layout of Dumping Areas and Quarries for Each

Subproject

3.6.1 Water-saving irrigation subproject

The amount of gravel required for water-saving irrigation works is very small, so the concrete and other building materials will be purchased by the contractor himself, and quarry is not arranged for water-saving irrigation subprojects. Since feasibility study did not give the specific location of dumping areas and quarries, so this report only proposes layout and use requirement of dumping areas and quarries.

3.6.2 Land management subproject

These subprojects include natural forest protection and cultivation demonstration, forest resource monitoring, grass condition stock capacity evaluation, not involving dumping areas and quarries.

3.6.3 Natural Reserve subproject

The construction projects that this subproject including are birds observation and habitat improvement, conservation and restoration of Lake Aibi birch, and protection and monitoring of Lake Aibi red deer. The concerning constructions are small, only birds observation and red deer monitoring will build several far-infrared monitoring towers, The amount of gravel required for this subproject is very small, so the concrete and other building materials will be purchased by the contractor himself, and quarry is not arranged for natural reserve subproject. This subproject is located in Natural Reserves, so it should reasonably use materials and reduce the generation of waste slag. The waste slag should be timely take out of Natural Reserves for other uses or disposal, and it forbids setting slag dump within Natural Reserve.

3.7 Construction Methods

3.7.1 Water-saving irrigation subproject

(1) Trench excavation

The trench opening is about 1m in flat area normally. It will be widened properly in the area with complex topographic conditions or deep excavation according to the geological conditions. To facilitate the operation, normally the trench depth is below the maximum frost depth, so the mean design

excavation depth of the trench will be determined based on the maximum frost depth of the project area. There should be quite wide working space at the position of valve in the valve shaft.

(2) Trench bottom leveling

The bottom of the trench should be leveled and cleared from debris, nub and other hard matters prior to pipe laying. The trench excavated in subsidence earth should be soaked with water. Its bottom should be leveled after full settlement, and then the irrigation facilities will be laid.

(3) Earth backfill

As for earth backfill, first wet broken earth will be used to backfill both sides of the pipe and be compacted solidly, and then the all-round backfill will be conducted.

3.7.2 Natural reserve subprojects

The main construction content of this subproject is building far infrared video surveillance tower, and the important thing during the installation is tower assemble and install. Under the premise of fully considering the impact on reserve and guaranteeing the project quality, the construction methods are as follows:

1 Tower assembly program

The tower has characteristics of high, big, heavy and difficult to control welding distortion, therefore, it can set up assembly platform on the ground, and use the method of bolts fastening first and then overall symmetry welding to assemble. To achieve bolt fastening, it should sets gusset to add bolts in Upper and lower surface of both ends of each horizontal web member, to fix horizontal web member.

2 The construction points of tower assembly

Tower lofting should be strictly in accordance with design drawings. According the ratio of 1:1, the tower is staked out on the steel platform. To ensure the quality of the tower assembly, the error of length, width of each template should be less than 1mm. Each stress type steel member are not allowed an interface. Welding assembly should be done by welders who hold the appropriate qualification certificate, and should be in accordance with operating instructions and the welding parameters.

3 Tower lifting

In order to protect reserve and considering the difficulty of drive a large crane to the construction site, monitor tower lifting use lift construction by setting up double "□"character backstay. To ensure the accuracy of the tower installation, first it installs the tower hinged-hinged beam on the foundation, and fixed it with profile steel, to make supine surface of hinged-hinged beam be horizontal. Then connect the connecting plate of tower bottom with hinge, and finally assembly weld junction panel and ribbed slab after tower hoisting alignment.

During hoisting large-scale steel structure, to avoid deformation because of non-uniform load, the force analysis and calculation should be done first before construction. Through calculating the tower, it can determine the location of lifting points and check the member bar strength at hanging points. According to the checking results of member bar strength, effective measures can be taken to avoid deformation in the lifting process and to ensure the safety of the construction process.

3.7.3 Land Management subproject

This subproject is only related to monitoring and demonstration establishment, such as forest monitoring sample plots, natural grassland monitoring sample plots, sign post inserting. This subproject has little impact on the environment. Through the separation fence, monitor and control of pests and diseases, forest fire, artificial reseeding and other measure, Natural forest demonstration projects is to protect natural forests, and has little effect on the environment.

3.8 Project implementation schedule and investment

3.8.1 Project implementation schedule

Project duration: from June 2011 to June 2015

3.8.2 Composition of capital

The budget including all activities is 81.89 million RMB, equating 12.04 dollars. In order to carry on this project, plan to apply GEF for donation 3 million dollars; government of Bortala Mongol self-governing state provide 9.04 million dollars□12.04 million dollars in total.

3.8-1 Estimated cost of subsidiary project and investors listed as following (RMB)

The sub-project and investors	GEF investment	Government Investment	Total	of the total %
A. Evaluation and optimization of water resources	588.58	448	10,365,800	13.09
B. Sustainable land management	221.86	2434.5	26,563,600	33.55
C. Biodiversity Conservation	798.63	2717.55	35,161,800	44.42
D. Project management and support services	325.55	381.82	7073700	8.94
The total investment	1935	5982	79160000	100

4. Project Area Environmental Conditions

4.1 Bortala Mongolian Autonomous Prefecture Environmental Overview

4.1.1 Natural Environment Overview

4.1.1.1 Location

Bortala Mongolian Autonomous Prefecture located in the north-west of Xinjiang. Its east longitude ranges from 79□53′ to 85□47′, and north latitude from 44□02′ to 45□23′. It is adjacent to the Tacheng Area in west, and to Yili Kazakh Autonomous Prefecture in south, and its north is border with the Republic of Kazakhstan. The boundary line of Bortala is 380 km long. Area of the whole prefecture is 27,000 square kilometers, including Bole city, Jinghe county, Wenquan county, Alashankou port administration area, Sayram Lake Scenic Spots, and Xinjiang Production and Construction Corps fifth agriculture division and its 11 regimental farms. In 2007, the total population reach 472,900(include the people of Production and Construction Corps fifth agriculture division). Bortala Mongolian Autonomous Prefecture has 35 nationalities, and the population of Mongolian, Han, Kazak, Hui is more than 10,000. Bole city is the metropolis of Bortala Mongolian Autonomous Prefecture and location of division headquarters the fifth agriculture division of Xinjiang Production and Construction Corps.

4.1.1.2 Topography

Bortala Mongolian Autonomous Prefecture is located in the hinterland of the Eurasian Continent, which crowed by hills in west, south and north. The central section is a horn-shaped valley plain, the west is narrow western, and the east is open broad. The whole Bortala surface is like a begonia leaf. From east to west, it is 315km length, and it is 125km from north to south. The highest mountain is the Main Peak of North Alatao Mountains at an elevation of 4569m. Lake Aibi basin is the lowest places at an elevation of 189m. The geomorphic feature roughly consists of three units, which are mountains in the north and south sides, central Valley and eastern basins. From east to west, the sloping was gradually increased.

4.1.1.3 Climate

Bortala located in the inland, and the climate belongs to temperate continental climate, with long sunshine hours, big temperature difference between day and night. The extreme maximum temperature is 44 ℃, extreme minimum temperature is -36 ℃, and frost-free period is about 153 to 195 days. Light, heat, water and soil elements of Bortala are well-integrated, which are suitable for planting cotton, wolfberry, wheat, corn, rice, sunflower, licorice, ephedra, tobacco, sugar beet and various fruit and other crops.

4.1.1.4 Land Resources

Total land area of Bortala is 27,000km^2, including 119,900 hectare cultivated land and 175,600hectare forest land. The average amount of land per person is 7.31 hectare in Bortala, and the cultivated land, grassland, forest land reach 0.35, 4.73 and 0.48 hectare respectively, which are 7.9 times, 2.9 times, 17.5 times and 3.6 times of our national per capita area separately. Bortala Mongolian Autonomous Prefecture has conducted three times wild land survey and once national soil survey. The soil type of Bortala can divided into 21 soil groups, 42 subgroups, and 92 soil genus. According to the characteristics of soil-forming processes and soil properties, the soil can be grouped into 10 soil orders, 15 suborders. In addition to the soil types mentioned above, there are salt crust, salt marsh, bare soil in Lake Aibi basin, and bare rock, glaciers, rivers and lakes in mountains.

4.1.1.5 Water resources

（1）Regional water system Composition

There are 6 rivers with the annual runoff over 1×10^{8}m^3 in the whole Bortala, and the total runoff reaches 13.23 × 10^{8}m^3, occupying 80% of the available surface water resources(see fig1).

（2）River runoff characteristics

1）Bortala River

It originates from Hongbielindaban of the junction of Biezhentao Mountain and Alatao mountain. The basin area is 11,367km^2, river length is 252 km, drainage density is 0.176, the average channel slope is 10%~8.3%, and annual runoff is 3.19 × 10^{8}m^3.

2）Wuerdakesai River

This river originates from Muwusidaban of Biezhentao Mountain. The basin

area is 1000 km^2. The river is 101km long, which flows from south-west to north-east, and pours into Bortala River at the Akyar. The main supplies are rain, spring water and melt water. The runoff is relatively stable, and the annual runoff can reach $1.48 \times 10^8 m^3$.

3) Daheyanzi River

This river originates from junction of the Keguerqin and Kushumuqieke Mountain. The basin area is 1820 km^2. The river is 107 km long, and pours into Bortala River in the vicinity of Xintala. The main supplies are rain, groundwater, and melt water. The annual runoff can reach $1.38 \times 10^8 m^3$.

4）Aqiale River

The main stream originates from Keguerqin Mountain and the east tributary originates from Poluokenu Mountain. The river flows from south to north, and the basin area is 628 km^2. The river is 55km long, and the annual runoff is $1.36 \times 10^8 m^3$.

5）Halatuluke river

It originates from south slope of the Alatao Mountains, and flows from north to south. Most water resources of this river are used by human, and it injects into Bortala River only in the flood period. The river bed gradient is 33.3%~ 16.7%, and it is a typical mountain stream river, which the basin area is 188 km^2 and the annual runoff is $1.3 \times 10^8 m^3$.

6）Jinghe

It originates from the north slope of Poluokenu Mountain, and the basin area is 2,150 km^2. The river is 114 km long, and the annual runoff is $4.17 \times 10^8 m^3$. it injects into Lake Aibi from south to north. The main supply is melt water, rainfall and groundwater. Besides, there are other 49 creeks, and the water amount is very small. However, the amount of the water increased quickly in rainfall season, so it often rise and drop steeply. After the mountain pass, most dissipate and leak in alluvial-proluvial fan plain. The annual runoff is about $5.12 \times 10^8 m^3$.

Fig 4.1-1 Water System in the Project Area

（3）Water Resources

The total surface water resources of Bortala Mongolian Autonomous Prefecture are 24.78 × $10^8 m^3$, and the available capacity is 16.5 × $10^8 m^3$. The total groundwater supplementary amount is 10.75 × $10^8 m^3$, and 4.51 × $10^8 m^3$ of which can be developed. Deducting the conversion part of surface water and groundwater, the total water resources of Bortala is 26.54 × $10^8 m^3$, and the annual total available amount is 21.01 × $10^8 m^3$, accounting for 79.2% of total water resources. At present, total irrigation water using amount is about 14.7 × $10^8 m^3$. There are 6 rivers with the annual runoff over 1×$10^8 m^3$ in the whole Bortala, and the total runoff reaches 13.23 × $10^8 m^3$, occupying 80% of the available surface water resources.

Bortala Mongolian Autonomous Prefecture is rich in water resources, and per capita water resource is 5,786m^3. At present, the already developed and utilized water resources only account for one 33rd of the theory reserves. Bortala River is the largest river in Bortala Mongolian Autonomous Prefecture, and the annual runoff is 5.77× $10^8 m^3$. Jinghe is second, and the annual runoff is over 4.74 × $10^8 m^3$. Besides, annual runoff of Dayanzhi river, Etuokeaier river, Aqiale River and Hriturege rver are all over 1× $10^8 m^3$. In addition, there are 75 valley streams, 17 mountain Streams and 52 plain springs, and the state's annual runoff is 2.026 × $10^8 m^3$. There are 5 lakes, and area of Lake Aibi is 860 square kilometers. Sailimu Lake is the second, and area of it is 458 square kilometers.

4.1.1.6 Animals and Plants

Bortala has hundreds of wild animals. Early research shows that the prefecture owns 3 classes, 10 orders, 17 families, and 39 species rare wild animals. Nine species of the wild animal are the first class national protected animals, such as sable, snow leopard, ibex, golden eagles, Aguila heliaca, Haliaeetus leucoryphus, lammergeier, beavers and bustard. Twenty seven of the species are the second class national protected animals, for example brown bear, stone marten, snow rabbit, mountain snow cock, red deer, Cygnus cygnus, cygnet. Besides, there are 3 first class autonomous regional protection animals, 1 second class autonomous regional protection animals. There are 79 families, 413 species medicinal plant resources, such as hay,

ephedra, sea buckthorn, wolfberry, Cistanche Salsa, apocynum and pearl.

Lake Aibi project area is located in flora intermediate zone of Central Asia to Mongolian. It has 2061 kinds of wild plants, including 23 State protection species. There are 300 kinds of wild animals, including 60 State protection species (15 species list in appendix □and □of Endangered Species of Wild Fauna and Flora). There are also 78 kinds of aquatic organisms, 420 kinds of insects, and 143 kinds of Macroscopic Fungi.

There are some endemic species in and around Lake Aibi wetland, such as Lake Aibi Birch (now only exist 322 plants), Red deer(very likely to be a new subspecies of red deer, now only exist 70), Ranodon sibiricus (has been listed as International critically endangered species, according to statistics there are only left 2400 in the word), and precious plankton- Artemia. Besides, there also has international rare plants Haloxylon persicum and the international rare snow leopard.

4.1.2 Projects Involving Environment and Ecologically Sensitive Areas

There are three Natural Reserves involving in the project, which are Lake Aibi Wetland National Natural Reserve, Ganjiahu Saxoul forests National Natural Reserve and Ranodon sibiricus Natural Reserve.

Sensitive areas referred in the project has mapped in figure 4.1-1:

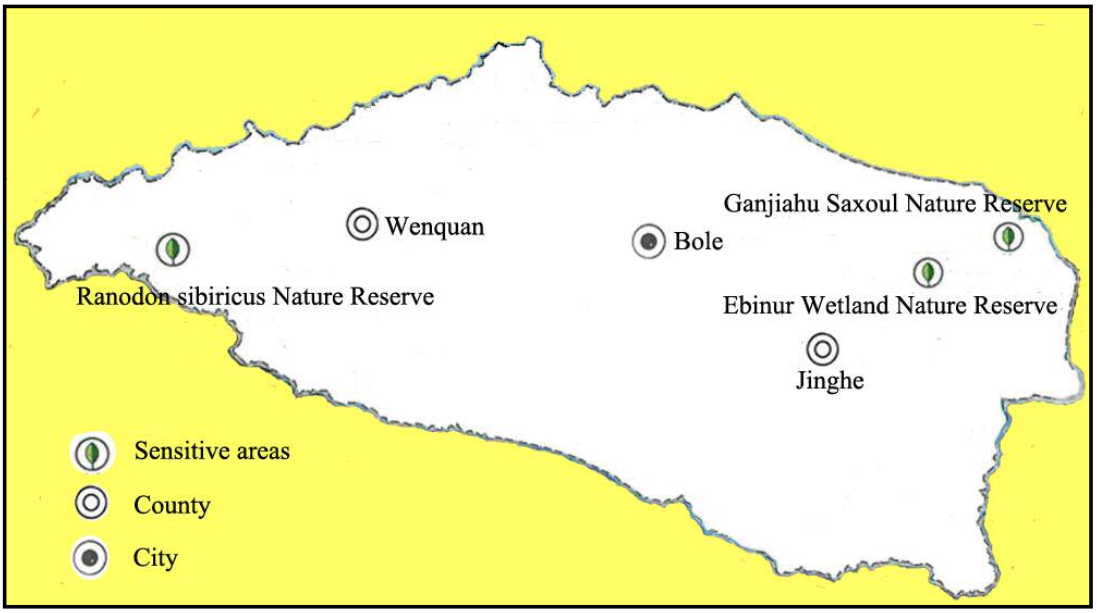


Fig. 4.1-1 The Referred Sensitive areas

4.1.2.1 Lake Aibi Wetland National Natural Reserve

Lake Aibi Wetland National Natural Reserve is located in Bortala prefecture. Its east longitude is 82°33′47″, and the north latitude ranges from 44°31′05" to 45°09′35". From east to west it is 102.63km long, and from north to south it is 72.3km wide. The basin strides across three counties, which are Jinghe, Bole, Ala Pass Port. The Total area is 2670.85 km^2.

Lake Aibi is the lowest depression of the west Junggar Basin, only the Northeast connected to the Gurbantonggut Desert, and the other sides are all crowed by mountains. The lake beach is composed by the piedmont alluvial plains, and rock desert, gravel desert, desert, desert soil, salt desert, marsh, beach are widely distributed on it. Lake Aibi is located in the middle-west of the wetland, and the elevation is 195m. At present, only $6\times10^8m^3$ water of the river pour into the lake, and the annual average area of Lake Aibi is about 500km^2.

Lakebed of the Lake Aibi is flat. Lake Aibi belongs to shallow lake. Now the average water depth can reach 1.4m, the depth of deepest area is 3m, and the water mineralization is100-300g / L.

Lake Aibi belongs to typical continental arid climate, which is drought and rich in light and heat resources. The average annual temperature is 6 to 8□, the lowest monthly average temperature is below -17□, while the highest monthly temperature can reach 28□. The accumulated temperature is 3000 to 3500□, and frost-free period is160 days. The annual average relative humidity is 50%. Due to drought climate, the extreme relative humidity is below 5%. The average annual precipitation is 90.9mm. However, the annual evaporation is as high as 3790mm. Lake Aibi wetland is located in the main air passage, and the strong wind days (>17m/s) can reach 165. Under the action of the wind, exposed dry lakebed dust become sand storm source.

Lake Aibi wetland is an important Bird Areas（IBA, and the number is CN112. Alashankou is an important bird migration passage, which is in the northwest of Lake Aibi. There are large areas of reed swamp in the south of the lake, which are breeding grounds, migration routes and dak of the birds. In migration period, there are hundreds of thousands of waterbirds passing

through. The international threatened birds in project area are Oxyura leucocephala (endangered) and Houbara Bustard (VU). The birds that number is more than 1% of the central asia - south asia stocks are mute swans, cormorants, red duck, Shelduck, Grey goose, bean goose, mallard, golden plover spot, crested wheat chicken, Green foot Sea snipe, anti-billed Sandpiper and Black-headed Gull. Ranodon sibiricus has been included in the World Conservation Union Red List (IUCN). In 1994, the animal was written into the “China Red Data Book of Endangered Animals” and the endangerment class is "very dangerous"; Lake Aibi Cervus elaphus also listed in the (IUCN), and the endangerment class is "little to be concerned about."

Both Lake Aibi Wetland National Natural Reserve and the Ganjiahu Saxoul forests are national Natural Reserve, and the Ranodon sibiricus Natural Reserve is a provincial Natural Reserve. There are 2,061 kinds of wild plant species, including 23 kinds of national key protected species. Vegetation distribution condition of Lake Aibi Wetland National Natural Reserve can be seen in figure 4.1-3. Lake Aibi Wetland National Natural Reserve has 300 kinds of wild animals, including 60 kinds of national key protected species (15 of the species have written into CITES Appendix □, □). Besides, there are 78 kinds of aquatic organisms, more than 420 kinds of insects and 143 kinds of large fungi.

In addition, the Lake Aibi Wetland Natural Reserve is in the process of join into the Ramsar Convention.

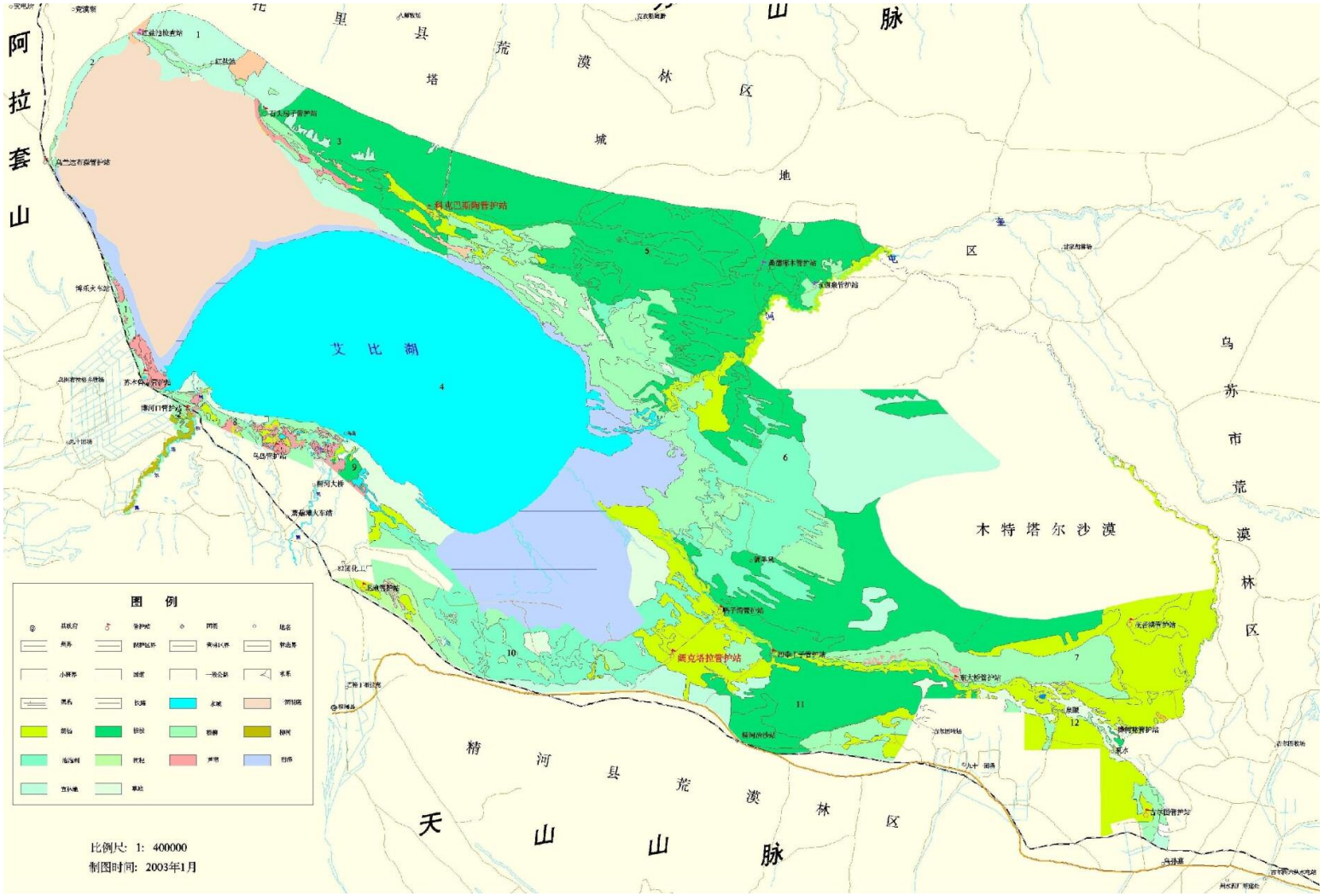


Figure 4.1-3 Lake Aibi Wetland National Natural Reserve Vegetation Distribution Map

4.1.2.2 Ganjiahu Saxoul Forests Natural Reserve

Ganjiahu Saxoul Forests Natural Reserve is located in the west of Junggar Basin, and belongs to the Lake Aibi basin areas. East and southeast of Ganjiahu Saxoul forests is adjacent to Wusu oasis and Kuitun Wieringermeer. Its south is connected to the Tianshan Mountains, its west is the beach of the Lake Aibi, and its north is adjacent to the Kitayama. The total area is 54,667 ha, the core area is 6,455 ha, buffer zone is 25,935 ha, and the experiment area is 22,277 ha.

There have two management branches (Jinghe and Wusu), which are responsible for protecting the Natural Reserve. But the project is only related to department of Jinghe.

(1) Physiognomy

Ganjiahu Saxoul Forests Natural Reserve is adjacent to Lake Aibi in the West. From the large physiognomy unit, it belonging to the rolling desert plain with Lake Aibi as sunken centering. Ganjiahu Saxoul Forests Natural Reserve as four physiognomy types, which are torrential gravel plain, central soil fluvial plain, aeolian dunes and the modern river fluvial physiognomy.

(2) Hydrology

The water resources are abundant in Ganjiahu Saxoul Forests Natural Reserve. Kuitun River, Four Trees River, Guertu River which originates from the north Tianshan Mountains are all converge here and flow into the Lake Aibi. Along the river, there form many brook, reed lakes and swamps. However, in recent decades, the river resource is used by local residents who live in the upper apart, lead to disappearance of reed lakes, swamps day by day.

(3) Climate and soil types

The climate of Ganjiahu Saxoul Forests Natural Reserve is temperate continental climate, belonging to temperate arid areas. The zonal soil is gray brown desert soil. It is rich in sunshine and heat resources, with strong and much wind and long frost-free period. It is hot in summer and cold in winter, and both the daily range and annual amplitude of temperature are large. It also has strong evaporation, which has the characteristic of temperature continental arid climate.

Ganjiahu Saxoul Forests Natural Reserve is the only Haloxyon protected

areas of temperate desert zone of China, and the main protect species is haloxylon persicum, which is rare and only exist there. Owing to its unique geographical position, the protected area is very important to the ecological security of and the sustainable economic development of the Northern Slope of Tianshan Mountains. Junggar Basin is the centralized distribution area of Haloxylon persicum in our country, and its distribution area accounts for 68% of our county‘s. According to statistics, China Haloxylon desert vegetation has 30 families, 123 genera, 209 classes, and Haloxylon desert vegetation of Junggar Basin has 29 families, 123 genera, 184 classes.

Ganjiahu Saxoul Forests Natural Reserve is the Haloxylon centralized distribution area of Junggar Basin. There are many desert physiognomy types various ecological systems. Therefore, it play an important role in protecting Haloxylon desert system and rare wildlife, maintaining the balance of desert oasis ecological system, and combating desertification. The forest resource distribution of Ganjiahu Saxoul Forests Natural Reserve is shown in Fig 4.1-4.

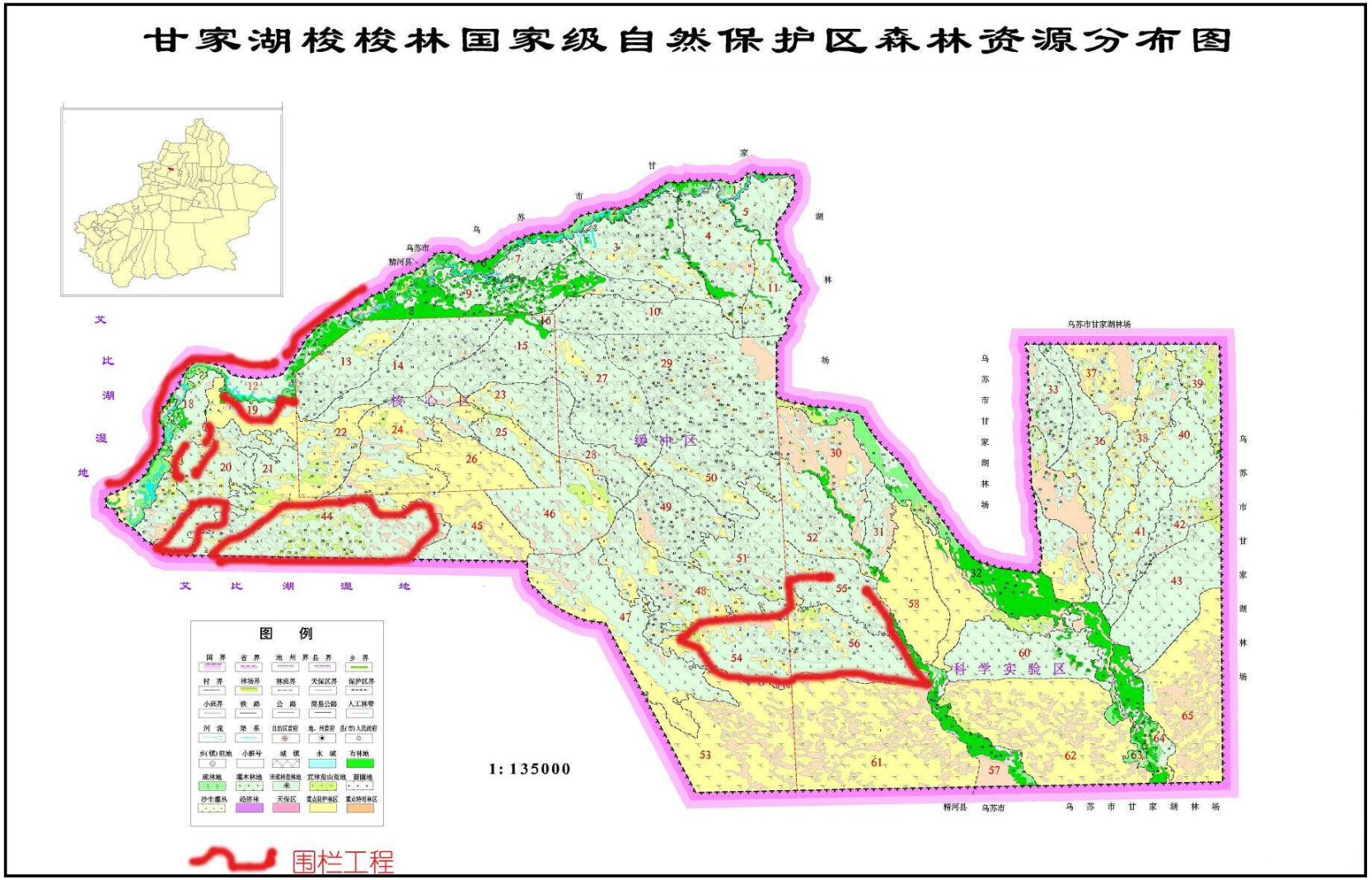


Figure 4.1-4 The Forest Resource Distribution Map of Ganjiahu Saxoul Forests Natural Reserve

4.1.2.3 The Ranodon Sibiricus Natural Reserve

The area of the Ranodon sibiricus Natural Reserve is 694.5 ha, and the area after increase is 101415.8 ha (see Fig 4.1-5). The core zone and buffer zone are all state-owned forest, and the land and resource ownership are belong to the Natural Reserve. Ranodon sibiricus is the first class protected animals of autonomous region, and is the only surviving tailed amphibians in Xinjiang. It only left in the extremely narrow border region between Wenquan and Kazakhstan, which has irreplaceable function to vertebrate system evolution research. Because it's an extremely rare species, it has been listed in IUCN. The Ranodon sibiricus in Wenquan County has several habitats, such as Sulubiezhen and JieMai KeGou. Sulubiezhen habitat only has 7 square kilometers area, which is listed as Ranodon sibiricus Natural Reserve. At present, the number of Ranodon sibiricus decrease to 2000 from 8000 at the beginning.

4.1.2.4 Others

Bortala also has national forest parks, geological parks, scenic areas, such as the Sahara spit Brook Forest Park, Rock valley national geological parks, and the Sayram Lake National Wetland Park. However, these regions are not involved in the project area.

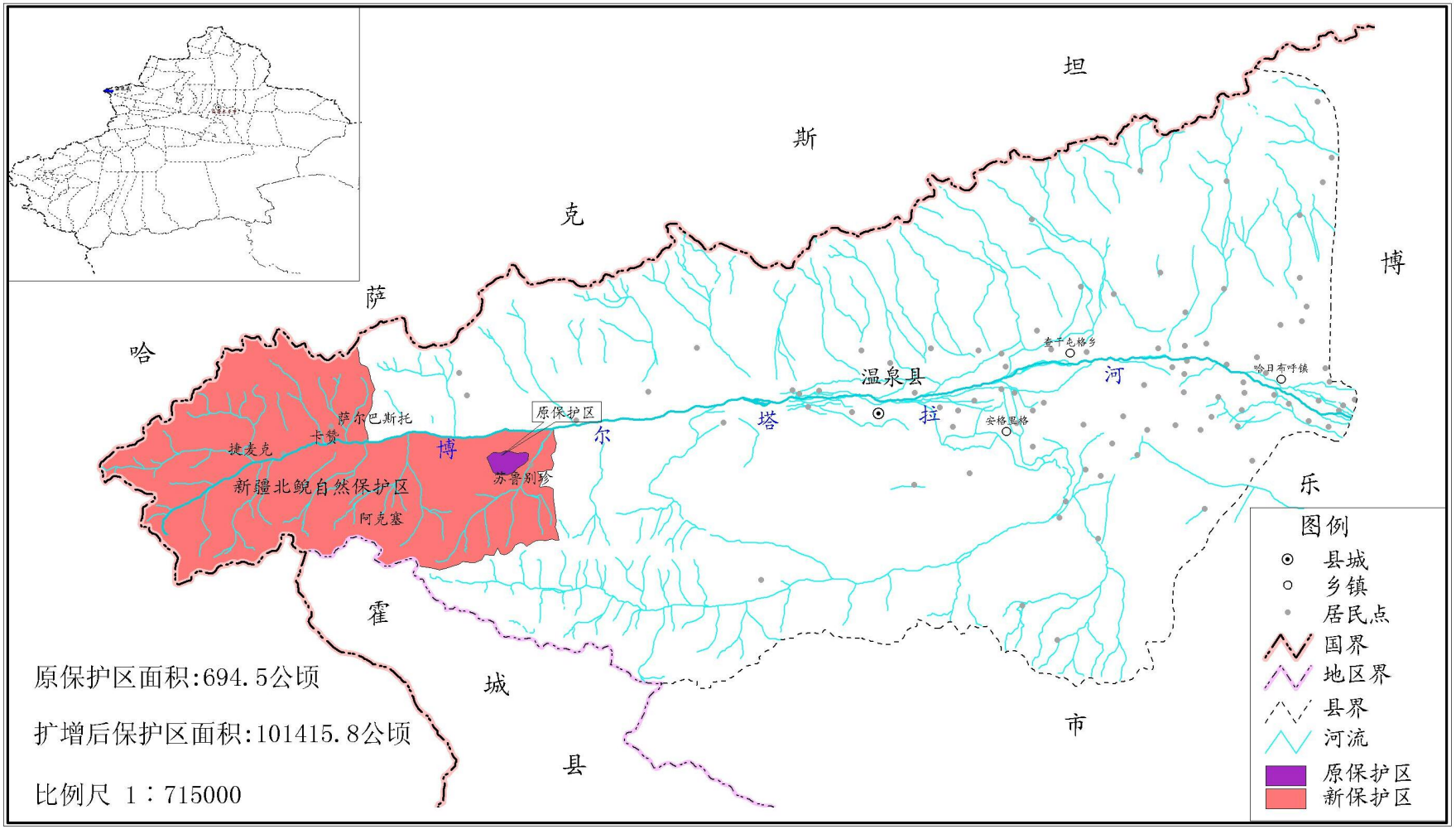


Figure 4.1-5 Salamander (*Ranodon Sibiricus)* Natural Reserve Area – Proposed Expansion

4.1.3 Social Environment Overview

4.1.3.1 Administrative divisions and population

The Bortala Mongol autonomous prefecture contains four counties, i.e. Bole, Jinghe, Wenquan and Alataw Pass. There are four types natural reserve areas (wetland, forest, wild animal, desert ecology) and four State-owned Forest Farms in mountain areas. According to the Bortala Statistical Yearbook in 2008, the prefecture has 472,918 people. The population consists of 35 nationalities, such as Han, Uygur, Kazak, Mongolian, Hui, Dongxiang, Xibo, Man and Russia. The natural population growth rate is 9.49%.

4.1.3.2 Social economy

The national economy of Bortala Mongol autonomous prefecture is agricultural, port business and processing industry. In 2009, the GDP of the whole prefecture was 10.03 billion Yuan, increased 11.5% compared to the last year. The district GDP was 8.02 billion Yuan, increased 10.4%. From the view of industry, the primary industry went up 2.05 billion Yuan, increased 12.1% compared with that of last year, the secondary industry went up 1.38 billion Yuan, increased 32.1% compared with that of last year, and the third industry went up 4.59 billion Yuan, increased 4.6% compared with that of last year. The ratio of these three industrial structures was 25.6:17.2:57.2. District per capita GDP was 22,402 Yuan, increased 9.4%. Translated by average exchange rate of that year, it reached 3279 dollars, which broke through 3000 dollars. The annual consumer price index was 101.1, and the price level rose 1.1% at the same ratio.

The whole state had 478,400 people at the end of the year 2009, increased by 1300 people compared to the last year, and the increase rate was 0.3%. It included urban population 167,000, increase rate was 0.9%, and the urbanization rate was 34.9%. The rural population was 311,400, decreased 0.06% than that of last year. Annual birth rate was11.35 ‰, mortality rate was 3.14 ‰, and the natural population growth rate was 8.21 ‰.

Per capita net income of farmers and herdsmen was 5963 Yuan, increased 529 Yuan, and increased rate was 9.7%. The workers' average wage was 22,449 Yuan, increased 15.5%. Neglecting the price factors, the actual growth rate was 14.3%. At the end of 2009, the urban residents' per capita living floor

area was 26.34 square meters, and rural resident's per capita living floor area was 24.7 square meters.

At the end of the year, the workers who buy the unemployment insurance reached to 30,800 people, increased 3.0%. 34,400 people got the basic pension insurance, increased 8.7%. 49,700 people bought the basic medical insurance, increased 5.3%. 31,000 people bought the Work injury insurance, increased 19.2%, which included 7,396 people migrant worker, increased 55.7%. 3.44 people bought the maternity insurance, increased 6.4%. The number of enjoy the benefits of urban and rural minimum living allowance was 34,900, decreased 1.4%. Among them, the number of people enjoy the urban benefits was 23,000, decreased 1.7%, and the number of people enjoy the rural benefits was 11,900, decreased 0.8%. The number of people participated in the new type rural cooperative medical reached 190,700, increased 9.2%. The number of people enjoyed the national subsidy and relief reached 1,154. There are 9 adoption organizations, 1048 beds, and adopted 879 people.

4.1.3.3 Mineral resources

Bortala prefecture owns 39 kinds of mineral resources. Among them, mine limestone, gypsum, perlite, marble and granite are the main non-metallic minerals. Salt, Glauber's salt, phosphorus, magnesium are the main metallurgical auxiliary materials. Iron, copper, platinum are the main metal miners, Occupy 28.3% of the Xinjinag mineral 28.3%, and the Lake Aibi salt and Glauber's salt are noted for its large amount, good in quality and easy to exploit. The salt reserves is about 1.25 billon tons, Glauber's salt reserves is about 97 million tons, and magnesium sulfate is about 1 million tons.

4.1.3.4 Cultural Relics

Bortala Mongol autonomous prefecture has long history. From time immemorial, it is a Minorities settlement. Serbs, the Huns, Rouzhi, Wusun, Rouran, Yuet-like, Turks, Khitan, Uighur and other ethnic tribes has been lived here. The ancient ancestors left a number of cultural relics, which is an important part of the Chinese culture.

Bortala Mongol autonomous prefecture has many antiquities, such as the ancient ruins, ancient tombs, ancient rock paintings and grassland stone human. Currently, the state has one national protected historic Site, 24

regional protected historic sites, 103 counties protected historic Sites. There are many types of ancient tombs on the Grassland pasture, which the surface was preserved quite well. From the surface of each tomb, they can be categorized into different types: the rubble tomb, sarcophagi, slab grave, mound cemetery, beard tomb, stone human tomb etc. From the second survey on cultural relics in 1988, they have found many rock paintings. In the 2008 to 2009 archaeological investigation, they found more, and the rock paintings in Wenquan is the most spectacular for its perfect sculpture techniques and rich content. The content is diverse, which has the human face, hunting, herding, dancing, wild animals, domestic animals etc. The project involves the rock paintings and tombs in Sulubiezhen Ranodon sibiricus Natural Reserve, but the construction contents is not in the scope of Historic Site, see Figure 4.3-1:

rock paintings

ancient tombs

Fig 4.3-1 Cultural Relics in Ranodon sibiricus Natural Reserve

4.1.3.5 Minorities

Bortala Mongol autonomous prefecture has 35 nationalities, Mongolian is the autonomous nation. Total population of the state is 424,300, of which 33% is the minority. Population in Mongolian, Uygur, Kazak, Hui is over 10,000 people.

4.2 Regional environmental problems

Lake Aibi Region is a confluence basin centering on Lake Aibi wetland. On the northwest, it faces a narrow channel Alashankou meeting the westerly current. On the east, it opens to Junggar Basin. As the terrain is surrounded

on three sides by mountain, it form natural environmental gradient of annular zone distribution centering on Lake Aibi. From snow and ice mountain to basin plain and to lake, dramatic environmental change of each part will l bring disaster to other parts. In the past half century, arid areas environment of Central Asia experienced the most intense human disturbance and left a deep mark in the history of regional environmental change, and Lake Aibi region was no exception. Project area is a region with rich and unique biodiversity in western China, and is also one of the most serious land degradation areas. Land degradation has drastically reduced biodiversity, and the ecological crisis has highlighted. All levels of government have been fully aware of ecosystems showing the trend of from the structural damage to functional disorders due to the sharp decline in biodiversity land degradation bringing great loss to local economic development and the production and life of farmers and herdsmen, and timely implement effective action step by step. Now the mainly facing ecological problems of Lake Aibi are as follows:

4.2.1 Wetland area has shrunk dramatically, the lakesides salinization and desertification has expanded

In the past 50 years, due to comprehensive influences of natural factors and human activities, water surface of Lake Aibi declined significantly. The lake is 1070km^2 in size in the mid 1950s, and shrunk to 499km^2 in 1980s. Affected by irrigation adjustment and fluctuations in rainfall, the lake has been restored after 2000, and once temporarily restored to more than 800 km^2. Then it appeared reduction rend, so Lake Aibi wetlands is at stake.

Although there is desert region in Lake Aibi region, but the desert basically was in fixed and semi-fixed state. With the lake shrinkage and surrounding wetland vegetation degradation, desertification has developed rapidly, appearing reactivation of fixed-dunes and bare land desertification. In the north of Lake Aibi, it also formed 4km wide wind-erosion drift sand belt from Jinghe Black Mountain to Kelierdun, five to six meter high drift sand 387 m from Uy highway. In the northern margin of Jinghe oasis farmland, activated dune attack the farmland with a rapid of more than 10 meters per year.

According to the survey, only in Jinghe from 1980 to 1996, sandy grassland area is 2.48 × 104hm^2, alkaline area is 0.71 × 104hm^2, and land degraded

area is 28.58 × 104hm^2 in 16 years. Grassland degradation seriously restricted animal husbandry development. Natural grassland carrying capacity decrease from 1hm^2 a sheep unit on average in 1980s to 2hm^2 a sheep unit in 2000.

4.2.2 Raging sandstorm

Shrinkage of the lake revealed a large area of dry lake. Since it is located in the outlet of Xinjiang Alashankou, with the rapid decline of Lake Aibi wetlands and frequent high winds, dry lake subjected to strong wind erosion. Wind erosion depth reach 2cm each year, and has become an important source of sand origin. Due to the exposed lake bottom formed by the heavy alkali-salinity soil, it has also become the birthplace of the typical salt dust, and brought serious injury to biodiversity conservation and socio-economic development of downwind areas. Jinghe weather station of lake downwind areas recorded dust weather change. In 1960s, the average annual sand and dust weather is totally 13 days, and it increase to 42 days in 1970s, 65 days in 1980s, and remain 63 days in 1990s. Produced damage is seriously restricting the healthy economic zone development of Tianshan Mountains North Slope. Severe sandstorm is directly endangering the normal operation of Eurasia Land Bridge railway.

According to Environmental Monitoring Station of Bortala prefecture in April 1989, it is measured that dust on the northern margin of Jinghe oasis reached 212.55t/km^2, and reached 182.28t/km^2 in October 1990. In May 3rd, 1991, Bortala prefecture Environmental Monitoring Station measured that the Total Suspended Particulate (TSP) concentration is 13.3mg/m3 in Bole, and soluble salt in dust is as high as 52.38%. In April 22nd, 1999, it measured that TSP concentration is 16.5mg/m^3 in Jinghe. TSP indicators have been far beyond the Urban Air Quality Standard. Meanwhile, according to the measurement of light intensity in sunny and flying dust weather by Jinghe Meteorological Bureau, flying dust weather lead to 50% reduction in light intensity, and 60% light intensity reduction under the plastic film.

4.2.3 Sharp Reduction of Biodiversity

Before 1980s, due to the rapid shrinkage of the lake, human collected firewood and over deforestation, nearly 60% of the lake vegetation has been decline. It is drought and overgrazing, and dust with grassland intrusion by saline and alkaline that aggravated grassland desertification, alkalization and degradation, and residual lakesides desert vegetation is changing into desert at a rate of 39.8km^2 per year. So it greatly damaged the living environment of wild animals, severe fragmented the local biological community distribution space, and made complete food chain based on Lake Aibi wetland ecosystems different to maintain. Natural regeneration capacity of many plants dropped significantly, even completely lost update ability in large area. Many animal populations significantly reduced, and some of them no longer appear in the region. For example, the saiga antelope has disappeared, snow leopard, at the top of the food chain, is also very rare.

Before 1950s, around Lake Aibi, there are 6.67 × 10^{4}hm^2 *Haloxylon ammodendron* forest, 3.78 × 10^{4}hm^2 Euphrates poplar forest, 1.0 × 10^{4}hm^2 meadow. Plus desert grassland the total area is 26.67 × 10^{4}hm^2. There are 13.67 × 10^{4}hm^2 desert secondary forest and 4.67 × 10^{4}hm^2 reed in Lake Aibi basin. According to the survey in 1978, the total area of *Haloxylon ammodendron* forest and Euphrates poplar forest is less than 4.0 × 10^{4}hm^2 surrounding Lake Aibi. Due to overgrazing and man-made sabotage, grassland degradation area is nearly 27.88 × 10^{4}hm^2 in Bortala prefecture. By 1990, the area of desert secondary forest decreased to 8.67×10^{4}hm^2, reed to 1.39 × 10^{4}hm^2. Since the sharp decline of lake level, coupled with over-collected firewood and deforestation, nearly 60% of the lakeside vegetation has declined, and the biomass sharply decreased.

4.2.4 Serious Degradation of Ecological Functions

In the past 50 years, Lake Aibi wetlands ecological functions seriously declined.

First, because the lake reduced in vast scale, the small climate of Wet Island significantly decreased in the arid zone. Boertala valley, Four Trees River, and the north slope of Western Tianshan Mountain formerly affected by lake moisture diffusion showed drought. Then, because Lake Aibi wetland ecosystems degradation□plant communities evolved from hygrophilous

vegetation to xeric vegetation to salt brine vegetation and to psammo tolerance vegetation. The density and coverage of Ultra-xeric small tree decreased, height of dominant plants reduced, and saline-alkali tolerant *Haloxylon ammodendron*, *Suaeda*, and *Salsola* reduced. The density of Sand-resistant plants with large root system was lower, such as *Haloxylon ammodendron*, *Calligonum*, *Agriophyllum squarrosum* and *Sageretia pycnophylla*. The age structure of *Haloxylon Persicum* was aging, i.e. rare young plants, slow update or even large areas renewal ability loss. Landscape fragmentation degree increased, biological habitat deteriorated, system stability reduced. Natural grassland carrying capacity decrease from $1hm^2$ a sheep unit on average in 1980s to $2hm^2$ a sheep unit in 2000. According to the survey, only in Jinghe from 1980 to 1996, sandy grassland area is $2.48 \times 104hm^2$, alkaline area is $0.71 \times 104hm^2$, and land degraded area is $28.58 \times 104hm^2$ in 16 years.

Second, biodiversity rapid loss leads to functional decline of biological species, gene pool and genetic resources center. The number and species of wild life decline, especially the birds, and geese, grey crane are basically extinct. Because of large area lake exposed, desertification extended around the wetland. Nearly 60% of the lake vegetation has been decline, and residual lakesides desert vegetation is changing into desert at a rate of $39.8km^2$ per year. Lake Aibi region developed into important source of atmospheric dust, soil and water conservation function of lake lost.

Finally, since the decline in lake water, the reduce scale of underground water table is more than 2m in lakeside, so the lake's water reserve function fade away.

In addition, Lake Aibi also undertakes irreplaceable function of biological population breeding and migration of arid region in Mid-Asia. Wetland degradation will inevitably lead to migrant, mainly habitat and breeding crisis of migratory birds.

4.3 Environment Assessment

According to Bortala environmental quality communique, it introduces the atmospheric, water, acoustic and ecological environment quality in the project area.

4.3.1 Water Environmental Status

4.3.1.1 Monitoring contents

The water environment monitoring contents of this project see in table 4.3-1.

Table 4.3-1 The water environment monitoring contents of this project

Water environment types		Monitoring time	Monitoring points	RemarK
Surface water	River	May, July, September of 2009	Bortala river, Jinghe river	it monitored 6 monitoring sections of Bortala river and 3 monitoring sections Jinghe river, and got 782 water quality monitoring data altogether.
	Lake	May, October of 2009	Lake Aibi, Lake Sayram	it monitored the 10 monitoring points of Lake Aibi and Lake Sayram, and 640 monitoring data was obtained.
Ground water	Centralized drinking water	The year of 2009	Bole City, Wenquan County, Jinghe County and Ala Moutain Pass	In Bole, it monitored once every quarter, the other places monitored once a year, and 246 monitoring data were got.

4.3.1.2 Evaluation results

（1）Rivers:Using the single factor pollution index method to calculate the result, the result showed that only eight of the monitoring sections reach the Grade III water standard of Surface Water Environmental Quality Standard (GB3838-2002), accounting for 88.9% of the monitoring sections. The monitoring sections of the downstream of Bortala river reached the Grade IV water standard of Surface Water Environmental Quality Standard (GB3838-2002), and the main exceed standard item is fluoride.

（2）Lakes: From the monitoring results, we can see that the Sayram Lake water quality remained stable, with no significant change compared to last

year. Using the single factor pollution index to calculate the result, the results showed that the lake water quality meets the Grade □ water standard of the Surface Water Environmental Quality Standard (GB3838-2002). Compared with last year, the Lake Aibi water quality still belongs to worse than Grade V, but the mainly excessive items increased. The main exceed standard items are fluoride, total phosphorus, total nitrogen, permanganate index and dissolved oxygen.

(3)Groundwater quality: Using the individual components evaluation method, the centralized drinking water sources of the whole Bortala all meet Grade III water standard of Underground Water Environmental Quality Standard (GB/T14848-93). On the whole, groundwater integrative quality evaluation level is well (Grade I).

From the monitoring results, we can see that the groundwater quality is well which can meet Grade III water standard of Underground Water Environmental Quality Standard (GB/T14848-93). In project area, 88.9% of rivers quality can meet Grade III water standard of Surface Water Environmental Quality Standard (GB3838-2002). The monitoring section in the downstream of Bortala river only reach Grade IV water standard of Surface Water Environmental Quality Standard (GB3838-2002), and the main exceed standard item is fluoride. Among the surface water, Sayram Lake water quality remained stable, with no significant change compared to last year. However, the water quality in Lake Aibi was still worse than Grade V, and the mainly excessive items increased. The main exceed standard items are fluoride, total phosphorus, total nitrogen, permanganate index and dissolved oxygen. Consequently, the environmental quality in Lake Aibi continued to deterioration, and protection measures are brook no delay.

4.3.2 Atmospheric Quality

4.3.2.1 Monitoring Contents

The Air environment monitoring contents of this project see in table 4.3-1.

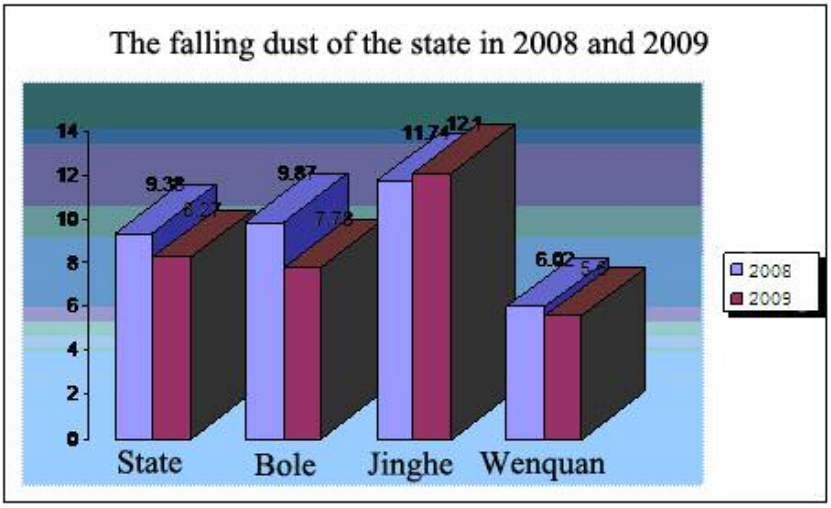
Monitoring item	Monitoring time	Monitoring point	Remark
Dust	The year of 2009	Bole city, Jinghe county, Wenquan	There are 8 dust monitoring places, Bole city owns 4, the other county

		County	owns 2, and every month monitored once.
Arid rain	The year of 2009	Bole City	In 2009, it has26 times acid rain monitoring in Bole City.

4.3.2.2 Evaluation results

(1)Falling Dust

According to monitoring results, the annual average falling dust is 8.27 t / (km2.30d), decreased 11.8% compared to last year. Bole City, Wenquan, Jinghe were 7.78t / (km2.30d), 5.60 t / (km2.30d) and 12.10t / (km2.30d) respectively, decreased 21.2%, 7.0%, increased 3.1% respectively compared to last year.

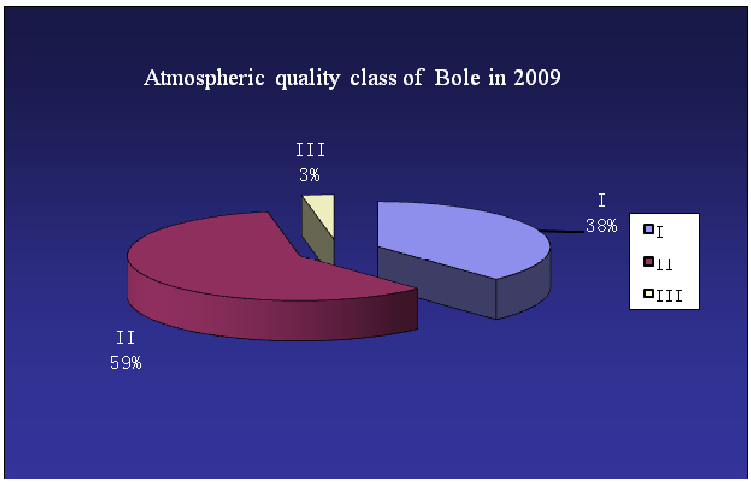


(2) Acid rain

According to monitoring results, the pH value of precipitation range from 5.4 to 8.3, and there is no acid rain (pH <5.6).

In 2009, the Atmospheric quality of Jinghe, Wenquan, Bole and Ala Mountain Pass all reached Grade II of Ambient Air Quality Standard (GB3095-1996). We monitored 352 days in Bole. 134 days meet the level I, accounting for 38.1% of the monitor days. 208 days meet the level II, accounting for 59.1％of the monitor days. 10 days meet the level III, accounting for 2.8％of the total monitor days. Annual air quality that above level “II’, accounted for 97.2%, increased 4.3 % compared to the last year. The city air quality was better than previous years. Primary pollutant is TSP, and the annual average

concentration is 0.136mg/m^3, and annual average concentration of sulfur dioxide and nitrogen dioxide were 0.009 mg/m^3 and 0.013mg/m^3 respectively.



From the above monitoring results, we can see that the air quality is good in the project area and improved over previous years.

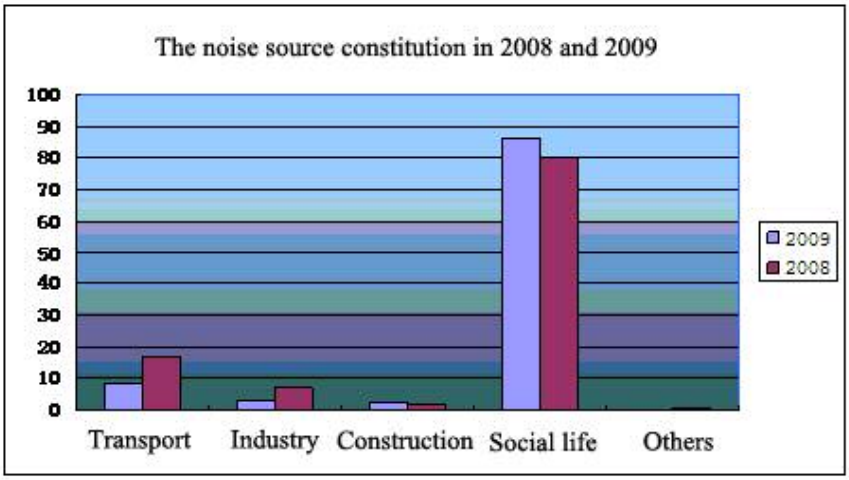
4.3.3 Acoustic Environmental Quality

4.3.3.1 Monitoring contents

In 2009, it monitored two counties and one city on the project area and the Alashankou of environmental noise of urban area and traffic noise respectively.

4.3.3.2 Evaluation results

The state's average equivalent continuous A-weighted sound pressure level (Leq) range from 35.1 to 65.0 dB (A). Compared to the last year, the regional acoustic environment quality has improved. In Bole City, the Leq in daytime is 49.9 dB (A), dropped by 2.5 dB (A), and the night was 44.4 dB (A). According to the Acoustic Environmental Quality Standard (GB3096-2008) , the acoustic environment in Bole is well.The Leq in Jinghe, Wenquan and Alataw Pass was 49.8dB (A), 45.9dB (A) and 48.6dB (A) respectively, so acoustic environmental quality of these places is well too.



Compared to the last year, the traffic noise condition has improved. In Bole, the average traffic equivalent continuous A-weighted sound pressure level (Leq) is 61.0dB (A), which dropped by 1.7 dB (A), and the traffic acoustic environment quality is well. The Leq in Jinghe, Wenquan and Ala mountain Pass was 66.3dB (A), 59.3dB (A) and 62.7dB (A) respectively, so the acoustic environment quality of these places is well too. Compared to the last year, 4.3% of the traffic noise exceeded the standard, decreased 2.3 percentage points. From the view of the noise source constitution, the main noise source is domestic noise, occupied 86.4%, and the second is traffic noise, accounting for 8.6%.

4.3.4 Ecological Quality

According to China's environmental quality evaluation research, the ecological quality of two counties and one city of Bortala rank in the middle and upper of Xinjiang. Among them, the ecological quality of Wenquan County is in general, and EQI is 35.18; the ecological quality of Bole is poor, and its EQI is 30.32; the ecological quality of Jinghe is also poor and its EQI is 29. The ecological quality of Bortala prefecture remained stable, with no significant change compared to last year. In 2009, the state forest coverage is 7.99%. It has two National Natural Reserves (Ganjiahu Saxoul Forest Reserve, Lake Aibi Wetland Natural Reserve), and two provincial Natural Reserves (Xiaerxili Natural Reserve, Ranodon sibiricus Natural Reserve). The total reserve area is 3271.8 square kilometers, accounting for 12.1% of the prefecture's land area. In 2009, *Wenquan Ranodon sibiricus Natural Reserve Management Act* was formally promulgated and came into force. At the same time, *Xinjiang Xiaerxili Natural Reserve Management Act (Draft)* has been submitted to the Autonomous Region People's Congress.

5. Alternatives Analysis

5.1 Without Project Scenario

According to the characteristics of the project and the main construction content, two programs we bring up are as follows:

Scenario I: Implement the Lake Aibi basin sustainable management and biodiversity conservation program

Advantage:

1. Promote the regional biodiversity conservation. With the implement of the biodiversity conservation project of Lake Aibi wetland, the prefecture's endangered species and endemic species can be protected as soon as possible. And this will be a remarkable contribute to the biodiversity conservation;

2. Taking the Lake Aibi biodiversity conservation as the main theme, the management of the Bortala Natural Reserve will be significantly improved;

3. The bad situation of Lake Aibi will be under control, and then the ecological conditions will be stable and gradually recover;

4. The regional water resources management can be strengthened, and it also can promote the protection of natural forest and grassland;

5. As Lake Aibi dry lake bed area can be controlled and may be reduced, the amount of salt dust because of the strong wind from Alashankou will be under control;

6. It can promote the alternative livelihoods for biodiversity conservation, ecological tourism, oasis agriculture structure adjustment, coordinate development between the agriculture and livestock, and improve the living standards of local people (including the minorities);

7. The biodiversity and existing environment protection project can promote the state's economic and resources use;

8. The establishment and development of Bortala export processing industry and Xinjiang North Slope of Tianshang mountain economic zone will obtain suitable environment and advantage. Therefore, it can effectively support development of Bortala and Xinjiang economic development capacity and raise the level of economic development;

9. Through the Eurasian Continental Bridge railway, direct and indirect economic benefits will be extended to the west of china, the whole country, the Central Asia countries and the other countries along the railway.

10. It can improve awareness and capacity of minority people about the biodiversity protection;

11. The government will be completely involved into the collaboration of different department, synergy the funding sources and project for the biodiversity conservation and socio-economic development.

Disadvantages:

1. Influence the water resources and interfere the regional hydrology;

2. Influence the groundwater level;

3. Surface water quality change, vegetation destruction and biomass loss;

4. Biological invasion.

Scenario II: Without the project

Advantage: Can avoid the environmental effects of project generating, and maintain present condition of Lake Aibi basin.

Disadvantage:

1 The water level of Lake Aibi surface will continues precipitous dropping, the lake area will reducing continually, and the wetland is on the verge of extinction, which directly threaten the safety of biodiversity species. The habitats of native birds will be loss and fragment, which seriously imperil bird perching, migration and reproduction.

2 Becoming an important sources of sandstorm and salt-dust in this area, poses a grave threat to the Bio-diversity Conservation and Social and Economic Development on the leeward region. At the same time, pose one of the biggest risks to the building and development in Northern Slope Economic Belt of Tianshan Mountains.

3 On account of the transportation of gale, the salt-dust in Lake Aibi region can gone with the wind to the glacial of West China, including Tianshan, which will accelerate the progress of melt in such area. The glacial is the major water source of the stabilization and development of the oasis in west china. Under these circumstances, there will be a grave threat to the Bio-diversity Conservation and Social and Economic Development on Bortala Mongol

autonomous prefecture and even Xinjiang.

4 Eurasia Land Bridge are serious affected by the sandstorm and soil erosion in the Lake Aibi region directly, where the hazards of sandstorm and soil erosion are serious. In recent years, more than 200 trains were running late and 3km roads were changed course on account of environmental problem. The highway connecting the port has 27km changed course.

In conclusion, ‘Do-nothing’ cannot protect environment of Lake Aibi basin. It is time to take some countermeasures to improve the environment, and this program can make it.

5.2 Water Saving Irrigation Alternatives Analysis

In modern times, agricultural irrigation methods can be divided into the 3 kinds, which are surface irrigation, sprinkler irrigation and micro irrigation. Traditional surface irrigation that includes the border irrigation, ditch irrigation, basin irrigation, flood irrigation. However, it is a bad irrigation method. The main defects are large amount of water consumption and lower utilization efficiency. Sprinkler irrigation is widespread in our country, but the utilization efficiency is still very low.

Modern agricultural irrigation includes micro-irrigation, drip irrigation and filtration irrigation. These techniques are well in efficiency. Of course, they also have some defects.

5.2.1 Traditional Surface Irrigation

Traditional irrigation method is the gravity irrigation, the main idea is the water flow into the field from the surface, with the help of the gravity and capillary action the water infiltrate into soil. This approach is the oldest and widely used one. According to the way to wet soil, they can be divided into border irrigation, ditch irrigation, basin irrigation, and flood irrigation.

5.2.1.1 Border irrigation

The main measures is leaded the water to the nursery garden. First, divide the land into some small rectangular plot. Lead water to the ridge field, then there will be format a water layer on the land surface, and with the influence of the gravity the water gradually infiltrated into soil.

5.2.1.2 Ditch irrigation

Ditch irrigation is a widely used method. In order to implementation of the Ditch irrigation techniques, the first step is to excavate ditches between the crops. Then the water flow into the field by the irrigation ditch. The main idea is with the help of the capillary, the water moist soil from the ditches and around places. Compared to the border irrigation, the main advantage is the method can not damage the soil structure around the crop roots, can not lead to field panel knot, reduce the soil evaporation, and appropriate to the wide-spaced row crops.

5.2.1.3 Flush Irrigation

First, divide the land into some grid fields. When irrigation there will be format a water layer, and with the influence of the gravity the water infiltrate into soil gradually. It is mainly used in rice irrigation.

5.2.1.4 Flood irrigation

Flood irrigation is an extensive irrigation. It is no need to excavate ditches, only need to embankment around the field to form a pond, then the water overflow the ground when irrigation.

The defects are poor uniformity, too much water waste, the groundwater elevation and soil alkalization. In addition, when large amounts of water flow into the fields, it can lead the water near the roots of crops evaporate quickly and reduce temperature, which is not conducive to crop growth.

5.2.2 Drip Irrigation

The main idea of the drip irrigation is that it can use the plastic pipe to transport water. When the water travels to the crop roots, the holes or the drippers irrigate the crops. It is one of the most effective water-saving irrigation in arid region. The water use efficiency is up to 95%. Compared to the spray irrigation, the drip irrigation is better in water saving and crop output. What more, it can dissolve fertilizer and improve fertilization effect. With the help of the low-pressure pipeline system, drip irrigation can transport the water and fertilizer to the crop root slowly and evenly.

Drip irrigation will not destroy the soil structure. The water, fertilizer, gas, and heat in the soil are suitable for the crop growth. The other virtues are low evaporation, and do not produce surface runoff and deep leakage. On the whole, it is a water-saving irrigation method. The main characteristic of drip

irrigation is small amount, and the flow rate of the douche is only 2-12 liters per hour. Therefore, long time irrigation, short irrigation cycle, low work pressure and precision irrigation can reduce evaporation and water waste. What is more, it is a automate management system.

5.2.2.1 Advantage

(1) Saving water, fertilizer and labor

The main idea of drip irrigation is full transportation combined with local micro irrigation, and minimized the water leakage and losses. At the same time, it can supply water timely and do not have external water loss problems, which can improve the water use efficiency. Irrigation can be easily combined with fertilization which dissolved the fertilizer into the irrigation system, which is *kill two birds with one stone*. This can greatly improve the efficiency of the fertilizer utilization. Owing to the local control and micro irrigation which can reduce the water and fertilizer leakage, it will save the chemical fertilizer and reduce pollution. Besides, drip irrigation system is a manual and automatic control system that will be savings labor inputs and lower production costs.

(2) Maintain soil structure

Owing to the large volume of water, the soil is easily to erode and compact. If not dig the soil promptly, it can cause serious compaction, aeration decrease, and damage soil structure. Because it is a micro irrigation, water slowly flow into the soil that can maintain the soil structure and format a suitable soil, fertilizer and thermal environment.

(3) Improve quality and increase production efficiency

Owing to the virtue mentioned above, the product quality can significantly improve. In a word, compared to traditional irrigation, this method can improve product yield greatly. The agricultural products can carry to the market as soon as possible and reduce the amount of fertilizer, pesticide and save labor cost. The economic and social benefits are significant. Drip irrigation conforms to requirements of modern agriculture which is high product, efficient and high quality. This is the main reason why it can be widely used.

5.2.2.2 Disadvantage

(1) Ease to block

Emitter clogging is the main issue of the present dripping irrigation. Some times the whole system can not work or even scrapped. The blockage reason

can be physical factors, biological factors or chemical factors, such as the sediment, organic material, microbial and chemical. Therefore, it has a high requirement to the water quality, so the general solution way is filtered. If necessary, it needs to precipitation and chemical treatment.

(2) cause salt accumulation

If irrigate the super salinity soil or use salt water to irrigation, the salt will accumulate at the edge of wet areas. If encountered rain, the salt may washed to the crop root and damage crop, then drip work should continue to implement. In the places of absent sufficient wash or with no adequate rainfall, do not irrigate the soil with high salt content or use drip salt water to drip irrigate.

(3) Limit root development

Because drip irrigation is only moist part of the soil, hydrotropic of the crop root can lead crop root growth to the humid area. In addition, in the arid region of northwest China should arrange the emitters properly when applied drip irrigation.

5.2.3 Spray Irrigation

The main method of spray irrigation is to use special equipment to pressurized water to spray into air, and form water droplets fall to the surface.

5.2.3.1 Advantage

Irrigation equipment, composed by inlet pipes, pumps, pipes, distribution pipes, sprinkler and so on, can be fixed or mobile. They has some advantages, such as saving water, protecting seal structure, regulating surface climate and high adaptation.

(1) Saving Water

Because of controlling the volume and uniformity of water, the spray irrigation can avoid surface runoff and deep percolation losses and improve the utilization rate of water. The spray irrigation can save about 30-50% of the volume of flooding irrigation, which means saving power and reducing irrigation costs.

(2) Labor Saving

The spray irrigation, which is easy to achieve mechanization and automation, can save a lot of labors. With the removal water ditches in the

field, it is not only beneficial to mechanical operations, but also greatly reduced the amount of labor. In addition, the fertilizers and pesticides can also be applied into the field combined with the spray irrigation. According to statistics, the amount of labors required for irrigation is only one fifth of surface irrigation.

(3)Improve the Land Utilization

There is not irrigation ditches and furrow ridge for spray irrigation, which can improve the land utilization through the fully use of farmland.

(4) Increase production

The spray irrigation is easy to strictly control the soil moisture, which can maintain the optimum range for the crop growth. It can also wash away the dust on the stems and leaves of plants, which is useful for the respiration and photosynthesis of plant. In addition, the spray irrigation can maintain the aggregate structure of soil and make the soil loose and porous, good ventilation, which is conducive to increase production, especially vegetables.

（5）High adaptation

The spray irrigation adapts various terrains. It doesn't need the leveling land like the flooding irrigation and it can irrigate in the slope and undulating ground. This region where the sandy soil is thin and high permeable is very suitable for spray irrigation. In addition, the spray irrigation is not only adapted to crops, but also adapt to variety economic crops, vegetables and pasture. It has some advantages and shortcomings. The biggest problem is the high investment costs. In the present conditions, the mobile spray irrigation is the cheapest irrigation system, but the investment costs also need 300-750 Yuan/ha (RMB). In addition, it is easy to effect by weed speed and climate. When the wind speed is over 5.5 m/s, the spray irrigation will be able to disperse and reduce the uniformity. The evaporation loss increase in the dry climate, which is also reduce the effectiveness of spray irrigation.

5.2.3.2 Shortcomings

(1) High investment costs

The investment cost of spray irrigation is higher than the flooding irrigation. In the present conditions, the investment costs of semi-fixed spray irrigation need about 500-800 Yuan/ha (RMB) or 300-500 Yuan/ha (RMB) except the

power transmission fee and manual charges. The investment cost of fixed spray irrigation is highest and it costs about 1000 Yuan/ha (RMB).

(2) Easy effect by wind and air humidity

When the wind speed is over 5.5~7.9 m/s, the spray irrigation will be able to disperse and reduce the uniformity. The evaporation loss increase when the air is dry. According to the results of Texas Southwestern Great Plains Research Center, the loss of evaporation and dispersant is only 10% when the wind speed is less than 4.5 m/s. The loss is about 30%, when the wind speed is 9 m/s. According to the measured results of Ningxia, Shaanxi, Yunnan, Henan, Hubei, Beijing, Fujian, Xinjiang, the loss of spray irrigation is about 7~28% when the air humidity is 30%~62% and the wind speed is 0.24~6.39 m/s.

(3) Larger energy

In order to run the sprinklers and make the irrigation uniformity, the spray irrigation need to pressure and consume some energy except the pressure irrigation system.

With the above advantages and disadvantages of spray irrigation, combined with the agricultural production in the study area, we can found that the spray irrigation is suitable for agricultural production status of the study area and it can produce higher economic benefits. It also can save water, fertile the farmland and improve the crop yield. Therefore, the drip irrigation is recommended by the project book.

5.3 Biodiversity conservation project Alternatives Analysis

5.3.1 Adjustments of Tourism Master Plan

Owing to influence of atmospheric movement and social activities, the Lake Aibi is a Water stressed places. In recent years, the ecological condition become worse and imbalance, and the biodiversity resources face threats. Although the wetland area has good tourism resources which can stimulate local economic development and bring some economic benefits, but the development of tourism resources will lead more serious damage to the Lake Aibi wetland. What is more, this wetland is not suitable for develop

ecotourism. Therefore, the eco-tourism plan has been drawn back in the preliminary feasibility study. As to the Lake Aibi wetland reserve, our main object is to protect the highly endangered species and birds habitat that has great influence in the world. Started from the observation and study, our target is strengthen the habitat protection and monitoring, improve the technical methods. And last, all survival species can get sustainable development.

5.3.2 Adjustments of the Natural Reserve

(1)Observation tower construction of the Lake Aibi Natural Reserve

As the project planning, infrared video monitoring devices and watchtowers will be constructed in the habitats of the birds and red deer. In the construction period, the project will be affected the atmospheric environment of the area. In the operation period, it will exert influence on the landscape. Therefore, we brought up two alternatives about the far-infrared video monitoring device construction. According to the construction content, we get two building programs:

Program I: Observation Tower Construction

Program II: No Observation Tower Construction

The results of plan comparison are shown in Table 5.3-1.

Tab 5.3-1 Observation Tower Construction Plan Comparison

Defect and Advantage	Program I	Program II
Advantage	real-time monitoring; warning for precipitating events; master the animal species and habitat; Research from the basic observation; strengthen habitat protection and monitoring; improve technology and methods. protect the safety of the species; It will play a positive role for the	Maintain the present land use pattern; Avoid the adverse effects that caused in the construction stage.

	biodiversity protection.	
Defect	**constriction stage:** Bring pollution such as dust, sewage, noise, Solid wastes; Damage land surface and vegetation; The influence is short-term, reversible, and can be effectively controlled by technical measures. **Operation stage:** Impact the landscape; Can coordination with the surrounding landscape, minimize the impact.	Can not monitored in real-time; Can not aware the precipitating events in advance(e.g. forest pests and diseases; human impact; forest fires); Can not command the species change and habitat; Unable to protect the biological diversity in the project area.

Compared “program I” with “program II”, we can conclude that “program I” is better which can bring social, economic and environmental benefits. The environment influence time is short, reversible and can be effectively controlled by technical measures.

(2) Constriction pipelines and artificial rain in the Ranodon sibiricus Natural Reserve

Owing to the water level continues precipitous dropping, the Natural Reserve’s ecological environment deteriorated in a bad condition. This has exerted a threat to the Ranodon sibiricus’ habitats. Therefore, the object of the project is through laying pipelines or artificial rainfall to protect the Ranodon sibiricus’ habitats. There will be some noise and atmospheric influence in the construction stage, Therefore, alternatives analysis about the "laying pipeline and artificial rainfall measures" was made. According to the project content, we conclude two building programs.

Program I: “taken the measures of constriction pipelines and artificial rainfall”.

Program II: "do-nothing”.

The results of plan comparison are shown in Table 5.3-2.

Tab 5.3-2 Alternatives between the pipeline constriction and artificial rainfall

Defect and advantage	Program I	Program II
advantage	improve the environmental ndition; restore the ecological vironment; Slowing the threat to the Ranodon Sibiricus' habitat.	Maintain the present land use pattern; Avoid the adverse effects that caused in the construction stage.
defect	Laying the pipeline would damage the environment, and impact the hydrogeology of the diversion area; Bring pollution such as dust, sewage, noise, Solid wastes into the habitat; Damage land surface and vegetation; The bad effect of artificial rainfall is unforeseen.	water surface will continue precipitous dropping, springs dry up, streams disappeared; ecology degradation; The salamander's habitats are under threat.

Compared program I with program II, we can see that program II is better. If it implements the program I, laying the pipeline will damage the environment and impact the hydrogeology of the diversion area. Besides, the bad effect of artificial rainfall is unforeseen. Therefore, the EIA recommended program II as final implementation plan.

5.3.3 Adjustments of the Land Sustainable Management

(1) Fence isolation in the natural forest protection cultivation demonstration

The demonstration area of forest cultivation management in the project duration is 52,600 Mu, respectively select 4 domonstration points (namely:

Santai Forestry Centre Mountain Natural Forest with the type of mountain land (12738Mu), Hot-spring County valley secondary forest with the type of bottom land forest (16361 Mu), Bole Gobi secondary forest with the type of wilderness (11024 Mu) and Jinghe County Huashan desert secondary forest with the type of desert (12600 Mu) as the foundation, roundly carry out closed cultivation and protection, applying closed forest and/or artificial reinforcement planting and after-culture measures in key areas. By applying measures like fence isolation, monitoring prevention and cure on insect pest, forest-fire prevention and artificial after-culture, and also making use of current technology high-efficiency management, improve the forest canopy density and the condition of wildlife, upgrading the value of ecological service.

Fence isolation will affect the wild animal at certain degree, and the project construction will also impact the vegetation and environment, so it compares fence isolation with doing nothing.

According to project construction content, it forms two building programs.

Plan 1: “Fence isolation”;

Plan 2: “Doing nothing”;

The results of scheme comparison can be seen in table 5.3-2.

Table 5.3-2 scheme comparison of “fence isolation” and “doing nothing”

Advantages and Disadvantages	Plan 1	Plan 2
Advantages	It can improve the natural forest of demonstration area and restore environment.	Maintain the condition of land use, and avoid the environment impact in construction period. Reduce the barrier effect on wildlife.
Disadvantages	Fence designation would damage the environment and it also would have barrier effect on wildlife.	Wild animal feeding will impact the natural forest habitat at certain degree.

	It would also produce dust, waste water, noise, solid waste pollution and damage to vegetation.	

Comprehensively comparing plan 1 with plan 2, fence setting would affect local environment and wild animal. It would also produce dust, waste water, noise, solid waste pollution and damage to vegetation. Therefore, the EIA recommend plan 2 as the optimal plan, to maintain land use condition, and avoid the environment impact in construction period. Moreover, after consulting with the PMO, it has canceled the event of fence setting.

5.5 Compliance Analysis with the Relevant Planning

5.5.1 International Level

The regional sustainable management and biodiversity conservation project is conforms to international conventions. In 1993, our country joined the "United Nations Convention on Biological Diversity", and in 1994 joined the "United Nations Convention to Combat Desertification" and the "International Convention on Wetlands". Later in 2002 established the "land degradation strategic partnership" with the Global Environment Facility. Therefore, we have the right to apply for the" Global Environmental Facility" (GEF).

5.5.2 National Level

The regional sustainable management and biodiversity conservation project is conforms to the national laws and policy orientation. In 1998, the State Council promulgated the "National Ecological Environment Construction Plan" and in 2000, the State Council promulgated the "Outline of National Ecological Environment Protection". Recently, the State Environmental Protection Ministry and Chinese Academy of Sciences promulgated the" Outline of National Ecological function zoning," in 2009. The schema specifically mentioned the following content: 'establish national or provincial ecological function conservation area; protect and improve environment; change the traditional development mode; pursue higher economic growth rate with low resources cost and environmental costs. And last, to achieve the economic,

social and environmental benefits.

5.5.3 Province Level

The regional sustainable management and biodiversity conservation projects conforms to the development of economic and social development planning; conform s to the objectives of biological diversity conservation and prevent land degradation in Xinjiang.

Some local development strategies and policies has established: "Xinjiang Uygur Autonomous Region Economic and Social Development Eleventh Five-Year Plan", "Xinjiang Uygur Autonomous Region Ecological Environment Construction Plan", "Xinjiang Uygur Autonomous Region desertification Eleventh Five-Year plan", "Xinjiang biodiversity conservation planning", "Xinjiang Natural Reserve Planning", "Xinjiang Uygur Autonomous Region of land degradation control strategy and action plan", "Xinjiang, regulations and policies to combat land degradation and institutional capacity assessment report" , all of the projects take the Lake Aibi as the priority protection areas in land degradation control and biodiversity protection.

5.5.4 Bortala Mongol Autonomous Prefecture Level

Bortala Mongol autonomous prefecture is an important economic region for Open-door to the outside world. Furthermore, it is a famous Station of the new Eurasian Continental Bridge. With Implementation of the project; it will promote the stats' biodiversity conservation significantly. And it is conforms to social and economic development in Bortala and Xinjiang. In the "Bortala Mongol autonomous prefecture Forestry Development Eleventh Five-Year Plan", "comprehensive management of the ecosystems in Lake Aibi " is an important ecological protection projects (Bortala Mongol autonomous prefecture [2007] 19). In this end, the implementation of GEF (sustainable land management and biodiversity conservation) project is conform to the international, national and state's environment policy, moreover, it is very necessary to the state's development.

6 Environmental Impact Assessment and Mitigation Measures

6.1 Overview of predicted impacts and benefits

The ecology of lake Aibi area is vulnerable, and there many problems exist in this area, including the unstable area of Lake Aibi, the degradation and destruction of vegetation in Natural Reserve, the threat of desertification and rodent, degradation of natural oases and desert vegetation, eco-environment Being worsened on the whole, soil salinization, worsening of the water environment, health hazards for residents, the threaten of sand storm, floating dust weather, and salt dust.

The project will strengthen integrated planning and implementation of natural resource management and mainstreaming of biodiversity values in Lake Aibi Basin. The project will strengthen sustainable management of watersheds to ensure a better balance between available supply and consumption and increase environmental flows to Lake Aibi while strengthening management of Lake Aibi National Wetland Reserve. The project will contribute to an overarching goal of reducing wind erosion from the dry bed of Lake Aibi that suspends small-sized salt dust particles in the upper atmosphere and to protect the aquatic and saline-steppe environmental of Lake Aibi – the largest terminal salt lake in the region.

Possible negative environmental impact could come from any limitations in availability of irrigation water or available natural resources to sustain livelihoods of local communities. Some engineering construction activities that have the potential to cause negative impacts during construction stage, as analyzed in below. The potential negative environment impacts identified in the EIA during implementation and implementation phase of the project are of temporary nature and limited in magnitude.

6.2 Assessment on Water Resource Allocation Optimization

In order to achieve balance between water supply and environmental flows into Lake Aibi, it is necessary to understand water resource supply and demand in Bortala Prefecture and use this to optimize water allocation. The

environmental benefits of implementation of water resource optimization plans include:

- Reduce unit water irrigation consumption, which will be monitored through remote sensing (RS) –based evapor-transpiration(ET) and find out actual water savings for crops;
- More available water resources that is released from water savings from optimized irrigation amount. This will contribute to local agricultural and livelihoods betterment.
- Increase river and ground flows gradually that eventually increase environmental flows into Lake Aibi. Lake surface area thus increases, promoting aquatic habitats, rehabilitation of ground vegetation, control of soil desertification, and conservation of biodiversity and integrity.

Possible negative impacts include

- The traditional irrigation approach will need to be gradually replaced by new water resource allocation mechanism. This will to some extent limit water resource use which will pose negative impacts to irrigation farmers or herders relying on those resources to sustain their livelihoods.
- Water-saving irrigation practices will require some construction civil work that will result in land occupation, vegetation clearance, soil erosion, pollution to nearby water bodies and ambient air, and disturbance to local communities
- Water-saving irrigation involves mainly crops such as corn. Improper use of fertilizer or pesticide will pose risks to environment and human health

However, these impacts are considered of limited scale, temporary and manageable. Recommended mitigation measures include

- The project needs to be in line with the water resources planning of the region, make sure that the available water resources are sufficient for sustainable implementation.
- Carry out comparisons between amount of ET reduced (irrigation water use reduced) and farmers' income change, make sure the

livelihood level of farmers or herders will not decrease as a result of the new technology.

- The project will encourage alternative, less water demanding, irrigation scheduling and management methods as well as alternative irrigated crops that require less water per unit of productivity.
- An integrated water and environmental management plan will be developed to ensure the water resource allocation optimization compatible with socio-economic development
- Carry out capacity building and public education for relevant government bodies, officials, farmers and herders to raise their awareness on sustainable water resource utilization and conservation of biodervisity.
- Assess exising pesticide control guideline in the area, which is considered proper.

6.3 Assessment on Sustainable Land Management Practices

Sustainable land management practices and above mentioned water resources allocation optimization will act together to present positive cumulative and synergistic effects on increasing environmental flows in to Lake Aibi. The sustainable land management practices include natural forest conservation, restoration and grassland management. The environmental benefits arising from these practices include:

- Conservation of natural forests that hold water resources. There are 900,000 mu/60,000 ha of natural forests in the project area. Forest protection measure would be extended to about 400,000 mu of those forests, and will include fire prevention, prevention of vegetation damage by livestock, patrolling and pest control, routine maintenance of related facilities, etc. These measures will be critical for securing ecosystem services in the basin.
- Increase forest coverage; improve habitats from flora and fauna and the overall ecological service values. 4 pilot demonstration

areas would be established on the area totaling 52,600 mu. These four plots would represent four types of forest eco-system found in the prefecture. Enrichment planting would be carried out with native species seedlings, and seeds collected locally.

- Carry out sustainable grassland management to reach the balance between population of livestock allowed into the pastureland and real carrying capacity. Development of artificial pastureland to increase herder's livelihood levels.
- Ensure soil quality stabilization and continuous improvement
- Demonstrate a model for sustainable land use and biodiversity

Potential negative impacts include

- The conservation of natural forests will require prohibition of grazing, wood/grass cutting and collections and other human activities that are not favorable for vegetation growing. This will restrict the livelihoods of the farmers or herders in the project region.
- Improper cultivation may cause invasive species and decrease the overall quality of the forests
- Some facilities will be built or installed for forest protection, such as bulletin boards, monitoring facilities. This will result in land occupation, vegetation clearance. However, such impacts are considered minimal

Recommended mitigation measures include

- As appropriate, provide economic compensation or jobs to impacted farmers or herder, or encourage alternative livelihoods to minimize the impacts of forest conservation to them in short term
- Since the exact location and scale of forests restoration, cultivation or enrichment planting has not been decided during project EA stage. A forests guideline is included in the EIA and EMP.

6.4 Impact Assessment on Biodiversity Conservation at Nature Reserves

Conservation activities in the Lake Aibi NWR, Ganjiahu NR and Salamander NR will directly contribute to the biodiversity of the reserves and at regional scale. The benefits are obvious.

- Species and habitat protection by patrolling, use of management system, sign boards and posters (awareness tool)
- Protection of key species, including 9 species on the IUCN Red List such as Goitered Gazelle (listed as Endangered in the IUCN Red List of Endangered Species, and protected as a Category II species under Chinese law), Red Deer, Aibi Birch tree, Native *Populus diversifolia* in Lake Aibi and Ganjiahu NR and Salamander in the Salamander NR.

The potential negative impacts also arise from the restriction of human activities such as grazing and resources collection in the nature reserve, notably the Kazakhstan monitories in the Kekebasto herders within the Lake Aibi NWR.

In order to manage the potential impacts, a livelihood enhancement program has been included in the project and summarized in below.

- Allow grazing in demarcated area
- Providing employment and job training to kekebasto herders
- Provide livelihood improvement measures to Kekebasto community, such as basic clinic
- Subsidy for any voluntary relocation out of Kekebasto.

6.5 Assessment on Construction Activities

The construction activities under the project is of pilot nature and small scale, this section presents predicted impacts and mitigation measures associated with these construction activities

6.5.1 Acoustical Environmental Influence of Construction Period

6.5.1.1 Noise Source Strength

Construction noise is mainly created by construction machinery and transport vehicle. Different construction stages, sites and operation types create different noise intensity of the project. There are many kinds of machines participate in the construction. The noise can spread further a field and affect more area, because the constructions are generally outdoor work and there are no applications to reduce noise and vibration. Noise source strength of different kinds of large construction machinery can be seen in Table 6.2-1.

Table 6.5-1 The main sound level strength of high noise equipment

No.	Name of equipment	Sound level dB□A□	No.	Name of equipment	Sound level dB□A□
1	Aircompressor	110	9	Crane	76
2	Crusher	97	10	Electric saw	90
3	Excavator	79~83	11	Welding machine	78
4	Bulldozer	85	12	Grafter	80
5	Loader	85	13	Road roller	84
6	Elevator	72	14	Pile hammer	110
7	Winding engine	97	15	Immersion vibrator	105
8	Autotruck	79~83	16	Concretepump	85

6.5.1.2 Environmental impact analysis of sound

According to the analysis of contaminative source, the noise source of construction plant is all kinds of construction machinery. There are many mechanical equipments running during every construction stag, and the

sound levels of every sound resource of single equipment are between 72dB(A)~110dB(A). These equipments can not be preserved. During the period of outdoor work, noise has a decreased correlation relationship with distance, it can be determined using the following equation:

$$L_2 = L_1 - 20\log\frac{r_2}{r_1}$$

In the equation: L_1□L_2— the sound level between the distance of sound resource r_1□r_2;

r_1□r_2—the distance vary the sound resource, when calculate□r_1=1m

The attenuation of sound level with distance of these equipments can be seen in Table 6.2-2.

Table 6.5-2 Construction Equipment Noise Attenuation

No.	Name of sound resource	Level of noise	Sound level in different distance from the sound resource							
			20m	40m	60m	80m	100m	200m	300m	500m
1	..	110	84	78	74	72	70	64	60	56
2	Crusher	97	71	65	61	59	57	51	47	43
3	Excavato	83	57	51	47	45	43	37	—	—
4	Bulldozer	85	59	53	49	47	45	39	—	—
5	Loader	85	59	53	49	47	45	39	—	—
6	Elevator	72	46	40	36	—	—	—	—	—
7	Winding	97	71	65	61	59	57	51	47	43
8	Autotruck	83	57	51	47	45	43	37	—	—
9	Crane	76	50	44	40	38	36	—	—	—
10	Electric	90	64	58	54	52	50	44	40	36
11	Welding	78	52	46	42	40	38	—	—	—
12	Grafter	80	54	48	44	42	40	34	—	—
13	Road	84	58	52	48	46	44	38	—	—
14	Pile	110	84	78	74	72	70	64	60	56
15	Immersio	105	79	73	69	67	65	59	55	51
16	Concrete	85	59	53	49	47	45	39	—	—

During the construction process, the noise created by construction machinery will be the main noise resource. Under the condition without taking the motion of building, trees and atmosphere into account, in the 100m of the boundary of the construction plant, the maximal sound level can reach to

70dB (A). in the 500m of the boundary of the construction plant, the maximal sound level can reach to 56dB (A). The sound levels have initiatively reached the day noise limits in construction site. If consider the noise reduction of the building and trees, the level of the reduction can be 15dB (A). The level of sound in the 100m of both sides of the construction plant can reach day noise limits. Decreasing the man-made noise should be considered during the construction process, applications to reduce noise and construction should be built, the time to use loud noise equipment should be arranged properly, and night construction should be avoided in order to reduce environmental influence during the construction period. At the same time, the place of the equipment should be chosen correctly, natural condition can be considered to reduce noise in order to reduce the noise affect to the minimum during the construction period.

6.2.1.3 Mitigation Measures

□1□Construction time should be arranged properly, a scientific construct plan should be worked out, and strong noise equipments should be avoided using in the same time. Beyond that, the equipments that can create strong noise, great impulses and strong vibration should be arranged in the daytime during the construction progress, night (22:00 to the next day 6:00) construction should be forbidden, and the construction progress should avoid the time of wild animals' breed.

□2□Construction site, construction plan and job practice should be arranged properly, and powered mechanical equipment should be cut-up arranged properly in the construction site to avoid arranging a large number of powered mechanical equipments in the same site and arousing high strong sound level in part place.

□3□Reduce the sound level of equipments. Use low noise type when choose the types of the equipments, for example, replace fossil fuels machinery with hydraulic machinery, use high-frequency vibrating tamper, and add muffler to the concrete mixing plant and head of belt feeder. For the fixed mechanical equipment and equipment of excavation, earthmoving such as excavator and bulldozer, it can use the blow-down silencer and isolate vibratory component of engine to reduce noise. The sound level will increase because of the vibration of the slack part of the machines, and breakdown of

mufeler, so the powered mechanical equipment should be maintained and conserved termly, the unused should be turned off immediately, and haulage vehicles should slow down and reduce honking when drive into the site.

□4□Reduce man-made noise. Operate the equipment by rule, dismantle the baffle and bracket by the job rule, reduce noise creating by colliding, avoid using whistle, bell and flute to command, and use thesophisticated equipment.

□5□Build temporary sound barrier. For the fixed machinery, they should be operated in the shelter. If they are not in the shelter□they can build single side sound barrier.

6.5.2 Environmental impact for ambient air during the construction period

6.5.2.1 Pollution source of fugitive dust and environmental impact analysis

During the construction period of this project, there are no living service facilities built in the construction site, so there are no air pollution sources caused by tea furnace and cooking stove.

The main air environmental contaminants are the fugitive dust caused by digging, stacking and back filling, and car the fugitive dust caused by car and people moving in the road, the fugitive dust caused by earth losing from the vehicle for earth. When the pipe network engineering teams was constructed, in the most part of the sector, the construction method is grooving on the ground, so there must be a lot of backfill and part of abandoned earth pile upon the ground. These will be stayed on the ground for 15□20days. When they are dry, there will fugitive dust formed under starting wind velocity. According to analogy investigation, under the condition of strong wind, the concentration of fugitive of downwind direction dust of the job site can reach 3mg/m^3, in the 25m, it can reach 1.53mg/m^3, TSP of in scare of 60m of downwind direction is out of limits. If the weather is rain or snow, scour of rain or snow and rolling compaction by the vehicle, this will make the job site muddy and trouble walking.

6.5.2.2 Mitigation measures

According to the main impact factor of the air environment during the construction period, in order to reduce the influence that affect the

surrounding environment up to the hilt, the protection methods are made as follows:

1□Reinforce the management, civilize construction□load and unload construction material carefully, and clean the mud on the vehicle before drive out the job site.

2□Fugitive dust of job site and road can be protected by cleaned and water-sprayed. If only water-spray and clean, fugitive dust will reduced by 70□80□. If water-spray after clean, fugitive dust will reduced by 90□. Some relative test indicate that spray water 4 or 5 times in the job site the pollution created by fugitive dust can reduce between 20 and 50m.

3□The abandoned soil should be transported to the low area that appoint by relevant department and handled. Don't overload when load and transport, and the vehicle transport the soil should not sprinkle along the road. Clean the mud on the tires of vehicle before drive out the job site.

4□Restore the vegetation after use the temporary land, prevent water loss and soil erosion.

5□Waste and trash are forbidden burned in the job site.

6□Labor protection should be done well for the workers, and they should wear filter dust masks.

6.5.3 Environmental impact for water environment during the construction period

6.5.3.1 Analysis of pollution source

During the construction period□site cleaning, pipe laying and construction will create a certain number of waste water and remained water. Besides, because the project will need some workers, and that will create a certain number of domestic sewage.

6.5.3.2 Analysis of the water environment influence

□1□Domestic sewage of workers

The main kinds of pollution in the domestic sewage are COD, BOD_5, SS, ammonia nitrogen and oil. According to analogy investigation, the sewage quality is 300mg/l COD, 5150mg/l BOD and 150mg/l SS. Establishment of infra-red video monitor multiple points should use the living facilities around the job site (such as the nearby managed and protected site).

□2□construction produce waste water

The main pollutions of the construction waste water are abioseston (SS) and slight amounts of oil. The effluent turn into sedimentary facies quickly because of the gravity settling and adsorption, and the waste water will not be harmful to the surface water and ground water.

6.5.3.3 Measures for prevention and control of pollution

□1□The construction company should build settling pond during the construction period, storm sewage, slime water and accumulation water should be disposed in the settling pond before exhause.

□2□Workers establish infra-red video monitor multiple points should use the living facilities around the job site. Contractor should take all necessary measures to prevent the waste water pour into the river and irrigation ditch without disposing.

□3□Reinforce the management in the job site, keep the ground neat , and keep the stack sloping surfaces of earth-rock neat to avoid the earth-rock go into the river channel.

□4□Material of construction like oil and chemicals should not be piled up around the river, and they should be piled away the river and put temporary weather stripped canvas on them to prevent them scoured into water by the storm. Strengthen environmental management, prevent the water pollution that caused by oil leakage of construction machinery or dumping scrap oil into the water, and suggest the catch the oil leakage of construction into cans.

6.5.4 Impact of solid wastes during construction period

6.5.4.1 Analysis of pollution source of solid wastes

The main solid wastes during the construction period are dregs and macadam caused by earth excavation. Besides, the workers will create some household garbage.

6.5.4.2 EIA

□1□Spoil

Spoil is created by earth excavating during the construction period, and these spoil will affect the environment during the process of transporting and disposing. According to estimate□the whole number of the digging soil is

10800m^3. The number of waste soil is 3240m^3. The number of filling is 7560m^3. Therefore, the number of the soil is balance and enough.

1□If the vehicles load too much, it will lead the soil scattered all along the road, and the soil on the wheels will cover the road. In good days, there will be dusty. In the rain day, the road will be muddy, and this will impact the air quality in the area of the project.

2□If the ground of disposing the waste soil is not explicit, or the waste soil are piled up without rule, this will impact the utilization of land, fluency of river, destroy the natural and ecological environment.

□2□Household garbage

Workers will create household garbage in the daily life. If the garbage is not disposed in time, there will create mosquiton, cacosmia and disease under suitable condition, and have negative impact on environment. Therefore, the household garbage should be transported into the designated site by the environment authorities and disposed (if it is not in the city, the site should be designated by environmental protection bureaus) to avoid affecting the environment.

6.5.4.3 Mitigation measures

□1□Waste soil and construction garbage should be filled in the designated site according to the requirements from relevant department. If the site of filling should not be used temporarily, plant trees on the ground, prevent water loss and soil erosion.

□2□The household garbage created by the construction site should be piled up in the designated facilities, and transported out the site in daily. Build harmless toilet in the working place and living place, excrement should be collected and transported out the site.

6.5.5 Soil Erosion and Preventive Measure

6.5.5.1 Analysis of soil erosion

The projects affect the soil erosion in the following two respects. Digging on the ground destroys the vegetation and soil erosion will take place when raining. All kinds of temporary covered area destroy intrinsical vegetation, and this aggravates the soil erosion. If the management of the temporary piling in the stock yard and waste soil, there will create soil erosion in the kind of

sheetflood and liner erosion. The main stage of the project that will create soil erosion is digging progress on the ground of the construction of infra-red video monitor. As the construction of infra-red video monitor is in the Natural Reserve of Lake Aibi, the construction time is short and the construction scale is small, the soil erosion caused by construction will greatly reduce. The soil should be piled up rationally in the job site, and keep certain distance from the river, building material and the waste soil that are not transported out the job site should be covered by the tarpaulin in the storm days.

6.5.5.2 Mitigation measures

□1□Digging construction should avoid the rainy season.

□2□Calculate the balance of the soil in the construction, the digging soil should use to fill back. The redundant waste soil that created by the construction of network engineering and infra-red video monitor after the back filling should be transported to other job site or use for plant.

□3□Choose the flat yard for temporary piling, and recover the vegetation after usage.

□4□Take preventive measure on the digging bare ground , shorten exposure time, reduce soil erosion.

□5□Consider the effort of afforesting for soil erosion, and afforest in time to reduce soil erosion.

□6□The soil should be piled up rationally in the job site, and keep certain distance from the river, prevent the soil influx into the river, and reduce the affection of soil erosion to the river.

6.5.6 Eco-environmental influence and mitigation measures

6.5.6.1 Eco-environmental impact analysis

□1□Analysis of the impact on vegetation

The permanent occupation area of this project is small, so the destruction of the natural vegetation is small. The temporary land occupation has temporary effect on the vegetation coverage. When the project is over, vegetation can be recovered quickly. Besides, during the construction period, there will be inevitable effect on the vegetation.

□2□Impact analysis of landscape ecology

During the construction of network engineering, because of the digging road and soil piling, the area will be in a mess. Though there are some barriers, the job site is impressive with the mess. The losing soil along the road of transporting will make the road dirty and arise dust, and will have undesirable impact on the landscape. Therefore, it is important to do clean wok in the job site.

6.5.6.2 Mitigation measures

□1□Protect the trees on the temporary land forbid felling.

□2□Filling back the digging soil layering in plan, and put the surface soil on the surface. Recover the destructive vegetation after the project.

6.6 Assessment on Ethnic Minority Development and Social Aspects

6.6.1 Overview of Ethnic Minority Potentially Impacted

On the basis of detailed survey of two social assessment teams, Kekebasto country was only the nomads of the Herders settlement in the buffer zone of Lake Aibi reserve, activity areas was about 24 km^2 for the incomes of herdsmen. Because of natural resource constraints, the settlement expansion is slow, e.g. three families in 1976, thirteen families in 1998, thereafter continuously someone ingoing every year. Population increase slowly. Until 2010, it has only 51 households, including 40 families built house on the village and 11 households seasonally leased housing. Since this project does not involve resettlement, the environmental impacts that may produce by resettlement have been avoided.

The previous social impact assessment survey shows that local residents cooperate with the government building reserve. They want to plant trees, patrol, training and so on. Indigenous can live in the natural reserve according to their original production and living style, thus it avoids the social impacts from resettlement.

At present, the residents' family income of reserve is mainly grazing, salvaging Artemia and digging herbs. The restriction of grazing or resources

collection activities may affect the family income of herders, and prohibit locals digging the Desertliving Cistanche Cistanche deserticola, so the income of some locals was decreased, and cause hardship.

6.6.2 Ethnic Minority Development Plan

Six families required emigration village in relocation area, finally reach an agreement through negotiation in 2009. Their houses compensated in accordance with the replacement cost. Five families found work in industrial park of ALATAW PASS, one move back to their original village.

In order to benefit for affected people, and promote participation process, Bortala Mongolia autonomous prefecture will support the whole settlement activities and will develop a more detailed participatory method in early project implementation. This will include take various measures to ensure a reliable way, decision is based on enough material and openly discussion. In order to ensure that the community and individuals can participate in and express their concern and suggestions, will take various steps.

For each herdsman's public consultation on this winter, and prepare plan for next year. The following measures can be used to improve or restore local people's livelihood.

- Demarcation, using boundary posts and signs, and protection against livestock grazing of an area dedicated to grass collection (for pan feeding domestic animals) in the 24km2 area inside the NWR Experimental Zone where Kekebasto community is allowed to graze animals
- Priority hiring of Kekebasto herders to be NWR staff, whether seasonal or long term work, in patrolling, monitoring and other NWR activities, as an incentive to engage in reserve management and to reduce reliance on grazing livestock in the reserve (years one through four)
- Training of Kekebasto community members to be able to undertake employment with the NWR
- Training (likely off-site in larger towns) of Kekebasto community members in specific skills (ie vocational training) to assist in employment opportunities to develop livelihoods and reduce reliance on grazing livestock in the reserve (years one and two)
- Training on-site of Kekebasto community members in skills to assist in employment opportunities to develop livelihoods and reduce reliance on grazing livestock in the reserve (years one to three)
- Establishment, staffing and provision of supplies of a basic clinic for the Kekebasto community, inside existing infrastructure at the

NWR Headquarters, to improve livelihood conditions, using entirely counterpart funds

- A subsidy for any voluntary relocations out of Kekebasto, using counterpart funds (estimated at 20 households for the community across all four years of the project based on recent trends in the community)

6.7 Summary

In the long-term, the project will have significant environmental, economic and social benefits. In short-term, negative impacts arising mainly from restriction on utilization of natural resources (water, forests□grassland, soils etc) will also exists. The relative impacts and benefits are summarized in table 6.7-1.

The benefits and effect of the project not only devote to the activities proposed by *United Nations Biodiversity Convention*, but also devote to the activities proposed by *United Nations Desertification Prevention Convention* and *United Nations Climate Change Framework Convention,* and other international conventions and agreements related with the issue of environment and development, such as: *International Wetland Convention*.

6.7.1 Environmental Benefits and Impacts

The Lake Aibi project is an absolute activity of public interest environmental protection. By the carry out of project activity and the reach of expected achievement, coordinated with other environmental public projects in many ways, the project will bring obvious positive environmental benefits.

The project area of Lake Aibi and the circumjacent area locate in the intermediate zone of Central Asia-Mongolia Plant Flora, possessing obvious long-span ecological gradient (such as: vertical gradient in the aspect of altitude, temperature-humidity gradient in the aspect of temperature and moisture, water-slat gradient in the aspect of drought, etc.); the types of ecosystem in those areas are of multiplicity, including forest, grassland, wetland, farmland, oasis and desert ecosystems, so those areas are rare plenty biodiversity areas in the hinterland of Eurasia; those areas have special irreplaceable biodiversity resources, they are species pools and gene pools with high biodiversity project value in the northwast of China and aid area and extreme aid area in the world. Eib Nuur and its circumjacent area not only have some endangered species and local special

species, but also be the interchange of North-south and west-east channels for birds migration to be an very important habitat and breeding place. The primary object of this project is the biodiversity protection of Lake Aibi, which will make Bortala endangered species and typical species be salvaged and protected specially, making great devotions to the biodiversity protection and environmental protection all over the world based on more comprehensive sense.
At the same time, the management ability of natural reserve in Bortala will be improved according to the subject of Lake Aibi biodiversity protection; the conditions the shrink of Lake Aibi wetland will be prevented, and the ecological conditions of wetland will be stabilized and renewed step by step; the management ability (whose target is the protection of biodiversity and habitat environment) of water resources areas in Bortala will be enhanced, and the protect of natural forest and grassland will be enhanced; the area of dry lake bed in Lake Aibi will be under control and may be reduced, which can effectively control the salt dust blew and spread by the strong wind in Alataw Pass. Those brought environmental effect can further promote the biodiversity and their habitat protection in Bortala and Xinjiang, improving the surroundings of local residents.

Environmental effect: the activities included by the project and related to objective construction, including: 1) water-saving irrigation demonstrations in Jinghe County, Bole, and Hot-spring County; 2) Facilities and devices on the monitoring and protection in Lake Aibi Natural Reserve, Ganjiahu Natural Reserve and Ranodon Sibiricus Natural Reserve, which may touch the environmental sense object of the project or change the natural progress of land. 3□Forest, grassland cultivation and protection subprojects is to stop deforestation, enhance fire safety, etc. The concrete possible effects include: a. some activities of project to help the restoration of natural habitat in natural reserves; b. agriculture structure improvement may involved in this project to realize more reasonable water resources management; c. the project may relate to historic sites distributed widely in Ranodon Sibiricus Protection Area; d. the project relates to the huloxylon ammondendron forest and diversiform-leaved poplar forest protection in Lake Aibi Natural Reserve and Ganjiahu Natural Reserve; e. the project relates to nine dams in Etoguse River and Bortala River. Protection of natural resources will potentially limit masses and herders dependent on natural resources for livelihoods. Therefore, the project

work team includes an expert on dam safety to participate the evaluation, and the expert has prepared the report draft of “Social Evaluation” and “Minority Development Action Projects”. EIA has been proposed to abolish all kinds of facilities, and the current feasibility study report also canceled a variety of facilities (including fence in North Salamander natural reserve and forest cultivation and demonstration area) to eliminate the influence of heritage, the reduction of large extent the impact of local herders.

In fact, the contents of project mainly are integrated management and monitoring, just a few used to evaluate the demonstration of objects (cognitive and comparison process, the acquisition of analysis parameter, the application effect of observation technique system and model, etc.), as the scale and strength of demonstration are limited, no influent effect will be exerted. What’s more, the concrete proposal design of above activities must pass the careful examination of expert consultation group who are responsible for to demonstrate not only the feasibility of technical policy but also the security of project implementation. Thus, the possibility, range and intensity of negative environmental effects will be controlled effectively.

6.7.2 Economic Benefits and Impacts

Based on the acquirement of environmental benefits, the immediate economic benefits produced by project are: By the realization of resources’ optimized distribution & high-efficiency ordinal utilization, directly promote biodiversity protection, livelihood replacement, ecotourism, development structure adjustment of oasis agriculture, coordination development between agriculture and livestock farming, etc, and improve the living standard of local people (including minority). The mediate economic benefits produced by project are: improve overall natural conditions of Bortala by the protection of biodiversity and their habitat, which can make the economic development resources brought to Bortala be identified widely and help to bring in & make sure of external finance; help the establishment and development of Bortala Export Processing Zone and Xinjiang Tianshan Beipo economic region to achieve suitable environment and favorable conditions, effectively supporting the improvement of economic development capacity and level in Bortala and Xinjiang as the area to live in a compact community for many nations. The representation of immediate and mediate economic benefits brought

by the project is to strengthen the excitation irritation on economic development, and to spread to the circumjacent area of Lake Aibi area, west of China, whole China and other countries (include Pakistan) passed along the railway in central Asia through Eurasia land bridge and railway.

6.7.3 Social Benefits and Impacts

The implementation of project is in favor of the social economic development of Bortala and Xinjiang as the area to live in a compact community for many nations. The implementation of project will also bring the following social benefits: Carry out of livelihood replacement, structure adjustment and coordination development of agriculture and livestock farming and the organization & integrated utilization of new economic development resources as the result of the protection of biodiversity and their living environment; make use of the participation of community residents and public to protection Lake Aibi wetland and circumjacent environment, which will promote the intercommunion and inter-trust between nations; support and advance the development of relevant industries, which will accelerate the assistance and support on the poor and add employment chances, improving the income level of local people (include minority crowds); raise the consciousness and ability of minority crowds to participate the activity of biodiversity protection; promote the cooperation ability of Government with many departments in the action of biodiversity protection and social economic development, assisting the cooperation between each funds resource and project. Against the effect of protection activity on the residents in project area, the project specially put forward plan of substituted livelihood for the residents in project area. The social evaluation of project proves the local residents have full consciousness on the significance to improve the natural environment of Lake Aibi area, no objection against any projects (include this project) related with the environmental protection in Lake Aibi area. However, there are some difference between the object and actual implementation of the activity for substituted livelihood and biodiversity protection, and the difference mainly caused by the traditional production model and life concept of local residents. For example, the change of pastoral nomadism into stable breeding should change leisurely life style into the life style restricted by season and production model, and the labor intensity should be increased if want more harvest. The project activity could realize the

demonstration from the process to publicize “ways, standard and procedure on effect-easing measure and indemnifying measures” by parole and pictures, letting local residents see and experience that substituted livelihood plan can indeed improve their life constantly, and progressively lead them become primary participators to protect and construct the protection areas.

Table 6.7-1 Summary of Environmental Benefits and Impacts

Project Name		Contents	Benefits	Impacts
1. Optimize the Allocation of Water Resource	Investigation & Evaluation on Water Resource of Project Area	Analysis on water consumption distribution of Lake Aibi watershed; Water resource evaluation on Lake Aibi watershed; Water consumption balance analysis on Lake Aibi watershed; Estimation on water-saving potential of Bortala State; Evaluation of water-saving effect based on ET water consumption balance	Adopting the reducing of the water consumption is to restrain Lake Aibi from depauperation, which can keep more water for the realization of sustainable management and biodiversity protection of this watershed and more water resource for industrial & domestic water.	• Restriction on water use • Construction activities will have adverse effect on the air, water, sound environmental and ecological environment at certain degree.
	Demonstration on Water Consumption Monitoring Analysis of Multi-types Irrigation Mode	Field observation; Computational model for irrigation draught quantity of different irrigation models; Water consumption management of rural water-user association	Save water, increase crop yields, thereby increase the income of local farmers.	

	The Exploitation of Dynamic Observation System for Water Consumption Structure	Data acquisition & processing; ET calculation; Analysis on water consumption structure	Fulfill the tracking observation of water consumption course of tested zone to realize the observation and monitoring of water consumption structure in Lake Aibi watershed.	
2. Sustainable land Management	The Protection on Natural Forest Resource in Water-head Site	Stop the logging of 90 mu of natural forests in water head site, strengthen forest fire prevention, and prevent the behavior of wildlife destruction	Conducive to protection and restoration of natural forest resources in water head site.	• Risk of biological invasion, wildlife barrier; • Signs, billboards setting would affect the local vegetation and soil; • During the period of enclosure, the ban on logging, wood cutting, grazing, mowing and other human activities that are not conducive to plant growth and breeding. It would have adverse social impacts on the surrounding pastoral at certain degree.
	Natural Forest Protection Cultivation Demonstration	Towards 52,600 mu Forest management demonstration area, carry out Closed cultivation isolation, Artificial after-culture, Monitoring prevention and cure on insect pest and forest-fire prevention	improve the forest canopy density and the condition of wildlife, upgrading the value of ecological service	
	Forest Resource Monitoring	Effect of land management monitoring, management capacity building, Protection cultivation management observation	Maintain the stability and continuous natural improvement of soil quality	

	Demonstration on Typical Natural Desert Grassland Sustainable Production Management	Sustainable management demonstration on typical natural desert grassland, Artificial desert rangeland construction demonstration, and The sustainable management regulation and capacity building for the natural desert grassland in Bortala	Provide template for the aim of sustainable land use and enrich biodiversity	
	Technical Support and Capacity building on Sustainable Land Management	Expert guiding and technique popularization; Technical training; Management training	Through capacity building, ensure implementation of the project tasks program	
3. Biodiversity Conservastion and livelihoods enhancement	Management and Protection on Desert Forest Resource	Protect the210 hectares Desert Forest of protected areas. Reinforce the publicity and teaching of forest laws and regulations and forest protection policies, prevent deforestation to farm, illegally occupy forest land, denudation, preventing illegal hunting and illegal picking of wild plants.	It is the intensive distribution area for various rare endangered species, thus, it is crucial for biodiversity protection to protect those desert forests.	• Restriction on grazing and resources collection in the nature reserve will impact the livelihoods of local communities • Establishment of sample line and observation point has little effect on the environment, the main problem is vegetation trampled by the monitor personnel

	Biodiversity Protection Observation and Typical Species Protect Analysis	Carry out the protection analysis of rare endangered plants & animals including red deer and Lake Aibi birch in Lake Aibi Wetland National Natural Reserve and Ganjiahu Haloxylon Forest National Natural Reserve and also the protection analysis on the ranodon sibiricus kessler in Ranodon Sibiricus Kessler Natural Reserve.	Ensure natural environment of special protection wildlife. Provide reliable detailed technical data for the effective protection and rapid population amplification of endemic rare endangered species and is of significant help to improve the technical development level and scientific research capacity of protection area project and to train technician group.	personnel. • The establishment infra-red video monitor multiple points has effect on the ecology and sound environment, the points also has effect on landscape environment during the running period.
	Biodiversity Protection Management	Training on management information and technique; Management measure and plan constitution for protection area and protect project; Alternative breading measures for herdsmen; Guide decision-making from expert consulting group; Propaganda in local area or bigger area	Make the activities on each protected area biodiversity protection management be ordered steadily advanced with the help of the implementation of system construction and measure plan against concrete object and matter, improving the achievement of administrative management.	
4. Technical Support and Project Management	Capacity building	Management Training; Technical Training	To achieve an efficient project management and successful implementation of project content	Paper using in training and publicity would produce solid waste if it is short of management. The EIA

	Project Management	Organization establishment and operation of project leading groups; Capacity-building training; carry out activity to promote the public understanding	timely provide analysis base for successful experience and negative issue of project management	management. The EIA suggests it uses reprocessed paper to print.

7 Public Participation and Information Disclosure

7.1 The relative environmental law and legal basis

Public participation of EIA can made the project democratization and publicity, let the people who are directly or indirectly related to the project take part in the EIA, they can express their attitudes to the construction project from their own interests and public interests composition, and give their opinion on the construction project impact on the environment, in order to achieve the views of the evaluation work perfect and justice. The project public participation and disclosure was conducted in compliance with Chines Environmental Impact Assessment Law and World Bank safeguard policy OP4.01 Environmental Assessment

Lake Aibi Natural Reserve is related to own benefit of township people in the project area, make public of project area understand the project construction condition and environmental impact may be caused by the construction through public participation way, offer opinions and suggestions for the project, and make the impact on the environment of the project reduce to the minimum.

Public participation can help deepen understanding of the potential influence of reconstruction projects, help determine the actual superseding plan and design program and slowdown measures, conduce to obtain understanding and support from citizens in the project area widely.

7.2 Procedure of public participation

7.2.1 Method and scope

7.2.1.1 Survey method

Way of public participation (survey method) can use environmental protectional announcement, questionnaire investigation, alone interview and telephone inquiries. The keynote is to have sampling investigation by access and symposiums within the scope of the project directly affected area. When use questionnaire method the investigators should introduce basic situation of this project, project size and favorable and unfavorable influence may be created in local to the surveyed, the persons being investigated fill public

opinion in the referring table voluntarily.

Using uniform interviews survey questionnaires "all-mood public opinion questionnaire", asking the same question to each respondents, respondents can play "appropriate" and fill out the form of asking advice column to express their apiration, and it is easy to do statistical analysis of all questionnaire for. According to the study report of Chinese Lake Aibi regional sustainable management and biodiversity conservation project feasibility, combined with the preliminary analysis of the environmental impact, the evaluation units formulate opinion questionnaire Lake Aibi regional sustainable management and biodiversity conservation project from the enterprises and institutions, government agencies and social groups and opinion questionnaire of Lake Aibi regional sustainable management and biodiversity conservation project public.（table7.1-1 and table7.1-2）。

In order to fully understand the opinions from departments and the masses of project area , and to protect the interests of residents who are affected, the evaluating unit conduct site survey under the support of relevant department and design units from June 2010, and went into county and village of the project affected zone regional to do investigation , visited the local residents, distribute public participation publicly, introduced project construction scheme and adverse environmental impacts face to face, explained the problem public concern, through the face-to-face communication and exchange, and recycling opinion consult table, the task of public participation in investigation was completed successfully, and has achieved the goal of the investigation. Photos of public participation investigation can be seen in the attached figure7.2-1.

7.1.1.2 Scopes and target of the survey

For reflecting public opinion and the suggestion comprehensively, the public participation survey included residents of the direct affected area. The local residents in the area and around the area were selected for respondents, including residents and floating population. This survey considered the differences of occupation, living area, cultural degree fully. This survey included forum of the government departments and social groups, and consultation of related experts.

In the public participation investigation, When use questionnaire method the investigators should introduce basic situation of this project, including project significance, construction project content, investment, the favorable and unfavorable environment effects, the measures intends to prevent etc, choose problem have closest relations with the public as the main investigation contents, emphasis on consult the public suggestion secondly.

7.2.2 Procedure of Public Participation

There has been ongoing public participation and information disclosure. This item is classified to B project according to the bank's requirements, and it only needs do public participation, public information, and public feedback only one time. According to requirements of the state environmental protection issued by administration of China provisional measures on public participation in EIA (March 18, 2006 implement), procedure and content of public participation of this project are as follows:

7.2.2.1 Announcement of Environmental Protection

Announcement were mainly posted in the area connected to the project, such as involves water-saving irrigation site in fifth team of Wutubulage village of Wutubulage county, Wulansumu country of Dalete county, the No.7 electromechanical well in irrigation experiment stations of Bortala, which covered all areas involving in this project. Main opinion of residents can be informed through email letter, telephone and other forms to the construction unit and the EIA units. Major announcement posted station can be seen in table 7.2-1, figure 7.2-1.

Table 7.2□1 Posted announcement table

No.	Located sites of announcement	Posted time
1	Kekebasto In Lake Aibi	2010.09.25□2010.09.30
2	Beilin viliige school of Bole city	2010.09.25□2010.09.30
3	Boa Road Fire Station	2010.09.25□2010.09.30
4	Aobao management and protection Station in Bole City	2010.09.25□2010.09.30
5	Beilin viliige of Bole city	2010.09.25□2010.09.30
6	Dalete town of Bole city	2010.09.25□2010.09.30

7	Qingdala forest management area of Bole city	2010.09.25□2010.09.30
8	Haoxi villige of Dalete town of Bole city	2010.09.25□2010.09.30
9	Wutubulage town of Bole city	2010.09.25□2010.09.30
10	90 management and protection station of Jinghe County	2010.09.25□2010.09.30
11	Daheyanzi Town of Jinghe County	2010.09.25□2010.09.30
12	Mangding village of Jinghe County	2010.09.25□2010.09.30
13	Tuoli village of Jinghe County	2010.09.25□2010.09.30
14	Tuotuo village of Jinghe County	2010.09.25□2010.09.30
15	Jinghe County	2010.09.25□2010.09.30
16	Qingdeli Valley Secondary forest management and protection station	2010.09.25□2010.09.30
17	Taxiu Village of Wenquan county	2010.09.25□2010.09.30
18	Dongfang village of Wutubulage town	2010.09.25□2010.09.30
19	Primary School of Wutubulage town	2010.09.25□2010.09.30

Kekebasto in Lake

Beilin viliige school of Bole

Boa Road Fire Station

Aobao management and protection

Beilin viliige of Bole city

Dalete town of Bole city

Qingdala forest management area of Bole

Haoxi villige of Dalete town of Bole

Wutubulage town of Bole

90 management and protection station (MPS) of Jinghe County

Daheyanzi Town of Jinghe County

Mangding village of Jinghe County

Tuoli village of Jinghe

Tuotuo village of Jinghe

Tuotuo village of Jinghe

Jinghe

Qingdeli Valley Secondary forest MPS

Taxiu Village of Wenquan

Dongfang village of Wutubulage town

Primary School of Wutubulage

Figure 7.2-1 Announcement Photograph

7.2.2.2 The newspaper and online publication

There has been ongoing disclosure and public consultation. This project issued the notice on newspaper of Boertala on September 24 of 2010, made public announcements on BoZhou forestry website on September 27, introduced the basic information of the project, the construction unit, EIA unit, EIA work, ask for public opinion and public feedback. The EIA public disclosure has been conducted 2 times on internet after the first one. The first time was in October 2010. The second one was made on March 2011, with Chinese and Kazakhstani announcement. Full EIA and EMP can be downloaded from the website and accessible in local environmental protection bureaus. See in figure 7.2-2.


中国艾比湖区域可持续管理与生物多样性保护项目环境影响评价第三次公示-博州政府新闻中心 - Windows Internet Explorer
http://www.xjboz.gov.cn/html/2011-03/11-03-03-c4lo.html
博尔塔拉 政府网
www.xjboz.gov.cn
州长致辞 | 走进博州 | 公众 | 企业 | 旅游 | 投资 | 三农 | 博州年鉴
最新新闻
精河县2011年春耕生产农级
2011年博州六揽并举加快转
州消防局：博州支队“五项
州消防局：博州两级消防部
阿拉山口：归联召开一届二
热点新闻
突发事件应对法培训复习大纲(
博州旅游景区简介
博乐城乡“文化墙”上“墙文化
博尔塔拉蒙古自治州2007年政府
2007年政府工作报告(摘要)
全州将有一次明显天气过程未来
当前位置： 首页 >> 博州新闻 >> 通知公告 >> 正文
中国艾比湖区域可持续管理与生物多样性保护项目环境影响评价
第三次公示
【来源】：博州GEF艾比湖项目执行办 【作者】： 【发布时间】：2011-3-3 【点击】：118
一、项目名称及概要
1、项目名称：中国艾比湖区域可持续管理与生物多样性保护项目
2、概要：
本项目包括四个子项目内容，各子项目所包括的活动内容见表1。
表1 本项目基本情况
项目名称
项目内容
1、优化水资源调配
项目区水资源调查评估
艾比湖流域的耗水格局分析；艾比湖流域水资源评价；艾比湖流域耗水平衡分析；博尔塔拉州节水潜力评价；基于ET耗水平衡的节水效果评价
多种灌溉模式耗水量监测分析的试验示范
田间观测，不同灌溉模式下灌溉取水量计算模型，农民用水者协会耗水管理
耗水结构动态监测系统开发
数据采集与处理；ET计算； 耗水结构分析
对水源地天然林资源保护
停止对水源地90万亩天然林的采伐，加强护林防火，防止对野生动植的破坏行为
Internet | Protected Mode: On
100%


中国艾比湖区域可持续管理与生物多样性保护项目环境影响评价第三次公示（哈文版）-博州政府新闻中心 - Windows Internet Explorer
http://www.xjboz.gov.cn/html/2011-03/11-03-03-2xw5.html
博尔塔拉 政府网
www.xjboz.gov.cn
州长致辞 | 走进博州 | 公众 | 企业 | 旅游 | 投资 | 三农 | 博州年鉴
最新新闻
中国艾比湖区域可持续管理
中国艾比湖区域可持续管理
少数民族发展行动计划公示
3月2日视频新闻
3月1日视频新闻
热点新闻
突发事件应对法培训复习大纲(
博州旅游景区简介
博乐城乡“文化墙”上“墙文化
博尔塔拉蒙古自治州2007年政府
2007年政府工作报告(摘要)
全州将有一次明显天气过程未来
当前位置： 首页 >> 博州新闻 >> 通知公告 >> 正文
中国艾比湖区域可持续管理与生物多样性保护项目环境影响评价
第三次公示（哈文版）
【来源】：博州GEF艾比湖项目执行办 【作者】： 【发布时间】：2011-3-3 【点击】：110
Done
Internet | Protected Mode: On
100%

7.2.2.3 Table of public inquiry

During the period of the announcement, we distributed public questionnaire participation to government representatives (bureau of agriculture, forestry, communications bureau, land bureau again, bureau, construction bureau, project office, women's federation), possibly affected residents and public randomly, questionnaire investigation contents and forms can be seen in table 7.1-2. Coverage of questionnaires survey are for units and residents that construction projects may affected. Numbers of total copies of issuing questionnaires is 72, numbers of copies of effective recycling questionnaires is 72, recovery is 100%. See in figure 7.2-3.

Figure 7.2-3 questionnaire

After the completion of compiling of the project, the EIA report the will be put on the place that people can get on the Internet or download.

Table 7.2-1 Opinionaire of GEF《Project of Lake Aibi regional sustainable development management and biodiversity conservation》involved Institutions, government agencies and social groups

name of organization	Location	Unit Total Persons	Preparer
Mainly engaged in the unit	Location relationship betweenunit and project	The potential impact on the unit	contact information
Executive Summary□Project overview, problem that faced, overall objective, main activity.	Lake Aibi basin has special geographical position and various ecological landscapes, and it is an important ecological barrier of economic belt in North Slope of Tianshan Mountains. But over the last 50 years, under the synthesis influence of natural factors and human activities, the water level of Lake Aibi had a sharp decline, the area of the lake surface drying shrank from 1070km2 of 1950s to 500 km2, the project area become important dust apodemus agrarius because of Lake Aibi wetland rapidly shrinking and frequent winds. Due to the winds glacial transportation, the salt dust of here can elegant to the Chinese western glaciers includes Tianshan mountain glaciers, influence of salt dust may accelerate the thaw of glaciers, thus the time of people to adapt to climate change is shortened, and have great threat on biodiversity protection and economic development of Bozhou, Xinjiang and western China. The increasingly serious sandstorm directly endanger the normal operation of the Eurasian continental bridge railway, the annual operating times have been delayed more than 200 times in recent years, 3 kilometers road has been caused to diverted. Railway management department have put large maintenance costs. 27 kilometers of connection ports highway road has diverted. The purpose of this program is laying equal stress on biodiversity protection and its living environment, and integrates with local society economic development. Bringing Lake Aibi basin protection within the work of agriculture, water, forestry and pasturage department, make it become one part of sustainable development of Bortala Mongol Autonomous Prefecture. The overall goal is to promote the ability of managing Natural Reserve, improve the biodiversity habitat in local, xinjiang and greater region, promote coordination and mutual support of social economical development and ecological protection, through optimization of water resources management and sustainable land management, as well as preservation and restoration of natural forest grassland in waterhead area, agricultural water saving, guarantee of usage of ecological water, control the shrinkage of Lake Aibi wetland, make the area of the lake gradually ascension back to 800km2. The project under the support of GEF, mainly develops the activity as follows: (1) the optimization of water resources deployment and activities are: a) analyze and evaluate balance of deprivation water. b) apply satellite remote sensing ET to monitor deprivation water. C) build model of experimentation of variety of irrigation water consumption and water-consumption monitoring		

	analysis. (2) the sustainable land management, activities are: a) build evaluation and capacity of grass load b) protection and cultivating of natural forest. (3) biodiversity protection management and repair in Lake Aibi Natural Reserve, activities are: a) formulate protection program and develop biodiversity conservation investigation in LakeAibi wetland. b) the resources protection of rare and endangered species such as red beer of Lake Aibi and Lake Aibi Birch c) repair management plan of degradation land and the demonstration of renewable resources sustainable utilization. d) observation of the bird types in Lake Aibi wetland . e) promote the process of Lake Aibi wetland joining the international important wetlands. (4) technical support and project management, activities are: a) establish department personnel training, coordinating mechanism. b) coordinate the relationship between environment and people; publish tourism guides Lake Aibi wildlife and ecology in a variety of languages, film and publish picture album of birds observe and ecological benefits trailer. c) establish natural forest grassland, biodiversity, monitoring and evaluation system of Lake Aibi wetland. d) conduct monitoring of melting glaciers, *Ranodon sibiricus* reserve and research of carbon absorption. This project is ecological protection project, but the project construction and operation will produce some adverse impact on the ecology and environment. This project will reduce the environmental impact to the minimum through the environmental impact assessment and public participation in the process of engineering design, construction and operation.		
Views and attitudes to this project			
Detailed opinions on the setup of a project			
The effect of the project impact on the regional economic development			
The effect of the project region impact on public undertakings, such as energy, transportation, communication, culture, entertainment, health, education, etc			
The effect of the project impact on regional ecological environmental			
The effect of the project impact on people's life quality			
The effect of the			

project impact on regional Natural Reserve and biodiversity conservation			
The question of specific requirements, advice and other needed explanation for the project			
Something else			

Table 7.2-2 Opinionaire of GEF《Project of Lake Aibi regional sustainable development management and biodiversity conservation》involved Institutions, government agencies and social groups

<table>
<tr><td>Name</td><td>Sex</td><td>Age</td><td>Nation</td><td colspan="2">degree of education</td></tr>
<tr><td></td><td>□male
□female</td><td></td><td></td><td colspan="2">□regular college course and higher
□senior high school
□junior high school and lower</td></tr>
<tr><td>Company and Home Address</td><td colspan="2">Job</td><td>Relationship with the progress</td><td colspan="2">The main effect</td></tr>
<tr><td rowspan="2"></td><td colspan="2" rowspan="2">□cadre □farmer □ worker
□individual □student
□other else</td><td>distant kilometers</td><td>□ direct</td><td>□ big</td></tr>
<tr><td>Locate__of planning area</td><td>□ indirect</td><td>□ small</td></tr>
<tr><td>Executive Summary□Project overview, problem that faced, overall objective, main activity.</td><td colspan="5">Lake Aibi basin has special geographical position and various ecological landscapes, and it is an important ecological barrier of economic belt in North Slope of Tianshan Mountains. But over the last 50 years, under the synthesis influence of natural factors and human activities, the water level of Lake Aibi had a sharp decline, the area of the lake surface drying shrank from 1070km2 of 1950s to 500 km2, the project area become important dust apodemus agrarius because of Lake Aibi wetland rapidly shrinking and frequent winds. Due to the winds glacial transportation, the salt dust of here can elegant to the Chinese western glaciers includes Tianshan mountain glaciers, influence of salt dust may accelerate the thaw of glaciers, thus the time of people to adapt to climate change is shortened, and have great threat on biodiversity protection and economic development of Bozhou, Xinjiang and western China. The increasingly serious sandstorm directly endanger the normal operation of the Eurasian continental bridge railway, the annual operating times have been delayed more than 200 times in recent years, 3 kilometers road has been caused to diverted. Railway management department have put large maintenance costs. 27 kilometers of connection ports highway road has diverted.
The purpose of this program is laying equal stress on biodiversity protection and its living environment, and integrates with local society economic development. Bringing Lake Aibi basin protection within the work of agriculture, water, forestry and pasturage department, make it become one part of sustainable development of Bortala Mongol Autonomous Prefecture. The overall goal is to promote the ability of managing Natural Reserve, improve the biodiversity habitat in local, xinjiang and greater region, promote coordination and mutual support of social economical development and</td></tr>
</table>

	ecological protection, through optimization of water resources management and sustainable land management, as well as preservation and restoration of natural forest grassland in waterhead area, agricultural water saving, guarantee of usage of ecological water, control the shrinkage of Lake Aibi wetland, make the area of the lake gradually ascension back to 800km2. The project under the support of GEF, mainly develops the activity as follows: (1) the optimization of water resources deployment and activities are: a) analyze and evaluate balance of deprivation water. b) apply satellite remote sensing ET to monitor deprivation water. C) build model of experimentation of variety of irrigation water consumption and water-consumption monitoring analysis. (2) the sustainable land management, activities are: a) build evaluation and capacity of grass load b) protection and cultivating of natural forest. (3) biodiversity protection management and repair in Lake Aibi Natural Reserve, activities are: a) formulate protection program and develop biodiversity conservation investigation in LakeAibi wetland. b) the resources protection of rare and endangered species such as red beer of Lake Aibi and Lake Aibi Birch c) repair management plan of degradation land and the demonstration of renewable resources sustainable utilization. d) observation of the bird types in Lake Aibi wetland . e) promote the process of Lake Aibi wetland joining the international important wetlands. (4) technical support and project management, activities are: a) establish department personnel training, coordinating mechanism. b) coordinate the relationship between environment and people; publish tourism guides Lake Aibi wildlife and ecology in a variety of languages, film and publish picture album of birds observe and ecological benefits trailer. c) establish natural forest grassland, biodiversity, monitoring and evaluation system of Lake Aibi wetland. d) conduct monitoring of melting glaciers, *Ranodon sibiricus* reserve and research of carbon absorption. This project is ecological protection project, but the project construction and operation will produce some adverse impact on the ecology and environment. This project will reduce the environmental impact to the minimum through the environmental impact assessment and public participation in the process of engineering design, construction and operation.			
Approve or disapprove the content of the project	□approve	□basically approve	□disapprove	□don't know
Agree or disagree the composition and layout of the project	□agree	□disagree	□don't know	else
This program is or not conducive to the development of the local economy	□favorable	□ unfavorable	□don't know	else
do you have any opinion on tearing some houses and buildings?	□no	□yes	□don't know	else

Do you understand the project land expropriation or urban-house removing compensation policy	□know	□know a little	□don't know	else
Whether obey land expropriation/demolition and relocation	□obey	□obey with out condition	□don't obey	else
If have any requirement of relocation compensation work	□economic compensation	□local integration	□change job	else
The influence on you of this project	□noise	□solid waste	□ecological environment	else
Suggest take whatever steps to ease influence	□afforest recovery	□ protection of enclosure	□avoid construction	else
Some else questions	Do you think which action of this project have the biggest adverse influence□ Do you think which action of this project have the biggest beneficial influence□ Do you think which action of this project must be carried out□ Do you think which action of this project can not be carried out□ Some else suggestions□			

Xinjiang Institute of Ecology and Geography

GEF□Project of Lake Aibi regional sustainable

development management and biodiversity conservation□

Group of EIA

7.3 Survey Result Analysis

Numbers of total copies of issuing questionnaires is 72, numbers of copies of effective recycling questionnaires is 72, 15 copies for enterprise and public institution, 57 copies for public, recovery is 100%. The investigators mostly participated positively, showed great concern to this project implementation.

According to the results of statistics and induction, statistical results of public participation in investigation can be seen in table 7.3-1.

Table 7.3-1 Statistical Results of Public Participation in Investigation

survey questions	statistical result
Agree or disagree with construction of the project.	Agree to 97%, not agree to 0%, don't know is 3%.
Agree or disagree with composition and layout of the project.	No opinion to 82%, have opinion to 0%, do not know is 18%
Construction of the project whether helps the development of economy in this region.	Benefit for 84%, adverse to 0%, do not know to 16%
The bigger effect on you caused by the construction is	Noise to 73%, exhaust to 21%, dust for 62%, other effects to 15%
Suggest take whatever steps to ease the influence	The ecological restoration to 77%, improve the construction equipment for 38%, be away from to 8%

（1）In the informants, 97% of them agreed the project's construction, 0%of them disapproved, the others said they did not know. It shows that most people support the construction project.

（2）82％ of the informants had no opinion to the composition and layout of the project, 0% of them disagreed to this, 18% didn't know .

（3）84% of people think construction project is conducive to the development of the economy in this region, it suggests that people pay attention to local economic development.

（4）In regarding of the questions that will be caused by the project construction, noise and dust are the biggest concerned question of the local residents, followed by effect of exhaust of monitoring and observation vehicle. Others said during the construction wild animals and plants will be affected.

（5）Seventy seven percent of respondents believed that peripheral environment influence can be slowed down by means of ecological restoration project construction, 38% of the people think that improvement of the

construction equipment performance is effective slowdown measures to slow noise effect, eight percent of them think slowing effect measures should be far from nearby residents.

(6) In the survey of relevant departments, the relevant departments have expressed their strong support to this project, and believe that the implementation of this project will play a very good role in improving local environment and all show no opinion.

7.4 Public Participation Conclusion

With a wide range and appropriate methods, the public participation survey of this project basically covers the major impact villages and towns. The representativeness of survey population is wide-range, and includes projects related to counties, towns, relevant departments and social organizations. The recovery coefficient of public participation questionnaire is also high.

Through public participation and investigation, the conclusions are as follows:

(1) Recovery coefficient of public participation questionnaire reaches 100%, which shows that public in the evaluation area are very concerned about the project, and the public awareness of environmental protection is very strong.

(2) In has returned questionnaires, 97% of the public support for project construction. The construction necessity, urgency and significance of the project are generally recognized by the public, and the support rate is very high,

(3) Project implementation has been widespreadly concerned by public involving the project, and different interest groups concerned with different issues. Generally speaking, issues concerned by public within project area involved the main aspects of adverse effect brought by the project, and it is also the core problem of environmental protection in project design and construction.

(4) At present, some issues that public concerns have been solved properly, such as the construction noise and dust impacts. The construction unit also will pay more attention to the construction process, and it will be

better resolved in the process of construction.

8. Environmental Management Plan (EMP)

8.1 Introduction

The aim of formulate EMP is making a technically feasible, financially sustainable and operational environmental countermeasure in view of unavoidable environmental impact, define implementing environmental alleviation, environmental management and agency construction measure and plan of project contractor, project supervisor, operators and environmental management department. It is aim to eliminate or compensate the undesirable social and environmental impact of the project, or reduce it to acceptable level. The specific objectives are as follows:

(1) Definite environmental management obligations of contractors and operators

Project owners, environmental impact assessment unit and design unit carried out detailed on-site check and confirmation, promoted effective environmental mitigation measures, and bring it into engineering design as contractual obligation of construction contractor and operator.

(2) As operational guidelines for environmental management

Environmental monitoring program of the construction and operation period promoted by environmental management plan can ensure the effective implementation of environmental mitigation measures, and will be provide to construction supervision unit, environmental supervision unit and other related units of construction and operation period as an environmental protection text. It defined responsibilities and role of relevant functional departments and management institution, and provided communication channels and modes between departments.

(3) Ensure funding for environmental management action

Environmental management plan makes estimates of the funding for environmental protection, environmental management, environmental supervision and capacity building, and state funding sources, to ensure that the environmental management action can be implemented. Administrative costs including labor costs and operating costs. The role

of environmental management plan is to prevent and control environmental impact in the process of project implementation and operation, and propose impact mitigation measures need to implement, monitoring measures, legal supervision means and safeguard mechanism of the above measures. At the same time, it is the key link to environmental impact, environmental assessment, described impact mitigation measures in detail, and alternative measure. For each environmental management measure, environmental management plan definite its connotation, investment estimates implementation plan the functions of government agencies, funding sources, and monitoring programs. To achieve the reduction targets, approach involved in environmental impact assessment report and environmental management plan must be implemented.

8.2 Environmental Action Plan

8.2.1 Summary of Project Impacts and Mitigation Measures

Typical environmental impacts and mitigation are summarized in Table 8.2-1.

Table 8.2-1 Undesirable environmental impact and alleviation measure in construction period

Receptor	Environmental impact	Alleviation measure
Landscape	Civil works has the potential to impact local landscape	Pay attention to protection of landscape. Landscape design where feasible.
Ecology	Vegetation clearance and land use type change associated with civil works	Minimizing land take and vegetation clearance. Reserve top soil and carry out revegetation timely.
Water	Wastewater from construction site or camp	Install wastewater collection system and sedimentation tank. Build septic tank for toilet.
Social	Restriction to farmer/herder livelihoods due to change or limit on water resource, natural resource use	Optimize the implementation plan, provide compensation, employment opportunities, training to minize such impacts.
Ambient Air	particle pollution especially at downwind distance	Sprinkling water to decrease the dust; cover the dust source
Acoustic	Noise arouse by construction machinery	Improve equipment performance and fix cushion blocking
Forests	If not properly managed,	Prepare environmental protection

	forests protection may cuase degradation of forest quality	guideline for forests to guide site clearing, preparation, tree species selection, planting, pest control, fire control. See EMP attachment on forest guideline

8.2.2 Project EA management during implementation

The project by nature is an environmental and ecological conservastion project that focuses on technical assistance and capacity building, with very limited construction activities. This EIA report is classified as planning EIA according to Chinese EIA law. Since project Feasibility Study does not specify exact location and scale of some project activities, which will be decided during project implementation, a guideline will be presented to guide EIA/EMP preparation during project implementation in accordance with domestic requirements and Word Bank safeguard polices, summarized in below.

(1) Forest and grassland conservation project: it can compile report table. Towards construction scale and scope in all kinds of construction activity of implementation plan, it puts forward supplementary corresponding biodiversity protection and social environmental impact mitigation measures, approved by the State Environmental Protection Agency.

(2) Nature Reserve Project: Involving project within and outside of protected areas, protected area authorities promote audit opinion, approved by the State Environmental Protection Agency.

(3) Agricultural Project: proposed farmland protection requirements, social environmental impact mitigation requirements, to prevent salinization, approved by the State Environmental Protection Agency.

(4) Other small-scale individual projects, such as installation of single monitoring house, power-operated well management house and small and medium sized monitoring equipment, and laying of temporary roads less than 1km using for Scientific research and monitoring. All this can compile report table, and can be approved by the State Environmental Protection Agency.

The project is similar to planning environmental assessment, and required to make a report, which is already explicit in the outline. Construction

content involving in the project is small, and feasibility study did not give the specific content and scale. Therefore, in accordance with domestic requirements, before the implementation of each subproject, they should compile corresponding report table or registration form according to its content and scale of feasibility study and designation. Whether compile the report table or registration form or not, should depends on the content and scale of construction project, so it is cannot be determined. The EIA require that before the implementation of each subproject, it should in strictly follow the requirements of domestic environmental impact assessment, prepare the corresponding report form or registration form, and strictly implement the measures proposed in the report to minimize the impact on the environment.

8.3 Institutional capacity building

8.3.1 Environmental management organization Institution

In project overall environmental management institutional framework, Bortala prefecture GEF Project Executive Office manage the entire project implementation. To ensure the smooth implementation of project environmental management actions, set up a number of full-time or part-time environmental management staff among PMO, project owners, contractors, and operators, and supervise the implementation of environmental management plans. In the process of project construction, allocate an environmental supervising engineer for each subproject, who responsible for project environmental supervision.

Bortala Prefecture Environmental Monitoring Station was commissioned to monitor the environmental quality of project construction and operation period.

8.3.2 Responsibility and Staffing of EMO

Autonomous region project office will appoint a project environment manager to supervise EMP implementation. This person will responsible for all problem involving The World Bank and environment. Bortala Prefecture project office will post a environmental management coordinator, to supervise EMP implementation in responsible area and

communicate with autonomous region project office toward some issues.

8.3.3 Other Environmental Management Participants

Techniques: In the environmental management technical level, an expert will attend to manage project.

Contractor: Provide 1 to 2 professional environmental protection staff to supervise project implementation solve and approach surrounding residents with environment problem, and communicate with environmental supervision agency timely.

Operator: Each corporation set up environmental management office containing two professional environmental engineers. Staffs of corporation will help the engineers, and the company will using internet, telephone keep touch with environmental management supervision agency.

Environmental management engineer: each proprietor employ an environmental management engineer to monitor during the construction and operation process.

8.3.4 EMP Budget

EMP costs are mainly used in environmental management of construction and operation period, including environmental monitoring costs, environmental supervision costs, staff training costs and environmental management agency operating costs. Project environmental management budget is shown in Table 8.3-2.

Table 8.3-2 Project Environmental Management Budget Summary (Unit: million)

Stage	Wage	Office expenses	Transportation	environmental monitoring	environmental supervision	staff training	To
Construction period	0.79	0.26	0.13	2	0.88	3.01	7.(
Operation period	0.13	0.21	0.08	15	0.41	1.67	17
Total	0.92	0.47	0.21	17	1.29	4.68	24

8.4 Environmental Training

During the construction period, propaganda, education and training of environmental protection should be strengthened. Project in-site manager, supervisor and contractor representative need environmental protection training. The contractor must arrange one staff to attend environmental protection training before construction in every contract section, and promise to have a person to implement environmental protection measure in every contract section. The environmental protection training scheme see table 7.5-1.

Table 8.4-1 Environmental Protection Training Schedule

Trainees	Contractor(builder), construction manger and relating supervisor
Training content	Environmental protection regulations, standard of construction period; content about environmental impact assessment report; pollution prevention measure and technique of construction period, workers' environmental protection handbook.
Training agency	Environmental impact assessment unit and environment monitoring unit
Time	2 to 3 days before project start

8.5 Environment monitoring plan

Environmental monitoring time step include project construction and operation period. Its purpose is to fully and timely handle the pollution trend of project, realize the impact scope, environmental quality change extent of construction project area and environmental dynamic quality of operation period, timely feedback to the competent authorities, and provide a scientific basis for environmental management.

8.5.1 Monitor key environmental issues

The construction of project is less, and impact on the environment is also little. Construction project include water-saving irrigation subproject and nature conservation subprojects. As the project area is far from the local residential area (1.5km away), water-saving irrigation projects has little effect on surrounding Atmospheric and acoustic environment. The main impact is groundwater quality effect of water-saving irrigation project in operation period. Natural reserve project involve erection of far infrared video surveillance towers. It will impact the atmospheric and acoustic environment

of natural reserve at certain degree in construction period, and damage the ecological environment of natural reserve at certain degree. Therefore, monitoring key issue of the subproject is the noise in construction period and ecological monitoring in operation period.

8.5.2 Comprehensive monitoring program

(1)Construction period

The monitoring of construction period is noise monitoring, and it is mainly about wild animal impact of construction machinery, as well as working procedures. Monitoring point and content see table 8.6-1.

Table 8.5-1 Noise Monitoring Point and Content

Test place	Height	Content
Natural reserve area of Lake Aibi	1.5 meters outside of the construction boundary	Leq□ L_{10} □L_{50} □L_{90} and SD of any hour day and night

(2)Operation period

After the project construction, make a checking monitoring of air, noise and water quality of the whole project area. Meanwhile, supervise and check the implementing effect of environmental protection measures, ecology restoration plan, and soil and water conservation plan implementation condition. Environmental monitoring schedule table 8.6-2.

Table 8.5-2 Environmental monitoring schedule of operation period

Environmental factor	Testing point	location	Testing content
Water quality	Underground water monitoring of each demonstration area in lake Aibi	Referring to monitoring stations of local environmental protection department	pH, CODcr, Ammonia Nitrogen ,SS, Petroleum and Mineralization
Ecology (vegetation, soil, wild animal)	Habitat and number of north salamander survey; birds watch; vegetation quadrat survey; soil quality monitoring of each demonstration area; Forest, grassland	Set monitoring points in typical land	water quantity, wild animal number, salt content, nutriment

	cultivation and protection demonstration area		

*Remote sensing and evapotranspiration of soil moisture monitoring, belong to monitoring content of research and demonstration, here not repeat them.

According to monitoring result of construction period and operation period, hand in an annual comprehensive report. The report contains various testing items, location and time statistics, over-standard condition and environmental impact comprehensive assessment. Attaching to impact analysis of surrounding environment, countermeasure and suggestion, finally inscribe signature. The report above will provide by project technique office of project office or other professional technique agency. After receiving the report, the program relating responsible unit should quick react according to its responsibility, and implement corresponding remedial measure.

9. Summary and Conclusion

9.1 Conclusion

The program located at Lake Aibi basin in southwest of Junggar Basin□Xinjiang, which belong to one of the most important region of ecology treatment. Recently, through implementing GEF—OP12 of preventing land degeneration pilot project, project area have basic condition, capability and experience to implement larger project. Autonomous region and Autonomous prefecture government established project coordination and leading mechanism and implementation agency. State and Autonomous region continue investing the environmental construction in project area, so the counterpart fund is ensured.

This project implementation also can extensively absorb the benefit-related unit participation. It not only can improve the comprehensive quality of project area staff and the environmental quality, but also let the project area staff study and master advanced ecology program comprehensive management idea. It also can guide ecology system comprehensive management to mainstream direction of local social economic development. The risk of program is low, and expectation output is feasible. Environmental benefit is significant, and it is a good demonstration on land generation prevention and

biodiversity conservation in arid desert land. From the view of water resource allocation optimization, sustainable land management and biodiversity protection management and restoration in natural reserve areas, the design content of project fully represents sustainable comprehensive management and biodiversity conservation.

During implementation process, it will construct some project, which will influence environment at certain degree. However, the influences are temporary and revisable. The impacts can be minimized by taking corresponding environmental protection measure. The influence to environment is small. Therefore, this program is feasible from the environmental protection view.

9.2 Suggestions

(1) Shorten the construction period to reduce impact on the local environment and people's lives construction period.

(2) Towards Temporary land occupation in construction period, do well in land covering and forest rehabilitation work. Try to move trees along construction line rather than the cut, and protect rare trees in particular.

(3) Prohibit night construction of water-saving irrigation points. Vehicle pass in and out should be restricted speed and forbidden horn-blowing. Reasonably arrange for construction period, avoid continuous operation of strong noise machines, and take temporary enclosure measures if necessary.

(4) Construction road and site need 3 to 4 times watering a day, each sub-project construction site shall be equipped with a sprinkler. Spoil should be timely removal, and transport vehicles should be stamped with tarpaulin, and landfill should be covered by soil compacted. Temporary land should be restored vegetation after use.

(5) Construction site should be provided medical and health facilities and health care workers for construction workers physical examination. If people suffering from infectious diseases were found, isolated in time, avoid the sick person approach and ensure project go on wheels.

(6) Properly solve the immigration problem, listen carefully to views on immigration, ensure that migrants working and living conditions not lower than current levels, improve housing area, and fully furnish public facilities.

(7) Do environmental monitoring work in operation period, concern about the dynamic change of monitoring items at moments, and timely detect potential problems and propose solutions.

Annex I Bortala Prefecture Pest Emergency Control Measures

棉花、甜菜、粮油和瓜菜等主要农作物病虫害应急防控措施

一、棉花主要病虫害应急防控措施。

棉蚜发生程度划分标准

害虫名称	项目	发生程度				
		轻	中偏轻	中度	中偏重	大发生
棉蚜（6月）	油蔓卷叶株率（%）	<5	6-20	21-35	36-50	>50
	发生面积占总播面积（%）	<5	>5			>40
	损失率（%）	<5	6-15	16-25	26-40	>40
棉伏蚜	棉叶污染率（%）	无	<25	26-50	51-75	>75
	发生面积占总播面积（%）	<5	>5			>40

棉铃虫发生程度划分标准

害虫名称	项目	发生程度				
		轻	中偏轻	中度	中偏重	大发生
棉铃虫（棉田）	百株虫口密度（%）	<5	6-10	11-20	21-30	>30
	发生面积占总播面积（%）	<5	>5			>20
	损失率（%）	<1	1-5	6-10	11-20	>20

棉叶螨发生程度划分标准

害虫名称	项目	发生程度				
		轻	中偏轻	中度	中偏重	大发生
棉叶螨	红叶率（%）	<5	6-10	11-20	21-40	>40
	发生面积占总播面积（%）	<5	>5			>30
	损失率（%）	<1	2-5	6-10	11-20	>20

应急防治综合技术措施

种类	措施	技术指标
棉蚜	防治策略	狠抓越冬虫源防治，控制棉田点片危害，合理调整作物布局，保护、利用天敌，适时物理诱杀，科学合理用药，保益控害。棉蚜虫情发生量级达到4级时启动防治预案。
	农业防治	调整棉区种植结构，小麦与棉花邻作，培育自然天敌，以益控害。
	生物防治	棉田四周农防护林内或田边地头种植牧草、小麦做为诱集带；或在棉田条田边缘种植生态油菜带，利用油菜上的萝卜蚜（不危害棉花）引诱和饲养天敌。
	棉蚜越冬寄主防治	(1) 花卉防治：3月底前，在花盆内距花株5厘米处，挖穴埋施3%呋喃丹颗粒剂5—10克或15%铁灭克1—5克，覆土浇水。 (2) 温室大棚防治：温室大棚内挂放黄板，并用爱福丁等生物制剂进行防治。 (3) 黄板诱蚜：棉蚜向棉田迁飞前即在4月初，将黄板插设在各植棉县市城乡结合部及乡镇、村队居民点四周的棉田外围和大面积棉蚜越冬寄主旁；5月10日前后棉田外围棚放黄板，对诱杀第一、二次迁飞期棉蚜。
	棉田点片发生期防治	(1) 药剂涂茎法：用氧化乐果等具内吸性农药制剂，按1:5—10兑水配制高浓度药液，涂抹于棉茎红、绿相间处一面，涂茎长度视棉苗大小2—5厘米即可，注意不得环涂，以免产生药害。 (2) 药剂滴心：农药品种同涂茎药剂，药液配制浓度1:10倍。使用喷雾器使药液滴状流出，在每株棉苗生长点，点滴药液1—2滴。 (3) 洗尿合剂喷雾：洗衣粉、尿素各1份，加水100份搅拌均匀进行茎叶喷雾。

种类	措施	技术指标
	大田棉蚜防治	实行药剂挑治，棉蚜扩散为害面积较大时，根据棉田益害比 1:150，逐田调查后化学防治，农药喷洒必须均匀、周到，确保施药质量。 科学选用农药。避免使用菊酯类农药防治棉蚜，为防止棉蚜抗药性的产生要避免长期使用单一农药品种，交替轮换使用不同类型机理的农药。
棉铃虫	防治策略	强化农业防治措施，压低越冬虫口基数，采用物理、生物防治，诱杀越冬代成虫，控制第一代棉铃虫发生量，科学用药挑治，狠抓第二、三代防治，保苗、保花、保铃、促增产。棉铃虫虫情发生量级达到 3 级时启动防治预案。
	秋耕冬灌	破坏蛹室，提高越冬死亡率，压低虫口基数；凡未秋翻冬灌田块，开春后必须实施削埂除蛹，消灭越冬蛹。
	种植玉米诱集带	棉花播种时，选育早熟玉米品种，在棉田四周地埂点播玉米，利用棉铃虫黎明后喜欢在玉米喇叭口内栖息和在玉米上产卵的习性，组织农户每天早晨拍打心叶灭蛾抹卵。
	杨树枝把诱蛾	利用棉铃虫趋性，制作杨树枝把润（晾成萎蔫状），每亩地棉行间竖立 6—8 把，每天日出前将杨枝把内的成虫处理完毕。
	加强田间管理	及时合理化控，防止棉株徒长，可降低棉铃虫为害；利用二代棉铃虫喜欢在棉株嫩尖上产卵习性，结合打顶整枝，拿到田外处理，降低虫源。
	设置频振式杀虫灯	根据虫情预报，分别在越冬代、一代、二代成虫羽化高峰期，即 5 月中下旬、6 月中下旬、7 月下旬至 8 月上旬，开灯并绑好诱虫袋，减少成虫数量。同时，要加强管理，避免误诱杀天敌。
	喷施过磷酸钙	棉铃虫产卵高峰期前，棉田喷施 2%过磷酸钙浸提液，中和嫩叶的草酸味，趋避棉铃虫在棉田产卵。
	科学使用化学农药	对达到百株卵量 20—30 粒或百株有虫 8—10 头指标的棉田实行药剂挑治，减少施药面积。施药期掌握在棉铃虫卵孵化高峰期至 2 龄之前。棉铃虫二代卵多产在顶部嫩叶和叶片正面，二代喷药应集中喷洒在顶部叶片上；三代产卵较分散，以采用机动喷雾器上、下均匀喷透为宜。选择对路农药，交替轮换用药。选用高效低毒、低残留的单剂品种为主，如美除、氟灵脲、爱福丁、BT、核多角体病毒、甲维盐等农药。禁止使用多元复配杀虫剂，防止产生交互抗性。
棉叶螨	防治策略	农业防治、生物防治和化学防治相结合，强化秋翻冬灌、早春药物封锁田边杂草等措施，实行生态控制，保护利用天敌，狠抓早期挑治，控制扩散蔓延，重点防治时间为 7、8 月。棉叶螨发生量达到 3 级即中度发生时启动应急防治预案。
	清洁田园秋翻冬灌	棉花收获后集中清理田间枯枝落叶和棉秆，带出田外处理。通过秋翻将土缝中、枯枝落叶下、杂草根际等处越冬叶螨翻入土壤深层，提高越冬死亡率、压低虫口基数。
	田边地头打封锁带	棉花播种后，用专性杀螨剂、石硫合剂在棉田四周及渠道、林带杂草区喷药打隔离带 1—2 次，有效减少早春越冬叶螨基数。
	早期挑治和点片防治	加强虫情监测，做好棉花苗期白查标识。5、6 月零星发生时，用氧化乐果涂茎和滴心进行防治；点片发生时，可用阿维菌素、尼索朗、螨克等农药点片防治。
	大田防治	田间发生量达到 3 级时，用阿维菌素、爱福丁、克螨特、螨净等专性杀螨剂全田防治。喷药防治要保证水量，注意均匀周到，不留死角。轮换用药，科学防治。
	中后期防治	根据条件可适量滴水或灌水，通过增加田间湿度，缓解危害，同时也促进棉花叶繁、提高产量。
立枯病	防治策略	采取药剂拌种等预防措施，结合中耕等农业防治措施，有效降低田间死苗率，控制棉花立枯病的扩散和危害。
	药剂拌种	精选种子，汰出秕种、破种，晒种 2—3 天。推广卫福、福多甲和敌克松等药剂包衣和拌种，选用卫福 200FF 种衣剂，按 1:250—300 的药种比进行机械或人工包衣；或选用 26%福多甲，按 1:50—60 的药种比机械或人工包衣。搅拌时要迅速，保证种衣剂的成膜性。注意用福多甲拌种时务必要洗种，降低种子残酸量。

种类	措施	技术指标
	农业防治	棉花现行后中耕2—3次，由浅至深，提高地温，对立枯病将起到一定预防和控制作用。结合间定苗，将病苗集中带出田外销毁处理，减少病菌在土壤中的积累。
枯、黄萎病	防治策略	改造重病区、控制轻病区、消灭零星病区、保护无病区，控制棉花枯、黄萎病的扩散和危害。
	推广抗耐病品种	这是目前最有效的防治方法，品种有冀958、博陆早1号（81—3）和新陆早33号等。注意保护无病田，严防在无病田种植抗病品种，防治病菌污染土壤。
	实行轮作倒茬	结合种植业结构调整，重病田及连作年限较长的地块与小麦、玉米等禾本科作物进行轮作3—5年，可减轻病害发生。

二、甜菜主要病虫害应急防控措施。

甜菜、瓜菜主要病害发生程度达到2级、虫害发生程度达到3—4级时启动防治预案。

种类	措施	技术指标
甜菜立枯病	种子处理	用敌克松可湿性粉剂按种子量0.2—0.3%拌种，也可用卫福200FF种衣剂进行包衣，可有效防止烂种、预防立枯病。
	农业防治	实行轮作倒茬，避免重茬和迎茬；科学合理使用氮磷钾肥，促进幼苗健壮生长，提高抗病虫能力；对沟播平铺甜菜要及时打洞破膜练苗，以降低膜内湿度，缓解甜菜立枯病的发生；加强农田管理，播后遇雨要及时破板结，苗期遇雨要及时中耕，提高地温。
甜菜根腐病	综合防治	实行轮作倒茬，避免重茬和迎茬；增施腐熟有机肥，改善土壤理化性质，促进甜菜根系发育，提高植株抗病能力；实行沟灌或滴灌，避免大水漫灌，减少病菌传播；加强地下害虫防治，避免根系损伤，减少病菌侵染机会。每年发病较重地块也可用根腐灵叶面喷施或灌根，提前预防。
甜菜褐斑病	农业防治	实行四年以上的轮作倒茬，避免重茬和迎茬；甜菜收获后，及时清除田间病残体，集中带出田外处理；实行秋翻冬灌，促进病残体分解，减少菌源越冬基数。
	化学防治	发病始期，用50%甲基托布津可湿性粉剂800倍—1000倍液或50%多菌灵可湿性粉剂1000倍液或75%百菌清可湿性粉剂800倍液叶面喷施，根据病情进行2—3次喷雾，间隔期7—10天。
甜菜白粉病	农业防治	选用抗病、耐病的品种；实行四年以上的轮作倒茬，避免重茬和迎茬；适时灌水，防止植株受旱；避免偏施过量氮肥，防止旺长，增强植株抗病能力；甜菜收获后及时清除田间病残体，集中带出田外处理；大力推行秋翻冬灌，促进病残体分解，减少菌源越冬基数。
	化学防治	发病始期，用25%粉锈宁可湿性粉剂亩用量40--60g或50%甲基托布津可湿性粉剂800—1000倍液叶面喷施。
甜菜象甲	农业防治	轮作倒茬，适期播种，秋翻冬灌，清除田间杂草，灌水淹杀。
	化学防治	幼苗期发现象甲（虫口数量在60头以上/m^2）或未作种子处理的地块，选用5%辛硫磷乳油800—1500倍液或2.5%敌杀死乳油1500倍液或选用35%甲基硫环磷乳油400—600倍液或25%亚胺硫磷乳油400—500倍液或50%敌敌畏乳油500倍液喷雾进行叶面喷雾。

三、小麦主要病虫害应急防控措施。

种类	技术措施
锈病	(1) 根据发病程度和区域，实行统防统治，狠抓孕穗后分片治理，发动群众开展锈病普查和系统调查。常发区3天一查，5天一报告，及时准确掌握病情，做好防治规划和指导防治。 (2) 及时封锁中心病团，“发现一点，防治一片”，做好早期防控，防治病情扩散蔓延。 (3) 若病情扩散和蔓延，对发生田块用对路农药每隔7天防治1次（2—3次），控前保后，统防统治，确保防控效果。可选用20%三唑酮50克+50%多菌灵80克，兑水16—20公斤，病株叶面喷施。
根腐病全蚀病	老麦区小麦苗期，若零星发生，及时选用三唑酮等杀菌剂，叶面喷施1—2次，控制其蔓延。

种类	技术措施
细菌性条斑病赤霉病	本州这两种病害发生危害一般在孕穗后，在“四定一查”和大田调查的基础上，根据天气降水量的大小和降水的频率，及时确定防治方法。防治方法同小麦锈病防治。
雪腐病雪霉病	对于暖冬和降雪较厚麦田，早春积雪即将消融时，及时对冬前壮苗（3叶1心苗），实施破雪追肥施药防病。即每亩追施尿素8—10公斤、拌15%三唑酮粉剂120克、50%多菌灵150克，条播机播入雪层下，可防止0—15℃时雪腐雪霉菌的发生。
蚜虫	百穗小麦蚜虫达到500头的田块，选用70%灭蚜松可湿性粉剂1000倍液等药剂统一喷施。
皮蓟马	小麦孕穗末期或灌浆初期，皮蓟马百穗300头以上，可用90%敌百虫1000倍液喷施。

四、玉米主要病虫害应急防控措施。

种类	措施	技术指标
玉米螟	物理防治	(1) 利用成虫趋光性，采用频振式杀虫灯、黑光灯夜间诱杀成虫。因玉米秸秆多堆放于村队居民点内，5月至6月在居民点内及玉米田四周设置杀虫灯，集中诱杀第一代成虫。具体开灯时间根据虫情监测和预报情况确定。 (2) 采用大型玉米收割机收获，玉米秸秆粉碎后还田，消灭秸秆中即将越冬的玉米螟幼虫。
	生物防治	(1) 喇叭口期用白僵菌可湿性粉剂（每克含孢子量4×10?个）每亩200毫升或用BT每亩200毫升，加少量水拌细砂5公斤，撒于玉米心叶内。 (2) 秋季用白僵菌统一喷施秸秆后封垛处理，减少次年虫源。
	化学防治	(1) 花叶率达20—30%时，选用菊酯类农药—2.5%功夫、劲彪1500—2500倍液药剂灌心，每心叶中灌20—30ML药液。 (2) 禁止使用呋喃丹等剧毒农药灌心，以确保绿色玉米质量，同时避免秸秆饲养牲畜发生中毒。
叶螨	打封锁带	4月中旬用专性杀螨剂、石硫合剂，在田边四周、渠道、林带杂草喷药打隔离带1—2次，减少早春越冬叶螨基数。
	早期挑治	加强虫情监测，早期挑治和点片防治。6月间玉米叶螨零星发生时，用阿维菌素、爱福丁等生物农药进行防治。
	大田防治	7月份在大田调查基础上，选用15%扫螨净、5%尼索朗乳剂、75%克螨特乳药剂等农药进行防治。药液尽量喷在叶背面，防治2次左右。
三点斑叶蝉	危害初期	即田边杂草及边行危害期，选用内吸性药剂控制虫口蔓延，可兼控玉米叶螨。
	危害高峰期	用10%吡虫啉WP2500倍液或20%啶虫脒液剂3000倍液喷雾防治。
玉米瘤黑粉病	种子处理	种子药剂处理是防治此病的关键防治技术，可用戊唑醇80FS包衣玉米种子，100kg玉米种子使用戊唑醇80FS125ml包衣，或采用12.5%烯唑醇（速保利）可湿性粉剂，按种子重量0.3%的药量拌种。
玉米锈病	栽培防病	(1)玉米锈病是一种气流传播的大区域发生和流行的病害，防治上必须采取以抗病品种为上、以栽培防病和药剂防治为辅的综合防治措施。病重地区应更换抗病品种；适时播种，合理密植，避免偏施氮肥，搭配使用磷钾肥。
	药剂防治	发病初期及时喷药防治，有效药剂有25%粉锈宁可湿性粉剂1000—1500倍液，65%代森锌500倍液，50%代森铵水剂800—1000倍液，隔10天左右喷1次，连续防治2—3次。

五、油葵病虫害应急防控措施。

种类	技术指标
油葵褐斑病	重茬油葵地块褐斑病为害偏重。苗期该病呈中度偏轻发生时，及时选用50%多菌灵液或70%甲基托布津杀菌剂800-1000倍药液进行叶面喷施，防治效果明显。
油葵菌核病	(1)适当晚播：5月初播种，以避免有利于菌核及侵染的天气条件，降低菌核病发病率；拔除病株，清除病残体。

种类	技术指标
	(2)药剂防治。5月底6月初，可用50%扑海因可湿性粉剂600倍液、40%菌核净可湿性粉剂400倍或50%速克灵可湿性粉剂500倍液等喷施，每隔7—10天喷施1次。
油葵白锈病	6月初开始发病期，对中心病株立即全面喷施药液，并及时清除病叶，用72%杜邦克露可湿性粉剂1500倍液、或53%金雷多米锰锌水剂分散粒剂1500倍液或64%杀毒凡粉剂1000倍液，喷2—3次，间隔7—10天。
向日葵列当	与禾本科等作物轮作8年以上；选用抗列当品种，如矮大头等；铲除田间列当；当油葵在蕾达10cm时，向地表及列当植株喷施15%金都尔乳剂85mL/亩。

六、瓜菜主要病虫害应急防控措施。

瓜菜主要病害发生程度达到2级、虫害发生程度达到3—4级时启动防治预案。

种类	措施	技术指标
枯萎病	农业防治	选用抗病品种如津杂系列品种；重病田采取轮作倒茬即与非瓜类作物实行3—4年轮作；用黑籽南瓜作砧木，黄瓜作接穗进行嫁接；及时清理田间病株残体，集中烧毁或深埋；进行土壤消毒处理，上茬蔬菜拉秧后，利用夏季高温，温室内土壤深翻后覆盖地膜，密闭棚室，使气温达50℃以上，高温消毒2—3天后把地再深翻一遍，继续密闭消毒2—3天，起到杀菌作用。
	种子消毒	用55℃温水浸种10分钟，不断搅拌，然后捞出催芽播种。或用50%多菌灵可湿性粉剂500倍液浸种1小时，用清水冲洗干净后催芽播种。
	药剂防治	发病初期，选用50%多菌灵可湿性粉剂500倍液或“农抗120”100倍液或10%世高1500倍液灌根。
黄瓜霜霉病	农业防治	清洁田园，收获后将散落田间的植物病残体、残枝败叶和杂草集中清理干净，带出温室，集中无害化处理，保持田间清洁，减少上茬生病原菌积累。
	物理防治	发病初期实施高温闷棚，选择在晴天上午浇1次大水后封闭棚室，将棚温提高到46—48℃，持续2小时，然后从顶部慢慢加大放风口，缓慢降低室温。以后如需要每隔15天闷棚1次，闷棚后加强肥水管理。
	药剂防治	发病初期进行统防统治，选用45%百菌清烟剂亩用量250克，在温室内分10处点燃进行熏蒸。72%克露可湿性粉剂800倍液喷雾58%甲霜灵锰锌可湿性粉剂1000倍液喷雾。
番茄早疫病 晚疫病	农业防治	选择高产、优质、抗耐病品种；轮作倒茬；前茬蔬菜拉秧后及时清除田间残枝败叶集中销毁。进行硫磺闷棚消毒，定植前熏蒸灭菌。增施充分腐熟的有机肥；合理密植，及时整枝，改善田间通风透光条件；灌水后及时通风降低空气湿度，避免叶片结露；及时清除中心病叶或病株。
	种子消毒	用52—55℃温水浸种15—20分钟或将种子用40%多菌灵可湿性粉剂400—800倍液浸泡2.5小时进行种子消毒。定植时选用无病壮苗定植。
	化学防治	番茄早疫病：发病初期及时统防统治，用百菌清烟剂在棚室内分10处点燃熏蒸防治。同时可用80%代森锰锌可湿性粉剂800—1000倍液或75%百菌清可湿性粉剂800—1000倍液等叶面喷雾，7—10天喷1次，连喷2—3次。 番茄晚疫病：发病初期及时统防统治，选用72%霜脲锰锌（杜邦克露）可湿性粉剂800倍液、60%安克锰锌可湿性粉剂1500倍液、25%雷多米尔可湿性粉剂800倍液、72%普力克（霜霉威）水剂600倍液。
马铃薯甲虫	检疫防治	严格开展产地检疫和调运检疫。马铃薯主要种植区域，积极开展自查划定疫区和非疫区，防止马铃薯块茎、活体植株从疫区调出。
	农业防治	实行秋翻冬灌、与非茄科蔬菜、玉米和小麦等作物轮作倒茬，恶化害虫生活环境，中断其食物链，降低害虫种群数量；利用该虫的假死性及迁移活动性较弱的特点，进行人工捕杀成虫和捏杀卵块，减少田间发生量，一般2—3天捕杀1次，以减轻二代发生量及危害。
	药剂防治	适期开展统防统治，关键期为卵孵化初期至1—3龄幼虫危害高峰期，防治指标为每10株寄主植物低龄幼虫达200头，高龄幼虫达115头，成虫25头时，选用BT乳剂、2.5%功夫水乳剂15ml/亩，5%锐劲特悬浮剂18ml/亩、5%来福灵乳油、20%杀灭菊酯、2.5%敌杀死5000倍液，

种类	措施	技术指标
		35%赛丹或啶虫咪等杀虫剂喷雾防治。注意农药的安全间隔期，降低蔬菜农药残留量。同时交替轮换用药，以免产生抗药性。
斑潜蝇	检疫防治	加强植物检疫，对从内地调进的蔬菜实施检疫，发现疫情及时处理，降低虫源基数。
	农业防治	发生期结合中耕松土，摘除有虫叶片集中烧毁，减少温室内虫口基数；少施氮肥，多施磷钾肥，以免蔬菜旺长，招引成虫产卵危害。
	物理防治	利用潜叶蝇成虫趋黄性，温室内悬挂黄板，诱杀斑潜蝇，兼治白粉虱和蚜虫。黄板规格 25×40cm，每亩 20—30 块，悬挂于温室虚侧，悬挂高度在植株顶部 10 厘米处。
	药剂防治	温室蔬菜潜叶蝇虫发生高峰期，每亩用 80%的敌敌畏乳油 200—300 克，在温室内分 4—5 处拌锯末点燃发烟熏杀成虫，或用 10%敌敌畏烟雾剂熏杀成虫，亩用量 200 克烟熏防治。
	化学防治	实施统防统治，选用高效、低毒、低残留农药，防治适期掌握在成虫羽化高峰期，选用锐劲特 1500 倍液或 5%抑太保 2000 倍液喷雾防治；幼虫 2 龄前，选用 1.8%阿维菌素乳油 2000—3000 倍液或 0.9%爱福丁 2000 倍液或 5%虫螨克 2000 倍液、40%绿菜宝乳油 1500 倍液喷雾防治。注意交替轮换使用农药，蔬菜采收严格控制农药的间隔期。

Annex II Inventory of Flora and Funa in Lake Aibi Reserve

Inventory of Flora in Lake Aibi Natural Wetland Reserve

□. □□□□□ **PTERIDOPHYTA**

□. □□□ **Equisetaceae**

1. □□□ **Equisetum L.**

(1) □ □ Equisetum arvense L.

(2) □□□ Equisetum ramosissimum Desf.

□. □□□□ **Thelypteris**

2. □□□□ **Thelypteris Schmidel.**

(3) □□□ Thelypteris palustris Schott

□. □□□□□ **GYMNOSPERMAE**

□. □□□ **Ephedraceae**

3. □□□ **Ephedra L.**

(4) □□□ Ephedra distachya L.

(5) □□□□ Ephedra equisetina Bge.

种类	措施	技术指标
	农业防治	棉花现行后中耕2—3次，由浅至深，提高地温，对立枯病将起到一定预防和控制作用。结合间定苗，将病苗集中带出田外销毁处理，减少病菌在土壤中的积累。
枯、黄萎病	防治策略	改进重病区、控制轻病区、消灭零星病区、保护无病区，控制棉花枯、黄萎病的扩散和危害。
	推广抗耐病品种	这是目前最有效的防治方法，品种有冀958、博陆早1号（81—3）和新陆早33号等。注意保护无病田，严禁在无病田种植抗病品种，防治病菌污染土壤。
	实行轮作倒茬	结合种植业结构调整，重病田及连作年限较长的地块与小麦、玉米等禾本科作物进行轮作3—5年，可减轻病害发生。

二、甜菜主要病虫害应急防控措施。

甜菜、瓜菜主要病害发生程度达到2级、虫害发生程度达到3—4级时启动防治预案。

种类	措施	技术指标
甜菜立枯病	种子处理	用敌克松可湿性粉剂按种子量0.2—0.3%拌种，也可用卫福200FF种衣剂进行包衣，可有效防止烂种、预防立枯病。
	农业防治	实行轮作倒茬，避免重茬和迎茬；科学合理使用氮磷钾肥，促进幼苗健壮生长，提高抗病虫能力；对沟播平铺甜菜要及时打洞破膜练苗，以降低膜内湿度，缓解甜菜立枯病的发生；加强农田管理，播后遇雨要及时破板结，苗期遇雨要及时中耕，提高地温。
甜菜根腐病	综合防治	实行轮作倒茬，避免重茬和迎茬；增施腐熟有机肥，改善土壤理化性质，促进甜菜根系发育，提高植株抗病能力；实行沟灌或滴灌，避免大水漫灌，减少病菌传播；加强地下害虫防治，避免根系损伤，减少病菌侵染机会。每年发病较重地块也可用根腐灵叶面喷施或灌根，提前预防。
甜菜褐斑病	农业防治	实行四年以上的轮作倒茬，避免重茬和迎茬；甜菜收获后，及时清除田间病残体，集中带出田外处理；实行秋翻冬灌，促进病残体分解，减少菌源越冬基数。
	化学防治	发病始期，用50%甲基托布津可湿性粉剂800倍—1000倍液或50%多菌灵可湿性粉剂1000倍液或75%百菌清可湿性粉剂800倍液叶面喷施，根据病情进行2—3次喷雾，间隔期7—10天。
甜菜白粉病	农业防治	选用抗病、耐病的品种；实行四年以上的轮作倒茬，避免重茬和迎茬；适时灌水，防止植株受旱；避免偏施过量氮肥，防止旺长，增强植株抗病能力；甜菜收获后及时清除田间病残体，集中带出田外处理；大力推行秋翻冬灌，促进病残体分解，减少菌源越冬基数。
	化学防治	发病始期，用25%粉锈宁可湿性粉剂亩用量40--60g或50%甲基托布津可湿性粉剂800—1000倍液叶面喷施。
甜菜象甲	农业防治	轮作倒茬，适期播种，秋翻冬灌，清除田间杂草，灌水淹杀。
	化学防治	幼苗期发现象甲（虫口数量在60头以上/m^2）或未作种子处理的地块，选用5%辛硫磷乳油800—1500倍液或2.5%敌杀死乳油1500倍液或选用35%甲基硫环磷乳油400—600倍液或25%亚胺硫磷乳油400—500倍液或50%敌畏乳油500倍液喷雾进行叶面喷雾。

(20) □□□□ Betula ebinuricum Hai ying (□□)

□. □ □ Uimaceae

7. □ □ Ulmus L.

(21) □ □ Ulmus pumila L.

□. □□□ Cannabinaceae

8. □□□ Cannabis L.

(22) □ □ Cannabis sativa L.

□. □□□ Urticaceae

9. □□□ Urtica L.

(23) □ □ Urtica cannabina L.

(24) □□□□ Urtica dioica L.

□. □ □ Polygonaceae

10. □□□ Atraphaxis L.

(25) □□□ Atraphaxis spinosa l.

(26) □□□ Atraphaxis compacta Ledeb.

(27) □□□□ Atraphaxis replicata Lam.

(28) □□□□ Atraphaxis laetevirens (Ldb.) Jaub.et Spach

(29) □ □ Atraphaxis frutescens (L.) Ewersm.

(30) □□□□ Atraphaxis virgata (Rgl.) Krassn.

11. □□□□ Calligonum L.

(31) □□□□□ Calligonum leucocladum (Schrenk) Bge.

(32) □□□□□□ Calligonum ebinuricum Ivanova ex Y.D.Soskov (□□)

(33) □□□□□ Calligonum trifarium Z.M.Mao (□□)

(34) □□□□□ Calligonum junceum (Fisch.et Mey.) Litv.

(35) □□□ Calligonum mongolicum Turcz

12.□ □ Polygonum L.

(36) □ □ Polygonum aviculare L.

(37) □□□ Polygonum convolvulus L.

(38) □□□ Polygonum polycnemoides Jaub.et Spach

(39) □□□ Polygonum patulum M.B.

(40) □□□□ Polygonum junceum Ledeb.

(41) □□□ Polygonum amphibium L.

(42) □□□□ Polygonum lapathifolium L.

(43) □□□ Polygonum persicaria L.

(44) □ □ Polygonum minus Huds.

(45) □ □ Polygonum hydropiper L.

13.□□□ Rumex L.

(46) □□□ Rumex halacsyi Rech.

(47) □□□□ Rumex marschallianus Rchb.

(48) □□□□ Rumex maritimus L.

(49) □□□□ Rumex stenophyllus Ledeb.

(50) □□□□ Rumex crispus L.

(51) □□□□ Rumex aquaticus L.

(52) □□□□ Rumex rechingerianus A.Los.

(53) □□□□□ Rumex ucranicus Fisch.ex Spreng.

□. □ □ Chenopodiaceae

14. □□□□ Salicornia L.

(54) □□□ Salicornia europaea L.

15. □□□□ Kalidium Moq.

(55) □□□ Kalidium foliatum (Pall.) Moq.

(56) □□□□□ Kalidium cuspidatum (Ung.-Sternb.) Grub.

(57) □□□□□ Kalidium schrenkianum Bge.ex Ung.-Sternb.

(58) □□□□□ Kalidium caspicum (L.) Ung.-Sternb.

16. □□□□ Halocnemum Bieb.

(59) □□□ Halocnemum strobilaceum (Pall.) Bieb.

17. □□□□ Halostachys C.A.Mey.

(60) □□□ Halostachys caspica (M.B.) C.A.Mey.

18. □□□□ Ceratoides (Tourn.) Gagnebin.

(61) □□□ Ceratoides latens (J.F.Gmel.) Reveal et Holmgren

(62) □□□□□ Ceratoides ewersmanniana (Stschegl.ex Losinsk.) Botsch.et Ikonn.

19. □□□ Atriplex L.

(63) □□□□ Atriplex micrantha C.A.Mey.

(64) □□□□ Atriplex hastata L.

(65) □□□□ Atriplex verrucifera Bieb.

(66) □□□ Atriplex cana C.A.Mey.

(67) □ □ Atriplex patens (Litv.) Iljin

(68) □□□□□□ Atriplex sibirica L.

(69) □□□ Atriplex fera (L.) Bge.

(70) □□□□ Atriplex centralasiatica Iljin

(71) □□□□ Atriplex dimorphostegia Kar.et Kir.

(72) □□□□ Atriplex tatarica L.

20. □□□□ Ceratocarpus L.

(73) □□□ Ceratocarpus arenarius L.

21. □□□ Agriophyllum Bieb.

(74) □ □ Agriophyllum squarrosum (L.) Moq.

22. □□□ Corispermum L.

(75) □□□□□□ Corispermum lehmannianum Bge.

23. □ □ Chenopodium L.

(76) □ □ Chenopodium aristatum L.

(77) □ □ Chenopodium botrys L.

(78) □□□ Chenopodium glaucum L.

(79) □□□ Chenopodium rubrum L.

(80) □□□ Chenopodium chenopodioides (L.) Aellen

(81) □□□□ Chenopodium acuminatum Willd.

(82) □□□ Chenopodium prostratum Bge.

(83) □ □ Chenopodium urbicum L.

(84) □ □ Chenopodium serotinum L.

(85) □ Chenopodium album L.

24. □□□ Kochia Roth

(86) □□□ Kochia prostrata (L) Schrad.

(87) □□□□ Kochia odontoptera Schrenk

(88) □□□□ Kochia iranica Litv.ex Bornm.

(89) □ □ Kochia scoparia (L.) Schrad.

(90) □□□□ Kochia krylovii Litv.

25. □□□□ Bassia All.

(91) □□□ Bassia dasyphylla (Fisch.et Mey.) O.Kuntze

(92) □□□□□ Bassia hyssopifolia (Pall.) O.Kuntze

26. □□□ Panderia Fisch.et Mey.

(93) □ □ Panderia turkestanica Iljin

27. □□□□ Camphorosma L.

(94) □□□ Camphorosma monspeliaca L.

28. □□□ Londesia Fisch.et Mey.

(95) □ □ Londesia eriantha Fisch.et Mey.

29. □□□ Kirilowia Bge.

(96) □ □ Kirilowia eriantha Bge.

30. □□□□ Borszcowia Bge.

(97) □□□ Borszcowia aralocaspica Bge.

31. □□□ Suaeda Forsk.ex Scop.

(98) □□□□ Suaeda microphylla (C.A.Mey.) Pall.

(99) □□□ Suaeda dendroides (C.A.Mey.) Moq.

(100) □□□ Suaeda altissima (L.) Pall.

(101) □□□□□ Suaeda linifolia Pall.

(102) □□□□ Suaeda physophora Pall.

(103) □□□□ Suaeda acuminata (C.A.Mey.) Moq.

(104) □□□□ Suaeda kossinskyi Iljin

(105) □□□□ Suaeda corniculata (C.A.Mey.) Bge.

(106) □□□□ Suaeda heterophylla (Kar.et Kir.) Bge.

(107) □□□□ Suaeda prostrata Pall.

32. □□□□ Horaninowia Fish.et Mey.

(108) □□□ Horaninowia ulicina Fisch.et Mey.

33. □□□ Haloxylon Bge.

(109) □□□ Haloxylon persicum Bge.ex Boiss.

(110) □ □ Haloxylon ammodendron (C.A.Mey.) Bge.

34. □□□□ Arthrophytum Schrenk

(111) □□□□□ Arthrophytum korovinii Botsch.

35. □□□□ Anabasis L.

(112) □□□□□ Anabasis elatior (C.A.Mey.) Schischk.

(113) □□□□□ Anabasis brevifolia C.A.Mey.

(114) □□□□□ Anabasis aphylla L.

(115) □□□□□ Anabasis salsa (C.A.Mey.) Benth.ex Volkens

(116) □□□□□ Anabasis cretacea Pall.

(117) □□□□□ Anabasis eriopoda (Schrenk) Benth.ex Volkens

36. □□□□□ Girgensohnia Bge.

(118) □□□□ Girgensohnia oppositiflora (Pall.) Fenzl

37. □□□□ Sympegma Bge.

(119) □□□ Sympegma regelii Bge.

38. □□□□ Halogeton C.A.Mey.

(120) □□□ Halogeton glomeratus (Bieb.) C.A.Mey.

39. □□□□ Iljinia Korov.

(121) □□□ Iljinia regelii (Bge.) Korov.

40. □□□□ Salsola L.

(122) □□□□□ Salsola orientalis S.G.Gmel

(123) □□□□□□ Salsola dschungarica Iljin

(124) □□□□□ Salsola arbuscula Pall.

(125) □□□□□ Salsola laricifolia Turcz.ex Litv.

(126) □□□□□ Salsola arbusculiformis Drob.

(127) □□□□ Salsola nitraria Pall.

(128) □□□□□ Salsola implicata Botsch.

(129) □□□□□ Salsola foliosa (L.) Schrad.

(130) □□□□□ Salsola subcrassa M.Pop.

(131) □□□□□ Salsola heptapotamica Iljin

(132) □□□□□ Salsola lanata Pall.

(133) □□□□□ Salsola korshinskyi Drob.

(134) □□□□□□ Salsola ferganica Drob.

(135) □□□□□ Salsola sukaczevii (Botsch.) A.J.Li

(136) □□□□□ Salsola brachiata Pall.

(137) □□□□□ Salsola affinis C.A.Mey.

(138) □□□□□ Salsola aperta Pauls.

(139) □□□ Salsola collina Pall.

(140) □□□□□ Salsola rosacea L.

(141) □□□□□ Salsola praecox Litv.

(142) □□□□□ Salsola paulsenii Litv.

(143) □□□ Salsola ruthenica Iljin

41. □□□ Nanophyton Less.

(144) □ □ Nanophyton erinaceum (Pall.) Bge.

42. □□□ Halimocnemis C.A.Mey.

(145) □□□□ Halimocnemis villosa Kar.et Kir.

(146) □□□□ Halimocnemis longifolia Bge.

(147) □□□□ Halimocnemis karelinii Moq.

43. □□□□ Petrosimonia Bge.

(148) □□□ Petrosimonia sibirica (Pall.) Bge.

(149) □□□□□ Petrosimonia squarrosa (Schrenk) Bge.

(150) □□□□□ Petrosimonia glaucescens(Bge.)Iljin

□□. □ □ Amaranthaceae

44. □ □ Amaranthus L.

(151) □□□ Amaranthus retroflexus L.

(152) □ □ Amaranthus albus L.

(153) □□□ Amaranthus roxburghianus Kung

(154) □□□ Amaranthus lividus L.

□□. □□□□ Portulacaeae

45. □□□□ Portulaca L.

(155) □□□ Portylaca oleracea L.

□□. □□□ Caryophyllaceae

46. □□□ Cerastium L.

(156) □□□□ Cerastium bungeanum Vved.

(157) □□□□ Cerastium arvense L.

47. □□□□ Arenaria L.

(158) □□□ Arenaria serpyllifolia L.

(159) □□□□□ Arenaria leptoclados (Reichb.) Guss.

48. □□□□ Silene L.

(160) □□□□□ Silene olgiana B.Fedtsch.

(161) □□□□ Silene heptapotamica Schischk.

(162) □□□□□□□ Silene sibirica (L.) Pers.

49. □□□ Acanthophyllum C.A.Mey.

(163) □ □ Acanthophyllum pungens (Bge.) Bioss.

50. □□□□□ Vaccaria N.M.Wolf

(164) □□□□ Vaccaria hispanica (Mill.) Rauschert.

□□. □□□□ Paronychiaceae

51. □□□□ Spergularia (Pers.) J.et C.Presl

(165) □□□ Spergularia marina (L.) Griseb.

□□. □□□ Ranunculaceae

52. □□□□ Thalictrum L.

(166) □□□□□ Thalictrum petaloideum L.

(167) □□□□□ Thalictrum simplex L.

53. □□□□ Clematis L.

(168) □□□□□□ Clematis songarica Bge.

(169) □□□□□ Clematis orientalis L.

54. □□□ Ranunculus L

(170) □□□□ Ranunculus polyrhizus Steph.

(171) □□□□ Ranunculus rigescens Turcz.ex Ovcz.

(172) □□□ Ranunculus sceleratus L.

(173) □ □ Ranunculus japonicus Thunb.

55. □□□□ Halerpestes Greene

(174) □□□□□ Halerpestes ruthenica (Jacq.) Ovcz.

(175) □□□□ Halerpestes sarmentosa (Adams) Kom.

56. □□□□ Batrachium J.F.Gray

(176) □□□□□ Batrachium kauffmannii (Clerc) Ovcz.

(177) □□□□□ Batrachium divaricatum (Schrank) Schur

57. □□□□□ Ceratocephalus Moench

(178) □□□□ Ceratocephalus testiculatus (Crantz) Bess.

□□. □□□ Berberidaceae

58. □□□ Berberis L.

(179) □□□□ Berberis nummularia Bge.

59. □□□□ Leontice L.

(180) □□□ Leontice incerta Pall.

□□. □□□ Papaveraceae

60. □□□□□ Roemeria Medik.

(181) □□□□□ Roemeria refracta (Stev.) DC.

61. □□□□ Glaucium Mill.

(182) □□□□□ Glaucium squamigerum Kar.et Kir.

62. □□□□ Hypecoum L.

(183) □□□ Hypecoum erectum L.

(184) □□□□□ Hypecoum parviflorum Kar.et Kir.

63. □□□ Fumaria L.

(185) □ □ Fumaria schleicheri Soy-Will.

□□. □□□ Capparidaceae

64. □□□ Capparis L.

(186) □ □ Capparis spinosa L.

□□. □□□□ Cruciferae

65. □□□□ Eruca Mill.

(187) □□□ Eruca sativa Mill.

66. □□□□ Lepidium L.

(188) □□□□ Lepidium cartilagineum (J.May.) Thell.

(189) □□□□□ Lepidium ferganense Korsh.

(190) □□□□□ Lepidium latifolium L.

(191) □□□□□ Lepidium obtusum Basin.

(192) □□□□□ Lepidium perfoliatum L.

(193) □□□□□ Lepidium ruderale L.

(194) □□□ Lepidium apetalum Willd.

67. □□□□ Cardaria Desv.

(195) □□□ Cardaria draba (L.) Desv.

(196) □□□□□ Cardaria chalepensis (L.) Hand.-Mazz.

68. □□□ Isatis L.

(197) □□□□ Isatis minima Bge.

(198) □□□□ Isatis violascens Bge.

69. □□□□ Pachypterygium Bge.

(199) □□□ Pachypterygium multicaule (Kar.et Kir.) Bge.

70. □□□ Thlaspi L.

(200) □ □ Thlaspi arvense L.

71. □□□ Capsella Medic.

(201) □ □ Capsella bursa-pastoria (L.) Medic.

72. □□□□ Hymenolobus Nuttall

(202) □□□ Hymenolobus procumbens (L.) Nutt.ex O.E.Schulz

73. □□□□ Lachnoloma Bge.

(203) □□□ Lachnoloma lehmannii Bge.

74. □□□□ Spirorrhynchus Kar.et Kir.

(204) □□□ Spirorrhynchus sabulosus Kar.et Kir.

75. □□□□ Tauscheria Fisch.ex DC.

(205) □□□ Tauscheria lasiocarpa Fisch.ex DC.

76. □□□□ Euclidium R.Br.

(206) □□□ Euclidium syriacum (L.) R.Br.

77. □□□ Alyssum L.

(207) □□□□ Alyssum linifolium Steph.ex Willd.

(208) □ □ Alyssum desertorum Stapf.

78. □□□ Draba L.

(209) □ □ Draba nemorosa L.

79. □□□□ Arabidopsis (DC.) Heynh.

(210) □□□ Arabidopsis thaliana (L.) Heynh.

80. □□□□ Turritis L.

(211) □□□ Turritis glabra L.

81. □□□ Rorippa Scop.

(212) □□□□ Roripa islandica (Oed.) Borb.

82. □□□□ Dontostemon Andrz.ex Ldb.

(213) □□□□□ Dontostemon senilis Maxim.

83. □□□□ Tetracme Bge.

(214) □□□ Tetracme quadricornis (Steph.) Bge.

(215) □□□□□ Tetracme recurvata Bge.

84. □□□□ Matthiola R.Br.

(216) □□□□□ Matthiola stoddarti Bge.

(217) □□□□ Matthiola odoratissima (Pall.) R.Br.

85. □□□□ Chorispora R.Br.

(218) □□□□□□□ Chorispora sibirica (L.) DC.

(219) □□□ Chorispora tenella (Pall.) DC.

86. □□□□ Diptychocarpus Trautv.

(220) □□□ Diptychocarpus strictus (Fisch.ex M.M.) Trautv.

87. □□□□ Leptaleum DC.

(221) □□□ Leptaleum filifolium (Willd.) DC.

88. □□□ Malcolmia R.Br.

(222) □ □ Malcolmia africana (L.) R.Br.

(223) □□□□ Malcolmia hispida Litw.

(224) □□□□ Malcolmia scorpioides (Bge.) Boiss.

89. □□□□ Goldbachia DC.

(225) □□□ Goldbachia laevigata (M.B.) DC.

90. □□□ Erysimum L.

(226) □□□□ Erysimum cheiranthoides L.

(227) □□□□ Erysimum diffusum Ehrh.

91. □□□□ Syrenia Andrz.ex DC.

(228) □□□ Syrenia siliculosa (M.B.) Andrz.

92. □□□□ Sisymbrium L.

(229) □□□□□ Sisymbrium loeselii L.

(230) □□□ Sisymbrium altissimum L.

93. □□□□ Neotorularia (Coss.) Hedge et J.Leonard.

(231) □□□□□ Neotorularia korolkovii (Rgl.et Schmalh.) Hedge et J.Leonard

94. □□□ Thellungiella O.E.Schulz

(232) □ □ Thellungiella salsuginea (Pall.) O.E.Schulz

95. □□□□ Camelina Crantz

(233) □□□ Camelina sativa (L.) Crantz.

96. □□□□ Descurainia Webb.et Berth.

(234) □□□ Descurainia sophia (L.) Webb.et Prantl

□□. □□□ Crassulaceae

97. □□□ Orostachys (DC.) Fisch.

(235) □□□□ Orostachys spinosus (L.) C.A.Mey.

(236) □□□□ Orostachys thyrsiflorus Fisch.

□□□. □□□ Rosaceae

98. □□□□ Potentilla L.

(237) □□□□□ Potentilla bifurca L.

(238) □□□□□ Potentilla supina L.

(239) □□□□□ Potentilla reptans L.

99. □□□□ Chamaerhodos Bge.

(240) □□□ Chamaerhodos erecta (L.) Bge.

100. □□□□□ Hulthemia Dumort

(241) □□□□ Hulthemia berberifolia (Pall.) Dumoet.

101. □□□ Rosa L.

(242) □□□□ Rosa spinosissima L.

(243) □□□□ Rosa beggeriana Schrenk

(244) □□□□ Rosa laxa Retz.

□□□. □ □Leguminosae

102. □ □ Sophora L.

(245) □□□Sophora alopecuroides L..

103. □□□□ Lotus L.

(246) □□□□□ Lotus frondosus (Freyn) Kur.

(247) □□□□□ Lotus tenuis Waldst. et Kit.ex Willd.

104. □□□□ Melilotus Mill.

(248) □□□ Melilotus suaveolens Ldb.

105. □□□□ Trigonella L.

(249) □□□□□ Trigonella cancellata Desf.ex Pers.

(250) □□□□□ Trigonella arcuata C.A.Mey.

(251) □□□□□ Trigonella orthoceras Kar.et Kir.

106. □□□ Medicago L.

(252) □□□□ Medicago lupulina L.

107□□□□□ Trifolium L.

(253) □□□□□ Trifolium repens L.

(254) □□□□□□ Trifolium fragiferum L.

108. □□□□ Sphaerophysa DC.

(255) □□□ Sphaerophysa salsula (Pall.) DC.

109. □□□□ Halimodendron Fisch.et DC.

(256) □□□ Halimodendron halodendron (Pall.) Voss.

110. □□□□ Caragana Fabr.

(257) □□□□□ Caragana leucophloea Pojark.

(258) □□□□ Caragana pumila Pojark.

111. □□□ Glycyrrhiza L.

(259) □ □ Glycyrrhiza uralensis Fisch.

(260) □□□□ Glycyrrhiza glabra L.

(261) □□□□ Glycyrrhiza aspera Pall.

(262) □□□□ Glycyrrhiza inflata Bat.

112. □□□ Oxytropis DC.

(263) □□□□ Oxytropis glabra (Lam.) DC.

(264) □□□□□ Oxytropis gorbunovii Boriss.

113. □□□ Astragalus L.

(265) □□□□ Astragalus contortuplicatus L.

(266) □□□□ Astragalus oxyglottis Stev.

(267) □□□□ Astragalus filicaulis Fisch.et Mey.

(268) □□□ Astragalus commixtus Bge.

(269) □□□□ Astragalus flexus Fisch.

(270) □□□□ Astragalus scabrisetus Bong.et Mey.

114. □□□□ Alhagi Gagneb.

(271) □□□□□ Alhagi sparsifolia (B.Keller et Shap.) Shap.

115. □□□□ Vicia L.

(272) □□□□□ Vicia angustifolia L.

(273) □□□□□ Vicia tetrasperma (L) Moench.

(274) □□□□□ Vicia cracca L.

□□□. □□□□□ Geraniaceae

116. □□□□□ Erodium L'Her.

(275) □□□□□□ Erodium oxyrrhynchum M.B.

117. □□□□ Geranium L.

(276) □□□□□ Geranium collinum Steph.

(277) □□□□□ Geranium sibiricum L.

□□□.□□□ Zygophyllaceae

118. □□□□ Peganum L.

(278) □□□ Peganum harmala L.

119. □□□ Nitraria L.

(279) □□□□□□□ Nitraria sibirica Pall.

(280) □□□□□□ Nitraria tangutorum Bobr.

120. □□□ Tribulus L.

(281) □ □ Tribulus terrestris L.

121. □□□ Zygophyllum L.

(282) □□□□ Zygophyllum rosovii Bge.

(283) □□□□ Zygophyllum macropodum Boriss.

(284) □□□□ Zygophyllum fabago L.

(285) □□□□ Zygophyllum oxycarpum M.Pop.

(286) □□□□ Zygophyllum pterocarpum Bge.

(287) □ □ Zygophyllum xanthoxylon (Bge.) Maxim.

□□□. □□□ Euphorbiaceae

122. □□□ Euphorbia L.

(288) □ □ Euphorbia humifusa Willd.

(289) □□□ Euphorbia turczaninovii Kar.et Kir.

(290) □□□□□ Euphorbia soongarica Boiss.

(291) □□□□□ Euphorbia inderiensis Rgl.

(292) □ □ Euphorbia heloiscopia L.

(293) □□□□ Euphorbia jaxartica Prokh.

□□□. □□□ Malvaceae

123. □□□ Malva L.

(294) □ □ Malva verticillata L.

124. □□□ Lavatera L.

(295) □□□□ Lavatera thuringiaca L.

125. □□□ Althaea L.

(296) □□□ Althaea officinalis L.

126. □□□ Hibiscus L.

(297) □□□□ Hibiscus trionum L.

□□□. □□□ Hypericaceae

127. □□□□ Hypericum L.

(298) □□□□ Hypericum hirsutum L.

□□□. □□□□ Elatinaceae

128. □□□□ Elatine L.

(299) □□□□□ Elatine alsinastrum L.

□□□. □□□□ Frankeniaceae

129. □□□□ Frankenia L.

(300) □□□ Frankenia pulverulenta L.

□□. □□□ Tamaricaceae

130. □□□□ Reaumuria L.

(301) □□□ Reaumuria soongorica (Pall.) Maxim.

131. □□□ Tamarix L.

(302) □□□□ Tamarix elongata Ledeb.

(303) □□□□ Tamarix laxa Willd.

(304) □□□□ Tamarix hohenackeri Bge.

(305) □□□ Tamarix hispida Willd.

(306) □□□□ Tamarix gracilis Willd.

(307) □□□□ Tamarix karelini Bge.

(308) □□□□ Tamarix leptostachys Bge.

(309) □□□□ Tamarix ramosissima Ledeb.

(310) □□□□ Tamarix korolkowii Rgl.et Schm

132. □□□□ Myricaria Desv.

(311) □□□□□ Myricaria alopecuroides Schrenk

□□□. □□□ Thymelaeaceae

133. □□□□ Thymelaea Endl.

(312) □□□ Thymelaea passerina (L.) Coss.et Germ.

□□□. □□□□ Elaeagnaceae

134. □□□□ Elaeagnus L.

(313) □□□□ Elaeagnus oxycarpa Schlecht.

(314) □□□□□ Elaeagnus songarica (Bernh.ex Schlecht.) Schlecht.

135. □□□ Hippophae L.

(315) □ □ Hippophae rhamnoides L.

□□□. □□□□ Lythraceae

136. □□□□ Lythrum L.

(316) □□□□ Lythrum intermedium Ldb.

(317) □□□ Lythrum salicaria L.

□□□. □□□□ Onagraceae

137. □□□□ Epilobium L.

(318) □□□□□ Epilobium parviflorum Schreb.

(319) □□□□□ Epilobium palistre L.

(320) □□□□ Epilobium minutiflorum Hausskn.

□□□. □□□□□ Haloragidaceae

138. □□□□ Myriophyllum L.

(321) □□□ Myriophyllum spicatum L.

(322) □□□□□ Myriophyllum verticillatum L.

□□□. □□□□ Hippuridaceae

139. □□□□ Hippuris L.

(323) □□□ Hippuris vulgaris L.

□□□. □□□ Cynomoriaceae

140. □□□ Cynomorium L.

(324) □ □ Cynomorium songaricum Rupr.

□□□. □□□ Umbelliferae

141. □□□□ Hymenolyma Korov.

(325) □□□ Hymenolyma trichophyllum (Schrenk) Korov.

142. □□□ Sium L.

(326) □□□□ Sium sisarum L.

143. □□□ Conium L.

(327) □ □ Conium maculatum L.

144. □□□ Ferula L.

(328) □□□□ Ferula syreitschikowii K.-Pol.

□□□. □□□□ Primulaceae

145. □□□□ Androsace L.

(329) □□□□□ Androsace maxima L.

146. □□□□ Glaux L.

(330) □□□ Glaux maritima L.

□□. □□□ Plumbaginaceae

147. □□□□ Limonium L.

(331) □□□□□ Limonium suffruticosum (L.) O.Kuntze

(332) □□□□□ Limonium gmelinii (Willd.) O.Kuntze

(333) □□□□□ Limonium coralloides (Tausch) Lincz.

(334) □□□□□ Limonium otolepis (Schrenk) O.Kuntze

(335) □□□□□ Limonium myrianthum (Schrenk) Kuntze.

(336) □□□□□ Limonium leptolobum (Rgl.) O.Kuntze

□□□. □□□□ Apocynaceae

148. □□□□ Apocynum L.

(337) □□□ Apocynum venetum L.

149. □□□ Poacynum Baill.

(338) □ □ Poacynum pictum (Schrenk) Baill.

(339) □□□□ Poacynum hendersonii (Hook.f.) Woodson

□□□. □□□ Asclepiadaceae

150. □□□□ Cynanchum L.

(340) □□□□□ Cynanchum sibiricum Willd.

□□□. □□□ Convolvulaceae

151. □□□ Convovulus L.

(341) □□□□ Convovulus fruticosus Pall.

(342) □□□ Convovulus arvensis L.

152. □□□□ Calystegia R.Br.

(343) □□□□ Calystegia sepium (L.) R.Br.

(344) □□□ Calystegia hedracea Wall.

153. □□□□ Cuscuta L.

(345) □□□ Cuscuta chinensis Lam.

(346) □□□□□ Cuscuta europaea L.

(347) □□□□□ Cuscuta cupulata Engelm.

(348) □□□□□□ Cuscuta lupuliformis Krocker

(349) □□□□□ Cuscuta monogyna Vahl.

□□□. □□□ Boraginaceae

154. □□□□ Heliotropium L.

(350) □□□□□□ Heliotropium ellipticum Ledeb.

(351) □□□□□ Heliotropium micranthum (Pall.) Bge.

(352) □□□□□ Heliotropium acutiflorum Kar.et Kir.

155. □□□□□ Rochelia Reichb.

(353) □□□□□ Rochelia leioaperma (M.Pop.) Golosk.

(354) □□□□ Rochelia retorta (Pall.) Lipsky

156. □□□ Asperugo L.

(355) □ □ Asperugo procumbens L.

157. □□□□□ Nonea Medic.

(356) □□□□ Nonea caspica (Willd.) G.Don.

158. □□□□□ Heterocarpum DC.

(357) □□□□ Heterocarpum rigidum DC.

159. □□□ Lappula L.

(358) □□□□ Lappula semiglabra (Ledeb.) Guerke

(359) □□□□ Lappula macra M.Pop.ex N.Pavl.

(360) □ □ Lappula myosotis Moench.

(361) □□□□ Lappula patula (Lehm.) Aschers.ex Guerke

160. □□□□ Lepechiniella M.Pop.

(362) □□□ Lepechiniella lasiocarpa W.T.Wang

161. □□□□ Arnebia Forsk.

(363) □□□□□ Arnebia decumbens (Vent.) Coss.et Kral.

□□□. □□□ Labiatae

162. □□□□ Teucrium L.

(364) □□□□□ Teucrium scordium L.

163. □□□□ Lagopsis Bge.ex Benth.

(365) □□□ Lagopsis supina (Steph.ex Willd.) Ik.-Gal.

164. □□□□□ Schizonepeta (Benth.) Briq.

(366) □□□□□ Schizonepeta annua (pall.) Schischk.

165. □□□□ Lallemantia Fisch.et Mey.

(367) □□□ Lallemantia royleana (Benth.) Benth.

166. □□□ Nepeta L.

(368) □□□□ Nepeta mecrantha Bge.

167. □□□□ Lagochilus Bge.

(369) □□□□□ Lagochilus pungens Schrenk

(370) □□□□□ Lagochilus diacanthophyllus (Pall.) Benth.

168. □□□□ Chamaesphacos Schrenk

(371) □□□ Chamaesphacos ilicifolius Schrenk

169. □□□ Mentha L.

(372) □ □ Mentha haplocalyx Briq.

170. □□□ Lycopus L.

(373) □□□ Lycopus europaeus L.

□□□. □ □ Solanaceae

171. □□□ Lycium L.

(374) □ □ Lycium ruthenicum Murr.

(375) □□□□ Lycium dasystemum Pojark.

172. □ □ Solanum L.

(376) □ □ Solanum nigrum L.

173. □□□□ Hyoscyamus L.

(377) □□□ Hyoscyamus niger L.

(378) □□□□□ Hyoscyamus pusillus L.

174. □□□□ Datura L.

(379) □□□ Datura stramonium L.

□□□. □□□ Scrophulariaceae

175. □□□□ Dodartia L.

(380) □□□ Dodartia orientalis L.

176. □□□□ Veronica L.

(381) □□□□□ Veronica biloba L.

(382) □□□ Veronica undulata Wall.

□□□. □□□ Orobanchaceae

177. □□□□ Cistanche Hoffmg.et Link

(383) □□□ Cistanche deserticola Ma

(384) □□□□□ Cistanche salsa (C.A.Mey.) G.Beck.

178. □□□ Orobanche L.

(385) □ □ Orobanche coerulescens Steph.

(386) □□□□ Orobanche amoena C.A.Mey.

(387) □□□□ Orobanche aegyptiaca Pers.

(388) □□□□ Orobanche cumana Wallr.

□□□. □□□ Lentibulariaceae

179. □□□ Utricularia L.

(389) □ □ Utricularia vulgaris L.

□□. □□□ Plantaginaceae

180. □□□ Plantago L.

(390) □□□ Plantago minuta Pall.

(391) □□□□ Plantago maritima L.

(392) □□□□ Plantago asiatica L.

(393) □□□ Plantago depressa Willd.

(394) □□□□ Plantago lessingii Fisch.et Mey.

□□□. □□□ Rubiaceae

181. □□□□ Galium L.

(395) □□□□ Galium spurum L.

(396) □□□□ Galium uliginosum L.

(397) □□□ Galium verum L.

□□□. □□□ Caprifoliaceae

182. □□□ Lonicera L.

(398) □□□□ Lonicera iliensia Pojark.

□□□. □ □ Compositae

183. □□□□ Heteropappus Less.

(399) □□□□□□ Heteropappus altaicus (Willd) Novopokr.

184. □□□□ Asterothamnus Novopokr.

(400) □□□□□ Asterothamnus poliifolius Novopokr.

185. □□□ Galatella Cass.

(401) □□□□ Galatella songorica Novopokr.

(402) □ □ Galatella punctata (Waldst.et Kit.) Nees

186. □□□□ Brachyactis Ldb.

(403) □□□ Brachyactis ciliata Ldb.

187. □□□□ Conyza Less.

(404) □□□□ Conyza canadensis (L.) Cronq.

188. □□□□ Karelinia Less.

(405) □□□ Karelinia caspica (Pall.) Less.

189. **□□□□ Inula L.**

(406) □□□□□ Inula caspica Blum.

(407) □□□□□ Inula britannica L.

(408) □□□□□ Inula racemosa Hook.f.

190. □□□ Pulicaria Gacrtn.

(409) □ □ Pulicaria prostrata (Gilb.) Aschers.

191. □□□ Xanthium L.

(410) □ □ Xanthium sibiricum Patrin.

192. □□□□ Bidens L.

(411) □□□ Bidens tripartita L.

(412) □□□□□ Bidens cernua L.

193. □ □ Achillea L.

(413) □□□ Achillea setacea Waldst.et Kit.

194. □□□□ Cancrinia Kar.et Kir.

(414) □□□ Cancrinia discoidea Ldb.) Poljak.

195. □□□ Ajania Poljak.

(415) □□□□ Ajania fruticulosa (Ldb.) Poljak.

196. □ □ Artemisia L.

(416) □□□ Artemisia scoparia Waldst.

(417) □□□ Artemisia sieversiana Ehrhart.ex Willd.

(418) □□□ Artemisia mongolica (Fisch.ex Bess.) Nakai

(419) □ □ Artemisia xerophytica Krasch.

(420) □□□ Artemisia annua L.

(421) □□□ Artemisia tournefortiana Reichb.

(422) □□□ Artemisia lavandulaefolia DC.

(423) □□□□□ Artemisia songorica Schrenk

197. □□□ Seriphidium (Bess.) Poljak.

(424) □□□□ Seriphidium nitrosum (Web.ex Stechm.) Poljak.

(425) □□□□ Seriphidium terrae-albae (Krasch.) Poljak.

(426) □□□□ Seriphidium borotalense (Poljak.) Ling et Y.R.Ling.□□□□

(427) □□□□ Seriphidium santolinum (Schrenk) Poljak.

198. □□□ Tussilago L.

(428) □ □ Tussilago farfara L.

199. □□□□ Senecio L.

(429) □□□□□ Senecio subdentatus Ldb.

200. □□□ Ligularia Cass.

(430) □□□□□ Ligularia songarica (Fisch.) Ling.

201. □□□□ Echinops L.

(431) □□□□ Echinops gmelinii Turcz.

202. □□□□ Saussurea DC.

(432) □□□□□ Saussurea amara (L.) DC.

(433) □□□□□ Saussurea prostrata Winkl.

203. □□□□ Cousinia Cass.

(434) □□□□□ Cousinia alata Schrenk

204. □□□ Arctium L.

(435) □ □ Arctium lappa L.

205. □□□□ Acroptilon Cass.

(436) □□□ Acroptilon repens (L.) DC.

206. □ □ Cirsium Mill.

(437) □ □ Cirsium vulgare (Savi) Ten.

(438) □□□□ Cirsium alatum (S.G.Gmel.) Bobr.

(439) □□□ Cirsium setosum (Willd.) M.B.Fl.

(440) □□□ Cirsium arvense (L.) Scop.

207. □□□ Jurinea Cass.

(441) □□□□ Jurinea pilostemonoides Iljin (□□)

208. □□□□ Onopordum L.

(442) □□□ Onopordum acanthium L.

209. □□□□ Russowia C.Winkl.

(443) □□□ Russowia sogdiana (Bge.) B.Fedtsch.

210. □□□ Amberboa (Pers.) Less.

(444) □ □ Amberboa turanica Iljin

211. □□□□ Centaurea L.

(445) □□□□□ Centaurea adpressa Ledeb.

(446) □□□□□ Centaurea squarrosa Willd.

212. □□□□ Schischkinia Iljin

(447) □□□ Schischkinia albispina (Bge.) Iljin

213. □□□□ Chartolepis Cass.

(448) □□□ Chartolepis intermedia Boiss.

214. □□□□ Hyalea (DC.) Jaub.et Spach.

(449) □□□ Hyalea pulchella (Ledeb.) C.Koch.

215. □□□ Cichorium L.

(450) □ □ Cichorium intybus L.

216. □□□□ Koelpinia Pall.

(451) □□□ Koelpinia linearis Pall.

217. □□□□ Garhadiolus Jaub.et Spach.

(452) □□□ Garhadiolus papposus Boiss.et Buhse.

218. □□□□ Heteracia Fisch.et Mey.

(453) □□□ Heteracia szovitsii Fisch.et Mey.

219. □□□□□ Tragopogon L.

(454) □□□□□ Tragopogon ruber S.G.Gmel.

(455) □□□□□□ Tragopogon kasahstanicus S.Nikit.

220. □□□ Scorzonera L.

(456) □□□□ Scorzone pusilla Pall.

(457) □□□□ Scorzone mongolica Maxim.

221. □□□□ Epilasia (Bge.) Benth.et Hook.f.

(458) □□□□□ Epilasia acrolasia (Bge.) Clarke

222. □□□□ Taraxacum Wigg.

(459) □□□□□ Taraxacum bessarabicum (Homem.) Hand.-Mazz.

(460) □□□□□ Taraxacum bicorne Dahlst.

(461) □□□□□ Taraxacum monochlamydeum Hand.Mazz.

223. □□□□ Chondrilla L.

(462) □□□□□ Chondrilla brevirostris Fisch.et Mey.

(463) □□□□□ Chondrilla ornata Iljin

224. □□□□ Sonchus L.

(464) □□□ Sonchus oleraceus L.

(465) □□□□□ Sonchus arvensis L.

225. □□□ Lactuca L.

(466) □□□□ Lactuca serriola Tomer ex L.

(467) □□□□ Lactuca undulata Ledeb.

226. □□□□ Crepis L.

(468) □□□□□ Crepis flexuosa (Ledeb.) Clarke

□□□. □□□ Typhaceae

227. □□□ Typha L.

(469) □□□□ Typha latifolia L.

(470) □□□□ Typha laxmannii Lep.

(471) □□□ Typha minima Funk ex Hoppe

(472) □ □ Typha angustifolia L.

□□□. □□□□ Sparganiaceae

228. □□□□ Sparganium L.

(473) □□□ Sparganium stoloniferum (Graebn.) Buch.-Ham.ex Juz.

(474) □□□□□ Sparganium microcarpum Celak.

(475) □□□□ Sparganium simplex Huds.

□□□. □□□□ Potamogetonaceae

229. □□□□ Potamogeton L.

(476) □□□□□ Potamogeton pectinatus L.

(477) □□□□ Potamogeton pusillus L.

(478) □□□□□ Potamogeton lucens L.

(479) □□□□□ Potamogeton natans L.

(480) □□□□□ Potamogeton nodosus Poir.

230. □□□□ Zannichellia L.

(481) □□□ Zannichellia palustris L.

□□□. □□□ Najadaceae

231. □□□ Najas L.

(482) □□□ Najas minor All.

□□□. □□□□ Juncaginaceae

232. □□□□ Triglochin L.

(483) □□□ Triglochin palustre L.

(484) □□□ Triglochin maritimum L.

□□□. □□□ Aliamataceae

233. □□□ Alisma L.

(485) □□□ Alisma gramineum Lej.

(486) □□□□ Alisma lanceolatum Wither.

□□. □□□ Gramineae

234. □□□ Phragmites Adans.

(487) □ □ Phragmites australis (Cav.) Trin.ex Steud.

235. □□□□ Aristida L.

(488) □□□ Aristida heymannii Regel

(489) □□□□□ Aristida pennata Trin.

236. □□□□ Schismus Beauv.

(490) □□□ Schismus arabicus Nees

237. □□□ Glyceria R.Br.

(491) □□□ Glyceria plicata (Fries) Fries

238. □□□ Poa L.

(492) □□□□□ Poa angustifolia L.

(493) □□□ Poa annua L.

239. □□□ Puccinellia Parl.

(494) □ □ Puccinellia distans (L.)Parl.

(495) □□□ Puccinellia tenuiflora (Griseb.) Scribn.et Merr.

240. □□□ Bromus L.

(496) □□□ Bromus tectorum L.

(497) □ □ Bromus japonicus Thunb.

241. □□□□ Elytrigaia Desv.

(498) □□□ Elytrigaia repens (L.) Desv.ex Nevski

242. □□□□ Eremopyrum (Ldb.) Jaub.et Spsh

(499) □□□□□ Eremopyrum orientale (L.) Jaub.et Spach

(500) □□□□□ Eremopyrum bonaepartis (Spreng.) Nevski

(501) □□□ Eremopyrum triticeum (Geartn.) Nevski

243. □□□□ Elymus L.

(502) □□□ Elymus dahuricus Turcz.ex Griseb.

(503) □□□□ Elymus excelsus Turcz.ex Griseb.

244. □□□ Hordeum L.

(504) □□□□□ Hordeum bogdanii Wilensky

245. □□□ Leymus Hochst.

(505) □□□□ Leymus multicaulis (Kar.et Kir.) Tzvski

(506) □ □ Leymus secalinus (Georgi) Tzvel.

246. □□□ Avena L.

(507) □□□ Avena fatua L.

247. □□□□ Alopecurus L.

(508) □□□ Alopecurus aequalis Sobol.

248. □□□□ Calamagrostis Adans.

(509) □□□ Calamagrostis epigeios (L.) Roth

(510) □□□□□ Calamagrostis pseudophragmites (Hall.f.) Koel.

249. □□□□ Agrostis L.

(511) □□□□□ Agrostis gigantea Roth

(512) □□□□□ Agrostis tenuis Sibth.

250. □□□□ Polypogon Desf.

(513) □□□□□ Polypogon monspeliensis (L.) Desf.

251. □□□ Beckmannia Host

(514) □ □ Beckmannia syzigachne (Steud.) Fernald

252. □□□ Stipa L.

(515) □□□□ Stipa glareosa P.Smirn.

(516) □□□□ Stipa gobica Roshev.

253. □□□□ Achnatherum Beauv.

(517) □□□ Achnatherum splendens (Trin.) Nevski

(518) □□□□□ Achnatherum caragana (Trin.et Rupr.) Nevski

254. □□□ Aeluropus Trin.

(519) □□□ Aeluropus pungens (Bieb.) C.Koch

(520) □□□□ Aeluropus pilosus (X.L.Yang) S.L.Chen □□□□

255. □□□□ Eragrostis N.M.Wolf

(521) □□□ Eragrostis pilosa (L.) Beauv.

(522) □□□□ Eragrostis minor Host

(523) □□□□□ Eragrostis collina Trin.

256. □□□□ Cleistogenes Keng

(524) □□□□□ Cleistogenes songorica (Roshev.) Ohwi.

257. □□□□ Chloris Sw.

(525) □□□ Chloris virgata Sw.

258. □□□□ Cynodon Rich.

(526) □□□ Cynodon dactylon (L.) Pers.

259. □□□□ Crypsis Ait.

(527) □□□□□ Crypsis schoenoides (L.) Lam.

(528) □□□ Crypsis aculeata (L.) Ait.

260. □ □ Echinochloa Beauv.

(529) □ Echinochloa crusgalli (L.) Beauv.

(530) □□□ Echinochloa colonum (L.) Link

261. □□□□ Setaria Beauv.

(531) □□□□□ Setaria glauca (L.) Beauv.

(532) □□□ Setaria viridis (L.) Beauv.

262. □□□ Arthraxon Beauv.

(533) □ □ Arthraxon hispidus (Thunb.) Makino

□□□. □□□ Cyperaceae

263. □□□ Scirpus L.

(534) □□□□ Scirpus planiculmis Fr.Schmidt

(535) □□□□ Scirpus strobilinus Roxb.

(536) □ □ Scirpus tabernaemontani C.Gmel.

(537) □ □ Scirpus triqueter L.

264. □□□□ Blysmus Panz.

(538) □□□ Blysmus compressus(L.) Panz.

265. □□□ Eleocharis R.Br.

(539) □□□□ Eleocharis palustris (L.) Roem.et Schult.

(540) □□□□ Eleocharis argyrolepis Kier.ex Bunge

(541) □□□□ Eleocharis uniglumis (Link) Schult.

266. □□□ Cyperus L.

(542) □□□□ Cyperus fuscus L.

(543) □□□□ Cyperus difformis L.

267. □□□□ Juncellus (Griseb.) C.B.Clarke

(544) □□□ Juncellus serotinus (Rottb.) C.B.Clarke

268. □□□□ Pycreus Beauv.

(545) □□□□ Pycreus sanguinolentus (Vahl) Nees

269. □□□ Carex L.

(546) □□□□ Carex riparia Curt.

(547) □□□□ Carex rugulosa Kuk.

(548) □□□□□ Carex songorica Kar.et Kir.

(549) □□□□ Carex diluta Bieb.

(550) □□□□ Carex bigelowii Torr ex Schwein.

(551) □□□□ Carex stenophylloides V.Krecz.

□□□. □□□ Lemnaceae

270. □□□ Lemna L.

(552) □ □ Lemna minor L.

271. □□□ Spirodela Schleid.

(553) □ □ Spirodela polyrrhiza (L.) Schleid.

□□□. □□□□ Juncaceae

272. □□□□ Juncus L.

(554) □□□□□ Juncus bufonius L.

(555) □□□□ Juncus compressus Jacq.

(556) □□□□□ Juncus gerardii Loisel.

(557) □□□□□ Juncus articulatus L.

□□□. □□□ Liliaceae

273. □□□□ Eremurus M.Bien.

(558) □□□□□ Eremurus inderiensis (M.Bieb.) Regel

(559) □□□□□ Eremurus anisopterum (Kar.et Kir.) Regel

274. □□□□ Gagea Salisb.

(560) □□□□□ Gagea sacculifer Regel

(561) □□□□□ Gagea albertii Regel

(562) □□□□□ Gagea bulbifera (Pall.) Roem.et Schult.

275. □□□□ Tulipa L.

(563) □□□□□ Tulipa iliensis Regel

276. □□□ Fritillaria L.

(564) □□□□ Fritillaria karelinii (Fisch.) Baker

277. □ □ Allium L.

(565) □□□ Allium oreoprasum Schrenk

(566) □ □ Allium polyrhizum Turcz.ex Regel

(567) □□□ Allium caespitosum Siev.ex Bong.

(568) □□□ Allium setifolium Schrenk

(569) □□□ Allium pallasii Murr.

278. □□□ Polygonatum Mill.

(570) □□□□Polygonatum roseum (Ledeb.) Kunth

279. □□□□ Asparagus L.

(571) □□□□□ Asparagus persicus Baker

(572) □□□□□ Asparagus neglectus Kar.et Kir.

(573) □□□□□ Asparagus angulofractus Iljin

□□□. □□□ Amaryllidaceae

280. □□□□ Ixiolirion (Fisch.) Herb.

(574) □□□ Ixiolirion tataricum (Pall.) Herb.

□□□. □□□ Iridaceae

281. □□□ Iris L.

(575) □□□ Iris ensata Thunb.

(576) □ □ Iris lactea Pall.

(577) □□□□□ Iris songarica Schrenk

(578) □□□□ Iris halophila Pall.

(579) □□□□ Iris tenuifolia Pall.

A. Inventory of Fauna in Lake Aibi Natural Wetland Reserve

□□□ **AMPHIBIA**

□□□□**ANURA**

[□]□□□ Bufonidae

□. □□□ Bufo

(1)□□□ Bufo viridis Laurenti

[□]□□ Panidae

2□□□ Rana

(2)□□ Rana ridibunda Pallas

(3)□□ Rana catesbeiana Shaw

(4)□□ Rana altaica Kastschenko

□□□ **REPTILIA**

□□□□ **TESTU DINATA**

□□□□□ Testudinieae

1□□□□ Testudo

(1) □□□□ Testudo horsfleldi Gray

□□□□ **SQUAMATA**

□□□□ **Lacertilia**

□□□□□Agamidae

2□□□□ Agama

(2) □□Agama stoliczkana(Blanford)(□□□□)

(3) □□Phrynocephalus heliocopus(Pallas.)

(4) □□□□ Agallla himalayana(Steindachner)

(5) □□□□ Agama stolic Z kana

(6) □□□□ Agama sanguinolenta

(7) □□□□ Phrynocep halus grumgrzimailoi

(8) □□□□ Phrynocep halus albolineatus

(9) □□□□ Eremias przewalskii

(10) □□□□ Eremias vermiculata

□□□□□ Lacertidae

(11)□□□□ Eremias multiocellata

(12)□□□ Lacetra agilis exigua

□□□□ **SERPENTES**

1□□□Boidas

(13) □□□□ Eryx tatriucs

2□□□□ Golabridas

(14)□□□□ Goluber ravergieri

(15)□□ Natrix natrix

(16) □□□□ Natrix tessellata

(17)□□□□ Elaphe dione

(18) □□□ Psammophis lineolatus

3□□□ Viperidae

(19)□□□ Vipera berus

(20)□□□ Vipera ursinii

□□□MAMMALIA

□□□□ **Insecti vora**

□□□□ Erinaceidae

(1) □□□ Hemiechinus auritus Gmelin

□□□□ **Carnivora**

□□□□ Ccnidae

(2) □ Canis Lupus Linnaeus

(3) □□ Vulpes corsac Linnaeus

(4) □□ Vulpes vulpes Linnaeus

□□□□ Muserlidae

(5) □□ Vormela peregusna Guldenstaedt

(6) □□ Mustela eversmanni L.

(7) □□ Musteal nivalis Linnaeus

(8) □□ Meles meles linnaeus

(9) □□ Lutra lutra Linnaeus

□□□□ Felidae

(10) □□ Felis mamul Pallas

(11) □□ Lynx Lynx

(12) □□□□ Felis silvestris

(13) □□□ Felis bieti

□ □□□ **Artiodactyla**

□□□□ Suidae

(14) □□ Sus scrofa Linnaeus

□□□□ Ceruidae

(15)□□ Cervus elaphus Linnaeus

□□□□ Bovidae

(16)□□□Gaxella subgutturosa Guldenstaedt

□□□□ **Lagomorpha**

□□□□ Leporidae

1□□□ Lepus Linuaeus

(17)□□ Lepus capensis Linuaeus

□□□□□ Ochotonidae

2□□□□ Ochotona Link

(18) □□□□ Ochotona pallasi Gray

□□□□ **Rodentia**

□□□□□ Cricetidae

□□□□ Cricetinae

3□□□□ Cricetulus Milne—Edwards

(19)□□□ Cricetulus migratorius Palls

(20)□□□□Cricetulus Longicaudatus Milne—Edmards

□□□□ Microtinae

4□□□□ Microtus Schrank

□21□□□□ Microtus oeconomus Palls

□□□□Gerbilinae

5□□□□ Meriones Illiger

□22□□□□□ Meriones tamari scinus Palls

□23□□□□□ Mereones libycus Lichtenstein

6□□□□□ Rhombomys Wager

□24□□□□ Rhombomys opimus Lichterslein

□□□□□□ Dipodidae

7□□□□□□ Euchoreutes Sclater

□25□□□□□ Euchoreutes naso Sclater

8□□□□□□ Allactaga Cuvier

□26□□□□□ Allactaga Sibirica Forster

□27□□□□□□ Allactaga elater Lichterstein

□□□□□ Muridae

9□□□□ Rattus Firscher

□28□□□□ Rattus uorvegicus Berkenhout

□29□□□□ Rattus flauipectus Milne--Edwards

10□□□□ Mus Linnaeus

□30□□□□ Mus musculus Linnaeus

11□□□□Apodemus Kaup

□31□□□□□ Apodemus sylvaticus Linnaeus

□□□□ CHIROPTERA

□□□□□□ Vespertilion Idae

□32□□□□□ Vespertilio murinus

□33□□□□ Plecotus auritus

□□ AVES

□□□ □□□ PODICIPEDIFLRMES

□□□□ □□□ Podicipcdidae

1□□□□ □□ Tachybaptus ruficollis(pall)

2□□□□ □□ Podiceps auritus(L)

3□□□□□ □□ Podiceps cristaus(L)

□□□□□□ P.c.cristaus(L)

□□□□ Pelecanidae

4□□□□ Pelecanus onocrotalus L.

5□□□□□ Pelecanus philippensis Gmel.

□□□□□□ P.phcrispus Bruch.

□□□□□ Phalacrocoracidae

6□□□ Phalacrocorax carbo L.

□□□□□□ Ph.c.sinensis(Blum)

□□□□ CICONIIFORMES

□□□□ Ardeidae

7□□□ Ardea cinera L.

□□□□□□ A.c.cinerea L.

8□□□□ Egretta alba(L.)

□□□□□□E.a.alba(L.)

□□□□ Cicomiidae

9□□□ Cicomia ciconia(L.)

□□□□□□C.c.asiatica Sev.

10□□□ Ciconia nigra(L.)

□□□□ **ANSERIFORMES**

□□□□ Anatidae

11□□□ Anser cygonides(L.)

12□□□ Anser anser(L.)

13□□□□ Cygnus cyagnus(L.)

□□□□□□ C.c.cygnus(L.)

14□□□□□ Cygnus ollr(Gmclin.)

15□□□□ Tadorna ferruginea(Pall.)

16□□□□□ Tadorna tadorna(L.)

17□□□□ Anas acuta L.

□□□□□□A.a.acuta L.

18□□□□ Anas platyrhynchos L.

□□□□□□A.p.platyrhynchos L.

19□□□□ Anas strepera L.

(□□□□) A.s.strepera L.

20□□□□ Anas penelope L.

21□□□□ Anas querquedula L.

22□□□□ Anas clypeata L.

23□□□□□ Netta rufina (Pall.)

24□□□□□ Aythya nyroca(Guld.)

25□□□□□ Aythya baeri(Radde.)

26□□□□□Aythya fuligula(L.)

27□□□□□□ Mergus albellus(L.)

28□□□□□□ Mergus merhanser L.

(□□□□) M.m.merganser L.

□□□□ **FALCONIFORMES**

□□□□ Accipitridae

29□□ Milvus korschum(Gmel.)

□□□□□□ M.k.lineatus (J.E.Gray.)

30□□□ Accipiter gentilis (L.)

□□□□□□ A.g.schvedovi(Menz.)

31□□□□ Accipiter badius (Gmel.)

(□□□□)A.b.cenchroides(Sev.)

32□□□ Accipiter nisus(L.)

(□□□□ similis(Tick.)

33□□□ rufinus(Cretz.)

□□□□□□□B.r.rufinrs(Cretz.)

34□□ eo buteo(L.)

(□□□□□ B.b.vulpinus(Gloger.)

35□□□ teo lagopus(Pont.)

(□□□□□ B.l.menzbieri Dement.

36□□□ Aquila chrysaetos(L.)

□□□□□□ A.c.daphanea Menz.

37□□□ A.clanga Pall.

38□□□□□ Haliaeetus leucoryphus(pall.)

39□□□Aegypius monachus(L.)

40□□□□□ Gyps himalayensis.Hume.

41□□□□ Gypaetus barbatus(L.)

□□□□□□G.b.aureus(Hutt.)

42□□□□ Circus aeruginosus(L.)

□□□□□□C.c.cyaneus(L.)

43□□□□ Circus aeruginosus(L.)

□□□□□□C.a.aeruginousus(L.)

44□□Pandion haliatus(L.)

□□□□□□P.h.haliatus(L.)

□□□□Falconidae

45□□□ Falco cherrug j.e.Gray.

□□□□□□F.c.milvipes Jerd.

46□□□ Falco rusticolus L.

(□□□□) F.r.obsoletus (Menz.)

47□□□ Falco subbuteo L.

□□□□□□F.s.subbuto L.

48□□□□ Falco columbarius L.

□□□□□□F..c.lymani Bang.

49□□□□ Falco naumanni Fleis.

50□□□ Falco tinnunculus L.

(□□□□)E.t.tinnunculuse L.

□□□□ **GALLIFORMES**

□□□□ Phasianidae

51□□□ Alectoris chukar(Meis.)

□□□□□□ A.c.dzungarica Sush.

52□□□□ Perdix perdix(L.)

□□□□□□P.p.robusta Hom.etc

53□□□□□Perdix dauuricae(Pall.)

□□□□□□P.d.dauuricae(Pall.)

54□□□ Conturmix coturnix(L.)

□□□□□□ C.c.coturnix(L.)

55□□□□ Phasianus colchicus L.

(□□□□□)Ph.c.mongolicus J.F.Brah.

□□□□ **GRUIFORMES**

□□□□ Gruidae

56□□□Grus grus(L.)

□□□□□□G.g.lilfordi sharpe.

57□□□□ Anthropoides virgo(L.)

□□□□□□ Rallidae

58□□□□□ Rallus apuaticus L.

□□□□□□R.a.korejewi Zarud.

59□□□□ Gallnula chloropus(L.)

□□□□□□G.ch.chloropus(L.)

60□□□□ Fulica atra L.

□□□□□□ F.a.atra L.

□□□□□ Otidae

61□□□ Otis terax L.

□□□□□□O.t.orentalis Hart.

62□□□ Otis tarda L.

(□□□□) O.t.tarda L.

63□□□□ Otis undulata(Jacq.)

(□□□□) O.u.macqueenii J.E.Gray.

□□□□□ **CHARADRIIFORMES**

□□□□ Haematopodidae(L.)

64□□ Haematopus ostralegus (L.)

□□□□□□H.o.osculans Swin.

□□ □□□Charadriidae

65□□□□□ Vanellus vanellus(L.)

66□□□□□ Charadrius dubius Scop.

(□□□□)Ch.d.curonicus Gmel.

67□□□□□ Charadrius alexandrinus L.

(□□□□) Ch.a.alexandrinus L.

68□□□□□□ Charadrius mongolus Pall.

□□□□□□Ch.m.pamirensis(Rich.)

69□□□□□ Charadrius asiaticus Pall.

□□□□□□Ch.a.asiaticus Pall.

□□□□□ Scolopacidae

70□□□□ Tringa totanus (L.)

□□□□□□ T.t.totanus(L.)

71□□□□□ Tringa ochropus L.

72□□□ Tringa hypoleucos L.

73□□□□ Gallinago solitaria(Hodg.)

□□□□□□ G.s.solitaria(Hodg.)

74□□□□ Crocethia alba(Pall.)

□□□□□□□ Recurvirostidae

75□□□□□□ Himantopus himantopus (L.)

□□□□□□ H.h. himantopus (L.)

76□□□□ Recurvirostra avosetta L.

□□□ □□□□ Burhinidae

77□□□□□ Burhinus oedicnemus L.

(□□□□) B.o.astutus Hart.

□ □□□ **LARIFORMES**

□□□□□ Laridae

78□□□ Larus argentatus Pont.

□□□□□□L.a.cachinnans Pall.

79□□□□ Larus ridibundus L.

80□□□□ Larus brunnicephalus Jerd.

81□□□□□ Childonias leucoptera (Temm)

82□□□□□ Sterna hirundo L.

□□□□□□ S.h.hirundo(L.)

83□□□□□ Sterna albifrons Pall.

□□□□□□ S.a.albifrons Pall.

84□□□Larus rdlictus lonnlerg.

85□□□ larusminajns

□ □□□ COLUMBIFORMES

□□□□□□ Pteroclididae

86□□□□□ Syrrhaptes paradoxus (pall.)

87□□□□□ Pterocles orientalis L.

□□□□□□P.o.arenarius (Pall.)

□□□□□□ Columbidae

88□□□ Columba rupestris Pall.

□□□□□□ C.r.turkestanica Bururl.

89□□□ Columba livia Gmel.

□□□□□□ C.l.neglecta Hume.

90□□□ Columba oenas L.

□□□□□□C.o.yarkandensis Buturl.

91□□□□ Columba eversmanni Bonap.

92□□□□ Streptopelia turtur(L.)

□□□□□□ S.t.arenicoal (Hart.)

93□□□□ Streptopelia orientalis (lath.)

□□□□□□ S.o.meena(Syk.)

94□□□□ Streptopelia decaocto (Friv.)

□□□□□□ S.d.stoliczkae(Hume.)

□ □□□ CUCULIFORMES

□□□□□□□ Cuculidae

95□□□□ Cuculus canorus L.

(□□□□) C.c.canorus L.

□□□□□□C.c.subtelephonus zarud.

□□□□□ STRIGIFORMES

□□□□□□□□ Strigidae

96□□□□□ Otus scops (L.)

□□□□□□ O.s.pulchellus(Pall.)

97□□□□ Bubo bubo(L.)

(□□□□) B.b.yenisseensis Butur.

98□□□□□□□ Athene noctua (Scopoli.)

□□□□□□ A.n.plumipes Swin.

99□□□□□ Asio otus (L.)

□□□□□□A.o.otus(L.)

□□□□□□ **CAPRIMULGIFORMES**

□□□□□□□ Caprimulgidae

100□□□□ Caprimulgus europaeus L.

□□□□□□ C.e.europaeus L.

□□ □□□ **APODIFORMES**

□□□□□□□ Apodidae

101□□□ Apus apus (L.)

□□□□□□ A.a.pekinensis(Swin.)

□□□□□□□ **CORACIIFORMES**

□□□□□□□ Alcedinidae

102□□□□□ Alcedo atthis(L.)

□□□□□□A.a.atthis(L.)

□□□□□□□ Meropidae

103□□□□□ Merops apiaster L.

□□□□□□□□ coraciidae

104□□□□□□ Coracias garrulus L.

□□□□□□ C.g.semenowi Loud.etc.

□□□□□□□ Upupidae

105□□□ U pupa epops L.

□□□□□□ U.e.epops L.

□□□□□□U.c.saturata Lonnb.

□□□ □□ **PICIFORMES**

□□□□□□□□ Picidae

106 □□□□□□ Pocoides major(L.)

□□□□□□ P.m.tianshanicus (Buturl.)

107□□□□□□ Pocoides leucopterus(Salv.)

(□□□□)P.l.leptorhynchus(Sev.)

108□□□□□□ Pocoides leucotos(Bech.)

□□□□□□ P.l.leucotos(Bech.)

109□□□□□□ Pocoides minor(L.)

(□□□□) P.m.kamtschakensis(Malh.)

□□□□□ **PASSERIFORMES**

□□□□□□ Alaudidae

110□□□□□ Melanocoryha bimaculata(Menet.)

(□□□□) M.b.bimaculata(Menet.)

111□□□□ Melanocoryha yelteniensis(Forst.)

112□□□□□□ Calandrella cinerea(Gmel.)

(□□□□)C.c.longipennis(Ever.)

113□□□□□□ Calandrella acutirostris Hume.

(□□□□)C.a.acutirostris Hume.

114□□□□□ Calandrella rufescens(Vie.) (□□□□) C.r.rseebohmi(Sharpe.)

115□□□□□ Galerida cristata(L.)

(□□□□)G.c.magna Hume.

116□□□ Alauda arvensis L.

(□□□□)A.a.dulcivox Hume.

117□□□□ E remophila alpestris(L.)

(□□□□)E.a.brandti (Dress.)

□□□□□□Hirundinidae

118□□□□□□ Riparia riparia (L.)

(□□□□) R.r.diluta (Sharpe.etc.)

119□□□ Ptyonoprogne rupestris(Scop.)

(□□□□)P.r.rupestris(Scop.)

120□□□ Hirundo rustica L.

(□□□□) H.r.rustica L.

121□□□□ Delichon urbica (L.)

□□□□□□ D.u.urbica(L.)

□□□□□□□□□ Motacillidae

122□□□□□□ Motacilla flava L.

(□□□□□) M.f.leucocephala(Prz.)

(□□□□)M.f.melanog risea(Hom.)

123□□□□□□□ Motacilla citreola Pall.

(□□□□) M.c.werae(Buturl.)

124□□□□□□ Motacilla cinerea Tuntst.

(□□□□) M.c.robusta(Brehm.)

125□□□□□□ Motacilla alba L.

(□□□□) M.a.personata Gould.

126□□□ Anthus novaeseelandiae(Gm.)

(□□□□) A.n.richardi Vieill.

(□□□□) A.n.centralasiae(Kist.)

127□□□□ Anthus campestris L.

(□□□□) A.c.griseus Nicoll.

128□□□ Anthus spinoletta L.

(□□□□) A.s.coutellii Aud.

□□□□□□□ Laniidae

129□□□□□ Lanius colluril L.

(□□□□) L.c.phoenicuroides (Sch.)

(□□□□) L.c.speculigerus Tacz.

130□□□□□ Lanius minor Gmel.

(□□□□) L.m.turanicus Fed.

131□□□□ Lanius excubitor L.

(□□□□)L.e.mollis Ever.

(□□□□□) L.e.funereus Menz.

□□□□□□□ Oriolidae

132□□□□ oriolus oriolus(L.)

(□□□□) O.o.oriolus(L.)

□□□□□□□ Sturmidae

133□□□□□ Sturnus roseus(L.)

134□□□□□ Sturnus vulgaris L.

□□□□□□ S.v.poltaratskyi Fins.

□□□□□□ Corvidae

135□□□ Pica pica(L.)

(□□□□) P.p.bactriana Bonap.

136□□□□□ Podoces hendersoni Hume.

137□□□□□ Corvus frugilegus L.

(□□□□) C.f.frugilegus L.

(□□□□)C.f.pastinator Gould.

138□□□ Corvus monedula L.

(□□□□) C.m.monedula L.

139□□□□□ Corvus macrorhynchos Wag

(□□□□) C.m.tibetosinensis K.et.W.

140□□□□□ Corvus corone L.

(□□□□) C.c.sharpii Oates.

□□□□□□ C.c.orientalis Ever.

141□□□ Corvus corax L.

(□□□□) C.c.kamtschaticus Dybov.

□□□□□□□ Muscicapidae

(一) □□□ Turdinae

142□□□□□ Luscinia megarhynchos Brehm

(□□□□) L.m.hafizi(Sev.)

143□□□□ Luscinia svecica (L.)

(□□□□) L.s.saturatior(Sush.)

144□□□□□□ Phoenicurus caeruleocephalus Vigors

145□□□□□ Phoenicurus ochruros(Gmel)

(□□□□)Ph.o.phoenicuroides H.etc.

146□□□□□□ Phoenicurus erythrogaster(Guld.)

(□□□□) Ph.e.grandis (Gou.)

147□□□□ Saxicola torquata (L.)

(□□□□) S.t.maura(Pall.)

148□□ Oenathe isabellina (Cretz.)

149□□ Oenathe oenaethe(L.)

□□□□□□ O.d.oenahthe(L.)

150□□ Oenanthe deserti (Temm.)

151□□□ Oenanthe hispanica(L.)

□□□□□□O.h.pleschanka(Lep.)

152□□□□□ Monticola saxatilis(L.)

153□□□□ Turdus ruficollis Pall.

(□□□□) T.r.ruficollis Pall.

□□□□□□□ Timaliinae

154□□□□ Panurus bisrmicus (L.)

□□□□□□ P.b.russicus (Brehm.)

□□□□□□ Sylviinae

155□□□□□ Acrocephalus agricola(Jerd.)

(□□□□) A.a.brevipennis Sev.

156□□□□ Hippllais caligata(Lich.)

□□□□□□ H.c.caligata(Lich.)

157□□□□□ Sylvia curruca(L.)

□□□□□□S.c.blythi Ticeh.

158□□□□□□ Sylvia minula Hume

(□□□□) S.m.minula Hume.

159□□□□ Sylvia nana (Hemp.etc)

(□□□□) S.n.nana(Hemp.etc)

160□□□□□ Phylloscopus inornatus(Blyth.)

(□□□□) Ph.i.humei(Brooks.)

161□□□□Phylloscopus sibilatrix Bech

□□□□□□□ Muscicapinae

162□□□□□□□ Ficedula mugimaki (Temm.)

□□□□□□□ Paridae

163□□□□ Parus major L.

□□□□□□P.m.kapustini Port.

164□□□□□ Parus bokharensis Lich.

(□□□□□) P.b.turkestanicus Z.et.L.

165□□□□□ Parus cyanus Pallas.

(□□□□) P.c.tianschanicus(Menzb.)

166□□□□□ Parus plaustris L.

(□□□□□P.p.brevirostris(Tacz.)

□□□□□□□ Remizidae

167□□□ Remiz pendulinus (L.)

(□□□□) R.p.coronatus(Sev.)

□□□□□□Ploceidae

168□□□□ Passer domesticus(L.)

(□□□□) P.d.bactrianus Zar.etc.

169□□□□□ Passer hipaniolensis(Tem.)

(□□□□)P.h.transcaspicucs Tsch.

170□□□□□ Passer ammodendri Gould.

(□□□□) P.a.nigricans Step.

171□□□□□□ Passer mintanus(L.)

(□□□□) P.m.dilutus Rich.

172□□□ Petronia petronia(L.)

(□□□□) P.p.intermedia Hart.

173□□□□□□ Montifringilla nivalis(L.)

(□□□□) M.n.alpicola(Pall.)

□□□□□□ Fringillidae

174□□□ Fringilla mimtifringilla L.

175□□□□□ Serinus pusillus (Pall.)

176□□□□□□ Carduelis carduelis L.

(□□□□) C.c.paropanisi Koll.

177□□□□□□ Carduelis cannabina(L.)

(□□□□) C.c.bella(Brehm.)

178□□□□□ Rhodopechys obsoleta(Lich.)

179□□□ Rhodopechys githagineus(Lich.)

□□□□□□R.g.mongolicus (Swin.)

180□□□ Carpodacus erythrinus (Pall.)

□□□□□□C.e.roseatus(Blyth.)

181□□□□ Uragus sibiricus(Pall.)

(□□□□) U.s.sibiricus (Pall.)

182□□□□ Coccothraustes coccothraustes(L.)

□□□□□□C.c.coccothraustes(L.)

183□□□□□□□ Mycerobas carnipes(Hodg.)

□□□□□□M.c.carnipes(Hodg.)

184□□□□□ Emberiza bruniceps Brandt

185□□□□□ Emberiza aureola Pall.

□□□□□□ E.a.aureola Pall.

186□□□□□ Emberiza buchanani Blyth.

(□□□□) E.b.neobscura Paynter.

187□□□□□□□ Emberiza cioides Brandt.

(□□□□) E.c.cioides Btandt.

188□□□□ Emberiza rustica Pall.

□□□□□□ E.r.rustica Pall.

189□□□□ Emberiza pusilla Pall.

190□□□□ Emberiza schoeniclus L.

(□□□□) E.s.passerina Pall.

□□**FISHES**

□□□**CYPINIFORMES**

□□Cyprinidae

(1)□□ Cyprinus carpio

(2)□Carassius auralus

(3)□□Phoxinus brachy urus

(4)□□□□□□

(5)□□□□

(6)□□□□□

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(10)□□□□